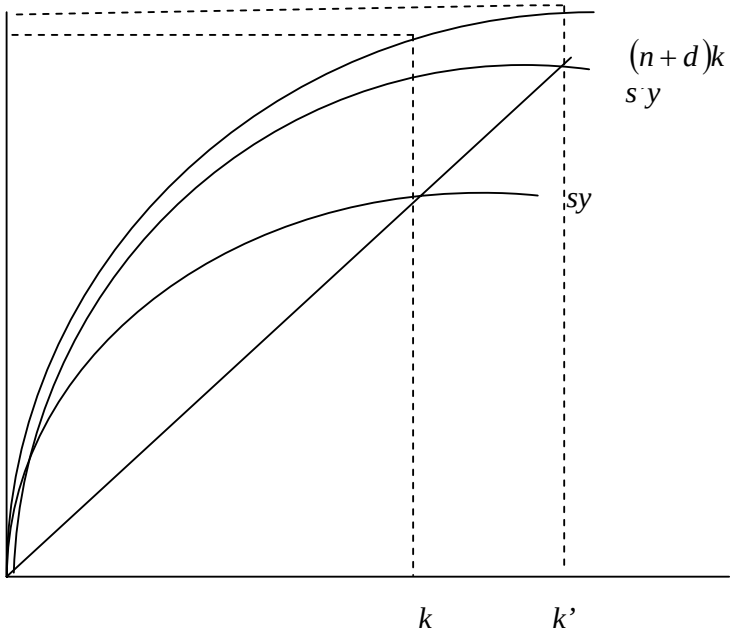
Chapter 16

Review questions

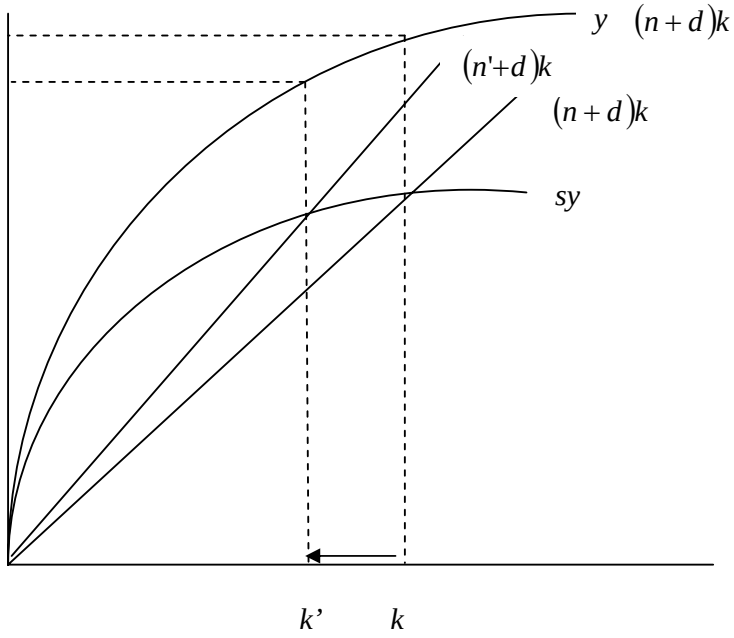
1. *After decades of exhorting, Americans are finally saving more. What will be the effects of this permanent change in behaviour in a simple Solow model without technology? What is the marginal product of capital in this new steady state? Is it possible to save too much?*



The effect will be a higher steady state for the economy, with higher capital per worker and output per worker. The marginal product of capital will be the same as before the change in saving rate. Finally, it is possible to save too much if an economy experiencing capital widening, and the amount of investment per worker provided by the economy is less than the amount needed to keep the capital-labour ratio constant. In this instance, with a permanent increase in the saving rate, the economy is moving to a new steady state.

2. *Suppose there is free migration throughout the European Union, and many workers immigrated into Germany. Graph the effects of this policy in the simple Solow model without human capital. Will this affect the level or the rate of economic growth?*

This will affect the level and not the rate of economic growth, as immigration has increased the population, and caused the steady state of the economy to move from k to k^*.



3. *To what extent does the Romer model depend on ideas being non-rivalrous? What would happen to the rate of economic growth if ideas were freely disseminated?*

The Romer model depends very much on ideas being non-rivalrous. This allows the model, and endogenous growth models in general, to overcome the diminishing returns to capital assumption in the neoclassical growth models. By so doing, accumulating ideas can generate technological progress and endogenise the determinants of economic growth inside the model. These models, therefore, can explain economic growth rates and not have to rely on external technology shocks. If ideas were freely disseminated, then if this affected the rate of innovation, then it would reduce economic growth. If, however, ideas were freely disseminated and there were increasing returns to capital as a result of cheap imitation, then the rate of innovation would increase and fuel economic growth.

