Fair Wage Hypothesis, International Factor Mobility and Skilled-Unskilled Wage Inequality in a Developing Economy

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20 June 2008

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(This version: June 2008)

Abstract: Agell and Lundborg (1995, Economica) have accommodated the fair wage hypothesis (FWH) in an otherwise 2×2 Hechscher-Ohlin-Samuelson model for examining the robustness of certain standard trade theorems. The present paper proposes to introduce the FWH in a three sector general equilibrium model with two types of labour: skilled and unskilled. Skilled labour is specific to the high-skill sector and receives the efficiency wage while unskilled labour in the other two sectors receives either the competitive wage or the high unionized wage. Using such a framework the consequences of international mobility of factors of production on the skilled-unskilled wage inequality and unemployment of skilled labour in a developing economy have been analyzed. Both foreign capital inflows and emigration of skilled labour improve the skilled-unskilled wage inequality under reasonable condition. Particularly, the result relating to emigration of skilled labour is counterintuitive.

JEL classification: F13; J41; O15

Keywords: Fair wage hypothesis; skilled labour; unskilled labour; wage inequality; Foreign capital; unemployment.

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1. Introduction

The persistence of involuntary unemployment and labour market imperfection are two of the salient features of the labour market in a developing economy. Labour can be of two types: unskilled and skilled. How to explain unemployment as a general equilibrium phenomenon depends on which type of labour we are considering. Harris-Todaro (1970) type of model is one way to explain unemployment in a general equilibrium setup where the efficiency of each worker is considered to be exogenously given and equal to unity. However, in such a model unemployment is specific to the urban sector and is suitable to explain unemployment of unskilled labour only.

The involuntary unemployment of unskilled labour can also be explained by using the 'consumption efficiency hypothesis' (CEH) of Leibenstein (1957), Bliss and Stern (1978), Dasgupta and Ray (1986) etc. where the nutritional efficiency of a worker depends positively on his consumption level. The CEH is the earliest version of the efficiency wage theory and is applicable to the poor unskilled workers who are at or slightly above their subsistence consumption level.

The unskilled labour force comprises of workers who are less educated and poor and cannot afford to remain unemployed for a long period of time. This is evident from the study of Udal and Sinclair (1982) who have noted that unemployment rates are low in very poor countries. The Unskilled labour market in a developing economy is imperfect and there is formal-informal sector segmentation. In the formal sector unskilled workers are organized and receive a higher unionized wage than what their counterparts receive in the informal sector of the economy. The unskilled workers who are unable to get employment in the formal sector are automatically absorbed in the informal sector as the wage rate there is assumed to be perfectly flexible to clear the unskilled labour market.[1]

[1] In reality, the informal sector and open unemployment of unskilled labour coexist. This happens if the informal sector unskilled wage is also rigid in the downward direction. The rigidity of the informal sector wage can be explained in three ways. First, it is observed in many developing

It is important to note that in an economy the possibility of being unemployed also rises with increasing education and skills. In the case of India, NSSO surveys conducted over the years show that the unemployment rate among those educated above the secondary level was higher, in both rural and urban areas, than those with lesser educational attainments. The NSSO 61st Round report, *Employment and Unemployment Situation in India 2004-05*, attributes this to the fact that "the job seekers become gradually more and more choosers as their educational level increases." Serneels (2007) also has found that in Ethiopia unemployment is concentrated among relatively well-educated first time job seekers who come from the middle classes.

The question now is how to theoretically explain the existence of unemployment of skilled labour. For that purpose one has to recourse to the efficiency wage theories. One version of efficiency wage theory is based upon the works of Shapiro and Stiglitz (1984) where the work-effort of a worker is positively related to both the wage rate and unemployment rate. However, it should be kept in mind that the Shapiro and Stiglitz (1984) type of unemployment is relevant only where there is 'hire and fire' recruitment policy of labour. A more generalized version of efficiency wage theory is the 'fair wage hypothesis' (FWH). Agell and Lundborg (1992, 1995), Feher (1991), Akerlof and Yellen (1990), etc. have explained unemployment as a general equilibrium phenomenon using the FWH. As per the Agell and Lundborg (1992, 1995) treatment of the FWH, efficiency of a worker is sensitive to the functional distribution of income. Consequently, the return to capital and wage rates of different types of labour appear as arguments in the efficiency function.

