BRUSSELS ECONOMIC REVIEW - CAHIERS ECONOMIQUES DE BRUXELLES
VOL. 47 - N°1 SPRING 2004

THE IMPACT OF TEMPORARY MIGRATION ON HUMAN CAPITAL ACCUMULATION AND ECONOMIC DEVELOPMENT

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ABSTRACT:

We study the long-run growth impact on the emigrants' country of origin of a change in immigration policy implemented by the host country. The policy change takes the form of an increase in the ratio of temporary to permanent visas issued. This policy change has two counteracting effects on the source country: first, it discourages human capital accumulation (which is harmful for development), and second, it facilitates the diffusion of knowledge (which encourages growth). We are able to analyze the determinants of an "optimal" (i.e. growth-maximizing) share of temporary visas.

JEL CLASSIFICATION: F22, J24, J68.

KEYWORDS: skilled migration, immigration policy, human capital, growth.

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INTRODUCTION

As OECD (1998) points out, many of the traditional "host" countries have recently redirected their immigration policy toward stricter conditions of admission for candidate immigrants. The general trend is an increase in the share of temporary visas issued (relative to permanent visas). From the host country's viewpoint, this shift in migration quotas---another aspect of which is to favor the immigration of *skilled* workers---is clearly aimed at facilitating the economy's response to aggregate fluctuations in economic activity. What is less clear, and will be the issue addressed in this paper, is the impact of this shift on the source countries.

Specifically, we show that exogenously raising the proportion of returnees among migrants has a generally ambiguous impact on long-run growth in the source country in a model where the engine of growth is knowledge accumulation. This ambiguous overall impact is the sum of two counteracting forces: a reduction in the educational effort put forth by locals in the source country, and an increase in knowledge diffusion. On one hand, assuming that individual skills are complementary to the economy's overall level of technological development, natives of developing countries are induced to invest more into education, the higher the probability that they can combine their skills with the more productive technology available abroad. Thus, a higher probability of only getting a temporary visa (as opposed to a permanent one) reduces the returns to education from the source countries' natives' point of view, which in turn reduces the aggregate level of educational effort undertaken in the developing economies and has an adverse effect on growth. On the other hand, assuming that returning emigrants contribute to knowledge diffusion, their higher number also has a positive impact on knowledge accumulation in their country of origin through this particular channel.

Many existing contributions already explore the causes and consequences of return migration. A very brief overview follows.

First, return migration can either be chosen or it can be constrained. For instance, some candidate immigrants only manage to receive a temporary visa (where they would have preferred a permanent one), and are therefore obliged to return to their country of origin against their will. Recent trends in the migration policies implemented in many traditional "host" countries clearly tend to amplify this phenomenon. On the other hand, some emigrants freely choose to return to their country of origin for a variety of reasons. For instance, they may have made their initial decision to emigrate based on erroneous information (Borjas and Bratsberg 1996). Return migration may also have been planned as part of an optimal life-cycle relocation sequence (Borjas and Bratsberg 1996, Djajic and Milbourne 1988, Stark et al., 1997).

Second, the perspective of being able (or even forced) to return to one's country of origin after a stay abroad is likely to influence some of the typical migrant's economic choices. For example, migrants who expect to return to their country of origin in the future tend to participate more than the locals in the labor market (Dustmann 1996).

However, contributions analyzing the impact of migration opportunities on the behavior of potential migrants before they leave their country of origin only address the issue of incentives to acquire education. What those contributions show is that being able to emigrate raises the expected returns to education and induce workers to train themselves more (Mountford, 1997). Subsequent work by Beine et al. (2001) brings some empirical support to this latter idea. One limitation of those contributions, though, is that they all consider that migration can only be permanent, and are completely silent on the impact of return migration.

Finally, the return of emigrants can be seen as a potential source of growth for the emigrants' home country, to the extent that they contribute to the diffusion of the more advanced skills that they have acquired during their stay abroad (Domingues Dos Santos and Postel-Vinay, 2003). Limited empirical evidence exists to support this idea, including Co, Gang and Yun (2000) who show that Hungarian migrants enjoy a wage premium when returning home, and Barrett and O'Connell (2000) who reach similar conclusions in their study of Irish migrants. However, all migration decisions are made freely in the model of Domingues Dos Santos and Postel-Vinay (2003). In other words, they completely shut down any possible constraint imposed by binding migration quotas, or any sort of migration policy. The aim of this contribution is precisely to incorporate constraining migration policy into a simple model of return migration.

