ECO 305: Intermediate Macroeconomics
Instructor: James Murray
Homework: Economic Growth
Spring 2014

1. Describe and illustrate how each of the following affects long-run capital per worker and long-run output per worker in a Solow growth model.

   (a) There is an improvement in communication technology, making workers more productive.

   (b) There is a decrease in average national saving rate.

   (c) There is a decrease in the population growth rate.

2. Modify the Solow growth model by adding in government spending, so that the aggregate goods market equilibrium condition is $Y = C + I + G$, where G is government expenditures. Further suppose that the government expenditures is a constant exogenous fraction, $g \in (0, 1)$, of real GDP, so that $G = gY$.

   Suppose the government finances government expenditures with lump sum taxes, so that $G = T$. Consumers spend a constant fraction of their after-tax income, so that $C = (1 - s)(Y - T)$, where $s \in (0, 1)$ is the exogenous savings rate.

   (a) Using the math we did in class twice and that is in your book (page 239-240), derive the expression for the evolution of capital. This will be an equation that looks like equation (7-19) in your textbook, but it will have a g in it.

   (b) Derive an expression for the steady state of capital. This will be an equation that looks like equation (7-20) in your textbook, but it will have a g in it.

   (c) Illustrate and label graphs that determines the long-run steady state level of capital per worker, as in Figure 7.14 in your textbook, but again, with a g in it.

   (d) From a long-run point of view, what is the consequence of permanently increasing government expenditures? Answer this using the graph in your previous answer to describe and illustrate the long-run effect from increasing government expenditures.

3. Describe and illustrate how each of the following affects (1) long-run output per worker, (2) land per worker, and (3) population size, in a Malthusian growth model.

   (a) There is an improvement in agricultural technology.

   (b) There is an improvement in health and nutrition, leading to lower death rates. Hint: upward shift in g(C/N).