Lecture 7

Economic Growth: Technological Progress

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Economic Growth and Economic Fluctuations

Increasing Living Standards

- **If we want our economy's living standards to be higher, then we want:**
  - **a higher physical capital saving rate,** s_K
  - **a higher human capital saving rate,** s_H
  - **a lower rate of physical and human capital depreciation,** δ
  - **a lower labor force growth rate,** n
  - **a HIGHER rate of technological progress,** g

- Recall from Lecture 4's discussion of the Solow Model with technological progress that when the economy converges to steady state, the growth rate of output per worker will be equal to the rate technological progress.

$$\text{in steady state: } \frac{\dot{\tilde{y}}}{\tilde{y}} = 0 \quad \text{which implies that: } \frac{(\dot{Y/L})}{(Y/L)} = g$$

- **So a faster rate of growth of technological progress implies a rapidly rising standard of living for the residents of that economy**

So how can we increase the growth rate of technological progress?

- **The answer to that question is worth an instant Nobel Prize.**
- **Economists have developed other models that attempt to answer that question.** Below is a summary of some of a few theories.

Research and Development Models

- **Some models of R&D predict that the long-run growth rate of output per worker is an increasing function of the growth rate of the labor force**
- **But that's a little odd.**
- **On average, the growth rate of output per worker is <u>not</u> higher in countries with faster population growth.**

- **As a model of worldwide economic growth however, such models are more plausible. If the variable A in our models:**
  - **represents knowledge that can be used anywhere in the world and**
  - **if the growth rate of that knowledge, g, depends on the growth rate of the labor force**
- **then the larger the world population is the more people there are to make discoveries that advance the rate of technological progress.**

So how can we increase the growth rate of technological progress?

"Learning by Doing" in AK Models

- **In AK models, the source of technological progress:**
  - **does <u>not</u> depend on a Research and Development sector, but rather**
  - **depends on how much new knowledge is generated by everyday economic activity**
- **The underlying theory behind these models is that:**
  - **learning occurs as new capital is produced, so**
  - **producing new capital has benefits that are not captured by the conventional return on capital investment, r**
- **Increased capital therefore raises output through:**
  - **its direct contribution to output**
  - **by indirectly contributing to the development of new ideas**
- **There's no steady state in these models. Instead the long-run growth <u>rate</u> of output per worker is proportionate to the saving rate.**
- **The implication of such models is that the government should intervene to subsidize the accumulation of new capital.**

So how can we increase the growth rate of technological progress?

International Trade and Foreign Direct Investment

- **Trade enables a less developed trade partner to learn from the more developed trade partner how to implement the managerial** (and other) **practices best suited to using new technologies.**
- **Also in the absence of trade, domestic producers may seek government protection from competition – licensing requirements, etc.**
- **When a country opens to trade however:**
  - **international competition forces domestic producers to cease their** (socially wasteful) **protective activities and**
  - **allocate resources towards becoming more productive by adopting new technologies.**
- **Recipients of FDI acquire knowledge of foreign managerial practices, which they can compare with their own to find more efficient methods of production**
- **Trade and FDI cannot affect the growth <u>rate</u> of technological progress**
- **It enables less developed countries to import a whole <u>level</u> of technology**

So how can we increase the growth rate of technological progress?

political structure

- **A country's political structure affects the rate at which new technologies are adopted.**
- **If there's a high risk that the government will infringe upon the returns to technology adoption by expropriating industrial capacity, businesses will be less likely to undertake an investment in new technology.**
- **Similarly, if the government:**
  - **redistributes tax revenues to a minority of the elite rather than**
  - **allocating tax revenues to public goods that are necessary for business development** (such as roads, communications, sewage, etc.)
- **then businesses will be less likely to undertake an investment in new technology**

So how can we increase the growth rate of technological progress?

political structure

- **If the adoption of new technology is costly, but use of that new technology greatly reduces the cost of producing a good, then the entry of firms using the new technology will lower the market price.**
- **Producers who continue to use the older, less productive technology may find it more profitable to lobby government to block the use of the new technology rather than adopting it.**
- **Such lobbying benefits the users of the old technology at the expense of the majority of society.**
- **In theory, a democratic government should protect property rights and act in the interest of the majority of the society and not in the interest of an elite minority or a vested interest.**