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## Should the Government Promote Global Education?

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### **Abstract:**

**Purpose:** Increased mobility of workers has made their competition intense. To increase employment opportunities, workers are attempting to build internationally transferable human capital and governments are responding to this situation by providing global education. This study attempts to find the effects of tertiary education's globalisation by the government on the labour-sending countries' human capital.

**Design/Methodology/Approach:** This study employs an analytical method by solving the maximisation problem of a representative individual in the labour-sending country to derive the demand for education.

**Findings:** Human capital increases by globalising education if the country's initial human capital is larger than the threshold level; however it decreases if the initial human capital is smaller than the threshold. Accordingly, in the process of education's globalisation, the disparity in human capital may widen among countries with large initial human capital and those with small one.

**Practical Implications:** It is not necessarily appropriate for the labour-sending country's government to conduct the policy of tertiary education's globalisation.

**Originality/Value:** This study reveals that global education may have negative consequences for the labour-sending country and that whether the government should conduct the policy of tertiary education's globalisation must be determined by observing their economic condition.

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**Keywords:** Global education, labour migration, human capital, international transferability of human capital, threshold externality, overlapping-generations economy.

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## **1. Introduction**

This study investigates the effects of the government policy of providing global education (internationally applicable education) on human capital of the labour-sending country under the mobility of labour. In particular, this study attempts to find whether the government's attempt to globalise education in the tertiary level really contributes to human capital formation of the labour-sending country or not and its effects on the disparity of steady state human capital among labour-sending countries with different initial human capital.

With growing interdependence, people tend to work in and out of their home countries. As a result, competition among workers has become quite intense. To get the better job, workers attempt to accumulate human capital to raise productivity that can be exerted in both the home and foreign countries. In response, governments in many countries are taking measures to provide global education in the tertiary level.

Clearly, global education benefits workers themselves because it broadens job opportunities and enables workers to earn higher wages. It also seems to be beneficial to the labour-sending country. It can be inferred that global education raises its human capital.

This study examines whether the government policy of providing global education in the tertiary level is invariably beneficial to workers and labour-sending countries by looking into its positive and negative effects explicitly.

For this purpose, this study utilises the analytical methods. In particular, this study builds a small open economic model with overlapping-generations where emigration is possible and part of education helps build transferable human capital. This study then solves the maximisation problem of an individual in the labour-sending country.

This study finds that global education does not necessarily raise the average human capital of the labour-sending country. In particular, global education might decrease the average human capital, depending on the initial level of human capital. This result comes from the mixed effects of education's globalisation on education demand. Globalisation increases the private cost of education and reduces its demand whereas it increases the return of education and raises its demand. Which of the negative and positive effects are dominant depends on the initial level of human capital.

As a result, when global education is promoted by the government, it is possible that some countries end up with the lower level of human capital and that the disparity of steady state human capital widens among countries with different initial human capital. In particular, countries with initial human capital larger than the threshold level increase steady state human capital whereas those with initial human capital

smaller than it decrease steady state human capital when education is globalised. This happens even if the difference of initial human capital is very small.

The contribution of this study to the literature on global education and human capital formation under migration possibilities lies in the presentation of the possible negative effects of global education at the tertiary level on human capital formation. The contribution regarding the conduct of the government education policy is the implication derived from the result. According to the result, the government should determine whether to implement the policy of tertiary education's globalisation or not by observing the state of the economy.

The remainder of this study is organised as follows: Section 2 reviews the related literature. Section 3 introduces the methodology used in this study. Section 4 models an economy where individuals are faced with labour migration prospects and the government provides global education. Section 5 examines the effects of increasing the degree of global education on human capital. Section 6 provides the concluding remarks.

## 2. Literature Review

With increases in globalisation, international migrants have reached 258 million in 2017 and migrant workers accounted for 164 million of them (International Labour Organization, ILO, 2018). International migrants were 232 million and migrant workers were 150 million in 2013 (International Labour Organization, ILO, 2015). This suggests that an increase in migrant workers and its contribution to an increase in international migrants from 2013 to 2017 have been substantial.

The increased mobility of labour has enhanced competition among workers. McDonald and Worswich (2015) suggested that this is not only because more people apply for a job due to globalisation but also because some occupations are difficult to enter for immigrants. Accordingly, to expand employment opportunities, workers must have high productivity that is valid both in the home and foreign countries. As a result, they have begun to accumulate human capital by receiving education, taking it as an investment that raises productivity (Rachaniotis *et al.*, 2013). According to Donald *et al.* (2018), undergraduates perceive higher education as an investment that brings about a net financial gain even though increased tuition fees and other costs narrow this perception. Accumulation of human capital is also a matter of great significance for an economy as a whole. As shown by Lucas (1988), Mankiw *et al.* (1992), Sultanova and Chechina (2016) and Barro (2001), human capital plays a vital role in development and economic growth. Accordingly, education must be provided and human capital must be accumulated for both individuals and an economy.

In general, as explained by Docquier and Rapoport (2012a), human capital is not perfectly transferable to the foreign country. Human capital built in the home

country is not necessarily fully available in the foreign country. Actually, the international transferability of human capital is low, as evidenced by Chiswick and Miller (1992, 2009), Özden (2006), Mattoo *et al.* (2008), Sanromá *et al.* (2015), Basilio *et al.* (2017) and Lancee and Bol (2017).

