Migration and the Skill Composition of the Labour Force: The Impact of Trade Liberalization in LDCs

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Migration and the skill composition of the labour force: the impact of trade liberalization in LDCs

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Abstract. In this paper we add four features to the standard Heckscher-Ohlin model: skilled and unskilled labour, international labour mobility, migration costs, and financing constraints. We show that migration of unskilled, financially constrained workers increases, while migration of skilled workers is unaffected by trade liberalization in a developing country with stable population. That is, trade and migration of unskilled workers are complements, with trade liberalization resulting in a smaller and more skilled labour force. Comparing two identical countries except for their trade regimes, we find that the country with lower tariffs has a larger emigration of unskilled workers (trade and migration of unskilled workers are complements) and a smaller emigration of skilled workers (trade and migration of skilled workers are substitutes), resulting in a more skilled labour force and in an ambiguous effect on the size of the labour force. The same result holds in the case of a trade reform within a country, with population growth replacing the migrants in the pre-reform situation.

Migration et structure des compétences de la main d'oeuvre: l'impact de la libéralisation du commerce dans les pays moins développés. Dans ce mémoire, les auteurs ajoutent quatre dimensions au modèle traditionnel d'Heckscher-Ohlin: travailleurs qualifiés et non-qualifiés, mobilité internationale du travail, coûts et contraintes financières attachés à la migration. On montre que la migration des travailleurs non-qualifiés et sujets à des contraintes financières augmente alors que la migration des travailleurs qualifiés ne change pas quand il y a libéralisation du commerce dans un pays à population stable. Commerce et migration des travailleurs non-qualifiés sont des compléments, et la libéralisation du commerce engendre une main d'oeuvre moins importante et plus qualifiée. En comparant deux pays identiques sauf pour le régime de commerce, on trouve que le pays qui a les droits de douane les plus faibles a une plus grande émigration de travailleurs non-qualifiés, et une plus faible émigration de travailleurs qualifiés. Voilà qui se traduit par une main d'oeuvre plus qualifiée, mais qui a un effet ambigu sur la taille de la main d'oeuvre. On obtient les mêmes résultats

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dans le cas où il y a réforme de la politique commerciale dans un pays où la croissance de la population remplace les immigrants dans la situation de pré-réforme.

1. Introduction

The question of whether trade and migration are complements or substitutes has been the focus of much research and has become a major topic in the policy debate in a number of OECD countries. The issue has been discussed prominently in North America in the context of the integration of Mexico into NAFTA. The same has occurred in Western Europe, where trade liberalization with Northern Africa and Eastern Europe has been seen as a way of reducing migration.[1]

Policymakers in the European Union (EU) have become increasingly concerned with this issue, owing to both a perceived diminished capacity to absorb immigrants and the fear of a large increase in immigration in the future. In other words, demand for immigrant labour has fallen, while the supply is expected to increase. Similarly, the Mexican crisis of December 1994 and the subsequent austerity program has led to fears of a significant increase in migration to the United States. In fact, it has been reported that the flow of immigrants from Mexico to the United States was twice as large in January 1995 as it was in January 1994.

Among other instruments, policy-makers have considered using trade policy in order to deal with the perceived immigration 'threat.' For instance, in the context of the concern with massive emigration from the former Soviet Union (FSU), Germany's Foreign Minister Kinkel recently declared that opening Western European markets to goods from the East should be a priority in a new initiative on a common European 'Ostpolitik' (*Financial Times*, 24 March 1994). In the context of NAFTA, former President Salinas of Mexico stated: 'Mexico wants to export more goods, not people.' Other proponents of NAFTA, including Vice-President Gore, have also argued that NAFTA will help to reduce the migration pressure from Mexico. This assumes that liberalizing trade results in lower migration.

The traditional trade literature based on the Heckscher-Ohlin model claims that trade liberalization leads to a fall in international migration by reducing international factor price differences. Since trade liberalization results in more trade, the implication is that trade and migration are substitutes.[2] The assumptions made in this literature, however, do not necessarily reflect the actual conditions under which migration between developing and developed countries takes place.

Other trade theoretic papers (Markusen 1983; Wong 1983) have argued that trade and migration may, in fact, be complements. Markusen argues that substitution is a special case based on factor proportion models. He claims that if the basis for trade is other than a difference in relative factor endowments – such as a difference

1 The studies that have examined the effects of regional integration have abstracted from the effect on migration. A number of interesting papers on regional integration in the major trading areas are presented in Anderson and Blackhurst (1993), including the history, political economy, and legal and institutional aspects of regional integration. On studies of European integration, see Winters (1992). On the expansion of the EU and on association agreements, see Winters (1993).

2 The seminal paper that derives the substitutability result is Mundell (1957).

in technology or economies of scale – then trade and migration are complements. Economies of scale, combined with preference for diversity, result in intra-industry trade and can explain an important share of North-North trade. It is less relevant for North-South trade; technological differences are more important in explaining North-South trade. Markusen's complementarity result in that case, however, is due to the assumption that technology is higher in one country, but only in one sector. Alternatively, one might realistically assume that the higher technology is embedded in one factor (say, capital) that is more productive in both sectors in the more advanced economy (say, with better machinery in both the agricultural and industrial sectors). If the cross-country difference in the technology of capital is the same in both sectors, we obtain the standard result that migration and trade are substitutes.

The migration literature claims that trade and migration are complements in the short and medium run, though not in the long run, so that liberalizing trade will raise migration for a period that may last ten or even twenty years (U.S. Commission for the Study of International Migration 1990; Russell and Teitelbaum 1992; Martin 1993). Though the ideas presented in that literature may have a lot of merit, no rigorous framework is presented.

