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# Can an FTA Help a Country with a Decreasing Population?

Introducing Foreign Workers and Training Them in order to Secure  
a Sufficient Supply of Qualified Labour

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## **Abstract**

To help a developed country with a decreasing population such as Japan, we analysed the effectiveness of various economic policies for securing a sufficient amount of qualified labour by introducing foreign unskilled workers and training them in terms of skill. We found that under certain conditions, the government must announce only the required period of skill training, while the total number of skilled trainees must be considered as endogenously given. Then, policies that would bring about change in required period, encourage capital outflow or raise the penalty charge for illegal immigration may become effective. On the other hand, announcing the total number of skilled trainees cannot simultaneously attain the above-mentioned political targets.

## **Keywords**

skilled trainee, international migration, minimum skill requirement, illegal foreign workers, aging society, free trade agreement

## **JEL Classification Numbers**

F22, J61

## 1. Introduction

In Japan, one of the most significant recent topics of discussion with regard to international migration is introducing workers from the Philippines in the field of health care services. Japan intends to accept 400 nurses and 600 nursing caregivers in the next two years—from fiscal 2007 onwards<sup>1</sup>. In order to work as health care professionals in Japan, it is imperative that workers possess the capability of communicating in Japanese as well as medical knowledge and skills. Therefore, it is necessary for Japan to provide these foreign workers sufficient supplementary education and training after they are accepted in the country. Thereafter, it is expected that Filipino nursing caregivers will be treated almost at par with domestic skilled workers<sup>2</sup>. This new aspect of the Japanese immigration policy is the result of a Free Trade Agreement (FTA) between Japan and the Philippines, which was concluded in 2006. Undoubtedly, the decreasing population in Japan was one of the main motive behind the FTA. Currently, although there exists a large number of illegal unskilled foreign workers in Japan and the younger generation that has failed to occupy permanent jobs, in the long-term, securing a sufficient number of workers in order to maintain economic prosperity is also the one of most serious and difficult problems not only for Japan but also for a majority of the developed countries.

Most studies on the economic welfare of host countries of international immigration have concluded that immigration is beneficial to the host country. The typical examples of such studies are Berry and Soligo (1969), Rivera-Batiz (1982), Quibria (1989), Wong (1995) and Kondoh (1999); however, it must be noted that these studies consider workers who possess the same ability, skill level and working spirit. In reality, potential immigrants have different levels of ability and skills, and the government of the host country is likely to be selective in granting entry and work permits to foreign workers. Further, developed countries accept only skilled workers. Occasionally, the above-mentioned theoretical analyses failed to consider the major reason for developed countries to often be reluctant in accepting immigrants. In order to minimize the potentially negative externalities associated with the sizeable inflow of foreign workers, it is necessary to consider the effectiveness of qualitative restrictions. When adopted effectively, these policies enable countries not only to gain useful skilled workers in their workforce but also help prevent an influx of 'undesirable', disgruntled immigrants who may bring problems with them.

Djajic (1989) analysed the effects of qualitative restrictions on international migration. Skills were considered to be the experience accumulated in school and at work as well as in everyday life, which increase the productivity of an individual. In order to obtain permission to enter the host country, potential immigrants are required to possess a minimum number of

skills; thus, there is an inverse relationship between the ability of a worker to acquire skills and the age at which he may become a qualified migrant. However, Djajic (1989) examined only the case of legal immigrants.

Kondoh (2000) extended Djajic's (1989) study by considering the alternatives of labour mobility—illegal migration<sup>3</sup>. In Kondoh's model, which considers the coexistence of legal and illegal immigrants, workers in the less developed home country who are lacking in sufficient ability, intend to migrate illegally early in life without acquiring any requisite skill. Unlike legal immigrants, illegal workers are risk-neutral and are assumed to abandon the opportunity to practice their acquired skills.

Kondoh (2006) also adopted the simplified basic model of Djajic (1989) that permitted immigrants to engage in repeat migration<sup>4</sup>. Kondoh (2006) assumed that the host country requires skilled immigrants possessing minimum skill requirements (for example, knowledge of a foreign language). In addition, the host country intends to exclude workers with both potentially lower ability and working spirits as a result of living abroad for a prolonged time period. Further, Kondoh (2006) discussed the effectiveness of certain policies adopted by the host country.

However, several issues remain to be studied. In particular, no studies have considered cases such as the Japan-Philippine FTA thus far. Firstly, if the host (developed) country permits the entry of a few unskilled workers and

provides them with opportunities to obtain sufficient skills, what type of effects will occur on the optimal behaviour of potential migrants in the home (developing) country? Secondly, for the host country, there are two alternative policies—one is the optimal selection of the total number of foreign workers who require skill training after immigration, while the training period will be endogenously given in equilibrium; another is the optimal selection of the training period, while the total number of immigrants will be endogenously given. It is an important issue to evaluate the effectiveness of these two different policies. In particular, it is necessary for the host country to seek a political method to secure a sufficient number of skilled workers in order to maintain economic prosperity, and at the same time exclude those foreign workers who are less capable.

The paper is organized as follows. Section 2 presents the model. Section 3, considers two cases—the government announces required period of skill training, and that announces the total number of skilled trainees. Thus, we compare the effectiveness of certain policies implemented by the host country by adopting a general equilibrium analysis. Section 4 offers some concluding remarks.