Accordingly, it is necessary for workers to receive education that raises the transferability of human capital so that they can bring their human capital to the foreign country without a significant loss and the economic gain of labour migration can be raised.

Many governments have responded to this situation. As described by Mundy *et al.* (2016), they are now promoting global education. This will help raise actual earnings of emigrants in the foreign country.

However, as for the effects on the home country, i.e. the labour-sending country, as a whole, global education and highly transferable human capital are not necessarily positive. In particular, high transferability of human capital realised by global education enhances the positive effect of migration. The research on this possibility goes back to Galor and Stark (1994), Vidal (1998), Stark *et al.* (1998), Mountford (1997), Beine *et al.* (2001), Stark and Wang (2002), Rupeika-Apoga *et al.*, (2019) and Strak (2004). Given the wage disparity between the home and foreign countries, individuals expect to earn *actually* higher wages in the foreign country by having highly transferable human capital since transferable human capital does reduce the wage disparity between the home and host countries. This makes the demand for education larger. As a result, those who attempt migration, regardless of whether it is successful or not, accumulate larger human capital, making the home country end up with larger human capital, compared with the case where global education is not provided and human capital built is not highly transferable. On the other hand, high transferability exacerbates the negative effect of migration, i.e. the brain drain that was initially noted by Bhagwati and Hamada (1974) and Hamada and Bhagwati (1975). By accumulating transferable human capital, individuals become more likely to migrate to the foreign country due to higher wages that they can actually receive in the foreign country for a given wage disparity. As a result, the home country may experience a significant outflow of human capital<sup>2</sup>.

If the above positive effect dominates, global education will increase human capital of the home country, i.e. brain gain happens; if the above negative effect dominates, it will decrease human capital, i.e. brain drain happens. Docquier and Rapoport (2012a) suggested that it is possible that the transferability of human capital changes the likelihood of either a brain drain or a brain gain. Indeed, higher transferability might help the home country's human capital formation. According to Thum and Uebelmesser (2000), transferability raises human capital in the home country. Pires

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<sup>2</sup>See Docquier and Rapoport (2012b) and Kone and Özden (2017) for the discussion of the problem of the brain drain and the brain gain.

(2015) showed that low transferability causes the brain waste and makes the brain gain less likely. These studies appear to be suggesting that the positive effect is dominant. Accordingly, it might be concluded that global education benefits the home country as well as individuals.

However, studies dealing with the imperfect transferability of human capital have not necessarily been explicit with regard to the financing problem of education. Thum and Uebelmesser (2000) assumed the pecuniary cost for education is financed privately. On the other hand, Pires (2015) focused on the opportunity cost for receiving education and did not include the pecuniary cost for education. Clearly, education demand and human capital formation are affected by who finances the pecuniary cost for education. The financing problem of education must be taken into account.

Although it cannot be determined a priori who should finance education, many governments have become less enthusiastic to use tax financing when faced with an increasing number of mobile workers and students even though they do not abolish regulations on education. Justman and Thisse (1997) and Poutvaara (2004, 2008) suggested that the mobility of labour reduces the incentive for public funding of global education.

Mobility of students generates positive effect on universities. They become competitive and attempt to raise the quality of education. However, according to Delpierre and Verheyden (2014), this positive effect can be dominated by the negative effect on governments in equilibrium. They attempt to take a free ride on education provided by other countries and become less willing to subsidise education.

Furthermore, as pointed out by Carnoy (2016), many countries which are under pressure to increase higher education have expanded it by introducing the private financing.

### **3. Methodology**

This study utilises the analytical method. In particular, by solving the maximisation problem of a representative individual in the labour-sending country, this study derives the education demand and the average human capital to find the evolution of the average human capital and the effects of global education on it.

### **4. Model**

This study assumes an overlapping-generations economy that is small and open and connected to the rest of the world through labour emigration. The small open economy is called the home country and the rest of the world is called the foreign country. There exists a wage disparity between the two countries.

All individuals in the home country are identical. They live for two periods. In their youth, they receive an education. They consume nothing in this period and derive no utility from education. When old, they work, either in the home country or migrate to the foreign country to work there.

An individual in the home country born in period  $t$  receives education of  $e_t$  in period  $t$  (the period of their youth) and education helps accumulate human capital to be used when he works in period  $t+1$  (the old period). Owing to intergenerational externality, his human capital built in period  $t$  and available in period  $t+1$  also depends on the human capital of an individual who was born in period  $t-1$  and is working in period  $t$ , i.e. the average human capital of the previous generation. Human capital is measured in efficiency units of labour.

Following Poutvaara (2004), this study assumes that tertiary education comprises two parts. One part is *global education* or internationally applicable education, in keeping with the terminology of Poutvaara (2004). Another part is *non-global education*. Global education builds transferable human capital that is good for production in the foreign country. It also helps build human capital that can be used in the home country. Non-global education has nothing to do with the formation of transferable human capital. Non-global education, together with global education, builds human capital that is good for production only in the home country. The assumptions on education and human capital in this study are different from those in Thum and Uebelmesser (2000) in which one part of human capital makes productivity higher after migration but is of no use in the home country, while another part raises productivity in the home country but becomes worthless after migration.