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countries the informal sector consists of several subcontract firms that produce various parts and semi-processed components for the parent formal sector firms. These activities are typically characterized by small scale and among others a low-wage rate suppressed by the parent firms. The informal sectors workers do not get more than their reservation wages. Secondly, several authors (e.g. Banerjee 1986, Gandhi-Kingdon and Knight 2001) have noted that many activities in the so-called informal sector of developing countries are highly stratified, requiring skills, experience and contacts, with identifiable barriers to entry. For example, petty trading often has highly structured labor and product markets with considerable costs of 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. Finally, unemployment of unskilled labour may also arise if the workers are paid their nutritional efficiency wage that maximizes the profits of their employers even though the workers are willing to work at a lower wage which is equal to their reservation wage.

Agell and Lundborg (1995) have demonstrated how the FWH can be accommodated in a 2×2 Hechscher-Ohlin-Samuelson (HOS) model and examined the robustness of some of the important trade theorems. They have shown that many of the important trade theorems would lose their validity and a protectionist policy may be preferable to free trade in the 2×2 HOS system in the presence of the FWH. However, there is no distinction between different types of labour according to their skills and hence the skilled-unskilled wage inequality that has worsened in the liberalized regime[2] in complete contrast to the predictions of the HOS model with the Stolper-Samuelson theorem at its core cannot be analyzed using their framework.

The present paper proposes to extend the Agell and Lundborg (1995) paper in the following directions. A third sector is introduced that produces a high-skill commodity with the help of skilled labour and capital while the first two sectors use unskilled labour and capital. So the distinction between two types of labour with respect to their skills is introduced. Besides, imperfections in the market for unskilled labour and its formal-informal sector division have also been taken into consideration. Unlike Agell and Lundborg (1995), wages are set according to the FWH in one sector (high-skill sector) only. In the other two sectors where unskilled labour is used competitive forces or trade union activities determine the wages. Using such a framework we analyze the consequences of international mobility of factors of production on the skilled-unskilled wage inequality and unemployment of skilled labour in a developing economy. This theoretical analysis leads to some interesting results. For example, both foreign capital inflows and emigration of skilled labour improve the skilled-unskilled wage inequality under reasonable condition. Particularly, the result relating to emigration of skilled labour is counterintuitive. We

[2] The theoretical literature explaining the deteriorating wage inequality in the developing countries during the liberalized regime includes works of Feenstra and Hanson (1996), Marjit and Acharya (2003), Marjit and Kar (2005), Yabuuchi and Chaudhuri (2007), Marjit, Beladi and Chakrabarti (2004) and Chaudhuri and Yabuuchi (2007). They have shown how trade liberalization, international migration of labour 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. However, all these papers have considered full-employment framework and hence ignored the problem of unemployment which is a salient feature of these economies. There is, however, a paper by Beladi, Chaudhuri and Yabuuchi (2008) that has used a 2×3 Harris-Todaro setup to examine the consequences of international mobility of different factors of production on the relative wage inequality. But it does not account for the unemployment of skilled labour which is also an alarming problem in a developing economy where skilled labour is a scarce factor.

also show that these policies are likely to increase the unemployment of skilled labour. Some of these results are new in the literature on trade and development.

