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A Short Note

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In economic literature by "growth" people refer to the growth of per capita output and view it as the positive feature of the economy. Why is growth of output good? Is it good *per se*, or it is good because of something else?

Of course growth of output is associated with the growth of consumption and thus with the temporal growth of utility of consumers. I argue that this is the feature of economic growth which is important, but not the growth of output itself. Thus the relevant growth rate would be the growth rate of the one-shot utility of a consumer (in simple representative agent framework), rather than the growth rate of output. Can this "relevant" growth rate be computed once we have the "conventional" growth rate?

Take the simple growth model (e.g. Romer, 1990). Define the consumer problem: consumers are maximizing the discounted stream of utilities through time, and one shot utility is that of a CES form:

$$U = \int_0^\infty e^{-\rho t} u_t dt = \int_0^\infty e^{-\rho t} \frac{c_t^{1-\theta} - 1}{1-\theta} dt \tag{1}$$

This problem, with the standard budget constraint yields the Euler equation giving the growth rate of the consumption

$$\frac{\dot{c}}{c} = \frac{r - \rho}{\theta} \tag{2}$$

Where r is the constant interest rate. The rest of the model is usually concerned with the determination of interest rate.

Now, as I argued above the relevant growth rate is not $\dot{c}/c$ but rather $\dot{u}/u$.

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Let's look at what will be the "relevant" growth rate of this economy. We know that one shot utility is $u_t = \frac{c_t^{1-\theta}-1}{1-\theta}$. Then if we define the moment next to time t as $t+1$, we can write $\dot{u}_t = u_{t+1} - u_t$. Let's define the "relevant" growth rate to be $\dot{u}/u \equiv \gamma_u$. Then we can write $u_{t+1} = (1+\gamma_u)u_t$. Let's also define $(r-\rho)/\theta = \dot{c}/c \equiv \gamma_c$. Then we can also write $c_{t+1} = (1+\gamma_c)c_t$.

Using these equalities we can solve for γ_u

$$\gamma_u = \frac{c_t^{1-\theta}}{c_t^{1-\theta}-1}\Big((1+\gamma_c)^{1-\theta} - 1\Big) \tag{3}$$

Now, as we see from this equation this growth rate is not constant. But we can look at its limit as $t \to \infty$. As we know (in interesting cases) γ_c is positive, thus when t goes to infinity so does c_t. If we apply the L'Hospital's rule, we get

$$\lim_{t\to\infty} \gamma_u = (1+\gamma_c)^{1-\theta} - 1 = \left(1 + \frac{r-\rho}{\theta}\right)^{1-\theta} - 1 \tag{4}$$

This is the "relevant" growth rate. If one calculates the growth like this, growth can be measured in economies where income and prices do not change, but there is a constant arrival of better quality products with the same prices. Clearly in this economy people are getting higher utilities as time goes by, without increase in output (but with the increase in productivity). Thus in this economy γ_c would be zero, while γ_u will be positive.

Some properties of γ_u (in the model specified above):

(1) If $0 < \theta < 1$ and $\rho < r \Rightarrow \gamma_u < \gamma_c$.

(2) As $\theta \to 1 \Rightarrow \gamma_u \to 0$ and $(\gamma_c - \gamma_u) \to (r-\rho)$.

References

[1] Romer, Paul (1990), "Endogenous Technical Change," *Journal of Political Economy,* **98** : S71-S102.