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Abstract

A previous result by Kemnitz (2001) based on AK type endogenous growth model implied that the gains from immigration depends up on the percapita possession of capital stock by immigrant relative to that of the natives'. However, such a framework ignores the incentive labor creates for innovation and productivity. By using framework of horizontal innovation of Romer (1991), it is shown that immigration entails Pareto improvement even when immigrants posses no physical capital in contrast to the result in the literature.

Key Words: Immigration Policy; Endogenous growth; Technical change

JEL classification: F22, O31, O41

Introduction

The consequence of skilled workers migration for sending and receiving countries has been on center of debate. The outflow of skilled labor was initially thought to be detrimental to development of sending countries. After a country has invested its scarce resources on the schooling of its citizens, the outflow of such a human capital was thought to be wastage of the scarce resources. However, recent research has provided the opposite conclusion[1]. The possibility of beneficiary brain drain formally investigated and it has been shown that immigration has a positive effect for source sountry, through higher incentive for skill formation. The possibility of beneficial "brain drain" has also been empirically detected. Thus, a considerable consensus has emerged about the effect of brain drain on sending countries.

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1 Beine et al. (2001), Chau and Stark (1999), Davenport (2004), Docquier and Rapoport (2003), Hemmi (2005), Lien (2006), Stark (2004), Stark et al. (1997) and Stark et al. (1998)

In order to understand the effect on receiving countries, the natural starting point has been the neoclassical migration theory, such as the one by Berry and Soligo (1969). According to the neoclassical model migration, the arrival of immigrants improves welfare as long as it alters the capital-output ratio in the host nation either through raising labor supply or through raising the stock of capital. Changes in the capital-output ratio results in the increase in remuneration of the ex-post scarce factor which offsets the decrease the marginal return of the ex-post abundant factor, resulting in an over all potential Pareto improvement. Recent paper by Kemnitz (2001) challenges this consensus by resorting to the AK type of argument.

Kemnitz (2001) using the AK model argued that when social interest rate is constant and increase in the immigration raises the return of the abundance factor if and only if typical migrant posses greater capital than typical natives'. Hence, the welfare gain from immigration depends whether immigrants are capital rich or not. We argue that the AK framework, which argues that accumulation of knowledge is an accidental by-product of investment activity, is not suitable, at least, for understanding the gains from immigration for four reasons.

First and foremost, one need not be invited to visit the Silicon Valley of the US, the Oslo innovation area of Norway, the Bangalore (which is also known as the Silicon Valley of India), Canada's Technology Triangle, the Dresden (which is also called the Silicon Valley of Germany), the Digital Harbour at Docklands in Australia, the High Tech Campus Eindhoven of the Netherlands, the Silicon Fen of the U. K., and Stockholm's Wireless Valley of the Sweden to understand that technical change is an intentionally directed activity.

Moreover, there is sufficient evidence that the share of capital in production is below one. For example, Mankiw, Romer, Weil (1992) or Jones (2002, pp165-166) suggested, after considering the broader capital, the share of capital to be 2/3 or at most 4/5.

Further more, AK model is at odd with a number of empirical regularities such as 1970s productivity slow down, conditional convergence, absolute convergence of OECD countries, lack of persistence in growth, etc[2].

Finally, the AK-model based view understates the importance of migration in endogenous growth framework. By focusing on capital accumulation alone, it rules out benefits associated with skill, market, and profitability.

I argue that immigration is win–win for both the immigrant and the natives. The intuition behind the result to follow is simple. In the setting where firms undertake purposive R& D, the incentive for innovation depends up on the profitability of the intermediate goods sector, which in turn positively depends upon the size of the market. Moreover, the wage of a typical worker depends up on its own productivity (the variety of intermediate goods), which in turn depends up on the size of the market. Thus, more migrants raise the profitability of intermediate sector and greater migration involves Pareto improvement for workers and intermediate goods producers[3].

Model

Let $N(t)$ be the number of natives at time, t and $M(t)$ be the number of migrants in the same year. Thus the total labor force, $L(t)$ in the economy is given by the sum of the two.

(1) $$L(t) = N(t) + M(t)$$

The final goods sector uses the aggregate production function which employs labor, $L(t)$ and intermediary input, $\{x_i\}_{i=0}^{A}$ to produce final good, $Y(t)$ which is the numeraire. The final good is sold at a competitive market.

[2] Klenow and Rodríguez-Clare (2005) present a detailed account of AK models.
[3] I will follow the same approach like Kemnitz (2001) to show that the result that follows comes from the production function than any thing else.

(2) $$Y(t) = L(t)^{1-\alpha} \int_0^A x_i(t)^{\alpha} di\,,\ i \in [0, A]$$

The optimal demand for labor and intermediaries satisfy the problem $\max_{L(t),\{x(t)_i\}_{i=1}^{A}} L(t)^{1-\alpha} \int_0^A x_i(t)^{\alpha} di - w(t)L(t) - \phi_{x_i} \int_0^A x(t)_j dj$, where $w(t)$ and ϕ_{x_i} are the price of a unit of labor and intermediate good "i", respectively.

$$x_i(t) = \left[\frac{\alpha}{\phi_{x_i}} \right]^{\frac{1}{1-\alpha}} L(t)$$

(3) $$L(t) = (1-\alpha)\frac{Y(t)}{w(t)}$$

The R& D sector is characterised by monopolies producing each intermediate goods. The monopolies of each intermediate good maximize profit subject to the demand constraint imposed by final goods sector, (3). We assume each intermediate good is produced with τ units of intermediate good. Thus, each producer solves the problem $\max_{x_i} \{\phi_{x_i} x_i - \tau x_i\}$ subject to the demand constraint given by $x_i(t) = \left[\frac{\alpha}{\phi_{x_i}} \right]^{\frac{1}{1-\alpha}} L(t)$. The optimal price of each monopolist is given by a constant.