The purpose of this paper is to shed some light on the conditions under which trade liberalization in the developing countries is likely to cause an increae or a decrease in out-migration. We also examine the impact of trade liberalization on the skill composition of migration and of the labour force. For this purpose, we explicitly incorporate four additional features in the Heckscher-Ohlin model: heterogeneity of labour skills, international migration, migration costs, and constraints on financing migration. Though the analysis of the impact of financial constraints on migration is not new (e.g., Banerjee and Kanbur 1981), the contribution of the present paper is the incorporation of financial constraints in an open-economy general equilibrium model.

The remainder of the paper is organized as follows. In section 2 we present supporting evidence on migration costs and financing constraints. In section 3 we discuss some basic assumptions. In section 4 we set forth the basic model and in section 5 we derive the comparative static results. In section 6 some extensions are provided, and we conclude in section 7.

2. Evidence on migration costs and financing constraints

Starting with financing constraints, many potential migrants in developing countries have little or no collateral and cannot obtain the necessary credit to finance their migration costs. As they are unable to borrow money based on their higher expected future earnings – especially since these earnings are expected to materialize in another country – workers who want to emigrate must, for the most part, rely on their own savings to finance their migration costs.[3]

3 They might have access to credit in the informal market at prohibitive rates, but the net present value of the migration project would be negative in those cases.

Second, migration costs may account for a large share of the income of potential migrants from developing countries. The empirical evidence regarding these costs is limited, but two recent studies by Richard Adams (1991, 1994) report high migration costs to the Gulf for potential emigrants from Pakistan and Egypt. The average cost of migration for an emigrant from rural Pakistan to Saudi Arabia or Kuwait, for example, was Rs 21,000 or US$1,300 at the time a survey of 727 households was performed (1986–89). Data indicate that this cost constituted an effective constraint to migration for potential migrants in the poorer households.

Similar findings are obtained in the case of Egypt. A survey of 1,000 households in rural Egypt performed in 1986 revealed that the average cost of migrating to Iraq was US$365. If one includes the subsistence cost required for the two-month period that was necessary on average to find a job in Iraq, the full migration cost is closer to US$500. Because of the cost of obtaining a number of expensive permits, the migration cost to Saudi Arabia was about US$1,000, or twice the cost of migrating to Iraq. These figures are extremely high, considering that the average monthly wage for the people surveyed was only US$65. Thus, the migration cost to Saudi Arabia (Iraq) was equivalent to a fifteen-(eight-)month salary for these (potential) emigrants, a sum that is not easy to accumulate in own savings.

What is the combined effect of migration costs and credit constraints? Some evidence is available from Reed (1994), who examines migration behaviour from the Northeast of Brazil, the country's poorest region, to Saõ Paulo in the South. She finds that adverse economic shocks in the Northeast deter migration, while family wealth promotes it. Reed concludes that migration from the Northeast of Brazil is limited by credit constraints. She also finds that the negative impact of credit constraints is weaker in the case of individuals with more years of schooling. These findings are a motivation for the ensuing analysis, which explicitly incorporates skill heterogeneity as well as migration costs and credit constraints.

3. Some basic assumptions

In the presence of migration costs and financing constraints, a richer analysis is obtained by allowing for both skilled and unskilled labour. We assume that both types of workers are identical, except that the skilled workers are more productive. Both types of workers live two periods. They work in their home country in the first period, earn some income, and must then decide whether or not to use some of that income to migrate.

Migration is assumed to take place from a small labour-abundant economy in the South to a capital-abundant economy in the North with the same technology. The South initially protects its capital-intensive activities (Krueger 1978; Bhagwati 1978), and the North imposes restrictions on imports from the South. The latter results in lower export prices for the South. Protection both in the South and in the North results in a lower wage rate in the South than in the North.[4]

4 In reality, wage differences between North and South are caused by other factors as well. These

Trade liberalization under these assumptions can be characterized by a reduction in the tariff rate imposed by the South, by an increase in the export prices faced by the South due to a relaxation of the North's restrictions on imports from the South (as in a preferential agreement), or both. Given the usual symmetry and homogeneity conditions, it is clear that the effects on factor prices in the South of a reduction in (tariff) protection or of an increase in the export price are qualitatively the same. Both will cause a rise in the wage rate and a reduction in the rental price of capital if the South protects its capital-intensive activities and exports labour-intensive goods. In this paper we choose to focus the analysis on a reduction of protection in the South. In fact, a number of developing countries that are a significant source of migration flows to the North, such as Mexico and Morocco, have liberalized their trade regime unilaterally. Consequently, the analysis focuses on the effects of unilateral trade liberalization in the South.

4. The model

We start from a Heckscher-Ohlin model and add four features that reflect conditions found in many developing countries: skill heterogeneity, international labour mobility, migration costs, and financing constraints. Consider a small open economy in the South that produces two goods under a constant returns technology using capital and labour. Capital and labour are assumed to be mobile across the two sectors. There are two categories of labour, skilled and unskilled, which differ in their productivity by a factor $\gamma(\gamma > 1)$. That is, skilled workers are γ times more efficient than unskilled workers, but otherwise both labour inputs are identical.[5] The production functions of each sector under perfect substitution can be represented as follows:

$$y_i = F^i(L_i^u + \gamma L_i^s, K_i); \qquad i = 1, 2, \tag{1}$$

where y_i is output of industry i, L_i^u and L_i^s are the levels of unskilled and skilled workers used in industry i, respectively, and K_i is the level of capital in industry i.

Since the relative labour efficiency is the same in both sectors (i.e., γ is identical for the two industries), and since labour is fully mobile across sectors, it follows that the real wage rate for skilled workers is γ times the real wage for unskilled workers, or

$$w_s = \gamma w, \tag{2}$$

include differences in the level of technology and in the level of human capital. We generate a lower wage in the South (and thus an incentive to migrate) through protection of imports, because we are interested in the impact of changes in trade policy on the level and composition of migration flows. Adding a difference in technology or human capital between North and South has no qualitative effect on our results (but see the extensions in section 6).

