

Problem Set 6

Due at the start of class, Thursday, October 11

1. Romer, Problem 4.3.

INSTRUCTIONS FOR PROBLEMS 2-8:

- Give the best answer to 6 of the following 7 questions. Note:
- If you wish, you may add a BRIEF explanation of your answer to AT MOST ONE question. In that case, your score 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 7 questions, your score on these questions will be based on your average, not on your 6 best scores.

2. In models where the allocation of resources to R&D is determined by market forces, the inputs that embody different ideas are typically modeled as:

- A. Supplied in exogenously determined amounts.
- B. Public goods.
- C. Perfect substitutes for one another.
- D. Imperfect substitutes for one another.

3. One of the empirical issues that Jones addresses in “Time-Series Tests of Endogenous Growth Models” is:

- A. Whether population growth is stationary or nonstationary.
- B. Whether the growth rate of income per capita is higher in countries with larger populations.
- C. The horizon over which investment affects growth.
- D. The correlation between the number of scientists and engineers and the saving rate.

4. In the P. Romer model of endogenous technological change, the condition for equilibrium in the allocation of workers between R&D and goods production at time t is:

- A. The wages in the two sectors at time t are equal.
- B. The present value of the revenues from an idea created at time t equals the wage in the goods-producing sector at time t .
- C. The marginal product of an idea in creating new ideas equals its marginal product in goods production.
- D. The price of using an idea equals $\eta/(\eta - 1)$ times the cost of producing the idea, where η is the elasticity of demand for the input using a given idea.

5. Of the following possible regression results concerning the elasticity of long-run output with respect to the saving rate, the one that would provide the best evidence that differences in saving rates are not important to cross-country income differences is:

- A. A point estimate of 5, with a standard error of 2.
- B. A point estimate of 0.1, with a standard error of 0.01.
- C. A point estimate of 0.001, with a standard error of 5.
- D. A point estimate of -2 , with a standard error of 5.

6. The “accounting” approach to decomposing cross-country income differences described in Section 4.2 of Romer, *Advanced Macroeconomics*, fails to assign to human capital:

- A. Differences in income stemming from 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 raising 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.

7. Consider an economy described by: $\dot{B}(t) = bB(t)$, $\dot{D}(t) = d[cB(t)]^\omega D(t)^\mu$, $J(t) = [(1 - c)B(t)]D(t)$, with $b > 0$, $d > 0$, $0 < c < 1$, $\omega > 0$, $B(0) > 0$, and $D(0) > 0$. This economy will converge to a balanced growth path if and only if:

- A. $\mu < 1$.
- B. $\mu \leq 1$.
- C. $\omega < 1$.
- D. $\omega \leq 1$.

8. Consider the production function of the Paul Romer model, and suppose that a firm changes from using inputs in equal amounts (for example, $L(i) = b$ for $0 \leq i \leq A$, where b and A are both positive) to using inputs in unequal amounts with no change in the total quantity of inputs (for example, $L(i) = 2bi/A$ for $0 \leq i \leq A$). Then the firm’s output will:

- A. Increase.
- B. Decrease.
- C. Stay the same.
- D. It is not possible to tell.

EXTRA PROBLEMS (NOT TO BE HANDED IN; COMPLETE ANSWERS MAY NOT BE PROVIDED)

9. Romer, Problem 3.11.

10. Romer, Problem 3.14.

11. Romer, Problem 4.4.

12. Romer, Problem 4.9.

13-18. Romer, Problems 3.2, 3.7, 3.12, 3.13, 4.1, 4.8.