

2 October, 2005

International Migration of Labour and Skilled-Unskilled Wage Inequality**Shigemi Yabuuchi^{a,♣} and Sarbajit Chaudhuri^b**

ABSTRACT: The present note develops a three sector general equilibrium structure with diverse trade pattern and imperfection in the unskilled labour market to analyze the consequences of international mobility of skilled and unskilled labour on the skilled-unskilled wage inequality in the developing economies. The analysis finds that an emigration (immigration) of either type of labour is likely to produce a favourable (an unfavourable) effect on the wage inequality. In particular, the result of emigration (immigration) of skilled labour on the relative wage inequality is counterintuitive. These results have important policy implications for an overpopulated developing country like India.

JEL classifications: F13, J31.

Keywords: Skilled labour, unskilled labour, wage inequality, emigration (immigration) of labour, labour market imperfection, diverse trade pattern.

^a Dept. of Economics, Nagoya City University, Yamanohata, Mizuho, Nagoya 467-8501, Japan. Email: yabuuchi@econ.nagoya-cu.ac.jp.

^b Dept. of Economics, University of Calcutta, 56A, B.T. Road, Kolkata 700 050, India. E-mail: sceco@caluniv.ac.in , sarbajitch@yahoo.com

♣ Corresponding author.

International Migration of Labour and Skilled-Unskilled Wage Inequality

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 borders. 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.

Trade liberalization in the less developed countries, according to the conventional wisdom, was expected to lower the skilled-unskilled wage inequality following increases in the prices of the export commodities as these are generally exporters of commodities that are intensive in the use of unskilled labour. But empirical studies¹ strongly suggest that the wage inequality has increased in many Latin American and South Asian countries including India. The scanty theoretical literature explaining the deteriorating wage inequality in the Southern countries includes works of Feenstra and Hanson (1996), Marjit, Broll and Sengupta (2000) and Marjit, Beladi and Chakrabarti (2004). They have shown how trade liberalization and inflows of foreign capital might produce unfavourable effects on the wage inequality in the South given the specific structural characteristics of the less developed countries, such as features of labour markets, structures of production, nature of capital mobility etc.

Unfortunately, economists have so far paid very little attention in analyzing the consequences of emigration of workers from developing economies on the skilled-unskilled wage inequality. Large-scale international migration of workers from a developing country, irrespective of whether skilled or unskilled, is expected to produce significant effects on the wage inequality. An exception in this regard is the paper of Marjit and Kar (2005) which has examined the consequence of emigration of skilled and unskilled labour on the wage inequality in an otherwise 2×3 specific factor model of Jones (1971). They have shown that unskilled (skilled) emigration worsens (improves) the wage inequality if and only if the distributive share of the intersectorally mobile factor (i.e. capital) of the skilled sector is greater (lower) than that of the unskilled sector. Their results point out an important implication between emigration and the wage inequality. However, they are completely reversed if the relative distributive shares of capital are opposite. Besides, the assumption that both the sectors use the same

¹ See Robbins (1994a, 1994b, 1995a, 1995b, 1996a, 1996b), Wood (1997), Khan (1998) and Tendulkar et al. (1996) in this context.

type of capital may not be quite realistic in the context of a developing economy. Moreover, labour market imperfection especially that of unskilled labour and diverse trade pattern which are the two salient features of the developing economies have not been taken care of in their model.

The purposes of the present note are to construct a three sector general equilibrium structure which incorporates the diverse trade pattern and the imperfection that exists in the unskilled labour market of the developing countries and to provide a sound theoretical foundation that can be used to analyze the consequences of rapidly increasing international mobility of different factors of production, trade related policies and also policies like labour market reform on the skilled-unskilled wage inequality in the liberalized regime. The analysis finds that an emigration (immigration) of either type of labour is likely to produce a favourable (an unfavourable) effect on the wage inequality. In particular, the result of emigration (immigration) of skilled labour on the relative wage inequality is counterintuitive. The results have important policy implications for an overpopulated developing country like India.

