Economic Growth ECON8050

EXAM 2000

Permitted Materials: non-programmable calculator
English / foreign language dictionary
1 A4 sheet of paper with notes

Answer FOUR (4) questions, including at least ONE from Section A.

SECTION A

QUESTION A1

Consider this version of Barro's (1990) model of government and growth. There are a large number, i = 1...N, of identical producers / consumers. They each use a single unit of labour to produce a homogeneous output, y, according to the individual production function, $y_i = g^a k_i^{1-a}$, where k_i is the stock of private capital (which does not depreciate) and g is the flow of rival and excludable services provided by the government to each producer.

Individuals choose their level of consumption at time t, c_t, to maximise discounted utility: $U = \int_0^{\infty} e^{-rt} \ln(c_t) dt$.

Government sets an income tax rate, τ. Government services, Ng, are fully funded out of contemporaneous tax income, τY, where Y is total output.

a) Derive an expression for the individual's private marginal return to investment, treating g as fixed. Derive an expression for the social return to investment by a single producer, dY/dk_i, treating τ as fixed and treating the capital stocks of other producers as fixed (and identical). Explain the difference between the private and social return.

b) Derive an expression for the growth rate of the economy with investment decisions made by individual producers. Contrast this with the growth rate that would be achieved by a social planner who mandates individual investments to maximise the welfare of the representative producer.

c) Discuss Barro's claim that "Because of familiar externalities implied by public expenditures and taxation, the decentralised choices of saving turn out to generate outcomes that are not Pareto optimal." (Barro 1990, p.247)

QUESTION A2

Consider the Mankiw-Romer-Weil (1992) version of the Swan-Solow model where the aggregate production function and exogenous labour force and exogenous technology growth are given by:

$$Y_t = K_t^{\,a} (AL)_t^{\,1-a} \quad ; \quad L = L_0 e^{nt} \quad ; \quad A = A_0 e^{gt} \qquad (1)$$

The exogenous savings rate is s, the rate of depreciation of capital is δ.

Derive an expression for the steady state value of output per unit of augmented labour, y* = Y*/AL. Then show how to derive the following expression for the logarithmic growth rate of y.

$$\hat{y}_t = a(n+d+g)\{[\frac{y^*}{y_t}]^{1-a/a} - 1\} \qquad (2)$$

Show how this exact expression can be linearised by taking the first order Taylor approximation for the growth rate, as a function of log y, around the steady state, log y*, to give the instantaneous growth rate:

$$\hat{y} \cong -(1-a)(n+g+d)(\log y - \log y^*) \qquad (3)$$

and show how to derive the discrete time growth rate, between t=0 and t=T:

$$\log(\frac{y_T}{y_0}) = (1-e^{-lT}) \log \frac{y^*}{y_0} \qquad (4)$$

Finally, transform (4) from the unobservable variable, y=Y/AL, to the observable variable, Y/L, to give the full (approximate) expression for the dynamics of the Swan-Solow model.

Discuss the assumption made by MRW that this expression can be estimated by Ordinary Least Squares regression to provide reliable estimates of the capital-output elasticity and the rate of convergence to steady state.

SECTION B

QUESTION B3

"Models of endogenous technological progress tend to assume non-diminishing returns to research effort and to the stock of domestic knowledge. As a consequence, they imply population scale effects which are counter-factual."

Discuss this statement, explaining in detail the argument that is proposed. Does evidence against scale effects invalidate theories of endogenous technological progress?

QUESTION B4

Is it the stock of human capital in an economy or the rate of growth of that stock that influences short-run and long-run economic growth? Does the evidence help us to distinguish between neo-classical growth theory and endogenous growth theories?

QUESTION B5

Murphy, Shleifer and Vishny (1989) analyse a closed economy where a firm's decision to invest in an increasing-returns technology can raise its productivity and profits, hence generating an aggregate demand externality which increases the returns to 'industrialisation' for other firms. They argue, however, that this aggregate demand externality is not sufficient to generate the coordination problems that might justify 'big push' intervention by government.

Explain this argument. Discuss circumstances under which 'big push' policies might be warranted.

QUESTION B6

"The gains from trade liberalisation in a static model are of the order of magnitude of the tariff squared. So the abolition of a 10% tariff is likely to raise GDP by no more than one percentage point."

Sachs and Warner (1995, p. 63) report "strong evidence of convergence among open economies …, as well as evidence of accelerated growth in the countries that have recently undertaken market reforms."

Evaluate these statements in the light of theories and evidence on growth and trade.