The ratio of global tertiary education is  $0 < \theta < 1$  and the ratio of non-global tertiary education is  $1 - \theta$ . The government sets this ratio. Alternatively, we can assume that this ratio is manipulated by individuals to maximise utility. However, in a current situation where the government is responding to the demand for global education and given the fact that even the provision of tertiary education by the private educational institutions is under the control of the government, it is likely that the government regulates and manipulates this ratio<sup>3</sup>. Since the ratio is given to an individual, he is to receive global education of  $\theta e_t$  and non-global education of  $(1 - \theta)e_t$ , if he receives education of  $e_t$ . The unit cost of global education is equal to a constant  $c' > 0$  and that of non-global education is equal to a constant  $c > 0$ .

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<sup>3</sup>Actually, for example, in Korea where the ratio of private schools in the tertiary education is more than 80%, international education is entirely regulated by the state (Krechetnikov and Pestereva, 2017).

Accordingly, the cost incurred is  $c(1-\theta)e_t + c'\theta e_t$  to receive education of  $e_t$ . Global education is assumed to be more expensive than non-global education, i.e.  $c < c'$ . Teachers who can provide global education have highly transferable human capital. The number of such teachers is limited.

This study explicitly assumes that the cost of education is financed privately. It is true that even in a world of the increased mobility of labour lower levels of education are financed publically. However, raising the transferability of human capital is not the prime target for such levels of education. This study focuses on education that can be used to raise the transferability of human capital, i.e. tertiary education. The government cannot reap the benefits of spending taxes on education if students, regardless of whether they are natives or migrants, do not remain their country after education to work. In such a situation, they do not have sufficient incentives to finance education.

On the one hand, since both types of education contribute to building human capital that can be effective in the home country, human capital for an individual in period  $t+1$  available in the home country,  $h_{t+1}$ , is built by  $e_t$  and  $h_t$ .

$$h_{t+1} = e_t^\alpha h_t^\beta, \quad 0 < \alpha, \beta, \quad \alpha + \beta < 1 \quad (1)$$

On the other hand, only global education builds human capital that can be taken to the foreign country. Accordingly, human capital that can be used in the foreign country, i.e. transferable human capital in period  $t+1$ ,  $\tilde{h}_{t+1}$ , is built by  $\theta e_t$  and  $h_t$ .

$$\tilde{h}_{t+1} = (\theta e_t)^\alpha h_t^\beta \quad (2)$$

For simplicity, it is assumed that the effects of intergenerational externality in building transferable human capital do not differ from those in building human capital that is good for production in the home country<sup>4</sup>. Using Equation (1), Equation (2) can be written as

$$\tilde{h}_{t+1} = \theta^\alpha h_{t+1} \quad (2)'$$

The larger part of human capital is transferable as education is more global. This ratio,  $\tilde{h}_{t+1}/h_{t+1}$ , comes from the government education policy in this paper. Of course,

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<sup>4</sup>*Intergenerational externality in building human capital was assumed by Galor and Stark (1994) and Vidal (1998). As in this study, individuals are homogenous in their models. See Cerniglia and Longaretti (2013) for the case where such externality is operative in an economy where individuals are heterogeneous.*

the degree of the transferability of human capital can be determined in a different manner<sup>5</sup>.

Equation (2)' suggests that the government can raise the ratio of transferable human capital by making education more global. However, this makes education more expensive since, as assumed, the unit cost is higher for global education than for non-global education. Individuals must pay more money to receive the same amount of education.

Wages per efficiency in the foreign country is given as  $d > 1$  times as high as wages per efficiency in the home country. Wages per efficiency in the home country are assumed to be equal to one.

The migration probability to the foreign country in period  $t+1$  is denoted by  $0 < p_{t+1} < 1$ . All individuals in the home country are faced with the same migration probability since they are identical. The probability of migration increases as firms in the foreign country *expect* that migrants have a larger transferable human capital. However, the firms do not have perfect information on migrants' transferable human capital at the time when they are hired. This study assumes that the firms raise their expectations on transferable human capital of migrants in the current period and thereby the probability for individuals in the home country to be accepted as migrants in the current period becomes higher if migrants in the previous period are equipped with a larger transferable human capital.

An individual in the home country born in period  $t$  attempts to migrate. He derives utility of

$$u_{t,t+1}^M = p_{t+1}[\theta^\alpha h_{t+1} d - \{(c'-c)\theta + c\}e_t] + (1 - p_{t+1})[h_{t+1} - \{(c'-c)\theta + c\}e_t] \quad (3)$$

For simplicity, it is assumed that migration does not incur cost. Also, the discount factor is not included in Equation (3) to simplify the expression. He demands education to maximise utility.