2. The Model and Results

We consider a small open developing economy with three sectors. Sector 1 produces a primary agricultural commodity using unskilled labour and land. Sector 2 produces a high-skill manufacturing commodity with the help of skilled labour and capital. Sector 3 uses unskilled labour and capital to produce a low-skill manufacturing product. So land and skilled labour are specific factors in sectors 1 and 2, respectively. Unskilled workers employed in sector 3 earn a unionized wage, W^* , while their counterparts in the agricultural sector earn a competitive wage, W , with $W^* > W$. All other markets are perfectly competitive. The diverse trade pattern of the economy is reflected in the fact that it exports the primary agricultural and the high-skill manufacturing commodities while it is a net importer of the low-skill manufacturing commodity. Product prices are given internationally. Commodity 1 is chosen as the numeraire. The following symbols will be used in the equations.

a_{ji} = amount of the capital-output ratio in the i th sector, $i = 2,3$;

a_{N1} = land-output ratio in sector 1;

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

a_{S2} = skilled labour-output ratio in sector 2;

P_i = exogenously given relative price of the i th commodity, $i = 2,3$;

X_i = level of output of the i th sector, $i = 1,2,3$;

W_s = wage rate of skilled labour;

W^* = unionized unskilled wage rate in sector 3;

W = competitive wage rate of unskilled labour in sector 1;

R = return to land;

r = return to capital;

U = parameter denoting the extent of bargaining power of the trade unions;

E_w, E_U = elasticities of the unionized wage rate, W^* , with respect to the informal sector wage rate, W ; and, the trade union bargaining power, U , respectively;

L = endowment of unskilled labour;

S = endowment of skilled labour;

N = endowment of land;

K = endowment of capital of the economy;

θ_{ji} = distributive share of the j th input in the i th sector for $j = L, S, N, K$ and $i = 1, 2, 3$;

λ_{ji} = proportion of the j th input employed in the i th sector for $j = L, K$ and $i = 1, 2, 3$;

$W_A \equiv (\lambda_{L1}W + \lambda_{L3}W^*)$ = average unskilled wage;

S_{ji}^k = the degree of substitution between factors j and i in the k th sector, $j, i = L, N, S, K$; and, $k = 1, 2, 3$. For example, $S_{LK}^1 \equiv (R/a_{L1})(\partial a_{L1}/\partial R)$, $S_{LL}^1 \equiv (W/a_{L1})(\partial a_{L1}/\partial W)$ etc. $S_{ji}^k > 0$ for $j \neq i$; and, $S_{ji}^k < 0$;

' \wedge ' = proportionate change.

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

$$Wa_{L1} + Ra_{N1} = 1 \quad (1)$$

$$W_s a_{S2} + ra_{K2} = P_2 \quad (2)$$

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

$$a_{N1} X_1 = N \quad (4)$$

$$a_{S2} X_2 = S \quad (5)$$

$$a_{L1} X_1 + a_{L3} X_3 = L \quad (6)$$

$$a_{K2} X_2 + a_{K3} X_3 = K \quad (7)$$

Equations (1), (2) and (3) are the three competitive industry equilibrium conditions in the three sectors. On the other hand, equations (4) – (7) are the full-employment conditions of the four factors of production.

The formal sector faces a unionized labour market. The relationship for the unionized wage rate is specified as²:

$$W^* = W^*(W, U) \quad (8)$$

$W^*(.)$ satisfies the following properties: $W^* = W$ for $U = 0$, $W^* > W$ for $U > 0$; $E_U = (\partial W^* / \partial U) / (W^* / W) > 0$; and, $E_W = ((\partial W^* / \partial W) / (W / W^*)) \leq 1$. E_W is the elasticity of W^* with respect to W .

Equation (8) states that in the absence of any bargaining power of the trade unions³ i.e. when $U = 0$, the unskilled wage rates are equal in sectors 1 and 3. However, the unionized unskilled wage rate in sector 3, W^* , exceeds the competitive unskilled wage rate, W , when there is at least some power to the trade unions. The unionized wage is scaled upward as the competitive wage rate rises. Also with an increase in the bargaining power, the unions bargain for a higher wage.

There are eight endogenous variables in the system: $W, W^*, W_S, R, r, X_1, X_2$ and X_3 . The parameters of the system are: P_2, P_3, U, N, K, L and S , which are exogenously given. It is easy to note that this production structure does not possess the decomposition property.

From equations (4) – (7), it is easy to derive the following equation.

$$[\{(a_{L1} / a_{N1})N\} + (a_{L3} / a_{K3})\{K - (a_{K2} / a_{S2})S\}] = L. \quad (9)$$

The five input prices, W, W_S, W^*, R and r are determined by solving equations (1), (2), (3), (8) and (9) simultaneously. Once the factor prices are known the factor coefficients, a_{ji} s, are also

² Assuming that each formal sector firm has a separate trade union, the unionized wage function may be derived as a solution to the Nash bargaining game between the representative firm and the representative union in the low-skill manufacturing sector. For detailed derivation see Chaudhuri (2003).

