STEG Virtual Course on
"Key Concepts in Macro Development"

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Lecture 3: Key theories

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Presentation Slides

Video

Q: Were the three sectors originally defined in a "yeah, that makes sense" sort of manner, or in a more data-driven/empirical manner?

> A: I've always figured that agriculture and manufacturing looked to be about one-third each of the economy back in the US in the 1920s and 1930s when Kuznets and others were putting together the structures of national accounting. So a third sector that was "everything else" kind of made sense, and a lot of it was recognizably distinct. But there was no theoretical understanding of how they differed, that I've ever found. (Happy to be educated, if someone else knows differently.)

> A: Perhaps definitions also reflect theories of value and production boundaries originating from Quesnay through to Smith, etc?

Q: What is the link between balanced growth and the fact that the model can be solved analytically?

> A: A balanced growth path means that there is a normalization that yields a steady state solution. This means you are only solving for those steady state values rather than an entire dynamic path.

Q: Final expenditures are counted from the sectors side or the final users. can it be elaborated more?

> A: This was just intended as a quick summary... But final expenditures are counted from the side of final users. The national accounts have the property that there are three parallel structures -- a production side, an expenditure side, and an income side. Because they are accounting concepts, they all have to arrive at the same total. But expenditures is a concept from the ... expenditure account. What Berthold was talking about was the mapping from there into the production sectors, which is not quite as straightforward as you might think.

> A: In the input-output table, VA + intermediate input = intermediate usage + final consumption roughly. So I think it's feasible to compute final consumption from sector statistics, if there's enough information. Hope this helps.

Q: Is there literature on the inflection point in manufacturing share of these fairly rich countries. T I'm curious because if poorer countries are added to the panel, these countries would perhaps all fall on the downward part of the curve..

> A: There is a very recent literature making progress on understanding the hump shape. The state of knowledge is that an increase in investment rates is key to understanding the growth, and a falling relative price of manufacturing is key to understanding the decline. The latter is driven by high relative productivity growth in manufacturing.

> A: Yes, there certainly is a literature on this. I think Berthold will be getting to this in a few minutes. A question is whether this is driven by something to do with manufacturing, or by services.

> A: What is also interesting is that the poorer countries hit a maximum level (a high point in the hump) that is much lower than the historic levels hit by countries that went through the transition in the past.

Q: Can one make similar graphs for consumption patterns? i.e. do we see that rich countries also decrease consumption of goods & food relative to services as countries get richer or are they still important due to the shift of manufacturing and agricultural output from domestic to imported?

> A: We see this in consumption, but consumption is somewhat distinct… e.g., people use food as a replacement for agriculture, but the agriculture content of final expenditures on food are typically small. Trade matters of course, but you see structural transformation in both consumption and investment composition, not just production.

> A: There's a neat paper by Berthold and Akos Valentinyi, in the Review of Economic Dynamics, that looks at this issue in more detail.

Q: Is there any relationship between inverted U shape of manufacturing and concern for Green GDP?

> A: Very much so. If you thought that manufacturing was the 'dirty' sector (not obvious, but plausible) then you might see the downward-sloping part of the inverse U as an optimistic sign... But you might also worry that the downward-sloping part needs to be understood in the context of a world economy with lots of trade, so that there is a possibility that the dirty activity is just being displaced. So it's a complicated world!

> A: There is work by Stefanski linking structural transformation patterns to the demand for oil.

Q: Given these facts, can we say a good policy for issues like low agriculture productivity would be to focus on structural transformation?

> A: It's certainly possible that one of the policy approaches to economies where agricultural productivity is very low is to think about ways to move people into other sectors. For many countries with extremely high shares of the economy in low-productivity agriculture, moving people out of agriculture may be an important policy response.

> A: Later in the literature we will explore why structural transformation happens. You could argue that if there are any barriers that preclude a country from making the transition, it would be a good policy to overcome those restrictions. I am not an expert on this, but I think this is related to the misallocation literature. Basically, think about what happens when a country allocates its resources in the "wrong" (less productive sector)

Q: About the Hump shape in manufacturing, possibly (I don't know) somehow related with outsourcing industrial activities to other countries? Can we expect a change on this? given the problems derived from not controlling a large share of the production chain in developed countries in current times.

> A: This is an interesting point. It is true that the patterns in world employment in industry look relatively flatter than we see within countries, almost certainly because of open-economy effects. But it seems that a lot is also driven by the patterns of demand for agriculture and services, so it's not all about trade.

Q: What are precisely the long turn impacts of bypassing manufacturing sector (missing middle) in structural transformation?

