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Abstract

In this note, we explore the implications of cultural preference for education in an innovation-driven growth model that features an interaction between endogenous human capital accumulation and technological progress. Parents invest in children's education partly due to the preference for their children to be educated. We consider a preference parameter that measures the degree of this parental or cultural preference for education. We find that a higher degree of parental preference for education increases human capital, which is conducive to innovation, but the increase in education investment also crowds out resources for R&D investment. As a result, a stronger cultural preference for education has an inverted-U effect on the steady-state equilibrium growth rate. We also analytically derive the complete transitional path of the equilibrium growth rate and find that an increase in the degree of education preference has an initial negative effect on economic growth.

JEL classification: E24, O31, O41
Keywords: economic growth, human capital, education, culture

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1 Introduction

It is well known that the Chinese culture places a very high value on education. In China's Song Dynasty, Emperor Zhenzong (968-1022) wrote his famous *Urge to Study Poem* in which an often quoted verse is "in books one finds golden mansions and maidens as beautiful as jade." Also in the Song Dynasty, a poet, Wang Zhu, wrote in his famous *Child Prodigy Poem*, "all pursuits are of low value; only studying the books is high." This cultural emphasis on education can be traced back to Confucianism, which emphasizes the importance of education. Studying the origins of this strong preference for education in China, Kipnis (2011) notes that education "... invokes a system of prestige in which those with educational accomplishments are marked as superior to the non-educated." Even in the case of Chinese families in the US, this cultural preference for education still exerts influences on parental investment and involvement in children's education. For example, from their survey data, Chen and Uttal (1988) find that Chinese parents have higher expectations on their children's academic achievement and spend more time working with children on their homework than American parents. Furthermore, Chen and Uttal (1988) argue that these different behaviors can be explained by differences in cultural values.[1] However, is a strong cultural preference for education necessarily good for the economy? A BBC News article[2] discusses the costs of this "education fever" in China as well as South Korea, which also shares the Confucian culture, and reports that in South Korea, "the government believes 'education obsession' is damaging society".

In this note, we use a growth-theoretic framework to explore the macroeconomic implications of a strong cultural preference for education. The growth-theoretic framework is an innovation-driven growth model that features an interaction between endogenous human capital accumulation and technological progress. Parents invest in their children's human capital due to the subjective utility that they derive from their children's education. We consider a preference parameter that measures the degree of this cultural preference for education. We find that a higher degree of cultural preference for education increases the accumulation of human capital, which is conducive to innovation, but the increase in education investment also crowds out resources for R&D investment. As a result, a stronger cultural preference for education has an inverted-U effect on the steady-state equilibrium growth rate. Furthermore, if the degree of cultural preference for education is sufficiently low or high, the economy would be trapped in a stagnant equilibrium with zero economic growth in the long run.

We also analytically derive the complete transitional path of the equilibrium growth rate from the initial steady state to the new steady state when the degree of cultural preference for education increases. We find that an increase in the degree of education preference has an initial negative effect on the equilibrium growth rate due to the crowding-out effect of education investment on R&D investment. However, as the level of human capital increases, the equilibrium growth rate also increases due to the positive effect of human capital on innovation. The new steady-state equilibrium growth rate may be higher or lower than the initial growth rate, depending on the relative magnitude of the negative crowding-out effect

[1] See also Huang and Gove (2012) for a discussion of Confucianism's influence on Chinese culture and educational practice of Chinese families in the United States.

[2] "Asia's Parents Suffering 'Education Fever'". BBC News, 22 October 2013.

of education investment and the positive effect of human capital on innovation and growth.

This study relates to the literature on parental investment in human capital and economic growth; see for example Glomm and Ravikumar (1992), Glomm (1997) and Futagami and Yanagihara (2008). These studies focus on human capital accumulation as the sole engine of economic growth. Instead, the present study considers parental investment in human capital as well as its interaction with endogenous technological progress. Therefore, this study relates more closely to the literature on R&D-driven innovation and economic growth.[3] Early studies in this literature do not consider endogenous human capital accumulation. More recent studies, such as Eicher (1996), Zeng (1997, 2003), Strulik (2005, 2007), Strulik *et al.* (2013), Chu *et al.* (2013), Hashimoto and Tabata (2015) and Prettner and Strulik (2015), explore human capital accumulation in the R&D-based growth model. However, these studies either do not explore the effects of parental preference for education or they find an unambiguously positive effect of education preference on growth. In contrast, we show that an increase in the degree of parental preference for education has an inverted-U effect on growth once the negative crowding-out effect of education investment is taken into consideration.