This is organized as follows: the next section presents the economic framework. Section 2 looks at the long-run equilibrium with a particular focus on the long-run consequences for economic groth in the source country of the migration policy implemented in the host country. Section 3 concludes.

1. The Model

We consider a dynamic two-country model – the foreign country, labelled by A and the home country, labelled by B – each country being populated by overlapping generations of two-period lived consumers.

1.1. Technology

Both countries produce one homogeneous consumption good thanks to a continuum of competitive firms with one worker each. Firms can freely enter or exit the market, so that any agent can start a firm and work in any period. Production requires two inputs: A certain amount of efficient labor, ℓ , and a country-specific, publicly available stock of knowledge. The stock of knowledge available at date t in country A (B) is denoted by a_t (b_t). Per period output is simply the product of both inputs, so that using ℓ units of labor in period t returns $y_t^A = a_t \bullet \ell$ units of good in country A and $y_t^B = b_t \bullet \ell$ units of good in country B.

The first key assumption that we make is that the foreign country is technologically more advanced than the home country. To model this, we adopt the extreme assumption that, if both countries stay in autarchy, the technology in country *B* stagnates at some initial level $\underline{b}$, whereas the technology in country *A* grows at some positive rate *g*: $a_{t+1}/a_t=1+g$. Since we only want to focus on the consequences of this assumption, we shall keep *g* an exogenous constant: The developing country has no engine of growth of its own whereas the developed country benefits from an exogenous source of technological progress.[1]

1.2. Preferences

Generations are of fixed, unit mass in each country. Upon being born, natives of the home country are endowed with one unit of labor, $\ell=1$. All agents have identical preferences over consumption, independently of their country of origin, given by:

$$U(c_1, c_2)=c_1+c_2 \tag{1}$$

where c_1 and c_2 respectively denote consumption in youth and old age. For simplicity, we assume that agents don't discount the future and only care about total consumption over their life cycle.

At the beginning of their life, natives of country *B* face an educational choice which takes the form of choosing the fraction $\theta\epsilon[0, 1]$ of their youth that they will spend at school. The cost of education is an opportunity cost (they will only spend a fraction $(1-\theta)$ of their youth working and earning an income), while the reward to education is enhanced productivity. Specifically, an agent having spent θ at school ends up with units of efficient labor to supply per unit time. The parameter *h* thus loosely measures $(1+h\theta)$ the efficiency of the schooling system in country *B*.

After their training period, workers are given the possibility to migrate to the more advanced country *A* with probability *m*. Moreover, conditional on getting a migrant's visa, the visa is permanent with conditional probability p/m and temporary with conditional probability $r/m=(m-p)/m$. Temporary visas only allow migrants to stay in country during their youth, while permanent visas allow them to stay until they die. Temporary visa holders thus return to their home country, *B*, in their old age.

Given negligible migration costs (which we shall assume), natives of country *B* always want to migrate to country *A* if offered the opportunity to do so provided that labor productivity is higher in country *A* than in country *B*. Throughout the paper, we shall

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[1] The way growth and migration dynamics would be modified under the assumption that both countries have an endogenous source of growth (based on human capital accumulation for instance) is left for later exploration. The interplay between endogenous growth, migration and knowledge diffusion is the issue in Domingues Dos Santos (1999), in a model where knowledge diffusion occurs through sheer technological imitation.

assume that country A always grows faster than country B, i.e. that $g>(b_{t+1}-b_t)/b_t$ for all t. This will imply some restrictions on the parameters, to which we will return in the sequel.

