WELFARE EFFECTS OF MIGRATION POLICIES WITH SKILLED AND UNSKILLED LABOUR AND CAPITAL MOBILITY

Michael S. Michael
University of Cyprus and CESifo (Center for Economic Studies and the Ifo Institute for Economic Research)

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Abstract
This paper investigates the welfare consequences of immigration policies in a model with two types of labour, skilled and unskilled and international capital mobility. Within the small country case, the paper examines the effect of government policies, which change the immigration cost, on the welfare of natives. It is shown, among other things, that a decrease in the immigration cost of skilled labour, which is a net fiscal contributor, may decrease the welfare of natives if unskilled labour is general equilibrium complement with skilled labour and capital while skilled labour and capital are general equilibrium substitutes. Within the case of two large countries in the labour market, the paper identifies conditions under which changes in the immigration policies of one country improve the welfare of natives and the world.

Key Words: Migration Policies, Skilled and Unskilled Labour, Welfare

J.E.L. Classification: F22 International Migration,
H24 Personal income and other no business taxes and subsidies

Correspondence: Michael S. Michael, Department of Economics, University of Cyprus, POBox 20537, Nicosia, CY1678, Cyprus. Tel. 0035722892433, Fax. 0035722892432, email: m.s.michael@ucy.ac.cy

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1. Introduction

The large differences in wages between Developed and Developing Countries cause a strong desire for migration towards the high wage Developed Countries. Developed Countries, however, are less willing to accept mass migration, even though the traditional international migration theory predicts that in most cases immigration is beneficial for the natives of the host country.\(^1\) Most Developed Countries accept only a small percentage of prospective migrants from Developing Countries. This restrictive immigration policy is not only due to the effect of immigration on local labour market and wages but also due to the fiscal effects of immigration. In modern economies, governments impose income and other taxes and implement programs which transfer income in cash or in kind such as education, health etc. It is argued that immigrants are net fiscal beneficiaries in the sense that their contributions through taxes fall short of the direct or indirect benefits that they enjoy from the government provisions.

The fact that modern economies impose taxes and make income transfers and provide public goods has relatively recently been explicitly introduced in the welfare analysis of international migration.\(^2\) For example, Wildasin (1994) using a single good model with income taxes and transfers shows that free immigration may lead to Pareto-inferior outcomes if in no-immigration situation owners of the immobile factor are being taxed to provide transfer payments to mobile workers. Michael (2003) in a model with income taxes and transfers and many traded and non-traded goods has shown that marginal immigration hurts the natives.\(^3\)

In recent years the immigration policies of the Developed Countries are designed in such a way so that immigration is easier for the skilled rather than the unskilled workers. For example, Carrington and Detragiache (1998) using data for OECD countries find that individuals with little or no education generally have limited access to international migration. It is argued that this is due to the fact that skilled immigrants are expected to be net fiscal contributors and thus their

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\(^1\) It has been shown that in the absence of income taxes, transfers and public goods, finite permanent migration is beneficial for the nationals in the host country and detrimental for people left behind in the source country and that marginal migration has no welfare effects in either country (e.g., Berry and Soligo 1969, Wong 1985 and Quibria 1988).

\(^2\) Michael and Hatzipanayotou (2001) have examine the welfare effects of migration in a model where revenue from indirect taxes are used to finance the provision of public goods.

\(^3\) Income taxes and transfers in migration models have also been used among others by Huizinga (1999) and Bucovetsky (2003)
immigration is beneficial for the natives.\textsuperscript{4,5} This is in line with the finding of Wellisch and Wildasin (1996) where in a model with constant goods prices and many jurisdictions have shown that immigration raises welfare in jurisdictions where immigrants are net fiscal contributors and it lowers welfare in jurisdictions where they are net fiscal beneficiaries.

The present paper extends the analysis of the previous papers by building a model where we have two types of workers, skilled with more education and high ability and productivity and unskilled with less education and low ability and productivity. The government imposes the same income tax rate on all incomes and the tax receipts are equally distributed to all residents. Within this framework and under different scenarios regarding the international mobility of skilled, unskilled workers and capital we examine the effects on the welfare of natives of changes in immigration policies which changes the immigration cost which induces or discourages immigration. Governments can change the immigration cost using either taxes or subsidies or by other indirect ways which can make migration easier or harder, less or more risky, and less or more expensive. The analysis is done for the case of a small open economy in goods and factor markets and for the case where we have two large countries in the labour market. In the first case, we identify the conditions under which government policies which change the immigration cost can improve the welfare of natives. It is shown, for example, that a decrease in the immigration cost of skilled labour, which causes inflow of skilled labour, which is a net fiscal contributor, increases the welfare of natives if unskilled labour is general equilibrium substitute in production with skilled labour and capital while skilled labour and capital are general equilibrium complements in production. The welfare of natives, however, may decrease with the reduction in the immigration cost of the skilled workers if the unskilled workers are general equilibrium complements in production with skilled labour and capital while skilled labour and capital are general equilibrium substitutes.

