INTERNATIONAL MIGRATION OF SKILLED AND UNSKILLED LABOUR, WELFARE AND SKILLED-UNSKILLED WAGE INEQUALITY: A SIMPLE MODEL

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Abstract: The paper shows that in a reasonable production structure for a developing economy a brain drain of skilled labour may raise the welfare of the economy while an emigration of unskilled labour is welfare reducing. Also an emigration of skilled / unskilled labour lowers the urban unemployment of unskilled labour and widens the skilled-unskilled wage-gap. The paper provides an alternative explanation for the increasing wage inequality in many less developed countries in the regime of liberalized trade and investment in terms of higher international mobility of skilled and unskilled labour during this period using a Harris-Todaro (1970) framework where the central principle of the Stolper-Samuelson theorem holds.

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1. Introduction:

The last two decades have witnessed a rapid growth of the global economy, reflected in reduced trade barriers, increased international trade, highly mobile capital and labour and the rapid transmission of technology across national lines. Globalization perpetuates emigration from developing countries in the following way. It stimulates consumerism and consumption and raises expectations regarding the standard of living. The widening gap between consumption expectations and the available standard of living within structural constraints of the developing countries, combined with easy access to information and migration networks, in turn create tremendous pressure for emigration (Zhou and Gatewood 2000).

Emigration from developing economies must have important consequences for the source countries. Trade and development economists are likely to be concerned in studying the implications of such emigration on welfare and labour markets of the developing countries.

There exists a conventional theoretical literature, which analyzes the effect of emigration of labour from a developing country on the welfare of the non-migrants in that country. The customary 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 (Bhagwati and Rodrigues 1975). However, 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 may lower the welfare of the non-migrants. But Quibria (1988) has shown that if the international migration of labour is not associated with any movement of capital, 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. However, in all the above papers we do not find any distinction between migrant and non-migrant labour force from the viewpoint of skill.

Unfortunately, economists so far have paid very little attention in analyzing the welfare consequences of emigration of skilled labour from the developing countries, which has gained momentum especially after globalization. A notable exception is, however, Chaudhuri (2001). In this paper, it has been shown that in a reasonable production structure for a developing economy a brain drain of skilled labour raises urban

unemployment of unskilled labour and may improve the welfare of the non-migrants in a tariff-distorted economy.

Developing economies are plagued by significant degree of skilled-unskilled wage inequality and high levels of unemployment of unskilled labour, especially in the urban areas. Large-scale international migration of workers from a developing country, irrespective of whether skilled or unskilled, may produce significant effects on overall employment and wages as well as skilled-unskilled wage gap in that country.

Trade liberalization in the less developed countries, according to the conventional wisdom, was expected to lower the skilled-unskilled wage gap following increases in the prices of the export commodities. The increases in the world prices of the exportables of the less developed countries are possibly owing to the multilateral tariff reductions by the large trading countries and the consequent increase in their import demands. This according to the celebrated Stolper-Samuelson (S-S) theorem should increase the wage rate of unskilled labour vis-à-vis skilled labour since the former type of countries generally export commodities that are intensive in the use of unskilled labour, and thus lead to a reduction in the wage inequality. But empirical evidence from several Latin American countries [see Wood (1995,1997), Robbins (1994a,1994b, 1995a,1995b, 1996a, 1996b)] has pointed out that the gap has in fact widened. The empirical literature in this area has identified the following as the prime factors responsible for the growing incidence of wage inequality in the Latin American countries:

(i) removal of tariff restrictions from the sectors which were relatively intensive in the use of unskilled labour (Harrison and Hanson 1999, Hanson and Harrison (1999), Curie and Harrison 1997);

(ii) growth in foreign direct investment which is positively correlated with the relative demand for skilled labour (Robbins 1994a,b, Feenstra and Hanson 1997); and,

(iii) falling real minimum wages and decline of union strength of the unskilled workers (Harrison and Hanson 1999).