³ The union power, denoted by U , is amenable to policy measures. If the government undertakes labour market reform measures e.g. partial or complete ban on resorting to strikes by the trade unions, reformation of employment security laws to curb union power, U takes a lower value.

known. X_1 and X_2 are obtained from equations (4) and (5), respectively. Finally, X_3 is found from either (6) or (7).

Unskilled workers in this system earn two different wages – either the unionized wage, W^* , in sector 3 or a lower competitive wage, W , in sector 1. The average wage for unskilled labour is given by

$$W_A \equiv (W\lambda_{L1} + W^* \lambda_{L3}) \quad (10)$$

where λ_{L1} and λ_{L3} denote the proportion of unskilled labour employed in sectors 1 and 3, respectively.

Totally differentiating equations (1), (2), (3), (8) and (9) and using envelope conditions we get the following expressions in the matrix form⁴

$$\begin{bmatrix} \theta_{L1} & 0 & 0 & 0 & \theta_{N1} \\ 0 & \theta_{S2} & 0 & \theta_{K2} & 0 \\ 0 & 0 & \theta_{L3} & \theta_{K3} & 0 \\ -E_W & 0 & 1 & 0 & 0 \\ A & B & C & D & E \end{bmatrix} \begin{bmatrix} \hat{W} \\ \hat{W}_S \\ \hat{W}^* \\ \hat{r} \\ \hat{R} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ (\hat{L} + G\hat{S}) \end{bmatrix}, \quad (11)$$

where

$$\begin{aligned} A &= \lambda_{L1}(S_{LL}^1 - S_{NL}^1) < 0, B = -(\lambda_{K2}\lambda_{L3} / \lambda_{K3})(S_{KS}^2 - S_{SS}^2) < 0, C = \lambda_{L3}(S_{LL}^3 - S_{KL}^3) < 0, \\ D &= \lambda_{L3}\{(S_{LK}^3 - S_{KK}^3) - (\lambda_{K2} / \lambda_{K3})(S_{KK}^2 - S_{SK}^2)\} > 0, \quad E = \lambda_{L1}(S_{LN}^1 - S_{NN}^1) > 0, \\ G &= (\lambda_{L3}\lambda_{K2} / \lambda_{K3}) > 0. \end{aligned}$$

On the other hand, totally differentiating (10), we find that⁵

$$\hat{W}_A = \{\alpha + \gamma(S_{LL}^1 - S_{NL}^1)\}\hat{W} + (1 - \alpha)\hat{W}^* + \gamma(S_{LN}^1 - S_{NN}^1)\hat{R} - \gamma\hat{L}, \quad (12)$$

where $\alpha = (W\lambda_{L1} / W_A) > 0$; and, $\gamma = ((W - W^*)\lambda_{L1} / W_A) < 0$ (as $W < W^*$).

⁴ See Appendix I for detailed derivations.

⁵ Derivations have been provided in Appendix II.

Now, let us investigate the effects of the change in the endowments of skilled and unskilled labour on the wage inequality. First, we can solve (11) for \hat{W} , \hat{W}_S , \hat{W}^* and \hat{R} by using the Cramer's rule as:

$$\hat{W} = (\theta_{N1}\theta_{S2}\theta_{K3}B / \Delta)(\hat{L} + G\hat{S}), \quad (13)$$

$$\hat{W}_S = (E_W\theta_{N1}\theta_{K2}\theta_{L3} / \Delta)(\hat{L} + G\hat{S}), \quad (14)$$

$$\hat{W}^* = (E_W\theta_{N1}\theta_{K3}\theta_{S2} / \Delta)(\hat{L} + G\hat{S}), \quad (15)$$

$$\hat{R} = -(\theta_{L1}\theta_{S2}\theta_{K3} / \Delta)(\hat{L} + G\hat{S}), \quad (16)$$

where Δ is the determinant of the coefficient matrix of the derived equation system (11), and it is expressed as

$$\Delta = \theta_{S2}\theta_{K3}(\theta_{N1}A - \theta_{L1}E) + \theta_{N1}E_W(\theta_{K2}\theta_{L3}B + \theta_{S2}\theta_{K3}C - \theta_{S2}\theta_{L3}D) < 0. \quad (17)$$

