

ON COMPATIBILITY OF STUDY MIGRANTS' ACCEPTANCE POLICIES AND IMMIGRATION POLICIES

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Abstract

Some countries accept study migrants to increase domestic skilled human capital. They induce study migrants to remain as skilled workers after education. At the same time, due to the shortage of unskilled labour, they tend to deregulate immigration policies and admit non-natives to take skilled and unskilled jobs. This study investigates the effectiveness of study migrants' acceptance policies under different immigration policies. In particular, this study examines how study migrants' human capital formation is affected by immigration policies. This study shows that total employed skilled human capital built by study migrants decreases as immigration policies are deregulated. This is because deregulation can lower the incentive of study migrants to produce skilled human capital. Therefore, deregulated immigration policies are not necessarily compatible with study migrants' acceptance policies. This study further shows that by giving study migrants with a low innate ability pecuniary benefits such as a discounted tuition fee or a scholarship, host countries can alleviate the harmful effects of incompatibility. Our results suggest that governments should conduct immigration policies, taking its possible negative effects on study migrants' acceptance policies into account, and that they can partly reduce such effects by implementing additional policies.

Keywords: *human capital, study migration, labour migration, immigration policies, deregulation, skilled jobs, unskilled jobs*

1. INTRODUCTION

This study deals with the problem of human capital formation by study migrants under different immigration policies. This study attempts to clarify how deregulation of immigration policies affects study migrants' human capital formation. This study also tries to find policies to alleviate the negative effects of incompatibility between study migrants' acceptance and immigration policies.

Due to increased mobility of labour, many countries are now faced with the brain drain problem. To cope with this problem, they attempted to receive skilled labour migrants. In addition, they also tried to receive study migrants. They induce study migrants to build skilled human capital by an education and to remain in the host country as skilled workers.

Many countries also suffered from an unskilled labour shortage. Natives do not want to take unskilled jobs. To fill the vacancy of such jobs, they often turned to non-natives.

As a result, immigration policies are often deregulated, and labour migrants are admitted to take both skilled and unskilled jobs. Moreover, under deregulated immigration policies, not only labour migrants but also study migrants can take unskilled jobs after education.

Doesn't such deregulation affect the effectiveness of the study migrants' acceptance policy? Can host countries successfully induce study migrants to build skilled human capital when receiving an education? Governments usually manipulate immigration policies without considering the effects on study migrants' acceptance policies. However, it is not definitely true that study migrants' acceptance policies are independent from immigration policies. For example, study migrants may lower their incentives to build skilled human capital if unskilled jobs are also available after education. If this is the case, the objective of study migrants' acceptance policies, i.e. to increase domestic skilled human capital may not be fully attained under deregulated immigration policies.

Therefore, we need to clarify whether or not and how much study migrants build skilled human capital by taking the effects of immigration policies on them into account. Unfortunately, previous studies on study migration did not focus on this issue.

This study finds that total employed skilled human capital is larger when study migrants can be employed only in a skilled job after education than when they can be employed either in a skilled or unskilled job. This study also finds that total employed skilled human capital is larger when both skilled and unskilled jobs are available to study migrants after education, although the host country accepts only study migrants, compared with the case in which they accept both study and labour migrants and admit both skilled and unskilled jobs to these migrants. Therefore, study migrants build smaller human capital as the host country deregulates immigration policies. This study shows that study migrants' acceptance policies and immigration policies are not necessarily compatible in increasing in domestic skilled human capital. Furthermore, this study shows that by providing pecuniary benefits to study migrants with a low innate ability, the host country's government can partly alleviate the negative effects caused by incompatibility between the two policies.

This study contributes to the literature on study migration by revealing that immigration policies and study migrants' acceptance policies are not independent and that even so, the host country's government can alleviate the negative effects generated by incompatibility.

The remaining of this study is structured as follows: In Section 2, we review related literature. Section 3 mentions the methodology this study adopts. Section 4 builds the model. Section 5 deals with human capital formation by study migrants under the regulated immigration policy. Section 6 examines the same issue under the less regulated immigration policy. Section 7 further relaxes the immigration policy and analyses its effects. Finally, Section 8 provides the concluding remarks.

2. LITERATURE REVIEW

This section reviews the literature on study and labour migration that motivated this study. The literature reviewed in this section is, of course, not exhaustive.

According to Organisation for Economic Co-operation and Development, OECD (2021, pp. 215-216), international student mobility has amplified quite consistently. The number of international and foreign tertiary students grew on average by 5.5 per cent per year in the past 20 years. In 2019, 6.1 million tertiary students worldwide studied abroad. This is more than twice the number in 2007. However, of course, the COVID-19 had negative effects on this growing trend. Many higher educational institutions around the world were imposed the lockdown in 2020. This affected potentially more than 3.9 million international and foreign students studying in OECD countries (OECD, 2021, p. 213).