The inability of the standard trade theoretic models to explain widening wage inequality calls for explanations. Although all the empirical studies acknowledge the inherent ambiguities of wage predictions in the higher-dimensional Heckscher-Ohlin (H-O) framework, the theoretical literature has not grown sufficiently to explain this puzzling empirical finding. However, mention should be made of papers by Feenstra and Hanson (1995) and Marjit, Broll and Sengupta (2000) who have explained the increasing wage inequality in developing countries theoretically in terms of specific structural characteristics of the less developed countries, such as features of labour markets, structures of production, nature of capital mobility etc. The paper of Feenstra and Hanson (1995) is based on the famous Dornbusch-Fischer-Samuelson continuum-of-goods framework. According to them, inflows of foreign capital induced greater production of skilled-intensive commodities in Mexico, thereby leading to a relative decrease in the demand for unskilled labour. On the other hand, Marjit, Broll and Sengupta (2000) have examined the

impact of trade liberalization on the wage inequality in the presence of informal sectors. They have shown that the impact of trade on skilled-unskilled wage gap crucially hinges on the nature of capital mobility between the formal and informal sectors.

The H-O model with S-S theorem at its core has come under increasing criticism from economists because of its assumptions like perfectly competitive markets, perfect mobility of factors across sectors of the economy, constant returns to scale technologies, the absence of non-traded goods etc. Winters (2000) has argued that relaxing one or more assumptions of the H-O model may lead to a weakening or complete reversal of the out-and-out prediction of the S-S theorem that trade liberalization causes skilled-unskilled wage inequality to change asymmetrically in developed and developing countries. So, one has to be very careful in using a theoretical framework, which is largely derived from the H-O model, for the purpose of analyzing changes in wage inequality in developing countries.

The present paper makes a modest attempt to analyze the implications of international migration of skilled and unskilled labour from the developing countries on its welfare, unemployment of unskilled labour and skilled-unskilled wage inequality. For expositional purpose we follow a two sector-specific factor Harris-Todaro (1970) model[1] with urban unemployment of unskilled labour where the basic principle of the S-S theorem holds. The economy has been divided into urban sector and rural sector. The urban sector is the tariff-protected import-competing sector, which produces a specialized manufacturing product using unskilled labour and capital along with the sector-specific input – skilled labour. The rural sector produces the exportable commodity of the economy with capital and unskilled labour.

Conventional wisdom suggests that 'brain drain' of labour from developing countries should reduce welfare. The analysis of the present paper, however, shows that in a production structure reasonable for a developing economy a brain drain of skilled labour may raise the welfare of the economy while an emigration of unskilled labour may be welfare reducing. More interestingly, the paper shows that an emigration of skilled / unskilled labour lowers the urban unemployment of unskilled labour and may widen the skilled-unskilled wage-gap. The paper, therefore, provides an alternative explanation for the increasing wage inequality in terms of higher international mobility of skilled and unskilled labour in the regime of

[1]A Harris-Todaro structure has been followed mainly for two reasons. First, one can explain the existence of urban unemployment of labour (a persistent problem in the developing countries) and, therefore, study the effects of different policies on its extent. In such a framework, unskilled workers in the urban sector receive an exogenously given unionized wage, which is greater than the competitive rural sector unskilled wage rate. This wage differential, a resultant of labour market imperfection in the urban sector, leads to rural-urban migration of unskilled labour, which is a common feature in the developing countries. Secondly, in an H-T framework the average unskilled wage rate of workers in the economy is equal to the rural sector wage rate. This is due to a special property implied by the framework, know as the envelope property. So to analyze the effect of a policy on the skilled-unskilled wage gap, one only needs to study the effects on the skilled and rural sector unskilled wage rates. Moreover, despite some limitations, the H-T framework has been used extensively in development economics.

liberalized trade and investment using a simple variant of the H-O model where the central principle of the S-S theorem holds.

2. The Model:

We consider a small open Harris-Todaro type[2] dual economy, which is divided into a rural sector and an urban sector. The first sector is the rural sector. It produces its product with unskilled labour and capital. The urban sector is the specialized manufacturing sector that requires skilled labour, unskilled labour and capital to produce its product. So capital is perfectly mobile between the two sectors. The rural wage rate W is flexible while the wage rate in the urban sector W* is exogenously given with W* > W. This wage differential leads to migration of labour from the rural to the urban sector. Skilled labour is specific to sector 2. Owing to our small open economy assumption we consider the two product prices to be given internationally. The production function of the rural sector exhibits constant returns to scale with diminishing marginal productivity to each factor. On the contrary, the production function of the urban sector is of the fixed-coefficient type.[3] We also assume that commodity 1 is less capital intensive than the other with respect to unskilled labour in value terms.