5 Relaxation of the perfect substitution assumption under other plausible conditions does not affect the results. Proofs are available from the authors.

where w_s is the real wage of skilled workers and w is the real wage of unskilled workers.

Given equation (2), the minimum average cost functions for each industry can be written as functions of either w_s or w. We choose to express them in terms of w. Normalizing the world prices to unity, competitive long-run equilibrium with diversified production implies

$$\begin{aligned} &\text{(i)} \quad c^1(\tilde{w}, r) = 1 + \tau, \\ &\text{(ii)} \quad c^2(\tilde{w}, r) = 1, \end{aligned} \tag{3}$$

where $c^i(\cdot)(i = 1, 2)$ are the minimum average costs in each industry, r is the (nominal) rental price of capital, $\tilde{w}$ is the nominal wage for unskilled workers, and τ is the rate of tariff protection to the capital-intensive industry 1. Equations (3) solve for $\tilde{w}$ and r, and substituting the value of $\tilde{w}$ obtained from equation (3) into equation (2), we obtain the nominal wage rate for the skilled worker, $\tilde{w}_s$.

We assume that workers do not have acces to credit to finance their migration costs and that their wage is their only source of income.[6] Workers are assumed to live two periods. They get paid and consume at the end of each period. Their decision is whether or not to migrate at the end of the first period. Output is assumed to be perishable, so that consumption – plus migration costs if they decide to migrate – equals income in each period. Also, workers need a minimum level of income in order to subsist. Thus, a worker is able to migrate at the end of the first period if his/her wage in that period is greater than or equal to the sum of the subsistence wage and the migration costs. Of course, this is only a necessary condition for migrating, not a sufficient one.

Unskilled worker j maximizes the present value V^j of his/her utility flow

$$V^j = U(C_i^j) + \delta U(C_2^j), \tag{4}$$

where δ is an intertemporal discount factor and C_i^j is the vector of consumption goods in period i. The budget constraint if he/she does not migrate and therefore does not save is $E(p_1, U_1^j) = \tilde{w}^1$ and $E(p_2, U_2^j) = \tilde{w}^2$, where $E(\cdot)$ is the expenditure function, $p_k(k = 1, 2)$ is a vector of goods prices in each period, and $\tilde{w}^1$ and $\tilde{w}^2$ are the nominal unskilled wages in period one and period two, respectively.

If the utility functions are linearly homogeneous, then we can write $E^1 = U_1^j e(p_1)$ and $E^2 = U_2^j e(p_2)$, where $e(\cdot)$ is a cost-of-living index and U_i^j is utility in period i. In this case,

$$U_1^j = \frac{\tilde{w}^1}{e(p_1)} \equiv w^1, \quad U_2^j = \frac{\tilde{w}^2}{e(p_2)} \equiv w^2,$$

6 As is the case in many developing countries, capital is assumed to be concentrated in the hands of a few capitalists. Since their entire income comes from capital, they have no incentive to migrate; and because migration is costly, they remain in the South.

where w^1 and w^2 are the real wages. If preferences are Cobb-Douglas, then the cost-of-living index is also Cobb-Douglas; hence, given that world prices are normalized to one, $e(\cdot) = (1+\tau)^{\alpha}$, where α is the share of good 1 in consumption. Thus, the real wage is simply equal to the nominal wage divided by $(1+\tau)^{\alpha}$.

Workers expect policies to remain unchanged over time, and any policy change is assumed to be permanent. Unskilled workers earn $w^1 = w$ in the home country (South) in period 1. If unskilled worker j remains in the South in period 2, he/she will earn $w^2 = w$ in period 2 as well. Then the utility level of worker j, if he/she does not migrate, is $V_A^j = w + \delta w$. If the unskilled worker j migrates, he/she must first invest a migration cost, g^j (for the unskilled), at the end of period 1 in order to earn the higher wage (abroad) w^* at the end of period 2. Then utility is $V_B^j = (w - g^j) + \delta w^*$. Potential migrants compare V_A^j and V_B^j and select the larger of the two. This is, of course, subject to the financing constraint that w be greater or equal to the sum of the subsistence cost and the cost of migration.

The condition $V_B^j > V_A^j$ is equivalent to the condition $w^* - w > (1/\delta)g^j$. For simplicity, we abstract from the discount factor δ. Then, the condition $V_B^j > V_A^j$ is equivalent to the condition that $w^* - w > g^j$, or to the condition that the wage difference be larger than the migration cost. These simplifying assumptions have no qualitative effect on our results.[7] Thus, the unskilled worker j is assumed to migrate if

$$\begin{aligned} &\text{(i)} \quad w - \bar{w} \geqq g^j, \text{ and} \\ &\text{(ii)} \quad w^* - w \geqq g^j, \end{aligned} \tag{5}$$

where $\bar{w}$ is the subsistence wage, w^* is the unskilled wage rate abroad, and g^j is the migration cost relevant to unskilled worker j.[8] The same condition (5) holds for the skilled workers, where the unskilled wages are replaced by the skilled wages, and the migration cost g^j is replaced by h^j, the migration cost of skilled worker j.

We assume that the cost of migration differs across individuals according to their location and their migration-specific skills. Thus, migration costs are not homogeneous but are distributed in the sending countries according to well-defined

7 Of course, if δ_j differed across workers, then this would be another reason why workers would have different effective migration costs, where effective migration costs are defined as $(1/\delta_j)g^j$. In fact, as long as the discount rate δ_j is constant for each worker and does not vary with his/her wage, we can redefine the cost of migration as $G^j = g^j/\delta_j$ and proceed with G^j rather than with g^j. This would not affect the ensuing analysis.