Such a long-term increase in study migration stems from its beneficial effects on students. Non-economic factors such as the availability of programmes taught in the English language and the quality of education (Kahanec and Králiková, 2011), per capita income of the host country (Perkins and Neumayer, 2014), geographical distance and the presence of a common language (Abbott and Silles, 2016) and international university rankings (ICEF Monitor, 2017) were found to motivate students to study abroad.

Although study migration is not necessarily directly tied to economic motivations, it can generate economic benefits. For example, Oosterbeek and Webbink (2006), Di Pietro (2012, 2015), Burmann and Delius (2017) and d'Hombres and Schnepf (2021) found that studying abroad increases the employment probability. This is partly because study migration raises the transferability of human capital. Human capital transferability across borders is generally low (Chiswick and Miller, 1992, 2009; Docquier and Rapoport, 2012; Basilio et al., 2017; Boyd and Tian, 2018). Of course, some studies indeed found different results. For example, based on Polish students' data, Liwiński (2019) presented evidence against abovementioned results. Also, utilising the Norwegian graduate surveys' data, Wiers-Jenssen and Støren (2021) found little impact of study migration on the transition from higher education to work in Norway.

Part of study migrants remain in the host country after education. They prefer to turn into labour migrants of the host country after education. Study migrants can be ‘a precursor to subsequent migrations of qualified workers’ (Tremblay, 2005, p. 205) or ‘*would be migrants*’ (Grimm, 2019, p. 237). They do so because it is economically beneficial to them. It goes without saying that in general, their intention to remain as labour migrants also depends on other factors. Baruch et al. (2007) found that study migrants’ perceptions of ethnic differences and labour markets, their adjustment process to the host country and their family ties in host and home countries affect their intention to stay. Integration (Istad et al., 2021) and cultural climate (Netierman et al., 2021) are also other factors.

Study migration is beneficial to host countries as well. Study migrants bring about various economic benefits. In the short run, they contribute to educational institutions and the local economy by paying higher tuition fees than domestic students and spending money for their living. In the long run, if they remain in the host country as workers after education, they may help innovation and increase economic performance (OECD, 2021). They will also mitigate skilled and unskilled labour shortages (Gribble, 2008; OECD, 2017). Given these positive effects, host countries’ governments promoted the acceptance of study migrants by manipulating immigration policies (Kuptsch, 2006; Adnett, 2010; Grimm, 2019).

Accordingly, it appears that both study migrants and host countries derive their economic benefits when study migrants turn into labour migrants after education in the host country. Actually, study migrants’ workforce integration has gained its magnitude and importance in real economies (Han et al., 2020).

However, the relation between study migration and labour migration that occur simultaneously in the same country has not been a serious research issue. These two migrations have been mostly examined separately. It has been rare that study and labour migrations are analysed in an identical setting. A few exceptions exist, though. Bergerhoff et al. (2013) combined study migration with labour migration in a dynamic context. Brezis (2016, 2019) examined the decisions about where to get an education and where to work in a single model. Shimada (2019) built a two-period model where study and labour migrations happen in the same country.

Furthermore, previous studies on study migration did not seriously examine the problem that is related to a study migrants’ incentive to receive education and build human capital in the host country. They assumed implicitly that the study migrants’ incentive to build skilled human capital does not change in any environment. Although many study migrants come into the host country to create skilled human capital, they cannot easily realise this objective. After migration, they have to overcome various problems such as cultural differences (Reyes and Wenbo, 2020) and economic problems (Tsuda and Cornelius, 2004, pp. 456-457; Liu-Farrer, 2011, pp. 64-70). Their incentive to build skilled human capital can easily change even without changes in immigration policies. Accordingly, it is less likely that a study migrants’ incentive to create skilled human capital remains unaffected by immigration policies. Host countries that accept study migrants must regard the effects of immigration policies on an incentive of study migrants to create human capital. Assuming a host country that accepts study migrants, Shimada (2022) addressed the problem of study migrants’ human capital formation under different immigration policies. In his model study migrants’ incentive to build skilled human capital changed with immigration policies, but his analyses did not include labour migrants.

3. THE METHODOLOGY

This study adopts the analytical method. In particular, this study builds a two-country model comprised of a country that sends students and workers and a country that receives them. Given the immigration policy in the receiving country, individuals in the sending country choose between study migration and labour migration and whether to build skilled human capital or unskilled human capital under study migration to maximise their utility. Although analyses are mathematical, they serve as a basis for empirical analyses. They will help to build concrete hypotheses.

4. THE MODEL

This paper assumes an economy comprised of developing and developed countries. Individuals in those countries live for young and old ages. They are in a single generation. They receive an education at a young age and work at an old age. The economy begins in the first period and ends in the second period.

Individuals born in the developing country can remain in that country throughout their life. However, there are no job opportunities in the developing country. Study migration or labour migration gives them higher expected utility than non-migration.