Given the assumption of perfectly competitive markets the usual price-unit cost equality conditions relating to the two sectors of the economy are given by the following two equations, respectively.

$W.a_{L1} + r.a_{K1} = P_1$ (1)

$W^*.a_{L2} + r.a_{K2} + W_S.a_{S2} = P_2^*$ (2)

where, a_{Ki} = capital-output ratio in the *i*th sector, $i = 1,2$; a_{Li} = unskilled labour-output ratio in the *i*th sector, $i = 1,2$; a_{S2} = skilled labour-output ratio in sector 2; P_i = world price of the *i*th good, $i = 1,2$; P_2^* = domestic

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[2] In a Harris-Todaro economy there two sectors: the rural sector and the urban or modern sector. There is imperfection in the urban labour market in terms unionized wage. The unionized wage is given exogenously and greater than the competitive rural wage. This wage differential leads to migration of workers from the rural to the urban sector. Migration equilibrium is attained when the expected urban wage and the rural wage are equal. In the migration equilibrium, the urban-rural wage differential and urban unemployment of labour persist. This is why equilibrium in the Harris-Todaro economy is sub-optimal. The present model is a small variant of the Harris-Todaro model. Here there are two types of labour– skilled and unskilled. The urban sector besides unskilled labour and capital uses a sector specific input, skilled labour.

[3] This is a simplifying assumption. We should note that there are three factors of production in the urban sector and that it is an uneven system. So if the production function of the urban sector too were of the variable-coefficient type, the algebra of the model would have been seriously complicated by the presence of partial elasticities of substitution between different inputs. Moreover, as the urban sector produces a specialized manufacturing product the scope for factor substitution is likely to be rather limited. Thus, even with variable coefficient technology, qualitative results are likely to be altered very little and the same results may hold with suitable restrictions on partial elasticities of substitutions between different inputs.

or tariff-inclusive price of good 2; t = ad-valorem tariff rate on good 2; W_S = wage rate of skilled labour; W = rural wage rate of unskilled labour; W* = urban wage rate of unskilled labour; and, r = return to capital.

Now we present the factor endowment equations.

$a_{S2}.X_2 = \alpha.L_S$ (3)

$a_{K1}.X_1 + a_{K2}.X_2 = K$ (4)

$a_{L1}.X_1 + a_{L2}.X_2 + L_U = \beta.L$ (5)

where, L = fixed amount of supply of unskilled labour; L_S = fixed amount of supply of skilled labour; K = fixed capital stock of the economy; β = fraction of L residing in the source country; α = fraction of L_S residing in the source country; and, L_U = level of urban unemployment of unskilled labour. Equations (3) and (4) are the full-employment conditions of skilled labour and capital, respectively. Equation (5) is the endowment equation for unskilled labour.

Finally, the Harris-Todaro migration equilibrium condition is given by the following.

$W^*.\{a_{L2}.X_2/(a_{L2}.X_2 + L_U)\} = W$ (6)

Here $\{a_{L2}.X_2/(a_{L2}.X_2 + L_U)\}$ is the probability of finding a job in the urban sector for an unskilled rural migrant. So, the left-hand side of equation (6) gives the expected urban wage rate for a prospective unskilled rural migrant. Migration of workers from the rural to the urban sector would continue so long as the expected urban wage exceeds the actual rural wage rate. Migration equilibrium is attained when the expected urban wage and rural wage rates are equal. Using (5), equation (6) can be rewritten as follows.