The maximisation problem for an individual born in period  $t$  can be summarised as follows:

$$\max_{e_t} u_{t,t+1}^M \quad (4)$$

## 5. Human Capital under Globalisation of Education

<sup>5</sup>*Mechtenberg and Strausz (2012) made the transferability depend on the comparability and the universal curriculum of higher education systems and the diversity in working cultures and languages spoken on the job.*



This section first solves the maximisation problem (4) and derives the dynamics of human capital. It then looks into the effects of globalisation of education on human capital. In particular, it examines how changes in the degree of global education by the government affect the home country's average human capital and its disparity in steady state among countries with different levels of initial human capital.

By solving the problem, the optimal demand for education is determined as

$$e_t = \alpha^{1/(1-\alpha)} \{(c'-c)\theta + c\}^{-1/(1-\alpha)} \{(\theta^\alpha d - 1)p_{t+1} + 1\}^{1/(1-\alpha)} h_t^{\beta/(1-\alpha)} \quad (5)$$

Equation (5) suggests that an individual demands more education with the migration probability, i.e.  $\partial e_t / \partial p_{t+1} > 0$ . This is because the return on education is higher as an individual is more likely accepted by firms in the foreign country and earns higher wages. On the other hand, the sign of  $\partial e_t / \partial \theta$  cannot be determined a priori, suggesting that an individual does not necessarily increase the demand for education when the government globalises education.

Assumptions on migration probabilities and firms' expectations of migrants' transferable human capital suggest that  $p_{t+1}$  increases with  $\tilde{h}_t$ . Similar to Chen (2008, the third section) and Garcon *et al.* (2013, the third section), this study introduces the threshold effect (Azariadis and Drazen, 1990; Azariadis, 1996)<sup>6</sup>. In particular, the firms in the foreign country raise their expectations on the transferable human capital of migrants (individuals from the home country) and migrants become more likely to be accepted once migrants' average transferable human capital has reached a certain threshold level,  $\tilde{h}^\# > 0$ .

$$p_{t+1}(\tilde{h}_t) = \begin{cases} p_L & \text{if } \tilde{h}_t < \tilde{h}^\# \\ p_H & \text{if } \tilde{h}_t \geq \tilde{h}^\# \end{cases}, \quad 0 < p_L < p_H < 1 \quad (6)$$

where  $p_L$  and  $p_H$  are given exogenously and constants, and  $\tilde{h}^\#$  is also given exogenously and a constant. Given Equation (2)', Equation (6) is rewritten as

$$p_{t+1}(h_t) = \begin{cases} p_L & \text{if } h_t < \theta^{-\alpha} \tilde{h}^\# \\ p_H & \text{if } h_t \geq \theta^{-\alpha} \tilde{h}^\# \end{cases} \quad (6)'$$

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<sup>6</sup>Chen (2008) and Garcon *et al.* (2013) related  $p_{t+1}$  to  $\tilde{h}_{t+1}$ . However, for this assumption to hold, firms must be fully aware of how migrants are productive when they hire migrants.

The threshold level represented by the amount of individual's human capital that is good for production in the home country,  $\theta^{-\alpha} \tilde{h}^\#$ , is higher with  $\tilde{h}^\#$  and lower with  $\theta$ .

Substituting Equation (5) into Equation (1), and noting Equation (6)', it is found that the home country's human capital evolves according to

$$h_{t+1} = \begin{cases} \alpha^{\alpha/(1-\alpha)} \{(c'-c)\theta + c\}^{-\alpha/(1-\alpha)} \{(\theta^\alpha d - 1)p_L + 1\}^{\alpha/(1-\alpha)} h_t^{\beta/(1-\alpha)} & \text{if } h_t < \theta^{-\alpha} \tilde{h}^\# \\ \alpha^{\alpha/(1-\alpha)} \{(c'-c)\theta + c\}^{-\alpha/(1-\alpha)} \{(\theta^\alpha d - 1)p_H + 1\}^{\alpha/(1-\alpha)} h_t^{\beta/(1-\alpha)} & \text{if } h_t \geq \theta^{-\alpha} \tilde{h}^\# \end{cases} \quad (7)$$

According to Equation (7),  $\partial h_{t+1} / \partial h_t > 0$  and  $\partial^2 h_{t+1} / \partial h_t^2 < 0$ .

If the home country's steady state human capital exists when  $h_t < \theta^{-\alpha} \tilde{h}^\#$ , then it is represented as  $h_L^*$  and

$$h_L^* = \alpha^{\alpha/(1-\alpha-\beta)} \{(c'-c)\theta + c\}^{-\alpha/(1-\alpha-\beta)} \{(\theta^\alpha d - 1)p_L + 1\}^{\alpha/(1-\alpha-\beta)} \quad (8a)$$

This is called *low* steady state human capital. If the home country's steady state human capital exists when  $h_t \geq \theta^{-\alpha} \tilde{h}^\#$ , then it is represented as  $h_H^*$  and

$$h_H^* = \alpha^{\alpha/(1-\alpha-\beta)} \{(c'-c)\theta + c\}^{-\alpha/(1-\alpha-\beta)} \{(\theta^\alpha d - 1)p_H + 1\}^{\alpha/(1-\alpha-\beta)} \quad (8b)$$

This is called *high* steady state human capital.