Accordingly, all individuals in the developing country may leave the country to receive an education at a young age seeking job opportunities at an old age in the developed country. Or they may go to work at an old age in the developed country after finishing education at a young age in the developing country. Even if study migrants adopted the former option, it is not certain that they can be employed at an old age in the developed country. However, such an attempt gives them higher expected utility than returning to the developing country since, as mentioned, there are no job opportunities in the developing country. The latter option is possible only when the developed country accepts labour migrants.

There are also individuals native to the developed country. They do not leave the country. They receive an education at a young age and work with migrants at an old age. This study assumes that their education and provision of labour do not affect and are not affected by migrants from the developing country. Accordingly, individuals native to the developed country do not appear explicitly in the model.

The developed country's government manipulates immigration policies. There are three varieties. They receive only study migrants and admit them to take only a skilled job after education under the *regulated* immigration policy. They receive only study migrants but admit them to take either a skilled job or an unskilled job after education under the *less regulated* immigration policy. Furthermore, they accept labour migrants as well as study migrants under the *deregulated* immigration policy.

Individuals native to the developing country are heterogeneous in innate abilities. An individual i has an innate ability $a_i \in [\underline{a}, \bar{a}]$, where $0 < \underline{a} < \bar{a}$. Innate abilities are uniformly distributed.

Given innate abilities, individuals native to the developing country build human capital by receiving a school education and exerting an effort either in developing or developed countries.

To build human capital for a skilled job, individuals have to receive a large amount of school education by s_H , that is a positive constant. This study assumes that school fees are financed privately. They also have to study *seriously*. In particular, they must exert a large effort, e.g. spending long hours in the library to learn by themselves. We denote such an effort as e_H , that is a positive constant. As will be mentioned in Section 7, building skilled human capital is possible only in the developed country since a sufficient school education is not available in the developing country.

On the other hand, school education and an effort necessary to build human capital for an unskilled job are s_L and e_L , respectively. They are positive constants and $s_L < s_H$, $e_L < e_H$. Building unskilled human capital is possible in both countries.

Regardless of whether it is large or small, an effort does not incur any pecuniary costs. However, it reduces utility since the time available for non-academic activities decreases at a young age.

5. STUDY MIGRANTS' HUMAN CAPITAL UNDER THE REGULATED IMMIGRATION POLICY

This section looks into human capital formation under the regulated immigration policy. In particular, this section examines study migrants' human capital formation in the case in which the developed country accepts only study migrants and admits them to take only a skilled job after education.

In this case, all study migrants build human capital for a skilled job h_{Hi} by receiving a large amount of school education and putting in a large amount of effort. This is because otherwise they cannot get a job in the developed country.

$$h_{Hi} = (e_H s_H a_i)^{1/2} \quad (1)$$

A study migrant with an innate ability a_i can be employed in a skilled job after education with a probability $\theta_H (e_H s_H a_i / e_H s_H \bar{a})^{1/2}$, where $0 < \theta_H < 1$ is the overall employment probability of a skilled job that is a constant given exogenously and $(e_H s_H a_i / e_H s_H \bar{a})^{1/2}$ measures how likely an individual study migrant is employed for a skilled job due to his relative human capital to the largest one (the denominator). Given an innate ability, he is more likely employed if, for example, many skilled work positions are available and thereby θ_H is high. Also, given the overall employment probability, he is more likely employed if he has a higher innate ability and builds larger relative human capital.

We represent lifetime utility of a study migrant in this case as

$$u_{Hi} = \theta_H \left(\frac{e_H s_H a_i}{e_H s_H \bar{a}} \right)^{1/2} (e_H s_H a_i)^{1/2} w_H - s_H - e_H \quad (2)$$

where w_H are wages per efficiency of a skilled job. The first term describes expected wages earned by working in a skilled job at an old age. The second term is the pecuniary cost for school education. The third term corresponds to the loss of utility that arises from exerting an effort. The time discount factor is disregarded. Under the regulated immigration policy, all study migrants derive utility according to Equation (2).

In general, an individual chooses the amount of school education and a level of effort to maximise his utility. However, this study gives them a priori. It is often the case that the education and effort necessary for a skilled job are given. For example, a doctoral degree is essential for a specific skilled job. A certain minimum amount of school education and effort is required to earn it regardless of an innate ability. The main results remain unchanged even if a study migrant manipulates school education and an effort to maximise his utility.

Utilising Equation (1), total employed skilled human capital built by study migrants when only a skilled job ESH_{reg} is calculated as

$$\begin{aligned} ESH_{reg} &= \int_{\underline{a}}^{\bar{a}} \theta_H (e_H s_H a_i / e_H s_H \bar{a})^{1/2} (e_H s_H a_i)^{1/2} da_i \\ &= \theta_H \left(\frac{e_H s_H}{\bar{a}} \right)^{1/2} \frac{\bar{a}^2 - \underline{a}^2}{2} \end{aligned} \quad (3)$$

According to Equation (3), given their employment probability, total employed skilled human capital increases as individuals exert more effort or they receive the larger amount of school education, i.e. $dESH_{reg}/de_H > 0$, $dESH_{reg}/ds_H > 0$. Also, given individual human capital, as the overall employment probability increases, they become more likely employed and total employed skilled human capital increases, i.e. $dESH_{reg}/d\theta_H > 0$.