4. *Is it possible for a developing country to "catch up" just by receiving technology transfers from developed countries?*

In the Solow model, it was predicted that countries could catch up by imitating more advanced technology from developed countries. This is because developing countries with higher returns to capital would attract investment that embodied more advanced technology that would improve its investment function as well as its production function. In the AK and endogeneous growth models, a similar process would be possible. However, in reality, the evidence of a lack of convergence in growth rates suggests that it is difficult for countries to catch up, whether it is because of a lack of capital flows or technology transfers or absorptive capacity.

Advanced Problems

5. *The Solow growth model is as follows: Y=Af(K,L), where f(·) is a Cobb-Douglas production function and K and L respectively represent capital and labour. The Solow residual is given by A. The model can be rewritten as* $Y=AK^bL^{1-b}$*, where b lies between 1 and 0 and A>0.*

a. Show that Y is increasing in K.

$$\frac{dY}{dK} = Ab$$

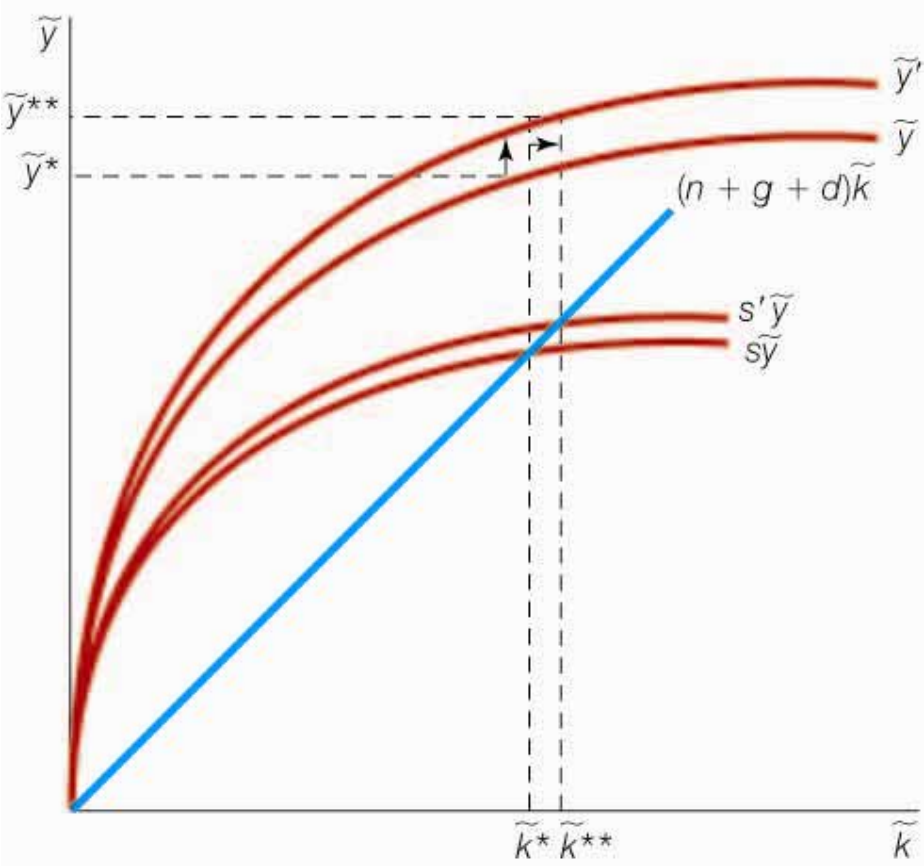
b. What is the marginal product of labour if K=25, L=10, and b=0.5?

