Diploma Growth Lecture 4

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Recap of last lecture and transition to this one

- We discussed two models of endogenous growth and how producing ideas are essential to generating endogenous growth

- Generating ideas requires increasing returns to scale and this in turn requires imperfect competition or the presence of externalities

- In this lecture, we will summarize what we've learned and use this knowledge to provide answers to the main questions underlying economic growth

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The Main Questions

- Why are some countries richer than others?

- What is the engine of economic growth?

- How do we understand growth miracles?

Why are some countries richer than others?

- ▶ The Solow model gives us some answers for this: higher savings/investment rate, lower populatioin growth

- ▶ Mankiw, Romer and Weil add greater investment in human capital to the equation

- ▶ Countries that adopt policies and create infrastucture that fosters physical and human capital investment thus tend to be richer than others

What is the engine of growth?

- The Romer model tells us that invention or innovation is the main engine of growth

- Ideas are at the core of innovation and Romer tells us it is the nonrivalrous nature of ideas that allows it to generate growth

- Because ideas are nonrivalrous and can be used simultaneously by lots of people, there are increasing returns to scale

- With increasing returns, there is a fixed cost to generating the idea and this tells us that firms must earn positive profits to cover this cost, hence the need for imperfect competition (the ability to patent and differentiate, and with it the necessary enforcement and regulatory environment)

How do we understand growth miracles?

- ▶ The previous two questions can be understood through steady-state analysis, and the analysis of balanced growth paths

- ▶ By contrast, to understand growth miracles, one has to think about transitional dynamics

- ▶ Growth miracles are cases of countries that are transitioning from one steady state to another

- ▶ In the transition to the new steady state with higher capital and output, the country expriences higher growth until it settles on a new balanced growth path

Revision: A second look at the Romer model

- Recall the production function takes the following form:
  $Y = K^\alpha (AL_Y)^{1-\alpha}$

- For a given level of A, the production function exhibits constant returns to scale (CRS) with respect to K and L

- The capital accumulation equation is as in the Solow Model:
  $\dot{K} = s_K Y - dK$

- Similarly, labor grows exponentially at an exogenous rate n as before

Revision: A second look at the Romer model

- Set $\dot{A} = \delta A^\phi L_A$, where L_A is the amount of labor used to discover new ideas

- Because labor is now used for both production and innovation, there is an additional constraint: $L_A + L_Y = L$

- We can now show that $g_y = g_k = g_A$, where $y = Y/L$ and $k = K/L$, i.e. the rate of technological progress is still the rate of growth for output and capital per worker

- To determine g_A: note that $\dot{A} = \delta L_A A^\phi$ hence $\frac{\dot{L_A}}{L_A} = (1-\phi)\frac{\dot{A}}{A} \Rightarrow n = (1-\phi)g_A \Rightarrow g_A = \frac{n}{1-\phi}$

Revision: A second look at the Romer model

- How do we get the last result? Use

$$g_A = \delta L_A A^{\phi-1}.$$

- In the balanced growth path g_A is a constant, so taking logs and differentiating with respect to time implies that

$$0 = \frac{\dot{L}_A}{L_A} + (\phi - 1)\frac{\dot{A}}{A}.$$

- Given the constant labor growth rate n, we have

$$0 = n + (\phi - 1) g_A \Rightarrow \frac{\dot{A}}{A} = g_A = \frac{n}{1 - \phi}$$

Other questions

- How does an increase in the savings rate affect the equilibrium in the Solow Model?

- How does the introduction of human capital affect the predictions of the Solow Model relative to the data?

- What are the main empirical facts of growth that our models are designed to address?

- Give examples of model implications that would lead one to reject the model under consideration.