In the two-large-country case, in addition to the previous result, we identify conditions under which the immigration policies which change the immigration cost

\textsuperscript{4} Another reason for the less restrictive immigration policy for high-skilled workers is the shortage of high-skilled workers in many developed countries. See for example Bauer and Kunze (2004).

\textsuperscript{5} Bellettini and Ceroni (2003) assuming that migration rate is higher among highly educated workers show that the optimal immigration policy from the point of view of natives is an immigration quota above a certain minimum level.
improve world welfare. For example, in the special case where the number of persons in the two countries is the same, and skilled and unskilled labour are substitutes in production, then a decrease in the Home immigration cost of the skilled labour increases world welfare if the net fiscal benefits of the unskilled and the net fiscal contributions of the skilled labour are greater in Home than in Foreign.

2. The Model

Consider a small open country, Home, that trades freely with the rest of the world. In Home there are two types of workers, skilled and unskilled. Skilled workers are more educated, have more abilities and thus are more productive. There are three types of agents in this country, those possessing only one unit of unskilled labour, those possessing only one unit of skilled labour and finally those possessing one unit of labour, either skilled or unskilled and other factors of production. Migration is assumed to take place only from the group of agents possessing only a unit of either skilled or unskilled labour. We denote with L the number of agents that posses only unskilled labour, with H the number of agents that posses only skilled labour and with F the number of agents that posses labour and other factors of production.

Let \( e'(u') \) be the minimum expenditure of an individual belonging to group \( j (j=L,H,F) \) required to achieve a level of utility \( u \) given the prices of goods. The country produces many traded goods using skilled and unskilled labour, capital (i.e., \( K \)) and other factors of production. With \( R(L,H,K) \) we denote the maximum value of the Gross Domestic Product (GDP) given the goods prices and the domestic supply of factors of production. The fixed endowments of the immobile factors and the prices of the traded goods are omitted from the GDP function since they do not affect the analysis. The partial derivative of the \( R(H,K,L) \) function with respect to \( L, H, \) and \( K \) (i.e., \( R_L, R_H, \) and \( R_K \) ) give the marginal revenue products of unskilled, skilled workers and capital, respectively. The GDP function is assumed strictly concave in the factors of production (e.g., \( R_{LL} < 0 \)).

Capital is perfectly mobile internationally and Home is a small country in the world capital markets. Equilibrium in the Home capital market requires that

\[
R_{ij} < 0 \quad \text{and} \quad R_{ij} R_{ii} - R_{ij}^2 > 0 \quad \text{for} \quad i,j=L,K,H.
\]

\( ^6 \) This assumption implies that \( R_{ij} < 0 \) and \( R_{ij} R_{ii} - R_{ij}^2 > 0 \) for \( i,j=L,K,H. \)
where $r^*$ is the world net rate of return to capital and $\rho$ is the Home income tax rate and is the same for all income from all factors of production.

It is assumed that migration is permanent in the sense that immigrants do not remit any of their income earnings in the host country to the source country. The Home imposes an income tax at a rate $\rho$ and redistributes the tax revenue equally to all residents. That is, each agent in the country receives a transfer payment $T = \rho R(H, L, K) / N$, where $N(=L+H+F)$ is the total number of residents (agents) in the country.

The country’s income expenditure identity requires that expenditure by all residents must equal to total net income from production plus transfer payments, minus net payments to foreign capital. That is

$$Le^L(u^L) + He^H(u^H) + Fe^F(u^F) = R(L,H,K) - r^* K^f,$$

where $K^f$ is positive (negative) if the Home is a net capital importer (exporter).

It is assumed that only agents that possess either skilled or unskilled labour can migrate and that skilled workers are more productive (i.e., $R_H > R_L$). Agents who, in addition to labour, possess other factors of production do no migrate. An agent will migrate if in the host country his net income from labour plus the transfer payments minus the migration cost is higher than the net income he receives in the source country. Thus equilibrium in the $j^{th}$ labour market is achieved when

$$w^{*j} = (1 - \rho) R_j (L, H, K) + T - t_j,$$

where $w^{*j}$ is the net income of a worker that belongs to group $j$ ($j=L, H$) receives in the source country and $t_j$ is the migration cost of a worker that belongs in group $j$. The migration cost can include taxes or subsidies, moving cost, settlement cost etc. It is assumed that the host country is small in the world factor markets and thus the inflow

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1 Razin, Sadka and Swagel (2002), in a political economy model, link the rate of low-skill immigration with the tax burden and redistribution. Using data on 11 European countries, they found that higher share of low-education immigrants in the population leads to a lower tax rate on labour income and less generous transfers.
of foreign workers does not affect their net income they receive in the source countries.