## 2. The Model

Let us focus on two countries—a developed country A and a less developed country B. We assume that the two countries produce a single commodity and treat the price of the commodity as the numeraire. The output in each country is produced with the aid of capital and labour. The production function in a country  $j(j = A, B)$  by  $F^j(K_j, L_j)$ . We assume that  $F^j$  denotes constant returns to scale with  $\partial F^j / \partial K_j > 0$ ,  $\partial F^j / \partial L_j > 0$ ,  $\partial^2 F^j / \partial K_j^2 < 0$ ,  $\partial^2 F^j / \partial L_j^2 < 0$  and  $\partial^2 F^j / \partial L_j \partial K_j > 0$ .

Following Djajic (1989), in order to simplify our analysis, the dynamic problems involving capital accumulation and population growth are not considered. We assume that country A (country B) is endowed with a fixed amount of capital,  $K_A$  ( $K_B$ ), and at every instant, a constant number of individuals— $N_A$  ( $N_B$ )—is born in country A (B).

Now, let us focus on country B. Following Djajic (1989), let us assume that each newborn individual differs from other members of his age group in terms of his innate ability and capacity to develop productive skills. In addition, suppose that the constant number of individuals born in country B in each period— $N_B$ —is sufficiently large so that, as an approximation, we may treat every age group as a continuum of individuals. Let us index each individual by  $i \in [0, 1]$ . Ability is innate, depending on heredity and birth circumstances, and



can be measured by a continuous function— $s(i)$ —where  $s'(i) > 0$  and  $s(0) = 1$ . Moreover, it is assumed that each generation is a replica of the previous one so that the distribution of aptitudes within the population is always constant.

We assume that the contribution of each worker to production depends on the differences in their potential ability. On the other hand, we assume that skills (for example, knowledge of a foreign language) are accumulated by experience from the beginning of one's life, and depending on one's innate abilities, skills are acquired through daily learning. As a result, certain individuals become sufficiently productive (for example, they are able to speak a foreign language fluently) before others. Further, we assume that an individual with a higher potential ability can improve his productive skills faster and acquire requisite skill levels before the others. It must be noted that in our model, sufficient skill (for example, speaking a foreign language) is the only necessary condition to migrate legally from country B to country A; moreover, we assume that each worker will be paid depending only on his ability (how efficiently one can deal with one's job).

The accumulation of skills by individual  $i$  at age  $t$  ( $0 \leq t \leq T$ ) is assumed to be given by

$$Q(i, t) = s(i)q(t), \tag{1}$$

where  $q(0)=1$ ,  $q'(t)>0$ ,  $q''(t)<0$ , and  $T$  denotes the retirement age. We assume that each individual begins working immediately after birth and all learning stops when it reaches the skill level required for migration. On the other hand, in the absence of migration, the total number of workers in country B can then be expressed as  $L_B = TN_B \int_0^1 s(i) di$ . Similarly, we define  $N_A$  as the constant number of newborn individuals in country A and  $L_A = TN_A \int_0^1 s(i) di$  as the labour endowment of country A in the absence of migration.

The presence of perfect competition and full employment in both markets ensures that  $\partial F^j / \partial K_j = r_j$  and  $\partial F^j / \partial L_j = w_j$ , where  $r_j$  and  $w_j$  denote the rental price of capital in an autarky and the wage rate per unit of efficiency labour, respectively, in country  $j(j = A, B)$ . Moreover, we also assume that in an autarky, country A is relatively capital abundant— $K_A/L_A > K_B/L_B$ —and therefore,  $w_A > w_B$  in order to provide motivation for migration.

Let us denote the steady-state wage rate per unit of efficiency labour prevailing in country A in the presence of migration as  $\tilde{w}_A$ . The wage rate of a worker with ability  $s(i)$  must be  $s(i)\tilde{w}_A$  in any period.

Now, following Djajic (1989), we assume that workers with at least  $\bar{Q}$  units of skills are permitted to migrate legally; further, we assume that they do not postpone their departure for country A once they have accumulated

sufficient skills. Thereafter, we obtain the following relationship between  $\bar{Q}, i$  and the migration age  $\tau$ :

$$\tau = \Psi(i, \bar{Q}), \tag{2}$$

where  $\Psi_1 < 0$  and  $\Psi_2 > 0$ . The function  $\Psi(i, \bar{Q})$  is given by  $q^{-1}(\frac{s(i)}{\bar{Q}})$ . This relationship is depicted by the  $\bar{Q}\bar{Q}$  schedule in Figure 1.

[Figure 1 should be around here]

Now, we consider the case in which country A begins to permit immigration of unskilled workers from country B. Let us consider that initially these workers must engage in skill training for a certain period of time without any income. Thereafter, they will be employed at par with domestic workers. Then these workers are known as skilled trainees<sup>5</sup>. Let  $\tilde{T}$  denote the fixed period of training for each foreign worker. For the sake of simplicity, we do not consider discounting in our model, following Dustmann and Kirchkamp (2002). As a result, the expected lifelong income of the representative foreign worker with ability  $i$  must be  $W^0 \equiv s(i)\tilde{w}_A(T - \tilde{T}) - \mu$ , where  $\mu$  is the constant trip cost of each individual.

