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A b s t r a c t

We construct a general equilibrium trade model of a two-class small open host or source country. Government consumption tax or tariff revenue finances either the provision of an imported public consumption good or income transfers. Within this framework, among other things, under plausible assumptions, we show the following: When consumption tax revenue finances the provision of a public good, marginal migration reduces social welfare in the source country and raises it in the host. When consumption tax revenue is equally distributed among domestic households in each country, then migration has an ambiguous impact on social welfare in either country. When tariff revenue in either country is either equally distributed among domestic households, or it is used to finance the provision of a public good, then migration has an ambiguous effect on social welfare in the host country, and is expected to reduce social welfare in the source**.**

Key words: International migration, taxes, tariffs, income transfers, welfare.

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1. Introduction

Within the neo-classical trade literature, it has been established that finite permanent migration is welfare beneficial to the nationals of the host country and welfare detrimental to the non-emigrants in the source country, and that marginal permanent migration has no welfare effects in either country.[1] This result holds, regardless of the number of goods or factors of production, or of whether commodity prices are endogenously determined or exogenously fixed (see Wong 1985, Quibria 1988). Recent contributions to this literature have provided cases where the above results can be reversed, e.g., Djajic (1986) in a model allowing for immigrant remittances, and Djajic (1998), in a model with traded and non-traded goods, and foreign capital.

In general, these neoclassical trade results have shown migration induced welfare gains to the host countries, despite certain losses to native workers substitutes for the immigrants. Contrary to this theoretical evidence, however, there is a widespread resistance against immigrants in host countries. Moreover, this resistance has been directed primarily towards unskilled, rather than skilled, immigrants who, as it is argued, exert downward pressures on wages in the host countries, and fiscally burden, at the expense of all domestic households, the host country's "welfare state".[2] That is, often it is argued that gains from trade associated with immigration are small relative to the increased costs of redistribution policies when transferring income from high-income natives, to low-income, fiscally beneficiary immigrants, since they cannot be excluded from or discriminated against from consuming congestable or quasi-private public services, such as health care, and public schooling.

[1] Permanent emigration is defined in the sense that immigrants do not remit any part of their income earnings back to the source country, and that their consumption and utility are part of the respective magnitudes in the host country. The other type of international migration considered in the relevant international trade and development literature is temporary migration. In that case, immigrants are viewed as guest workers in the host country, who remit their income earnings back to the source country, and whose consumption and utility are part of that country's consumption and welfare. For the distinction between permanent and temporary migration, and for its analytical implications see, among others, Wong 1995.

[2] For example, Sala-i-Martin (1995) notes the argument against migration due to human capital externalities derived from human interaction.

In line to these concerns it is only recently that models of international migration have departed from the notion of distortions free theoretical settings, and have explicitly incorporated an active government engaged in redistribution policies through income transfers. For example, Wildasin (1994) in a single commodity model with income taxes and transfers demonstrates, among other things, the possibility of migration induced Pareto-inferior outcomes when in the no-immigration situation, owners of the immobile factor are being taxed to provide transfer payments to mobile workers. Razin and Sadka (1995) use a two-class --high productivity (skilled) labor, and low productivity (unskilled) labor-- model of international migration, where the government uses a redistribution policy (*i.e.,* an egalitarian income tax and a lump-sum grant) in order to maintain the pre-migration level of disposable income (consumption) of native born unskilled workers. Within their context it is shown that free migration is Pareto-inferior for the native born population. Wellisch and Wildasin (1996), assuming that prices of goods are fixed, examine within a system of jurisdictions the effect of immigration in one jurisdiction. They show, among other things, that when each jurisdiction chooses optimal redistribution policies, the external effects are purely fiscal, that is, immigrants who make net fiscal payments (receipts) create external benefits (costs). Wellisch and Walz (1998) show that social welfare in countries with relatively small number of low-skilled native workers is higher with free trade than with free migration due to redistribution of income towards immigrating workers. Finally, Michael (1999) using a two-class model with many traded and non-traded goods and where income taxes finance income transfers, show that marginal emigration (immigration) benefits (hurts) those left behind (already in the country).

We argue, however, that two equally important considerations may still be missing from the above reviewed literature on the fiscal repercussions of international migration. First, governments in addition to income transfers and congestable or quasi-private public services, they also provide non-congestable public consumption goods or public inputs (*e.g.,* national defense). Second, aside of income taxes equally important sources of generating government revenue, to finance such government activities, have been consumption taxes, and particularly for the LDCs tariffs.[3]

[3] For example, during 1990 in India income taxes accounted approximately for the 15.5 percent of government revenue, while domestic taxes on goods and services, and taxes on international trade accounted respectively for the 35.5 and 28.8 percent. In Pakistan, the respective percentages were 10.0,

Michael and Hatzipanayotou (1998) examine the welfare implications of marginal migration when income taxes finance the provision of pure public good in a two-class economy, and show that, under plausible assumptions, emigration (immigration) hurts (benefits) those left behind (already in the country). The welfare implications of migration, however, when the provision of public goods or the income transfers are financed through consumption or trade taxes are unexplored. [4]

Motivated by this realization, the present paper constructs a general equilibrium trade model of a two-class, *i.e.,* internationally immobile *capitalists* and prospective *emigrant workers*, small open source country, or of a two-class, *i.e.,* internationally immobile *natives* and *immigrant workers*, host country. Capitalists and natives are endowed with a unit of labor and other factors of production, while workers are only endowed with a unit of labor. The country produces two private traded goods, while its government is assumed to generate revenue by levying consumption taxes or tariffs. In turn, such revenue is either used as an income transfer equally distributed to domestic households, or it is used to finance the provision of an imported, and not locally produced, pure (non-congestable) public good.[5] Within this framework, we examine the effects of marginal international migration on class and social (*i.e.,* capitalists and workers, natives and immigrants jointly) welfare under the two government tax policies, and under their assumed alternative uses.

2. The Model

Consider a small open economy producing two private traded --one exported and one imported-- goods, and importing a public consumption good (g) which is not produced locally.[6] Labor and other factors of production such as capital and land are used in the production of the two private traded goods. It is assumed that the other

32.2 and 30.6. On the other hand, in developed countries, *e.g.,* the U.K. the respective percentages were 40.3, 30.8 and 0.1, while in Sweden 18.1, 28.9 and 0.5 percent, respectively (World Bank, 1992).

[4] A considerable volume of the public finance literature is devoted to the issue of optimal taxation (income and commodity taxes) and public good provision in closed economy models (*e.g.,* see Stiglitz 1982, Christiansen 1984, Nava *et al*. 1996).

[5] Such income transfers are primarily in the form of congestable or quasi-private public goods such as health care, education, etc., and rarely in the form of lump-sum cash transfers. We assume that the country treats all individuals equally, regardless of their origin. For a more extensive discussion of this issue, see for example Wellisch and Wildasin (1996).

[6] The assumption that the public good is imported is made for simplicity, since now the unit cost (=unit price) of the public good is constant and is not affected by changes in factor supplies or public good provision. In section 6 where we examine the welfare effects of migration within the Heckscher-Ohlin (H-O) model, this assumption is irrelevant since within this model changes in factor supplies or public good provision do not affect factor rewards and the unit cost of public good. That is, within the H-O model, the results of the analysis are same when either the public good is imported or locally produced.

factors of production are internationally immobile, labor is imperfectly mobile internationally. As a result, the rate of return to labor is not equalized between a labor-exporting, source, country or a labor importing, host, country and the rest of the world. International trade in goods can either be free or subject to tariffs. Since the country is small in world markets, changes in domestic policies and labor flows cannot affect the world prices of goods and the world rates of returns to factors of production.

