

The AK Growth Model

Econ 4960: Economic Growth



Endogenous Growth: A Brute Force Approach

- ✦ The reason there is no long-run growth without TFP growth in the Solow model is because of diminishing marginal returns to capital assumed in Inada conditions.
- ✦ One can see that as long as $\lim_{k \rightarrow \infty} sf'(k) < n + d$ the savings curve will eventually cross the required investment line and there will be a steady state.
- ✦ Alternatively, look at the capital dynamics in the Solow model:

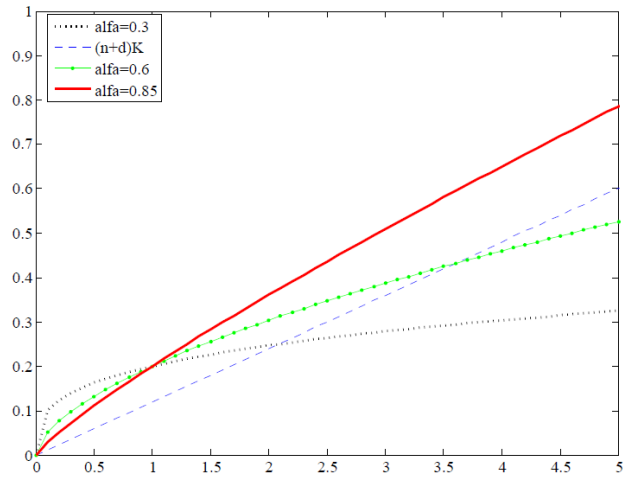
$$\frac{\dot{K}}{K} = sAK^{\alpha-1} - (n+d)$$

- ✦ So, capital growth goes to zero **unless $\alpha = 1$**
- ✦ Setting **$\alpha = 1$** gives $Y=AK$, which is the AK model.

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Solow Diagram for different α values



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The AK model

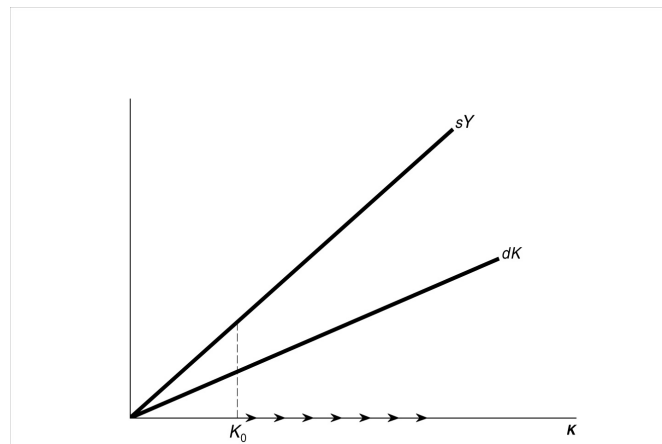


FIGURE 8.1 THE SOLOW DIAGRAM FOR THE AK MODEL

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- ✦ Use the capital accumulation equation:

$$\frac{\dot{K}}{K} = s \frac{Y}{K} - d = sA - d$$

- ✦ Key points to note:

- ❖ The economy is always on the balanced growth path (whereas in the Solow model we can only talk about BGP for an economy that has completed the transition)
- ❖ Savings rate **does** affect the long-run growth rate
- ✦ An important shortcoming of this simple AK model is that when $\alpha = 1$, capital is the only factor of production, violating one of Kaldor's facts.

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Growth through Externalities

- ✦ Romer (1986) and Lucas (1988) proposed two different models that end up looking very similar to the AK model.
- ✦ Both models manage to circumvent the problem with increasing returns (e.g., firms would like to produce an infinite amount.)
 - ❖ Cobb-Douglas production for each firm: $Y = AK^\alpha L^{1-\alpha}$
 - ❖ Key assumption: A is determined **at the aggregate level** as $A = \bar{A}K^{1-\alpha}$ whereas each firm takes A as given.
 - ❖ In other words, firms ignore that the capital they accumulate at the aggregate level is a determinant of productivity. Therefore, they create a positive externality on other firms.
 - ❖ Aggregate production function is:

$$Y = AK^\alpha L^{1-\alpha} = (\bar{A}K^{1-\alpha})K^\alpha L^{1-\alpha} = \bar{A}KL^{1-\alpha}$$

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The AK model and Policy Debates

- ✦ The fact that savings rate can affect the growth rate (and in a big way) made the AK model very popular in policy discussions.
- ✦ It makes government policy potentially very important for growth.
- ✦ In a famous paper, Lucas (1990) called tax cuts on savings as the “largest genuinely free lunch I have seen in 25 years in this business.”
- ✦ Even today when candidates fiercely debate tax policy, an important part of discussion revolves around growth

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The AK model and Policy Debates

- ✦ King and Rebelo (1990, JPE): The “welfare effect ”of a 10 percent increase in income tax is 40 times larger in an (AK) endogenous growth model (65% of consumption) than it is in a neoclassical growth model (1.6% of consumption)
- ✦ Stokey and Rebelo (1995) and Lucas (1990) argue that if endogenous growth models are calibrated to plausible values the effect on welfare is not likely to be large.
- ✦ Note that this “gift” of the AK model is also its “curse.”
- ✦ Because if tax differences are so important for growth, how come countries like Sweden with extremely high tax rates grow as fast as the US?

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Shortcomings of the AK model

- ✦ Growth is the outcome of accidents---actions that are completely unintentional.
- ✦ Externalities must be substantial: For example, the capital bought by an investor contributes twice as much to others' production than to his/her own. Same for human capital: Your education benefits others more than it benefits you.
- ✦ Alternatively stated, the Social return on many types of investments far exceed their private return.
- ✦ If externalities are really that big, individuals will typically find a way to capitalize on them (A doctor will not distribute advise on the street, etc.)
- ✦ Coefficient on externality must be exactly $1-\alpha$. Otherwise, there will be no BGP

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