The rest of this note is organized as follows. Section 2 presents the model. Section 3 explores the implications of cultural preference for education. The final section concludes.

2 The model

We consider a discrete-time version of the seminal R&D-based growth model in Romer (1990). We extend the Romer model by considering a simple structure of overlapping generations and human capital accumulation. Each individual is endowed with one unit of time to be allocated between leisure, work and the education of her child.[4] As in Glomm and Ravikumar (1992), Glomm (1997) and Futagami and Yanagihara (2008), individuals derive utility from their children's education. Furthermore, they supply labor that is embodied with human capital to earn a wage income. For simplicity, we follow previous studies to assume that individuals only consume goods when they are old. In this case, they save all of their wage income when they are young and consume their asset income when they are old.

2.1 Individuals

In each generation, there is a unit continuum of individuals. An individual who works at time t has the following utility function indexed by a superscript t:

$$U^t = u(l_t, C_{t+1}, H_{t+1}) = \eta \ln l_t + \ln C_{t+1} + \gamma \ln H_{t+1}. \tag{1}$$

l_t denotes the individual's leisure at time t, and the parameter $\eta \geq 0$ captures leisure preference. C_{t+1} denotes the individual's consumption at time $t+1$. H_{t+1} denotes the level

[3]See Romer (1990), Segerstrom *et al.* (1990), Grossman and Helpman (1991) and Aghion and Howitt (1992) for seminal studies in this literature.

[4]In this study, we do not consider endogenous fertility. See for example Chu *et al.* (2013), Strulik *et al.* (2013), Hashimoto and Tabata (2015) and Prettner and Strulik (2015) for an analysis of human capital accumulation and endogenous fertility in the R&D-based growth model.

of human capital possessed by the individual's child. The parameter $\gamma > 0$ measures the degree of cultural preference for education (i.e., the amount of utility that an individual derives from her child's education). The amount of time e_t a parent invests in her child's education determines her level of human capital according to the following equation:

$$H_{t+1} = \phi e_t + (1-\delta)H_t, \tag{2}$$

where $\phi > 0$ is an education efficiency parameter and $\delta \in (0, 1)$ is the depreciation rate of human capital that the parent passes onto her child.[5] Following previous studies, we assume for simplicity that education is the only form of bequest.

Individuals use their remaining time endowment $1 - l_t - e_t$ combined with their human capital H_t to earn a wage income $w_t(1 - l_t - e_t)H_t$. Given that individuals consume only when they are old, their consumption at time $t + 1$ is given by

$$C_{t+1} = (1 + r_{t+1})w_t(1 - l_t - e_t)H_t, \tag{3}$$

where r_{t+1} is the real interest rate. Substituting (2) and (3) into (1), we can express an individual's optimization problem as follows.

$$\max_{e_t,\, l_t} U^t = \eta \ln l_t + \ln[(1 + r_{t+1})w_t(1 - l_t - e_t)H_t] + \gamma \ln[\phi e_t + (1-\delta)H_t],$$

taking $\{r_{t+1}, w_t, H_t\}$ as given. The utility-maximizing levels of l_t and e_t are respectively

$$l_t = \eta \frac{\phi + (1-\delta)H_t}{\phi(1 + \eta + \gamma)}, \tag{4}$$

$$e_t = \frac{\phi\gamma - (1+\eta)(1-\delta)H_t}{\phi\,(1 + \eta + \gamma)}. \tag{5}$$

Substituting (5) into (2) yields the level of human capital at time $t + 1$ as

$$H_{t+1} = \frac{\gamma}{1 + \eta + \gamma}\left[\phi + (1-\delta)H_t\right], \tag{6}$$

which is the accumulation equation of human capital and shows that the dynamics of H_t is stable. Therefore, given any initial H_0, H_t always converges to its steady state.