(4) $$\phi_{x_i} = \phi_x = \frac{\tau}{\alpha}$$

Proposition 1*: When research is purposive, intermediate good producers respond to profits. The profit from the production of each intermediate good an increasing function of the labor that compliments intermediate goods in the production of*

final goods. Hence, immigration provides intermediate good producers greater incentive and hence raises the return from innovation.

Proof:

Equation (4) implies that the quantity of each type of intermediary is equal, $x_i(t) = x(t)$ and using (3) and (4), the profit of the intermediate goods producing monopolist, $\pi(t)$ is given by $\pi(t) = (1-\alpha)\alpha^{\frac{1+\alpha}{1-\alpha}}\left[\frac{1}{\tau}\right]^{\frac{\alpha}{1-\alpha}} L(t)$. In the event of zero immigration profit becomes $\pi(t \mid M = 0)$ and positive immigration the profit becomes $\pi(t \mid M > 0)$ which is given by,

$$\pi(t \mid M = 0) = (1-\alpha)\left[\frac{\alpha^{1+\alpha}}{\tau^{\alpha}}\right]^{\frac{1}{1-\alpha}} N(t)$$

$$\pi(t \mid M > 0) = (1-\alpha)\left[\frac{\alpha^{1+\alpha}}{\tau^{\alpha}}\right]^{\frac{1}{1-\alpha}} N(t) + (1-\alpha)\left[\frac{\alpha^{1+\alpha}}{\tau^{\alpha}}\right]^{\frac{1}{1-\alpha}} M(t) \quad (5)$$

What is left is to show that the inequality $\pi(t \mid M > 0) > \pi(t \mid M = 0)$ holds.

$$\frac{\pi(t \mid M > 0)}{\pi(t \mid M = 0)} = 1 + \frac{M(t)}{N(t)} \Leftrightarrow \pi(t \mid M > 0) > \pi(t \mid M = 0) \quad (6)$$

QED.

But the fact that there is greater profit from the same unit of intermediary , $\pi(t \mid M > 0) > \pi(t \mid M = 0)$, implies that the incentive to innovate and it implies that the number of varieties, $A(t)$ is greater in the presence of immigration than without, $A(t \mid M = 0) < A(t \mid M > 0)$.

Proposition 2*: The productivity, and hence wage, of each worker is an increasing function of the number of intermediate goods used in the production of final goods. By creating greater incentive for the production of intermediate goods, immigration raises the return of each labour by raising their productivity. Thus,*

the arrival of immigrants raises the wage of average worker, including the natives, independent of the amount of capital each immigrant posses.

Proof:

At optimum, the demand for intermediary is increasing function of the total labor used in the production of final goods $x(t) = \left[\frac{\alpha^2}{\tau}\right]^{\frac{1}{1-\alpha}} (N(t) + M(t))$. The total final good also given by (7) in the absence and presence of immigration is given by

$$Y(t \mid M(t) = 0) = A(t \mid M = 0) N(t) \left[\frac{\alpha^2}{\tau}\right]^{\frac{\alpha}{1-\alpha}}$$

$$Y(t \mid M(t) > 0) = A(t \mid M > 0)\left[N(t) + M(t)\right]\left[\frac{\alpha^2}{\tau}\right]^{\frac{\alpha}{1-\alpha}} \quad (7)$$

The wage of average worker, including a native, using equation (3) and substituting $x_i(t) = \left[\frac{\alpha}{\phi_{x_i}}\right]^{\frac{1}{1-\alpha}} L(t)$, in the absence of immigration, is given by

$$w(t \mid M(t) = 0) = (1-\alpha) A(t \mid M(t) = 0) \left[\frac{\alpha^2}{\tau}\right]^{\frac{\alpha}{1-\alpha}} \quad (8.1)$$

On the other hand, in the presence of positive number of migrants, the wage is given by

$$w(t \mid M(t) > 0) = (1-\alpha) A(t \mid M(t) > 0) \left[\frac{\alpha^2}{\tau}\right]^{\frac{\alpha}{1-\alpha}} \quad (8.2)$$

What remains is to show is that wage is greater in the presence of immigration, $w(t \mid M(t) > 0) > w(t \mid M(t) = 0)$ Taking the ratio of (8. 1) to (8.2) and rearranging we have $w(t \mid M(t) > 0) > w(t \mid M(t) = 0)$ since $A(t \mid M = 0) < A(t \mid M > 0)$.

Conclusion

In the presence of horizontal innovations, the profitability of the intermediate goods producing sector and the wage in the final goods producing sector depends on the size of the market. Unlike, the result based on AK type models, the result above implies that both workers and intermediate goods producing firms are better off in the presence of immigration. In fact, as Rodrik (2001) noted, "… *every economist knows, the efficiency cost of any policy-imposed ("artificial") price wedge is proportional to the square of the wedge. Where international markets for commodities and financial assets are concerned, these price wedges rarely exceed a ratio of 2:1. Where labor services are concerned, however, wages of similarly qualified individuals in the advanced and low-income countries differ by a factor of 10 or more. So the gains from liberalizing labor movements across countries are enormous, and much larger than the likely benefits from further liberalization in the traditional areas of goods and capital. If international policy makers were really interested in maximizing worldwide efficiency, they would spend little of their energies on a new trade round or on the international financial architecture. They would all be busy at work liberalizing immigration restrictions*.

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