Economics Letters 108 (2010) 116–118

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Is skilled immigration always good for growth in the receiving economy?

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ARTICLE INFO

Article history:
Received 23 September 2009
Received in revised form 7 April 2010
Accepted 19 April 2010
Available online 24 April 2010

Keywords:
Skilled immigration
Growth

JEL classification:
F22
O15
O40

ABSTRACT

A highly skilled immigration can be growth enhancing if the positive contribution of the imported brains to the host economy's human capital stock outweighs the immigration-induced adverse effect on educational incentives for natives, or growth depleting if the latter effect dominates.

1. Introduction

This work examines the effect of a sizable highly skilled immigration on educational incentives for the native population. The analysis is performed in the context of a growth model with uncertainty regarding the return to previously acquired human capital building on Mountford (1997) who identified the importance of uncertainty with regard to the possibility of migration to a higher wage country as a driving force behind the beneficial effect of a brain drain emigration for human capital formation in the source countries. Later on, this idea became popular in development economics (see references e.g. in Fan and Stark, 2007; Beine et al., 2008). All these publications assume that immigration flows are sufficiently small and do not affect labor market opportunities in the destination countries. Here, in contrast, I suppose that immigration inflows are not too small, and point to the uncertainty with regard to the labor market opportunities for the native population in the receiving countries as a result of the arrival of a sizable mass of foreign competitors.

The main idea is roughly as follows. In a world with some uncertainty with regard to the occupational match along with the irreversibility of investments in education, the arrival of a sizable mass of potential competitors is likely to increase the perceived probability of a possible occupational mismatch for skilled native individuals. This reduces their ex-ante returns to human capital investments and discourages them at the margin. As a consequence, if the immigration-induced adverse effect on educational incentives for the natives outweighs the positive contribution of the imported brains to the host economy's human capital stock, the highly skilled immigration may adversely affect economic growth in the host economy.

The present model relies upon empirical observations from labor economics. As has been widely recognized in the labor economics, an arrival of a sizable mass of foreign competitors reduces economic opportunities for native labor force (e.g., Borjas, 2003, 2005, 2007, 2009). In particular, it has been found that an exogenous increase in the supply of skilled labor, as a result of a sizable skilled immigration, adversely affects educational incentives for natives (e.g., Borjas, 2007, 2009). Evidence also suggests that in the US in several high-skilled fields such as, for instance, computer science and research biology labs, foreign labor, to a large extent, drove native labor out.

Moreover, in a large and growing recent literature on the formation of attitudes of natives toward immigrants,[1] it has been argued that the natives' concerns about the detrimental effect of immigration on their labor market opportunities are not necessarily driven by the true negative effect of immigration, but rather by the perceived negative effect, which is likely to overstate the real effect thus reducing the natives' ex-ante returns to human capital investments more than proportionally.

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[1] Some references to this literature can be found, for instance, in Dustmann and Preston (2006); cf. also Azarnert (2010b).

0165-1765/$ – see front matter
doi:10.1016/j.econlet.2010.04.032

2. The model

The model presents a small open overlapping generations economy that exists in a world with one good and perfect capital mobility. The world's one good is produced under constant returns to scale by two factors, capital and efficiency units of labor. There is a continuum of agents in each generation. For simplicity the measure of agents in the starting period is normalized to unity.

2.1. Production of goods and factor prices

The total amount of capital and efficiency units of labor in time period t, are denoted by K_t and L_t, respectively. The productivity of labor in period t is given by λ_t.

At time t the output Y_t is produced using a constant returns to scale production function:

$$Y_t = F(K_t, \lambda_t L_t) = f(k_t)\lambda_t L_t, \quad \text{where } k_t \equiv K_t / \lambda_t L_t. \tag{1}$$

This production function is required to satisfy the standard assumptions: $\forall k>0$, $f(k)>0$, $f'(k)>0$, $f''(k)<0$ along with the Inada conditions: $\lim_{k\to 0} f'(k) = \infty$, $\lim_{k\to\infty} f'(k) = 0$ and $\lim_{k\to 0} f(k) = 0$.

