

**ECONOMIC LIBERALIZATION AND WAGE INEQUALITY IN THE PRESENCE OF
LABOUR MARKET IMPERFECTION**

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Abstract: Removal of tariff restrictions from the relatively low-skill sectors; growth in foreign direct investment; and, decline of trade union strength of the unskilled workers are cited in the empirical literature as the prime factors responsible for the growing incidence of wage inequality in many of the developing countries in the liberalized trade and investment regime. This paper has made an attempt to provide a theoretical foundation of those empirical findings in terms of a three sector general equilibrium model reasonable for at least a few developing economies. The analysis of the paper has found that the wage inequality rises unambiguously due to policies like an increase in the relative price of the high-skill commodity and a reduction of import tariff from the low-skill manufacturing sector. However, an inflow of foreign capital produces a favourable effect on the wage inequality under a reasonable factor intensity condition. Interestingly, contrary to the common wisdom, a policy of labour market reform may raise the competitive unskilled wage and improve wage inequality under reasonable condition.

JEL classifications: F13, J31.

Keywords: Skilled labour, unskilled labour, wage inequality, Latin American countries, trade liberalization, labour market imperfection.

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1. Introduction

As per the prediction of the baseline $2 \times 2 \times 2$ Heckscher-Ohlin trade model, trade liberalization in the developing countries that are relatively well endowed with unskilled labour was expected to lower the skilled-unskilled wage inequality. But empirical evidence from the developing countries tells a somewhat different story. From the empirical studies of Robbins (1994a, 1994b, 1995a, 1995b, 1996a, 1996b) and Wood (1997) it has been found that while the inequality has narrowed in the East Asian countries, the Latin American countries like Mexico, Chile, Costa Rica and Columbia have experienced increasing skilled-unskilled wage gap following the liberalized trade and investment policies. On the other hand, there are some indirect studies, which point out that economic reforms have led to a widening of the skilled-unskilled wage inequality also in the South Asian countries including India. For example, Khan (1998) and Tendulkar et al. (1996) have found that the incidence of poverty has increased in the post-reform period. As unskilled workers belong to the poorer section of the population, an increase in poverty implies deterioration in the wage inequality.

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; (ii) growth in foreign direct investment which is positively correlated with the relative demand for skilled labour; and, (iii) falling real minimum wages and decline of union strength of the unskilled workers. See for example, Harrison and Hanson (1999), Hanson and Harrison (1999), Curie and Harrison (1997), Robbins (1994a,b), Feenstra and Hanson (1997) and Beyer, Rojas and Vergara (1999).

The H-O model with Stolper-Samuelson (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. Many of the above aspects have been documented and analyzed in Marjit and Acharyya (2003).

The inability of the standard trade theoretic models to explain widening wage inequality in the developing countries 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, Feenstra and Hanson (1996), Marjit, Broll and Sengupta (2000) and Marjit, Beladi and Chakrabarti (2004) are the notable exceptions which 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 (1996) 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. Besides, 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. An important piece of work in this area is that of Marjit, Beladi and Chakrabarti (2004) who have analyzed how diverse trade pattern and market fragmentation in world trade can adversely affect the skilled-unskilled wage inequality in the developing countries. They have also studied the consequences of an improvement of terms of trade and inflows of foreign capital on wage inequality with or without trade fragmentation. The paper finds that without trade fragmentation improvements in terms of trade and/or inflows of foreign capital may worsen wage inequality if the vertically integrated skilled export sector is more capital intensive vis-à-vis the import-competing sector. But, with trade fragmentation the consequences on the relative wage inequality might be different.¹ However, in this paper all input markets have been assumed to be perfect and therefore labour market imperfection especially that of unskilled labour has not been taken care of.

One of the salient features of the developing economies is the existence of distortion in the unskilled labour market. Unskilled workers are employed in different sectors of a developing economy. Workers employed in the organized (formal) sectors receive relatively high contractual (unionized) wage while their counterparts engaged in the informal sector earn a lower competitive wage.^{2, 3} The

¹ An inflow of foreign capital may worsen the wage inequality even with trade fragmentation if the traded intermediate good sector is capital intensive relative to the importable sector.