**Figure 1:** The evolution of human capital

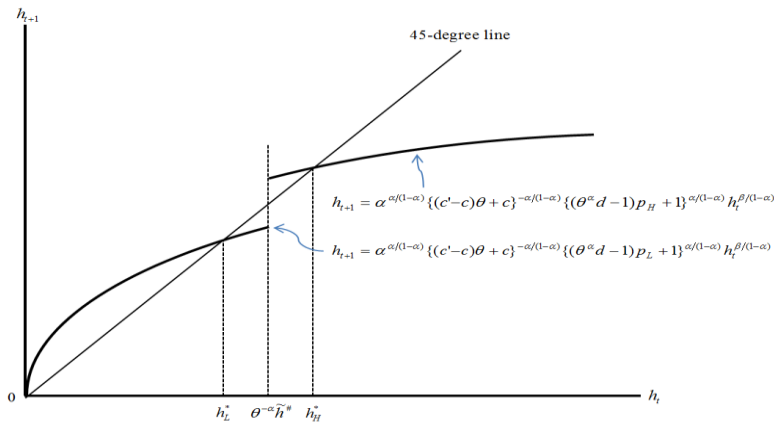


Figure 1 illustrates the case where the evolution of human capital described by Equation (7) has both  $h_L^*$  and  $h_H^*$ . In such a case, if the initial human capital is smaller than  $\theta^{-\alpha} \tilde{h}^\#$ , then human capital converges to  $h_L^*$ ; if the initial human capital is larger than  $\theta^{-\alpha} \tilde{h}^\#$ , then it converges to  $h_H^*$ . Therefore, the dynamics of human capital and steady state human capital depends on its initial level.

This suggests that if initial human capital is in the different regions among countries, even if the differences are small, then they experience a disparity in steady state human capital which is equal to  $h_H^* - h_L^*$ .

Now, let us examine the effects of globalisation of education. If the government raises the ratio of global education from  $\theta_1$  to  $\theta_2 (> \theta_1)$ , then the threshold level of human capital decreases from  $\theta_1^{-\alpha} \tilde{h}^\#$  to  $\theta_2^{-\alpha} \tilde{h}^\#$  since human capital effective in the home country includes the larger share of transferable human capital. In addition, the evolution of human capital changes from

$$h_{t+1} (\equiv h_{t+1, \theta_1}) = \begin{cases} \alpha^{\alpha/(1-\alpha)} \{(c'-c)\theta_1 + c\}^{-\alpha/(1-\alpha)} \{(\theta_1^\alpha d - 1)p_L + 1\}^{\alpha/(1-\alpha)} h_t^{\beta/(1-\alpha)} \\ \alpha^{\alpha/(1-\alpha)} \{(c'-c)\theta_1 + c\}^{-\alpha/(1-\alpha)} \{(\theta_1^\alpha d - 1)p_H + 1\}^{\alpha/(1-\alpha)} h_t^{\beta/(1-\alpha)} \end{cases} \text{ if } \begin{cases} h_t < \theta_1^{-\alpha} \tilde{h}^\# \\ h_t \geq \theta_1^{-\alpha} \tilde{h}^\# \end{cases} \quad (9)$$

to

$$h_{t+1} (\equiv h_{t+1, \theta_2}) = \begin{cases} \alpha^{\alpha/(1-\alpha)} \{(c'-c)\theta_2 + c\}^{-\alpha/(1-\alpha)} \{(\theta_2^\alpha d - 1)p_L + 1\}^{\alpha/(1-\alpha)} h_t^{\beta/(1-\alpha)} \\ \alpha^{\alpha/(1-\alpha)} \{(c'-c)\theta_2 + c\}^{-\alpha/(1-\alpha)} \{(\theta_2^\alpha d - 1)p_H + 1\}^{\alpha/(1-\alpha)} h_t^{\beta/(1-\alpha)} \end{cases} \text{ if } \begin{cases} h_t < \theta_2^{-\alpha} \tilde{h}^\# \\ h_t \geq \theta_2^{-\alpha} \tilde{h}^\# \end{cases} \quad (10)$$

Figure 2a corresponds to the case where  $\theta = \theta_1$  and Figure 2b corresponds to the case where  $\theta = \theta_2$ . It is assumed in these figures that there are low and high steady states for each case, and they are represented as  $h_{L, \theta=\theta_1}^*$  and  $h_{H, \theta=\theta_1}^*$  before the change in  $\theta$  and  $h_{L, \theta=\theta_2}^*$  and  $h_{H, \theta=\theta_2}^*$  after the change. The graph of  $h_{t+1}$  for  $h_t < \theta_2^{-\alpha} \tilde{h}^\#$  in Figure 2b lies below the graph of  $h_{t+1}$  for  $h_t < \theta_1^{-\alpha} \tilde{h}^\#$  in Figure 2a. The graph of  $h_{t+1}$  for  $h_t \geq \theta_2^{-\alpha} \tilde{h}^\#$  in Figure 2b lies above the graph of  $h_{t+1}$  for  $h_t \geq \theta_1^{-\alpha} \tilde{h}^\#$  in Figure 2a. Clearly, as will be discussed shortly, there are other possibilities. At any rate, changes in the ratio of global education affect not only the threshold level but also the evolution of human capital.

