

**Econ 102**  
**Economic Growth**  
**Due in Sections, Jan 26, 2007**

1. Be sure to read your copy of the Wall Street Journal every weekday, looking especially for items related to the material in this course. Find an article in this week's Wall Street Journal that is relevant to the topic of this homework assignment. Turn it in, or a copy of it, with your assignment, and write a brief summary of it (half a page to a page). Your summary should outline the main points of the article **and** explain why it is relevant to the homework topic, in this case "Economic Growth."
2. Discuss how and why each of the following might affect US per capita GDP growth:
  - a) An increase of foreign direct investment into the US from Europe is caused by a decline in the value of the European currency, the euro.
  - b) Congress passes a law exempting capital gains from taxation.
  - c) College tuition across the US increases by 2% per year in nominal terms, while inflation is steady at 2%.
  - d) Fertility drugs increase the maximum childbearing age of US women.
  - e) Lengthening the life of patents on new inventions.
  - f) Due to lower-than-expected tax revenues (due to tax cuts and the recession), the state of Michigan is forced to slash spending on higher education.
  - g) Congress increases the research and development tax credit, which reduces a firm's tax bill if it engages in research into developing new technologies.
3. A Bangladeshi worker who immigrates to America is likely to find that her average labor productivity is much higher in the U.S. than it was at home. The worker is, of course, the same person she was when she lived in Bangladesh. How can the simple act of moving to the U.S. increase the worker's productivity? What does your answer say about the incentive to immigrate?
4. Why small differences in growth rates matter:

In 1986 your aunt deposited \$100 in a bank account at 4 percent interest to help out with your college tuition bill in 2006. Interest is compounded annually (so that interest paid at the end of each year receives interest itself in later years). The account was worth \$100 in 1986;  $\$100 \times 1.04 = \$104$  in 1987;  $\$100 \times 1.04 \times 1.04 = \$100 \times (1.04)^2 = \$108.16$  in 1988; and so on. Since 20 years will have elapsed

between 1986, the year the account was opened, and 2006, the year she withdraws the money, the value of the account in the year 2004 is  $\$100 \times (1.04)^{20} = \$219.11$ .

Economic growth rates are similar to compound interest rates. Real U.S. GDP per person was \$3,412 in 1870 and \$37,500 in 2003 (both in 2003 U.S. Dollars). Suppose that real GDP per capita in the U.S. had grown at 2.5 percent per year instead of the actual 1.82 percent per year, from 1870 to 2003. How much larger would real GDP have been in the U.S. in 2003?

5. The web reading by Paul M. Romer "It's all in Your Head," outlines what New Growth Theory is all about. Use the reading to answer the following questions:
  - a) Can policymakers alter the rate of technological change? Why?
  - b) If there were no railroads in the early United States, what mechanisms would have fueled the growth of the economy?
  - c) What are the three features that make growth possible?
  
6. (True/False/Uncertain--Explanation determines grade) Suppose Toyota builds four new automobile factories in the U.S. in 2007, and the combined value of the 4 new factories is 12 billion dollars. This investment increases the capital stock of the U.S., thereby increasing the productivity of U.S. workers. In addition, this investment also increases the growth rates in productivity and the growth rates of income in the U.S. economy for 2007 and for subsequent years.
  
7. Thirteen Central, Eastern and Southern European countries applied to join the European Union (EU), and were kept waiting for about ten years, some even longer. In December 2002, the European Council met in Copenhagen and decided to accept as members the following ten nations: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic and Slovenia, starting in May of 2004. The Council also expects that it will accept Bulgaria and Romania into the European Union by 2007, and it has now opened accession negotiations with Turkey. A major political concern is that all 13 countries are significantly poorer than the current members. Due to the internal transfer system of the EU, Eastern European membership will imply a heavy burden on the citizens of the incumbent EU countries. In this question, we are going to calculate how long it will take for the newly accepted countries to reach the living standards of the EU, if indeed they ever will. The following table gives the per capita real GDP of the 13 countries, and the EU average in 1999. It also gives their expected growth rates in 2000. Assume that countries will keep growing at the given rates until they reach the level of the EU average. [PLEASE NOTE THAT SOME OF THE ACTUAL GROWTH RATES AND GDP PER CAPITA FIGURES HAVE BEEN CHANGED TO MAKE THE PROBLEM MORE INTERESTING]

Country	Real GDP per capita	Growth rate of GDP per capita	Ratio of per capita GDP to EU average	Years to double this ratio
EU average	\$25,660	2.7%		
Hungary	\$5,218	4.8%		
The Czech Rep.	\$5,170	1.5%		
Poland	\$4,257	5.7%		
Slovenia	\$9,994	3.6%		
Estonia	\$4,259	5.5%		
Cyprus	\$13,389	2.3%		
Malta	\$13,025	4.1%		
Romania	\$2,323	7.3%		
Bulgaria	\$1,691	4%		
Lithuania	\$3,420	4.3%		
Latvia	\$3,092	3.6%		
Slovakia	\$3,818	5%		
Turkey	\$6,230	2.9%		

- a) Without any calculations, are there any countries that will not be able to catch up to the level of per capita income in the EU?
- b) For Hungary, calculate the ratio of its real per capita GDP to that of the EU average. The growth rate of a fraction is approximately equal to the growth rate of the numerator minus the growth rate of the denominator. How rapidly, therefore, will this ratio of Hungary's GDP to EU GDP grow? Using the Rule of 70 from Mankiw (p. 184), how many years will it take for this ratio to double? Will Hungary, by then, have caught up to the EU in terms of real per capita GDP? If not, about how much longer do you think it will take?
- c) Repeat the same calculations for the other countries in the table to find their ratios of per capita GDP to the EU's, and the numbers of years it will take for these ratios to double. Will any of them catch up to the EU in this number of years?
- d) What is wrong with the assumption of keeping the growth rate constant as countries are accumulating capital and growing? How will that affect your calculation in c)?
- e) What other factors will affect the rate of growth for these applicant countries?