² The segmented nature of the labour market in the developing countries has been empirically verified and theoretically analyzed by different authors. See Cole and Sanders (1985), Majumdar (1983, 1993),

unionized wage is positively related to the competitive informal wage. As unskilled workers earn two different wages in the two different segments of the labour market, the average unskilled wage should be a weighted average of the two wages with weights being the proportions of unskilled labour employed in the two segments of the unskilled labour market. There are theoretical papers in the existing literature e.g. Carruth and Oswald (1981), Agenor and Montiel (1995), Marjit and Beladi (2002) and Marjit (2003) which have dealt with labour market distortion for different purposes. Carruth and Oswald (1981) using a two sector general equilibrium model with wage differential have shown that an increase in the union wage raises the non-union wage in a small open economy and that this result is independent of the ranking of the sectors in terms of factor intensities. Marjit and Beladi (2002) have built up a two sector general equilibrium model with distorted labour market with one fixed (unionized) wage and one variable (competitive) wage. The unionized wage rate is positively related to the two commodity prices. They have found that a Stolper-Samuelson type result holds without any assumption on factor-intensity ranking. Marjit (2003), on the other hand, has developed a three sector wage differential model, with one of the two informal sectors producing a non-traded intermediary for the formal sector and restricted capital mobility, to show how economic liberalization may result in greater employment and higher real wage for the workers employed in the informal sector despite contraction of the formal sector of the economy. Finally, Agenor and Montiel (1995, chapter 17) have modeled many of the important implications of different types of labour market segmentation emphasizing the role of imperfect mobility of labour for the efficacy of macroeconomic policy shocks in a developing country. However, none of these papers has examined the consequences of liberalized economic policies and the role of labour market imperfection on the skilled-unskilled wage inequality in the developing countries.

Under the circumstances, the present paper purports to construct a general equilibrium model outside the H-O structure that emphasizes the existence of distortion in the market for unskilled labour and may be useful in explaining as to how some of the factors identified in the empirical literature can lead to deteriorating skilled-unskilled wage inequality in the developing countries in the post reform period. A three sector general equilibrium model which is similar to a full employment analogue of

Fields (1990), Turham (1993), Agenor and Montiel (1995), Agenor (1996) and Marjit and Acharyya (2003) among others.

³ On an average, more than 70 % of the working population in the developing countries is employed in the informal sector (see Agenor (1996)). The corresponding figure in case of India is more than 90 % including agriculture. The percentage of population engaged in the informal sector has increased in the post-reform period. See Marjit (2003) and Dev (2000) in this context. **That the informal sector is growing in most developing countries has also been pointed out in Djankov (2003).**

Jones and Marjit (2003) has been developed for the purpose of the analysis.⁴ Two of the three sectors use unskilled labour while in the other skilled labour is a specific input. Two types of distortion, a labour market distortion in the form of unionized unskilled labour market in the low-skill manufacturing sector and a commodity market distortion in the form of tariff protection of the import-competing sector, which the developing countries are plagued with, have been considered. Two different trade patterns⁵ have been taken into account so that the model is relevant either to a country like Mexico, which has comparative advantage in low-skill manufacturing commodities or to a country similar to India, which exports both high-skill and primary agricultural commodities.