8 Condition (5)(ii) holds under the assumption that w and w^* will remain unchanged in the future. If potential migrants believe that w or w^* may chnge over time, then there are two reasons why conditions (5)(ii) may not hold. First, if potential migrants are risk averse, they will also be concerned with the distribution of w and w^* and, ceteris paribus, will prefer the one with the lower variance. Second, even under risk neutrality, condition (5)(ii) may not hold because migration involves an element of irreversibility or hysteresis. Once the person has migrated, if the return on migration falls (say, because w increased unexpectedly), the person cannot undo the migration choice in a costless way because of the exit cost (migration costs are sunk and additional costs must be paid to return to the home country). These considerations lead migrants to demand a higher rate of return on migration in order to cover (insure) against these potential losses. On hysteresis, see Dixit (1989) and Pindyck (1993).

distribution functions. International migration costs are lower for people living close to the border with the destination country rather than in remote locations, for those who are better at searching for jobs in the destination country, for those who are better informed about the market for illegal migration services, and generally for those living in cities rather than in rural areas.[9]

Real migration costs for skilled workers are also likely to be lower than those for unskilled workers. There are at least two reasons. First, one would expect the skills of the skilled workers also to apply to the ability to acquire information about job opportunities in the destination country, about best migration routes, and about legal aspects related to residence and work in the destination country. Second, a larger proportion of unskilled workers migrates illegally. This is the case, for instance, with Mexican immigration to the United States. Illegal immigration is generally more expensive than legal immigration because of the payments illegal migrants need to make to the intermediaries who provide illegal migration services (the so-called coyotes on the Mexico–U.S. border) and because some illegal migrants get caught and must make more than one attempt before succeeding.

We first assume that the binding constraint to the migration of skilled workers is the incentive to migrate, while the binding constraint to the migration of unskilled workers is the financing constraint. These assumptions seem to be supported by some of the available (and limited) evidence and were selected because they enable us to show in a clear way the differential impact that changes in trade policy have on the migration of skilled and unskilled labour. In section 5, we also examine the effects of trade liberalization in the more general case, where these assumptions are relaxed. We rank the potential skilled and unskilled migrants according to their *individual* migration costs, with the ranking made in the order of increasing costs. We assume that migration costs for skilled and unskilled workers in the sending country are distributed according to a well defined density function.

Denoting by $f^s(c^s)[F^s(c^s)]$ the density (distribution) function of migration costs for the skilled workers in the sending country, the total migration of skilled workers, M_s, is

$$M_s = \left[\int_0^{w_s^* - \gamma w} f^s(c^s)dc^s\right] L_s = F^s(w_s^* - \gamma w)L_s, \tag{6}$$

where L_s is the domestic endowment of skilled workers. Inverting $F^s(\cdot)$ we obtain

$$w_s^* - \gamma w = h(L_s/M_s), \tag{7}$$

where, given the properties of $F^s(\cdot)$, we have that $h'(\cdot) < 0$ for $L_s/M_s < 1$, $h(1) = \bar{h}$, and $h(\cdot)$ is, of course, the migration cost schedule. That is, the (marginal) migration

9 It should be noted that the relevant migration costs from the viewpoint of financing constraints include not only transportation costs and fees for intermediaries, but also the subsistence cost while a job in the destination country is searched for.

cost is increasing in the number of migrants, M_s, and the highest migration cost is $\bar{h}$. Similarly, migration of the unskilled workers can be defined by

$$M_u = \left[\int_o^{w-\bar{w}} f^u(c^u)dc^u\right] L_u = F^u(w-\bar{w})L_u, \tag{8}$$

where $f^u(c^u)$ is the density function of the migration costs of the unskilled and $F^u(\cdot)$ is the cumulative distribution function. Equation (8) indicates that the total unskilled migrants are all those that have migration costs below their savings, $w-\bar{w}$. Inverting $F^u(\cdot)$, we get

$$w-\bar{w} = g(L_u/M_u) < 0;\ g'(\cdot),\ \text{for } L_s/M_s < 1,\ g(1) = \bar{g}, \tag{9}$$

where $g(\cdot)$ is the marginal migration cost when M_u unskilled workers migrate. The migration cost is increasing in M_u, and the maximum migration cost for the unskilled is $\bar{g}$.

The limits of integration in (6) and (8) reflect our assumption that the binding constraint for the migration of the skilled workers is the incentive constraint, while that for the unskilled workers is the financing constraint. That is, the wage for skilled workers is assumed to be sufficiently above $\bar{w}$ to cover the maximum migration cost possible among the skilled workers, that is, $w_s - \bar{w} > \bar{h}$. The migration cost is assumed not to be a binding constraint even for the skilled worker with the highest cost of migration. For the unskilled workers we assume that the gap between foreign wages and domestic wages is greater than the migration cost of the workers with the highest migration cost, or $w^* - w > \bar{g}$.

Given w and $\bar{w}$, only a subset of the unskilled workers is able to pay the migration costs. This subset migrates. Figure 1 shows the situation where $w^* - w > \bar{g}$ and $w-\bar{w} < \bar{g}$. All the unskilled workers would like to migrate, since their income gain $w^* - w$ is larger than the migration cost $\bar{g}$ of the least efficient potential migrant. However, not all are able to pay for the cost of migration. Out of the initial total population of unskilled workers, $0L_u$, only $0M_u$ workers are able to finance their migration costs from their income net of the subsistence wage. This means that at the start of the second period, $0M_u$ unskilled workers have emigrated, and the total effective endowment of unskilled labour is $L_u - M_u$.

Figure 2 shows the migration equilibrium for skilled workers, with $0M_s$ workers emigrating at the end of period 1 and the endowment of skilled workers at the start of period 2 being equal to $L_s - M_s$. Note that figure 2 differs from figure 1. In figure 1, the binding constraint on migration is the ability to finance the migration costs. In figure 2, the binding constraint is the wage differential between the destination and the home country.