> A: We don't really know, to be honest. There is a widespread view in policy circles that manufacturing is an *essential* stage of transformation and that economies which skip manufacturing are wounded forever after. But the empirical evidence for this is pretty weak. This is precisely an area of research that we are aiming at in STEG. What exactly is so special about manufacturing? And if we can specify those special characteristics, can we find those same characteristics in other sectors? I wish I had a good answer to this question!!

Q: What are the fundamental differences between manufacturing and services? Maybe back in the time, services use labor intensive technologies, now they use capital intensive ones. Does this matter and does the current framework capture this?

> A: First, manufacturing produces tangible goods, while services provides intangibles. That is in terms of definitions. In terms of production, it is still true that manufacturing is more intensive in capital than services. That said, both sectors have incorporated more capital, in the form of equipment, because the price of capital has fallen significantly. The framework does capture this, to an extent, as the capital intensity will be increasing. But, because of the assumptions in the production function (exponent theta is the same in both sectors) the capital/labor ratio will be the same in both sectors (i.e. increase equally)

> A: Great question. I think it's a really blurry area. In fact, one of my favourite examples includes all three sectors. If I buy beans from the market, this is an agricultural purchase. If I buy a can of beans, it's a manufactured goods. And if I buy the beans heated and served on a plate, it's food service... The fundamental distinctions between sectors are often unclear, and this is one of the challenges that we face in trying to theorize the sectoral patterns of growth. As you say, it's not clear that services are more labor-intensive, or lower productivity, etc. The current framework captures the patterns that we observe in the data, but we are all very much trying to understand whether those patterns are driven by the ways in which sectoral output is defined and measured -- or whether there is something more fundamental at work.

Q: Are capital-labor ratios actually similar to each other across sectors, empirically?

> A: This is related to the question about factor income shares by sector. They do differ, and there is the question about how to think about land (especially for agriculture), but they don't differ as much as you might think (if we aggregate land and capital).

> A: They are less different than you might think. (That's not a great answer, I know!!) They also differ within sector across country, because of movement along isoquants. For example,

agriculture has an incredibly high capital-labor ratio in rich countries but a very low one in the poorest contries. Within countries, these ratios don't look *very* different, in many cases. But Berthold is talking a bit about this now.

Q: If we look at the cross-sectional data of the world today, we see that the service share is above 40% even for currently developing countries. It seems to suggest the current global economic environment is very different from the historical one. Can you provide insight on how we should interpret this pattern?

A: This is a great and open question: Qualitatively, historic patterns look like today's patterns, but how quantitatively different are patterns today than historically and why? It may be the result of different productivity patterns in agriculture and industry, or different relative prices because of globalization. That said, if you look at the U.S., the share of services was roughly 40% even in the 19th century.

A: You are exactly right. I wrote a bit about this in an answer to another question. Countries seem to be reaching a maximum level of manufacturing (the top of the hump) at a much lower level than was true for the countries that went through the structural transformation process at an earlier stage of history. Why? Possibly because the world is richer... Possibly because the world is more open to trade... Possibly because the world has changed.

Certainly there are questions about whether some of today's poorest countries can expect to reach the high levels of industrialization that they are hoping for.

I guess I'd say that this is one of the central questions that we are hoping to understand better through the research of the STEG programme. Lots of questions, fewer answers!!

Q: Is there full employment in the model?

A: Yes, there is. $w > 0$ and workers don't have disutility from working.

Q: Can Generalized Stone-Geary utility be extended to accommodate "love of variety"/differentiated goods?

A: Yes. It's fairly straightforward to have one of the consumption goods be a composite of differentiated goods... If you were thinking instead about having different minimum consumption requirements for different goods, I think that would also be straightforward, but I don't have an example in my head.

Q: Relative prices are determined by technology. Kindly explain a bit.

A: Well, relative prices are determined by supply and demand for different goods. Given a set of preferences, different levels of technology will affect the supply side. A productivity increase in a particular good would tend to drive down the relative price of that good... But the extent to which it will do so depends on whether that good has acceptable substitutes and complements from the perspective of the consumer. Does that make sense?

A: In general, if a sector has high productivity, it's output will be relatively cheap as it will use fewer resources. The assumption of identical Cobb-Douglas exponents in each sector make this exactly true: resources are used in equal proportions, so one can think of it as a bundled resource of capital and labor with a linear production technology. With a linear production possibility frontier, relative prices are always the inverse of relative productivities.

A: As long as you are interior (producing a mix of goods).

Q: Is there any work done on Tangible vs intangible investment? I can imagine how R&D plays a significant role here, specially when countries like Japan, China, Korea, US and some European countries represent almost all the R&D expenditure in the planet.

