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**Principles of Economics**

**Long Term Economic Growth**

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Introduction

Growth in U.S. real GDP has averaged 2.5% per year since World War II (and 4.1% per year since 1995). Let's try to explain this growth, since long term economic growth is the key to higher material living standards for future generations.

Growth Accounting

*Growth accounting* theorizes that long term GDP growth depends upon three things

--rate of growth of the labor supply

--rate of growth of the capital stock

--rate of growth of *total factor productivity*: the efficiency with which capital and labor can be used to produce stuff. (This depends upon the state of human knowledge about production in the economy—its production technology)

Let's get a bit more specific. The **growth accounting equation** is:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + a_N \frac{\Delta N}{N} + a_K \frac{\Delta K}{K}$$

What are these weird symbols?

$\frac{\Delta Y}{Y}$  is the change in real GDP divided by the total amount of real GDP. This is equal to the percentage change in real GDP—the *growth rate of real GDP*.

$\frac{\Delta A}{A}$  is the change in total factor productivity divided by the level of total factor productivity. This is equal to the percentage change in total factor productivity—the *rate of productivity growth*.

$\frac{\Delta N}{N}$  is the change in the labor supply divided by the total labor supply. This is equal to the percentage change in the labor supply—the *growth rate of the labor supply*.

$\frac{\Delta K}{K}$  is the change in the capital stock divided by the total amount capital. This is equal to the percentage change in the capital stock—the *growth rate of capital*.

$a_N$  is called the *elasticity of output with respect to labor*. It equals the percentage change in real GDP divided by the percentage change in the labor supply

$a_K$  is called the *elasticity of output with respect to capital*. It equals the percentage change in real GDP divided by the percentage change in capital.

### Application of the growth accounting equation to the United States

Suppose we believe that

- the productivity growth rate for the coming decade will average 2.5% per year.
- the labor supply will grow at 1% per year on average
- the capital stock will grow at 2% per year on average
- $a_N$  will be .7
- $a_K$  will be .3

Then our estimate of the average annual growth rate of real GDP in the U.S. over the next decade is:

$$\text{average annual growth rate of real GDP} = 2.5\% + .7(1\%) + .3(2\%) = 3.8\% \text{ per year}$$

### Warning! Growth accounting equation is very bad at short run forecasts.

The best use of the growth accounting forecast is for very long term forecasts such as the one we just did for the U.S. for the coming decade. It is very bad to use it for short run forecasts, such as to try to predict GDP growth for the coming year or two. This is because there are loads of other things that can affect GDP growth in the short term. (We'd best use model #5 to do short run forecasts.)

### Strategies to increase the growth rate of real GDP

The growth accounting equation gives us hints as to things that would increase the long term growth rate of real GDP. Here are some examples:

#### 1. Increase the rate of productivity growth

How? Good question. Much controversy surrounds this issue. Most economists believe that free markets and free trade lead to the best innovation and application of technology. A few economists, however, believe that government intervention can lead to higher rates of productivity growth. Certainly a better-educated workforce is a more productive workforce; theories to improve education abound and are beyond my area of expertise and beyond the scope of the course.

#### 2. Increase the growth rate of the labor supply.

Though this will lead to higher total GDP, it will not necessarily lead to higher GDP *per citizen*, unless the labor force participation rate rises. And though this will lead to higher material living standards, it will result in a sacrifice of leisure time that may not be desirable.

### 3. Increase the growth rate of the capital stock

Recall that investment increases the capital stock, so techniques that increase investment will increase the growth rate of the capital stock.

Recall also that in model #5, things such as a tax hike, a reduction in government spending, or an increase in the personal savings rate cause investment to be higher in the long run. So these things should cause higher growth in the very long term. BUT, don't forget—these things also caused a recession in the short run!

Notice the tradeoff between the short run and the very long term. If the present generation accepts higher taxes and/or lower government benefits or if it cuts its own consumption in order to increase its savings, then future generations may be better off through higher long term growth. The present generation must sacrifice if it wants to increase standards of living of future generations.

(What's happening today, in the year 2002? Americans have the lowest savings rates in their history, and they want more government spending and more tax cuts. This is hardly a prescription for the prosperity of future generations.)