On the other hand, the lifelong income of a legal worker with ability  $i$  must be  $W^1 \equiv s(i)[\tilde{w}_A(T - \tau) + \tilde{w}_B\tau] - \mu$ . Thus, let us define  $i^1$  as the value of  $i$  that satisfies  $W^0 = W^1$ ; in other words, the worker with ability  $i^1$  is indifferent to being a legal migrant or a skilled trainee. Then, we have

$$P \equiv -\tilde{w}_A(\tau^1 - \tilde{T}) + \tilde{w}_B\tau^1 = 0, \quad (3)$$

where  $\tau^1 = \Psi(i^1, \bar{Q})$ . Therefore, it may be concluded that individuals with  $i > i^1$  would have an incentive to migrate legally, while individuals with  $i < i^1$  prefer to be skilled trainees.

Similarly, the lifelong income of a worker with ability  $i$  must be  $W^2 \equiv (1 - p)\tilde{w}_A T + p(s(i)\tilde{w}_B T - \theta)$  if he selects illegal migration, where  $p$  ( $0 < p < 1$ ) is the possibility of disclosure of the border enforcement policy adopted by country A, and  $\theta$  is the penalty charge. It must be noted that these illegal workers are easy to distinguish from legal or domestic workers because of their poor skill levels; thus, the wage rate offered to them by employers is the lowest level in country A regardless of the abilities of the workers. Let us define  $i^2$  as the value of  $i$  that satisfies  $W^0 = W^2$ ; in other words, the worker with ability  $i^2$  is indifferent to being a skilled trainee or an illegal migrant. Then, we also have

$$R \equiv s(i^2)[\tilde{w}_A(T - \tilde{T}) - p\tilde{w}_B T] + p\theta - (1 - p)\tilde{w}_A T = 0 . \quad 4)$$

Now, we have the following assumption.

Assumption 1:  $\tilde{T} < pT$ .

This assumption implies that the possibility of disclosure is sufficiently large and the required training period  $\tilde{T}$  is sufficiently small. Then, it may also be concluded that under the assumption, individuals with  $i > i^2$  would have an incentive to be skilled trainees, while individuals with  $i < i^2$  prefer to be illegal migrants.

It is evident that  $i^1 > i^2$  if we assume a sufficiently large penalty charge after the entry of skilled trainees in country A; as shown in Figure 2, there is a complete distinction between the group of legal migrants (those with innate ability index  $i \in [i^1, 1]$ ), the group of skilled trainees (those with innate ability index  $i \in [i^2, i^1]$ ) and the group of illegal migrants (those with innate ability index  $i \in [0, i^2]$ ).

[Figure 2 should be around here]

Now, the total number of skilled trainees,  $S$ , is given by

$$S = (i^1 - i^2)(T - \tilde{T}), \quad (5)$$

and we can express the steady-state wage rate per unit of efficiency labour prevailing in country A (B) in the presence of migration,  $\tilde{w}_A$  ( $\tilde{w}_B$ ), as follows.

$$\tilde{w}_A = \tilde{w}_A(K_A, i^1, i^2, \tilde{T}, \bar{Q}); \quad (6a)$$

$$\tilde{w}_B = \tilde{w}_B(K_B, i^1, i^2, \tilde{T}, \bar{Q}). \quad (6b)$$

Under Assumption 1, we can assert that the sign of partial differentiation of the above functions are  $\tilde{w}_A^K \equiv \partial \tilde{w}_A / \partial K_A > 0$ ,  $\tilde{w}_A^1 \equiv \partial \tilde{w}_A / \partial i^1 < 0$ ,  $\tilde{w}_A^2 \equiv \partial \tilde{w}_A / \partial i^2 > 0$ ,  $\tilde{w}_A^T \equiv \partial \tilde{w}_A / \partial \tilde{T} > 0$ ,  $\tilde{w}_A^Q \equiv \partial \tilde{w}_A / \partial \bar{Q} > 0$ ,  $\tilde{w}_B^K \equiv \partial \tilde{w}_B / \partial K_B > 0$ ,  $\tilde{w}_B^1 \equiv \partial \tilde{w}_B / \partial i^1 > 0$ ,  $\tilde{w}_B^2 \equiv \partial \tilde{w}_B / \partial i^2 < 0$ ,  $\tilde{w}_B^T \equiv \partial \tilde{w}_B / \partial \tilde{T} < 0$  and  $\tilde{w}_B^Q \equiv \partial \tilde{w}_B / \partial \bar{Q} < 0$ .

### 3. Analysis

#### 3-1. Case of Exogenous Training Period

Now, let us consider two different cases. In the first case, the government of country A determines the period of skill training  $\tilde{T}$ . Then, if the required skill level  $\bar{Q}$ , trip cost  $\mu$ , and capital endowment in both countries— $K_A$  and  $K_B$ , respectively—are exogenously given, two endogenous variables,  $i^1$  and  $i^2$  will be determined by (3) and (4). Further, the total number of skilled trainees,  $S$ , will be determined by (5). It must be noted that among the above-mentioned exogenous variables,  $K_B$  cannot be changed for country A due to political reasons.