6. STUDY MIGRANTS' HUMAN CAPITAL UNDER THE LESS REGULATED IMMIGRATION POLICY

This section discusses human capital formation under the less regulated immigration policy. In particular, this section considers study migrants' human capital formation in a case in which the developed country accepts only study migrants but admits them to take either a skilled job or an unskilled job after education.

If study migrants try to be employed in a skilled job, they build human capital according to Equation (1) and derive utility as defined by Equation (2). This study assumes that those who sought a skilled job by accumulating skilled human capital do not attempt to get an unskilled job even if it is available. This is because they experience so-called 'over-education' from a mismatch between education and a job and it lowers migrant's utility significantly (Frank and Hou, 2018; Wassermann and Hoppe, 2019).

If they attempt to be employed in an unskilled job, they build human capital according to

$$h_{Li} = (e_L s_L a_i)^{1/2} \quad (4)$$

and derive lifetime utility by

$$u_{Li} = \theta_L \left(\frac{e_L s_L a_i}{e_L s_L \bar{a}} \right)^{1/2} (e_L s_L a_i)^{1/2} w_L - s_L - e_L \quad (5)$$

where θ_L is the overall employment probability of an unskilled job. In this case, expected wages are lower since human capital is smaller (compare Equations 4 and 1), whereas costs are smaller than those under the regulated immigration policy. Although the developed country needs to employ some study migrants in an unskilled job after they finished education, they are not enthusiastic about placing them in such a job so that $0 < \theta_L < \theta_H$.

An individual study migrant determines whether to seek a skilled job or an unskilled job after education via utility comparison. If $u_{Hi} \geq u_{Li}$, he tries to get a skilled job, and for this purpose, he receives a large amount of school education and exerts a large amount of effort. If $u_{Hi} < u_{Li}$, he tries to get an unskilled job and receives a small amount of school education and exerts small effort.

By comparing Equations (2) and (5), individuals with an innate ability equal to or higher than

$$a_i \Big|_{u_{Hi}=u_{Li}} = \frac{s_H - s_L + e_H - e_L}{\theta_H (e_H s_H / \bar{a})^{1/2} - \theta_L (e_L s_L / \bar{a})^{1/2}} \equiv \hat{a}_{H,L} \quad (6)$$

attain higher utility by seeking a skilled job. On the other hand, those with an innate ability lower than $\hat{a}_{H,L}$ achieve higher utility by seeking an unskilled job (see Figure 1).

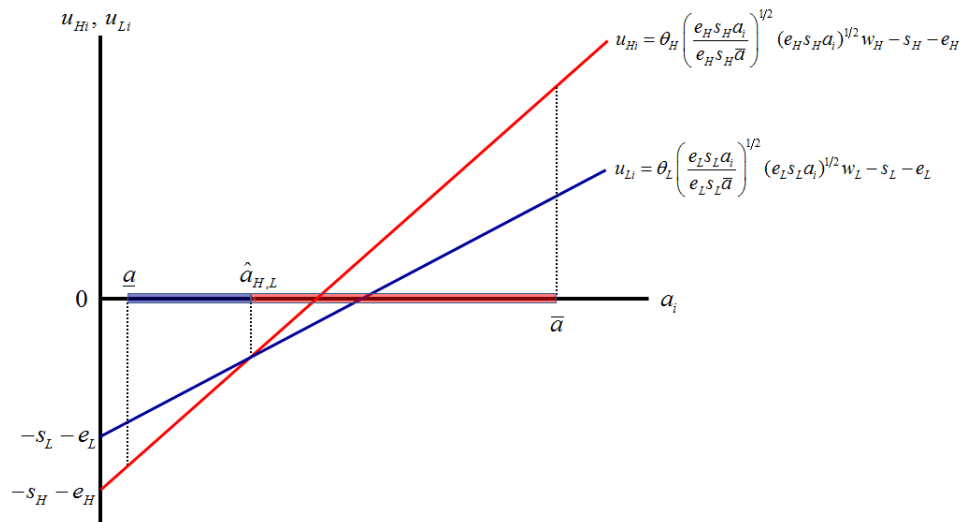


Figure 1. Comparison of utility when seeking a skilled job and when seeking an unskilled job under the less regulated immigration policy.

Accordingly, study migrants with $\hat{a}_{H,L} \leq a_i \leq \bar{a}$ build skilled human capital whereas those with $\underline{a} \leq a_i < \hat{a}_{H,L}$ build unskilled human capital.