There is a strong element of irreversibility in the migration of labour. For instance, assume that in the second period the wage in the destination country is lower than expected at migration time and/or that the wage in the sending country is higher than expected. Hence, in retrospect, some emigrants would have been

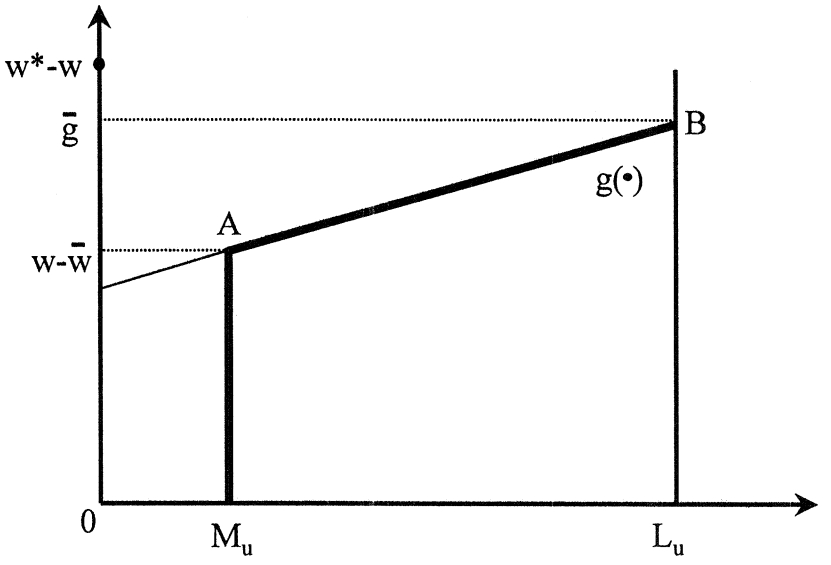

FIGURE 1

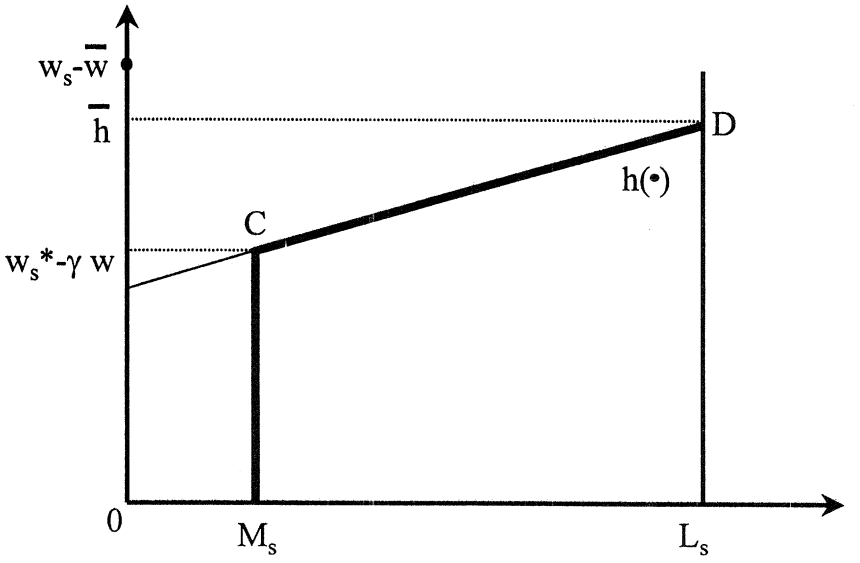

FIGURE 2

better off had they not migrated. They will not return, however, unless w^* falls sufficiently below w to make it worth-while to pay for return migration costs. Since wages in the North (or West) are typically higher than in the South (or East), there will be no return migration even if some migrants would have preferred not to have migrated given the new wage configuration. In our model, with protection of the capital-intensive sector in the South and positive return migration costs, migrants do not return.

To close the model we need to include the conditions for factor market equilibrium,

$$\begin{aligned} &\text{(i)} \quad c_1^1(\cdot)y_1 + c_1^2(\cdot)y_2 = L_u - M_u + \gamma(L_s - M_s) \\ &\text{(ii)} \quad c_2^1(\cdot)y_1 + c_2^2(\cdot)y_2 = K, \end{aligned} \tag{10}$$

where $y_i (i = 1, 2)$ are the output levels in each industry and K is the total endowment of capital. The labour endowment is expressed in labour efficiency units of those workers remaining in the country (with $M_u = M_s = 0$ during the first period).

Equations (2), (3i), (3ii), (7), (9), (10i), and (10ii) solve for $\tilde{w}$, $\tilde{w}_s$, r, M_u, M_s, y_1 and y_2. In fact, the system is recursive, with (3i) and (3ii) solving for $\tilde{w}$ and r; $\tilde{w}_s$ is next obtained from (2), M_u and M_s are solved from (7) and (9); and finally, (10i) and (10ii) solve for y_1 and y_2. Note that the real wages w and w_s are obtained by using $w = \tilde{w}/(1+\tau)^{\alpha}$ and $w_s = \tilde{w}_s/(1+\tau)^{\alpha}$.

The model is deterministic and agents are assumed to have perfect foresight. Burda (1993, 1995), Faini (1995), and Wyplosz (1994) have examined the impact of migration costs under uncertainty. Given the irreversibility of migration costs, there is an option value of waiting, which increases with the degree of uncertainty about the evolution of incomes in the sending and receiving countries. This argument has been used to explain why migration may be low despite large wage differentials. Our primary interest is in the migration impact of trade liberalization and, more specifically, of changes in ad valorem tariffs. The question then is: How does the assumption of uncertainty affect the *qualitative* effect of changes in the ad valorem tariffs on migration? It can be shown that the effect of Hicks-neutral technology shocks and terms-of-trade shocks on factor rewards is independent of the ad valorem tariff.[10] Hence, if uncertainty is mainly associated with these types of shocks, it follows that our qualitative results are not affected by the deterministic nature of the model. Furthermore, note that the option value of waiting is essentially a short-run phenomenon, and its impact disappears as information is revealed. The focus in this paper is on the long-term impact of changes in trade policy.