Figure 2a: The evolution of human capital when  $\theta = \theta_1$

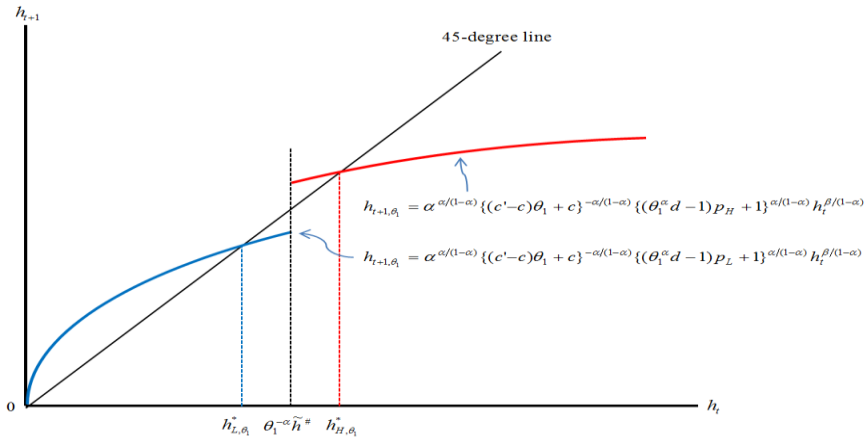
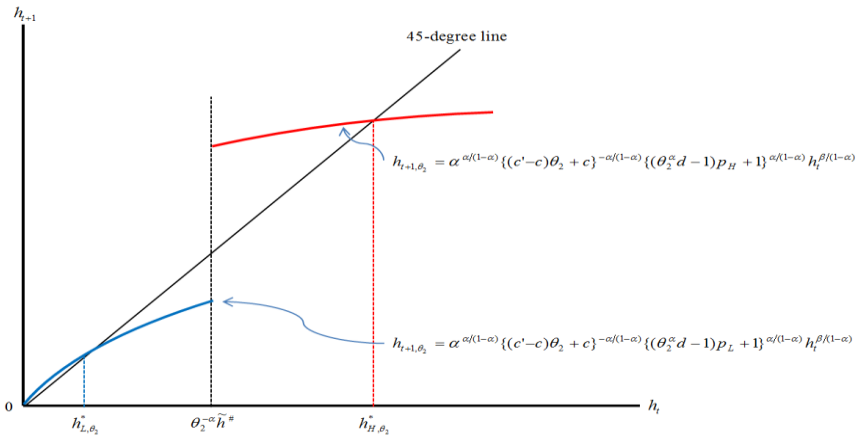


Figure 2b: The evolution of human capital when  $\theta = \theta_2$



By raising the ratio of global education the higher migration probability, i.e.  $p_H$  applies at the wider range of human capital, i.e.  $h_t > \theta_2^{-\alpha} \tilde{h}^\#$  rather than  $h_t > \theta_1^{-\alpha} \tilde{h}^\#$  and the lower migration probability, i.e.  $p_L$  applies at the narrower range of human capital, i.e.  $h_t < \theta_2^{-\alpha} \tilde{h}^\#$  rather than  $h_t < \theta_1^{-\alpha} \tilde{h}^\#$ . This suggests that for a given initial human capital, by raising the degree of global education it becomes more likely that the labour-sending country ends up with the high steady state  $h_{H, \theta = \theta_2}^*$  and that it becomes less likely that it falls into the low steady state  $h_{L, \theta = \theta_2}^*$ . Accordingly, globalisation of education appears to be beneficial to the labour-sending country.

However, it cannot be determined generally whether the curve (the short-run human capital trajectory) shifts upwards or downwards. Given the migration probability, the higher ratio of global education makes human capital more transferable and the return on education higher but it also makes the unit cost of education higher. The former has positive effects on the demand for education and human capital, and this will make the curve shift upwards. The latter has negative effects, and this will make the curve shift downwards. Differentiation of Equation (7)

$$\frac{\partial h_{t+1}}{\partial \theta} = h_{t+1} \frac{\alpha}{1-\alpha} \left\{ -\frac{c'-c}{(c'-c)\theta+c} + \frac{\alpha\theta^{\alpha-1} dp_i}{(\theta^\alpha d-1)p_i+1} \right\} \cong 0, \quad p_i = p_L, p_H$$

shows that it cannot be determined a priori as to which of these two effects is dominant and thereby whether the curve shifts upwards or downwards. The effects on human capital depend on the value of  $\theta$  as well as on the migration probability and on the cost difference between global and non-global education.

As a result, whether the higher ratio of global education makes steady state human capital larger or smaller cannot be determined a priori. In other words, it is possible that  $h_{L,\theta=\theta_1}^* \cong h_{L,\theta=\theta_2}^*$  and  $h_{H,\theta=\theta_1}^* \cong h_{H,\theta=\theta_2}^*$ .