It has been found that policies like a reduction of import tariff from low-skill manufacturing sector and an increase in the relative price of high-skill commodity unambiguously worsen the skilled-unskilled wage inequality. Besides, an inflow of foreign capital into the manufacturing sectors improves the wage inequality under a reasonable factor intensity condition. Also, a decline in the trade union strength of unskilled labour does not necessarily lead to deterioration in the wage inequality. In fact, such a policy of labour market reform may improve the skilled-unskilled wage inequality under reasonable condition. This result is extremely crucial in the present context because after essentially satisfactory progress in implementation of trade and investment reforms, many of the developing countries are presently thinking about undertaking labour market reforms. But, the policymakers are hesitating to implement measures like partial or complete ban on resorting to strikes by the trade unions, reformation of employment security laws to curb union power on the apprehension that any such attempt would be vehemently opposed by trade unions and opposition political parties. A populist belief is that policies pertaining to labour market reform would lead to a general reduction in the unskilled wages and make all the common (unskilled) workers worse off. But the analysis of the present paper shows that there is very little substance in such a populist belief. Labour market reform might not only increase the competitive informal wage but also lead to an improvement in the skilled-unskilled wage disparity.

⁴ The similarities and differences between Jones and Marjit (2003) and the present analysis have been discussed in detail at the end of section 3.

⁵ See footnote 7 in this context.

2. The Model

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. Production functions exhibit constant returns to scale with diminishing marginal productivity to each factor. Markets, except the low-skill manufacturing sector labour market, are perfectly competitive. Unskilled workers employed in sector 3 earn a unionized wage, W^* , while their counterparts in the agricultural sector earn a competitive wage, W , with $W^* > W$. Due to our small open economy assumption product prices are given internationally. The following two alternative trade patterns⁶ will be considered. The country exports both the agricultural and the high-skill commodities and is a net importer of the low-skill manufacturing commodity. Alternatively, it only exports the agricultural commodity and is a net importer of the other two commodities. In both the cases the low-skill manufacturing sector (sector 3) is protected by an import tariff. A developing country which fits the first type of comparative advantage is India.⁷ On the contrary, an example of the second type of country is Mexico.⁸ Throughout the paper, commodity 1 has been assumed to be the numeraire.

The following symbols will be used in the equations.

a_{Ki} = 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;

⁶ The results of the paper, as summarized in proposition 1, do not depend on the trade pattern of the economy.

⁷ It may be mentioned that besides primary agricultural commodities, India is also a large exporter of high-skill products like computer software.

⁸ Empirical evidence (e.g. Revenga (1997), Hanson and Harrison (1999)) suggests that Mexico does not have a comparative advantage in high-skill manufacturing commodities and that its exports are negatively correlated to skill intensity.

t = ad-valorem rate of tariff on the import of commodity 3;

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

$P_3^* = P_3(1+t)$ = domestic or tariff-inclusive relative price of commodity 3;

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

W_s = wage rate of skilled labour;

W^* = institutionally determined (or 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 = elasticity of the unionized wage rate, W^* , with respect to the informal sector wage rate, W ;

E_U = elasticity of W^* with respect to the trade union bargaining power, U ;

L = endowment of unskilled labour;

S = endowment of skilled labour;

N = endowment of land;

K = endowment of capital of the economy (domestic plus foreign);

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 $i = 1,2,3$;

$W_A = (\lambda_{L1}W + \lambda_{L3}W^*)$ = 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, $S_{jj}^k < 0$;

' \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) state that unit cost of production of each commodity must equal its relative domestic price in equilibrium. In other words, these 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 as⁹:

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

$W^*(.)$ satisfies the following properties:

$$W^* = W \text{ for } U = 0, W^* > W \text{ for } U > 0; E_U = (\partial W^* / \partial W), (\partial W^* / \partial U) > 0; \text{ and,}$$

$$E_W = ((\partial W^* / \partial W) / (W / W^*)) \leq 1. E_W \text{ is the elasticity of } W^* \text{ with respect to } W.$$

Equation (8) states that in the absence of any bargaining power of the trade unions 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.¹⁰ Also with

⁹ 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).

¹⁰ On one hand, the trade union requires a higher wage rate than the competitive one as usual and on the other, the competitive wage rate itself rises as the union wage rate increases if the collective bargaining institutions exist and have some effects on the unskilled-labour market. See Carruth and Oswald (1981) in this context. Besides, the informal sector is not generally a free-entry sector in the developing countries as it is thought to be. Several authors, including Banerjee (1986) in case of India and Gandhi-Kingdon and Knight (2001) in case of South Africa, have noted that many activities in the

an increase in the bargaining power, the unions bargain for a higher wage.¹¹ 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.