$a_{L1}.X_1 + (W^* / W).a_{L2}.X_2 = \beta.L$ (6.1)

We should note that the production structure described by (1) – (6) depicts an in-decomposable system. So input prices are not determined by product prices alone. These also depend on factor endowments. Using (3) from equation (6.1) we may write

$X_1 = (1 / a_{L1}).[\beta.L – (W^*/W).(a_{L2}/a_{S2}).\alpha.L_S]$ (7)

Using (3) and (7) equation (4) can be rewritten as

$(a_{K1}/a_{L1}).[\beta.L – (W^*/W).(a_{L2}/a_{S2}).\alpha.L_S] + (a_{K2}/a_{S2}).\alpha.L_S = K$ (4.1)

(1), (2) and (4.1) are the three equations to solve for the three input prices – W, W_S and r. Equations (1) and (4.1) are solved simultaneously to get the equilibrium values of W and r. Inserting the value of r into equation (2), W_S is obtained. Once the factor prices are known, the factor coefficients are also known. X_2 is found from (3). X_1 is solved from equation (6) once the factor prices and X_2 are known. Finally, L_U is found from equation (5). In this model, it may be checked that the basic tenet of the Stolper-Samuelson theorem holds. An increase in the price of the export commodity P_1, which is intensive in the use of unskilled labour, will lead to an increase in both W and r. Note that W and r are found from equations (1)

and (4.1). We now argue why an increase in r leads to a decrease in the skilled wage rate, W_S. Note that equation (2) is the zero profitability condition for the urban sector. If r rises, the cost of capital input used in the urban sector rises. This implies that the skilled wage rate, W_S, must fall given the urban unskilled wage rate, W*, to enable the firms to earn zero profits. Thus the skilled-unskilled wage gap declines as the price of the exportable commodity rises following a liberalized trade policy. On the other hand, an increase in P_2 cannot affect both W and r. It only raises W_S – the skilled wage rate. As a consequence, the skilled-unskilled wage inequality rises following an increase in the price of the skill-intensive commodity.

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

$$Y = W.\beta.L + W_S.\alpha.L_S + r.K - t.P_2.X_2 \qquad (8)$$

Here $W.\beta.L$ is the total wage income of the unskilled workers in a Harris-Todaro economy and $W_S.\alpha.L_S$ is the wage income of skilled labour. r.K denotes the income earned from the economy's capital stock. Finally, $t.P_2.X_2$ measures the cost of tariff protection of the import-competing sector.

3. Comparative Static Exercises:

Let us now analyze the effects of emigration of skilled / unskilled labour on welfare, urban unemployment of unskilled labour and skilled-unskilled wage gap in the economy. An emigration of skilled labour lowers the value of α while an international migration of unskilled labour leads to a fall in the value of β. We assume that the international migration of labour does not deplete the economy's given capital stock[4] 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. Totally differentiating equations (1), (2) and (4.1) and after putting ($dP_1 = dP_2^* = dK = da_{L2} = da_{K2} = da_{S2} = 0$) we get the following equations, respectively:

$$\theta_{L1}.\hat{W} + \theta_{K1}.\hat{r} = 0 \qquad (9)$$

$$\theta_{K2}.\hat{r} + \theta_{S2}.\hat{W}_S = 0 \qquad (10)$$

and,

$$A.\hat{W} - \sigma_1.\lambda_{L1}.\hat{r} = -\hat{\beta} + D.\hat{\alpha} \qquad (11)$$

where, $A = \{(W^*/W).a_{L2}.X_2 + \sigma_1.\lambda_{L1}\} > 0$; λ_{ji} = proportion of the *j*th input employed in the *i*th sector of the economy, *j* = L, K, L_S, and, *i* = 1, 2; θji = distributive share of the *j*th input in the *i*th industry, *j* = L, K, L_S, and, *i* = 1, 2; σ1 = elasticity of substitution between two inputs in sector 1; "^" = proportional change; and,

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

$D = [\lambda_{K2}.(K/\beta.L).\{(a_{L2}.W^*/a_{K2}.W) - (a_{L1}/a_{K1})\}] < 0$ (note that $\{(a_{L2}.W^*/a_{K2}.W) - (a_{L1}/a_{K1})\} < 0$ if the urban sector is more capital-intensive than the rural sector with respect to unskilled labour in value terms.) Solving (9), (10) and (11) by Cramer's rule we get

$$\hat{W} = (\theta_{K1}.\theta_{S2} / \Delta).(-\hat{\beta} + D.\hat{\alpha}) \qquad (12)$$

$$\hat{r} = -(\theta_{L1}.\theta_{S2} / \Delta).(-\hat{\beta} + D.\hat{\alpha}) \qquad (13)$$

and, $$\hat{W}_S = (\theta_{L1}.\theta_{K2} / \Delta).(-\hat{\beta} + D.\hat{\alpha}) \qquad (14)$$

where, $\Delta = [\theta_{L1}.\theta_{S2}.\sigma_1.\lambda_{L1} + \theta_{K1}.\theta_{S2}.A] > 0$.