2. The model

We consider a three-sector economy where all the sectors operate at close vicinity. There are two types of labour: unskilled and skilled. Sector 1 is the primary export sector that produces an agricultural commodity using unskilled labour and capital. This is an unorganized sector where unskilled workers receive a competitive wage, W. Sector 2 is the import-competing sector of the economy which also uses unskilled labour and capital for producing a low-skill manufacturing commodity. Unskilled workers in this sector are organized. They successfully bargain with their employers to secure a higher unionized wage, W^*, than their counterparts in sector 1. Sector 3 is another export sector that produces a high-skill commodity with the help of skilled labour and capital. So capital is perfectly mobile among all the three sectors of the economy while unskilled labour is imperfectly mobile between the first two sectors. The efficiency of each unskilled worker is assumed to be exogenously given and is equal to unity. On the other hand, skilled labour is specific to sector 3. We assume that the fair wage hypothesis (FWH) is valid and is applicable to skilled workers only. This gives rise to unemployment of skilled labour. On the contrary, there is no unemployment of unskilled labour. The unskilled workers first try to get employment in the higher paid formal manufacturing sector (sector 2) and those who are unable to get employment there are automatically absorbed in sector 1 owing to complete flexibility of the wage rate in that sector. All the goods are internationally traded and hence their prices are given internationally. The production functions exhibit constant returns to scale with positive but diminishing marginal productivity to each factor. All markets excepting the unskilled labour market in sector 2 and the skilled labour market are perfectly competitive. The capital stock of the economy consists of both domestic capital and foreign capital which are perfect substitutes Finally, commodity 2 is chosen as the numeraire.

The following symbols will be used for formal presentation of the model.

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

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

a_{S3} = skilled labour-output ratio in sector 3 (in efficiency unit);

P_i = exogenously given relative price of the i th commodity, i = 1,3;

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

E = efficiency of each skilled worker;

W_S = wage rate of skilled labour;

$\frac{W_S}{E}$ = wage rate per efficiency unit of skilled labour;

$W*$ = unionized unskilled wage in sector 2;

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

W_A = the average unskilled wage;

r = return to capital (both domestic and foreign);

L = endowment of unskilled labour (in physical unit);

v = unemployment rate of skilled labour;

S = endowment of skilled labour (in physical unit);

U = unemployment of skilled labour (in physical unit);

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

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

'$\wedge$' = proportionate change.

Given the perfectly competitive commodity markets the three price-unit cost equality conditions relating to the three industries are as follows.

$$Wa_{L1} + ra_{K1} = P_1 \tag{1}$$

$$W^* a_{L2} + ra_{K2} = 1 \tag{2}$$

$$\frac{W_S}{E} a_{S3} + ra_{K3} = P_3 \tag{3}$$

As the unskilled workers in this model earn two different wage rates in the two sectors the average unskilled wage is given by[3]

$$W_A \equiv W\lambda_{L1} + W * \lambda_{L2} \equiv W^* - \lambda_{L1}(W^* - W) \tag{4}$$

[3] Note that $\lambda_{L2} = 1 - \lambda_{L1}$.

Following Agell and Lundborg (1992, 1995) we assume the efficiency of each skilled worker to be positively related to the skilled wage relative to the average unskilled wage, skilled wage relative to the return to capital and the skilled unemployment rate.[4] Thus we have

$$E = E(\frac{W_S}{W_A}, \frac{W_S}{r}, v);\ E_1, E_2, E_3 > 0; E_{11}, E_{22} < 0;\ E_{13} = E_{12} = E_{23} = 0 \quad (5)$$

[5]

The unit cost of skilled labour, ϖ , is given by

$$\varpi = (\frac{W_S}{E(.)}) \quad (6)$$

Apart from skilled labour, capital is used in production in sector 3. Assuming capital to be perfectly mobile intersectorally and its uniform return be r economy-wide, each firm in sector 3 minimizes its unit cost of skilled labour as given by (6). The first-order condition of minimization is

$$E = \frac{W_S}{W_A} E_1 + \frac{W_S}{r} E_2 \quad (7)$$

where: $E_1 = (\frac{\partial E}{\partial \frac{W_S}{W_A}}) > 0$; and, $E_2 = (\frac{\partial E}{\partial \frac{W_S}{r}}) > 0$ are the partial derivatives of the efficiency function with respect to $(\frac{W_S}{W_A})$ and $(\frac{W_S}{r})$, respectively.

