

INTERNATIONAL MIGRATION OF SKILLED LABOUR, WELFARE AND UNEMPLOYMENT OF UNSKILLED LABOUR: A NOTE

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ABSTRACT:

The present paper makes an attempt to examine theoretically the impact of emigration of skilled labour from developing countries on the level of welfare of the non-migrants and the level of urban unemployment of unskilled labour in a three sector Harris-Todaro model. The analysis suggests that in a reasonable production structure for a developing economy a brain drain of skilled labour raises urban unemployment of unskilled labour. The paper also shows that an emigration of skilled labour may raise the welfare of the non-migrants in a tariff-distorted economy if it imports the specialized manufacturing product or the labour-intensive good. However, if the economy imports the traditional manufacturing product, the welfare of the non-emigrating workers is likely to deteriorate.

JEL Classification: F2, F 00, F22, J64.

Keywords: Emigration of skilled labour; unskilled labour; Harris-Todaro framework; welfare of the non-migrants; urban unemployment.

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1. Introduction

There exists a traditional theoretical literature on the effect of international migration from a less developed country on the welfare of the non-migrants in that country. Notable contributions in this field are Bhagwati and Rodrigues (1975), Rivera-Batiz (1982, 1984), Thompson (1984), Djajic (1986), Quibria (1988), etc. The traditional result in the literature is that, in a two-product small open economy, any given amount of emigration does not affect the welfare of the non-migrants because the presence or the absence of the migrant group in the population implies the same terms of trade, and hence the same trade opportunity for the non-migrants (see Bhagwati and Rodrigues (1975)). Rivera-Batiz (1982) has shown that if one of the two commodities is internationally non-tradable, the emigration, if it is from the non-tradable goods sector, reduces the 'exchange opportunities' the non-migrants have under the presence of (and with) the migrants, in terms of the exchange of traded for non-tradable goods. Relative price of the non-tradable goods goes up and this adverse terms of trade lowers the welfare of the non-migrants. But Quibria (1988) has shown that if any movement of capital does not accompany the international migration of labour then per capita availability of capital for the non-migrants labour force also rises. This produces a positive income-effect. If the positive income-effect outweighs the adverse terms of trade effect, the effect on welfare is exactly opposite to that Rivera-Batiz (1982) has found. In these papers neo-classical full-employment framework has been followed. However, the LDCs are plagued by high levels of unemployment, especially in the urban sector. So a full-employment neo-classical structure cannot appropriately depict the true picture of the labour market in the LDCs. Gupta (1991) in terms of a two-sector dual economy model with Harris-Todaro (1970) type of rural-urban migration has shown that the emigration to the foreign country worsens the income distribution and hence lowers the welfare of the non-migrants. However, in all these papers we do not find any distinction between migrant and non-migrant labour force from the viewpoint of skill.

Only in recent years we find that there exists a large number of theoretical and empirical works related to various aspects of international trade where the labour force is of two types – skilled and unskilled. A representative sample of this literature is difficult to construct. One can refer to the works of Berman, Bound and Grilliches (1994), Bhagwati (1995), Borjas and Ramey (1995),

Leamer (1995), Wood (1995, 1997), Collins (1996), Jones and Engerman (1996), Marjit (1997, 1998) etc. on this issue. The existing works mainly deal with the impact of trade and technology on the skilled - unskilled wage gap. Our idea in this paper, however, is different. We consider the simultaneous existence of skilled and unskilled labour in the economy to examine the impact of the international migration of skilled labour from the developing countries on the welfare of the non-migrants and on the unemployment of unskilled labour.

The present paper is based on a general equilibrium framework. The economy has been broadly divided into urban sector and rural sector. The urban sector consists of a specialized manufacturing sector and a traditional manufacturing sector. The economy produces two exportable commodities and one importable and the import-competing sector is protected by a tariff. We refer to the international migration of skilled labour force from developing economies as 'brain drain'.

Conventional wisdom suggests that 'brain drain' of skilled labour from developing countries should reduce welfare. The analysis of the present paper, however, shows that in a reasonable production structure for a developing economy a brain drain of skilled labour may raise the welfare of the economy (and of the non-migrants) if it imports the labour-intensive good or the specialized manufacturing product. However, if the economy imports the traditional manufacturing product, the welfare of the economy unambiguously deteriorates. The welfare of the non-emigrating workers is also likely to fall in this case. Also an emigration of skilled labour always raises urban unemployment of unskilled labour.