Total differentiation of (3) and (4) yields

$$\begin{bmatrix} P_1 & P_2 \\ R_1 & R_2 \end{bmatrix} \begin{bmatrix} di^1 \\ di^2 \end{bmatrix} = - \begin{bmatrix} P_K \\ R_K \end{bmatrix} dK_A - \begin{bmatrix} P_Q \\ R_Q \end{bmatrix} d\bar{Q} - \begin{bmatrix} 0 \\ R_\theta \end{bmatrix} d\theta - \begin{bmatrix} P_T \\ R_T \end{bmatrix} d\tilde{T}, \quad (7)$$

where,

$$P_1 \equiv \partial P / \partial i^1 = -\tilde{w}_A^1 (\tau^1 - \tilde{T}) + \tilde{w}_B^1 \tau^1 - \Psi_1 (\tilde{w}_A - \tilde{w}_B) > 0, \quad (8-1)$$

$$P_2 \equiv \partial P / \partial i^2 = -\tilde{w}_A^2 (\tau^1 - \tilde{T}) + \tilde{w}_B^2 \tau^1 < 0, \quad (8-2)$$

$$P_K \equiv \partial P / \partial K_A = -\tilde{w}_A^K (\tau^1 - \tilde{T}) < 0, \quad (8-3)$$

$$P_Q \equiv \partial P / \partial \bar{Q} = -\tilde{w}_A^Q (\tau^1 - \tilde{T}) + \tilde{w}_B^Q \tau^1 - \Psi_2 (\tilde{w}_A - \tilde{w}_B) < 0, \quad (8-4)$$

$$P_T \equiv \partial P / \partial \tilde{T} = \tilde{w}_A - \tilde{w}_A^T (\tau^1 - \tilde{T}) + w_B^T \tau^1, \quad (8-5)$$

$$R_1 \equiv \partial R / \partial i^1 = [s(i^2)(T - \tilde{T}) - (1-p)T] \tilde{w}_A^1 - s(i^2) \tilde{w}_B^1 pT < 0, \quad (8-6)$$

$$R_2 \equiv \partial R / \partial i^2 = [s(i^2)(T - \tilde{T}) - (1-p)T] \tilde{w}_A^2 - s(i^2) \tilde{w}_B^2 pT \\ + s'(i^2) [\tilde{w}_A (T - \tilde{T}) - \tilde{w}_B pT] > 0, \quad (8-7)$$

$$R_K \equiv \partial R / \partial K_A = [s(i^2)(T - \tilde{T}) - (1-p)T] \tilde{w}_A^K > 0, \quad (8-8)$$

$$R_Q \equiv \partial R / \partial \bar{Q} = [s(i^2)(T - \tilde{T}) - (1-p)T] \tilde{w}_A^Q - s(i^2) \tilde{w}_B^Q pT > 0, \quad (8-9)$$

$$R_\theta \equiv \partial R / \partial \theta = p > 0 \quad \text{and} \quad (8-10)$$

$$R_T \equiv \partial R / \partial \tilde{T} = -s(i^2) \tilde{w}_A + [s(i^2)(T - \tilde{T}) - (1-p)T] \tilde{w}_A^T \\ - s(i^2) \tilde{w}_B^T pT < 0. \quad (8-11)$$

The determinant of the matrix of the LHS of (7),  $\Delta$ , is

$$\Delta = P_1 R_2 - P_2 R_1 \\ = (\tilde{w}_B^1 \tilde{w}_A^2 - \tilde{w}_B^2 \tilde{w}_A^1) [\tau^1 \{s(i^2)(T - \tilde{T}) - (1-p)T\} - (\tau^1 - \tilde{T}) s(i^2) pT] \\ + P_{1-1} R_{2-2} + P_{1-2} R_{2-1}, \quad (9)$$

where  $P_{1-1} \equiv -\tilde{w}_A^1 (\tau^1 - \tilde{T}) + \tilde{w}_B^1 \tau^1 > 0$ ,  $P_{1-2} \equiv -\Psi_1 (\tilde{w}_A - \tilde{w}_B) > 0$ ,

$R_{2-1} \equiv [s(i^2)(T - \tilde{T}) - (1-p)T] \tilde{w}_A^2 - s(i^2) \tilde{w}_B^2 pT > 0$  and

$R_{2-2} \equiv s'(i^2) [\tilde{w}_A (T - \tilde{T}) - \tilde{w}_B pT] > 0$ .



The sign of the second and third term of the RHS of (9) is positive, while the sign of the first term is unclear. Now, let us assume that the marginal change in labour (not efficiency unit) caused by an increase (a decrease) in  $i^1$  and a decrease (an increase) in  $i^2$  is almost of the same magnitude in both countries. This assumption can be expressed as

$$\text{Assumption 2: } s(i^1)(\tau^1 - \tilde{T}) \approx s(i^2)(pT - \tilde{T}).$$

It must be noted that since  $s(i^1) > s(i^2)$ , Assumption 2 implies  $\tau^1 < pT$ . Under the above assumptions, we have  $\tilde{w}_A^1 \approx -\tilde{w}_A^2$ ,  $\tilde{w}_B^1 \approx -\tilde{w}_B^2$ , and thus  $\tilde{w}_B^1 \tilde{w}_A^2 - \tilde{w}_B^2 \tilde{w}_A^1 \approx 0$ ; therefore, the first term in the RHS of (9) would be sufficiently small regardless of the sign of the term in square brackets. In this case, the sign of  $\Delta$  is positive.

Following the straightforward calculation in Appendix 1, we have

$$\frac{di^1}{dK_A} \gg 0, \frac{di^2}{dK_A} < 0, \frac{dS}{dK_A} > 0, \quad (10-1)$$

$$\frac{di^1}{d\theta} < 0, \frac{di^2}{d\theta} < 0, \frac{dS}{d\theta} > 0, \quad (10-2)$$

$$\frac{di^1}{d\tilde{T}} < 0, \frac{di^2}{d\tilde{T}} > 0, \frac{dS}{d\tilde{T}} < 0 \text{ and} \quad (10-3)$$

$$\frac{di^1}{d\tilde{Q}} > 0^*, \frac{di^2}{d\tilde{Q}} < 0^*, \frac{dS}{d\tilde{Q}} > 0^*, \quad (10-4)$$

where relationships with \* are valid under certain conditions.