Domestic endowments of factors are fixed. The domestic supply of other factors equals their fixed endowments, but the domestic supply of labor (L) is variable due to international migration. Thus, assuming full employment dL is negative with emigration in the case of a source country, and it is positive with immigration in the case of a host country. Production functions are homogeneous of degree one and strictly concave to all factors.

The private sector, producing the traded goods is assumed to behave competitively. The public sector (government) is assumed to levy consumption taxes or import tariffs. Revenue from such taxes is assumed to be either equally distributed among domestic households, or used to finance the provision of the imported public consumption good that is provided to people free of charge. Furthermore, we consider as a benchmark case, the financing of the provision of the public good through pure lump-sum taxes.

Let $R(q, L)$ be the maximum value of the private gross domestic product (GDP), given the producer domestic relative price of the taxed good (q), and the local supply of labor (L). When consumption taxes are levied, q equals p^* the world price of the taxed commodity. When a tariff is the implemented policy instrument, $q = p^* + t$, where t is the tariff rate. For the rest of the analysis, treating t as constant q is omitted from the GDP function. The $R(L)$ function is assumed strictly concave in L (*i.e.,* R_{LL} is negative).[7] Its partial derivative with respect to p (*i.e.,* R_p) is the supply function of the imported good, and with respect to L (*i.e.,* R_L) is the marginal revenue product of labor, which in equilibrium equals the domestic rate of return to labor.

[7] In the two private-traded good, two-factor, Heckscher-Ohlin trade model $R_{LL} = 0$.

We assume that the small open source or host country comprises of two groups of identical individuals. In the source country prospective emigrants and capitalists, and in the host natives and immigrants. Capitalists and natives are assumed to posses a unit of labor and other factors of production. Prospective emigrants and immigrants are assumed to posses only one unit of labor. Migration is from the class of workers, and it is assumed to be permanent in the sense that immigrants do not remit any of their income earnings back to the source country, and that their utility is part of the host country's welfare.[8]

We denote by $e^j(p,g,u^j)$, $j=k,w$, the minimum expenditure of a representative capitalist (k) or worker (w) required to achieve a level of utility u^j, given the consumer domestic relative price of the taxed good (p), and the level of public good consumption (g). When consumption taxes are levied, $p=p^*+\tau$, where $\tau(>0)$ is the consumption tax rate, while when a tariff is the chosen policy instrument $p(=q)=p^*+t$. The partial derivative of the representative expenditure function with respect to $p(i.e.,e_p^j)$ is the compensated demand function for the taxed good by a representative capitalist or worker. Following standard practice of the public finance literature, we call $-e_g^j(>0)$ the individual "*marginal willingness to pay for the public good*" in group j (*e.g.,* see King, 1986). Since, again, consumer domestic relative prices are treated as constant, henceforth (p) is omitted from the representative minimum expenditure functions.

The country's income-expenditure identity requires that total spending by its residents must equal total income from the production of private traded goods plus any consumption tax or tariff revenue accruing to them, minus lump-sum taxes. That is:

$$L^k e^k(u^k,g)+L^w e^w(u^w,g)=R(L)+\alpha\tau E_p(u^k,u^w,g)+\beta t Z_p(u^k,u^w,g,L)-TL, \quad (1)$$

[8] We assume, for simplicity, that emigrants do not remit income back to the source country, and that their welfare is not part of that country's welfare. Source countries, however, do care about the well being of their permanent emigrants, who quite often remit, part of their earnings back to the source country.

where L^j is the total number of individuals in the j^{th} group, $L = L^k + L^w$, $E_p = L^k e_p^k(u^k, g) + L^w e_p^w(u^w, g)$ is the country's aggregate consumption of the taxed good, and $Z_p = L^k e_p^k + L^w e_p^w - R_p$ is its aggregate import demand, and T is the lump-sum tax per individual in the country. Under consumption taxes (*i.e.,* T= $t = 0$), α is the fraction of this revenue equally distributed to domestic households. Under tariffs (*i.e.,T*= $\tau = 0$), β is the fraction of tariff revenue equally distributed to domestic households (see for more details Appendix A).

The income-expenditure identity of the class of workers requires that their aggregate expenditure equal income from labor service plus any equal proportion of accruing consumption tax or tariff revenue minus lump-sum taxes. Thus,

$$L^w e^w(u^w, g) = L^w R_L + \alpha(L^w / L)\tau E_p(u^k, u^w, g) + \beta(L^w / L)tZ_p(u^k, u^w, g, L) - TL^w . \quad (2)$$

Given this specification a representative worker has the incentive to migrate if total income earned in the host country (*i.e.,* labor income plus possible fiscal benefits due to redistributed tax revenue minus lump-sum taxes) exceeds the corresponding income in the source country.

We complete the model by introducing the government budget constraint. When the government provides the public good, financed through a consumption tax or a tariff or a lump-sum tax, its budget constraint requires that revenues from such taxes must equal the cost of the public good. That is:

$$B = (1-\alpha)\tau E_p(u^k, u^w, g) + (1-\beta)tZ_p(u^k, u^w, g, L) + LT - g , \quad (3)$$

where B denotes the government net tax revenue and for simplicity it is assumed that the price of the public good equals one. We assume that in equilibrium the government maintains a balanced budget (*i.e.,* $B = 0$).

Following the specification of equations (1), (2), and (3), our analysis examines the effects of international migration on group and social welfare in a source or in a host country, under the following five policy regimes. First, when only lump-sum taxes exist *(i.e.,* $t = \tau = 0$), and the tax revenue finance the provision of the public good. Second, when consumption taxes are imposed (*i.e.,T*= $t = 0$) and revenue

from such taxes (i) is equally distributed among domestic households (*i.e.,* $\alpha = 1$), or is entirely used to finance the provision of the public good (*i.e.,* $\alpha = 0$). This analysis is also repeated when the government uses only tariff revenue (*i.e.,* T= $\tau = 0$) which is either equally distributed among domestic households (*i.e.,* $\beta = 1$), or used to finance the provision of the public good (*i.e.,* $\beta = 0$).

3. Migration, Lump-Sum Taxes and Welfare

First, we consider the benchmark case where no tariff or consumption tax exists and the government finances the provision of the public good using lump-sum taxes. Using equations (B.1) to (B.3), straightforward algebra leads to the following results:

$$L^w(du^w / dL) = L^w R_{LL} - TL^w e_g^w \,, \tag{4}$$

$$L^k(du^k / dL) = -L^w R_{LL} - TL^k e_g^k, \tag{5}$$

$$(dW / dL) = -\,\mathrm{E}_g(dg / dL) = -E_g T \tag{6}$$

where $(dW / dL) = L^k(du^k / dL) + L^w(du^w / dL)$, and by choice of units we assume that the marginal utility of income for all households equals to one, *i.e.,* $e_u^k = e_u^w = 1$. Thus, *dW* is the change in social welfare. We implicitly assume a utilitarian social welfare function with weights given by the number of individuals in each group and with the same and equal to one marginal social utility of income for all individuals.

