UNIVERSITY OF CALIFORNIA SPRING 2006
Department of Economics C. Jones/D. Romer

ECONOMICS 202B

MIDTERM EXAMINATION

The exam consists of two parts. Do each part in a separate blue book.

Part I (Romer)

Section A. Multiple choice (16 points)

In your blue book, give the best answer to 4 of the following 5 questions.

Note:
-- If you wish, you may add a brief explanation of your answer to AT MOST ONE question. In that case, your grade on that question will be based on your answer and explanation together. This means that an explanation can either raise or lower a grade.
-- If you answer all 5 questions, your overall score will be based on your average, not on your 4 best scores.

1. Albouy argues that:
A. Historical settler morality from yellow fever is not a good instrument in a regression of modern income per person on social infrastructure, because historical mortality from yellow fever is correlated with the presence of diseases that directly affect income today.
B. Acemoglu, Johnson, and Robinson do not follow a consistent set of rules in constructing their estimates of historical settler mortality.
C. Using the mortality of bishops to estimate settler mortality is not a good idea, because bishops' living arrangements were unrepresentative of the typical settler's living arrangements.
D. All of the above.
E. None of the above.

2. Hall and Jones's "accounting" approach to decomposing cross-country income differences fails to assign to human capital:

A. Differences in income stemming form differences in the quality of schooling.

B. Any impact of human capital on income that operates through externalities.

C. The fact that when human capital raises income, if the saving rate does not change then the quantity of saving rises, thereby rasing the stock of physical capital.

D. (A) and (B).

E. (A) and (C).

F. (B) and (C).

G. (A), (B), and (C).

H. None of the above.

3. The fact that our measures of social infrastructure are highly imperfect implies that:

A. A regression of income per person on measured social infrastructure will necessarily understate social infrastructure's impact on income.

B. If we have correctly estimated social infrastructure's impact on income, multiplying the estimated coefficient on social infrastructure by the difference in measured social infrastructure between two countries is not an appropriate way of estimating social infrastructure's contribution to the difference in income between the two countries.

C. No statistical procedure can produce a valid estimate of social infrastructure's impact on income per person.

D. (A) and (B).

E. None of the above.

4. In Parente and Prescott's model:

A. The price that can be charged by the coalition (or monopoly-rights group) is limited by the possibility of entry by a firm using the world-frontier technology.

B. The tradeoff between the disutility of work and the utility of consumption can cause the monopoly-rights group to operate its technology inefficiently.

C. The profits that a firm entering using the world-frontier technology would earn are decreasing in both the size of the coalition and the amount each coalition member can produce.

D. If a firm enters using the world-frontier technology, the monopoly-rights group chooses to produce at full capacity in order to punish the entrant.

5. The following is an example of income differences NOT due to differences in social infrastructure:

A. Country A has a better functioning legal system than Country B; as a result, fewer resources are devoted to litigation in Country A than in Country B.

B. Country A has higher equipment investment than Country B because of more favorable tax treatment; equipment investment has large externalities, so the difference in equipment investment translates into a large difference in income per worker.

C. Because of a government-sponsored religious campaign, the citizens of Country A become much more honest than those of Country B; as a result, output per worker is higher in Country A than in Country B.

D. None of the above.

Section B. Problem (20 points)

6. Consider the Solow model. Let r(t) denote the marginal product of capital, $\partial F(K(t),A(t)L(t))/\partial K(t)$.

A. Show that $r(t) = f'(k(t))$.

B. Let y* denote the balanced-growth-path value of y. If y(t) is greater than y*, is $\dot{r}(t)$ positive, negative, zero, or of ambiguous sign? Explain your answer.

C. Let r* denote the balanced-growth-path value of r. Find an expression of the form $\dot{r}(t) \simeq a + b[r(t) - r^*]$ in the vicinity of $r = r^*$. (If you are unable to find such an expression, sketch as well as you can how you would go about doing so.)

Econ 202b Midterm Exam — Part II (Jones)

March 16, 2006

PLEASE USE A NEW BLUE BOOK FOR PART II

Section A. Answer all questions (15 points). Explanations are not necessary.

1. In the standard neoclassical growth model with exogenous technical change at rate $g > 0$, an increase in g leads to

   (a) an increase in the Golden Rule level of $\tilde{k} \equiv k/A$.

   (b) a decrease in the steady state value of $\tilde{k}$ for the competitive equilibrium (the modified golden rule).

   (c) both (a) and (b).

   (d) neither (a) nor (b).

2. In the neoclassical growth model with overlapping generations

   (a) the competitive equilibrium allocation is Pareto efficient.

   (b) subsidies to capital accumulation may be needed to get Pareto efficiency.

   (c) the allocation that maximizes a well-defined social welfare function that discounts the utility of future generations at rate θ may be Pareto inefficient.

   (d) a symptom of dynamic inefficiency is that the wage rate in the steady state of the inefficient competitive equilibrium is too high, assuming the production function is Cobb-Douglas.

3. In the first generation of endogenous growth models where total factor productivity is itself an increasing function of the capital stock, a pure/perfectly competitive equilibrium typically does not exist because

   (a) increasing returns to scale implies firms make positive profits.

   (b) households have incentives to underaccumulate capital.

(c) monopoly power leads prices to exceed marginal cost.

(d) none of the above.

Section B. A Mankiw-Romer-Weil Neoclassical Growth Model (29 Points)

Consider the following economic environment, which is a variant of the Mankiw, Romer, and Weil (1992) growth model. (It is okay if you are not familiar with details of that model). The notation should mostly be familiar from class, and the equations have the usual interpretation. The one difference is that this environment includes a second kind of capital, which Mankiw-Romer-Weil call "human capital," denoted H_t:

$$Y_t = A_t K_t^{\alpha} H_t^{\beta} L_t^{1-\alpha-\beta}, \tag{1}$$

$$\dot{K}_t = I_{kt} - \delta K_t, \quad \delta > 0, \quad K_0 = \bar{K}_0 > 0 \tag{2}$$

$$\dot{H}_t = I_{ht} - \delta H_t, \quad H_0 = \bar{H}_0 > 0, \tag{3}$$

$$C_t + I_{kt} + I_{ht} = Y_t, \tag{4}$$

$$L_t = \bar{L}_0 e^{nt}, \tag{5}$$

$$A_t = \bar{A}_0 e^{gt}, \tag{6}$$

$$U_0 = \int_0^{\infty} L_t u(c_t) e^{-\rho t} dt \tag{7}$$

where α and β are both between zero and one, as is the sum of these two parameters, and $c_t \equiv C_t/L_t$. Assume ρ is sufficiently large so that preference orderings are well-defined, and assume that $u(\cdot)$ satisfies the usual neoclassical conditions.

(a) (10 points) Define the optimal allocation of resources for this economy (be sure to include all endogenous variables in your definition).

(b) (10 points) Write down the Hamiltonian (you might call it $\mathcal{H}$ to distinguish it from human capital) and all of the first-order necessary conditions that characterize the solution. For example, you should take the derivatives to get the actual equations that characterize the solution, but there is no need to solve these equations further. Hint: Before writing the Hamiltonian, do some substitutions so that you have two state variables and two control variables — what are they?

(c) (9 points) Along a balanced growth path, what is the growth rate of $y \equiv Y/L$? Provide one or two sentences of intuition for the result.