In the steady state, the level of leisure is $l^* = \eta/(1 + \eta + \delta\gamma)$, which is decreasing in γ, whereas the level of education is $e^* = \delta\gamma/(1 + \eta + \delta\gamma)$, which is increasing in γ. The steady-state level of human capital is $H^* = \phi\gamma/(1 + \eta + \delta\gamma)$, which is also increasing in γ. However, the steady-state level of human-capital-embodied labor supply is

$$(1 - l^* - e^*)H^* = \frac{\phi\gamma}{(1 + \eta + \delta\gamma)^2}, \tag{7}$$

which is an inverted-U function of γ. The negative effect of γ on human-capital-embodied labor supply is due to the crowding-out effect of education, which is captured by $1 - l^* - e^* = 1/(1 + \eta + \delta\gamma)$. Intuitively, an increase in γ causes parents to devote more time to their children's education e^*. As a result, they have to devote less of their time to other productive activities. Although they also reduce leisure l^*, the reduction in l^* only partly offsets the increase in e^*, resulting into an overall decrease in $1 - l^* - e^*$.

[5] Our results are robust to $\delta \to 1$ (i.e., parents' human capital does not transfer to their children).

2.2 Final goods

Final goods Y_t are produced by competitive firms using the following production function:

$$Y_t = L_t^{1-\alpha} \sum_{i=1}^{N_t} X_t^{\alpha}(i), \tag{8}$$

where L_t is production labor and $X_t(i)$ is intermediate goods $i \in [1, N_t]$. The firms take as given the output price (normalized to unity) and input prices w_t and $p_t(i)$. The familiar conditional demand functions for L_t and $X_t(i)$ are respectively

$$w_t = (1-\alpha) Y_t / L_t, \tag{9}$$

$$p_t(i) = \alpha \left[L_t / X_t(i) \right]^{1-\alpha}. \tag{10}$$

2.3 Intermediate goods

There is a number of differentiated intermediate goods $i \in [1, N_t]$. We consider the following simple production process that is commonly used in the literature. Specifically, we assume that one unit of intermediate goods is produced by one unit of final goods. In this case, the profit function is given by

$$\pi_t(i) = p_t(i) X_t(i) - X_t(i). \tag{11}$$

The familiar unconstrained profit-maximizing price is $p_t(i) = 1/\alpha$. Here we follow Goh and Olivier (2002) and Iwaisako and Futagami (2013) to introduce patent breadth $\mu > 1$ as a policy variable such that

$$p_t(i) = \min\{\mu, 1/\alpha\}. \tag{12}$$

We focus on the more realistic case in which $\mu < 1/\alpha$.[6] Substituting $p_t(i) = \mu$ into (10) shows that $X_t(i) = X_t$ for all $i \in [1, N_t]$. In this case, (11) becomes

$$\pi_t = (\mu - 1) X_t = (\mu - 1) \left(\frac{\alpha}{\mu} \right)^{1/(1-\alpha)} L_t, \tag{13}$$

where the second equality follows from (10).

2.4 R&D

Denote v_t as the value of a variety of intermediate goods invented at time t. The value of v_t is equal to the present value of future profits given by[7]

$$v_t = \sum_{s=t+1}^{\infty} \left[\pi_s / \prod_{\tau=t+1}^{s} (1 + r_\tau) \right]. \tag{14}$$

[6] Given a labor share $1-\alpha$ of roughly two-thirds, the unconstrained markup ratio is $1/\alpha = 3$, which is unrealistically large. However, all our results are robust to the case of $p_t(i) = 1/\alpha$.

[7] A new variety invented at time t will only start generating profits in the next period.