Using equations (12) – (16) one can show that⁶

$$\begin{aligned} (\hat{W}_S - \hat{W}_A) &= (G / \Delta)\hat{S}[E_W\theta_{N1}(\theta_{K2}\theta_{L3} - \theta_{K3}\theta_{S2}) + \alpha\theta_{N1}\theta_{S2}\theta_{K3}(E_W - 1) \\ &\quad (-) \quad (+) \quad (\leq 0) \\ &\quad + \gamma(S_{LN}^1 - S_{MN}^1)\theta_{S2}\theta_{K3}] \\ &\quad (-) \quad (+) \\ &+ (\hat{L} / \Delta)[E_W\theta_{N1}(\theta_{K2}\theta_{L3} - \theta_{K3}\theta_{S2}) + \alpha\theta_{N1}\theta_{S2}\theta_{K3}(E_W - 1) \\ &\quad (-) \quad (+) \quad (\leq 0) \\ &\quad + \gamma\{(S_{LN}^1 - S_{NN}^1)\theta_{S2}\theta_{K3} + \Delta\}] \quad (18) \\ &\quad (-) \quad (+) \quad (-) \end{aligned}$$

From (18) we can now establish the following proposition.

PROPOSITION 1: An emigration (immigration) of skilled labour improves (worsens) the skilled-unskilled wage inequality if the low-skill manufacturing sector is not less capital intensive (in a

⁶ This has been derived in Appendix III.

special sense)⁷ relative to the high-skill sector i.e. $(\theta_{K3} / \theta_{L3}) \geq (\theta_{K2} / \theta_{S2})$ while an emigration (immigration) of unskilled labour improves (worsens) the wage inequality if (i) $(\theta_{K3} / \theta_{L3}) \geq (\theta_{K2} / \theta_{S2})$; and if, (ii) $\{(S_{LN}^1 - S_{NN}^1)\theta_{S2}\theta_{K3} + \Delta\} \geq 0$.

We can intuitively explain proposition 1 as follows. An emigration of skilled labour leads to an increase in the skilled wage rate, W_S . To satisfy the zero profit condition in sector 2, the return to capital, r , falls. Producers in sector 2 substitute capital for skilled labour. So, a_{S2} falls and a_{K2} rises. As r falls given the relative price of commodity 3, the unionized unskilled wage, W^* , rises to satisfy the zero profit condition in sector 3. But, W^* can increase only if the competitive unskilled wage, W , rises. The return to land, R , falls as a consequence. Producers in sector 1 adopt more (less) land (unskilled labour) intensive techniques than before which in turn implies a contraction of sector 1 both in terms of output and employment of unskilled labour, as land is specific to this sector. The released workers from sector 1 are now absorbed in sector 3. Sector 3 expands both in terms of output and employment. Thus, we find that the average unskilled wage increases due to (i) an increase in W ; (ii) an increase in W^* ; and, due to (iii) an increase (a decrease) in the proportion of unskilled labour employed in the higher (lower) wage-paying sector i.e. λ_{L3} (λ_{L1}). Therefore, the average unskilled wage, W_A , rises unambiguously.

What happens to the skilled-unskilled wage inequality depends on the rates of increase in W_S and W_A . If $(\theta_{K3} / \theta_{L3}) > (=)(\theta_{K2} / \theta_{S2})$ the savings on capital cost in the low-skill manufacturing sector is more than (equal to) that in the high-skill sector, which in turn, implies that the rate of increase of the unionized unskilled wage, W^* , is greater than (equal to) that of the skilled wage, W_S . But, as we have mentioned above, that there are other two factors working positively on the average unskilled wage. Thus, the wage inequality improves under the sufficient condition as mentioned in proposition 1. The presence of the other two factors implies that proposition 1 may hold even under situations where the above sufficient condition does not hold. The effect of an immigration of skilled labour can be explained exactly in the opposite way.

On the other hand, an emigration of unskilled labour raises the competitive unskilled wage, W , in sector 1. The return to land decreases. Consequently, producers in sector 1 increase (lower) the per unit use of land (unskilled labour). Sector 1 contracts, both in terms of output and employment. As W increases the unionized unskilled wage, W^* , in sector 3 also increases. So, the

⁷ See Jones and Neary (1984).

return to capital, r , falls to satisfy the zero profit condition. This in turn raises the skilled wage, W_S , in sector 2. In both sectors 2 and 3 the capital intensity of production increases. Sector 2 expands as it employs a specific factor, skilled labour. Sector 3 releases capital to the expanding sector 2. Sector 3 contracts both in terms of output and employment.