From (12) – (14) we can observe that any particular factor price moves in the same direction due to an emigration of labour, irrespective of its type (skilled or unskilled).

In this Harris-Todaro type economy, W is the average wage of unskilled labour. To find out the impact of an emigration of labour (skilled or unskilled) on the skilled-unskilled wage gap, after subtracting (14) from (12) one gets

$$(\hat{W}_S - \hat{W}) = [(\theta_{L1}.\theta_{S2} / \Delta).\{(\theta_{K2} / \theta_{S2}) - (\theta_{K1} / \theta_{L1})\}.(-\hat{\beta} + D.\hat{\alpha})] \qquad (15)$$

It is sensible to assume[5] that the capital-skilled labour ratio in sector 2 is greater than the capital-unskilled labour ratio in sector 1. Hence $\{(\theta_{K2} / \theta_{S2}) - (\theta_{K1} / \theta_{L1})\} > 0$. Thus from (15) it follows that $(\hat{W}_S - \hat{W}) > 0$ when $\hat{\beta}$ and / or $\hat{\alpha} < 0$. Therefore, we have the following proposition.

PROPOSITION 1: An international migration of labour (skilled or unskilled) raises the skilled-unskilled wage gap.

Proposition 1 can be intuitively explained as follows. As the system does not possess the decomposition property, factors prices depend not only on the commodity prices but also on the factor endowments. An emigration of unskilled labour (skilled labour) lowers its availability to the domestic industries. Now given its demand, the unskilled (skilled) wage rate rises due to relative scarcity of that factor. Given the product prices, the rate of return to capital, r, falls to satisfy the zero profitability condition. From the price-unit cost

[5] In this model the rural sector (sector 1) produces an unskilled labour intensive primary agricultural commodity while the urban sector is assumed to produce a skilled-intensive commodity like R & D. Both sectors use capital. However, the capital-skilled labour ratio in the R & D sector is likely to exceed the capital-unskilled labour ratio in the sector producing an agricultural commodity. However, it should be pointed out that in the mechanized capitalist agriculture highly sophisticated equipments like tractors, harvesters etc. are used. But ours is a dual economy with a predominantly backward agricultural sector. So in such a framework the above assumption is justified.

equality condition[6] for the other sector, it then follows that the skilled (unskilled) wage rate rises too. This may be explained economically as follows. Emigration of skilled labour raises the skilled wage rate resulting from relative scarcity of that factor than before. The sector using skilled labour must contract thereby releasing capital for the other sector. The return to capital decreases. The other sector expands and raises the demand for unskilled labour resulting in an increase in the unskilled wage rate. On the other hand, international migration of unskilled labour raises the competitive unskilled wage rate. The urban sector remains undisturbed as it uses a specific input – skilled labour and the production technology is of the fixed coefficient type. The return to capital, r, decreases as it now becomes relatively abundant than previously. A decrease in r raises the skilled wage rate to satisfy the zero profitability condition. Thus, both skilled and unskilled wage rates increase following international migration of labour of either type. The skilled-unskilled wage inequality must depend on the relative increases of the two wage rates. Relative capital intensities of the two sectors must play the most crucial role in determining the magnitudes of increases in the two wage rates. It is realistic to assume that capital would be more intensively used in the production (with respect to skilled labour) of the specialized manufacturing sector vis-à-vis the unskilled agricultural sector (with respect to unskilled labour). Thus, the wage inequality may worsen following an international migration of labour of either type.

Proposition 1 provides an alternative explanation for the widening of the skilled-unskilled wage gap in many third world countries in the post-liberalization period. The fact that the wage gap has increased in the post-liberalization era does not necessarily imply a refutation of the Stolper-Samuelson theorem[7], but may be because of the higher international mobility of the factors of production (e.g. an international migration of both skilled and unskilled labour) resulting from the liberalized trade policies.