Unlike the case under the regulated immigration policy, study migrants do not necessarily seek a skilled job and do not necessarily build skilled human capital. It is not worth paying a large amount of money and exerting a large amount of effort to build skilled human capital for individuals with low innate ability. Accordingly, they do not have enough incentive to create skilled human capital when an unskilled job is available. Only for those with the high innate ability, it is profitable to do so. They have a sufficient incentive for building skilled human capital.

Total employed skilled human capital built by study migrants when skilled and unskilled jobs are available to migrants ESH_{les} is

$$\begin{aligned}
 ESH_{les} &= \int_{\hat{a}_{H,L}}^{\bar{a}} \theta_H (e_H s_H a_i / e_H s_H \bar{a})^{1/2} (e_H s_H a_i)^{1/2} da_i \\
 &= \theta_H \left(\frac{e_H s_H}{\bar{a}} \right)^{1/2} \frac{\bar{a}^2 - \hat{a}_{H,L}^2}{2} \quad (7)
 \end{aligned}$$

Employed skilled human capital is larger when more skilled jobs are available to migrants, i.e. $dESH_{les}/d\theta_H > 0$. This is because the number of study migrants who seek a skilled job increases with the overall employment probability, i.e. $d\hat{a}_{H,L}/d\theta_H < 0$. Also, for a given innate ability, each migrant builds larger human capital when the employment probability is higher and thereby education is more profitable.

Comparison of Equations (3) and (7) reveals that $ESH_{les} < ESH_{reg}$ since $\hat{a}_{H,L} > \underline{a}$. This suggests that the study migrants' acceptance policy is not independent of immigration policies. In particular, the less regulated immigration policy lowers the effectiveness of the study migrants' acceptance policy. It decreases employed skilled human capital.

Faced with this situation, what the government of the developed country can do if they are to increase employed skilled human capital? As explained already, study migrants with $\underline{a} \leq a_i < \hat{a}_{H,L}$ attain higher utility by not building skilled human capital since their innate ability is low. This situation is remedied

if the government enables them to achieve higher utility by building skilled human capital. Since their innate ability is low, even if they increased school education and effort, human capital does not increase significantly and thereby utility does not increase significantly. However, suppose the government discounted the tuition fee or provided them with a scholarship or other pecuniary benefits for building skilled human capital. In that case, they may attain higher utility. Some study migrants with $\underline{a} \leq a_i < \hat{a}_{H,L}$ will seek a skilled job. These policies targeted to study migrants with a low innate ability partly solve the problem.

Since the developed country needs to fill the vacancy of unskilled jobs by non-natives under the less regulated immigration policy, they need to relax immigration policies and admit an unskilled job to study migrants after education. In such a case, the government does not induce all study migrants with a low innate ability to seek a skilled job. They will provide pecuniary benefits to some of, but not all of, study migrants with low innate ability. Therefore, total employed skilled human capital is still smaller than the one under the regulated immigration policy.

7. STUDY MIGRANTS' HUMAN CAPITAL UNDER THE DEREGULATED IMMIGRATION POLICY

This section examines human capital formation in a case where the immigration policy is deregulated. The developed country admits study migrants to take skilled and unskilled jobs after education. In addition, they also accept labour migrants who finished education in the developing country at a young age and admit such migrants to take an unskilled job.

Under the deregulated immigration policy, an individual born in the developing country can migrate to the developed country to study at a young age. He puts in either a high or low effort when receiving education.

He can also migrate to work at an old age after receiving an education in the developing country. If he opted for labour migration, he would receive school education by s_L^* and exert an effort by e_L^* at a young age in the developing country. Since a sufficient amount of school education is not available in that country, i.e. $0 < s_L^* < s_L$, effort they exert is also smaller, i.e. $0 < e_L^* < e_L$. For this reason, human capital he builds in the developing country is suitable only for an unskilled job.

$$h_{LMi} = (e_L^* s_L^* a_i)^{1/2} \quad (8)$$

Comparison of Equations (1), (4) and (8) suggests that human capital is smallest under labour migration.

He attempts to be employed in an unskilled job in the developed country and derives lifetime utility by

$$u_{LMi} = \theta_L \left(\frac{e_L^* s_L^* a_i}{e_L^* s_L^* \bar{a}} \right)^{1/2} (e_L^* s_L^* a_i)^{1/2} w_L - s_L^* - e_L^* \quad (9)$$

Given an innate ability a_i , an individual born in the developing country chooses the option that provides him with the highest utility among u_{Hi} , u_{Li} and u_{LMi} .