Factor prices are determined in the standard way by the factor's marginal product. Suppose, for simplicity, that the world rate of return to capital r^* is constant. Under assumption of perfect capital mobility and the smallness of the economy, the domestic rate of return to capital r_t is thus fixed to r^*, which fixes the domestic capital to the efficiency labor ratio k_t as well.

Thus, $\forall t$ where k is constant, $k_t = k$. Given the level of technology λ_t, k determines the wage rate per efficiency unit of labor, $w(k)$:

$$w_t = \lambda_t \left[f(k) - k f'(k) \right] = \lambda_t w(k), \quad \text{where} \quad w(k) \equiv f(k) - k f'(k). \tag{2}$$

2.2. The distribution of ability

Individuals possess different levels of latent ability where e^i denotes the latent ability level of individual i. This latent abilities are assumed to be distributed over the closed interval $[0, E]$ according to the density function $g(e^i)$ where $\forall e^i \in [0, E]$,

$$\int_0^E g\left(e^i\right) de^i = 1, \quad g\left(e^i\right) > 0. \tag{3}$$

We assume that all generations have latent abilities, which are picked from the same distribution and that the abilities of children are independent from the abilities of their parents.

2.3. Individuals' educational decision

Agents live for two periods in an overlapping-generations world and derive utility from their consumption in the second period. In their first period of life agents can invest in education. The cost of education is assumed to be fixed at c units of output. There are no restrictions on borrowing at a fixed interest rate r^*. Agents, who invest in education, obtain e^i efficiency units of labor in their second period of life where e^i is the level of the latent ability of agent i. Agents, who do not invest in education, have only one unit of efficiency labor. Agents work only in their second period of life. In this period they repay the debt of the first period and use the remainder of their income to consume. All agents have the same preferences and access to the same technology although they have different levels of latent ability.

Suppose that agents face some uncertainty in the job market. To model this uncertainty suppose that in the event of the occupational mismatch if an educated individual does not find a job that requires the level of his ability e^i, he works as an uneducated worker and receives the salary as an uneducated agent that has only one unit of efficiency labor. Assume that in the absence of immigration the probability of employment in accordance with the individual's level of ability is $\pi^{NI} \in (0, 1)$, and, correspondingly, the probability of an occupational mismatch is $1-\pi^{NI}$.

Therefore, for agent i it is optimal to invest in human capital if

$$\pi^{NI}\lambda_t w(k) e^i + \left(1-\pi^{NI}\right)\lambda_t w(k) > \lambda_t w(k) + c(1 + r^*). \tag{4}$$

Thus, in the absence of immigration, all agents with a latent ability greater than $\hat{e}^{NI}$ will invest in education, where in period t $\hat{e}_t^{NI}$ is uniquely defined by the following equality:

$$\hat{e}_t^{NI} = \frac{\pi^{NI}\lambda_t w(k) + c(1 + r^*)}{\pi^{NI}\lambda_t w(k)}. \tag{5}$$

2.4. Dynamics of the economy

To characterize the dynamic behavior of the economy, we assume that there is an economy-wide growth externality related to the proportion of educated workers in the economy in the previous period. An assumption that the level of productivity in an economy is related to some measure of past educational level has been widely used in the models of economic growth.[2] To model this externality, here, as in Mountford (1997), λ_t is assumed to be a positive function of the proportion of educated workers (S) in the previous period:

$$\lambda_t \equiv \lambda(S_{t-1}), \quad \text{where} \quad S_{t-1} = \int_{\hat{e}_t^{NI}}^{E} g\left(e^i\right) de^i, \lambda'(S_{t-1}) > 0. \tag{6}$$

It is also assumed that $\lambda(0) = 1$ and $\lambda(1)$ is finite.

By construction in this model, the only dynamics stem from the growth externality. From Eq. (6), it is clear that the proportion of workers who are educated in period t is an increasing function of the proportion of workers who were educated in period $t-1$, since $\frac{d\hat{e}_t^{NI}}{dS_{t-1}} < 0$, which implies that $\frac{dS_t}{dS_{t-1}} > 0$.