5. The effect of trade liberalization

In this section, we examine the comparative statics of trade liberalization by the country of the South. We first examine the effect of a change in the tariff level τ

10 This result follows from the homogeneity of the cost function (3). The proof is available from the authors.

within a given country over time with stable population, and then we compare two countries with stable population which are identical except for their tariff level τ. In the comparison over time, we assume that the tariff level was permanently fixed in the past, so that the country is in long-run equilibrium, and we examine the effect of a permanent trade reform (i.e., of a change in the tariff level). In the cross-country comparison, we examine the differences between two countries which are at their long-run equilibrium under different tariff levels. The latter is equivalent to a comparison within a given country over time with population growth replacing the emigrants (under the initial trade regime).[11] The two types of simulations are identical if there are no irreversibilities. With irreversibilities, the two simulations give different results.

The comparison over time with stable population may apply to countries that are in the post-demographic transition stage, such as Eastern European countries and countries from the former Soviet Union where the rate of population growth is about nil. As mentioned above, the cross-country comparison is qualitatively equivalent to a comparison within a country with population growth and applies to immigration from countries such as Eqypt, Morocco, and Mexico, which experience rapid population growth.

5.1. Comparison over time

5.1.a. Skilled (unskilled) labour constrained by incentives (costs)

We first consider the case where unskilled workers' migration is cost constrained and skilled workers' migration is incentive constrained. This assumption is supported by Reed's empirical results mentioned earlier. Below, we show the conditions under which this is true. Consider the case of a country in the South in long-run equilibrium with unskilled labour force $L_u - M_u$ and skilled labour force $L_s - M_s$. Assume the country carries out a partial trade liberalization, which is represented by a fall in tariff protection τ to the capital-intensive import-substitution sector. This causes $\tilde{w}$ and $\tilde{w}_s$ to increase and causes r to fall. Since the nominal wages $\tilde{w}$ and $\tilde{w}_s$ increase and τ falls, the real wages w and w_s increase proportionately more than the nominal wages. With partial trade liberalization, wages in the domestic economy remain lower than wages abroad. The fact that unskilled wages increase enables a greater number of unskilled workers to finance their migration costs. Thus, migration of unskilled workers takes place and a new equilibrium occurs at a migration level above M_u in figure 1.

The equilibrium level of skilled migrants, however, is not affected by the reduction in the gap between wages at home and abroad if M_s workers have already migrated (figure 2). Although fewer workers would have wanted to migrate at the higher real wage w_s, those who have already migrated will not return, since $w_s^* > \gamma w$ and return migration is costly. Hence, trade liberalization causes no

11 Changes in the trade regime will affect the level and skill composition of migration. Population growth is assumed to be equal to the initial level (and composition) of migration and not to change with changes in trade policy.

skilled migration flow and no change in the stock of skilled workers remaining in the South.

Thus, the effect of partial trade liberalization is threefold: it raises the total stock of migrants; it lowers the total labour endowment of the economy; and it raises its average skill level. Trade and labour migration are complements, rather than substitutes, in this case. The net effect on the domestic production of exportables and import substitutes is ambiguous. Trade liberalization has a positive impact on the production of exportables and a negative impact on the production of importables. On the other hand, the increased migration that trade liberalization induces has the opposite (Rybczynsky) effect.

We show below the conditions under which the assumption of an incentive constraint for skilled workers and a cost constraint for unskilled workers holds. These conditions are more likely to hold the higher the subsistence wage is and the higher γ is, the parameter of wage difference between skilled and unskilled labour.

5.1.b. Unskilled labour constrained by either costs or incentives

Consider now the case where domestic wages for unskilled workers in the South are closer to those in the North, so that the assumption that $w^* - w > \bar{g}$ does not necessarily hold.[12] In this case, migration of unskilled workers may be determined by the capacity to finance migration costs when the wage is low and by the expected wage gain if the domestic wage is higher (as might occur with trade liberalization). Figure 3 shows the migration supply function in this case.[13] Point B is the only point where both conditions are binding, that is, where $w^* - w = g = w - \bar{w}$. This occurs when $w = (w^* + \bar{w})/2$. This is also the maximum migration point ($\tilde{M}_u$). Thus, for $w > (w^* + \bar{w})/2$, the relevant migration schedule is CB, while for $w < (w^* + \bar{w})/2$, the relevant migration schedule is AB.

Note that as the wage rate increases, migration does not rise indefinitely. It reaches its maximum at $\tilde{M}_u$ for the unskilled and $\tilde{M}_s$ for the skilled (see figure 4). Thus, the model yields a maximum rather than an unbounded migration level. This is an appealing feature, since it is consistent with the observation that countries do not empty themselves of their entire population. The maximum outmigration of effective labour is $\tilde{M} = \tilde{M}_u + \gamma \tilde{M}_s$. As is well known, a country may specialize in production if migration is sufficiently large. The analysis is based on the assumption that specialization in production takes place at a level of migration larger than $\tilde{M}$.

In figure 3, a trade liberalization that raises the domestic wage rate from w_0 to w_1 would increase the stock of migrant workers from M_u^0 to M_u^1, and trade and migration would thus be complements. If the wage increase is larger (because trade liberalization is deeper) and wages increase from w_0 to w_2, migration patterns

12 As mentioned earlier, differences in technology or human capital could have been used to generate the wage difference. Then, this case might apply to a middle income country, while the case examined in sub-section 5.1.a would apply to a lower-income country, the wage difference between the two types of countries being due to technology or human capital differences. In this model, wage differences are generated by trade policy. Then, the analysis in sub-section 5.1.b applies to the case of lower trade protection.