MPL: $\frac{dY}{dL} = A\left(\frac{K}{L}\right)^b (1-b) = 0.79A$

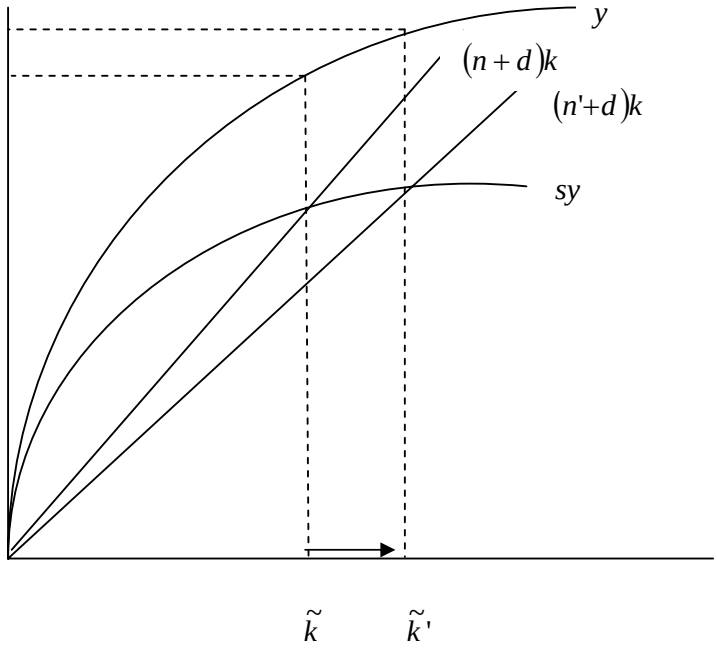
c. What is the value of the Solow residual if Y=30, $\dot{Y}$*=64.5,* $\dot{K}$*=20,* $\dot{L}$*=5?*

A=64.5/30-0.5(20/25)-0.5(5/10)=2.15-0.4-0.25=1.5

6. *Using the Solow model with human capital, assess the effects of the following factors:*
a. The rate of technological progress is permanently doubled.



b. The rate of population growth permanently halves.

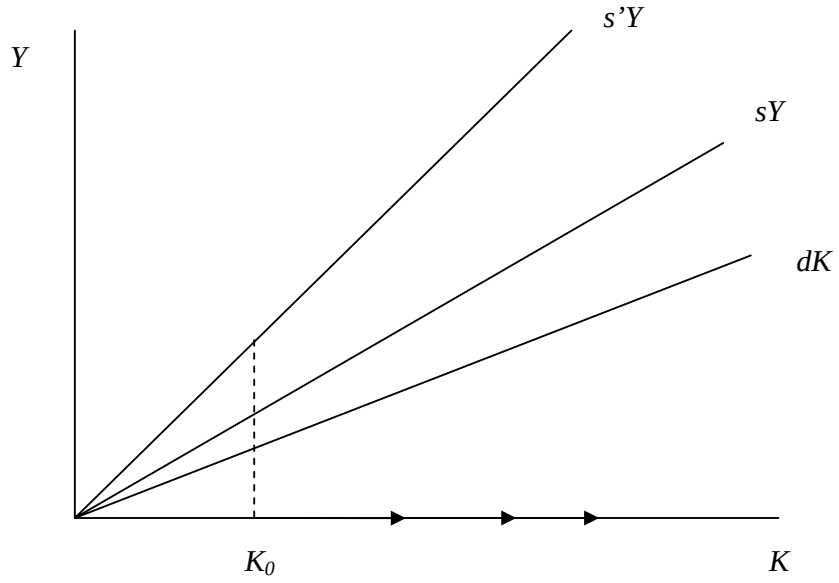


c.

The average educational attainment of the labour force increases by 2 years. The effect would be the same shift in the production function as in *a.* Consider why? Hint: *h* is similar to A in the Solow model without human capital.

7. *Sketch what happens in the AK Model when the rate of investment permanently increases three-fold.*

The increase in investment would shift up the *sY* function, leading to even greater output for every level of capital. The economy will still grow perpetually, but at a faster rate than before.



8. *Which of these economies will become the largest in the world and why?*

Country	GDP per capita	Growth rate	TFP growth
United States	$36,006	2.0%	4.0%
Japan	$31,407	2.6%	3.0%
Germany	$24,051	2.0%	1.5%
China	$989	8.2%	1.5%
India	$487	3.3%	1.5%
Brazil	$2,593	0.8%	0.8%

China with a rate of growth of 8.2% is the most likely to become the largest in the world despite having a rather low level of TFP growth. Moreover, with the low level of output per worker and therefore capital per worker, it may well grow rapidly until it reaches its steady state. However, the U.S. continues to have high rates of TFP growth, suggesting that even at growth rates of 2%, it would continue to retain its position as the world's largest economy. Can Japan catch up to the U.S. if it maintains a higher growth rate? What about India and Brazil? Which has the greater potential to catch up to China?