Exam 2. Econ499. Spring 2011

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UNC

Instructions:

- The exam consists of 4 questions.
- Answer all questions.
- *Explain* your answers – do not just state them.
- *Show* your derivations – do not just state the final result.
- Do not refer to any notes or books. You may use a calculator.
- The total time is 75 minutes.
- The total number of points is 100.

1 Growth and Ideas

In the Romer model, ideas grow according to the production function

$$\dot{A}_t = \delta(s_R L_t)^\lambda A_t^\phi \tag{1}$$

with $L_t = e^{nt}$, $\delta > 0$, $\lambda > 0$, and $\phi < 1$. In the long run we find the strange result that the growth rate of ideas is proportional to population growth

$$g(A) = \frac{\lambda n}{1-\phi} \tag{2}$$

1. [8 points] Set $\lambda = 1$ and $\phi = 0$. Plot $g(A)$ against A/L. Show the balanced growth path. Show that it is stable.

2. [14 points] Using this graph, provide the intuition why the long-run growth rate is proportional to n. Explain the two forces that work against each other to determine the balanced growth rate.

2 Fiscal Policy

Consider a household who lives for 2 periods. She receives earnings of y today and y' tomorrow. She pays lump-sum taxes of t today and t' tomorrow. The real interest rate is r.

1. [7 points] Draw the lifetime budget constraint, which is given by the usual expression:

$$c + \frac{c'}{1+r} = y - t + \frac{y' - t'}{1+r}$$

   c and c' denote consumption today and tomorrow. Explain what you draw. In particular, what are the intercepts and the slope of the budget constraint?

2. [5 points] Consider a temporary tax cut: t falls by 1 and t' rises by $1 + r$. How does your graph change? Explain.

3. [8 points] In your graph, show the changes in consumption (today and tomorrow) and saving. Can you assign numerical values to those changes? Explain.

4. [6 points] What general message would you draw about the effectiveness of temporary tax cuts for stimulating aggregate demand?

3 The Fiscal Deficit

1. [8 points] Give two reasons why the government budget deficit is not a good measure of the budget imbalance. Provide an example that illustrates each reason.

2. [10 points] When the government borrows more, the demand for funds rises. Ceteris paribus, the interest rate should rise. Which two channels affect the supply of funds that could dampen the interest rate increase? Hint: One channel is domestic (think life-cycle model), the other is foreign.

4 International Trade

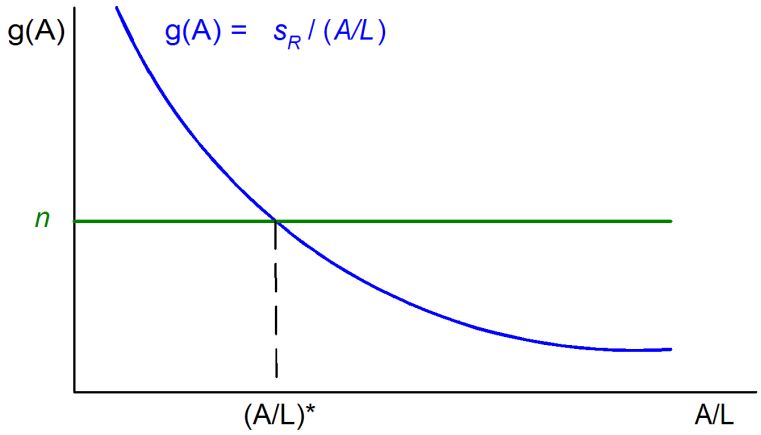
1. [10 points] Explain the two main reasons why countries trade with each other.

2. [8 points] Based on those reasons, would you expect that the U.S. trades most with other rich countries or with less developed countries? Explain.

3. [16 points] Productivity growth has been extraordinary in China for several years. At the same time, the U.S. has experienced growing trade deficits and sluggish real wage growth. Observers have suggested that the latter are a consequence of China's growth. Comment on this idea. You should explain the main determinants of trade deficits and real wages.

End of exam.

Figure 1: $g(A)$ against A/L



5 Answers

5.1 Answers: Romer Model

1. We did this in class. $g(A) = \delta(s_R L_t)^\lambda A_t^{\phi-1}$. Now we set $\lambda = 1$ and $\phi = 0$ to obtain $g(A) = \delta s_R L_t / A_t$.

   When plotted, the $g(A)$ curve is downward sloping. The balanced growth path occurs where $g(A) = n$. See figure 1.

   To see that the balanced growth path is stable, note that A/L grows when it is below the steady state $[g(A) > n]$, but shrinks when A/L is above the steady state.