Equations (4) and (5) capture, in the present context of a lump-sum tax, the effects of international migration on the welfare of non-emigrant workers and capitalists in the case of the source country, or of natives and migrants in the case of the host country. International migration affects group welfare through a *wage-effect* and through, what we call, *net revenue change public good effect*. Equation (6) shows that international migration affects the social welfare of the source or of the host country through changes in the level of public good provision.

Consider the case of the source, labor exporting, country where due to emigration $dL < 0$. Equations (4) and (5), indicate that the emigration induced *wage-effect* has a negative impact on the welfare of capitalists, and a positive one on the welfare of non-emigrant workers. This is because emigration raises the marginal

revenue product of labor, and thus wage rate in the source country. Therefore, income of capitalists' decreases by $L^w R_{LL}$ and that of workers increases by $L^w R_{LL}$. At the same time emigration reduces the lump-sum tax revenue, and thus the level of public good is reduced, affecting negatively, through the induced *net revenue change public good effect,* the group (*i.e.,* $TL^j e_g^j$) and social (*i.e.,* $E_g T$) welfare**.** Thus, emigration reduces the capitalists and social welfare while the effect on workers welfare is ambiguous.

For the host country, marginal immigration has the opposite effects. That is, an inflow of a foreign worker increases the welfare of natives and social welfare and has an ambiguous effect on the welfare of immigrants.[9]

Proposition 1: *Consider a small open source or host country, where a public good is financed through lump-sum taxes. Marginal emigration decreases social and capitalists welfare while the effect on workers welfare is ambiguous. Similarly for the host country, marginal immigration increases social and natives welfare while the effect on migrants welfare is ambiguous.*

When the lump-sum tax revenue are equally distributed to all individuals, then marginal permanent migration induces only the *wage-effect*. In this case emigration increases workers welfare and decreases that of capitalists, while immigration increases natives' welfare and decreases that of migrants. In both cases social welfare is not affected by marginal international migration.

4. Migration, Welfare and Consumption Taxes

In this section we examine the welfare effects of international migration on group and social welfare in a source or host country, when the government's policy instrument is only a consumption tax, and tax revenue is either equally distributed among domestic households, or it is used to finance the provision of a public consumption good.[10] Differentiating equations (1), (2), and (3), and letting $T = t = 0$, we obtain equations (C.1), (C.2) and (C.3) of Appendix C.

[9] When we talk about the effect of migration on the social welfare in the host (source) country, we basically mean the effect of migration on the welfare of those already in the country (those left behind).
[10] When we say that revenue is equally distributed among domestic households, we mean, among other things, that people are eligible to consume the same amount of congestable public services such as health care, public schooling, etc.

4.1 Equal distribution of consumption tax revenue

In this case there is zero provision of the public good. Letting $\alpha = 1$, and $dg = 0$ in equations (C.1) and (C.2), and eliminating equation (C.3), we obtain the welfare effects of international migration on group and social welfare as follows:

$$\Delta L^k (du^k / dL) = \tau(1-\mu)[e_p^w - (E_p / L)] - (1-\tau e_{pu}^w) L^w R_{LL}, \quad (7)$$

$$\Delta L^w (du^w / dL) = \tau\mu[e_p^w - (E_p / L)] + (1-\tau e_{pu}^k) L^w R_{LL}, \quad (8)$$

$$\Delta(dW / dL) = \tau[e_p^w - (E_p / L)] + \tau(e_{pu}^w - e_{pu}^k) L^w R_{LL}, \quad (9)$$

where $\mu = (L^w / L)$ and $\Delta = 1 - \tau(1-\mu)e_{pu}^k - \tau\mu e_{pu}^w$ is positive. Equations (7) and (8) capture, in the present context of a consumption tax, the effects of international migration on the welfare of capitalists and non-emigrant workers, respectively, in the case of the source country, or of, respectively, natives and migrants in the host country. International migration affects group welfare through a *wage-effect and*, what we call, a *tax-revenue-effect (direct and* a *wage change-induced-tax-revenue-effect)*. Equation (9) shows that international migration affects social welfare of a source or of a host country through an induced *tax-revenue-effect.*

Consider the case of the source, labor exporting, country where due to emigration $dL < 0$. Equations (7) and (8), respectively, indicate that the emigration induced *wage-effect,* similar to the one in the case of lump-sum taxes*,* has a negative impact on the welfare of capitalists, and a positive one on the welfare of non-emigrant workers.

The emigration *wage change-induced-tax-revenue-effect* on group welfare is positive for capitalists (*i.e.,* $\tau L^w R_{LL} e_{pu}^w$), and negative on welfare of non-emigrant workers (*i.e.,* $-\tau L^w R_{LL} e_{pu}^k$). Intuitively, as noted above the *wage-effect* reduces incomes of capitalists by $L^w R_{LL}$ and raises income of non-emigrant workers by this amount. As a result, consumption of capitalists decreases by $L^w R_{LL} e_{pu}^k$, affecting negatively consumption tax revenue that is distributed and welfare of non-emigrant workers. On the other hand, consumption of non-emigrant workers increases by

$L^w R_{LL} e^w_{pu}$, affecting positively the distributed consumption tax revenue by $\tau e^w_{pu} L^w R_{LL}$ and welfare of capitalists by $\Delta^{-1}\tau e^w_{pu} L^w R_{LL}$.

Since $(1-\tau e^w_{pu})$ and $(1-\tau e^k_{pu})$ are both positive, then observing equations (7) and (8) the combined *wage-effect* and *wage change-induced-tax-revenue-effect* affect negatively the capitalists welfare (*i.e.,* $-(1-\tau e^w_{pu})L^w R_{LL} > 0$), and positively the welfare of non-emigrant workers (*i.e.,* $(1-\tau e^k_{pu})L^w R_{LL} < 0$).

In the absence of consumption tax revenue, the income gain to workers due to emigration exactly offsets the income loss of capitalists and thus social welfare is not affected. In the present framework, however, if $e^w_{pu} \neq e^k_{pu}$, then as a result of emigration, and group income change, total consumption changes, and so does consumption tax revenue. Consequently, as shown by the second right hand side term of equation (9), emigration, through the *wage change-induced-tax-revenue-effect*, has a positive (negative) impact on the source country's social welfare if $e^w_{pu} > (<) e^k_{pu}$**.** That is, emigration, which raises wages to non-emigrant workers, affects positively (negatively) social welfare if that group's marginal propensity to consume the taxed good exceeds (is smaller than) the corresponding marginal propensity of consumption of capitalists.