Introducing a greater penalty charge would directly reduce  $i^2$  by (4), which increases the total number of foreign workers, thereby lowering  $\tilde{w}_A$  and raising  $\tilde{w}_B$ . Therefore, for the marginal individual to be a legal worker must be preferred because of the greater lifelong income; thus,  $i^1$  must decrease in equilibrium. Moreover, as  $P_1 + P_2 \approx P_{1-2} > 0$  under Assumption 2, the magnitude of decreasing  $i^1$  is relatively small to satisfy  $di^2/d\theta < di^1/d\theta < 0$ ; therefore, we obtain  $dS/d\theta > 0$ .

The representative policy that would encourage capital outflow from country A to the rest of the world is to permit capital movement with lesser restrictions. Capital outflow lowers the wage rate per unit of efficiency labour in country A— $\tilde{w}_A$ . Then, straightforwardly,  $i^2$  will increase and in turn lower the wage rate in country B— $\tilde{w}_B$ . Since the wage rate in both countries decreases, the effect on  $i^1$  is ambiguous. However, under Assumption 2, we have  $|di^2/dK_A| > |di^1/dK_A|$  and thus we can assert that  $dS/dK_A > 0$ .

Shortening the skill training period,  $\tilde{T}$ , is also an available policy. Under Assumption 2, following the optimal behaviour of marginal workers, a decrease in  $\tilde{T}$  will directly lower  $i^2$  and raise  $i^1$ . Therefore, it can clearly be asserted that  $dS/d\tilde{T} < 0$ .

Finally, under the assumption that  $\Psi_2$  is sufficiently small, an increase in minimum skill requirement,  $\bar{Q}$ , makes it possible to raise  $S$ ; however, the effects on both  $i^1$  and  $i^2$  are unclear in the absence of additional conditions. If conditions  $|\tilde{w}_A^2| > |\tilde{w}_B^2|$  and  $\tilde{w}_A^0 \approx \tilde{w}_B^0$  are satisfied, we have  $di^1/d\bar{Q} > 0$ . On the other hand, if conditions  $|\tilde{w}_A^1| < |\tilde{w}_B^1|$  and  $\tilde{w}_A^0 \approx \tilde{w}_B^0$  are satisfied, we can conclude that  $di^2/d\bar{Q} < 0$ . However, under Assumption 2, it is impossible to simultaneously satisfy both the conditions— $|\tilde{w}_A^2| > |\tilde{w}_B^2|$  and  $|\tilde{w}_A^1| < |\tilde{w}_B^1|$ .

The host country, which intends to introduce skilled trainees in order to deal with the shortage of labour, usually aims to maintain a certain total amount of labour along with improving their quality. Thus, the optimal situation for country A is to increase the total number of legal foreign efficiency labour (in addition to skilled workers and trainees) as well as exclude those with lower ability. Now, we have three adoptable policies that are as follows. An increase in the penalty charge— $\theta$ , an increase in the capital endowment of the home country A— $K_A$  and a decrease in the period of skill training— $\tilde{T}$ . These

policies will raise  $S$  but reduce  $i^2$  simultaneously, and are rather suitable for country A. Moreover, it must be noted that the effects of the above mentioned three policies on  $i^1$  are different. Even though  $S$  increases, it is not a certainty that the total amount of efficiency labour will increase under a decreasing  $i^1$ . Therefore, the best policy among the three is to reduce the period of skill training; the other two policies are second-best.

Now, we establish the following proposition:

### **Proposition 1**

Consider the case that Assumptions 1 and 2 are satisfied and the period of skill training is exogenously given. Shortening the duration of the skill training period is the optimal policy for maintaining or enhancing the total number of efficient foreign workers as well as excluding those workers with lower abilities. In addition, raising penalty charges or encouraging capital outflow may also prove effective.

### **3-2. Case of Exogenous Total Number of Skilled Trainees**

Next, let us consider the second case in which the host country determines the total number of skilled trainees— $S$ , and in contrast with the first case, the

training period— $\tilde{T}$ —is now endogenously given in equilibrium. Now, we have three equations, (3), (4) and (5) with three endogenous variables,  $i^1, i^2$  and  $\tilde{T}$ .

Total differentiation of (3), (4) and (5) yields

$$\begin{aligned} & \begin{bmatrix} P_1 & P_2 & P_T \\ R_1 & R_2 & R_T \\ T - \tilde{T} & -T + \tilde{T} & -i^1 + i^2 \end{bmatrix} \begin{bmatrix} di^1 \\ di^2 \\ d\tilde{T} \end{bmatrix} \\ & = - \begin{bmatrix} P_K \\ R_K \\ 0 \end{bmatrix} dK_A - \begin{bmatrix} P_Q \\ R_Q \\ 0 \end{bmatrix} d\bar{Q} - \begin{bmatrix} 0 \\ R_\theta \\ 0 \end{bmatrix} d\theta + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} dS. \end{aligned} \quad (11)$$

The determinant of the LHS matrix of (11),  $\Delta'$ , is

$$\Delta' = (-i^1 + i^2)\Delta + (T - \tilde{T})[R_T(P_1 + P_2) - P_T(R_1 + R_2)], \quad (12)$$

and under Assumption 2 we have  $R_1 + R_2 \approx R_{2-2} > 0$  and  $P_1 + P_2 \approx P_{1-1} > 0$ ; thus, it can be concluded that  $\Delta' < 0$ .