2. The two opposing forces are: population growth pushing up growth through scale effects and diminishing returns to A in the production of ideas, which pushes growth towards zero.

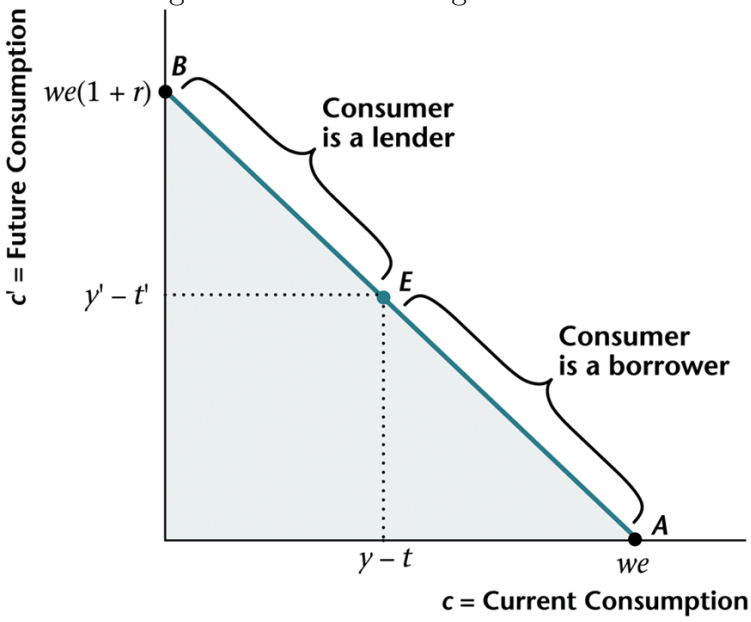
   Consider the case without population growth, $n = 0$. As time goes by, A/L rises. Diminishing returns push growth towards zero. We move along the curve to the right. However, population growth lowers A/L in each period. Allocating more people to R&D raises growth. We move along the curve to the left. The balanced growth path occurs where these two forces balance each other.

   You can also show this by plotting $g(A)$ against A. Then population growth shifts the curve up in each period.

5.2 Answers: Fiscal Policy

1. The lifetime budget constraint is shown in figure 2. The x axis intercept is the present value of lifetime earnings, we. The y axis intercept is $(1+r)we$. The slope is $-(1+r)$.

Figure 2: Lifetime budget constaint



2. Lifetime income does not change, so the budget constraint does not shift. The endowment point moves along the budget constraint to the right.

3. By the PIH, there is no change in consumption. Therefore, saving must rise by 1. This is the essence of the PIH: only the present value of income matters, not the timing. The household understands that his income will drop in the future and saves more to pay the higher taxes.

4. The general message is: Temporary tax cuts are not very effective. The reason is really the PIH. Households look at the increase in lifetime income when they decide how much more to consume. Lifetime income does not rise much, in part because the tax cut is temporary, and in part because it is followed by higher future taxes.

5.3 Answers: Fiscal Deficit

1. What appears in the budget is an accounting convention. Recall our example of Social Security benefits that could either be promised by issuing bonds (part of the deficit) or by just promising benefits (does not appear in budget).
   When the government sells off assets or lets assets depreciate, this does not appear in the budget. The main examples are environmental decay and deteriorating public capital (infrastructure, etc).

2. Domestic channel: households save more, expecting higher future taxes. Foreign channel: capital inflows, attracted by rising interest rates. We illustrated those in class with a figure showing supply and demand for funds.

5.4 Answers: International Trade

1. Comparative advantage and trade across time. Both are explained in detail in the slides.

2. Both suggest that we should trade mostly with dissimilar countries, i.e., less developed countries. Relative productivities differ more between rich and poor countries, leaving more room to exploit comparative advantage. Differences in growth rates are larger between rich and poor countries, leaving more room to trade across time.

   By contrast, in the data most trade occurs between rich countries. The reason is that there is a third benefit from international trade that we have not discussed. Roughly speaking, there are benefits from consuming many varieties of the "same" good. Those varieties are mainly produced in other rich countries. This is a point we did not discuss in class and which I did not expect you to mention in your answer.

3. What causes trade deficits? Recall $I = S^p + S^G - NX$. Trade deficits are the result of high investment or low saving. High productivity growth in China suggests that investment in China should be high (which is true). This would give China a trade deficit, not a surplus. What determines U.S. wages? Recall the examples we worked through. The U.S. real wage (denoted in units of the goods produced in the U.S.) are determined by U.S. labor productivity, not by Chinese productivity. The main effect of Chinese productivity growth is to lower the prices of imported goods, which increases U.S. real wages.

End of answers.