

Ec453 Theories of Growth and Development
Fall 2002, Final Exam

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YOU HAVE 2 HOURS FOR THIS EXAM. THUS TIME IS AN EXTREMELY
SCARCE GOOD. USE IT **OPTIMALLY**
(You know what this means as an economist, by now)

1) *Knowledge as an Economic Good* (20 points)

a) Romer (1990) specifies the following relationship for the knowledge function:

$$\dot{A} = \delta L_A A$$

where A is stock of knowledge (ideas), δ is productivity of research-personnel; and L_A is the amount of labor allocated to knowledge production. Discuss the implications and shortcomings of this specification in explaining the nature and rate of growth of real world economies.

b) Given the shortcomings of Romer's formulation for R&D production, Jones has suggested the following:

$$\dot{A} = \delta L_A^\lambda A^\phi$$

Contrast the two formulations. In particular, how do you justify the Jones's treatment of R&D?

2) (40 points)

Consider the R&D-driven endogenous growth model with the following technology for the production of the final good:

$$Y = L_Y^{1-\alpha} \sum_i^A x_i^\alpha$$

- a) Given the above technology, find the demand function for labor and the intermediate good, x_i .
- b) Suppose that one unit of x_i is being produced by η units of the foregone output. Thus the profit function of the intermediate good producer can be written as:

$$\pi(x) = p_i(x)x_i - r\eta x_i$$

find the optimal price in terms of a mark up and the marginal cost. What is the amount of the mark up? Interpret the optimal pricing rule of the oligopolist.

- c) Draw graphically the equilibrium of the oligopolist in the price-output space.
- d) Using the fact that aggregate “capital”, K , is $K = \sum x_i$, show that the above technology is equivalent to:

$$Y = K^\alpha (AL_Y)^{1-\alpha}$$

- e) Show that payments to L_Y and x in terms of w and r do not exhaust total value of the final output. Discuss what happens to the difference.
- f) Why is it necessary in this model to have non-competitive pricing behavior in the market for intermediates? Discuss analytically

3) (30 points)

Consider the neoclassical (Solow) model of exogenous growth with the following technological set up: Single output Y is produced by labor, L , and capital, K . The production technology is:

$$Y = A_0 K^\alpha L^{1-\alpha}$$

where there is no technological progress, thus A_0 is constant. labor grows at the rate n , and capital depreciates at δ . A fraction s of output is saved and invested for capital accumulation.

- a) Find an expression for the output per worker Y/L under the steady state.
- b) True or False: Suppose that the saving rate s is increased permanently. Then output per worker is increased permanently under the long run equilibrium.
- c) True or False: the permanent increase in the saving s -rate increases the rate of growth of Y under long run equilibrium.
- d) True or false: the permanent increase in the saving rate increases consumption per worker under the steady state.
- e) Derive an expression for profits per worker under the steady state.

4) (10 points)

Consider the fragility indicators of the Turkish economy

	1995	1996	1997	1998	1999	2000	2001
Current Account Balance	-1.4	-1.3	-1.4	1.0	-0.7	-4.8	1.4
Foreign Debt Stock	42.8	46.2	47.8	47.2	55.7	59.1	74.3
Domestic Debt Stock	14.6	18.8	21.4	22.5	29.3	28.7	68.1
Short Term Foreign Debt / CB							
International Reserves (%)	128.7	104.2	95.1	105.4	98.9	127.6	85.9
M2Y / CB Inter. Reserves (%)	354.0	314.1	287.8	321.8	329.4	381.4	380.6
Interest Paym. on Dom. Debt /							
Total Tax Revenues (%)	43.9	59.2	41.7	61.0	66.4	63.7	103.4

Discuss each of these fragility indicators for the period 1995-2001. (Any educated guess for the 2002 value of any of these variables gets extra credit). In particular what kind of mechanisms were at work behind the evolution of these indicators over the period of concern?