The expenditure of a worker that belongs in group \( j \) equals his net wage income, plus the transfer payments he receives and is given by

\[
e_j = (1 - \rho)R_j + T. \tag{4}
\]

The social welfare function is defined as the weighed sum of utilities of all agents in the country with constant number of individuals. Differentiating equation (2) and using equations (1), (3) and (4), we get

\[
dW = -\rho \lambda_L dL - \rho \lambda_H dH + \rho R_H dK, \tag{5}
\]

where \( dW = L e_L^* du^L + H e_H^* du^H + F e_u^* du^F \) is the weighted sum of changes in the utility of all the initial residents in the host country. We call \( dW \) the change in social welfare or the change in the welfare of natives. Also, using equation (4)

\[
\lambda_j = (R - NR_j) / N. \tag{5}
\]

For the unskilled labour \( \lambda_L = (R - NR_L) / N \) is positive since it is assumed that its marginal revenue product is lower than that of the skilled labour. In other words, \( \lambda_L = (R / N) - R_L \) is positive if the average income is greater than the marginal revenue product of the unskilled labour. Intuitively, an unskilled worker receives \( \rho R / N \) transfer payments and pays \( \rho R_L \) taxes. Since the former exceeds the latter, the unskilled worker is a net fiscal beneficiary. For the skilled labour, however, \( \lambda_H = (R - NR_H) / N \) can be either positive or negative. In the case where only skilled and unskilled labour exists, that is, no other factors exist, then \( \lambda_H \) is unambiguously negative. For the analysis that follows, it is assumed that \( \lambda_H \) is negative. The assumption that \( \lambda_H \) is negative implies that the marginal revenue product of the skilled labour is greater than the average income. When \( \lambda_H \) is negative, it implies that the skilled workers are net fiscal contributors. That is, the tax payments of a skilled worker \( \rho R_H \) exceed the transfer payments he receives \( \rho R / N \).

Equation (5) shows that an inflow (outflow) of unskilled workers reduces (increases) the social welfare of the country if the domestic supply of the other factors remain
fixed. The opposite, however, is true for the skilled workers. An inflow (outflow) of skilled workers increases (decreases) social welfare.

Differentiating equation (1) and (3) gives

\[ (1 - \rho)(R_{KK}dK + R_{KL}dL + R_{KH}dH) = 0 , \]

\[ dw^* = [(1 - \rho)NR_{JK} - \rho \lambda_H]dH + [(1 - \rho)NR_{KL} - \rho \lambda_L]dL \]
\[ \quad + [(1 - \rho)NR_{HK} + \rho R_K]dK - Nd_{t+1} = 0 . \]

3. Migration with internationally immobility of capital

In this section, for simplicity, it is assumed that capital is internationally immobile. That is, Home economic policies do not induce any international movements of capital, and thus the stock of the capital in the country remains fixed. Under this assumption we examine two cases. In case one, the international mobility of skilled workers is free while the mobility of unskilled workers is restricted. In the second case, the opposite scenario is considered.

3.1 International mobility of skilled workers

First, it is assumed that there is international mobility of skilled workers, while the international mobility of unskilled workers is restricted. Within this framework, we examine how changes in the immigration cost of the skilled workers and how an exogenous inflow of unskilled workers affects social welfare. Using equation (5) and equation (7) for the case where \( j=H \), gives

\[ \Delta_H (dw / dt_H) = -\rho N\lambda_H , \]

where \( \Delta_H = (1 - \rho)NR_{HH} - \rho \lambda_H \) and is negative.\(^8\) Equation (8) shows that a decrease in the immigration cost of skilled workers increases social welfare.\(^9\) Intuitively, the

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\(^8\) The sign of \( \Delta_H \) is not clear that is negative. Using equations (5) and (7) when \( dL=0 \), and considering welfare and the net income of the skilled workers as the endogenous variable we get that 
\( (dw^* / dH) = \Delta_H \). It is assumed that an increase in the domestic supply of skilled workers decreases the net income of a skilled worker, which implies that \( \Delta_H \) is negative.
decreases in the immigration cost causes domestic supply of skilled workers to increase and since they are net fiscal contributors social welfare increases.

The effect of an exogenous immigration of unskilled workers, e.g., due to a partial relaxation of immigration restrictions on unskilled labour, on social welfare is given by

\[
\Delta_W (dW / dL) = \rho (1 - \rho) N \rho \lambda_{L} \lambda_{R}^{-1} R_{L}. \tag{9}
\]

Equation (9) shows that an exogenous immigration of unskilled workers decreases social welfare if skilled and unskilled workers are substitutes in production (i.e., \( R_{HL} < 0 \)). Intuitively, when an unskilled worker immigrates, social welfare decreases directly since he is a net fiscal beneficiary and indirectly by reducing the immigration of skilled workers who are net fiscal contributors. If, however, skilled and unskilled workers are complements in production, then the immigration of unskilled workers causes immigration of skilled workers and the indirect effect on welfare is positive, making the total effect on welfare ambiguous.

3.2 International mobility of unskilled workers

Now it is assumed that unskilled workers are freely mobile internationally but the international mobility of skilled workers is restricted. Using equation (5) and equation (7) for the case where \( j = L \), and noting that \( dH = 0 \), we get the effect of a change in the immigration cost of unskilled workers as follows:

\[
\Delta_L (dW / dL) = -\rho N \lambda_{L}, \tag{10}
\]

where \( \Delta_L = (1 - \rho) N \rho \lambda_{L} \lambda_{R}^{-1} R_{L} \) and is negative. From equation (10) it is clear that an increase in the immigration cost of unskilled workers, who are net fiscal beneficiaries, reduces their immigration and raises the host country’s social welfare.