Following the straightforward calculation in Appendix 2, we have

$$\frac{di^1}{dK_A} \gg 0, \frac{di^2}{dK_A} \gg 0, \frac{d\tilde{T}}{dK_A} > 0, \quad (13-1)$$

$$\frac{di^1}{d\theta} < 0, \frac{di^2}{d\theta} < 0, \frac{d\tilde{T}}{d\theta} > 0, \quad (13-2)$$

$$\frac{di^1}{dS} > 0, \frac{di^2}{dS} < 0, \frac{d\tilde{T}}{dS} < 0 \quad \text{and} \quad (13-3)$$

$$\frac{di^1}{dQ} \gg 0, \frac{di^2}{dQ} \gg 0, \frac{d\tilde{T}}{dQ} > 0. \quad (13-4)$$

In order to introduce a sufficient amount of efficiency labour as well as exclude those with lower abilities in country A, the optimal policy is to increase the total number of skilled trainees who are permitted to enter the country. This is the only policy that will enable the attainment of both political targets. An increase in penalty charge will reduce the number of immigrants with relatively lower ability; however, in this case, contrasting with the first case, the total amount of efficiency labour will surely decrease. Moreover, there will be no apparent economic effects caused by capital outflow or by an increase in minimum skill requirement.

We now establish the following Proposition.

**Proposition 2**

Consider the case that Assumptions 1 and 2 are satisfied and the total number of skilled trainees is exogenously given. In such a case, controlling the capital outflow or penalty charges will not produce any apparent and positive effects; the only optimal policy for maintaining or enhancing the total number of

efficient foreign workers as well as excluding those with lower abilities is permitting the immigration of a greater number of skilled trainees.

As shown in the Japan-Philippines case, the host country initially announces the total number of skilled trainees that it intends to immigrate, as in the second case of our analysis. Further, it must be noted that it is usually difficult to make a change of this number because it is determined after negotiations with the government of the home country. Thereafter, the host country attempts to determine the optimal training period. If the period is shorter than the period that is determined endogenously, a few workers become illegal immigrants. However, this realistic case has two disadvantages. Firstly, if the training period is not optimal, workers with a relatively higher ability fail to become skilled trainees and other workers with relatively lower ability may succeed. This contradicts the two political targets mentioned earlier. Secondly, following the above analysis, the second case with an exogenously determined number of skilled trainees is not favourable from the political viewpoint. Changing the number of immigrants is the only apparent and positive political method; however, usually it cannot be fulfilled without the approval of the home country. Therefore, it is probably more beneficial for the host country to announce only the requisite period for skill training and attempt to control

three variables—the period for skill training, penalty charge and capital outflow in accordance with particular situations.

#### **4. Concluding Remarks**

We have considered a topic of great current significance in a developed country such as Japan—decreasing population and the need for introducing and training foreign workers in terms of skill. Further, we studied the effects of economic policies that can be adopted by the host country with regard to skilled trainees, such as nursing workers from the Philippines.

Further, we considered two different cases and found that for the host country to simultaneously maintain (or increase) the total number of foreign skilled workers and exclude workers with relatively lower abilities the more beneficial policy is to announce only the requisite skill training period and control exogenous variables. It is interesting to note that this is contrary to the actual policy adopted by the Japanese government, which announces the total number of skilled trainees required.

A possible extension of this study may be achieved by introducing discounting and a variety of trip costs, which are considered in Djajic (1989). Moreover, certain interesting differences would arise if we consider the case in



which the government of country A adopts internal enforcement policies, for example, in Kondoh (2000), instead of border enforcement.

## Appendix 1

We obtain the following results from equations (8) and (9).

$$\frac{di^1}{dK_A} = \frac{1}{\Delta} [\tilde{w}_A^K \tilde{w}_B^2 C + \tilde{w}_A^K R_{2-2} (\tau^1 - \tilde{T})], \quad (\text{A-1})$$

$$\text{where } C \equiv \tau^1 T (1-p)(s(i^2) - 1) + \tilde{T} s(i^2)(pT - \tau^1) > 0.$$

$$\frac{di^2}{dK_A} = \frac{1}{\Delta} [-C \tilde{w}_A^K \tilde{w}_B^1 - P_{1-2} R_K] < 0, \quad (\text{A-2})$$

$$\begin{aligned} \frac{dS}{dK_A} &= \frac{1}{\Delta} [\tilde{w}_A^K C (\tilde{w}_B^1 + \tilde{w}_B^2) \\ &+ \tilde{w}_A^K \{P_{1-2} [s(i^2)(T - \tilde{T}) - (1-p)T] + R_{2-2} (\tau^1 - \tilde{T})\}] > 0 \end{aligned}, \quad (\text{A-3})$$

$$\frac{di^1}{d\theta} = \frac{1}{\Delta} pP_2 < 0, \quad (\text{A-4})$$

$$\frac{di^2}{d\theta} = \frac{1}{\Delta} [-pP_1] < 0, \quad (\text{A-5})$$

$$\frac{dS}{d\theta} = \frac{1}{\Delta} [p(P_1 + P_2)] \approx \frac{1}{\Delta} pP_{1-2} > 0, \quad (\text{A-6})$$