2. The Model

We consider a small open monetised dual economy, which is broadly divided into an urban sector and a rural sector. The urban sector is subdivided into two sub-sectors so that all total we have three sectors in our economy. The first sector within the urban sector is the manufacturing sector that requires only skilled labour¹ apart from capital to produce its product. We refer to the sector as the specialized manufacturing sector.² **[[Footnote 1:** One may consider an alternative production structure where sector 1 also requires unskilled labour to produce its output. The qualitative results of the model remain unaltered. See also footnote 4 in this context.]]. **[[Footnote 2:** We may call it the 'R & D' sector.]]. The second sector within the urban sector is a

manufacturing sector, which produces its product with the help of unskilled labour and capital. The third sector is the rural sector. It has been assumed that it produces its product with unskilled labour and capital. So capital is mobile among all the three sectors and unskilled labour is mobile between sectors 2 and 3. But skilled labour is specific to sector 1. Owing to our small open economy assumption we consider all the three product prices to be given internationally. Let us assume that the urban unskilled labour earns a minimum wage W^* . The wage rate of the rural unskilled labour W and W^* (with $W^* > W$) are related by the Harris-Todaro (1970) condition of migration equilibrium where the expected urban wage rate equals the rural wage rate. We also assume that the economy exports two of the three commodities and is a net importer of the other. At this moment we do not specify any specific trade pattern of the economy. Production functions exhibit constant returns to scale with diminishing marginal productivity to each factor.

The following symbols will be used in the equations.

a_{Ki} = capital-output ratio in the i th sector, $i = 1,2,3$;

a_{Li} = labour-output ratio in the i th sector, $i = 1,2,3$;

P_i = world price of the i th good, $i = 1,2,3$;

P_i^* = domestic or tariff-inclusive price of the i th good, $i = 1,2,3$;

t_i = ad-valorem tariff rate on the i th good and $t_i \geq 0$;

W_s = wage rate of skilled labour;

W = wage rate of unskilled labour;

r = return to capital;

L^* = fixed amount of supply of unskilled labour;

L_U = urban unemployment of unskilled labour;

L_S^* = fixed amount of supply of skilled labour;

K^* = fixed capital stock of the economy.

As the economy imports only one commodity and exports the rest only one of the three t_i s is positive and the rest are zero.

A general equilibrium of the system is represented by the following set of equations:

$$W_s \cdot a_{LS1} + r \cdot a_{K1} = P_1^* \quad (1)$$

$$W^* \cdot a_{L2} + r \cdot a_{K2} = P_2^* \quad (2)$$

$$W \cdot a_{L3} + r \cdot a_{K3} = P_3^* \quad (3)$$

$$a_{LS1}.X_1 = L_S^* \quad (4)$$

$$a_{K1}.X_1 + a_{K2}.X_2 + a_{K3}.X_3 = K^* \quad (5)$$

$$a_{L2}.X_2 + a_{L3}.X_3 + L_U = L^* \quad (6)$$

$$(W^*/W).a_{L2}.X_2 + a_{L3}.X_3 = L^* \quad (7)$$

Equation (7) is the Harris-Todaro (1970) migration equilibrium condition. We have seven equations to solve for seven unknowns (W_S , W , r , X_1 , X_2 , X_3 and L_U). The system possesses the decomposition property. So the three factor prices are determined from the price system alone, independently of factor endowments, i.e. from equations (1), (2) and (3). Once we know the factor prices, all the factor coefficients are also known. X_1 , X_2 and X_3 are then determined from equations (4), (5) and (7). Finally, L_U is found from (6) once X_2 and X_3 are known.