Equations (7) and (8), respectively, indicate that the emigration induced *direct tax-revenue-effect* (*i.e.,* $\tau[e^w_p - (E_p / L)]$**)** entails a positive and a negative impact on group welfare. The positive impact is due to consumption tax revenue forgone by an emigrant worker (*i.e.,* $(\tau E_p / L)$). Now, due to emigration, a fraction $(1-\mu)$ of this revenue is equally distributed among the country's capitalists, and the remaining μ among its non-emigrant workers. The negative impact of the *direct tax-revenue-effect* is due to lost consumption tax revenue contributed by an emigrating worker (*i.e.,* τe^w_p), which if it were not for emigration would have been equally distributed, at a fraction (1-μ) among the country's capitalists and the remaining μ among its non-emigrant workers. Thus, if the average consumption of the taxed good is larger (smaller) than the consumption of a typical emigrant worker (*i.e.,* $(E_p / L) > (<) e^w_p$), emigration, through the *direct tax-revenue-effect*, entails a fiscal benefit (loss) that affects positively (negatively) the welfare of all households, *i.e.,* capitalists and non-

emigrant workers, left behind. In other words, if the consumption of the taxed good by a typical capitalist is larger (smaller) than that of a typical worker, then emigration through the *direct tax-revenue-effect*, benefits (hurts) those left behind. Thus, equations (7) to (9) indicate that the emigration induced *direct tax-revenue-effect* affects positively group and social welfare through higher distributed consumption tax revenue, if $e_p^k > e_p^w$, and negatively otherwise.[11]

Equivalently, in the case of a host, labor-importing, country, immigration increases domestic labor supply (*i.e.,* $dL > 0$). As a result, the induced *direct tax-revenue-effect* affects negatively group and social welfare if $e_p^k > e_p^w$, positively otherwise. Migration also lowers wages to immigrants. Thus, the combined *wage-effect* and *wage change-induced-tax-revenue-effect* affects positively the welfare of natives, negatively the welfare of immigrants already in the country, and has an ambiguous impact on social welfare.

Proposition 2: *Consider a small open source or host country where consumption tax revenue is equally distributed to all individuals.* ***If*** $e_p^k > e_p^w$, *then marginal emigration (immigration) increases (decreases) welfare of non-emigrant workers (immigrants) while the effect on the welfare of capitalists (natives) in the source (host) country is ambiguous. If* $e_p^k < e_p^w$, *then international migration has an ambiguous effect on workers welfare in either country, while it reduces (raises) welfare of capitalists (natives) in the source (host) country. If* $e_p^k > e_p^w$ *and* $e_{pu}^w > e_{pu}^k$, *then international migration increases (decreases) social welfare in the source (host) country.*

In most countries governments usually impose high consumption taxes on luxury goods, for which the more affluent capitalists (natives) have higher marginal propensities to consume than workers (immigrants) (*i.e.,* $e_{pu}^k > e_{pu}^w$**)**, and low or zero taxes on necessities. Thus, the last term on the right hand side of equation (9) is expected to be positive. At the same time consumption of the taxed good is expected to be greater by the more affluent capitalists in the source country, and natives in the host, compared to the corresponding levels of consumption of workers and

[11] Using the definition of E_p, it can be shown that $(e_p^w - (E_p / L)) = (1-\mu)(e_p^w - e_p^k)$.

immigrants, respectively, in the two countries (*i.e.,* $(E_p / L) > e_p^w$ implying that $e_p^k > e_p^w$). Thus, the first right-hand-side term of equations (7) to (9) is expected to be negative.

Therefore, under such plausible assumptions and within the present context, we expect that international migration raises the welfare of workers in the source country, and reduces welfare of immigrants in the host. On the other hand, its effect on the welfare of capitalists in the source country, of natives in the host, and on social welfare in either country is ambiguous.

4.2 Consumption taxes and public good provision

Letting $\alpha = 0$, $g > 0$, and $dg > 0$ in equations (C.1) to (C.3), we obtain the welfare effects of international migration on group and social welfare, with consumption taxes and public good provision, as follows:

$$\Delta^g L^w (du^w / dL) = L^w R_{LL} [\tau E_{pg} - 1 - \tau e_{pu}^k E_g] + L^w e_g^w \tau e_p^w \ , \text{ or} \tag{10}$$

$$\Delta_1^g L^w (du^w / dL) = L^w R_{LL} [1 - E_g (\partial B / \partial g)^{-1} (\partial B / L^k \partial u^k)] - L^w (\partial u^w / \partial g)(\partial B / \partial g)^{-1} (\partial B / \partial L) \tag{10´}$$

$$\Delta^g L^k (du^k / dL) = -L^w R_{LL} [\tau E_{pg} - 1 - \tau e_{pu}^w E_g] + \tau e_p^w L^k e_g^k, \text{ or} \tag{11}$$

$$\Delta_1^g L^k (du^k / dL) = -L^w R_{LL} [1 - E_g (\partial B / \partial g)^{-1} (\partial B / L^w \partial u^w)] - L^k (\partial u^k / \partial g)(\partial B / \partial g)^{-1} (\partial B / \partial L) \tag{11´}$$

$$\Delta^g (dW / dL) = - \mathrm{E_g} \Delta^g (dg / dL) = E_g [\tau (e_{pu}^w - e_{pu}^k) L^w R_{LL} + \tau e_p^w], \tag{12}$$

where $\Delta_1^g = \Delta^g (\partial B / \partial g)^{-1}$, Δ^g is the determinant of the matrix of coefficients with endogenous variables (u^w, u^k, g) in equations (C.1) to (C.3) when $\alpha = 0$. The

determinant Δ^g is negative if an increase in the level of public good provision reduces net government revenue.[12]

Using equation (C.1) $L^j(\partial u^j/\partial g) = -L^j e_g^j > 0$. Using equation (C.3) $(\partial B/\partial L) = \tau e_p^w > 0$, and $(\partial B/L^j \partial u^j) = \tau e_{pu}^j > 0$. That is, government net tax revenue is an increasing function of the level of employment and group income. Finally, using again equation (C.3), $(\partial B/\partial g) = (\tau E_{pg} - 1)$. The following Assumption facilitates the comparative statics analysis of this section**:**

Assumption (1): Government net tax revenue is a decreasing function of the level of public good provision, i.e., $(\partial B/\partial g) < 0$.[13]

Equations (10´) and (11´) indicate that international migration affects group welfare through three effects. The first right-hand-side term of the two equations (*i.e.,* $L^w R_{LL}$) is the previously referred to as the *wage-effect*. The second right-hand-side term (*i.e.,* $-E_g(\partial B/\partial g)^{-1}(\partial B/L^j \partial u^j)$) we call the *income change-induced public-good-effect*, and the last right-hand-side term (*i.e.,* $-L^j(\partial u^j/\partial g)(\partial B/\partial g)^{-1}(\partial B/\partial L)$) we call the *net revenue change-induced-public-good-effect*. Equation (12) indicates that the effect of international migration on social welfare is through the induced changes in the provision of the public good.

Consider the case of the source country where emigration, among other things, raises the marginal revenue product of labor, and the wage rate. As a result, emigration, through the induced *wage-effect*, affects positively the welfare of non-emigrant workers, and negatively the welfare of capitalists. In the case of a host country the induced *wage-effect* exerts a negative impact on the welfare of immigrants already in the country, and a positive effect on the welfare of natives.

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[12] If in the system of equations (1), (2) and (3) we treat u^k, u^w and B as the endogenous variables, and g and τ as the exogenous, then $(dW/dg) = -E_g > 0$ and $(dB/dg) = \Delta^g$. If at the neighborhood of the equilibrium $\Delta^g > 0$, then given τ, a small increase in public good provision increases social welfare and the government net tax revenue, which in turn successively increases the public good provision, utility and net tax revenue. Thus, if at the neighborhood of the equilibrium $\Delta^g > 0$, equilibrium is unstable. Consequently, it is assumed that for given τ, stability at least in the neighborhood of the equilibrium requires that $\Delta^g (= dB/dg) < 0$.

