Economic Development and Population Growth

Let us consider a modification of the Solow neoclassical one-sector growth model. Whereas in the standard Solow model, the rate of population growth is a fixed value n, instead let the rate of population growth depend on the level of economic development. Here the capital/labor ratio k is the measure of economic development—a higher value signifies a more developed economy.

In a poor economy (low k), population growth is negative. The society is so poor that the people lack food and care.

In a richer but still less developed economy (moderate k), population growth is positive and high. Today a typical less developed economy does have high population growth.

In a rich, developed economy (high k), population growth is low or negative. Today in some European countries the birth rate is so low that deaths outnumber births.

Uniform Technology

For simplicity, assume that every economy has the same technology (the same aggregate production function).

It is *not* the case that a rich economy has superior technology; instead it just has a higher capital/labor ratio.

Capital Accumulation

The standard Solow equation for the capital/labor ratio applies. The change in the capital/labor ratio (capital deepening) is saving *per capita* less capital widening *per capita*,

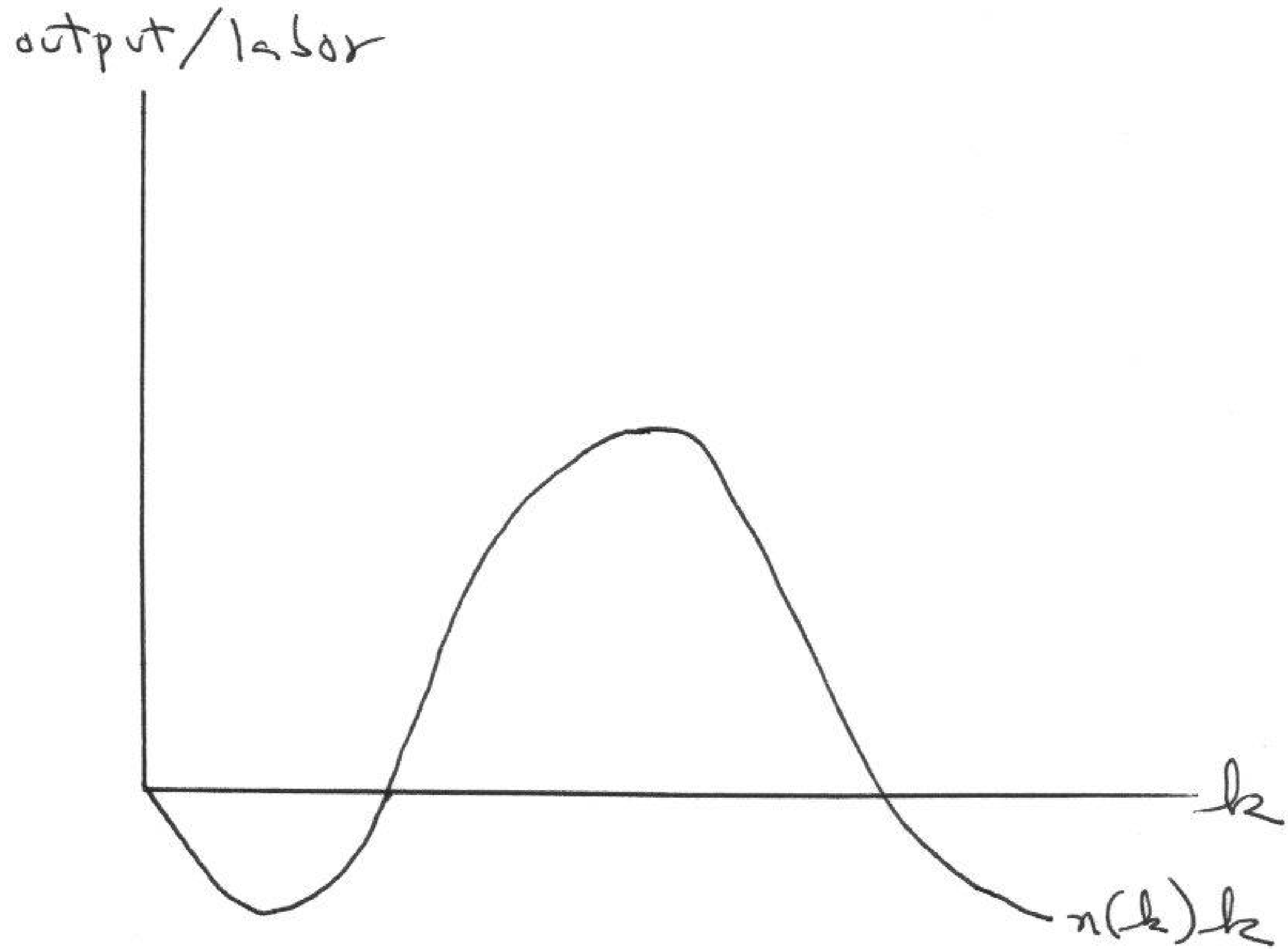
$$\frac{\mathrm{d}k}{\mathrm{d}t} = sf(k) - n(k)k,$$

except that here n depends on k.

Capital Widening

Figure 1 graphs $n(k)k$, capital widening *per capita*, as a function of k. For low k, it is negative. For moderate k, it reaches its peak. As k rises further, it falls, as the population growth is less.

