Lecture 18: Growth

• Facts

• Solow’s model
Growth

- Facts: Figure 10-1 / table 10-1 / fig 10-2
- Sources of growth (per/capita): Capital accumulation / Technological progress
- \( Y = F(K, NA) \) h.d. 1
- \( y = (Y/NA) = F(K/NA,1) = f(k) \)
- figure 10-5
Solow’s Growth Model

A = 1, N = 1

\[ Y = y = f(k) \]

\[ S = sY \]

\[ I = S \]

\[ K(t+1) = (1-d) K(t) + I(t) \]

\[ => \]

\[ k(t+1) - k(t) = s f(k(t)) - d k(t) \]

Figures 11-1, 11-2
Steady State and the Saving Rate

In steady state: \( k(t+1) = k(t) = k^* \)

\[
k(t+1) - k(t) = s f(k(t)) - d k(t)
\]

\[=> \]

\[sf(k^*) = d k^* \]

\[g_y^* = 0 \quad (\text{if } n > 0, \ g_y^* = 0 => g_Y = g_K = n > 0) \]

In steady state, the saving rate does NOT matter for per-capita growth.

It does matter, however, for the level of per-capita output and transitional dynamics

Figures 11-3, 11-4
Some numbers

- \( Y = (KN)^{0.5} \Rightarrow y = (K/N)^{0.5} = k^{0.5} \)
- \( k(t+1) - k(t) = s k(t)^{0.5} - dk(t) \)
- St.St: \( k^* = (s/d)^2 \); \( y^* = (s/d) \)
- \( s0=d=0.1; \ s1=0.2 \Rightarrow \)
- \( k^* \) goes from 1 to 4 and \( y^* \) from 1 to 2.
- Higher saving=> need to maintain more capital
- \( c^* = y^* - dk^* \)
- The Golden Rule: Table 11-1
Dynamics

- Dynamics: $k(1) = 1 + 0.2 - 0.1 = 1.1 > 1$
- … and so on
- Figure 11-7