2.1 The general equilibrium

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, t, U, N, K, L and S , which are exogenously given. There are eight independent equations, namely, equations (1) to (8). Equations (1), (2) (3) and (8) together form the price system of the model. It is easy to note that this production structure does not possess the decomposition property. So the input prices cannot be solved from the price system alone, independently of the output system. 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 working of the general equilibrium model is as follows. 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

so-called informal sector of the developing countries are highly stratified, requiring skills, experience and contacts, with identifiable barriers to entry. Even when skill and capital are not required, entry can be difficult because of the presence of cohesive networks, which exercise control over location and zone of operation. Thus, various impediments to entry make the wage rate downwardly rigid in many cases. Also, in the case of agriculture there are cases of downward wage rigidity that can be explained by the ‘collusive theory of unemployment’ (Osmani (1991)). However, as a first step to address the role of trade unionism on wage inequality, we emphasize in this paper the role of trade union in the formal sector only.

¹¹ It should be pointed out, in this context, that the channels through which unionization of the unskilled labor market affects the skilled-unskilled wage dispersion are far more complex (covering wages and benefits, work rules limiting the intensity of work, stabilizing hours, reducing arbitrariness in management actions etc.) than has been worked out here. Although, the unionized wage function used in the present analysis is simple in form and does not consider some of the complex issues relating to collective bargaining, however, has solid micro-foundation with Nash bargaining behind the scene. Besides, use of this function provides us a theory (though not derived here) of wage differential between the sectors and helps to derive some interesting results which are new in the literature on trade and development.

are known the factor coefficients, a_{ji} s, are also 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. In this case, the skilled–unskilled wage gap improves (worsens) in absolute terms if the gap between W_S and W_A falls (rises). On the other hand, the wage inequality improves (deteriorates) both in absolute and relative terms if $(\hat{W}_S - \hat{W}_A) < (>)0$.

3. Economic Liberalization and Wage Inequality

In this model a liberalized economic policy implies any subset of the following measures: (i) an increase in the relative price of the high-skill manufacturing product, P_2 ; (ii) a reduction in the ad-valorem rate of tariff on the import of the low-skill manufacturing product, t (i.e. a reduction in P_3^*); (iii) an inflow of foreign capital; and, (iv) a decline of the trade union strength of the unskilled workers implying a reduction in the contractual wage rate, W^* . Although trade and investment liberalization actually implies a subset of the above policy measures, to establish ideas we consider the effects of each of these changes one at a time.

Totally differentiating equations (1), (2), (3), (8) and (9) and using envelope conditions we get the following expressions in the matrix form¹²

¹² See appendix I for detailed derivations.

$$\begin{bmatrix} \theta_{L1} & 0 & 0 & 0 & \theta_{N1} \\ 0 & \theta_{S2} & 0 & \theta_{K2} & 0 \\ 0 & 0 & \theta_{L3} & \theta_{K3} & 0 \\ -E_W & 0 & 1 & 0 & 0 \\ A & B & C & D & E \end{bmatrix} \begin{bmatrix} \hat{W} \\ \hat{W}_S \\ \hat{W}^* \\ \hat{r} \\ \hat{R} \end{bmatrix} = \begin{bmatrix} 0 \\ \hat{P}_2 \\ \hat{P}_3^* \\ E_U \hat{U} \\ -F \hat{K} \end{bmatrix}, \quad (11)$$

where

$$A = \lambda_{L1}(S_{LL}^1 - S_{NL}^1) < 0,$$

$$B = -(\lambda_{K2}\lambda_{L3} / \lambda_{K3})(S_{KS}^2 - S_{SS}^2) < 0,$$

$$C = \lambda_{L3}(S_{LL}^3 - S_{KL}^3) < 0,$$

$$D = \lambda_{L3}\{(S_{LK}^3 - S_{KK}^3) - (\lambda_{K2} / \lambda_{K3})(S_{KK}^2 - S_{SK}^2)\} > 0,$$