Figure 1: Capital Widening

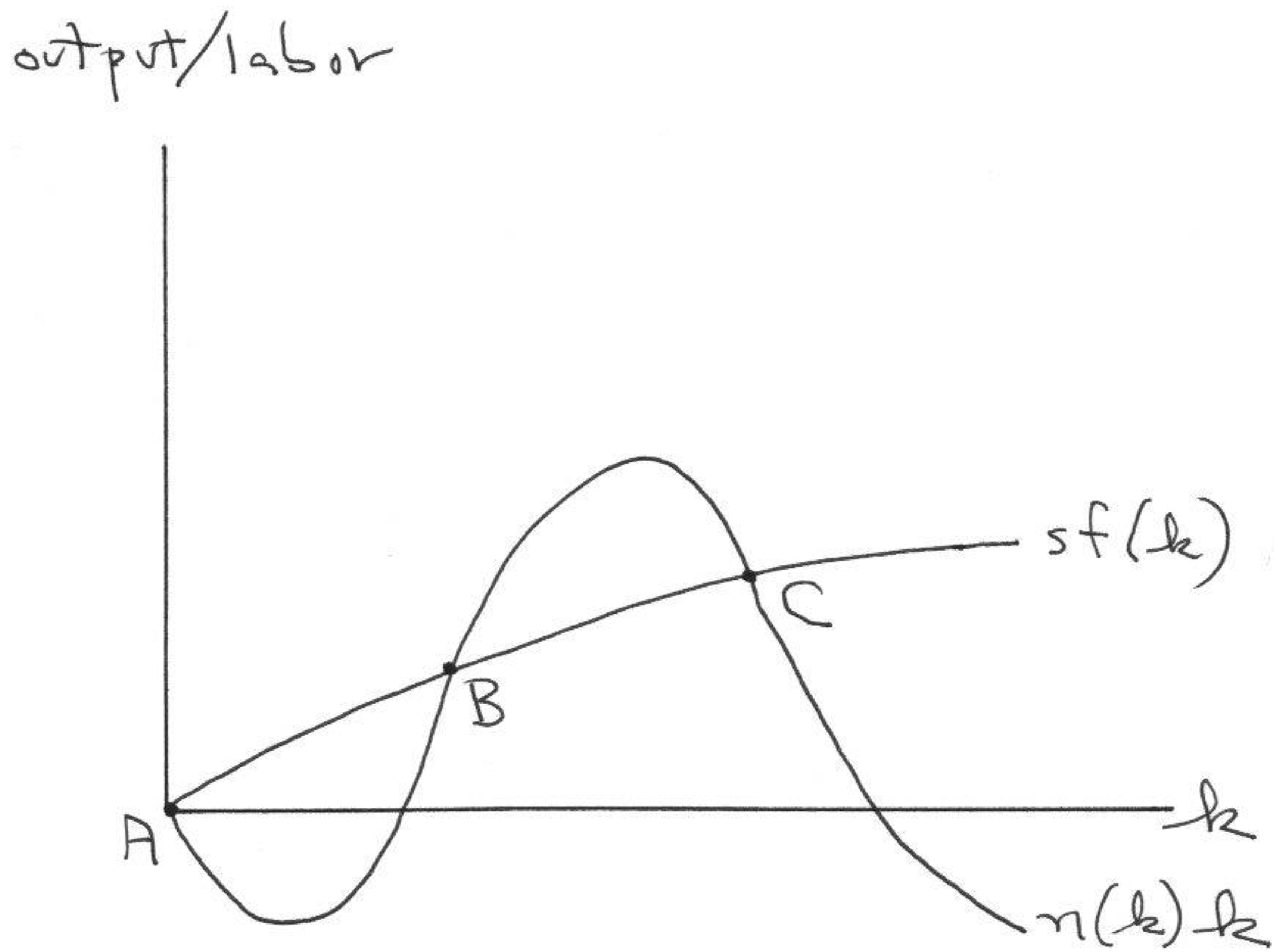


Long-Run Steady State Growth

In the Solow model, there is steady-state growth if the capital/labor ratio stays constant. Saving is totally devoted to capital widening, so no saving remains to raise the capital/labor ratio.

In figure 2, a steady-state growth occurs at k such that $sf(k) = n(k)k$. The graph shows three possibilities—points A, B, and C.

Figure 2: Long-Run Growth



Stability

Steady-state growth at B is stable. If k starts somewhat below the steady-state value, then k rises, as $sf(k) > n(k)k$. Conversely, if k starts somewhat above the steady-state value, then k falls. In the long run the economy moves to the k value at B.

Instability

In contrast, steady-state growth at C is unstable.

If k starts somewhat below the steady-state value, then k falls, moving toward B.

If k starts somewhat above the steady-state value, then k rises. As population growth is so low that the saving required for capital widening is small, saving raises k indefinitely.

Analogously, steady-state growth at A is unstable.

Growth in a Developed Economy

A developed economy has values of k above point A. The economy grows permanently. Both k and $f(k)$ rise indefinitely.

Low-Level Equilibrium Trap

In contrast, a less developed economy is trapped at a lower capital/labor ratio. It is moving toward the steady-state growth at point B. Population growth is high, so the requirement for capital widening is great. Saving is insufficient to keep k growing.

Big Push

Perhaps the less developed economy can break out of the low-level equilibrium trap, by temporarily saving and investing at a high rate.

In the 1950's some development economists recommended this "big push" strategy. They argued that the government should impose a socialist economy, with government ownership of industry and high government saving. They also advocated foreign aid, to increase investment temporarily.