Next, we examine how an exogenous immigration of skilled workers affects social welfare in the presence of free international mobility of unskilled workers. Using equations (5) and (7) we get

\[^9\text{As noted in the introduction, the government can change the immigration cost by using either taxes or subsidies on labour movements, or by other indirect ways which could make immigration easier or harder and more or less expensive.}\]
Equation (11) shows that an exogenous inflow of skilled workers increases social welfare if skilled and unskilled workers are substitutes in production (i.e., $R_{LH} < 0$). Intuitively, the immigration of skilled workers increases welfare directly since they are net fiscal contributors and indirectly by reducing the immigration of the unskilled workers who are net fiscal beneficiaries. If, however, skilled and unskilled workers are complements in production, then the immigration of skilled workers causes also immigration of unskilled workers making the total welfare effect of an exogenous immigration of skilled labour ambiguous.

### 3.3 Free international mobility of both types labour

In this subsection, it is assumed that both skilled and unskilled labour are freely mobile internationally, and examine how changes in the immigration cost on each type of labour affects social welfare. Using equations (5) and (7) for the case where $j=L,H$, we get

\[
\Delta_{LH} \left( \frac{dW}{dH} \right) = \rho(1 - \rho)NR_{LH} \left( -\lambda_H + \lambda_L R_{LH}^{-1} R_{LH} \right).
\]

(11)

where $\Delta_{LH} = (1 - \rho)N(R_{LH} - R_{HL}^2) - \rho\lambda_H (R_{LH} - R_{HL}) - \rho\lambda_L (R_{HL} - R_{HL})$ and is positive under the assumption that an increase in the domestic supply of a factor decreases its net domestic income. This assumption is used in all the analysis. The welfare effects of an increase in the immigration cost on unskilled (skilled) labour are similar to those when we have an exogenous inflow of unskilled (skilled) labour. Thus, when skilled and unskilled labour are substitutes in production, then an increase in the immigration cost on unskilled labour increases social welfare while an increase in the immigration cost on skilled labour decreases social welfare. When skilled and unskilled labour are complements in production, however, an increase in either immigration cost has an ambiguous effect on welfare.
Proposition 1. Assume that skilled and unskilled labour is internationally mobile. Social welfare increases by reducing the immigration cost of skilled labour and by increasing that of unskilled labour if skilled and unskilled labour are substitutes in production. If, however, they are complements in production, reducing the immigration cost of the skilled labour and increasing the immigration cost of the unskilled labour may reduce social welfare.

4. International mobility of capital.

In this section it is assumed that there is free international mobility of capital. We examine how the existence of international capital mobility affects the welfare effects of the immigration policies towards skilled and unskilled labour.

4.1 Free international mobility of capital and skilled labour.

First, it is assumed that capital and skilled labour are freely mobile internationally while unskilled labour is internationally immobile. Within this framework we examine how changes in the immigration cost of the skilled workers affect social welfare. Using equations (5), (6) and (7) for the case where \(j=H\), we get

\[
\Delta_{ik} \left( \frac{dW}{dt_i} \right) = -\rho NR_{kk} \left( \lambda_{ii} + R_k R_{kk}^{-1} R_{kh} \right),
\]

where \(\Delta_{ik} = (1 - \rho)N(R_{kk} R_{ii} - R_{ik}^2) - \rho(\lambda_{ii} R_{kk} + R_k R_{kh})\) and is positive.

Equation (14) shows that a decrease in the immigration cost of the skilled labour increases social welfare if skilled labour and capital are complements in production (i.e., \(R_{kh} > 0\)). Intuitively, social welfare increases since the decrease in the immigration cost increases the immigration of skilled, net fiscal contributors, workers and this has a direct positive effect on social welfare. This direct effect is further enhanced by an indirect welfare improvement due to increased capital inflow and higher tax revenue from taxing capital income.

4.2 Free international mobility of capital and unskilled labour

Next, it is assumed that capital and unskilled labour are internationally mobile while skilled labour is immobile. Using equations (5), (6) and (7) for the case where
j=L, we obtain the welfare effects of changing the immigration cost on unskilled labour as follows:

\[
\Delta_{KL}(dW / dt_L) = -\rho NR_{KK} (\lambda_L + R_K R_{KK}^{-1} R_{KL}) ,
\]

(15)

where \( \Delta_{LK} = (1 - \rho)N(R_{KK} R_{LL} - R_{LK}^2) - \rho(\lambda_L R_{KK} + R_K R_{KL}) \) and is positive. Equation (15) shows that a decrease in the immigration cost decreases social welfare if unskilled labour and capital are substitutes in production. In this case the decrease in the immigration cost increases the domestic supply of unskilled labour and this decreases social welfare directly since unskilled labour is a net fiscal beneficiary and indirectly by causing capital outflow which causes income tax revenue to decrease. If, however, capital and unskilled labour are complements in production, this indirect effect is of opposite sign and thus the total effect on welfare is ambiguous.