$$E = \lambda_{L1}(S_{LN}^1 - S_{NN}^1) > 0,$$

$$F = (\lambda_{L3} / \lambda_{K3}) > 0,$$

and S_{ji}^k is the elasticity of substitution between factors j and i in sector k (e.g.,

$$S_{NL}^1 = (W / a_{N1})(\partial a_{N1} / \partial W).$$

On the other hand, totally differentiating (10), we find that¹³

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

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

Now, let us investigate the effect of the change in the skilled-intensive manufacturing product on the wage inequality. First, we can solve (11) for $\hat{W}, \hat{W}_S, \hat{W}^*$ and \hat{R} with respect to \hat{P}_2 by using the Cramer' rule as:

$$\hat{W} / \hat{P}_2 = -\theta_{N1}\theta_{K3}B / \Delta < 0, \quad (13)$$

$$\hat{W}_S / \hat{P}_2 = -\theta_{N1}E_W(\theta_{K3}C - \theta_{L3}D) / \Delta < 0, \quad (14)$$

¹³ See appendix II.

$$\hat{W}^* / \hat{P}_2 = -\theta_{N1}\theta_{K3}E_W B / \Delta < 0, \quad (15)$$

$$\hat{R} / \hat{P}_2 = \theta_{L1}\theta_{K3}(B - \theta_{S2}E) / \Delta > 0, \quad (16)$$

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

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

From (12) and (14), we obtain

$$(\hat{W}_S - \hat{W}_A) / \hat{P}_2 = [\hat{W}_S - \{\alpha + \gamma(S_{LL}^1 - S_{NL}^1)\}\hat{W} - (1 - \alpha)\hat{W}^* - \gamma(S_{LN}^1 - S_{NN}^1)\hat{R}] / \hat{P}_2. \quad (18)$$

It can be seen that $(\hat{W}_S - \hat{W}_A) / \hat{P}_2 > 0$ since $\hat{W}_S / \hat{P}_2 < 0$, $\hat{W} / \hat{P}_2 < 0$, $\hat{W}^* / \hat{P}_2 < 0$, $\hat{R} / \hat{P}_2 > 0$, $\gamma < 0$, $S_{ji}^k < 0$, and $S_{ji}^k > 0$ ($i \neq j$). Therefore, (18) implies that if $\hat{P}_2 > 0$, then $(\hat{W}_S - \hat{W}_A) > 0$.

Similarly we can examine the effect of the change in the price of the low-skill manufacturing product on the wage inequality. We obtain the result that if $\hat{P}_3^* < 0$, then $(\hat{W}_S - \hat{W}_A) > 0$.

Now let us investigate the effect of the change in capital endowment due to, for example, an inflow of foreign capital on the wage inequality. We can solve (11) for \hat{W} , \hat{W}_S , \hat{W}^* and \hat{R} with respect to \hat{K} by using the Cramer' rule as:

$$\hat{W} / \hat{K} = -\theta_{N1}\theta_{S2}\theta_{K3}F / \Delta > 0, \quad (19)$$

$$\hat{W}_S / \hat{K} = -\theta_{N1}\theta_{K2}\theta_{L3}E_W F / \Delta > 0, \quad (20)$$

$$\hat{W}^* / \hat{K} = -\theta_{N1}\theta_{S2}\theta_{K3}E_W F / \Delta > 0, \quad (21)$$

$$\hat{R} / \hat{K} = \theta_{N1}\theta_{S2}\theta_{L3}E_W F / \Delta < 0. \quad (22)$$