Under those assumptions, a native of country B born in period t who did not get any visa (i.e. who has lost the m-lottery) enjoys utility:

$$U^S(c_1, c_2;\theta)=(1+h\theta)[(1-\theta)b_t+b_{t+1}], \tag{2}$$

while a worker who receives a permanent visa (which happens with probability $p=m-r$) benefits from the higher stock of knowledge available in country A and enjoys:

$$U^P(c_1, c_2;\theta)=(1+h\theta)[(1-\theta)a_t+a_{t+1}] \tag{3}$$

Finally, a worker who receives a temporary visa benefits from the stock of knowledge a_t in her/his first period of life, while s/he has to return to the less productive country in her/his home country in her/his old age. Here we further assume that migration entails the following additional benefit: migrants learn from working in a technologically more advanced environment, and increase their labor endowment which will be effective in the following period. The way migrants acquire knowledge in the host country is not explicitly formalized: migrants benefit from a positive `learning-by-doing' type of externality. More specifically, we suppose that the amount by which their labor endowment is increased in each period –in other words, how much they can learn in each period– is an increasing function of their initial level of education θ. Formally, we simply assume that the temporary migrants' second period labor endowment equals $1+(h+\alpha)\theta$, instead of $1+h\theta$ for non-migrants. As a result, temporary migrants reach a level of well-being given by:

$$U^T(c_1, c_2;\theta)=(1+h\theta)[(1-\theta)a_t+b_{t+1}]+\theta\alpha b_{t+1} \tag{4}$$

Following the set of assumptions that we made, the level of training initially chosen by natives of country B at the beginning of their life solves:

$$\left|\begin{array}{l}\theta^*=\arg\max\ \{(1-m)[U^S(c_1, c_2;\theta)+(m-r)U^P(c_1, c_2;\theta)+rU^T(c_1, c_2;\theta)\},\\ \text{subject to } \theta\in[0,1].\end{array}\right. \tag{5}$$

Given our functional forms, an interior solution must solve the following first-order condition:

$$h[(1-m)[(1-\theta)b_t+b_{t+1}]+(m-r)[(1-\theta)a_t+a_{t+1}]+r[(1-\theta)a_t+b_{t+1}]]+r\alpha b_{t+1}=(1-h\theta)[(1-m)b_t+ma_t] \tag{6}$$

Clearly, an interior solution is not always guaranteed. Moreover, equation (6) can be simplified in various ways depending on the migration policy that is being implemented (the parameters m and r). In the following section we will carry out an exhaustive analysis of all possible situations. Before we do this, however, we must define the law of motion of b_t, the stock of knowledge in country B.

1.3. Knowledge accumulation

Here we simply assume that b_{t+1} (the stock of knowledge available in country B at date t+1) equals *the output per old worker residing in country B*. This assumption has two parts. First, saying that next period productivity is proportional to output per worker in this period is akin to a standard "learning-by-doing" hypothesis and probably needs no further comment. The second part of the assumption is that only old workers "count" in knowledge accumulation. This can be loosely justified by saying that only experienced workers effectively diffuse knowledge to their fellow workers. Here we will only say that we make this assumption for analytical simplicity.[2]

Formally, we thus have:

$$\frac{b_{t+1} - b_t}{b_t} = g^B = h\theta + \frac{r\theta\alpha}{1-(m-r)} \simeq (h + r\alpha)\theta, \tag{7}$$

where the last (approximate) equality stems from the fact that m and r, which are shares of migrants in a generation, are typically small numbers. One thus sees that productivity growth in country B has two sources: one is the direct effect on mean productivity of the initial education that workers choose to take ($h\theta$), and the other is the diffusion of knowledge due to temporary migrants returning from coutnry A in their old age.

2. Equilibrium Configurations

We now go through all the possible long-run equilibrium situations, the occurrence of which depends on migration policy parameters m and r. We start with the simplest possible case, which is autarky.

2.1. Autarky (m = 0)

Absent any migratory flows (m=0), the only source of knowledge accumulation in country B is education. In this case it is easy to show, using (6) and (7), that the equilibrium values of θ^* and g^B are as follows:

$$\text{If } h \le \frac{1}{2}, \text{ then } \theta^*_{\text{aut}} = 0 \text{ and } g^B_{\text{aut}} = 0\,;$$
$$\text{If } \frac{1}{2} < h < 1, \text{ then } \theta^*_{\text{aut}} = \min\left\{\frac{2h-1}{h(2-h)}, 1\right\} \text{ and } g^B_{\text{aut}} = h\theta^*_{\text{aut}}. \tag{8}$$

[2] Assuming that young workers also contribute to knowledge accumulation is a straightforward extension of this setting. It only leads to analytical complications without changing the main results.