**Proposition 2.** When only capital and skilled labour are internationally mobile welfare increases by reducing the immigration cost on skilled labour if these two factors are complements in production. When only capital and unskilled labour are internationally mobile, welfare increases by increasing the immigration cost of unskilled labour if these two factors are substitutes in production.

4.3 Capital, skilled and unskilled labour are internationally mobile

Next, we assume that capital, and both types of labour are internationally mobile. Using equations (5)-(7), the welfare effects of changing the immigration cost are given by

\[
\Delta(dW / dt_L) = -\rho(1 - \rho)^2 N^2 (\lambda_L R_{KK} \overline{R}_{HH} - \lambda_H R_{KK} \overline{R}_{HL} + R_K R_{HH} \overline{R}_{KL}) ,
\]

(16)

\[
\Delta(dW / dt_H) = -\rho(1 - \rho)^2 N^2 (-\lambda_L R_{KK} \overline{R}_{HL} + \lambda_H R_{KK} \overline{R}_{LL} + R_K R_{LL} \overline{R}_{KH}) ,
\]

(17)

where \( \Delta \) is the determinant of the system of equations (5)-(7) for \( j=L,H \) and is negative, and \( \overline{R}_{ij} = R_{ji} - R_{jK} R_{KK}^{-1} R_{Kj} \), \( \overline{R}_{HH} = R_{HH} - R_{HL} R_{KL}^{-1} R_{LH} \), \( \overline{R}_{KL} = R_{Kj} - R_{Ki} R_{i}^{-1} R_{j} \), \( \overline{R}_{HL} = R_{jK} - R_{jL} R_{i}^{-1} R_{Kj} \), \( \overline{R}_{KH} = R_{ji} - R_{jK} R_{KK}^{-1} R_{Ki} \), where i,
We say that two factors of production are general equilibrium complements if an increase in the domestic supply of one factor increases the marginal revenue of the other factor when the domestic supply of the third mobile factor adjust to the change (i.e., $\bar{R}_{ji} > 0$). For example, capital and skilled labour are general equilibrium complements (substitutes) if an increase in the domestic supply of skilled labour increases (decreases) the marginal revenue product of capital when the domestic supply of unskilled labour adjust to the increase in skilled labour. When two factors are compliments in production does not mean that they are also general equilibrium complements and vice versa. In general, the welfare effects of changing the immigration cost are ambiguous and depend, in addition to whether migrants are net fiscal beneficiaries or contributors, on whether factors of production are general equilibrium substitutes or complements in production. For example, equation (16) shows that an increase in the immigration cost of the unskilled labour increases welfare if unskilled labour is general equilibrium substitute with skilled labour and capital. Equation (17) shows that a decrease in the immigration cost of skilled labour increases welfare if capital and skilled labour are general equilibrium complements and unskilled and skilled labour are general equilibrium substitutes.

In the case, however, where unskilled labour is general equilibrium complements in production with skilled labour and capital and skilled labour and capital are general equilibrium substitutes, then the reduction in the immigration cost of skilled labour, or the increase in the immigration cost of unskilled labour may reduce the welfare of natives.

**Proposition 3.** Assume that unskilled labour is a general equilibrium substitute (complements) in production with skilled labour and capital while skilled labour and capital are general equilibrium complements (substitutes) in production. Domestic welfare increases (may decrease) by reducing the immigration cost of the skilled workers and by increasing the immigration cost of the unskilled workers.

Comparing Propositions 1 and 3, we observe that when capital is internationally mobile, substitutability between skilled and unskilled labour is not sufficient to

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10 The strict concavity of the GDP function implies that $R_{ji} = R_{ij} - R_j^2$ for $i,j=L,K,H$ is positive.
guarantee the improvement in social welfare when the immigration cost of skilled labour is reduced and that of unskilled is increased.

5. Migration policies and world welfare

In this section, it is assumed that we have two large countries, Home and Foreign, in the labour market. The structure of foreign economy is similar to that of Home country. That is, we have three types of agents and two types of workers, skilled and unskilled, the same income tax rate for all sources of income, equal redistribution of tax revenue among all residents, migration cost etc. Migration occurs from one country to the other and vice versa only (i.e., $dL = -dL^*$ and $dH = -dH^*$) and this affects in both countries the marginal revenue product of labour. Note that with an asterisk we denote the variables of Foreign. For tractability of the results, throughout this section capital is assumed to be internationally immobile and thus the domestic supply of capital in each country remains fixed. In this case, the equilibrium in the $j^{th}$ labour market is achieved when the net wage income plus the transfer payments minus migration cost for each type of labour in Home equals that in Foreign. That is

$$(1 - \rho)R_j(L, H) + T - t_j = (1 - \rho^*)R_j^*(L^*, H^*) + T^* - t_j^*.$$  

(18)