$$\begin{aligned} \frac{di^1}{d\tilde{T}} &= \frac{1}{\Delta} \{-P_T R_{2-2} + \tilde{w}_A \tilde{w}_B^2 s(i^2)(pT - \tau^1) \\ &+ \tilde{w}_A \tilde{w}_A^2 [s(i^2)(\tau^1 - T) + (1-p)T]\} < 0 \end{aligned}, \quad (\text{A-7})$$

$$\begin{aligned} \frac{di^2}{d\tilde{T}} &= \frac{1}{\Delta} \{-P_{1-2} R_T + \tilde{w}_A \tilde{w}_A^1 [-s(i^2)(\tau^1 - T) - (1-p)T] \\ &+ \tilde{w}_A \tilde{w}_B^1 s(i^2)(pT - \tau^1)\} > 0 \end{aligned}, \quad (\text{A-8})$$

$$\frac{dS}{d\tilde{T}} = -(i^1 - i^2) + (T - \tilde{T}) \left[ \frac{di^1}{d\tilde{T}} - \frac{di^2}{d\tilde{T}} \right] < 0, \quad (\text{A-9})$$

$$\frac{di^1}{dQ} = \frac{1}{\Delta} [-\Psi_2 \{w_A - \tilde{w}_B\} R_2 - R_{2-2} P_Q - C(\tilde{w}_A^2 \tilde{w}_B^Q - \tilde{w}_B^2 \tilde{w}_A^Q)], \quad (\text{A-10})$$

$$\frac{di^2}{dQ} = \frac{1}{\Delta} [-P_{1-1} R_Q - \Psi_2 (\tilde{w}_A - \tilde{w}_B) R_1 - C(\tilde{w}_A^Q \tilde{w}_B^1 - \tilde{w}_B^Q \tilde{w}_A^1)] \quad \text{and} \quad (\text{A-11})$$

$$\begin{aligned} \frac{dS}{dQ} = \frac{1}{\Delta} [-\Psi_2 (\tilde{w}_A - \tilde{w}_B) (R_2 - R_1) + P_{1-1} R_Q - R_{2-2} P_Q \\ + C\{\tilde{w}_A^Q (\tilde{w}_B^2 - \tilde{w}_B^1) - \tilde{w}_B^Q (\tilde{w}_A^2 - \tilde{w}_A^1)\}] \end{aligned} \quad (\text{A-12})$$

## Appendix 2

We obtain the following results from equations (8), (11) and (12).

$$\frac{di^1}{dK_A} = \frac{1}{\Delta'} [(-i^1 + i^2)(P_2 R_K - P_K R_2) + (T - \tilde{T})(P_T R_K - P_K R_T)], \quad (\text{A-13})$$

$$\frac{di^2}{dK_A} = \frac{1}{\Delta'} [(-i^1 + i^2)(-P_1 R_K + P_K R_1) + (T - \tilde{T})(P_T R_K - P_K R_T)], \quad (\text{A-14})$$

$$\begin{aligned} \frac{d\tilde{T}}{dK_A} &= \frac{1}{\Delta'} (T - \tilde{T}) [-R_K (P_1 + P_2) + P_K (R_1 + R_2)] \\ &\approx \frac{1}{\Delta'} (T - \tilde{T}) (-R_K P_{1-1} + P_K R_{2-2}) > 0 \end{aligned} \quad (\text{A-15})$$

$$\frac{di^1}{d\theta} = \frac{1}{\Delta'} R_\theta [P_2 (-i^1 + i^2) + (T - \tilde{T}) P_T] < 0, \quad (\text{A-16})$$

$$\frac{di^2}{d\theta} = -\frac{1}{\Delta'} R_\theta [P_1 (-i^1 + i^2) - (T - \tilde{T}) P_T] < 0, \quad (\text{A-17})$$

$$\frac{d\tilde{T}}{d\theta} = -\frac{1}{\Delta'} R_\theta (T - \tilde{T}) (P_1 + P_2) \approx -\frac{1}{\Delta'} R_\theta (T - \tilde{T}) P_{1-1} > 0, \quad (\text{A-18})$$

$$\frac{di^1}{dS} = \frac{1}{\Delta'}(P_2 R_T - P_T R_2) > 0, \quad (\text{A-19})$$

$$\frac{di^2}{dS} = -\frac{1}{\Delta'}(P_1 R_T - P_T R_1) < 0, \quad (\text{A-20})$$

$$\frac{d\tilde{T}}{dS} = \frac{1}{\Delta'}(P_1 R_2 - P_2 R_1) < 0, \quad (\text{A-21})$$

$$\begin{aligned} \frac{di^1}{d\bar{Q}} = \frac{1}{\Delta'} \{ & -(i^1 - i^2)(-P_Q R_2 + R_Q P_2) \\ & + (T - \tilde{T})[\Psi_2 R_T + \tilde{w}_A s(i^2)(P_Q - R_Q) - C(\tilde{w}_A^T \tilde{w}_B^Q - \tilde{w}_B^T \tilde{w}_A^Q)] \} \end{aligned}, \quad (\text{A-22})$$

$$\begin{aligned} \frac{di^2}{d\bar{Q}} = \frac{1}{\Delta'} \{ & (i^1 - i^2)(P_1 R_Q - R_1 P_Q) \\ & + (T - \tilde{T})[\Psi_2 R_T + \tilde{w}_A s(i^2)(P_Q - R_Q) - C(\tilde{w}_A^T \tilde{w}_B^Q - \tilde{w}_B^T \tilde{w}_A^Q)] \} \end{aligned} \quad \text{and(A-23)}$$

$$\begin{aligned} \frac{d\tilde{T}}{d\bar{Q}} = \frac{1}{\Delta'} (T - \tilde{T}) & [-R_Q (P_1 + P_2) + P_Q (R_1 + R_2)] \\ \approx -\frac{1}{\Delta'} (T - \tilde{T}) & [-R_Q P_{1-1} + P_Q R_{2-2}] > 0 \end{aligned} \quad (\text{A-24})$$