The growth rate of country *B* thus only depends on the productivity of the educational system, as measured by h. If it is low ($h \leq 1/2$), then the gains in terms of productivity (which are only proportional to the low technological stock b_t in the absence of any opportunity to migrate) are not enough to compensate for the opportunity cost of eductio. In this case, country *B* stagnates and its natives do not acquire any training.

As the efficiency of training rises ($h > 1/2$), it becomes worthwhile for young workers to get some education, which increases their productivity and guarantees a positive growth rate for the economy *B*, through sheer learning by doing. Note in this case that our assumption that country *B* always lags behind country *A* amounts to assuming that $g > h$, which is the maximum rate of growth attainable by country *B*.

2.2. Positive migratory flows ($m > 0$)

From the moment when some natives of country *B* are allowed to migrate (be it only temporarily) to country *A*, then the productivity level of country *A*, a_t, enters the typical agent's arbitrage equation (6). Focusing on the long-run, and given the assumption that country *A* always grows faster than country *B*, one can then simplify (6) if $m > 0$ by noticing that b_t becomes negligible compared to a_t as $t \rightarrow +\infty$. Specifically, (6) simplifies into:

$$\theta = \frac{1}{2h}\left[h\left(2 + g - \frac{r}{m}(1 + g)\right) - 1\right]. \tag{9}$$

This formula gives the long-run equilibrium educational choice of country *B* natives, provided that it is an interior solution (i.e. it has to lie between 0 and 1).

This equilibrium value (and its consequences on the growth rate of economy *B*) again depend on the particular migration policy that is being implemented. In this paper we will be interested in the effects of r given a value of m, i.e. we want to analyze the impact of changing the *proportion* of temporary visas given a fixed total number of entry visas, m. Also, for expositional clarity, we start with the simple case where $r=0$, i.e. where all migration is permanent.

2.2.1. Permanent visas only: $r = 0$

In this case, keeping in mind that θ cannot be outside of [0, 1], equations (7) and (9) imply the following equilibrium pattern:

$$\begin{aligned} &\text{If } h \leq \frac{1}{2+g}, \text{ then } \theta_0^* = 0 \text{ and } g_0^B = 0; \\ &\text{If } \frac{1}{2+g} < h, \text{ then } \theta_0^* = \min\left\{\frac{h(2+g)-1}{2h}, 1\right\} \text{ and } g_0^B = h\theta_0^*. \end{aligned} \tag{10}$$

The minimum value of h ensuring a positive growth rate for economy B now becomes $1/(2+g)$, which is less than 1/2, the corresponding threshold in autarky. Otherwise stated, allowing some people to migrate makes it more likely that the source economy exhibits sustained growth in the long-run. In particular, whenever $1/(2+g)<h\leq 1/2$, country B stagnated in autarky and grows under positive probability of migration. The reason is clearly that a positive probability of migration increases the private returns to education by a considerable amount —really an infinite amount, in the long-run. Natives of country B thus get more training. Some of the benefits of this increased educational effort go to country A, as a share m of country B natives migrate and stay abroad forever. But since a share $(1-m)$ of each generation is forced to stay in their home country, their educational effort contributes to increasing the productivity in country B. Our model thus reproduces a stylized version of the mechanism originally pointed out by Mountford (1997).

2.2.2. Permanent and temporary visas ($r > 0$)

We now turn to the situation on which this paper is focused, i.e. the case where temporary visas are issued, together with permanent ones. In order to stick to one single, "realistic" case, we do this under the following restriction on the parameters:

Assumption 1. *Country B stagnates in the "autarky" regime and sustains positive long-run growth with* $\theta_0^* < 1$ *in the "permanent visas only" regime, i.e.*

$$\frac{1}{2+g} \leq h \leq \min\left\{\frac{1}{2}, \frac{1}{g}\right\}.$$

Clearly, this assumption is not necessary for the upcoming analysis. We only adopt it in order not to have to distinguish between several degenerate sub-cases[5]. The lower bound $h\geq 1/(2+g)$ ensures that θ_0^* (and thus g_0^B) are positive. The restriction $h\leq 1/2$ ensures that $g_{aut}^B = 0$: country B stagnates in autarky. Finally, the condition $h\leq 1/g$ ensures that $\theta_0^* < 1$, i.e. country B natives spend at least some of their youth working (as opposed to getting educated). Note in passing that the bounds thus imposed on h are not as tight as it might first seem: since the time unit here is half the aldult life of a native of country B (say, somewhere in the vicinity of 20 years), g is likely to be a fairly large number. For instance, assuming that country A grows at 1.5 percent per annum, then $1+g=1.015^{20}\simeq 1.35$, implying $g\simeq 0.35$. As a by-product of this quick look at reasonable orders of magnitude, one sees that the upper bound $h\leq 1/g$ is not likely to place any additional restriction on top of $h\leq 1/2$.

