Economics 302
Prof. Kelly
Problem Set 3
Due: Wednesday, March 2

Exercise 1 *Open Economy Equilibrium*

Suppose in the country of Kelly, which is initially closed to the outside world (ie, does not trade with other nations), output is produced in each period using just two factors, capital (K) and labor (L) under the following production function:

$$Y = F(K, L) = 6K^{.5}L^{.5}$$

Kelly has a population of one million people; every individual gets an equal share of output; and each individual consumes output according to the following Keynesian consumption function, where y is the output allocated to an individual and t is the tax paid by each individual:

$$c = .8(y - t)$$

Every individual in Kelly inelastically supplies one unit of labor and four units of capital for production. We then have that k is the amount of capital provided by each individual and K is the total amount of capital provided for production. Similarly for l and L. The government of Kelly runs a balanced budget and spends two million units of output per period. Every individual faces the same tax.

a) What is total ouput in the economy?

b) What is the wage rate in the economy?

c) How much does an individual consume in the economy?

d) What is total investment (I) in the economy

Now, suppose that we have the following investment function for each individual:

$$i = \frac{.08}{r}$$

e) Determine what the interest rate is in this economy.

f) What is the interest rate if government spending increases to 3 million units and the government maintains a balanced budget? What if government spending decreases to 1 million units?

g) What happens to the interest rate if government spending increases to 3 million units but does not change the tax to maintain a balanced budget? What happens if government spending decreases to 1 million units.

Next, assume that the economy of Kelly opens up to world trade and the world interest rate, r^w, is .05.

h) What is total investment in the economy?

i) What are the net exports in the economy? Is Kelly a net exporter or a net importer? Provide intuition as to why this is the case.

Exercise 2 *Solow Growth: Empirical Exercise*

First, I highly recommend that you use Microsoft Excel to complete this assignment, as many "not neat" calculations are involved that can be simplified using Excel's equation command ("=(B1-C1)/A1", for example). Richard will put up a brief introduction to Microsoft Excel on his webpage to get you started if you have never attempted this before. It is an extremely valuable tool to know before you graduate.

Second, finding this data is not particularly easy, so we have included as much guidance as possible for you to find the data and also to become acquainted with these data sources.

Suppose we are using a Solow growth model that includes capital depreciation at rate δ, population growth at rate n, and technological advance at rate g. Additionally, we assume that in all countries, output is produced using a constant returns to scale Cobb-Douglas production function with two inputs: capital, K, and labor, L. Capital accounts for 1/3 of national income. Individuals in all countries consume using a Keynesian consumption function without autonomous consumption and a constant marginal propensity to consume from disposable income that may vary across nations.

Using the World Development Indicators: (http://www.library.wisc.edu/reslist.reference/reference-w.html) find the following information for each of these countries: the United States, France, Canada and Ireland. Some of this information will be provided directly (you will be able to select a data series with the title "GDP (% change)", while other figures will require you to apply the results you already have from lecture, the textbook or previous homeworks. This is often the case in empirical economics: you may need one statistic that is only available by combining or manipulating several others. Additionally, there are often many ways of calculating the same statistic. In your work, be very specific about how you are determining the value of these variables. Finally, some data may just be missing. If this is the case, then say so, but come up with a reasonable way to deal with the issue, don't just give up and say it's impossible to do.

a) The level of disposable income for each year between 1995-2001 (hint: you will need to calculate this).

b) The average savings rate over that period. Hint: you will be able to find savings as a percentage of GDP, but this is not what you want. Why not?

c) The average growth rate of output over that period.

d) The average population growth rate over that period, this will be the value for n.

Now, use OECD data (www.oecd.org, the OECD–Organization for Economic Cooperation and Development– is one of the primary data sources for economists doing international comparisons of developed nations) by clicking on "Statistics" then "Productivity" to find the average percentage change in Multi-Factor Productivity (MFP) between 1995 and 2001 using harmonized prices ("harmonized prices" means that the figures are calculated adjusting for the relative values of output between countries–if the same product is twice as expensive in Switzerland as in Austra, it does not imply that the Swiss are twice as productive. Just as economists seasonally adjust unemployment data, they often harmonize prices across countries. You will have the option of selection "harmonized prices" or "local currency" so select the data from "harmonized prices"). This will be the value for g. Assume depreciation for all 4 countries is 10% each year. Also, under "Statistics", click on "Labour" to find the size of the labor force of each of these nations for 1995-2001 (the OECD is headquartered in Paris and thus uses standard British English, thus "Labour" statistics to find (American English) "labor force" figures). You will need to click on "Labour Force Statistics-Data" then in

the bottom window, the blue box to the left of "LFS by Sex." A query dialogue will appear, and you should select "Civilian Labour Force." You will also need to select the four countries, the appropriate years (1995 to 2001), and whether you want just men (M), just women (F), or, what you want, both (M&W).

e) If all four countries are in long-run equilibrium, what is the equilibrium capital to labor ratio in each country according to the Solow Growth Model with technological advance?

f) Now assume that the four countries share the same level of technology in 1995, and normalize this level of technology to equal 1 (this is econ speak for "in 1995, set A=1 for all countries"). Using your knowledge of Cobb-Douglas production, the assumption given, and the information you have found, solve for the capital to labor ratio in each country for every year from 1995 to 2001 and compare these to the equilibrium levels you found in part (e). Do they match? If not, give several explanations for why this might occur.

Exercise 3 *CPI*

See CPI excercise from problem set 2 and repeat it here. Include the prices from the previous 3 homeworks.