Taking the log of human capital before and after the globalisation of education (Equations 9 and 10), their difference is

$$\ln h_{t+1,\theta_2} - \ln h_{t+1,\theta_1} = \frac{\alpha}{1-\alpha} \ln \frac{\{(c'-c)\theta_1+c\} \{(\theta_2^\alpha d-1)p_i+1\}}{\{(c'-c)\theta_2+c\} \{(\theta_1^\alpha d-1)p_i+1\}}, \quad \text{where } i = L, H$$

Since  $\ln h_{t+1,\theta_2} - \ln h_{t+1,\theta_1} \Big|_{p_i=0} < 0$ ,  $h_{t+1,\theta_2} - h_{t+1,\theta_1} < 0$  when  $p_i$  is sufficiently close to zero.

However, the sign of  $\ln h_{t+1,\theta_2} - \ln h_{t+1,\theta_1} \Big|_{p_i=1}$  cannot be determined a priori. Even when the migration probability is one, it is negative if  $c'-c$  is large whereas it is positive otherwise. In what follows, this study assumes that  $c'-c$  is not large so that

$$\ln h_{t+1,\theta_2} - \ln h_{t+1,\theta_1} \Big|_{p_i=1} > 0 \quad \text{and thereby } h_{t+1,\theta_2} - h_{t+1,\theta_1} > 0 \quad (11)$$

when  $p_i$  is sufficiently close to one.

Moreover,

$$\begin{aligned} & \frac{\partial(h_{t+1,\theta_2} - h_{t+1,\theta_1})}{\partial p_i} \\ &= \frac{\alpha^{1/(1-\alpha)}}{1-\alpha} h_i^{\beta/(1-\alpha)} \left[ \{(c'-c)\theta_2 + c\}^{-\alpha/(1-\alpha)} \{(\theta_2^\alpha d - 1)p_i + 1\}^{(2\alpha-1)/(1-\alpha)} (\theta_2^\alpha d - 1) \right. \\ & \quad \left. - \{(c'-c)\theta_1 + c\}^{-\alpha/(1-\alpha)} \{(\theta_1^\alpha d - 1)p_i + 1\}^{(2\alpha-1)/(1-\alpha)} (\theta_1^\alpha d - 1) \right] \end{aligned}$$

Since  $\partial\{(\theta^\alpha d - 1)p_i + 1\}^{(2\alpha-1)/(1-\alpha)} (\theta^\alpha d - 1) / \partial \theta > 0$ ,  
 $\{(\theta_2^\alpha d - 1)p_i + 1\}^{(2\alpha-1)/(1-\alpha)} (\theta_2^\alpha d - 1) > \{(\theta_1^\alpha d - 1)p_i + 1\}^{(2\alpha-1)/(1-\alpha)} (\theta_1^\alpha d - 1)$ .

Although  $\{(c'-c)\theta_2 + c\}^{-\alpha/(1-\alpha)}$  is smaller than  $\{(c'-c)\theta_1 + c\}^{-\alpha/(1-\alpha)}$ , the difference is not large and the above-mentioned effect is dominant if  $c'-c > 0$  is not large. Therefore, if  $c'-c$  is not large, then  $\partial(h_{t+1,\theta_2} - h_{t+1,\theta_1}) / \partial p_i > 0$ .

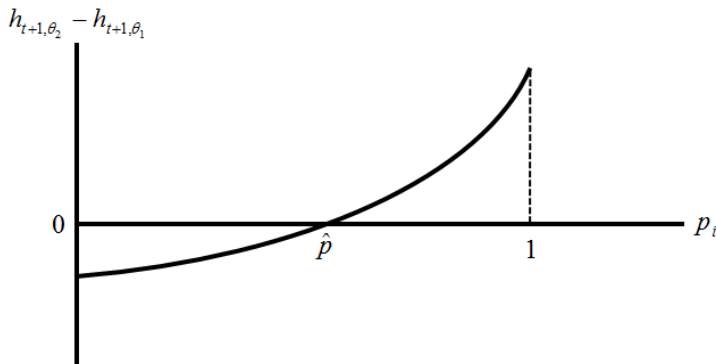
From the assumption, Equation (11) and the derived results, it is found that

$$\begin{aligned} h_{t+1,\theta_2} - h_{t+1,\theta_1} &< 0 \text{ if } p_i < \hat{p} \\ h_{t+1,\theta_2} - h_{t+1,\theta_1} &= 0 \text{ if } p_i = \hat{p} \\ h_{t+1,\theta_2} - h_{t+1,\theta_1} &> 0 \text{ if } p_i > \hat{p} \end{aligned}$$

where  $\hat{p}$  is a probability such that  $h_{t+1,\theta_2} - h_{t+1,\theta_1} = 0$ , i.e.

$$\begin{aligned} \hat{p} &\equiv (c'-c)(\theta_2 - \theta_1) \\ &\times [ \{(c'-c)(\theta_1\theta_2^\alpha - \theta_2\theta_1^\alpha) + (\theta_2^\alpha - \theta_1^\alpha)c\}d + (c'-c)(\theta_2 - \theta_1) ]^{-1} \text{ (see Figure 3).} \end{aligned}$$

**Figure 3:** The difference of human capital under different migration probabilities



This suggests that human capital decreases by raising the degree of global education so that the curve shifts downwards when the migration probability is lower than  $\hat{p}$ , whereas human capital increases by raising the degree of global education so that the curve shifts upwards when the probability is higher than  $\hat{p}$ .