Now from (7) after differentiating we can derive the following results:

$$(da_{L1}.X_1/d\beta) = [L + (W^* / W^2).(a_{L2}/a_{S2}).\alpha.L_S.(dW/d\beta)] \; ; \qquad (16)$$

$$\text{and, } (da_{L1}.X_1/d\alpha) = [(a_{L2}/a_{S2}).L_S.(W^*/W).\{(1/W).(dW/d\alpha) - 1\}] \qquad (17)$$

Using (3), equation (5) may be rewritten as

[6] The price-unit cost equality conditions for the two sectors are basically the zero profitability conditions given the perfectly competitive product markets where the firms cannot earn more than normal profits. So the relationship between two variable input prices must be a negative one for each sector. Thus, if the skilled (unskilled) wage rate rises resulting from emigration of skilled (unskilled) labour, the rate of return to capital must fall. Then, from the zero profitability condition for the other sector it follows that the wage rate for unskilled (skilled) labour increases as well.

[7] It has been already pointed out that the basic tenet of the Stolper-Samuelson theorem holds in the given set-up.

$a_{L1}.X_1 + (a_{L2}/a_{S2}).\alpha.L_S + L_U = \beta.L$ (5.1)

Differentiating (5.1) and after using (16) and (17) the following expressions can be obtained:

$(dL_U/d\beta) = -[(W^*/W^2).(a_{L2}/a_{S2}).\alpha.L_S.(dW/d\beta)] > 0$ (since $(dW/d\beta) < 0$ from (12))

and, $(dL_U/d\alpha) = -(a_{L2}/a_{S2}).L_S - [(a_{L2}/a_{S2}).L_S.(W^*/W).\{(1/W).(dW/d\alpha) - 1\}]$

$= -(a_{L2}/a_{S2}).L_S.[(W^*/W^2).(dW/d\alpha) + ((W - W^*)/W)]$

> 0 (since $W < W^*$ and $(dW/d\alpha) < 0$ from (14))

So we have the following proposition.

PROPOSITION 2: An international migration of labour (skilled or unskilled) lowers the level of urban unemployment of unskilled labour.

The intuition behind proposition 2 is fairly straightforward. An emigration of unskilled labour raises the rural wage rate of unskilled labour as the supply of this input decreases relative to its demand. As the urban sector uses a specific input - skilled labour and production technology is of the fixed coefficient type, the output of the urban sector remains unaltered. Then the employment level of unskilled labour in this sector also remains unchanged. As the wage differential between the two sectors decreases, a reverse migration takes place resulting in a lower level of urban unemployment of the unskilled labour. On the other hand, an international migration of skilled labour not only raises the rural wage rate for unskilled labour but also leads to shrinkage of the urban sector since skilled labour is specific to the urban sector. The latter also lowers the expected urban wage rate of unskilled labour. Hence, the urban unemployment of unskilled labour decreases following a reverse migration from the urban to the rural sector.

We are now in a position to analyze the impact of an emigration of labour (skilled or unskilled) on the welfare of the economy. Differentiating (8) with respect to β we get

$(dY/d\beta) = W.L + (dW/d\beta).\beta L + (dr/d\beta).K + (dW_S/d\beta).\alpha.L_S$ (18)

Note that X_2 does not change as β falls. Using (12) – (14) and after simplification this reduces to[8]

$(dY/d\beta) = (\theta_{S2}/\Delta)[WL.\theta_{K1}.\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} + (\theta_{L1}.\theta_{K2}.P_2^*/\beta.a_{K2}).(K - a_{K2}.X_2)]$

So $(dY/d\beta) > 0$ if $\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} > 0$. (Note that $(K - a_{K2}.X_2) > 0$ as $X_1 > 0$.).

However, the effect of a decrease in β on the per capita income of the non-migrants $(Y/(\beta L + \alpha L_S))$ is ambiguous.