[13] Because of Assumption (1), $\Delta_1^g (= \Delta^g (\partial B/\partial g)^{-1}) > 0$.

In the case of the source country, under *Assumption 1*, the *income changed-induced-public-good-effect* is negative on the welfare of the non-emigrant workers. Intuitively, because of the emigration induced reduction in the real income of capitalists, their consumption, and thus consumption tax revenue fall. This hinders the government's ability to provide the public good, which affects negatively the non-emigrant workers welfare. On the other hand, the impact of the emigration through this effect on the source country's capitalists' welfare is positive. Intuitively, emigration increases the income of non-emigrant workers, increases consumption, consumption tax revenue, and the provision of public good. Welfare of capitalists increases through this effect. In the case of the host country, the *income change-induced-public-good-effect* has the opposite impact on the welfare of immigrants, and of natives. That is, through this effect, welfare of immigrants is affected positively and of natives negatively.

Through the last term in equations (10´) and (11´) it is shown that, under *Assumption* (1), the *net revenue change-induced-public-good-effect* due to emigration entails a negative impact on welfare of both non-emigrant workers and of capitalists in the source country. Intuitively, emigration reduces government net tax revenue (*i.e.,* $(\partial B/\partial L) > 0$), which in turn, under *Assumption* (1), reduces the provision of the public good. Then, group welfare is affected negatively due to lower consumption of the public good. In the case of the host country, this effect affects positively the welfare of natives, and of immigrants.

Lastly, as shown by equation (12) the effect of international migration on either country's social welfare depends on its effect on the provision of the public good. Consider the case of the source country. Emigration reduces government net tax revenue *directly* and in*directly* if the workers marginal propensity of consumption of the taxed good is smaller than that of the capitalists (*i.e.,* $e^k_{pu} > e^w_{pu}$). Intuitively, when a worker leaves the country, total domestic consumption is reduced directly by e^w_p and tax revenue by τe^w_p. His emigration increases the income of the remaining workers and reduces the income of capitalists. If the marginal propensity to consume the taxed good by capitalists is greater than that of workers, then total consumption tax revenue declines. Therefore, the level of public good provision and the joint welfare of non-emigrant workers and of capitalists in the country is reduced due to emigration. If,

however, $e^k_{pu} < e^w_{pu}$, then emigration may increase social welfare in the source country. Similarly, under the condition $e^k_{pu} > e^w_{pu}$, international migration increases the social welfare in the host country.

Proposition 3: *Consider a small open source or host country, where a public good is financed through consumption tax revenue. If* $e^k_{pu} > e^w_{pu}$, *then marginal emigration (immigration) decreases (increases) the source (host) country's welfare. If* $e^k_{pu} < e^w_{pu}$, *then emigration (immigration) may increase (may decrease) social welfare in the source (host) country.*

As previously conjectured, in most countries government usually impose high taxes on luxury goods, for which the more affluent capitalists (natives) have higher marginal propensities to consume than workers (immigrants), and low or zero taxes on necessities (*i.e.,* $\tau e^k_{pu} > \tau e^w_{pu}$). Thus we expect that emigration (immigration) reduce (increases) social welfare in the source (host) country.

Finally, consider the special case where the consumption and the marginal propensity to consume the taxed good by a typical capitalist and a typical worker is the same. In this case, social welfare in either country is not affected by marginal migration when there is equal distribution of taxed revenue (see equation (9)), while it decreases (increases) in the source (host) country when tax revenue finances the provision of the public good (see equation (12)). Intuitively, the reason for this result under the above assumptions is as follow. With equal distribution of tax revenue social welfare is not affected by migration since (i) the migrant contributes to the tax revenue exactly what he receives and (ii) tax revenue are not affected by income redistribution among the two groups. In the case of public good provision, the marginal immigration (emigration) increases (decreases) tax revenue by his tax payments and thus it increases (decreases) public good provision and social welfare.[14]

5. Migration, Welfare and Tariffs

We now examine the effects of international migration on group and social welfare in the source or in the host country, when the implemented policy is only an import tariff, and government revenue from such policy is either equally distributed among domestic households (*i.e.,* $\beta = 1$), or it is used to finance the provision of the public good (*i.e.,* $\beta = 0$). Differentiating equations (1), (2) and (3), and letting T=$\tau = 0$, we obtain equations (D.1), (D.2) and (D.3) of the Appendix D.

5.1 Equal distribution of tariff revenue

Again in this case, there is no provision of the public good. Letting $\beta = 1$ and $dg = 0$ in equations (D.1) and (D.2), and eliminating equation (D.3), we obtain the welfare effects of international migration on group and social welfare as follows:

$$\Omega L^k (du^k / dL) = t(1-\mu)[(e_p^w - (E_p / L) + (1-\varepsilon)(R_p / L)] - (1 - te_{pu}^w)L^w R_{LL}, \qquad (13)$$

$$\Omega L^w (du^w / dL) = t\mu[(e_p^w - (E_p / L) + (1-\varepsilon)(R_p / L)] + (1 - te_{pu}^k)L^w R_{LL}, \qquad (14)$$

$$\Omega (dW / dL) = t[(e_p^w - (E_p / L) + (1-\varepsilon)(R_p / L)] + t(e_{pu}^w - e_{pu}^k)L^w R_{LL}, \qquad (15)$$

where $\Omega = 1 - t(1-\mu)e_{pu}^k - t\mu e_{pu}^w$ is positive and $\varepsilon (= (L / R_p)R_{pL})$, denoting the labor elasticity of domestic supply of the imported good, is positive (negative) if $R_{pL} > (<) 0$.

Equations (13) and (14) capture, in the present context of a tariff, the effect of international migration on the welfare of capitalists and non-emigrant workers in the source country, or of natives and of immigrants in the host country. Following the analysis of the previous section, the impact of international migration on group welfare is through the induced *wage-effect*, and through what we now call a *tariff*-revenue-*effect* (*direct* and *wage change induced-tariff*-revenue-*effect*). Equation (15) shows that international migration affects social welfare of the source or of the host country through the induced *tariff*-revenue-*effect*.

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[14] In general, from the viewpoint of existing residents in the host country immigration is more likely to be beneficial when consumption tax revenue is used to finance the provision of a public good than when is equally distributed to all individuals.

Since a tariff is a consumption tax and a production subsidy, some effects of migration on group and social welfare in the case of a tariff are identical to the ones discussed in the case of a consumption tax. Thus, as shown by the last term of equation (13) and (14), the migration induced *wage-effect* and the *wage change-induced-tariff-revenue-effect* on group welfare are the same as in the case of a consumption tax. Since, again, $(1-te^{w}_{pu})$ and $(1-te^{k}_{pu})$ are both positive, the combined *wage-effect* and *wage change-induced-tariff-revenue-effect* affect negatively the capitalists welfare (*i.e.,* $-(1-te^{w}_{pu})L^{w}R_{LL}>0$), and positively the welfare of non-emigrant workers (*i.e.,* $(1-te^{k}_{pu})L^{w}R_{LL}<0$) in the source country. Similarly, the second right hand side term of equation (15), is the same as the corresponding term in equation (9) and thus emigration, through the *wage change-induced-tariff*-revenue-*effect*, has a positive (negative) impact on the source country's social welfare if $e^{w}_{pu}>(<)e^{k}_{pu}$.