Full-employment conditions for unskilled labour and capital are given by the following two equations, respectively.

$$a_{L1}X_1 + a_{L2}X_2 = L \quad (8)$$

$$a_{K1}X_1 + a_{K2}X_2 + a_{K3}X_3 = K \quad (9)$$

Sectors 1 and 2 use the same two inputs: unskilled labour and capital; and, hence can be classified in terms factor intensities. It is natural to assume that sector 2 is more capital-intensive than sector 1 in value sense.[6]

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[4] The micro foundation of such an efficiency function is available in Agell and Lundborg (1992, 1995).

[5] The cross-effects have been assumed to zero which is a simplifying assumption. However, Agell and Lundborg (1992, 1995) in some cases have also made this assumption.

There is unemployment of skilled labour in the economy and the rate of unemployment is v. The skilled labour endowment equation is, therefore, given by

$$a_{S3}X_3 = E(1-v)S \tag{10}$$

The general framework consists of equations (1) – (3), (5) and (7) – (10). There are eight independent equations and the same number of endogenous variables; namely, W, r, W_S, E, v, X_1, X_2 and X_3.

Using (10), equation (9) can be rewritten as

$$a_{K1}X_1 + a_{K2}X_2 + (\frac{a_{K3}}{a_{S3}})E(1-v)S = K \tag{9.1}$$

Given W^*, r is determined from equation (2). Substituting the value of r into (1), W is found. The equilibrium values of W_S, E, v, X_1 and X_2 are obtained by solving equations (3), (5), (7), (8) and (9.1). Finally, plugging the values of W_S, r, E and v into (10), X_3 is found.

Unskilled workers in this system earn two different wages – either the unionized wage, W^*, in sector 2 or a lower competitive wage, W, in sector 1. The average wage for unskilled labour is given by equation (4). The skilled–unskilled wage gap in the present case 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. Comparative Statics

In this section of the paper we will examine the consequences of an inflow of foreign capital and/or an emigration of skilled labour on the relative wage inequality. The effects of these policies on the skilled unemployment will also be analyzed. We assume that any movement of capital does not accompany the international migration of skilled labour.[7]

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[6] This means that $(\frac{\theta_{K2}}{\theta_{L2}} > \frac{\theta_{K1}}{\theta_{L1}})$. From this it automatically follows that sector 2 is more capital-intensive than sector 1 in physical sense as well.

[7] This is a well-known assumption in the literature studying the welfare impact of international migration of labour. See Quibria (1988) in this context.

As r is obtained from equation (2), it follows from (3) that $(\frac{W_S}{E})$ is constant. So the skilled wage and the efficiency of skilled labour must move in the same direction and in the same proportion.

Differentiating equations (3) and (4) we get, respectively

$$\hat{W}_S = \hat{E} \tag{11}$$

$$\hat{W}_A = -\frac{(W^* - W_A)}{W_A}\hat{X}_1 \tag{12}$$

Totally differentiating equation (5) one gets

$$\hat{E} = \varepsilon_1(\hat{W}_S - \hat{W}_A) + \varepsilon_2\hat{W}_S + \varepsilon_3\hat{v} \tag{13}$$

where $\varepsilon_1, \varepsilon_2$ and $\varepsilon_3 > 0$ are the elasticities of $E(.)$ with respect to $\frac{W_S}{W_A}, \frac{W_S}{r}$ and v, respectively.

Dividing both sides of (7) by E one obtains

$$1 = \varepsilon_1 + \varepsilon_2 \tag{14}$$

This is the famous modified Solow condition as obtained in Agell and Lundborg (1992,1995). Substituting $\varepsilon_2 = (1 - \varepsilon_1)$ into (13), using (11) and simplifying we find

$$\varepsilon_1\hat{W}_A = \varepsilon_3\hat{v} \tag{15}$$

Equation (15) implies that the average unskilled wage, W_A, and the unemployment rate of skilled labour, v, are positively related. This establishes the following corollary.