2.5. The effect of immigration

To analyze implications of the skilled immigration for this economy, suppose that all immigrants are highly skilled and their latent abilities are distributed as the abilities of the native individuals, but over the interval $[\hat{e}_t^F, E]$, where $\hat{e}_t^F > \hat{e}_t^{IMM}$, as specified below in Eq. (7).

If the number of highly skilled immigrants is large enough, the arrival of a sizable mass of potential competitors is likely to increase the perceived probability of occupational mismatch for skilled native individuals. To model this effect, suppose that in presence of a sizable highly skilled immigration the perceived probability of a successful occupational match for an educated native individual is $\pi^{IMM} < \pi^{NI}$, and, correspondingly, the probability of an occupational mismatch is $1-\pi^{IMM} > 1-\pi^{NI}$. Clearly, it is natural to assume that π^{IMM} decreases with the size of immigration. Denoting by IMM_t the fraction of immigrant population relative to the original native population in period t, this implies that $\forall IMM_t > 0$, $\frac{d\pi_t^{IMM}}{dIMM_t} < 0$.

Therefore, in presence of immigration, only agents with a latent ability higher than $\hat{e}^{IMM}$ will invest in education, where $\hat{e}_t^{IMM}$ is defined by:

$$\hat{e}_t^{IMM} = \frac{\pi^{IMM}\lambda_t w(k) + c(1 + r^*)}{\pi^{IMM}\lambda_t w(k)}. \tag{7}$$

[2] See, for instance, Azarnert (2008, 2010a) for references.

Obviously, since $\pi_t^{IMM}<\pi_t^{NI}$, $\hat{e}_t^{IMM}>\hat{e}_t^{NI}$. Moreover, since under $\frac{d\pi_t^{IMM}}{dIMM_t}<0$, $\frac{d\hat{e}_t^{IMM}}{dIMM_t}>0$, the higher is the size of the skilled immigration, the lower is the fraction of the native population that becomes skilled.

To establish whether skilled immigration is growth enhancing or depleting, compare the fraction of educated workers, natives and immigrants, in the host economy in presence of immigration (S_t^{IMM}) to the fraction of native educated workers in the absence of immigration (S_t^{NI}). With the measure of native agents in period t normalized to one and with the fraction of immigrant population relative to the original native population denoted by IMM_t, for given $\hat{e}_t^F$, $\hat{e}_t^{NI}$ and $\hat{e}_t^{IMM}$, the percentages of educated workers in the absence or in presence of immigration are, respectively:

$$S_t^{NI}=\int_{\hat{e}_t^{NI}}^{E} g\left(e^i\right)de^i \tag{8}$$

and

$$S_t^{IMM}=\frac{\int_{\hat{e}_t^{IMM}}^{E} g\left(e^i\right)de^i+\int_{\hat{e}_t^{F}}^{E} g\left(e^i\right)de^i}{1+IMM_t}. \tag{9}$$

Comparing S_t^{IMM} from Eq. (8) to S_t^{NI} from Eq. (9) allows us to establish that

Proposition 1. *Skilled immigration is growth enhancing if:*

$$\int_{\hat{e}_t^{F}}^{E} g\left(e^j\right)de^j>(1+IMM_t)\int_{\hat{e}_t^{NI}}^{E} g\left(e^i\right)de^i-\int_{\hat{e}_t^{IMM}}^{E} g\left(e^i\right)de^i. \tag{10}$$

Otherwise, highly skilled immigration is growth depleting and the host economy loses from the arrival of imported brains.

3. Conclusion

This work distinguishes two opposite growth effects of a highly skilled immigration. I point to the uncertainty regarding the labor market opportunities for the native population in the destination country due to the arrival of a sizable mass of foreign competitors. I further show that a highly skilled immigration can be either growth enhancing if the positive contribution of imported brains to the host economy's human capital stock outweighs the immigration-induced adverse effect on educational incentives for natives, or growth depleting if the latter effect dominates.

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