13 Note that in figure 3 we are using w rather than $w - \bar{w}$ on the vertical axis.

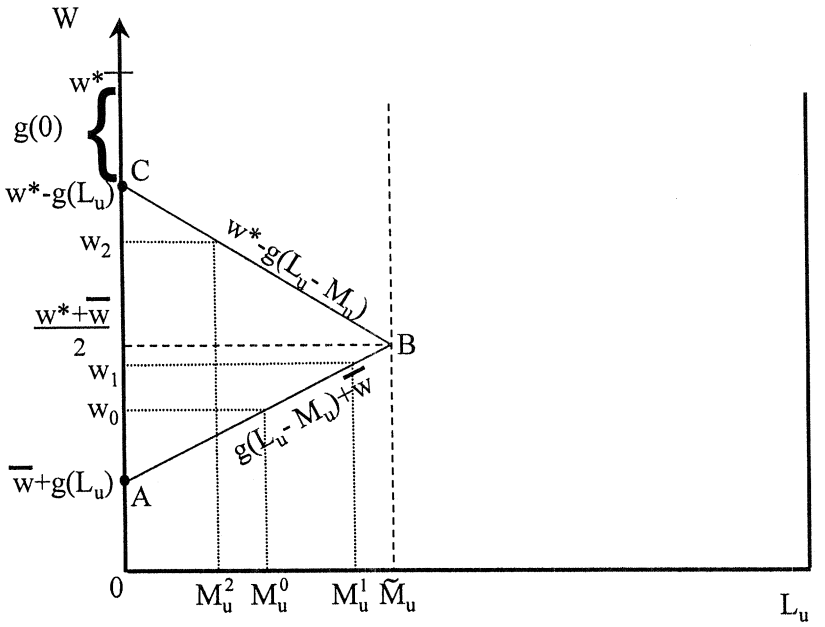

FIGURE 3

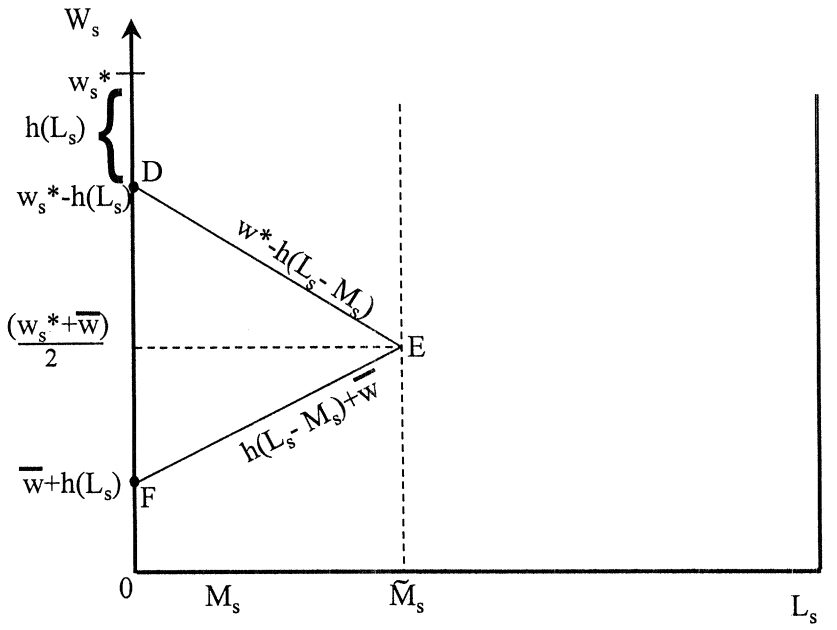

FIGURE 4

switch from the AB to the CB schedule. The interesting point is that in this case because initially M_u^0 workers are already out of the country and w^* is higher than w_2, workers will not come back, and trade liberalization thus would have no effect. That is, trade liberalization can never lead to return migration and to a decrease in the stock of migrants. It will either raise the number of migrants or leave it unchanged.

Under what conditions is it true that migration of unskilled workers is determined by the financing constraint while migration of skilled workers is determined by the incentive constraint? From the previous analysis, it is clear that this occurs when

$$\begin{aligned} &\text{(i)} \quad w < \frac{w^* + \bar{w}}{2}, \\ &\text{(ii)} \quad w_s > \frac{w_s^* + \bar{w}}{2}. \end{aligned} \tag{11}$$

where $w_s^* = \gamma^* w^*$. Equations (11i) and (11ii) are simultaneously satisfied if

$$\frac{w_s^* + \bar{w}}{2\gamma} < w < \frac{w^* + \bar{w}}{2}. \tag{12}$$

If w is outside the range set by equation (12), both skilled and unskilled workers are either cost-of-migration-constrained (if $w < (w_s^* + \bar{w})/2\gamma$) or both are incentive-constrained (if $w > (w^* + \bar{w})/2$). Anything that increases

$$\left(\frac{w^* + \bar{w}}{2}\right) - \left(\frac{w_s^* + \bar{w}}{2\gamma}\right) = \frac{1}{2}\left[w^* - \frac{w_s^*}{\gamma} + \frac{\gamma - 1}{\gamma}\bar{w}\right]$$

raises the range for which inequality (12) holds. Thus, the larger the subsistence wage and the larger the wage differential γ between skilled and unskilled labour, the broader is the wage range for which inequality (12) holds, that is, for which migration of skilled workers is incentive constrained and migration of unskilled workers is cost constrained.[14]

Proposition 1, below, summarizes the findings so far. These results hold under the following conditions (hereafter denoted '*conditions A*'): A standard Heckscher-Ohlin model with four distinctive features added, namely, international labour mobility, migration costs, financing constraints, and skilled and unskilled labour, which are assumed to be perfect substitutes. The latter assumption is later relaxed to show that it is a sufficient but by no means necessary condition for the results.