Corollary 1: The average unskilled wage, W_A, and the rate of skilled unemployment, v, are proportionately related.

Totally differentiating equations (5), (7), (8) and (9.1), using (11) and (12) and solving by Cramer's rule the following results can be derived,

(1) When $\hat{K} > 0$, $\hat{X}_1 < 0$; $\hat{X}_2 > 0$; $\hat{X}_3 < 0$ iff $|\bar{D}| > 0$; and,

(2) When $\hat{S} < 0$, $\hat{X}_1 < 0$; and, $\hat{X}_2 > 0$; $\hat{X}_3 < 0$ iff $|D| > 0$ (16)

It can be proved[8] that the output levels respond normally (i.e. as per the relative factor intensities) to changes in factor endowments under the necessary and sufficient condition that $|D| > 0$. The unskilled labour-intensive (capital-intensive) sector expands (contracts) if the endowment of unskilled labour goes up and vice versa. On the other hand, the unskilled labour-intensive (capital-intensive) sector contracts (expands) following an increase in the endowment of capital. This is the Rybczynski effect. We assume that the condition ($|D| > 0$) holds so that output levels respond normally to changes in factor endowments.

Again differentiating (5), (7), (8) and (9.1) and solving the following expressions are obtained.[9]

$$\hat{W}_S = -\frac{\lambda_{L2}\varepsilon_3}{|D|}(\frac{W^* - W_A}{W_A})\{\varepsilon_1 E + E_{11}(\frac{W_S}{W_A})^2\}\hat{K} + \frac{\lambda_{L2}\lambda_{K3}\varepsilon_3}{|D|}(\frac{W^* - W_A}{W_A})\{\varepsilon_1 E + E_{11}(\frac{W_S}{W_A})^2\}\hat{S} \tag{17}$$

$$\hat{W}_A = -(\frac{\varepsilon_3\lambda_{L2}G}{|D|})(\frac{W^* - W_A}{W_A})\hat{K} + (\frac{\varepsilon_3\lambda_{L2}\lambda_{K3}G}{|D|})(\frac{W^* - W_A}{W_A})\hat{S} \tag{18}$$

and,

$$\hat{v} = [-\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}G}{|D|}]\hat{K} + [\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}\lambda_{K3}G}{|D|}]\hat{S} \tag{19}$$

$$\left.\begin{aligned} &\text{where: } G = \{E_{11}(\frac{W_S}{W_A})^2 + E_{22}(\frac{W_S}{r})^2\} < 0\text{; and,} \\ &|D| = [(\lambda_{K3}\lambda_{L2})(\frac{W^* - W_A}{W_A})\{\varepsilon_1(\frac{Gv}{1-v} - \varepsilon_3 E) - \varepsilon_3 E_{11}(\frac{W_S}{W_A})^2\} - |\lambda|\varepsilon_3 G] \end{aligned}\right\} \tag{20}$$

Also as $E_1 = ((\frac{\partial E}{\partial(\frac{W_A}{W_S})})(\frac{(\frac{W_A}{W_S})}{E})) > 0$ and $E_{11} < 0$ we must have $\{\varepsilon_1 E + E_{11}(\frac{W_S}{W_A})^2\} > 0$ (21)

Subtracting (18) from (17) the following two results can be easily derived.

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[8] This has been proved in Appendix I.

[9] For detailed derivations see appendices I and II.

$$\left.\begin{aligned} &\frac{(\hat{W}_S - \hat{W}_A)}{\hat{K}} < 0 \text{ iff } |D| > 0 \\ &\frac{(\hat{W}_S - \hat{W}_A)}{\hat{S}} > 0 \text{ iff } |D| > 0 \end{aligned}\right\} \qquad (22)$$

From (22) the following proposition follows immediately.