By comparing Equations (5) and (9), migrating to study seeking an unskilled job after education gives higher utility than migrating to work in an unskilled job if an innate ability is equal to or higher than

$$a_i \Big|_{u_{Li}=u_{LMi}} = \frac{s_L - s_L^* + e_L - e_L^*}{\theta_L (e_L s_L / \bar{a})^{1/2} - \theta_L (e_L^* s_L^* / \bar{a})^{1/2}} \equiv \hat{a}_{L,LM} \quad (10)$$

Similarly, by comparing Equations (2) and (9), migrating to study seeking a skilled job after education gives higher utility than migrating to work in an unskilled job if an innate ability is equal to or higher than

$$a_i|_{u_{LMi}=u_{Hi}} = \frac{s_H - s_L^* + e_H - e_L^*}{\theta_H (e_H s_H / \bar{a})^{1/2} - \theta_L (e_L^* s_L^* / \bar{a})^{1/2}} \equiv \hat{a}_{LM,H} \quad (11)$$

The comparison of Equations (6), (10) and (11) reveals

$$\text{sign}(\hat{a}_{LM,H} - \hat{a}_{L,LM}) = \text{sign}(\hat{a}_{H,L} - \hat{a}_{LM,H})$$

$$\text{sign}(\hat{a}_{L,LM} - \hat{a}_{H,L}) = -\text{sign}(\hat{a}_{H,L} - \hat{a}_{LM,H})$$

From these relations, we find that

$$\text{if } \hat{a}_{H,L} > \hat{a}_{LM,H}, \text{ then } \hat{a}_{H,L} > \hat{a}_{L,LM} \text{ and } \hat{a}_{LM,H} > \hat{a}_{L,LM}$$

$$\text{if } \hat{a}_{H,L} < \hat{a}_{LM,H}, \text{ then } \hat{a}_{H,L} < \hat{a}_{L,LM} \text{ and } \hat{a}_{LM,H} < \hat{a}_{L,LM}$$

Therefore, the rankings of $\hat{a}_{H,L}$, $\hat{a}_{L,LM}$ and $\hat{a}_{LM,H}$ are either

$$\text{if } \hat{a}_{H,L} > \hat{a}_{LM,H}, \text{ then } \hat{a}_{L,LM} < \hat{a}_{LM,H} < \hat{a}_{H,L}$$

$$\text{if } \hat{a}_{H,L} < \hat{a}_{LM,H}, \text{ then } \hat{a}_{H,L} < \hat{a}_{LM,H} < \hat{a}_{L,LM}$$

Henceforth, we call the situation in which $\hat{a}_{H,L} > \hat{a}_{LM,H}$ happens the case *A* and the situation in which $\hat{a}_{H,L} < \hat{a}_{LM,H}$ happens the case *B*.

The case *A* likely happens when the effect of building skilled human capital by study migration rather than building unskilled human capital in the developing country (the denominator of Equation 11) is large compared with the difference of the cost between the two (the nominator of Equation 11) and when the effect of building unskilled human capital by study migration rather than building unskilled human capital in the developing country (the denominator of Equation 10) is large compared with the difference of the cost between the two (the nominator of Equation 10). Under these conditions, $\hat{a}_{LM,H}$ and $\hat{a}_{L,LM}$ are smaller than $\hat{a}_{H,L}$.

If the case *A* happens, as Figure 2 shows, individuals born in the developing country choose

$$\text{labour migration if } \underline{a} \leq a_i < \hat{a}_{L,LM} \text{ since } u_{LMi} > u_{Li} > u_{Hi},$$

$$\text{study migration seeking an unskilled job if } \hat{a}_{L,LM} \leq a_i < \hat{a}_{LM,H} \text{ since } u_{Li} > u_{LMi} > u_{Hi} \text{ or if}$$

$$\hat{a}_{LM,H} \leq a_i < \hat{a}_{H,L} \text{ since } u_{Li} > u_{Hi} > u_{LMi},$$

$$\text{study migration seeking a skilled job if } \hat{a}_{H,L} \leq a_i \leq \bar{a} \text{ since } u_{Hi} > u_{Li} > u_{LMi}$$

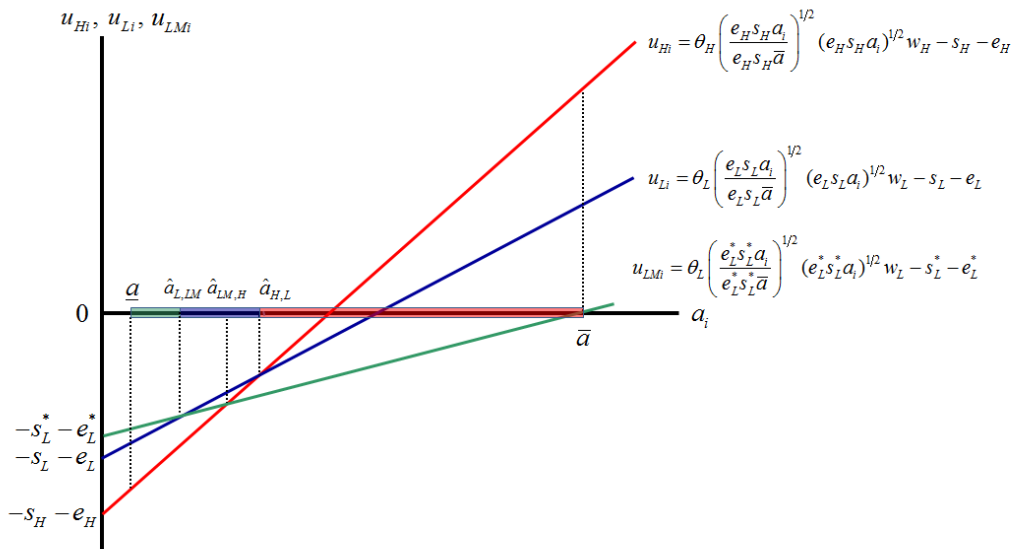


Figure 2. Comparison of utility when $\hat{a}_{H,L} > \hat{a}_{LM,H}$ i.e. the case *A* under the deregulated immigration policy.