Also differentiating (8) with respect to α one gets

[8] See appendix I for the mathematical proof of this result.

$$(dY/d\alpha) = \beta L.(dW/d\alpha) + W_S.L_S + \alpha L_S.(dW_S/d\alpha) + (dr/d\alpha).K - t.P_2.(dX_2/d\alpha) \quad (19)$$

Using (12) – (14) and after simplification this reduces to[9]

$$(dY/d\alpha) = [(D.r.W.a_{K1}.a_{L2}.X_2) / (P_1.\alpha.\sigma_1.\lambda_{L1})] + (P_2^*.X_2 / \alpha).[\theta_{S2} - (t/(1+t))]$$

$$< 0 \text{ if } [\theta_{S2} \leq (t/(1+t))].$$

So if the share of tariff revenue in domestic price of import of good 2, $(t/(1+t))$, is not less than the distributive share of skilled labour in industry 2, θ_{S2}, then an emigration of skilled labour raises the economy's national income at world prices. It is needless to mention that the per capita income of the non-migrants also increases as Y increases due to an emigration of skilled labour. Hence the following proposition[10] can now be established.

PROPOSITION 3: (i) Emigration of unskilled labour worsens the welfare of the economy if $\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} > 0$. The effect on the per capita income of the non-migrants is, however, uncertain. On the contrary, (ii) an international migration of skilled labour raises the per capita income of the non-migrants and improves the welfare of the economy if $[\theta_{S2} \leq (t/(1+t))]$.

4. Concluding Remarks:

This paper analyzes the impact of international migration of skilled and unskilled labour in a two sector specific factor general equilibrium model with Harris-Todaro type unemployment of unskilled labour. The rural sector produces the export commodity using capital and unskilled labour while the urban sector is the tariff-protected import-competing sector that produces its output using unskilled labour, capital and the sector-specific input – skilled labour. In this production structure, we find that an emigration of unskilled labour is likely to be welfare reducing while the international migration of skilled labour under a reasonable sufficient condition is welfare improving. An emigration of labour (skilled or unskilled) raises the wage rates of both types of labour. However, the effect on total wage income is ambiguous since factor endowment decreases. On the other hand, the rental rate and hence total income earned from the economy's capital stock falls. An emigration of unskilled labour cannot affect the level of production of the urban sector and hence the cost of tariff protection of the import-competing sector. The national income at world prices decreases under the sufficient condition, $\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} > 0$. On the contrary, in the case of international migration of skilled labour, there is another factor leading to an increase in the economy's welfare. As the size of skilled labour of the economy decreases, the output of the protected import-competing sector (urban sector) contracts. This tends to push up the welfare as the volumes of trade increase. The expansionary forces on Y dominates over the contractionary forces if the sufficient condition, $[\theta_{S2} \leq (t/(1+t))]$, is fulfilled. Therefore, we may get opposite results on welfare in the two cases. Besides,

[9] This has been derived in appendix I.

the international migration of labour (skilled as well as unskilled) lowers the urban unemployment of unskilled labour and more interestingly leads to an increase in the skilled-unskilled wage gap. The latter result is quite interesting because it provides an alternative explanation for the widening of wage inequality in the liberalized trade and investment regime in terms of a simple variant of the H-O model where the basic tenet of the S-S theorem is satisfied.

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[10] The results of proposition 3 have been intuitively explained in section 4.

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Appendix I:

1.

$$(dY/d\beta) = WL - \beta L.(W/\beta).(\theta_{K1}.\theta_{S2}/\Delta) + r.(K/\beta).(\theta_{L1}.\theta_{S2}/\Delta) - (W_S/\beta).(\theta_{L1}.\theta_{K2}/\Delta).\alpha L_S \qquad (18)$$

$$= (1/\Delta)[LW^*\theta_{S2}.\theta_{K1}.a_{L2}.X_2 + WL.\theta_{S2}.\sigma_1.\lambda_{L1} - WL.\theta_{K1}.\theta_{S2} + (rK/\beta).\theta_{L1}.\theta_{S2} - (W_S/\beta).\alpha L_S.\theta_{L1}.\theta_{K2}]$$