Competitive entrepreneurs employ R&D labor R_t for innovation. The innovation process is

$$\Delta N_t = \theta N_t R_t, \tag{15}$$

where $\Delta N_t \equiv N_{t+1} - N_t$. The parameter $\theta > 0$ denotes an R&D productivity parameter, and N_t captures knowledge spillovers as in Romer (1990). The zero-profit condition is given by

$$\Delta N_t v_t = w_t R_t \Leftrightarrow \theta N_t v_t = w_t. \tag{16}$$

2.5 Aggregation

Substituting $X_t = (\alpha/\mu)^{1/(1-\alpha)} L_t$ into $Y_t = L_t^{1-\alpha} N_t X_t^{\alpha}$ yields the aggregate production function given by

$$Y_t = \left(\frac{\alpha}{\mu}\right)^{\alpha/(1-\alpha)} N_t L_t \tag{17}$$

and the amount of intermediate goods given by $N_t X_t = \alpha Y_t / \mu$. The resource constraint on final goods is

$$C_t = Y_t - N_t X_t = \left(1 - \frac{\alpha}{\mu}\right) Y_t. \tag{18}$$

The resource constraint on human-capital-embodied labor input is

$$(1 - l_t - e_t) H_t = L_t + R_t. \tag{19}$$

2.6 Equilibrium

The equilibrium is a sequence of allocations $\{X_t(i), Y_t, C_t, L_t, R_t, H_t, e_t, l_t\}$ and prices $\{p_t(i), w_t, r_t, v_t\}$ such that the following conditions are satisfied:

- individuals choose $\{e_t, l_t\}$ to maximize utility taking $\{r_{t+1}, w_t, H_t\}$ as given;
- competitive final goods firms choose $\{X_t(i), L_t\}$ to maximize profit taking $\{p_t(i), w_t\}$ as given;
- monopolistic intermediate goods firms choose $\{p_t(i), X_t(i)\}$ to maximize profit (11) taking (10) as given;
- competitive entrepreneurs in the R&D sector choose $\{R_t\}$ to maximize profit taking $\{w_t, v_t\}$ as given;
- the resource constraint on final goods holds such that $Y_t = N_t X_t + C_t$;
- the resource constraint on human-capital-embodied labor input holds such that $L_t + R_t = (1 - l_t - e_t) H_t$;
- the amount of saving equals the value of assets such that $w_t (1 - l_t - e_t) H_t = N_{t+1} v_t$.

3 Cultural preference for education

In this section, we explore the implications of cultural preference for education on economic growth. Section 3.1 focuses on the balanced growth path. Section 3.2 considers the transitional paths of human capital and the equilibrium growth rate.

3.1 Balanced growth path

Human-capital-embodied labor allocations $\{L_t, R_t\}$ are stationary in the steady state. Then, (13) implies that π_t is also stationary in the steady state. As a result, the steady-state version of (14) simplifies to $v = \pi/r$. Substituting this condition into the R&D zero-profit condition in (16), we have $\theta N_t \pi/r = w_t$, where $N_t\pi = \alpha Y_t(\mu - 1)/\mu$ and w_t is given by (9). Solving these conditions yields

$$L = \frac{\mu}{\mu - 1}\left(\frac{1-\alpha}{\alpha}\right)\frac{r}{\theta}. \tag{20}$$

The next step is to determine the steady-state equilibrium interest rate r. Wage income at time t is $w_t(1 - l_t - e_t)H_t = w_t(L_t + R_t)$, which is also the total amount of saving in the economy at time t. The total value of assets in the economy at the end of time t is $N_{t+1}v_t$, which includes the new varieties created at time t. Given the overlapping-generation structure of the economy, the amount of saving must equal the value of assets such that

$$w_t(1 - l_t - e_t)H_t = N_{t+1}v_t \Leftrightarrow w_t(L + R) = (1 + \theta R)N_t\pi/r, \tag{21}$$

where $N_t\pi = \alpha Y_t(\mu - 1)/\mu$ and w_t is given by (9). Solving these conditions, we obtain

$$\frac{(1-\alpha)(L+R)}{L} = \frac{\alpha(1+\theta R)}{r}\left(\frac{\mu-1}{\mu}\right), \tag{22}$$

which determines the equilibrium interest rate that equates the amount of saving to the value of assets in the economy.