PROPOSITION 1. *If conditions A hold, the effect of trade liberalization in a country with stable population is as follows: (1) it raises the migration of unskilled workers; (2) migration of skilled workers remains unchanged; (3) the size of the labour force*

14 We have assumed that the wage differential γ in the South is not necessarily equal to the wage differential in the North γ^*. If $\gamma = \gamma^*$, then $w^* = w_s^*/\gamma$ and the range set by equation (12) simplifies to $(\bar{w}/2)[1 - (1/\gamma)]$.

falls; (4) the average skill level rises; but (5) in the case where unskilled labour becomes incentive constrained after trade liberalization, their migration level may remain unchanged.

The effect of increased protection is as follows: (1) it has no effect on the migration of unskilled workers; (2) it raises the migration of skilled workers; (3) it lowers the average skill level of the population; and (4) it reduces the size of the labour force. A surprising result is that any trade policy change will induce greater migration.

5.2. Comparison across countries

We now turn to a comparative statics exercise which compares two countries in the South that are identical except for their trade regime. This comparison applies also to the effect of a trade reform in a given country whose population growth replaces the pre-reform migrants. The question in this case is: How do the level and composition of the labour force differ in two countries that have identical technologies and equal initial factor endowments and that face the same world prices but differ in the level of protection conferred to the capital-intensive industry?

Using figures 3 and 4 can provide some insights in this respect. The high-protection country has lower wages than the low-protection country. If the unskilled wage rate is below $(w^* + \bar{w})/2$ in both countries, more unskilled labour will have migrated in the country that has a more liberal trade regime (complementarity between trade and migration). If the skilled wage rate is above $(w_s^* + \bar{w})/2$, the more liberal country will have fewer skilled workers who migrated than the more protected country (substitution between trade and migration). That is, if migration of unskilled workers is cost constrained and that of skilled workers is incentive constrained, we find that the more open country will have had a larger emigration of unskilled workers and a smaller emigration of skilled workers. Thus, the effect on the total level of migration is ambiguous. Consequently, the labour force may be larger or smaller in the country that follows a more liberal trade policy, but it will unambiguously be more skilled.

Alternatively, assume that population growth within a country is such as to replace the migrants and leave the level and skill composition of the population unchanged given the initial trade policy. Then, trade liberalization will result in a continuous increase in the skilled level of the population. The reason is that fewer skilled and more unskilled workers leave than are being replaced. The effect on the labour force as a whole is ambiguous.

To summarize the above, we can state:

PROPOSITION 2. *When two countries with stable populations but with different trade policies are compared, assuming that unskilled workers are cost-constrained and that conditions A hold in both countries, the more open country will have (1) a larger emigration of unskilled workers; (2) a smaller emigration of skilled workers; and (3) a more skilled population.*

6. Extensions

The approach developed here can be used to study the effect of other policies and exogenous changes on migration. Three cases are briefly examined.

First, setting a minimum wage for unskilled labour results in unemployment in the standard Heckscher-Ohlin model (and specialization). Assuming that unskilled labour experiences a constraint on financing migration costs, the higher minimum wage will result in an increase in migration. This will reduce the unemployment level originally induced by the minimum wage. Moreover, employers will substitute towards skilled labour, whose wage will increase. This will have no impact on migration of skilled labour if the comparison is within a country with stable population, and the result will be lower emigration of skilled labour under the other comparisons. Thus, a minimum wage law will create less unemployment in the presence of migration and financing constraints and will raise the average skill level.

Second, if wages in the South are lower because of a lower level of human capital than in the North, an increase in human capital would not necessarily affect the incentive to migrate (since wages would rise in both countries for those who acquire more human capital), but it would weaken the financing constraint. This would result in a higher level of emigration of the less skilled labour who were originally affected by the financing constraint. In that case, an investment that raised the level of human capital uniformly across the labour force would raise the average skill level in two ways: first, because of the investment, and second, because more unskilled labour would migrate.[15]

Third, assume a growing economy whose level of wages increases over time and whose population grows as well. Assume that in the early stage of its development, the country consists mainly of unskilled workers whose migration is restricted by financing constraints. Then, the increase in the level of wages will result in an increase in migration. This increase will continue until the financing constraint is no longer binding, that is, when $w > (w^* + \bar{w})/2$. As wages rise above that level for most workers, the effect of a further increase in wages is a reduction in the level of migration. This reduction continues until the wage differential is equal to the migration cost of the most efficient migrant, at which point migration stops. This migration pattern over time was found by Faini and Venturini (1993) for Greece, Portugal, and Turkey.

7. Conclusion

In this paper we have considered the impact of trade liberalization in a small developing economy on the migration of skilled and unskilled workers to higher-wage

15 The above is rigorously true if the utility function is log-linear, so that the incentive to migrate depends on the relative wage differential. If the utility function is *closer* to a linear function, then an increase in human capital would raise the incentive to migrate. As long as marginal utility of income is diminishing, however, the effect of an increase in human capital on the financing constraint will be larger than the effect on the incentive to migrate.

countries. The analysis is developed using a modified Heckscher-Ohlin framework that allows for heterogeneity of skills, international labour mobility, migration costs, and constraints on financing migration costs. Consistent with the stylized facts, developing countries are assumed to protect capital-intensive activities.

We have shown that migration of unskilled, financially constrained workers increases, while migration of skilled workers is unaffected by trade liberalization, in a developing country with stable population. That is, trade and migration of unskilled workers are complements, with trade liberalization resulting in a smaller and more skilled labour force. Comparing two identical countries except for their trade regimes, we found that the country with lower tariffs has a larger emigration of unskilled workers (trade and migration of unskilled workers are complements) and a smaller emigration of skilled workers (trade and migration of skilled workers are substitutes), resulting in a more skilled labour force and in an ambiguous effect on the size of the labour force. The same result holds in the case of a trade reform within a country with population growth replacing the migrants in the pre-reform situation.

In countries where emigration is an important phenomenon, a more liberal trade regime with internationally immobile capital will result in a labour force with a more favourable skill mix. This finding is robust whether the comparison of trade regimes is made across countries or over time and, under certain plausible conditions, whether substitutability of skilled and unskilled labour is perfect or not.

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