Differentiating equation (18) gives

$$(NN^* \Gamma_{jL} + \rho^* N\lambda^*_L - \rho N^* \lambda_L) dL + (NN^* \Gamma_{jH} + \rho^* N\lambda^*_H - \rho N^* \lambda_H) dH =$$

$$NN^* dt_j - NN^* dt_j^*,$$  

(19)

where $\Gamma_{jL} = (1 - \rho)R_{jL} + (1 - \rho^*)R_{jL}^*$ and $\Gamma_{jH} = (1 - \rho)R_{jH} + (1 - \rho^*)R_{jH}^*$ for $j = L, H$. The counterpart of equation (5), the equation that shows the effect on social welfare when migration occurs, for Foreign is given by

$$dW^* = \rho^* \lambda^*_L dL + \rho^* \lambda^*_H dH.$$  

(20)
5.1 Mobility of only one type of labour

First we consider the case where only one type of labour skilled or unskilled is perfectly mobile between the two countries while the mobility of the other factor is completely restricted. Under this scenario, we examine the welfare implications for Home, Foreign, and the World of a change in the immigration cost of the mobile type of labour. Using equations (5), (19) and (20), gives

\[
\Omega_j (dW / dt_j) = -NN^* \rho \lambda_j,
\]

\[
\Omega_j (dW^* / dt_j) = NN^* \rho^* \lambda^*_j,
\]

\[
\Omega_j ((dW / dt_j) + (dW^* / dt_j)) = NN^* \rho^* \lambda^*_j - \rho \lambda_j,
\]

(21)

where \( \Omega_j = NN^* \Gamma_{jj} + \rho^* NN^* \lambda_j - \rho NN^* \lambda_j \) and is negative.

Equation (21), when \( j=L \) for example, shows that if the immigration cost of unskilled labour in Home increases, the welfare of Home increases, the welfare of Foreign decreases and the impact on the world welfare (i.e., the sum of the effects on the two countries welfare) is ambiguous. World welfare increases with the increase in Home immigration cost when the net fiscal benefits of the unskilled worker in Home is greater than in Foreign (i.e., \( \rho \lambda_j > \rho^* \lambda^*_j \)). This occurs when either the tax rate is greater in Home and or when the difference between the average income and his marginal revenue product is higher in Home than in Foreign (i.e., \( \lambda_j > \lambda^*_j \)). Similarly, an increase in the immigration cost of the skilled workers in Home (\( j=H \)), as equations (21) show, lowers the welfare of Home, raises the welfare of Foreign, and raises World welfare if the net fiscal contribution of a skilled worker is greater in Foreign than in Home. For example, in the special case where the income tax rates and the average income in both countries are the same, an increase in Home’s immigration cost of the skilled workers, which reduces immigration in Home and increases employment in Foreign, increases World welfare if their wage rate is higher in Foreign than in Home.\textsuperscript{11}

\textsuperscript{11} In the traditional migration theory, without income taxes and transfers, world welfare increases if the marginal revenue product of the migrant is higher in the host than in the source country. This is also true in this model in the case where income taxes and average incomes in the two countries are the same (sufficient but not necessary).
**Proposition 4.** Assume that only one type of labour at a time is mobile between the two countries. World welfare increases if the country with the higher (lower) net fiscal contributions of a skilled worker reduces (increases) his immigration cost. Similarly, World welfare increases if the country with the higher (lower) net fiscal benefits of unskilled worker increases (reduces) his immigration cost.

5.2 International mobility of both types of labour

Next, we consider the case where both types of labour are perfectly mobile between the two countries and examine how changes in the migration cost of each type affects the world welfare. Using equations (5), (19) and (20) for \( j=H \), the effect of changing Home immigration cost of skilled labour on Home, Foreign and World welfare is given by

\[
\Omega(dW / dt_H) = \rho NN^*[-NN^*\Gamma_{LL}(\lambda_H^* - \lambda_L^*\Gamma^{-1}_{LL}\Gamma_{LH}) + \rho^*N(\lambda_L^*\lambda_H^* - \lambda_L^*\lambda_H^*)],
\]

\[
\Omega(dW^* / dt_H) = \rho^* NN^*[NN^*\Gamma_{LL}(\lambda_H^* - \lambda_L^*\Gamma^{-1}_{LL}\Gamma_{LH}) - \rho N^*(\lambda_L^*\lambda_H^* - \lambda_L^*\lambda_H^*)],
\]

\[
(NN^*)^{-1}[(\Omega((dW / dt_H) + (dW^* / dt_H))] =
\]

\[
NN^*\Gamma_{LL}[(\rho^*\lambda_H^* - \rho\lambda_H^*) - (\rho^*\lambda_L^* - \rho\lambda_L^*)\Gamma^{-1}_{LL}\Gamma_{LH}] + \rho\rho^*(\lambda_L^*\lambda_H^* - \lambda_L^*\lambda_H^*)(N - N^*),
\]

where \( \Omega \) is the determinant of the coefficients on left side of the system with endogenous variables \( dW, dW^* \) and \( dL \), and is positive.

