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Technology and Economic Growth
Additional Homework Problems
ECON 3133
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Answers

1.
$$\%\Delta Y = \%\Delta A + (2/3)\times\%\Delta N + (1/3)\times\%\Delta K$$
$$5 = \%\Delta A + (2/3)\times(2) + (1/3)\times(4)$$
$$5 = \%\Delta A + 4/3 + 4/3$$
$$\%\Delta A = 5 - 4/3 - 4/3$$
$$\%\Delta A = 2\text{-}1/3\%$$

If $\%\Delta K$ rises by 1%, then $\%\Delta Y$ rises by 1/3%. A 1% increase in the $\%\Delta N$ causes $\%\Delta Y$ to rise by 2/3%.

2.
a. The growth rate of GDP per capita equals the growth rate of GDP minus by the population growth rate. Since the population is growing by 1% a year, GDP must grow by 2% per year for GDP per capita to grow at 1% per year.
$$\%\Delta Y - \%\Delta N = 1 \text{ and } \%\Delta N = 1$$
$$\%\Delta Y - 1 = 1$$
$$\%\Delta Y = 2$$

b. Using the growth accounting equation and substituting the appropriate values for real GDP growth (2%), labor input growth (1%), and productivity growth (0.5%), we find that the capital stock must grow by 2.5% to hit the target of 2% growth in real GDP.
$$\%\Delta Y = \%\Delta A + (2/3)\times\%\Delta N + (1/3)\times\%\Delta K$$
$$2 = 0.5 + (2/3)\times(1) + (1/3)\times\%\Delta K$$
$$12/6 = 3/6 + 4/6 + (1/3)\times\%\Delta K$$
$$5/6 = (1/3)\times\%\Delta K$$
$$\%\Delta K = 5/2\% = 2.5\%.$$

If productivity growth were completely absent, the capital stock would need to grow by 4.0%.
$$\%\Delta Y = \%\Delta A + (2/3)\times\%\Delta N + (1/3)\times\%\Delta K$$
$$2 = 0 + (2/3)\times(1) + (1/3)\times\%\Delta K$$
$$6/3 = 2/3 + (1/3)\times\%\Delta K$$
$$4/3 = (1/3)\times\%\Delta K$$
$$\%\Delta K = 4\%.$$

3. The rate of GDP growth will increase while the economy is in transition to a new, higher level of labor force participation that is the result of the tax reform. The greater participation may take the form of increased demand for hours or entry of new workers. Once adjustment has taken place, the growth in labor will again be due to growth in the population and other demographic factors. Thus, the rate of growth in GDP due to growth in labor input will be back to the rate at which it had been growing prior to tax reform.

4. If the labor supply schedule is vertical, labor supply is perfectly inelastic to changes in the wage rate. Thus, a change in the tax on labor would have no effect on the labor supply schedule.