Solving (7), (19), (20) and (22) yields the steady-state equilibrium values of $\{r^*, L^*, R^*\}$.

$$r^* = \frac{\alpha}{1-\alpha}\left(\frac{\mu-1}{\mu}\right), \tag{23}$$

$$L^* = \frac{1}{\theta}, \tag{24}$$

$$R^* = \frac{\phi\gamma}{(1+\eta+\delta\gamma)^2} - \frac{1}{\theta}, \tag{25}$$

which shows that R^* is an inverted-U function of γ. From (15) and (25), the steady-state equilibrium growth rate is given by

$$g^* \equiv \frac{\Delta N_t}{N_t} = \theta R^* = \frac{\theta\phi\gamma}{(1+\eta+\delta\gamma)^2} - 1 \geq 0, \tag{26}$$

which is also an inverted-U function of γ. Specifically, the growth-maximizing value of γ is given by $(1+\eta)/\delta > 0$. To ensure that there exists an intermediate range of γ in which g^* is positive, we impose the following parameter restriction: $\theta\phi > 4(1+\eta)\delta$. Under this parameter restriction, there still exists a lower bound value $\underline{\gamma}$ of γ below which $g = 0$, and there also exists an upper bound value $\overline{\gamma}$ of γ above which $g = 0$. In other words, if $\gamma = \underline{\gamma}$ or $\gamma = \overline{\gamma}$, then $R^* = 0$. Solving the quadratic function $\theta\phi\gamma = (1+\eta+\delta\gamma)^2$, we derive the values of $\{\underline{\gamma}, \overline{\gamma}\}$ given by

$$\{\underline{\gamma}, \overline{\gamma}\} = \frac{\theta\phi - 2(1+\eta)\delta \pm \sqrt{[\theta\phi - 4(1+\eta)\delta]\theta\phi}}{2\delta^2}. \tag{27}$$

We summarize these results in Proposition 1 and plot g^* as a function of γ in Figure 1.

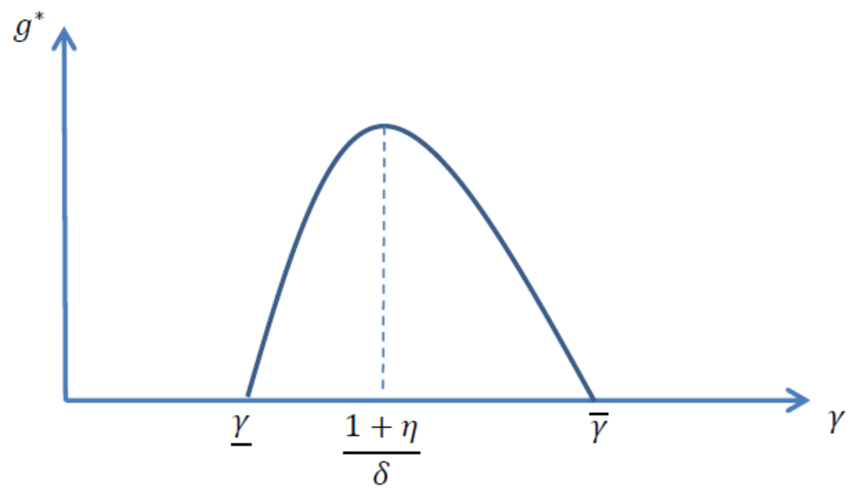

Figure 1: Steady-state effect of education preference on growth

Proposition 1 *The degree of cultural preference for education has an inverted-U effect on the steady-state equilibrium growth rate. Under a sufficiently low or high degree of cultural preference for education, the economy is trapped in a zero-growth equilibrium.*

The intuition of the above results can be explained as follows. An increase in the degree of cultural preference for education increases education investment and human capital accumulation. However, it also crowds out productive resources for R&D. Specifically, if $\gamma > (1+\eta)/\delta$, then any further increase in γ would lead to a decrease in human-capital-embodied labor supply, which in turn reduces the amount of resources available for innovation. In this case, a stronger degree of cultural preference for education is detrimental to economic growth. Furthermore, in the R&D-based growth model, the market size needs to be sufficiently large in order for R&D investment to be profitable. Therefore, when the degree of cultural preference takes on a sufficiently high or low value, the market size measured by $(1-l-e)H$ becomes so small that there is no incentive for entrepreneurs to invest in R&D. In this case, the economy is trapped in a stagnant equilibrium with zero economic growth.

