Module 5

Lecture 36

Topics

5.4 Growth Theory IV

5.4.1 Neo-Schumpeterian Growth Models IV

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- The most crucial step for the emergence of Neo-Schumpeterian growth models was to replace competitive market based models with ones with imperfect competition.

- The basic structures of the models used in this genre came from industrial organization.

- By the late 1970s, there were many aggregate models with many firms (this takes care of the first objection from the last lecture), each of which could have market power (answer to objection 5).

- The most convenient of these models was developed by Dixit and Stiglitz (1977). William either subsequently showed how their model of preferences over many goods could be interpreted as a production function that depended on a large number of inputs in production.

- The use of imperfect market structure freed the growth economists from being constrained by the price taking doctrine of the competitive structure.

- The only other problem that is left to be resolved is the equation of motion for technology.

- The general form for the equation of motion is

$$\dot{A} = gA^{\phi} \tag{1}$$

- Models with steady state growth sets $\phi = 1$ so that growth rate of technology is g.This is not however, mathematically robust. If ϕ is slightly greater than 1, the stock of technology will go to infinity in finite time. On the other hand if it is less than one, growth would eventually stop.

- To stay away from the knife edge problem economists assumed thatϕ is strictly less than one. To keep the economy growing in a model like Nordhaus' growth can be kept going only by adding a second type of knowledge A_2 that grows exogenously.

- Romer on the other hand modified his models to have finite rate of growth with a range of values forϕ which is strictly more than 1. Even for $\phi < 1$ he showed that growth would eventually stop, but it would persist for a long time.

- By the late 1980s, economists like Kenneth Judd (1985) and Gene Grossman and Elhanan Helpman (1989) were working out models of growth with monopolistic competition.

- Judd's model had exogenous technological change to keep the economy growing while Grossman and Helpman were investigating the connection between trade and growth. Their model converged to a steady state.

- In both the models, monopoly profits motivate discovery.

- Romer also had an important contribution in this phase by combining his spillover models with monopolistic competition models which would mean incomplete intellectual property right.

- Research on endogenous growth models in which monopoly profits motivate innovation has progressed rapidly and uncovered a hitherto rarely analyzed area of trade, market size and international trade.

- One important problem of modeling innovation motivated by monopoly patent centered around the uncertainty associated with RD activities.

- A research project may not yield any result or yield a result which it did not intend to. The production of new technology cannot be simply modeled as a production function type relation where certain input always yield the same value of output.

- The insights we get from the scientists, sociologists and economists who work on the history of technology cannot be directly fit into the abstract models that we use in macroeconomics.

- Aghion and Howitt (1992) modeled Schumpeterian *creative destruction*. In their model each innovation kills off its predecessors. However, one must also keep in mind that new innovations do not always eliminate old ones; sometimes they are complementary to each other.

- The main lesson that we learn from these new generation growth models is that modeling technological innovation is crucial to lay hand on a satisfactory growth theory.

- The problem is that innovation is a complex social process and often there is no objective measure which can be used to measure technological developments. Hence, it's difficult to test the models of technological development. The most widely used measure of technological development is Solow residual -- the share of growth which cannot be measured by capital and labor. But this unaccounted part of growth is just a black box. This includes all other factors except labor and capital such as institutions, culture, geography etc.

- Case studies on technological development -- both contemporary and historical -- can be useful. But often nuances of such studies are lost when they are converted to abstract mathematical modeling.

- In spite of these issues, new wave endogenous models made some important strides by going beyond competitive market models and exogenous technology. Technological development being the main motor of growth, one important implication of the endogenous growth models is the policy prescriptions for government to encourage innovations. Such policy prescriptions were not possible in case of exogenous technological progress.