A: There's lots of interest in trying to figure out how to account properly for intangible investment. And yes, it's probably concentrated in some countries... I'll defer to others to offer specific citations here, though... it's not my area. :)

A: Tangible vs intangible worries me 70% of the time :). thank you

A: Not sure I fully follow your question: are you asking something specific to structural transformation? Certainly, there is work on tangible vs. intangible capital and the role of R&D. Empirically, the difference between market value of a firm and the book value is often used as a measure of intangible capital. Theoretically, there is a lot of work (e.g., by McGrattan and Prescott, Luttmer, and others) on firms' investment in intangible capital.

A: I'm wondering if this "intangible" investment is accounted in services or manufacturing. They differ in characteristics but they both share the spirit of trading consumption for a productive investment. So, employment and GDP shares might be affected by this. Yeah, I know Mcgrattan and Prescott, great references.

Q: Going back to a point in Rogerson's lecture about the technology frontier having more relevance to growth in rich countries, how can we really say that labor-augmenting tech progress is exogenous? I would imagine tech progress is very endogenous to sectoral compositions and productivity.

A: IE, in lower-income countries the argument about exogeneity might hold more water.

A: I think that was very much the nature of Richard's point in his lecture. If you want to think about the technology frontier for the world, you would very much need to model the process of innovation and technical change. But if you are focusing on low-income economies, as we are in this course, it might be reasonable to get away with modelling the changes in the world frontier as exogenous.

Q: How important in this model is the property that aggregate production should add over industries? What if the sum of industries' production doesn't equate the production we get when we plug aggregate K and N in the production function?

A: We will discuss heterogeneous producers, misallocation, etc. later in the course. This is a very important topic. Sometimes, you can write things as an aggregate production function, but the distribution across industries, firms, etc. simply matters for the resulting productivity. Sometimes you cannot write an aggregate production function.

Q: Are there papers that consider models of structural transformation in an open-economy setting or under international trade? Can you recommend some?

A: A couple older papers: Matsuyama (2009) and Uy, Yi, and Zhang (2013) show theoretically and quantitatively that trade matters. There is work on the distinction between VA trade and output at the sector level by Johnson and Noguera. Some working papers by Sposi, Yi, Zhang,

A: We'll get to this later in the course, but there is actually surprisingly little. The obvious reference is Matsuyama.

https://www.sciencedirect.com/science/article/pii/002205319290057O

A fascinating paper is by Uy, Yi, and Zhang

https://ideas.repec.org/a/eee/moneco/v60y2013i6p667-682.html, and another nice paper is Trevor Tombe's paper on "The Missing Food Problem."

There is starting to be a literature here!

Q: The light shedding of this model rely only on the preferences properties in my understanding. Why is then the model useful? Is there any policy implication of the exploit of generating the empirical facts in the model alone?

A: If I understand your question right, the model generates a transformation from a mixture of preference effects and technology effects. More precisely, you could think about income effects, relative price effects, and other preference-side effects. Preferences affect the relative prices, but so does the differential rate of productivity change across sectors, as in Ngai and Pissarides, for example.

Q: This all assumes closed economy. Has it been explored if the force behind is the demand of goods of a certain kind from RoW?

A: In a response to a previous question a second ago, I suggested a few references. What is true is that there is far less work on open economy models.

Q: What is the impact of the reallocation of industries from developed countries to less developed ones?

A: A couple of previous responses in the Q&A touch on this... There is certainly some effect from offshoring, but I think many of us believe that the closed economy effects must be important, because of the ways in which the patterns of structural transformation seem to be reproduced so similarly across economies. But you are right to be asking this question. It's an important issue.

Q: Has there been any work that get rid of the "perfectly competitive" market structure, at least in the manufacturing and service sector? some references would help.

A: There are certainly papers -- including much of the macro development literature -- that take this basic model and add various kinds of market failures and frictions. We typically start with the competitive model and then add in monopolistic power, or distortionary policies, or public goods and externalities... I don't know if that's the question you're asking, though...

Q: Are there perhaps more micro-level studies about what happens to countries during the hump phase (when their manufacturing sector peaks)?

A: Good question. I'm not aware of anything that does exactly that. But there is lots of work trying to use firm-level micro data in new and innovative ways to think about structural transformation questions... so there is room for research!

Q: Is there any paper, or would it be easier to explain the hump shape of the manufacturing sector, if that is the only consumption sector that is taken? I mean having all three sectors could complicate matters when it comes to showing the hump behaviour...

A: It doesn't make much sense to think about the hump shape with fewer than three sectors. Because the agriculture share falls steadily (for reasons that we understand pretty well), if we only had manufacturing as the other sector, it would simply rise... so the hump shape actually doesn't make sense without a services sector. Does that make sense?