As a result, total employed skilled human capital built by study migrants $ESH_{der} \Big|_{\hat{a}_{LM,H} < \hat{a}_{H,L}}$ is

$$\begin{aligned}
 ESH_{der} \Big|_{\hat{a}_{LM,H} < \hat{a}_{H,L}} &= \int_{\hat{a}_{H,L}}^{\bar{a}} \theta_H (e_H s_H a_i / e_H s_H \bar{a})^{1/2} (e_H s_H a_i)^{1/2} da_i \\
 &= \theta_H \left(\frac{e_H s_H}{\bar{a}} \right)^{1/2} \frac{\bar{a}^2 - \hat{a}_{H,L}^2}{2}
 \end{aligned} \tag{12}$$

Clearly, $ESH_{der} \Big|_{\hat{a}_{LM,H} < \hat{a}_{H,L}}$ is equal to ESH_{les} (see Equations 7 and 12). Therefore, relaxing the immigration policy from less regulation to deregulation does not change total employed skilled human capital. Individuals who migrate to study seeking a skilled job are the same as those under less regulated and deregulated immigration policies. They are with an innate ability $\hat{a}_{H,L} \leq a_i \leq \bar{a}$. On the other hand, some individuals who migrate to study seeking an unskilled job switch to labour migration once the developing country deregulates the immigration policy. They are with an innate ability $a \leq a_i < \hat{a}_{L,LM}$. It is not profitable for those with a very low innate ability to study at the developed country. In the case *A*, since study migration is efficient compared with labour migration in building human capital, individuals who choose study migration seeking a skilled job under the less regulated immigration policy do not change their choice even if labour migration has become available. We should notice that the case *A* corresponds to the situation in which building human capital is more effective in the developed country than in the developing country.

The case *B* likely happens when the effect of building skilled human capital by study migration rather than building unskilled human capital in the developing country (the denominator of Equation 11) is less significant compared with the difference of the cost between the two (the nominator of Equation 11) and when the effect of building unskilled human capital by study migration rather than building unskilled human capital in the developing country (the denominator of Equation 10) is less significant is small compared with the difference of the cost between the two (the nominator of Equation 10). Under these conditions, $\hat{a}_{LM,H}$ and $\hat{a}_{L,LM}$ are larger than $\hat{a}_{H,L}$.

If the case *B* happens, as Figure 3 shows, individuals born in the developing country choose

labour migration if $a \leq a_i < \hat{a}_{H,L}$ since $u_{LMi} > u_{Li} > u_{Hi}$ or if $\hat{a}_{H,L} \leq a_i < \hat{a}_{LM,H}$ since $u_{LMi} > u_{Hi} > u_{Li}$,

study migration seeking a skilled job if $\hat{a}_{LM,H} \leq a_i < \hat{a}_{L,LM}$ since $u_{Hi} > u_{LMi} > u_{Li}$ or if $\hat{a}_{L,LM} \leq a_i \leq \bar{a}$ since $u_{Hi} > u_{Li} > u_{LMi}$