(obtained after putting the value of Δ and simplification)

$$= (1/\Delta)[WL.\theta_{S2}.\theta_{K1}.\{(W^*/W).a_{L2}.X_2 - 1 + (\sigma_1.\lambda_{L1}/\theta_{K1})\} + (\theta_{L1}/\beta).\{(rKW_S.a_{S2}/P_2^*) - \alpha W_S.L_S.\theta_{K2}\}]$$

$$= (1/\Delta)[WL.\theta_{S2}.\theta_{K1}.\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} + (a_{S2}.W_S.\theta_{L1}.\theta_{K2}/\beta).\{(K/a_{K2}) - (\alpha L_S/a_{S2})\}]$$

$$= (1/\Delta)[WL.\theta_{S2}.\theta_{K1}.\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} + (a_{S2}.W_S.\theta_{L1}.\theta_{K2}/\beta.a_{K2}).\{(K - a_{K2}.X_2\}]$$

So $(dY/d\beta) > 0$ if $\{(W^*/W).\lambda_{L2}.\beta L + (\sigma_1.\lambda_{L1}/\theta_{K1}) - 1\} > 0$.

[Note that $\lambda_{L2} = (a_{L2}.X_2 / \beta L)$, and from (3) $X_2 = (\alpha.L_S / a_{S2})$].

2. $(dY/d\alpha) = \beta L.(dW/d\alpha) + W_S.L_S + \alpha L_S.(dW_S/d\alpha) + (dr/d\alpha).K - t.P_2.(dX_2/d\alpha)$ (19)

After using (12) – (14), putting the value of Δ and noting from (3) that $(dX_2/d\alpha = X_2/\alpha)$ this becomes

$(dY/d\alpha) = \beta L(W/\alpha).(\theta_{K1}.D/\sigma_1.\lambda_{L1}) + W_S L_S + L_S W_S.(\theta_{L1}.\theta_{K2}.D/\theta_{S2}.\sigma_1.\lambda_{L1}) - (rK.\theta_{L1}.D/\alpha.\sigma_1.\lambda_{L1}) -$

$(tP_2.X_2/\alpha)$

$= (D/\alpha\sigma_1\lambda_{L1}).[W\beta L.\theta_{K1} + (\alpha L_S.W_S.\theta_{L1}.\theta_{K2}/\theta_{S2}) - rK.\theta_{L1}] + (1/\alpha)[a_{S2}.W_S.X_2 - tP_2.X_2]$ (after using (3))

$= (D/\alpha\sigma_1\lambda_{L1}).[W\beta L.\theta_{K1} + X_2.\theta_{L1}.\theta_{K2}.P_2^* - rK\theta_{L1}] + (P_2^*.X_2/\alpha).[\theta_{S2} - (t/(1+t))]$ (note that $P_2^* = (1+t)P_2$)

$= (D/\alpha\sigma_1\lambda_{L1}).[W\beta L.\theta_{K1} + \theta_{L1}(r.a_{K2}.X_2 - rK)] + (P_2^*.X_2/\alpha).[\theta_{S2} - (t/(1+t))]$

$= (D/\alpha\sigma_1\lambda_{L1}).[(W\beta L.r.a_{K1} / P_1) + (r.W.a_{L1} / P_1).(a_{K2}.X_2 - K)] + (P_2^*.X_2 / \alpha).[\theta_{S2} - (t/(1+t))]$

$= (W.r.D/P_1.\alpha\sigma_1\lambda_{L1}).[a_{K1}.\beta L + a_{L1}.(a_{K2}.X_2 - K)] + (P_2^*.X_2 / \alpha).[\theta_{S2} - (t/(1+t))]$

$= (W.r.D/P_1.\alpha\sigma_1\lambda_{L1}).[a_{K1}.\beta L - a_{L1}.a_{K1}.X_1] + (P_2^*.X_2 / \alpha).[\theta_{S2} - (t / (1+t))]$

$= (W.r.D/P_1.\alpha\sigma_1\lambda_{L1}).[\beta L - a_{L1}.X_1] + (P_2^*.X_2 / \alpha).[\theta_{S2} - (t/(1+t))]$

$= (W.r.D.a_{K1}.a_{L2}.X_2 / P_1.\alpha\sigma_1\lambda_{L1}) + (P_2^*.X_2 / \alpha).[\theta_{S2} - (t / (1+t))]$

(–)

Hence $(dY/d\alpha) < 0$ if $\theta_{S2} \leq (t / (1+t))$.