

## **The Growth and Development of Nations in the Global Economy**

### *Problem Set 2: Economic Growth and Unconditional Convergence*

Due 16 October

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This problem set requires accessing the internet and working with Microsoft Excel. You will also need a printer for your results. You may work from home, the Taylor Hall computer lab, or any other computer with internet access. Please note that you will not be able to save your work on any machine in the Taylor Hall computer lab. You must either bring a disk or email your work to yourself.

Download the data file PSET2.XLS from [www.aae.wisc.edu/aae374/](http://www.aae.wisc.edu/aae374/) and save the file to a memorable local directory of the computer on which you are working. You are welcome to use this document as the basis for your work, adding in your answers, graphs, etc. at the appropriate places. If you prefer, you may also prepare a new document, though please do type your work. Be sure to attach or otherwise include any graphs that you made that are part of your answer.

1. The file PSET2.XLS contains a worksheet called 2000 that contains 2000 per-capita GDP levels for all countries for which such data is available in both 2000 and 1960. GDP levels are measured in purchasing power parity adjusted to 1996 \$US. This data is the real stuff and is widely used by economists. It comes from the Penn World Tables, maintained by Summers and Heston at the University of Pennsylvania (<http://pwt.econ.upenn.edu> ).
  - a. Using the 2000 data, create a histogram that shows the distribution of 2000 per-capita GDP levels for the nations of the world.
  - b. Briefly describe the resulting distribution in terms of its shape, center (central tendency) and spread.
2. The file PSET2.XLS also contains 1960 per-capita GDP levels in the worksheet 1960.
  - a. Create a histogram for the distribution of 1960 per-capita GDP. To make comparisons between 1990 and 1960 easier, use the same data range classes for the 1960 histogram that you used for the 2000 histogram.
  - b. Describe the shape, center and spread of the 1960 distribution. Do the 1960 and

2000 distributions appear to be very different? If so, please describe the differences and relate them to the discussion about convergence versus divergence in the global economy.

3. Briefly explain what is meant by unconditional economic convergence. What forces might be expected to promote convergence (for example, why does the Solow model suggest convergence might occur while the Harrod-Domar model suggests that it will not occur)? What forces might be expected to retard convergence?
4. The file PSET2.XLS also includes a worksheet labeled Growth. Open that and calculate the average rate of growth of per-worker GDP for each country in the sample over the 1965 to 2000. (See page 10 of the Weil textbook for the formula to calculate growth rates.) Please put your growth rates into the empty column D in the spreadsheet (already labeled Growth, 65-00) as that will make your graphing life easier.
  - a. Divide countries into two groups: those with 1960 per-capita GDP below the world average per-capita GDP for 1960 and those with per-capita GDP above the 1960 world average. For each of these two groups, calculate measures of central tendency for the growth rate (mean and median), as well as a measure of dispersion (standard deviation). Are the growth rates of the two groups statistically different from each other? Please carefully explain your reasoning.
  - b. Prepare a scatter diagram that plots growth rates (on the y-axis) against 1965 income levels on the x-axis. To create this scatter diagram, highlight the “GDP/worker, 1965” and the “Growth, 65-00” columns. Click the “Chart Wizard icon on the toolbar (alternatively, go to the insert menu and select chart). Next select “XY (scatter)” as your plot type. If you have selected the data columns before entering chart wizard, it should correctly make your chart showing 1965 GDP/worker on the x or horizontal axis and the 65-00 Growth Rate on the y or vertical axis. Then add in a trend line.
  - c. Please discuss any patterns apparent in your scatter diagram. Does it appear to support unconditional convergence? Does it show divergence, or any other visible pattern? Or is it just a “mess”?
5. Suppose that environmental regulations lead to a diversion of investment spending from investments that boost the capital stock to investments that decrease pollution. In the Solow model, what would be the consequences on the economy's steady-state levels of capital and income? What would be the effect on the economy's measured growth rate of GDP and on its capital-output ratio? Would it make sense to say that these environmental regulations diminished economic well-being?
6. The Prebisch critique rests on two crucial assumptions:

**Assumption 1.** As a country's per capita income increases, the country will tend to spend proportionately less on primary goods and proportionately more on manufactured goods.

**Assumption 2.** Primary good producing countries tend to get "locked into" primary good production.

- a. The file PSET2.XLS includes a worksheet labeled Prebisch which has information about the growth rates of Brazil from 1965-2000. Assuming the income elasticity of demand for primary goods is .75 and the income elasticity of demand for manufactures is 1.5, compute the growth rates of consumption for these two types of goods. Assuming that if primary goods are not consumed they are exported, compute the growth rate of exports for Brazil as well. Record the average rates of growth for: Brazil, consumption of primary goods, consumption of manufactures and primary exports.
- b. Under Assumption 2, we could consider Brazil as a primary good producer whose entire national income is due to the sales of primary goods. Therefore Brazil's growth rate is the growth rate of primary good production. Comparing the growth rates of potential exports and consumed imports, what would you expect to happen to Brazil's trade deficit in the long run?
- c. In light of your answer to part b, why might institutions like the International Monetary Fund insist that debtor nations devalue their currency? Make sure to explain how your answer depends on Prebisch's Assumptions, or if not explain why.