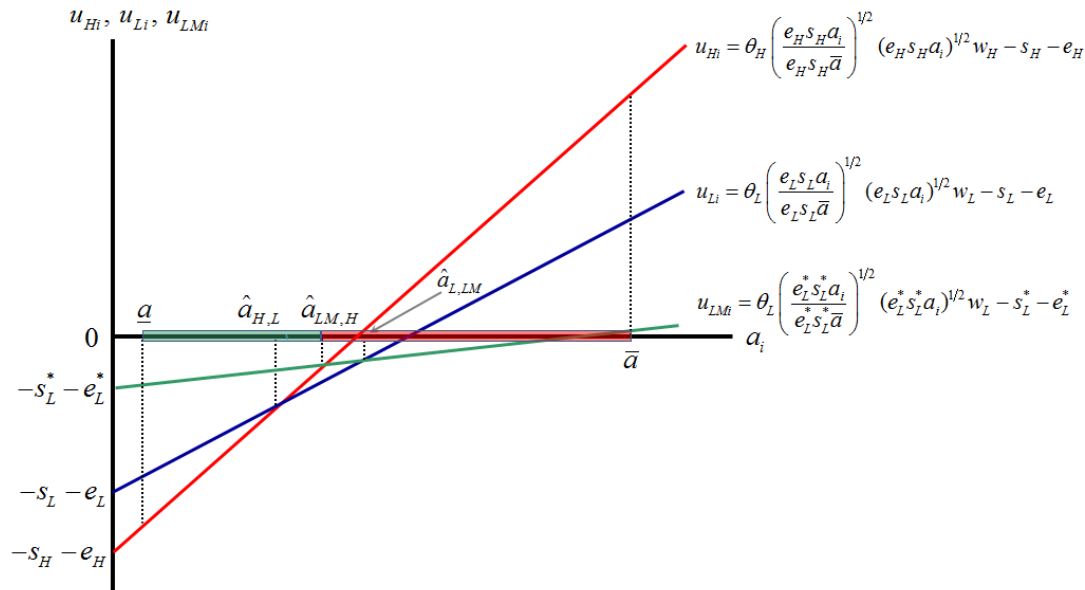


Figure 3. Comparison of utility when $\hat{a}_{H,L} < \hat{a}_{LM,H}$ i.e. the case *B* under the deregulated immigration policy.

As a result, total employed skilled human capital built by study migrants $ESH_{der} \Big|_{\hat{a}_{H,L} < \hat{a}_{LM,H}}$ is

$$\begin{aligned}
 ESH_{der} \Big|_{\hat{a}_{H,L} < \hat{a}_{LM,H}} &= \int_{\hat{a}_{LM,H}}^{\bar{a}} \theta_H (e_H s_H a_i / e_H s_H \bar{a})^{1/2} (e_H s_H a_i)^{1/2} da_i \\
 &= \theta_H \left(\frac{e_H s_H}{\bar{a}} \right)^{1/2} \frac{\bar{a}^2 - \hat{a}_{LM,H}^2}{2}
 \end{aligned} \tag{13}$$

It is clear that $ESH_{der} \Big|_{\hat{a}_{H,L} < \hat{a}_{LM,H}}$ is smaller than ESH_{les} since $\hat{a}_{H,L} < \hat{a}_{LM,H}$ (see Equations 7 and 13).

Therefore, in the case *B*, relaxing the immigration policy from less regulation to deregulation lowers total employed skilled human capital. Some individuals with a low innate ability who migrated to study seeking a skilled job under the less regulated immigration policies switch to labour migration once the developed country deregulates the labour immigration policy. On the other hand, for individuals with high innate ability, study migration seeking a skilled job is profitable even if labour migration is available. In the case *B*, since study migration seeking a skilled job is not so efficient in building human capital, some individuals with a low innate ability opt for labour migration if labour migration has become available. We should notice that the case *B* correspond to the situation in which building human capital in the developed country is not so effective.

These results suggest that employed skilled human capital may decrease when the immigration policy is deregulated.

If study migration does not generate human capital effectively and the case *B* happens, what the developed country's government can do to increase employed skilled human capital? Like the case under the less regulated immigration policy, the government can turn some potential labour migrants with $\hat{a}_{H,L} \leq a_i < \hat{a}_{LM,H}$ into study migrants who seek a skilled job by discounting the tuition fee or providing other pecuniary benefits. Such a policy partly solves the problem.

However, if a large amount of vacancy has to be filled by labour migrants, only a small portion of migrants with $\hat{a}_{H,L} \leq a_i < \hat{a}_{LM,H}$ will receive pecuniary benefits from the government. As under the less regulated immigration policy, an increase in total employed skilled human capital is not large.

8. CONCLUDING REMARKS

With increases in globalisation, many countries attempted to increase domestic skilled human capital by accepting skilled workers and able students from abroad. However, due to the paucity of unskilled labour, they also admitted non-natives to take unskilled jobs. Governments conducted study migrants' acceptance policies and immigration policies independently, implicitly assuming that they are not related.

However, it is not apparently true that they are unrelated and can be conducted without considering their possible interdependence. This study shed light on this issue and examined how study migrants build skilled human capital under different immigration policies.

This study found that deregulation of immigration policies harms the study migrants' incentive for building skilled human capital and lowers their total employed skilled human capital. Therefore, study migrants' acceptance and immigration policies are not necessarily compatible. Additional policies may be necessary if the host country's government attempts to alleviate the adverse effects.

This study put some simplifying assumptions. It was assumed that all individuals born in the developing country, even with different innate abilities, exert an effort by the same amount to build skilled human capital. However, individuals with a low innate ability will usually need a greater effort than those with a high innate ability to create a certain quantity of skilled human capital. The amount of effort is generally determined endogenously. Also, the overall employment probability of a skilled or unskilled job was assumed to be constant. However, it will change with the number of individuals who attempt to be employed in a skilled job or an unskilled job. Furthermore, individuals born in the developed country were not assumed explicitly. If they were included in model explicitly and participated in the developed country's labour market, study migrants would have to compete with these natives, and the competition would also affect study migrants' human capital formation. The model can be extended to discuss these issues.

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