Proposition 1: The skilled-unskilled wage inequality improves owing to an inflow of foreign capital and/or an emigration of skilled labour iff $|D| > 0$.

Proposition 1 can intuitively be explained as follows. We note that W, r and $(\frac{W_S}{E})$ are determined from the price system[10] consisting of equations (1) – (3) and hence are independent of factor endowments e.g. K, S etc. An inflow of foreign capital produces a Rybczynski effect and leads to an expansion of sector 2 and a contraction of sector 1 as sector 2 (sector 1) is capital-intensive (unskilled labour-intensive). However, the capital released by sector 1 would be insufficient for the expansion of sector 2. Hence sector 3 also has to contract[11] and release capital to the expanding sector 2. The average unskilled wage, W_A, rises as the higher (lower) unskilled wage-paying sector expands (contracts). This raises the skilled unemployment rate, v (see corollary 1). As the high-skill sector (sector 3) contracts the demand for skilled labour also decreases which in turn lowers the skilled wage rate, W_S. This also reduces the efficiency of each skilled worker, E, as W_S and E must move in the same direction and in the same proportion (see equation (11)). Consequently, the relative wage inequality improves following an inflow of foreign capital. All these effects take place subject to the condition that $|D| > 0$.

On the other hand, an emigration of skilled labour results in a contraction of the high-skill sector (sector 3). The demand for skilled labour decreases that lowers the skilled wage rate, W_S. Sector 3 releases capital to the other two sectors. Consequently, a Rybczynski type effect takes place that

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[10] The skilled wage per efficiency unit, $\frac{W_S}{E}$, is determined from equation (3) once r is obtained from (2). However, determination of individual W_S and E requires the use of equations of the output system. Thus, these variables depend on factor endowments although their ratio does not.

[11] This has been proved in Appendix I.

leads to an expansion of sector 2 and a contraction of sector 1 as sector 2 is capital-intensive. The average unskilled wage goes up as the higher (lower) unskilled wage-paying sector has expanded (contracted). The result would be an improvement in the relative wage inequality subject to the condition: $|D| > 0$.

Now let us examine the consequences of international factor mobility on the unemployment of skilled labour, denoted, U, and is given by

$$U = vS \tag{23}$$

Differentiating (23) and using (19) the following results can be obtained.[12]

$$\frac{\hat{U}}{\hat{K}} = \frac{\hat{v}}{\hat{K}} = [-\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}G}{|D|}] > 0 \text{ iff } |D| > 0 \text{ and,} \tag{24}$$

$$\frac{\hat{U}}{\hat{S}} = (\frac{\hat{v}}{\hat{S}} + 1) = \frac{1}{|D|}[\lambda_{L2}\lambda_{K3}(\frac{W^* - W_A}{W_A})\beta + G\{\varepsilon_1(\frac{W^* - W_A}{W_A})\lambda_{L2}\lambda_{K3} - |\lambda|\varepsilon_3\}] \tag{25}$$

$$< 0 \text{ if (i) } (\frac{W^* - W_A}{W_A}) \geq (\frac{|\lambda|\varepsilon_3}{\lambda_{L2}\lambda_{K3}\varepsilon_1}) \text{; and,}$$

$$\text{(ii) } |D| > 0.$$

Hence the following proposition can now be established.

Proposition 2: An inflow of foreign capital raises the level of skilled unemployment iff $|D| > 0$. On the other hand, an emigration of skilled labour leads to an increase in the skilled unemployment if (i) $|D| > 0$; and, (ii) $(\frac{W^* - W_A}{W_A}) \geq (\frac{|\lambda|\varepsilon_3}{\lambda_{L2}\lambda_{K3}\varepsilon_1})$.

