Section #1

1 Outline

1. Go over syllabus
2. Critiquing Arguments (Eichengreen/ Olney 5 Step Method)
   (a) Partner activity
   (b) Group activity
3. Growth Model

2 Critiquing Arguments

2.1 Think, Pair, Share

Consider the problem of choosing a major in college. To think about this problem, let's use the three types of reasoning discussed in Eichengreen (2012). On your own, work through the thought process in each example below (it's OK to make additional assumptions) to reach a conclusion about the college major(s) you should pick.

1. A **deductive reasoning** approach will refer to a set of first principles or general theory. For instance, you could base your decision on the set of majors that will maximize your utility function (you can make a functional form assumption if you want) subject to your budget constraint. What are the types of majors that you would choose?
2. An **inductive reasoning** approach requires close scrutiny of the facts. For instance, you could crunch the Bureau of Labor Statistics' (BLS) Current Population Survey, to see which industries and occupations have had the most recent growth in employment and wages over the last decade. Suppose you find that natural gas mining is the best industry in terms of employment and wage growth.
3. The **analogical approach** requires you to make parallels with other similar situations, such as historical events. Consider the experiences of older friends or family members that went to college, what majors did they choose and do they seem happy with their choices?

Now, for each of the three sets of majors you chose above, use the "Olney 5-Step Method" to critique your own conclusions. Recall the 5-Steps:

1. **Replicate** the argument
2. **Identify** assumptions
3. **Change** an assumption

4. **Argue** to conclusion
   (a) Same conclusion? Go back to # 3
   (b) New conclusion? Go on to # 5
5. **Defend** your alternative assumption: Verify empirically if evidence exists or construct a tight logical argument in favor of the validity of your alternative assumption.

Now turn to your partner. Discuss:

1. Their background: name, year, where they're from, and major.
2. Ask them about events in economic history have shaped their lives? If they can't think of anything, they can also share what period in economic history they are most looking forward to studying this semester.
3. Discuss what major you chose for each type of reasoning. Ask your partner about their decision-making process, and run through Professor Olney's 5-Steps. Try and reach Step #5 for each of the major choices you arrived at above.
4. Get ready to share with the class!

2.2 Group Activity

For the next exercise, get together with your group. Assign one of the four roles to each person (you may need to take on more roles in smaller groups, or share roles in larger groups). Make sure to copy down each student's name onto the sheet.

You are asked by the *Economist* magazine to write an article with your forecast of when China's GDP per capita will surpass U.S. GDP per capita. You do some research, and find out that China's real GDP per capita grew at 10% a year over the last decade, while the U.S. economy grew at a rate of 1%. In levels, GDP per capita is about $3,000 in China, compared with $45,000 in the U.S. (World Bank).

First, reach conclusions based on a "deductive reasoning approach", an "inductive reasoning approach", and an "analogical reasoning approach." It is OK if you reach different conclusions in each approach. Next, pick the approach and conclusion that you think is the strongest. I will ask the rest of the class to critique your conclusion based on Professor Olney's "5-Step Method." Let's see whose conclusion holds up to scrutiny!

3 Growth Models

3.1 Growth Accounting

One of the "big" questions we're investigating throughout this course is which factors were behind the significant growth in living standards in the United States from the Colonial period to the modern era.

We start from an aggregate production function that relates total output, GDP or Y, to inputs and productivity. A standard analysis uses just capital (K) and labor (L). But for studying history we need to also include land (T).