Substituting (19), (20), (21) and (22) into (12), and arranging terms, we obtain

$$(\hat{W}_S - \hat{W}_A) / \hat{K} = \theta_{N1}F[\{-\theta_{K2}\theta_{L3} + (1 - \alpha)\theta_{S2}\theta_{K3}\}E_W + \{\alpha + \gamma(S_{LL}^1 - S_{NL}^1)\}\theta_{S2}\theta_{K3} - \gamma(S_{LN}^1 - S_{NN}^1)\theta_{S2}\theta_{L3}] / \Delta. \quad (23)$$

We can show that $(\hat{W}_S - \hat{W}_A)/\hat{K} < 0$ if $\theta_{S2}\theta_{K3} \geq \theta_{K2}\theta_{L3}$ since

$$\begin{aligned} & \{-\theta_{K2}\theta_{L3} + (1-\alpha)\theta_{S2}\theta_{K3}\}E_W + \alpha\theta_{S2}\theta_{K3} \\ & > \{-\theta_{K2}\theta_{L3} + (1-\alpha)\theta_{S2}\theta_{K3} + \alpha\theta_{S2}\theta_{K3}\}E_W = (-\theta_{K2}\theta_{L3} + \theta_{S2}\theta_{K3})E_W \end{aligned} \quad (24)$$

(Note that $E_W \leq 1$.)

Thus, we obtain the result that if $\hat{K} > 0$, then $(\hat{W}_S - \hat{W}_A) < 0$ under the sufficient condition $\theta_{S2}\theta_{K3} \geq \theta_{K2}\theta_{L3}$.¹⁴ These results are summarized in the form of the following proposition.

PROPOSITION 1: An increase in the relative price of the high-skill manufacturing product and/or a reduction of tariff restriction on the import of the low-skill manufacturing product unambiguously worsens the skilled-unskilled wage inequality. Besides, the wage inequality improves owing to an inflow of foreign capital if $(\theta_{S2}\theta_{K3} \geq \theta_{K2}\theta_{L3})$.

These results are more or less consistent with the empirical findings which have been mentioned at the very outset of the paper. We explain the results presented in proposition 1 as follows. As the system does not possess the decomposition property and the five unknown factor prices are obtained by solving five equations simultaneously, any parametric changes in the system can affect all factor prices and output levels.

An improvement in the relative price of the high-skill product leads to an expansion of sector 2. This raises the demand for skilled labour (a specific input) and capital. The skilled wage rate, W_S , and the return to capital, r , both increase as a consequence. Capital moves from sector 3 to sector 2 leading to a contraction of the former. This releases unskilled labour to sector 1. As the expanding sector 1 has now to absorb more unskilled labour than before, the competitive unskilled wage rate, W , decreases. This also lowers the unionized unskilled wage, W^* , in sector 3 given the bargaining strength of the trade unions, U . Thus we find that both W and W^* fall and the higher (lower) wage-paying sector 3 (sector 1) contracts (expands). The average unskilled wage rate, W_A , falls and the skilled-unskilled wage inequality deteriorates unambiguously.

¹⁴ While examining the consequence of emigration of skilled and unskilled labour on the wage inequality in an otherwise 2×3 specific factor model of Jones (1971), Marjit and Kar (2005) have shown that with international factor flows factor shares matter in determining the trend in wage distribution.

On the other hand, a reduction of import tariff lowers the relative domestic price of the low-skill manufacturing commodity, P_3^* . This leads to a contraction of sector 3 and releases both capital and unskilled labour. The released capital goes to sector 2, which lowers the return to capital and leads to an expansion of sector 2. The demand for the sector specific input, skilled labour, rises. The skilled wage, W_S , rises as a consequence. On the other hand, unskilled labour released from sector 3 moves to sector 1. The competitive unskilled wage rate falls, which also lowers the unionized wage in sector 3. The two reasons that the unskilled wage rates have fallen and that the lower wage-paying sector has expanded at the cost of the higher wage-paying sector cause the average unskilled wage to fall. The skilled-unskilled wage inequality worsens unequivocally.