On one hand, when  $p_L < p_H < \hat{p}$ , human capital in the short run certainly becomes smaller by making education more global and both curves below and above the threshold level shift downwards. As a result, human capital both in low steady state and in high steady state, if they exist, also becomes smaller, i.e.  $h_{L,\theta=\theta_1}^* > h_{L,\theta=\theta_2}^*$  and  $h_{H,\theta=\theta_1}^* > h_{H,\theta=\theta_2}^*$ .

On the other hand, when  $p_H > p_L > \hat{p}$ , human capital in the short run certainly becomes larger by making education more global and both curves below and above the threshold level shift upwards. Human capital, therefore, both in low steady state and in high steady state, if they exist, also becomes larger, i.e.  $h_{L,\theta=\theta_1}^* < h_{L,\theta=\theta_2}^*$  and  $h_{H,\theta=\theta_1}^* < h_{H,\theta=\theta_2}^*$ .

In these two cases it cannot be determined a priori whether the disparity between low and high steady state human capital narrows or widens when the degree of global education is raised, i.e.  $h_{H,\theta=\theta_1}^* - h_{L,\theta=\theta_1}^* \gtrless h_{H,\theta=\theta_2}^* - h_{L,\theta=\theta_2}^*$ . Accordingly, in general, it cannot be determined whether the disparity of steady state human capital among economies with different initial human capital decreases, or increases or remains unchanged when the government raises the degree of global education.

However, in the case where  $p_L < \hat{p}$  and  $p_H > \hat{p}$ , which is more likely to happen, the curve below the threshold level shifts downwards and the curve above the threshold level shifts upwards. As a result, if the initial human capital is smaller than  $\theta_2^{-\alpha} \tilde{h}^\#$ , then the economy falls into the *lower* low steady state, i.e.  $h_{L,\theta=\theta_2}^* < h_{L,\theta=\theta_1}^*$  and if the initial human capital is larger than  $\theta_2^{-\alpha} \tilde{h}^\#$ , then the economy ends with up with the *higher* high steady state, i.e.  $h_{H,\theta=\theta_2}^* > h_{H,\theta=\theta_1}^*$ ,  $h_{L,\theta=\theta_2}^* > h_{L,\theta=\theta_1}^*$ . Figure 2a and Figure 2b correspond to this case.

Therefore, it is possible that the disparity in human capital widens among economies with different initial human capital when education is globalized and human capital has become more transferable. It actually happens between an economy whose initial human capital is very small, i.e. smaller than  $\theta_2^{-\alpha} \tilde{h}^\#$  and another whose initial human capital is not very small, i.e. larger than  $\theta_2^{-\alpha} \tilde{h}^\#$ . The former economy's

steady state human capital decreases from  $h_{L,\theta=\theta_1}^*$  to  $h_{L,\theta=\theta_2}^*$ , whereas the latter economy's steady state human capital increases from  $h_{L,\theta=\theta_1}^*$  to  $h_{H,\theta=\theta_2}^*$  or from  $h_{H,\theta=\theta_1}^*$  to  $h_{H,\theta=\theta_2}^*$ . As a result, the disparity increases from 0 ( $= h_{L,\theta=\theta_1}^* - h_{L,\theta=\theta_1}^*$ ) to  $h_{H,\theta=\theta_2}^* - h_{L,\theta=\theta_2}^*$  or from  $h_{H,\theta=\theta_1}^* - h_{L,\theta=\theta_1}^*$  to  $h_{H,\theta=\theta_2}^* - h_{L,\theta=\theta_2}^*$ .

This result suggests that global education may increase the disparity among economies under plausible conditions. Economies that have increased steady state human capital via global education will raise the growth rate and well-being whereas those that have decreased steady state human capital via global education will lower them.

In summary, by globalising education it becomes more likely that an economy experiences an increase in human capital in the short run and steady state if initial human capital is distributed evenly. However, this does not mean that global education is beneficial in every sense. An economy with low initial human capital will decrease human capital when the government globalises the tertiary education. In addition, the disparity may increase among economies with large human capital and those with small human capital.

## **6. Concluding Remarks**

Due to globalisation, a growing number of people are seeking employment opportunities not only in home countries but also in foreign countries today. Many governments are responding to this trend by globalising the tertiary education to raise the transferability of human capital.

This study examined the consequences of these developments. In particular, it examined the effects of the government policy of raising the degree of global education and encouraging the formation of transferable human capital in a situation where the cost of tertiary education is financed privately and global education is more expensive than non-global education.

This study revealed that such a government policy does not necessarily generate positive effects on the labour-sending country's human capital. Depending on the initial level of human capital, education's globalisation might reduce human capital. As a result, the disparity in steady state human capital may increase among economies with different initial levels of human capital.

This study suggests that what type of education should be provided in an economy must be determined by observing its stage of development. The education policies effective in developed economies are not necessarily effective in developing economies. It is possible that they are harmful.



One way to extend the present analysis is to assume a situation where education is partly financed by taxes. Even under the increased mobility of workers, some individuals will remain in the country after education. Also, education has an externality, suggesting that the government does not lose the incentive to finance tertiary education. It is interesting to examine how human capital formation will be affected by raising the ratio of private financing under the mobility of labour.

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