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# Figures

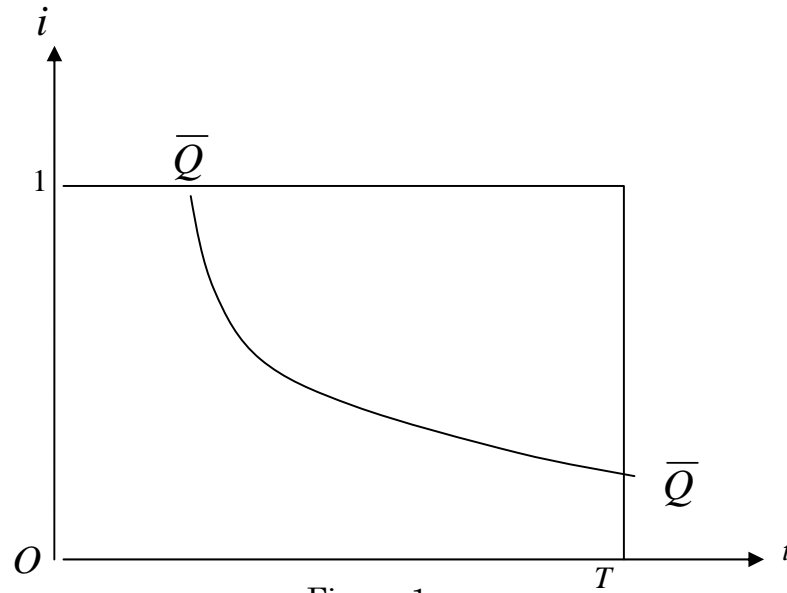


Figure 1

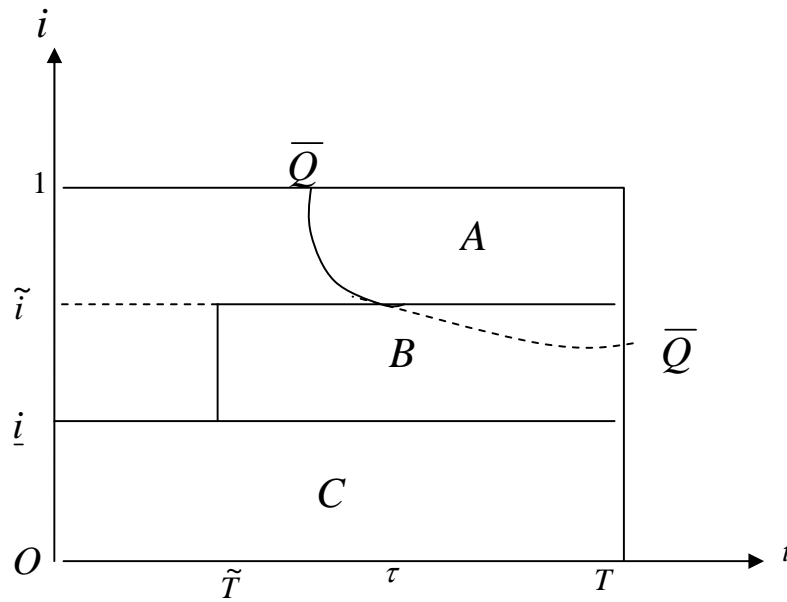


Figure 2

*A*: Legal Migrants; *B*: Skilled Trainees; *C*: Illegal Migrants



## Endnotes

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<sup>1</sup> In order to ensure a sufficient number of nursing caregivers, the Health, Labor and Welfare Ministry of Japan intends to certify those who do not pass the national exam as 'practical' nursing caregivers if they have completed related courses at colleges, universities or vocational schools.

<sup>2</sup> In Japan, there already exists a system for training unskilled foreign workers known as the Industrial Training Program (ITP). In this program, each worker from a less developed country is known as a 'trainee' and is expected to obtain the necessary technological or other skills and/or knowledge; after returning to his or her country, the trainee is also expected to engage in a job that requires the learnt technological and other skills. Similar training is included in the on-the-job training (OJT) program; therefore, since this has become a matter of public concern, certain Japanese companies hire ITP workers who are not trained in any technological skills or knowledge at extremely low wage rates. The case of Filipino nursing caregivers is similar to those under the ITP, particularly in terms of the status ascribed to the caregivers who are undergoing training or education.

<sup>3</sup> There are numerous studies with regard to the economic effects of illegal migrants. The benchmark studies are Ethier (1986), Bond and Chen (1988), Djajic (1987), Yoshida (1993) and Djajic (1997).

<sup>4</sup> Theoretical studies with regard to repeat migration are not sufficient in number. The only example is Hill (1987). Djajic and Milbourne (1988), Galor and Stark (1990), Dustmann (1997) and Dustmann and Kirchkamp (2002) studied return migration issues.

<sup>5</sup> It must be noted that Filipino nursing caregivers are skilled workers because they have passed national exams or graduated from schools. However, it is also true that these workers are not considered to be skilled in Japan because of the language barrier and difference in education curriculum.