Equation (22) shows that when Home increases the immigration cost for the skilled workers, the effect on its welfare is generally ambiguous. The first term in the brackets on the right hand side is similar to that of equation (13) and is negative if \( \Gamma_{LL} \) is negative, that is, when skilled and unskilled labour are substitutes in production in both countries. The second term is present only in this case and it is negative if \( |\lambda_L^*\lambda_H^*| > |\lambda_L^*\lambda_H^*| \). This inequality holds when the net fiscal benefits for the unskilled workers are higher and the net fiscal contribution for the skilled are lower in Home than in Foreign (sufficient but not necessary conditions). The effects on the increase in the immigration cost in Home on Foreign welfare are similar but of the opposite sign.
Proposition 5. Assume that i) skilled and unskilled labour are substitutes in production, ii) the net fiscal benefits for the unskilled are higher and the net fiscal contribution for the skilled are lower in Home than in Foreign. In this case, a decrease in the immigration cost of the skilled workers in Home increases the welfare for Home, decreases that of Foreign and has an ambiguous effect on World welfare.

Equation (24) shows that the effect of an increase in Home immigration cost on world welfare is generally ambiguous. For example, world welfare increases if the population in the two countries are the same, the net fiscal benefit and contribution in Home is lower than in Foreign and $\Gamma_{lh}$ is negative. If, however, skilled and unskilled labour are complements in production (i.e., $\Gamma_{lh}$ is positive), equation (24) shows than an increase in the immigration cost of the skilled labour in Home increases World welfare if the net fiscal contribution of a skilled worker is lower and the net fiscal benefit of an unskilled worker is higher in Home than in Foreign and the initial population in Home is not less than in Foreign.

A similar analysis can be pursued for change in the immigration cost of the unskilled labour. Using equations (5), (19) and (20) for $j=L$, the effect of changing Home immigration cost of unskilled labour on Home, Foreign and World welfare is given by

$$\Omega(dW / dt_L) = \rho NN^*[-NN^*\Gamma_{hh}(\bar{\lambda}_L - \bar{\lambda}_H \Gamma_{hh}^{-1} \Gamma_{hl}) + \rho^* N(\bar{\lambda}_L \bar{\lambda}_H - \bar{\lambda}_L \bar{\lambda}_H)]$$,  \hspace{1cm} (25)

$$\Omega(dW^* / dt_L) = \rho^* NN^*[NN^*\Gamma_{hh}(\bar{\lambda}_L^* - \bar{\lambda}_H^* \Gamma_{hh}^{-1} \Gamma_{hl}) - \rho N^*(\bar{\lambda}_L^* \bar{\lambda}_H^* - \bar{\lambda}_L^* \bar{\lambda}_H^*)]$$,  \hspace{1cm} (26)

$$\Omega((dW / dt_L) + (dW^* / dt_L)) = (NN^*)^{-1}\left[\Omega((dW / dt_L) + (dW^* / dt_L))\right] =$$

$$NN^*\Gamma_{hh}[(\rho^* \bar{\lambda}_L^* - \rho \bar{\lambda}_L) - (\rho^* \bar{\lambda}_H^* - \rho \bar{\lambda}_H) \Gamma_{hh}^{-1} \Gamma_{hl}] + \rho \rho^*(\bar{\lambda}_L^* \bar{\lambda}_H^* - \bar{\lambda}_L^* \bar{\lambda}_H^*)(N^* - N)$$,  \hspace{1cm} (27)

Equation (25) shows that when Home increases the immigration cost for the unskilled workers, the effect on its welfare is generally ambiguous. The first term in the brackets on the right hand side is similar to that of equation (12) and is positive if
\( \Gamma_{LH} \) is negative, that is when skilled and unskilled labour are substitutes in production in both countries. The second term is present only in this case and it is positive if \( |\lambda_L^* \lambda_{LH}^*| < |\lambda_L^* \lambda_{LH}| \). This inequality holds when the net fiscal benefits for the unskilled are higher and the net fiscal contribution for the skilled are lower in Foreign than in Home. The effects on the increase in the immigration cost in Home on Foreign welfare are similar but of the opposite sign.

**Proposition 6.** Assume that i) skilled and unskilled labour are substitutes in production, ii) the net fiscal benefits for the unskilled are lower and the net fiscal contribution for the skilled are higher in Home than in Foreign. In this case, an increase in the immigration cost of the unskilled workers in Home, increases the welfare for Home, decreases that of Foreign and has an ambiguous effect on World welfare.

Equation (27) shows that the effect of an increase in Home immigration cost of the unskilled labour on world welfare is generally ambiguous. For example, an increase in this immigration cost, increases world welfare if the population in the two countries is the same and the net fiscal contribution the net benefits are higher in Home than in Foreign and the two types of labour are substitutes in production. Combining the discussions of equation (24) and (27), yield the following proposition.