Formally, the analysis doesn't differ from the $r=0$ case: again using equations (7) and (9), we get:

[5] A complete analysis is available upon request to the authors.

$$\text{If } h \leq \frac{1}{2+g-\frac{r}{m}(1+g)}, \text{ then } \theta_r^* = 0 \text{ and } g_r^B = 0\,;$$
$$\text{If } \frac{1}{2+g-\frac{r}{m}(1+g)} < h, \text{ then } \theta_r^* = \frac{h\left(2+g-\frac{r}{m}(1+g)\right)-1}{2h} \tag{11}$$
$$\text{and } g_0^B = (h+r\alpha)\ \theta_r^*.$$

Given our interest in r as a policy parameter, it may be more convenient to redefine the threshold between the 2 regimes in (11) explicitly in terms of r. To this end, let us define:

$$\overline{r} = \frac{m}{1+g}\left(2+g-\frac{1}{h}\right). \tag{12}$$

It is straightforward to check that Assumption 1 ensures that $\bar{r}$ is greater than 0 smaller than m.[6] With this notation, (11) rewrites as:

$$\text{If } r \geq \overline{r}, \text{ then } \theta_r^* = 0 \text{ and } g_r^B = 0\,;$$
$$\text{If } r < \overline{r}, \text{ then } \theta_r^* = \frac{h(2+g-\frac{r}{m}(1+g))-1}{2h} \text{ and } g_r^B = (h+r\alpha)\theta_r^*. \tag{13}$$

The first thing we can notice about (13) is that increasing the share of temporary visas, r/m, always discourages training in the source country B: formally, θ_r^* is an unambiguously decreasing function of r. Under Assumption 1, θ_0^* is always positive—i.e. natives of country B always undertake at least some training when all visas are permanent.[7] As r is increased, the equilibrium amount of time spent at school θ_r^* decreases and even hits 0 before r reaches its maximum value of m, i.e. before one reaches the situation where only temporary visas are issued.

The reason why an increase in the share of temporary visas discourages education is clear enough: a lower chance of getting a permanent visa means a lower chance of being able to "combine" one's personal labor input ($1+h\theta$) with a more productive technology (a_{t+1} vs. b_{t+1}) in the following period. The expected returns to training are therefore lower, the higher the probability of getting a temporary visa only.

[6] In fact, it is smaller than $gm/(1+g)$.

[7] It is also strictly less than 1, which implies that θ_r^* is also strictly less than 1 for any $r>0$. We thus have an interior solution for θ_r^* whenever $0<r<\bar{r}$.

2.2.3. The optimal share of temporary visas

Does all that mean that introducing temporary visas (as opposed to permanent ones) is necessarily harmful for the source country's growth rate? Not necessarily, at least not under our assumption that return migration comes with the benefit of knowledge diffusion. On one hand, increasing r discourages training which lowers the average productivity of country B natives and tends to slow down growth in country B. But on the other hand, increasing r fosters knowledge diffusion: as more temporary migrants return to their home country in their old age, more productive skills are brought back from country A to country B.

Those two counteracting effects can be translated formally: (13) states that $g_r^B = (h + r\alpha)\theta_r^*$ is the product of the equilibrium educational effort, g_r^B, which decreases with r, by the overall "social returns" to educational efforts, $(h+r\alpha)$, which increases with r. It is thus possible that g_r^B be maximized at some strictly positive value of the share of temporary visas, r/m. Clearly, this will be the case if $\partial g_r^B/\partial r$ is positive at $r=0$.[8] Specifically, turning to (13) and denoting the optimal —i.e. growth-maximizing for country B —share of temporary visas by $(r/m)^*$, one has:

$$\left(\frac{r}{m}\right)^* = \max\left\{\frac{h(2+g)-1}{2h(1+g)} - \frac{h}{2m\alpha}, 0\right\}. \tag{14}$$

