

Advanced Macroeconomics

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Tutorial 6: Innovation & Growth

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1. Compute optimal allocation of expenditure over time (i.e. $\dot{E}/E$) using the following function and the result in Tutorial 5 Q.2, for optimal consumption levels (Hint: *use the indirect utility function and Keynes-Ramsey rule*):

$$\int_t^\infty e^{-\rho(\tau-t)} \ln c(\tau) d\tau$$

2. What is a reduced form of an equilibrium? Solve for $\dot{n}$ and $\dot{E}/E$ (use the following results from the lectures, and standard profit and consumption maximisation functions)

Where $\dot{n}$ is the accumulation of knowledge, L_R is the share of the labour force engaged in R&D, and φ is a parameter:

$$\dot{n} = \varphi L_R$$

Technology in the economy is equal to labour directed towards building a specific good for a specific firm:

$$x(i) = l(i)$$

The amount of labour in this economy can be characterised by the sum of labour directed toward production and dedicated to research:

$$L = \int_0^n l(i) di + L_R$$

Assets accumulation is given by the interest value of assets plus wage minus expenditure:

$$\dot{a} = ra + w - e; \quad r = \frac{\dot{v} + \pi}{v}$$

3. Derive the phase diagram. Discuss the long-run implications of this model.
4. Derive growth in the consumption index, with Dixit-Stiglitz preferences.