Nancy Stokey's Technology, Skill and Long Run Growth

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Summary of model

- Earlier paper Technology, Skill and the Wage Structure
  - A flexible and *tractable* framework to analyze the GE effects of technical change.
- Single final good, many intermediate goods.
- Intermediate good producers differ in their technology level x. Mass N_p of intermediate firms and density f.
- Intermediate goods use only labor. Workers characterized by human capital level h. Mass L_w and density g.
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$$y_F = \left[N_p^{1-\nu} \int y(x)^{(\rho-1)/\rho} f(x) dx \right]^{\rho/(\rho-1)} \tag{1}$$

Summary of model

- With the final good as numeraire

$$\begin{aligned} y^d(x) &= N_p^{\rho\nu} p(x)^{-\rho} y_F \\ 1 &= \left[N_p^{1-\rho\nu} \int p(x)^{1-\rho} f(x) dx \right]^{1/(1-\rho)} \end{aligned}$$

- Each worker with skill h employed in firm with technology x produces $\phi(h,x)$ where

$$\begin{aligned} \phi(h,x) &= \left[\omega h^{(\eta-1)/\eta} + (1-\omega) x^{(\eta-1)/\eta}\right]^{\eta/(\eta-1)}, \\ \eta, \omega &\in (0,1) \end{aligned}$$

- Positive assortative matching in efficient allocation.

Equilibrium

- Equilibrium in this static set up is efficient.
- Firms with better technologies have lower prices, higher sales, employ higher human capital workers and pay higher wages.
  - units fixed by symmetry in technology for production of final goods.
- Homogeneity properties
- For Pareto distributions of h and x that satisfy some extra restrictions linear assignment of skill to technology and iso-elastic wage, price and profit functions.

Dynamics: Producers

- Firms may die or continue to produce or choose to increase x by not producing.
  - Firms that stay increase x at rate μ_x
  - Firms that leave become identical
  - There must exist a lower threshold $X_m(t)$ such that (only) firms with $x < X_m(t)$ leave.
  - Firms that invest have fixed hazard rate for "success". If success get random drawn from the current technologies.
- New entrants choose a hazard rate for success at a (convex, increasing) cost. If they "succeed" and pay a cost for starting that scales with the average profit of current incumbents, they get a random drawn from the current technologies.
- Characterization of flows (stopping time) and of the dynamics of technology DF.

Dynamics: Workers

- Workers die and are born (population growth rate ν.)
- If a worker produces, h increases at fixed rate
- Workers can increase h by not working. If not working they succeed with a fixed hazard rate and get a random draw of the current skill distribution. Same for new workers.
- Characterization of flows (stopping time) and of the dynamics of technology DF.

Dynamics: CE

- Household := mean worker
  - Owns mean firm.
- Constant elasticity preference for households
- Define CE, studies BGP.
  - With (properly restricted) Pareto distributions, existence of CE that is a BGP is established and fully characterized.
  - Several comparative statics established.

Discussion

- Great paper! Ambitious and technically challenging model.
- To study non-BGP equilibria (transition) would probably need numerical methods
- Which empirical evidence is useful to assess the model ?
  - Model of the whole (closed) economy
  - Homogeneous households
  - No physical capital
- Other ways to close the model?

Discussion

- In BCP skills and technology grow at same rate but in general the model growth in skills (technology) induces growth in technology (skills).
- Identify investment in technology with changes in TFP and investment in skills with education?
- Correlation between growth in TFP and education in cross section and time-series.
- Probably true, but evidence of no growth in TFP in Brazil while quality of labor force improved.
  - Frequency
  - Accounting for experience
  - Mis-measurement of education inputs.
  - Missing factors that affect productivity of firms.
- Tiago Cavalcanti (Cambridge): Also not true on Latin American panel