Discussion of

Engines of Sectoral Labor Productivity Growth
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Quick Summary

- **What is the source of labor productivity growth, by sector?**
- Nested CES production function by sector:
  1. 3 sectors (islands), 3 occupations, 2 types of capital
  2. Capital (2) and labor (3) augmenting productivities, for each sector
  3. So $5 \times 3 = 15$ “productivities”
- **Capital vs Labor**: labor-augmenting quantitatively more important
- **Traditional vs ICT Capital**: traditional capital more important
- **Occupation vs Sectors**: occupation-specific more important
Quick Comments

+ Transparent framework, easy to understand where the decompositions are coming from
+ Comprehensive empirical work to understand how different layers of the macroeconomy affect sectoral productivity
- Not sure what LFP is (as opposed to TFP), or why we should care
- What is “technology?”
What is Technology?

1. Accounting vs. counterfactuals (always) a problem in such calibration exercises
   \[(c.f. \text{I’m also a guilty of this...})\]

2. As a quantitative exercise, the framework is useful in identifying in which dimensions we should be looking if we want to understand sources of (sectoral) productivity growth:
   - Things that affect capital or labor?
   - Which types of capital and labor?

3. The quantitative framework gives clean-cut answers

4. But it does not mean $\alpha$’s are actually technology, nor that it is biased toward particular inputs

$\Rightarrow$ $\alpha$’s in this framework are essentially wedges, that we cannot account for from observable data
Primitives

\[
Y_{\sigma} = (\alpha_{kj}k_{j})^{\sigma} + \\
\left[ \alpha_{mJl_{mJ}}^{\rho-1} + \left( \alpha_{rJl_{rJ}}^{\sigma-1} + \alpha_{cJcJ}^{\sigma-1} \right)^{\sigma_{c}(\rho-1)} \sigma_{c} + \alpha_{mJl_{mJ}}^{\rho-1} \right]^{\sigma-1} \rho
\]

1. Changing \(\alpha\)'s or inputs are symmetric
2. No need to analyze separately, can just compare \(\alpha\) changes directly against input changes
3. For accounting, the actual values of the changes are more relevant (i.e., is it ir/relevant because the values (don't) change a lot, or despite (not) changing a lot?)
Biased Technology or Diff. Elast. of Substitution?

\[
Y_j^{\frac{\sigma-1}{\sigma}} = (\alpha_{kj}k_j)^{\frac{\sigma-1}{\sigma}} + \\
\left[ (\alpha_{mJ}l_{mJ})^{\frac{\rho-1}{\rho}} + \left( (\alpha_{rJ}l_{rJ})^{\frac{\sigma_c-1}{\sigma_c}} + (\alpha_{cJ}c_j)^{\frac{\sigma_c-1}{\sigma_c}} \right)^{\frac{\sigma_c(\rho-1)}{(\sigma_c-1)\rho}} + (\alpha_{mJ}l_{mJ})^{\frac{\rho-1}{\rho}} \right]^{\frac{\sigma-1}{\sigma}}
\]

1. Computer capital “replaces” routine labor
2. More precisely, replaces \(l_{rJ}\) more than \((l_{mJ}, l_{aJ})\): implicitly complements both high- and low-skill labor
3. Sectoral differences in replacement may come from differential “biased technology growth”...
Biased Technology or Diff. Elast. of Substitution?

\[
Y_J^{\frac{\sigma-1}{\sigma}} = (\alpha_k k_J)^{\frac{\sigma-1}{\sigma}} + \\
\left[ (\alpha_m l_m J)^{\frac{\rho-1}{\rho}} + \left( (\alpha_r l_r J)^{\frac{\sigma_c-1}{\sigma_c}} + (\alpha_c c_J)^{\frac{\sigma_c-1}{\sigma_c}} \right) \frac{\sigma_c (\rho-1)}{(\sigma_c-1)\rho} + (\alpha_m l_m J)^{\frac{\rho-1}{\rho}} \right]^{\frac{\sigma-1}{\sigma}}
\]

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4. but can also interpret as differential elasticities of substitution, among other observationally equivalent possibilities
Computer Capital and Sectors/Occupations

Allocation of computer capital across sectors

- Hardware (L)
- Software (L)
- Routine task share (R)
Biased Technology or Diff. Elast. of Substitution?

\[
Y_j^{\frac{\sigma-1}{\sigma}} = (\alpha_{kJkJ})^{\frac{\sigma-1}{\sigma}} + \\
\left[ (\alpha_{mJlmlJ})^{\frac{\rho-1}{\rho}} + \left( (\alpha_{rJlrlJ})^{\frac{\sigma_c-1}{\sigma_c}} + (\alpha_{cJcJ})^{\frac{\sigma_c-1}{\sigma_c}} \right) \frac{\sigma_c(\rho-1)}{(\sigma_c-1)\rho} + (\alpha_{mlmlM})^{\frac{\rho-1}{\rho}} \right]^{\frac{\sigma-1}{\sigma}}
\]

- Reassuring the most action comes from between-occupations (for me)
- But to put a technological interpretation, need to dig into the \( \alpha \)'s
- At least part of it must be supply (skills), not demand (technology)...
- **Where does technology come from if not embedded in capital?**
- How does \((k_J, c_J)\) affect \(l_{xj}\)'s by \(x \in \{m, r, a\}\)?
Computer capital definitely related to differential sectoral growth

If not direct and quantitative “bias” comes from occupational labor, there must be some channel s.t.

\[ c_J \Rightarrow (\alpha_{mJ}/\alpha_{rJ}, \alpha_{aJ}/\alpha_{rJ}) \Rightarrow (l_{mJ}/l_{rJ}, l_{aJ}/l_{rJ}) \]

differentially across \( J \)
Conclusion

- Very useful and intuitive decomposition exercise
- Interpretation of capital, labor and technology is a bit vague

THANK YOU!