3.2 Transition dynamics

In this subsection, we derive a closed-form solution for the transitional path of the economy when the degree of education preference γ changes from an initial value γ_0 to a new value γ_1. Substituting (17) into (9) yields

$$w_t = (1-\alpha)\left(\frac{\alpha}{\mu}\right)^{\alpha/(1-\alpha)} N_t. \tag{28}$$

Substituting (28) into (16) yields

$$v_t = \frac{1-\alpha}{\theta}\left(\frac{\alpha}{\mu}\right)^{\alpha/(1-\alpha)}, \tag{29}$$

which is stationary both on and off the balanced growth path. Substituting (28) and (29) into (21) yields

$$w_t(1-l_t-e_t)H_t = N_{t+1}v_t \Leftrightarrow N_{t+1} = \theta N_t(1-l_t-e_t)H_t. \tag{30}$$

Substituting (4) and (5) into (30) yields

$$g_t \equiv \frac{N_{t+1}}{N_t} - 1 = \frac{\theta}{\phi(1+\eta+\gamma)}\left[\phi H_t + (1-\delta)(H_t)^2\right] - 1, \tag{31}$$

which is decreasing in γ for a given H_t due to the crowding-out effect of education investment but is increasing in H_t due to the positive effect of human capital on innovation. Equation (31) also shows that the dynamics of N_{t+1}/N_t is completely determined by the dynamics of H_t given by (6).

We next determine the transitional path of output. Substituting (15) and (19) into (30) yields

$$\frac{N_{t+1}}{N_t} = \theta(1-l_t-e_t)H_t \Leftrightarrow 1+\theta R_t = \theta(L_t+R_t), \tag{32}$$

which shows that $L_t = 1/\theta$ even when the economy is off the balanced growth path. As a result, (17) simplifies to

$$Y_t = \frac{1}{\theta}\left(\frac{\alpha}{\mu}\right)^{\alpha/(1-\alpha)} N_t, \tag{33}$$

which shows that $Y_{t+1}/Y_t = N_{t+1}/N_t$ at any point in time.

We are now ready to examine the complete transitional effects of a change in cultural preference for education. Suppose at time $t=0$ the economy is at an initial steady state with $\gamma = \gamma_0$. In this case, the initial value of human capital is $H_0 = \phi\gamma_0/(1+\eta+\delta\gamma_0)$, and the initial steady-state equilibrium growth rate is $g_0|_{\gamma=\gamma_0} = \theta\phi\gamma_0/(1+\eta+\delta\gamma_0)^2 - 1$. From (31), we see that when γ increases at time 0 from γ_0 to $\gamma_1 > \gamma_0$, the growth rate at time 0 immediately falls to

$$g_0|_{\gamma=\gamma_1} = \frac{\theta}{\phi(1+\eta+\gamma_1)}\left[\phi H_0 + (1-\delta)(H_0)^2\right] - 1 = \underbrace{\frac{1+\eta+\gamma_0}{1+\eta+\gamma_1}}_{<1}\frac{\theta\phi\gamma_0}{(1+\eta+\delta\gamma_0)^2} - 1 \tag{34}$$

given that H_0 is predetermined. Therefore, a stronger education preference has an initial negative impact on growth. Then, at time $t = 1$, the level of human capital increases to

$$H_1 = \frac{\gamma_1}{1+\eta+\gamma_1}[\phi + (1-\delta)H_0] = \underbrace{\frac{1+\eta+\gamma_0}{\gamma_0}\frac{\gamma_1}{1+\eta+\gamma_1}}_{>1}\frac{\phi\gamma_0}{1+\eta+\delta\gamma_0} > H_0, \tag{35}$$

which determines the equilibrium growth rate at time $t = 1$ given by

$$g_1 = \frac{\theta}{\phi(1+\eta+\gamma_1)}\left[\phi H_1 + (1-\delta)(H_1)^2\right] - 1, \tag{36}$$

where H_1 is given by (35). After the initial decrease, the equilibrium growth rate gradually increases until it reaches the new steady state given by $g^* = \theta\phi\gamma_1/(1+\eta+\delta\gamma_1)^2 - 1$, which may be higher or lower than the initial steady-state growth rate given that g^* is an inverted-U function in γ as demonstrated in (26) and Proposition 1.