Equations (13) and (14), indicate that the *direct tariff*-revenue-*effect* of international migration on group welfare can be decomposed to a consumption-component (*i.e.,* $[e^{w}_{p}-(E_{p}/L)]$, that is the same as in the case of a consumption tax, and a production component (*i.e.,* $(1-\varepsilon)(R_{p}/L)$) which is the new effect, present only in the case of a tariff. Through its consumption component, the *direct tariff-revenue-effect* of emigration entails a positive impact on group welfare if $(E_{p}/L)>e^{w}_{p}$, or alternatively if $e^{k}_{p}>e^{w}_{p}$. That is, if the average consumption of the imported good is larger than the consumption of a typical non-emigrant worker, or if the consumption of a representative capitalist exceeds that of a representative worker. Through its production component, the *direct tariff-revenue-effect* entails a positive impact on group welfare if the labor elasticity of domestic supply of the imported good is greater than one (*i.e.,* $\varepsilon>1$). In such a case, emigration, which reduces domestic labor supply, raises imports and tariff revenue by reducing domestic supply of the imported good. Since tariff revenue is equally distributed among capitalists and non-emigrant workers, emigration through this effect exerts a positive impact on group and social

welfare.[15] If any of the above conditions does not hold, then the *direct tariff-revenue-effect* of emigration has an ambiguous impact on social welfare.

Similarly, in the case of a host, labor importing, country, immigration increases domestic labor supply and lowers wages. As a result, the combined *wage-effect* and the *wage changed induced tariff revenue effect,* affects positively the welfare of natives, and negatively the welfare of immigrants. The migration *wage change-induced-tariff-revenue-effect* has a negative impact on social welfare if $e^w_{pu} > e^k_{pu}$, and positive one otherwise. Finally, immigration, through the *direct tariff-revenue-effect* affects negatively group and social welfare if $(E_p / L) > e^w_p$ (*i.e.,* $e^k_p > e^w_p$), and $\varepsilon > 1$.

Finally note that social welfare increases (decreases) with immigration if it increases (decreases) the tariff revenue.[16]

Proposition 4*: Consider a small open source or host country where tariff revenue is equally distributed to all individuals. If* $e^k_p > e^w_p$ *and* $\varepsilon > 1$*, then emigration (immigration) increases (decreases) welfare of non-emigrant workers (immigrants) while the effect on capitalists (natives) in source (host) country is ambiguous. If also* $e^w_{pu} > e^k_{pu}$*, then international migration increases (decreases) social welfare in the source (host) country. If any of these conditions does not hold, then international migration has an ambiguous effect on social welfare in either country.*

For most source, LDCs the imported goods subject to tariffs are relatively capital intensive manufactured goods (*i.e.,* $\varepsilon < 0$) and are considered luxuries

[15] In a two-good, two-factor H-O model, Brecher and Diaz-Alejandro (1977) have shown that in the presence of a tariff welfare decreases with the factor inflow if the imported good is intensive in this factor and the factor payments are repatriated untaxed. In terms of the notation of our model, the Brecher and Diaz-Alejandro effect is captured by $\Omega(du / dL) = -tR_{pL}$. In our model however, this effect is only part of the overall impact of marginal migration on group and social welfare. Note also that, along with two groups of individuals, we assume permanent migration where there is no repatriation of any factor income.

[16] Note that in the two-good, two-factor H-O model, in the presence of a tariff, social welfare decreases with an inflow of foreign workers if the imported good is relatively labor intensive (*i.e.,* $R_{pL}>0$) and their earnings are repatriated untaxed. This result is due to the fact that in this case, a labor inflow reduces the tariff revenue. In our model, when $R_{pL}>0$, then the inflow of workers, increases production of the imported good and exerts a downward pressure on tariff revenue. But, at the same time, it may increase the consumption of the public good and thus imports and tariff revenue.

compared to the exported agricultural goods.[17] Thus we expect again $e^w_{pu} < e^k_{pu}$ and thus the last right hand side term of equation (15) is expected to be positive. Note that $[(e^w_p - (E_p / L)) + (1-\varepsilon)(R_p / L)]L = Le^w_p - Z_p - LR_{pL}$. Then, $Le^w_p - Z_p - LR_{pL}$ is positive if imports are not greater than the product of the consumption of the imported good by the representative worker multiplied by the total number of individuals in the country (a sufficient but not necessary condition). The later condition is likely to hold, since imports are a fraction of domestic consumption and thus the first right-hand-side term of equations (13) to (15) is expected to be positive. Under these plausible assumptions and within the present context, we expect that emigration would entail a deteriorating effect on the welfare of capitalists, and on social welfare, while it would have an ambiguous effect on the welfare of workers. On the other hand, in most host developed countries the imported goods (*e.g.,* food, cloth) are usually relatively labor intensive (*i.e.,* $R_{pL} > 0$) and necessities. Thus, we expect that $e^k_{pu} < e^w_{pu}$ and the last right hand side term of equation (15**)** is expected to be negative. The sign of the first term on the right hand side of equation (15) (*i.e.,* $[(e^w_p - (E_p / L)) + (1-\varepsilon)(R_p / L)]L = Le^w_p - Z_p - LR_{pL}$), is generally ambiguous, making the total effect ambiguous. Thus immigration has an ambiguous effect on host country's welfare.

5.2 Tariffs and public good provision

In this case, letting $\beta = 0$, $g > 0$ and $dg > 0$ in equations (D.1) to (D.3), we obtain the welfare effects of international migration on social welfare, as follows:

$$\Omega^g (dW / dL) = -\mathrm{E_g}\Omega^g (dg / dL) = E_g[t(e^w_{pu} - e^k_{pu})L^w R_{LL} + t(e^w_p - R_{pL})], \qquad (16)$$

where Ω^g, the determinant of the matrix of coefficients of the endogenous variables (u^w, u^k, g) in equations (D.1) to (D.3) when $\beta = 0$, is assumed negative (see the discussion for the sign of Δ^g in footnote 10).

[17] In a standard H-O model, we can say that $R_{pL} > (<) 0$ if the imported good is labor (capital) intensive. It is known, however, that beyond this model, while the concept of factor intensity is used, it looses its rigor. In particular, in two-goods and three-factor trade models, an increase in one factor, though quite unlikely, may reduce the output of the good intensive in this factor, or may increase the output of both goods (e.g., see Jones and Easton 1983).

The effect of migration on group welfare is given, respectively, by equations (10´) and (11´), but now using equation (D.3) and letting $\beta = 0$, $(\partial B / \partial g) = (tZ_{pg} - 1)$ is negative under *Assumption* 1, and $(\partial B / \partial L) = t(e_p^w - R_{pL})$. The following Assumption facilitates the comparative statics analysis of this section.

Assumption 2: Government net tax revenue is an increasing function of the level of employment, i.e., $(\partial B / \partial L) > 0$.

In the remaining terms, *t* replaces τ. Thus the relevant discussion of section 4.2 applies here as well.

The effect of migration on social welfare is given by equation (16), and again it depends on whether migration increases or decreases the level of public good provision. Thus, emigration (immigration) decreases (increases) social welfare if it decreases (increases) the tariff revenue and thus the public good provision.