Robert Solow noticed in 1957 that it was possible to relate the aggregate production function to productivity and economic growth. Specifically, he found that the production function $Y = A \cdot F(K, L, T)$ could be expressed in the following form:

rate of growth of GDP=

rate of growth of A
+ (responsiveness (elasticity) of output to a change in capital) $\times$ rate of growth of K
+ (responsiveness (elasticity) of output to a change in labor) $\times$ rate of growth of L
+ (responsiveness (elasticity) of output to a change in land) $\times$ rate of growth of T

We can express this mathematically:

$$\%\Delta Y = \%\Delta A + \frac{\Delta Y}{\Delta K}\frac{K}{Y}\%\Delta K + \frac{\Delta Y}{\Delta L}\frac{L}{Y}\%\Delta L + \frac{\Delta Y}{\Delta T}\frac{T}{Y}\%\Delta T \tag{1}$$

where T is the land input into production. Notice that we could also split up the capital input in this procedure into private, government, and human capital that Professor Olney discussed in the second lecture.

3.2 The Solow Model

The Solow Model was created to try and answer a simple but incredibly important question: What causes some countries to growth faster than others? In other words, why are some countries richer than other countries. Robert Solow attempted to answer this question by building a simple model with two inputs in the economy: labor and capital. We add a third input: land.

And we allow ourselves to think about the differences between private, government and human capital

The Solow model is useful for thinking about long-run changes in output (GDP) or in material living standard (output per person). Remember here "long run" refers to generation-to-generation changes. We're not focused on 2013 vs 2011. We're focused on the last half of the 20th century vs the first half to the 20th century.

There are a few important predictions that the Solow model makes:

- Long run output per worker will depend only on an economy's savings rate, population growth, depreciation rate, the share of capital in production, and the rate of growth of TFP (A)
- Output and capital per worker will grow at the rate of TFP growth
- Output and capital will grow at the rate of population growth plus the rate of TFP growth

Now we can discuss the effect of changes in the savings rate, depreciation rate, population growth, TFP and capital and labor on the Solow model diagram.

Movements

- An increase in the capital stock, K, will temporarily raise the level of capital and output per worker but over time the economy will be pushed back but in the long run the economy will move back to the original capital-labor ratio so nothing will have changed. Changes in K or L lead to movements along the curves and not shifts!
- An increase in the labor force, L, will temporarily raise the amount of output but will lower the amount of capital and output per worker but the economy will move back toward its steady state so a change in L will not have any effect on the long-run capital-labor ratio.

Shifts

- $A \uparrow$ An increase in TFP shifts both the production function up which results in both a higher capital per worker and a higher output per worker
- An increase in the savings rate, s, leads to a higher capital per worker and a higher output per worker.
- An increase in the depreciation rate of capital, δ, leads to lower capital and output per worker.
- An increase in the population growth rate, n, leads to a lower capital and output per worker. Since n increases the levels of output and capital will be growing faster in the long run.

3.3 Exercise: Check your Understanding

1. Assume that the aggregate production function (in per worker terms) for the US economy consists of two factors: capital per worker (K/L) and land per worker (T/L). It is also augmented by a total factor productivity term (A) which accounts for the growth in output not attributable directly to capital or land. On your own choose from the following list of items and pick one and match it to each of the two factors (capital per worker and land per worker) as well as for total factor productivity and describe what happens to output per worker as a result (both short- and long-run)
   (a) The Spanish Flu pandemic in 1918 leads to a decline in the US population of approximately 0.65 percent.
   (b) The 1906 Earthquake in San Francisco leads to a fire that destroys nearly 80 percent of the city.
   (c) The invention of the continuous rotary motion steam engine in 1781 by James Watt
   (d) The Lewis and Clark expeditions
   (e) The invention of the cotton gin in 1793 by Ely Whitney
   (f) After decades in which there was no common currency, Congress establishes a common national currency, the U.S. dollar in the 1860s.
   (g) Construction of the Interstate Highway System beginning after 1956
   (h) Completion of the transcontinental railroad on May 10, 1869
   (i) The Northwest Ordinance of 1787
   (j) The Louisiana Purchase of 1803
   (k) The introduction and adoption of the tractor in US agriculture
   (l) The invention of the AC induction motor by Nicola Tesla and Gallileo Ferrais independently
   (m) The increase in secondary and post-secondary education starting in the early 20th century in the US