An inflow of foreign capital, *ceteris paribus*, leads to a decrease in the return to capital, r . Both sectors 2 and 3 expand as they use capital. The demand for skilled labour rises in sector 2 and that of unskilled labour increases in sector 3. Consequently, W_S and W increase. An increase in W implies an increase in the unionized unskilled wage rate, W^* . Sector 1 contracts and releases unskilled labour to the expanding sector 3. The proportion of unskilled labour employed in the higher (lower) wage-paying sector increases (decreases). Therefore, the average unskilled wage, W_A , rises as a consequence. What happens to the skilled-unskilled wage inequality crucially depends on the rates of increase in W_S and W_A . However, if sector 3 is capital intensive in a sense that $(\theta_{S2}\theta_{K3} \geq \theta_{K2}\theta_{L3})$,¹⁵ the decrease in the return to capital is larger than that in sector 2. Thus, this implies that the increase in W^* is larger than the increase in W_S from (2) and (3). This improves the wage inequality.

Finally, we want to examine the consequence of labour market reform on both the competitive wage rate and relative wage inequality. In this model labour market reform implies a decline in the bargaining power of the trade unions, denoted by U . We can solve (11) for $\hat{W}, \hat{W}_S, \hat{W}^*$ and \hat{R} with respect to \hat{U} by using the Cramer' rule as:

$$\hat{W} / \hat{U} = -(E_U \theta_{N1} / \Delta) [B \theta_{L3} + C \theta_{S2} \theta_{K3} - D \theta_{S2} \theta_{L3}] > 0, \quad (25)$$

$$\hat{W}^* / \hat{U} = (E_U \theta_{S2} \theta_{K3} / \Delta) (\theta_{N1} A - \theta_{L1} E) < 0, \quad (26)$$

¹⁵ See Jones and Neary (1984).

$$\hat{R} / \hat{U} = (\theta_{L1} E_U / \Delta) [\theta_{S2} (C \theta_{K3} - D \theta_{L3}) + B \theta_{K2} \theta_{L3}] < 0, \quad (27)$$

$$\hat{W}_S / \hat{U} = (\theta_{K2} \theta_{L3} E_U / \Delta) (\theta_{N1} A - \theta_{L1} E) < 0. \quad (28)$$

Now using equations (12), (25), (26), (27) and (28) it is easy to find that

$$\begin{aligned} (\hat{W}_S - \hat{W}_A) = & [(E_U \hat{U} / \Delta) (\theta_{N1} A - \theta_{L1} E) (\theta_{K2} \theta_{L3} - \theta_{S2} \theta_{K3}) + \alpha \hat{W}^* \\ & - \gamma (S_{LN}^1 - S_{NN}^1) \hat{R} - \{\alpha + \gamma (S_{LL}^1 - S_{NL}^1)\} \hat{W}] \end{aligned} \quad (29)$$

From (29) it follows that if $\hat{U} < 0$, then $(\hat{W}_S - \hat{W}_A) < 0$ under the sufficient condition $\theta_{K2} \theta_{L3} \geq \theta_{S2} \theta_{K3}$. This establishes the following proposition.

PROPOSITION 2: A decline in the trade union strength of unskilled labour unambiguously raises the competitive unskilled wage and does not necessarily lead to deterioration in the skilled-unskilled wage inequality in the existing setup. This policy actually improves the wage inequality if $(\theta_{K2} \theta_{L3} \geq \theta_{S2} \theta_{K3})$.

Proposition 2 can intuitively be explained as follows. A decline of the trade union strength of the unskilled workers, U , implies a reduction in the contractual wage rate, W^* , given W . A reduction in the wage cost in sector 3 leads to an expansion of this sector, which in turn implies higher demand for both capital and unskilled labour. Capital is drained out of sector 2 to sector 3. The increased demand for unskilled labour is met by release of that input by sector 1. Both sectors 1 and 2 contract. The demand for skilled labour in sector 2 falls. Both r and W increase while W_S decreases. Two opposite forces work on W^* . While W^* falls directly due to a fall in U , it rises with an increase in W . However, the net result would be a fall in W^* . Thus, W rises but W^* falls. Besides, the proportion of unskilled labour employed in the higher wage-paying sector 3 (i.e. λ_{L3}) rises. But, what happens to W_A is somewhat uncertain. However, the wage inequality improves under the simple sufficient condition $(\theta_{K2} \theta_{L3} \geq \theta_{S2} \theta_{K3})$.