Before going to comparative statics, it is important to mention that our measure of welfare in this small open economy is national income measured at world prices, Y , and it is expressed as follows.

$$Y = W_S.L_S^* + r.K^* + W.L^* - t_i.P_i.X_i \quad (8)$$

In equation (8) $W_S.L_S^*$ is the income of the skilled workers within the economy. $r.K^*$ is the capital income. $W.L^*$ is the wage income of the unskilled workers of the economy. Finally, $t_i.P_i.X_i$ measures the cost of tariff-protection of the i th import-competing sector. The per capita income of the non-migrating labourers, y is given by

$$y = (Y / (L^* + L_S^*)) = [(WL^* + rK^* + W_S.L_S^* - t_i.P_i.X_i) / (L^* + L_S^*)] \quad (8.1)$$

2.1 *Effects of Emigration of Skilled Labour*

We shall now consider the impact of emigration of skilled labour on the endogenous variables of the system. We assume that the international migration of skilled labour does not deplete the economy's given capital stock³ and that the labourers are the owners of capital. The latter implies that the total population of the economy comprises of only the skilled and unskilled labourers.

[[Footnote 3: See Quibria (1988). The international movement of capital accompanying an emigration of labour may be prevented by government laws.]]

Using the 'hat mathematics' of Jones (1965) and noting that K^* and L^* do not change, from equations (4), (5) and (7) we may write

$$\hat{X}_1 = \hat{L}_S^* \quad (9)$$

$$\lambda_{K1} \cdot \hat{X}_1 + \lambda_{K2} \cdot \hat{X}_2 + \lambda_{K3} \cdot \hat{X}_3 = 0 \quad (10)$$

$$\lambda_{L2} \cdot \hat{X}_2 + \lambda_{L3} \cdot \hat{X}_3 = 0 \quad (11)$$

where $\lambda_{K1} = (a_{K1} \cdot X_1 / K^*)$; $\lambda_{K2} = (a_{K2} \cdot X_2 / K^*)$; $\lambda_{K3} = (a_{K3} \cdot X_3 / K^*)$; $\lambda_{L2} = ((W^*/W) \cdot (a_{L2} \cdot X_2 / L^*))$; $\lambda_{L3} = (a_{L3} \cdot X_3 / L^*)$ and the circum flex denotes a proportional change. Using (9), equation (10) may be rewritten as

$$\lambda_{K2} \cdot \hat{X}_2 + \lambda_{K3} \cdot \hat{X}_3 = -\lambda_{K1} \cdot \hat{L}_S^* \quad (10.1)$$

Solving (10.1) and (11) by Cramer's rule one gets

$$\begin{aligned} \hat{X}_2 &= -(1/\Delta) \cdot \lambda_{K1} \cdot \lambda_{L3} \cdot \hat{L}_S^* > 0 \quad (\text{since } \hat{L}_S^* < 0) &) \\ \hat{X}_3 &= (1/\Delta) \cdot \lambda_{K1} \cdot \lambda_{L2} \cdot \hat{L}_S^* < 0 &) \end{aligned} \quad (12)$$

where, $(\Delta = \lambda_{K2} \cdot \lambda_{L3} - \lambda_{K3} \cdot \lambda_{L2}) > 0$ if $[(\lambda_{K2}/\lambda_{L2}) > (\lambda_{K3}/\lambda_{L3})]$, i.e. if sector 2 is relatively capital intensive to sector 3 in value terms. So X_1 and X_3 decrease and X_2 increases as L_S^* decreases following an emigration of skilled labour.

The above results can be explained intuitively as follows. An emigration of skilled labour cannot change the factor prices (and hence factor coefficients) since these are determined independently of the factor endowments. However, as L_S^* decreases due to an emigration of skilled labour, X_1 decreases since a_{LS1} does not change. So capital is released from sector 1 which produces a Rybczynski effect. If $(\lambda_{K2}/\lambda_{L2}) > (\lambda_{K3}/\lambda_{L3})$ i.e. if sector 2 is capital intensive relative to sector 3 in value terms, X_2 increases and X_3 decreases⁴. **[[Footnote 4: Unskilled labour is also released from sector 1 if it also uses unskilled labour along with skilled labour and capital to produce its output. But despite this modification sector 2 expands and sector 3 contracts if sector 1 is more capital intensive than both sector 2 and sector 3 with respect to unskilled labour. The subsequent results of the paper remain valid even in this alternative production structure.]]**.

Differentiating equation (8) with respect to L_S^* we get

$$(dY/dL_S^*) = W_S - t_i \cdot P_i \cdot (dX_i/dL_S^*) \quad (8.2)$$

We now consider the different possible trade patterns for a developing economy.

Case I: The country is an importer of the labour-intensive commodity (product of the rural sector)⁵.