What happens to the proportions of unskilled labour in sector 1 and 3 (λ_{L1} and λ_{L3}) is somewhat uncertain as the endowment of unskilled labour has fallen. At least, it can be shown that λ_{L1} falls (λ_{L3} rises) if and only if $\{(S_{LN}^1 - S_{NN}^1)\theta_{S2}\theta_{K3} + \Delta\} \geq 0$. However, this is only a sufficient condition for W_A to increase as both W and W^* have increased. Now, the rate of increase in W_A is greater than that in W_S under another sufficient condition that the low-skill manufacturing sector is not less capital intensive (in a special sense) relative to the high-skill sector. Consequently, the wage inequality improves under the above two sufficient conditions. The consequence of an immigration of unskilled labour can be explained in the opposite manner.

3. Concluding Remarks

In this note we have developed a three sector specific factor general equilibrium framework incorporating some of the essential characteristics of the developing economies e.g. market distortions of unskilled labour, diverse trade pattern etc. to analyze the consequences of emigration (immigration) of both skilled and unskilled labour on the skilled-unskilled wage inequality in the developing countries. The issue is important because the international mobility of labour has significantly increased in the liberalized regime and that it has so far drawn very little attention of the trade and development economists. We have shown that an emigration (immigration) of either type of labour is likely to produce a favourable (an unfavourable) effect on the wage inequality. In particular, the result of emigration (immigration) of skilled labour on wage inequality is interesting and counterintuitive. Also, the results have important policy implications for a developing country like India where illegal immigration of people (unskilled labour) from neighboring poor countries through border areas is a serious and mounting problem. The central government and the governments of the bordering states have so far remained indifferent to such an influx for petty political interests. But, the present analysis finds that the governments should take appropriate measures to prevent the immigration of unskilled labour⁸ in order to improve the skilled-unskilled wage inequality.

⁸ Measures to encourage emigration of skilled labour also produce the same result. But such a policy may not be desirable from the view point of national welfare.

References

- Chaudhuri, S. (2003): 'How and how far to liberalize a developing economy with informal sector and factor market distortions', *Journal of International Trade and Economic Development*, 12(4).
- Feenstra, R.C. and Hanson, G.H. (1996): 'Foreign investment, outsourcing and relative wages', in R. Feenstra, G. Grossman and D. Irwin (eds.), *Political Economy of Trade Policies: Essays in Honor of J. N. Bhagwati*, Cambridge, MIT Press, MA.
- Ronald, Jones, 1971. A three-factor model in theory, trade and history. In: Bhagwati, J., et al. (Eds.), *Trade, Balance of Payments and Growth*. North-Holland, Amsterdam, pp. 3–21.
- Jones, R.W. and Neary, P. (1984): 'Positive theory of international trade', Jones, R.W. and P. B. Kenen (eds.), *Handbook of Development Economics* Vol. 1, North-Holland, 1-62.
- Khan, A.R. (1998): 'The impact of globalization in South Asia', in A.S. Bhalla (ed.), *Globalization, Growth and Marginalization*, Macmillan.
- Marjit, S., Beladi, H. and Chakrabarti, A. (2004): 'Trade and wage inequality in developing countries', *Economic Inquiry* 42(2), 295-303.
- Marjit, S. and Kar, S. (2005): 'Emigration and wage inequality', *Economics Letters* 88, 141-145.
- Marjit, S., Broll, U. and Sengupta, S. (2000): 'Trade and wage-gap in poor countries: the role of the informal sector', in A. Bose et al. (eds.), *Macroeconomics, Trade and Institutions: Essays in Honour of M.K. Rakshit*, Oxford University Press, Kolkata.
- Robbins, D. (1994a): 'Malaysian wage structure and its causes', Harvard Institute for International Development (HIID).
- Robbins, D. (1994b): 'Philippine wage and employment structure 1978 – 1983', HIID.
- Robbins, D. (1995a): 'Earnings dispersion in Chile after trade liberalization', HIID.
- Robbins, D. (1995b): 'Trade, trade liberalization and inequality in Latin America and East Asia: Synthesis of seven country studies', HIID.
- Robbins, D. (1996a): 'Stolper-Samuelson lost in the tropics - Trade liberalization and wages in Columbia', HIID.
- Robbins, D. (1996b): 'HOS hits facts: facts win: evidence on trade and wages in developing world', HIID.
- Tendulkar, S., Sundaram, D.K. and Jain, L.R. (1996): *Macroeconomic Policies and Poverty in India 1966-67 to 1993-94*, manuscript, ILO, New Delhi.
- Wood, A. (1997): 'Openness and wage inequality in developing countries: the Latin American challenge to East Asian conventional wisdom', *World Bank Research Observer*, January.