**Proposition 7.** Assume that the size of the population of the two countries is the same, and that skilled and unskilled labour is substitutes in production. World welfare increases when Home decreases its immigration cost of the skilled and increases that of the unskilled workers if the net fiscal benefits and net fiscal contributions in Home are greater than in Foreign.

Consider the special case where the two types of labour are substitutes in production, the two countries have the same population size and the same income tax rate (i.e., \( \rho = \rho^* \)). Note that \( \lambda_j = \tilde{R} - R_j \) and \( \lambda_j^* = \tilde{R}^* - R_j^* \), where \( \tilde{R}(\tilde{R}^*) \) is the average income in Home (Foreign). When \( \lambda_L > \lambda_L^* \) and \( -\lambda_H > -\lambda_H^* \), it implies that the difference between the average income and the marginal revenue product of each type of labour is higher in Home than in Foreign. Under the above assumptions,
equations (24) and (27) imply that world welfare increases if the country with more unequal distribution of income between skilled and unskilled labour decreases the immigration cost of the skilled and increases that of the unskilled workers. If, in addition to the above assumptions, the average incomes in the two countries are the same (i.e., $\bar{R} = \bar{R}^*$), then when $\lambda_L > \lambda_L^*$ and $-\lambda_H > -\lambda_H^*$, it implies that $R_L^* > R_L$ and $R_H^* > R_H$. Thus, if $R_L^* > R_L$ and $R_H^* > R_H$, world welfare increases when Home decreases the immigration cost of the skilled and increases that of the unskilled workers. In other words, world welfare increases if the immigration policies are changed in such a way to direct immigration of each type of workers in the country where are more productive.\(^{12}\)

When the skilled and unskilled labour are complements in production, equation (27) shows, for example, than an increase in the immigration cost of the unskilled labour in Home decreases world welfare if the net fiscal contribution of a skilled worker is lower and the net fiscal benefit of an unskilled worker is higher in Foreign than in Home and the initial population in Home is not less than in Foreign.

6. Concluding remarks

The immigration policy of some developed countries is designed in such a way that individuals with little or no education generally have limited access to permanent migration and immigrants tend to be better educated than the rest of the population in the country of origin. It is argued that this could be due to the fact that skilled immigrants are expected to be net fiscal contributors and thus their immigration is not expected to affect negatively the welfare of natives. To examine analytically this observation, we build a model with two types of workers, skilled workers with more education and high ability and productivity and the unskilled workers with less education and low ability and productivity. It is assumed that all incomes from various sources are taxed with the same rate and all tax revenue is equally distributed among all residents. Within this framework and under different scenarios concerning the international mobility of capital and the existence or not of restrictions in the migration of each type of labour, we examine how changes in the

\(^{12}\) This finding is similar with Bucovetsky (2003) where in a model with migration, income taxes, transfers and migration cost, found that immigration of most skilled workers in the high productivity region increases the overall value of national output.
government policies which change the immigration cost and thus induce or discourage immigration affect the welfare of natives in the host country.

Initially the analysis is carried out within a framework of a small open economy in goods and factor markets. Within this framework, we find that the welfare effect on natives from a change in the immigration cost on a type of labour depends on whether this type of labour is a net fiscal contributor or beneficiary, on the relationship in production between the two types of labour and capital and on whether the other type of labour is a net fiscal contributor or beneficiary. For example, when capital and both types of labour are mobile, skilled labour is a net fiscal contributor, the unskilled labour is a net beneficiary, the unskilled labour is general equilibrium substitute in production with skilled labour and capital while skilled labour and capital are general equilibrium complements in production, the welfare of natives increases by reducing the immigration cost of the skilled workers and by increasing the immigration cost of the unskilled workers. If, however, unskilled labour is a general equilibrium complement with skilled labour and capital while skilled labour and or capital are general equilibrium substitutes, then a decrease in Home immigration cost of skilled labour, which causes inflow of skilled labour, can decrease the welfare of natives. Thus, the common wisdom that the inflow of skilled workers, which are fiscal contributors, increases the welfare of natives is only partly true since this inflow causes movements of capital and unskilled labour which could affect negatively the welfare of natives.

We also consider the case of two large countries where the immigration policies of one country affect the labour market of the other country. In this case, more conditions are required to guarantee that a certain change in the immigration policy will unambiguously improve the welfare of natives. That is, the welfare effects of a change in the immigration policy depend on the complementarity or substitutability in production between skilled and unskilled labour, on the size of the net fiscal benefits of the unskilled and on the size of the net contribution of the skilled in each country. The effect on world welfare depends, in addition to that, on the population size in each country. For example, when Home decreases the immigration cost on skilled labour, world welfare increases if i) skilled and unskilled labour are substitutes in production, ii) the population of the two countries in the same and iii) the net fiscal contribution of the skilled and the net fiscal benefit of the unskilled are greater in Home than in Foreign. In the special case where, in addition to
the previous first two assumptions, the two countries have the same income tax rate and average income, world welfare increases if the immigration policies changed in such a way in order to direct the immigration of each type of workers in the country where are more productive.
References