[[**Footnote 5:** According to the World Development Report (1991), most less developed countries are net importers of food, some of these are net exporters in specific food items. For example, Erstwhile Soviet Union, Egypt, Nigeria, Iran, Iraq, South Korea, Brazil, Cuba, Mexico etc. are major importers of wheat and have so far operated under a tariff-quota-subsidy system of trade restrictions. See also Raghavan (1991) and Marjit and Gupta (1995) in this context. At the same time there are many newly industrializing economies which have grown to be large manufacturing exporters. See Beladi and Marjit (1996), page 932. Also there are countries like India which are large exporters of many manufacturing products as well as of highly specialized manufacturing products like computer soft-wares.]]. In this case, $t_3 > 0$ but $t_1, t_2 = 0$. A decrease in L_S^* leads to a contraction of sector 3. So we have $(dX_3/dL_S^*) > 0$. We can show⁶ that $(dY/dL_S^*) < 0$ iff $[(W_S \cdot L_S / W \cdot L^*) \cdot (\theta_{L3} / \lambda_{K1}) \cdot \{(\lambda_{K2} / \lambda_{L2}) - (\lambda_{K3} / \lambda_{L3})\}] < (t_3 / (1+t_3))$.

[[**Footnote 6:** This result has been proved in appendix I.]]. The per capita income of the non-migrants, y increases if (not only if) the above condition holds.

Case II: The country is an importer of the specialized manufacturing product and an exporter of the other two commodities. This is also a realistic trade pattern for a technologically backward country, which may not possess sufficient resources (e.g. skilled labour) and appropriate technology to produce sufficient amount of the good to satisfy its domestic demand. In this case, $t_1 > 0$ but $t_2, t_3 = 0$. A decrease in L_S^* leads to a contraction of sector 1. In this case $(dY/dL_S^*) < 0$ iff $\theta_{LS1} < (t_1 / (1+t_1))$ ⁷. [[**Footnote 7:** See appendix I for the proof.]]. In this case too, y increases if (not only if) $\theta_{LS1} < (t_1 / (1+t_1))$.

Case III: The country is an importer of the traditional manufacturing product. So we have $t_2 > 0$ but $t_1, t_3 = 0$. As X_2 increases due to an emigration of skilled workers $(dX_2/dL_S^*) < 0$. So from (8.2) we find that $(dY/dL_S^*) > 0$. The per capita income of the non-migrants is also likely to fall unless the size of the economy's capital stock is abnormally large⁸, which is, of course, highly implausible for a typical capital scarce less developed economy. [[**Footnote 8:** See appendix I for the mathematical proof.]].

This establishes the following proposition.

PROPOSITION 1: An emigration of skilled labour from a small open economy with a tariff protected import-competing sector raises the welfare of the non-migrants measured in terms of the per capita income (i) if $[(W_S \cdot L_S / W \cdot L^*) \cdot (\theta_{L3} / \lambda_{K1}) \cdot \{(\lambda_{K2} / \lambda_{L2}) - (\lambda_{K3} / \lambda_{L3})\}] < (t_3 / (1+t_3))$, when the economy is an importer of the unskilled labour-intensive commodity; and, (ii) if $\theta_{LS1} < (t_1 / (1+t_1))$ when it imports the specialized manufacturing product. However, if the economy imports the traditional manufacturing product, the non-migrating workers are likely to be worse-off unless the size of capital stock of the economy is abnormally large.

Using (12) from (6) one can derive

$$-(1/\Delta) \cdot \lambda_{L2} \cdot \lambda_{L3} \cdot \lambda_{K1} \cdot \hat{L}_S^* [(W/W^*) - 1] + \lambda_{LU} \cdot \hat{L}_U = 0$$

(+) (-) (-)

So, $\hat{L}_U > 0$ when L_S^* decreases. This leads to the following proposition.

PROPOSITION 2: An emigration of skilled labour raises the level of urban unemployment of unskilled labour.

Intuition behind the result is fairly straightforward. An international migration of skilled labour leads to an expansion of the urban manufacturing sector (sector 2), thereby raises the expected urban wage rate of the unskilled labour above the actual rural wage rate. Unskilled labourers migrate from the rural sector to the urban sector. The number of new migrants outweighs the number of new vacancies created in sector 2 resulting in an increase in the level of urban unemployment and a contraction of the rural sector.

