

Australian National University

Second semester examination – November 1997

ECONOMIC GROWTH (ECON8050)

Study Period: 30 minutes

Time Allowed: Three Hours

Permitted Materials: Calculator, Dictionary, One A4 page with notes on both sides

Instructions to candidates: there are five questions; students should complete Q1 and two additional questions. Answer all parts of the questions. Q1 is worth 40% of the final exam mark and the other questions are worth 30% each.

Q1 (compulsory)

The neo-classical growth model with labour-augmenting technical progress can be represented as: $Y = F(K_t, LA_t)$ where Y is real output and $F(.,.)$ exhibits constant returns to scale with respect to capital, K , and effective labour, LA_t . L is assumed constant, whilst technical progress is represented by a constant exogenous rate of growth, λ : $A_t = e^{\lambda t}$. Capital depreciates at a constant rate, δ . A unit of output can be used for unit of consumption, C , or for one unit of gross investment.

The representative household wishes to maximise overall utility, U , given by: $U = \int_0^{\infty} \ln(\tilde{c}_t) e^{-\rho t} dt$ where $\tilde{c} = C/L$ is *per capita* consumption and ρ (>0) is a constant rate of time preference.

- (a) Derive the equation of motion describing the evolution of the capital stock per unit of effective labour ($k_t \equiv K_t / LA_t$) in relation to consumption per unit of effective labour ($c_t \equiv C_t / LA_t$)
- (b) Derive the result that the optimal path of consumption is characterised by the condition that $\frac{\dot{C}}{C} = \frac{\partial F}{\partial K} - \delta - \rho$ and provide an intuitive explanation for this result. (*Hint: translate the problem into variables measured per effective worker*)
- (c) Assume that the Inada conditions hold and that the steady state is characterised by a constant value of the capital stock *per effective worker*. Derive the steady state rates of growth of output, consumption and capital stock. What is the contribution of technical progress to steady state growth ?
- (d) Describe the Inada conditions. Give examples and an intuitive explanation of conditions under which they do not hold. What are the implications for the (steady state) balanced growth path if these conditions do not hold ?
- (e) Use the results from (c) to explain why the growth accounting approach might underestimate the contribution of technical progress to growth.

Q2

- (a) “Unconditional β -convergence is a necessary but not sufficient condition for σ -convergence to occur. Conditional β -convergence is neither necessary nor a sufficient condition.”. Explain. *(10 marks)*
- (b) “A critical test between the Solow-Swan model of growth and the newer theories of endogenous growth is whether empirical studies find evidence of conditional β -convergence across countries.” Discuss. *(20 marks)*

Q3

Barro (1990) models the relationship between productive government spending, distortionary taxation and economic growth.

- (a) Explain and discuss critically the structure of the Barro model. *(10 marks)*
- (b) Explain the effects of increasing tax rates to fund the provision of more public goods? *(10 marks)*
- (c) In the light of this model, how should we interpret evidence that countries with higher rates of expenditure on government services tend to have lower rates of economic growth? *(10 marks)*

Q4

- (a) Discuss theory and evidence on the contribution of human capital to growth. *(20 marks)*
- (b) Can these theories explain why capital doesn't flow from rich to poor countries? *(10 marks)*

Q5

Sala-i-Martin (1997) notes that “... some researchers' reading of the Levine and Renelt paper concluded that nothing can be learned from this empirical growth literature because no variables are robustly correlated with growth.”

- (a) Explain and evaluate the Levine and Renelt evidence on “robustness”. *(15 marks)*
- (b) Is Sala-i-Martin's “I just ran two million regressions” approach an improvement on the Levine and Renelt approach? *(15 marks)*