We can now examine the determinants of the optimal share of temporary visas. Whenever $(r/m)^*>0$ (we shall return to the case $(r/m)^*=0$ at the end of this discussion), equation (14) tells us that $(r/m)^*$ increases with a, m and g, and reacts ambiguously to changes in h. That $(r/m)^*$ increases with a is unsurprising: when each returning migrant comes back with more productive skills, it is interesting (from the viewpoint of country B) to have more of them come back. Likewise, $(r/m)^*$ increases with m because what matters for knowledge diffusion is the *absolute number* (not the share) of returning migrants. Thus, when there are more migrants to start with (a higher m), a marginal increase in the share of temporary visas brings back a greater absolute number of migrants and therefore has a larger positive impact on knowledge diffusion. The fact that $(r/m)^*$ increases with g may sound less intuitive. This is an indirect effect that flows through educational choices. Faster growth in the host country A increases the expected returns to education and therefore induces country B natives to increase their educational investment θ_r^*. As a result of higher training efforts, returning migrants become more valuable to the source country B because of the complementarity between private training and public knowledge in production. Formally, looking at (7), one sees that a ceteris paribus higher θ^* reinforces the positive impact on g^B of raising r. Finally, the ambiguous response of $(r/m)^*$ to an increase in h is more tricky to analyze. A first, positive effect of h on $(r/m)^*$ is similar to the effect of g on $(r/m)^*$: since a higher value of h means higher returns to training, it encourages training and thus implies a higher

[8] Note in passing that the optimal value of r can be zero, but surely has to be in $[0, r]$ as $g_0^B > 0$ under Assumption 1 and g_r^B for all $r \geq \bar{r}$.

equilibrium value of θ^*. As in the case of a rise in g, this tends to increase $(r/m)^*$. But on the other hand, raising (r/m) tends to discourage training. And since a higher h also implies a higher direct effect of θ^* on the growth rate, a higher h makes it ceteris paribus more costly for growth to discourage education by raising the share of temporary visas. This latter effect pleads for a lower value of $(r/m)^*$ when h increases. Overall, those two counteracting forces add up to an ambiguous response of the optimal share $(r/m)^*$ to an increase in h.[9]

To conclude this discussion, we should re-emphasize the fact that it is only substantial in the parameter configurations such that $(r/m)^*$ is indeed positive. No looking at (14), one sees that $(r/m)^*$ is in fact very likely to equal zero, since again m is likely to be a very small number. So, unless α (the efficiency of knowledge diffusion) is really large, the negative term in (14) probably dominates. Of course, one may not want to take this particular conjecture too seriously, given how stylized our model is. Much of it may depend on the specific functional forms that we have chosen (mostly for the sake of tractability). And after all, we don't really know how important the somewhat abstract phenomenon of "knowledge diffusion" can be in reality...

Concluding Remarks

Do emigration countries benefit or suffer from the increase in the share of tempory visas ? Here our goal was to highlight some aspects of the nexus between migration and long-run growth. More precisely, our contribution focuses on the impact of the propensity to return on human capital accumulation. We show that the intensification of return migration has an ambiguous effect on the human capital accumulation process: on the one hand, it discourages training, whereas on the other hand, it fosters knowledge diffusion.We notably show how the result of this trade off depends on the total share of migrants, the efficiency of the schooling system, the growth rate of the receiving country and the efficiency of knowledge diffusion.

However, our model does not account for the impact of the propensity to return on another crucial source of economic development: the accumulation of physical capital. The propensity to return is likely to have at least two effects on this second engine of growth. Firstly, returning emigrants invest in their home country thanks to the savings they made abroad (Ilahi, 1999 ; Mc Cormick and Wahba, 2001). Second, temporary emigrants remit a higher part of their income than permanent ones while abroad (Lucas et Stark, 1985 ; Hoddinott, 1994). Hence; taking into account the impact of the propensity to return on physical capital accumulation is likely to reinforce the expansionary effect of return migration on the source country. This assertion has to be confirmed.

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9 Yet, formally, one can easily see that $\partial(r/m)^*/\partial h$ has the sign of $1/[4(1+g)^2]-1/[2m\alpha]$. Since m is likely to be a small number, it would take a large value of α for $(r/m)^*$ to react positively to an increase in h. That is, $(r/m)^*$ is likely to decrease with h.

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