3. Concluding Remarks

The paper theoretically examines the impact of emigration of skilled labour from developing economies on the level of social welfare and urban unemployment of unskilled workers in terms of a three-sector Harris-Todaro (1970) model. The main contribution of the paper is two-fold. First, the paper shows that in a reasonable production structure for a developing economy a brain drain of skilled labour raises urban unemployment of unskilled labour. Second, it shows that an emigration of skilled labour may raise the welfare of the tariff-distorted economy if it imports the specialized manufacturing product or the labour-intensive good. However, if the economy imports the traditional manufacturing product, an international migration of skilled labour has

unambiguous adverse effect on the economy's welfare. These results are important in the context of greater openness in the trade and investment regimes and also in the context of the ongoing debate on skilled-unskilled wage gap in many Third World Economies.

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Appendix I:

Case I: In this case from (8.2) $(dY/dL_S^*) = W_S - t_3.P_3.(dX_3/dt_3)$. Using (12) this becomes

$$\begin{aligned}
 (dY/dL_S^*) &= W_S - t_3.P_3.(\lambda_{K1}.\lambda_{L2}.X_3 / \Delta.L_S^*) \\
 &= [[W_S.L_S^*.\lambda_{L3}.\{(\lambda_{K2}/\lambda_{L2}) - (\lambda_{K3}/\lambda_{L3})\} - t_3.P_3.\lambda_{K1}.X_3].[\lambda_{L2} / L_S^*.\Delta]] \\
 &= X_3.[[W_S.(L_S^*/L^*).\alpha_{L3}.\{(\lambda_{K2}/\lambda_{L2}) - (\lambda_{K3}/\lambda_{L3})\} - t_3.P_3.\lambda_{K1}].[\lambda_{L2} / L_S^*.\Delta]] \\
 &= X_3.P_3^*[[(W_S.L_S^*/W.L^*).\theta_{L3}.\{(\lambda_{K2}/\lambda_{L2}) - (\lambda_{K3}/\lambda_{L3})\} - (t_3/(1+t_3))\lambda_{K1}].[\lambda_{L2} / L_S^*.\Delta]] \\
 &\quad ((\text{Note that } P_3^* = (1+t_3).P_3 \text{ and } \theta_{L3} = (W.\alpha_{L3} / P_3^*))
 \end{aligned}$$

$$\text{So } (dY/dL_S^*) < 0 \text{ iff } [(W_S.L_S / W.L^*).\theta_{L3} / \lambda_{K1}].\{(\lambda_{K2}/\lambda_{L2}) - (\lambda_{K3}/\lambda_{L3})\} < (t_3/(1+t_3))] \quad (\text{A.1})$$

Case II:

From (8.2) $(dY/dL_S^*) = W_S - (t_1.P_1 / \alpha_{LS1}) = ((W_S.\alpha_{LS1} - t_1.P_1) / \alpha_{LS1}) = (P_1^* / \alpha_{LS1})(\theta_{LS1} - (t_1/(1+t_1)))$

(Note that from (4) $(dX_1/dL_S^*) = (1 / \alpha_{LS1})$) and $\theta_{LS1} = (W_S.\alpha_{LS1} / P_1^*)$ where $P_1^* = (1+t_1).P_1$.

$$\text{So } (dY/dL_S^*) < 0 \text{ iff } \theta_{LS1} < (t_1 / (1+t_1)) \quad (\text{A.2})$$

If Y increases due to an emigration of skilled labour, the per capita income of the non-migrants, y also increases since the size of non-migrant people, $(L^* + L_S^*)$ decreases.

Case III:

Differentiating equation (8.1) one can derive

$$\begin{aligned}
 (dy/dL_S^*) &= (1 / (L^*+L_S^*)^2).[L^*.(W_S - W) - r.K^* + t_2.P_2.\{X_2 - (L^*+L_S^*).(dX_2/dL_S)\}] \quad (\text{A.3}) \\
 &\quad (+) \qquad \qquad \qquad (-)
 \end{aligned}$$

The sign of (dy/dL_S^*) in case III is ambiguous. However from (A.3) it is apparent that the most likely sign of (dy/dL_S^*) is positive unless the size of the domestic capital stock is abnormally large which is, of course, quite improbable for a typical capital scarce less developed country.