Using (31) and the transitional path of human capital in (6), we can also trace out the complete transitional path of the equilibrium growth rate from the initial steady state to the new steady state when γ increases at time 0 from γ_0 to γ_1. From (6), the equilibrium level of human capital at time $t+s$ for any $s \geq 1$ is given by

$$H_{t+s} = \frac{\phi\gamma_1}{1+\eta+\delta\gamma_1}\left\{1 - \left[\frac{(1-\delta)\gamma_1}{1+\eta+\gamma_1}\right]^s\right\} + \left[\frac{(1-\delta)\gamma_1}{1+\eta+\gamma_1}\right]^s H_t, \tag{37}$$

where $H_t = H_0 = \phi\gamma_0/(1+\eta+\delta\gamma_0)$ at time $t = 0$. Then, the equilibrium growth rate at time $t+s$ for any $s \geq 1$ is given by

$$g_{t+s} = \frac{\theta}{\phi(1+\eta+\gamma_1)}\left[\phi H_{t+s} + (1-\delta)(H_{t+s})^2\right] - 1. \tag{38}$$

We summarize the results in Proposition 2 and plot in Figure 2 the transitional paths of g_t when γ increases at time 0 from γ_0 to γ_1.

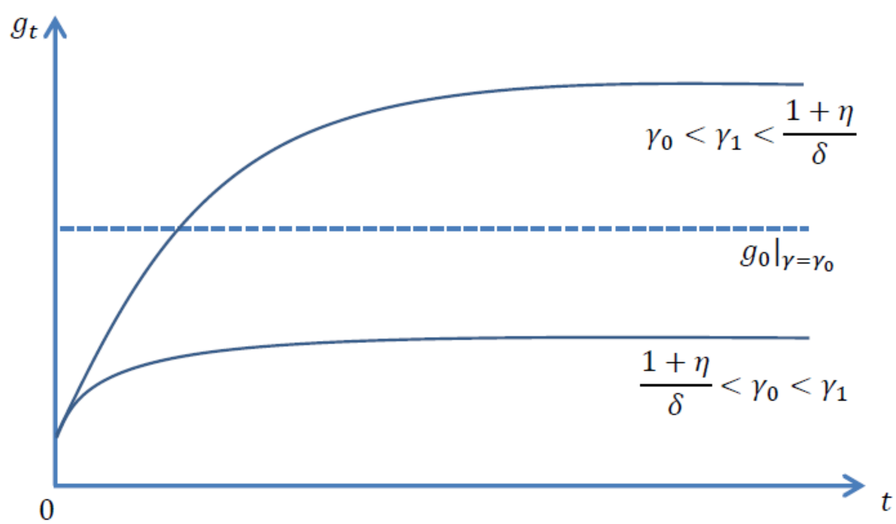

Figure 2: Transitional effect of education preference on growth

Proposition 2 *An increase in the degree of cultural preference for education has an initial negative effect on the equilibrium growth rate and a gradual positive effect on the level of human capital. As the level of human capital increases, the equilibrium growth rate also increases. The new steady-state equilibrium growth rate may be higher or lower than the initial steady-state equilibrium growth rate.*

4 Conclusion

In this note, we have explored how cultural preference for education affects economic growth. Although a stronger preference for education leads to more human capital which is an important input for innovation, the larger investment in education crowds out resources for R&D investment. As a result, the overall effect of a stronger cultural preference for education on economic growth is ambiguous. More specifically, it has an inverted-U effect on the steady-state equilibrium growth rate. Our simple model also allows us to provide a closed-form solution for the complete transitional dynamics. We find that the initial impact of an increase in the degree of education preference on growth is always negative. However, this negative initial effect on economic growth can be offset by a positive long-run effect of accumulating more human capital so long as the degree of education preference is not excessively high.

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