Specifically, social welfare in the source country falls due to emigration when (i) workers marginal propensity to consume the imported good is smaller than that of the capitalists, and (ii) $R_{pL} < 0$. Under the above conditions, international emigration reduces the source country's social welfare.

Proposition 5: *Consider a small open source or host country, where the provision of a public good is financed through tariff revenue. If* $e_{pu}^k > e_{pu}^w$, *and* $R_{pL} < 0$, *then emigration (immigration) decreases (increases) the source (host) country's welfare. If* $e_{pu}^k < e_{pu}^w$ *and/or* $R_{pL} > 0$, *then migration has an ambiguous effect on social welfare in either country.*

We again conjecture that in most source LDCs the imported, subject to tariffs, goods are manufactured goods that are considered luxuries and are relatively capital intensive $(i.e., R_{pL} < 0)$. Thus, we expect that $e_{pu}^k > e_{pu}^w$, and thus we expect emigration will reduce the source LDC welfare. In most host developed countries the imported goods (*e.g.,* food, cloth) are usually relatively labor intensive (*i.e.,* $R_{pL} > 0$) and necessities. Thus, we expect that $e_{pu}^k < e_{pu}^w$. Therefore, while the effect of

immigration on the level of public good and welfare in the host-developed country is in general ambiguous, it is more likely to be detrimental in the case of tariffs.

6. The Heckscher-Ohlin (H-O) model.

To obtain a clearer interpretation of the general results presented thus far, we consider the effects of international migration on group and social welfare, in the present context of taxes, income transfers, or public good provision within the Heckscher-Ohlin (H-O) model.

Through the use of the above model we attempt to relate the previous general results to the case of a typical source labor-exporting country or of a typical host labor-importing country based on certain likely real world conjectures. First, labor-exporting countries are, by and large, less developed countries (LDCs), while developed countries have mostly served as hosts. Second, LDCs, historically, have relied primarily on tariffs, and to a lesser extent on income or consumption taxes to generate government revenue which in turn can finance other public sector activities. To the same end, developed labor-importing countries rely mostly on the use of the latter tax instruments. Third, imported, subject to tariffs, goods by LDCs are generally capital intensive manufactured goods ($i.e., R_{pL} < 0$). Lastly, in most countries governments usually impose high consumption taxes on luxury goods. We expect that the level of consumption of the taxed good is greater by the more affluent capitalists in the source country, and natives in the host, compared to the corresponding levels of consumption of workers and immigrants, respectively, in the two countries (*i.e.,* $(E_p / L) > e_p^w$ implying that $e_p^k > e_p^w$).

Within this model, two intersectorally mobile factors, labor and capital, are used in the production of the two commodities. In addition, labor is imperfectly mobile internationally, while capital is internationally immobile. In this context, it is commodity prices that determine factor rewards (*e.g.,* R_{LL} =0). Furthermore, we assume that income transfers are financed through tariff revenue, or consumption tax revenue in the source LDC, and through consumption taxes in the host developed country. The public good provision in each country is financed with this type of tax revenue and lump-sum taxes.

First, consider the case where consumption tax revenue is equally distributed among households in either country. Given that in this model R_{LL}=0, equations (7) to

(9) indicate that international migration affects group and social welfare only through the *direct tax-revenue-effect*. Under the assumption that $e_p^k > e_p^w$, we expect that immigration reduces the welfare of immigrants already in the country, of natives and social welfare in the developed host country and we expect that emigration increases the welfare of workers, of capitalists and social welfare in the source country. Intuitively, the inflow of a worker increases consumption by e_p^w and the consumption tax revenue distributed to people already in the country revenue by τe_p^w. At the same time, the immigrant gets a share ($\tau E_p / L$) of the tax revenue which is a loss for the people already in the country. Under our assumption that $(E_p / L) > e_p^w, or (e_p^k > e_p^w)$, the loss is greater than the gain and thus group and social welfare decreases with marginal immigration

For the source LDC, when tariff revenue is equally distributed, we expect that $R_{pL}<0$, and we conjecture that $Le_p^w - Z_p - LR_{pL}$ is positive (see the discussion right after Proposition 4). Thus, we expect that emigration will reduce the tariff revenue and thus entail a deterioration of the welfare of workers, of capitalists and of social welfare in the source country in the case of tariffs. Intuitively, an outflow of a worker reduces tariff revenue distributed to those left behind since (i) domestic consumption of the imported good and thus imports and tariff revenue are reduced and (ii) when the imported good is capital intensive the outflow of a worker increases the production of the imported good and thus imports and tariff revenue are reduced. At the same time, the outflow of a worker increases the tariff revenue distributed to those left behind by his forgone share (i.e., tZ_p/L). Under our assumptions, we expect that the net welfare effect will be negative for those left behind.

Proposition 6: *Consider a Heckscher-Ohlin small open source or host country where consumption tax revenue is equally distributed among domestic households. Then, under plausible assumptions marginal migration increases social welfare in the source country and reduces it in the host. When, however, the source country uses tariff revenue, then emigration is expected to reduce its social welfare.*

Next consider the case where tax revenue is used to finance the provision of the public good. When lump-sum taxes are used to finance the provision of the public

good, equations (4)-(6) show that migration reduces group and social welfare in the source country and increases them in the host. For the source LDC, where tariff revenue is used to finance the provision of the public good, equations (10) to (12) can be used to show that the effect of international migration on group and social welfare is given by the previously called *net revenue change-induced-public good-effect*, as follows:

$$\Omega^g L^w (du^w / dL) = t(e_p^w - R_{pL}) L^w e_g^w , \tag{17}$$

$$\Omega^g L^k (du^k / dL) = t(e_p^w - R_{pL}) L^k e_g^k , \tag{18}$$

$$\Omega^g (dW / dL) = -E_g \Omega^g (dg / dL) = t(e_p^w - R_{pL}) E_g . \tag{19}$$

Because of the assumed attributes for the source country, $(e_p^w - R_{pL}) > 0$. Equations (17) and (19) indicate that in this (H-O) model emigration reduces group and social welfare by reducing the level of public good provision. Intuitively, the outflow of a worker reduces the consumption of the imported good by e_p^w and thus imports and tariff revenue are reduced. At the same time, the outflow of a worker increases the production of the capital intensive imported good (i.e., $R_{pL}<0$), reducing further imports and tariff revenue. The reduction in tariff revenue reduces the provision of the under-provided public good and thus social and group welfare is reduced. By allowing in equations (17) to (19) for $R_{pL} = 0$, and for τ to substitute for *t,* we get the case where consumption tax revenue are used to finance the provision of the public good. It can be easily concluded that migration increases the level of public good and the group and social welfare in the host and reduces them in the source country.[18]

Proposition 7: *Consider a Heckscher-Ohlin two-class small source (host) country using lump-sum tax, tariff or consumption tax (lump-sum tax, or consumption tax)*

[18] The literature on local public economics has examined, among other things, the effect on the local public good provision when local governments tax the mobile factor. This lead to a tax competition which results in lower taxes for the mobile factor and under-provision of public goods. In our case, even though the analysis and the results are not strictly comparable, we see that the outflow of a factor (maybe due to a lower income tax in the host country) leads to a lower provision of a public good.

revenue to finance the provision of the public good. Then marginal international migration reduces social welfare in the source country and raises it in the host.