It is now worthwhile to compare the results obtained in our model with those in Jones and Marjit (2003). As stated earlier, the basic production structure we have developed is similar to a full employment analogue of Jones and Marjit (2003) model with one additional specification in the form

of labour market distortion, which is a salient feature of the developing countries. We have provided a theory of determination of the unionized wage, although its derivation has not been worked out in detail. Owing to the analogy between the two models, the results on foreign capital inflow found in our model are comparable to those derived in their paper. But, the condition under which the results in Jones and Marjit (2003) hold is both a necessary and sufficient one. On the contrary, the condition derived in our model and stated in proposition 1 is only a sufficient condition. This is due to the following two reasons. First, ours is a wage differential model in the sense that the unskilled workers employed in the two sectors earn two different wages. So, the average unskilled wage is the weighted average of both the unionized and non-unionized wages, with weights being the proportions of unskilled labour employed in the two sectors. Secondly, the unionized unskilled wage is positively related to the competitive non-unionized wage. Therefore, even if both the wages rise (fall) the average unskilled wage does not necessarily rise (fall) if the proportion of unskilled labour employed in the high wage sector falls (rises) sufficiently. Apart from these, in the present model we can study the outcome of labour market reform on the skilled-unskilled wage inequality. This study is crucial as falling trade union strength has been cited as a contributing factor for deterioration in wage inequality in Mexico in the liberalized regime (Harrison and Hanson (1999)) and the developing countries are now contemplating seriously in undertaking labour market reforms.¹⁶ However, Jones and Marjit (2003) have investigated the effect of training of unskilled workers on wage inequality and discussed how their models can be useful to analyze the outcomes of international factor mobility in a two-country setting, which have not been explored in our model.

4. Concluding Remarks

The model of the paper, although being stylized, does point to possible channels of influence that would explain as to why many of the developing countries have experienced deteriorating skilled-unskilled wage inequality in the regime of trade and investment liberalization, belying the expectations of the proponents of these policies. The empirical literature in this area has identified a few factors responsible for the deteriorating wage inequality in the liberalized regime. This paper has made an attempt to provide a theoretical foundation of those empirical findings in terms of a three sector general equilibrium model reasonable for at least a few developing economies.

¹⁶ This has an important policy implication in the context of the developing countries, which has been discussed in the concluding section.

The analysis of the paper has found that the wage inequality rises unambiguously due to policies like an increase in the relative price of the high-skill commodity and a reduction of import tariff from the low-skill manufacturing sector. On the other hand, an increase in capital endowment due to, for example, an inflow of foreign capital improves the wage inequality if the skill-intensive sector is not more capital intensive (in a special sense) vis-à-vis the low-skill manufacturing sector. Interestingly, contrary to the common wisdom a decline in the trade union power of the unskilled labour that results from a policy of labour market reform does not necessarily lead to deterioration in the skilled-unskilled wage inequity. In fact, such a policy may improve the wage inequality under reasonable condition. This result is important especially, when many of the developing countries are hesitant to undertake labour market reforms seriously in the fear that such a move would be vehemently resisted by the political parties and trade unions on the plea that it would lead to general wage reductions of the poorer groups of the working population engaged in different sectors of the economy and accentuate the wage inequality. But, the analysis of the paper has shown that there is very little substance in such a common and populist belief. The vast section of the poor working population engaged in the different unorganized sectors of the economy will ultimately be benefited from such a policy and the wage inequality is also very much likely to get better.

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