7. Concluding Remarks

International migration affects factor supplies, factors productivity, thus factor prices in source and host countries. In addition, a widely noted economic dimension of international migration has been its induced fiscal impact in source and host countries. Because of these effects, and given a source or a host country's government redistribution policies, the resulting income distribution after migration differs from that of the pre-migration state. Such migration induced changes in income distributions affect welfare in source and host countries. International migration also affects the share of consumption of congestable public goods (*e.g.,* health care, public schooling). On the other hand, in the case of pure public goods (*e.g.,* national defence) this issue of congestability in consumption is not of concern. International migration raises issues not only with regards to the consumption of such, congestable or not, public goods, but also in terms of the commensurable contributions made by immigrants, through the tax system, for their provision. Immigrants through their tax payments raise tax revenue, and thus the host country's ability to raise the provision of congestable and pure public goods. It is frequently argued, however, that such immigrant tax contributions are not at par with immigrant levels of congestable public good consumption. As a result, international migration burdens a host country's "welfare state" by raising the economic costs of various entitlement programs. At the other end of this spectrum, international migration may hamper a source country's ability to generate government tax revenue and provide congestable and pure public goods. Although such, and other, migration induced fiscal and welfare considerations have long dominated the national debates over migration policies, it is only recently that some of these issues have been explicitly accounted for in theoretical models of international migration. The purpose of this paper is to introduce some of the above-unexplored issues into the international migration literature.

In concluding this section, we refrain from repeating the major results of the paper, which are summarized in its propositions. Instead, we would like to relate some these findings to the existing literature of international migration. According to this literature, in the absence of taxes, income transfers and public goods, finite permanent migration is welfare beneficial to the nationals of the host country, and welfare

detrimental to the non-emigrants in the source country. Moreover, marginal migration has no welfare effects. When income taxes are used to generate revenue for income transfers, it has been shown that international migration benefits non-emigrants in the source country, and hurts those already in the host country. When income tax revenue finances the provision of a locally produced, non-tradable and under-provided public good, then under plausible assumptions, international migration hurts non-emigrants in the source country, and benefits those already in the host.

This analysis, under plausible assumptions pertaining to a typical source LDC or to a developed host country shows the following: First, when consumption tax revenue in either country is equally distributed among domestic households, then marginal migration has an ambiguous impact on either country's social welfare**.** Second, when the consumption tax revenue in either country is used to finance the provision of an imported but not locally produced public good, then emigration (immigration) is expected to decrease (increase) social welfare in the source (host) country. Third, when tariff revenue in either country is either equally distributed among domestic households, or it is used to finance the provision of an imported but not locally produced public good, international migration has an ambiguous effect on social welfare in the host country, and is expected to reduce social welfare in the source. The analysis uses as a special case the Heckscher-Ohlin model to examine the effect of international migration on group and social welfare in the source and host country.

Summarizing the analysis of this paper, and the review of the relevant literature, it becomes evident that the way governments in source or in host countries raise tax revenue (*e.g.,* income or consumption taxes, tariffs) as well as the way they dispense of it (*e.g.,* income transfers, provision of public goods) matter greatly for the welfare effects of international migration.

Appendix A: Derivation of equation (1)

When the public good is entirely imported, the trade balance equilibrium requires that the value, at world prices, of exports to equal the value of imports of the imported private traded good and of the public consumption good. That is,

$$Q_1 - D_1 = p^*(D_2 - Q_2) + g\,, \qquad \text{(A.1)}$$

where Q_i and D_i, i=1,2 are respectively the quantities produced and consumed of the two private traded goods. For simplicity it is assumed that the price of the public good equals one. Note also that $Q_2 = R_p$ and $D_2 = E_p$. Adding and subtracting pD_2 in the right-hand-side of (A.1), rearranging terms, and assuming that only consumption taxes finance the provision of the public good, we obtain:

$$Q_1 + p^* Q_2 = D_1 + pD_2 - (p - p^*)D_2 + g\,. \tag{A.2}$$

Using equation (4) and the assumption that B=0, $(p - p^*)D_2 = \tau E_p = -g$, equation (A.2) reduces to

$$Q_1 + p^* Q_2 = D_1 + pD_2\,, \quad \text{or} \quad R(L) = E = L^k e^k + L^w e^w\,. \tag{A.3}$$

Simple algebra can show that equation (A.3) also holds for the case where only tariffs are used to finance the provision of the public good (*i.e.,* $\alpha = 0, \beta = 1$).

Appendix B: Migration, Welfare and Lump-sum Taxes

Differentiating equations (1), (2) and (3), and letting τ=t=0, we get:

$$L^k du^k + L^w du^w + E_g dg = 0 \tag{B.1}$$

$$L^w du^w + L^w e_g^w dg = L^w R_{LL} dL \tag{B.2}$$

$$dg = TdL \tag{B.3}$$

Appendix C: Migration, Welfare and Consumption Taxes

Differentiating equations (1), (2) and (3), and letting T=t=0, we get:

$$(1 - \alpha\tau e_{pu}^k) L^k du^k + (1 - \alpha\tau e_{pu}^w) L^w du^w + (E_g - \alpha\tau E_{pg}) dg = -\alpha\tau(1-\mu)(e_p^k - e_p^w) dL\,, \tag{C.1}$$

$$-\alpha\tau\mu e_{pu}^k L^k du^k + (1 - \alpha\tau\mu e_{pu}^w) L^w du^w + (L^w e_g^w - \alpha\tau\mu E_{pg}) dg =$$

$$[L^w R_{LL} + \alpha\tau\mu(1-\mu)(e_p^w - e_p^k)]dL\,, \qquad \text{(C.2)}$$

$$(1-\alpha)\tau e_{pu}^k L^k du^k + (1-\alpha)\tau e_{pu}^w L^w du^w + [(1-\alpha)\tau E_{pg} - 1]dg =$$
$$-(1-\alpha)\tau e_p^w dL\,, \qquad \text{(C.3)}$$

where $E_{pg} = L^k e_{pg}^k + L^w e_{pg}^w$, $E_g = L^k e_g^k + L^w e_g^w$ and $\mu = (L^w / L)$.

Appendix D: Migration, Welfare and Tariffs

Differentiating equations (1), (2) and (3), and letting $T = \tau = 0$, we get:

$$(1-\beta t e_{pu}^k)L^k du^k + (1-\beta t e_{pu}^w)L^w du^w + (E_g - \beta t Z_{pg})dg =$$
$$-(\beta t / L)[L^k(e_p^k - e_p^w) - (1-\varepsilon)R_p]dL\,, \qquad \text{(D.1)}$$

$$-\beta\mu t e_{pu}^k L^k du^k + (1-\beta t e_{pu}^w)L^w du^w + L^w(e_g^w + (\beta t / L)E_{pg})dg =$$
$$[L^w R_{LL} - (\beta t / L)(L^k(e_p^k - e_p^w) - (1-\varepsilon)R_p)]dL\,, \qquad \text{(D.2)}$$

$$(1-\beta)t e_{pu}^k L^k du^k + (1-\beta)t e_{pu}^w)L^w du^w + [(1-\beta)tE_{pg} - 1]dg =$$
$$-(1-\beta)t(e_p^w - R_{pL})dL\,, \qquad \text{(D.3)}$$

where $Z_{pg} = E_{pg}$, and $\varepsilon = (R_p / L)R_{pL}$.

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