From corollary 1 we know that the average unskilled wage, W_A, and the skilled unemployment rate, v, are positively related. As sector 2 expands and sector 1 contracts following an inflow of foreign capital, W_A, rises which in turn raises, v. The aggregate skilled unemployment, vS, rises as S has not changed. On the other hand, an emigration of skilled labour implies a fall in S. As explained under proposition 1 that the average unskilled wage rises when S decreases. The skilled unemployment rate, v, rises as well. What happens to aggregate unemployment of skilled

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[12] These expressions have been derived in Appendix II.

labour is somewhat uncertain. It depends on the rates of fall and increase in S and v, respectively. Our analysis suggests that the rate of increase in the unemployment rate is greater than the rate of decrease in the endowment of skilled labour under the sufficient conditions as presented in proposition 2. Consequently, the absolute number of unemployed skilled worker rises although the skilled labour endowment of the economy has fallen.

4. Concluding remarks

This paper has extended the analysis of Agell and Lundborg (1995) by introducing the distinction between skilled and unskilled labour and imperfections and formal-informal sector segmentation of the unskilled labour market which are some of the salient features of the labour market in the developing economies. A third sector where skilled labour is a specific input has also been brought in where skilled wages are set according to the fair wage hypothesis (FWH) while in the other two sectors where unskilled labour is used competitive forces or trade union activities determine the unskilled wages. This theoretical analysis deserves special attention because no attempt has earlier been made to use the efficiency wage theory, especially the FWH version of the theory, in analyzing the skilled-unskilled wage inequality in a developing economy. This exercise leads to some interesting results. The efficiency skilled wage is constant and there is a proportional relationship between the average unskilled wage and skilled unemployment rate. Inflows of foreign capital and/ or an international migration of skilled labour may improve the relative wage inequality and raise the level of skilled unemployment under reasonable conditions. The result relating to emigration of skilled labour is particularly interesting as it is contrary to the conventional wisdom.

References:

Agell, J. and Lundborg, P. (1995): 'Fair wages in the open economy', *Economica* 62, 325-351

Agell, J. and Lundborg, P. (1992): 'Fair wages, involuntary unemployment and tax policy in the simple general equilibrium model', *Journal of Public Economics* 47, 299-320.

Akerlof, G. and Yellen, J. (1990): 'The fair wage effort hypothesis and unemployment', *Quarterly Journal of Economics* 105, 255-284.

Banerjee, B. (1986): *Rural to Urban Migration and the Urban Labour Market: A case study of Delhi*, Mumbai: Himalaya Publishing House.

Beladi, H., Chaudhuri, S. and Yabuuchi, S. (2008): 'Can international factor mobility reduce wage inequality in a dual economy?', *Review of International Economics* (forthcoming).

Bliss, C.J. and Stern, N,H. (1978): 'Productivity, wages, and nutrition, Parts I and II', *Journal of Development Economics* 5.

Chaudhuri, S. and Yabuuchi, S. (2007): 'Economic liberalization and wage inequality in the presence of labour market imperfection', *International Review of Economics and Finance* 16, 592-603.

Dasgupta, P. and Ray, D. (1986): 'Inequality as a determinant of malnutrition and unemployment' *Economic Journal* 96, 1011-1034.

Feenstra, R. C., and Hanson, G. H. (1996): 'Foreign investment, outsourcing and relative wages'. In R. C. Feenstra, G. M. Grossman, and D. A. Irwin (Eds.), Political economy of trade policies: Essays in honor of J. N. Bhagwati (pp. 89-127). Cambridge, MA: MIT Press.

Feher, E. (1991): 'Fair wages and unemployment', Dept. of Economics, University of Technology, Vienna.

Kingdon, G. Gandhi and Knight, J. (2004):'Unemployment in South Africa: the nature of the beast', *World Development* 32(3), 391-408.

Harris, J.R. and M. P. Todaro (1970): "Migration, Unemployment and Development: A Two-sector Analysis", *American Economic Review*, 60: 126-42.

Leibenstein, H. (1957): Economic Backwardness and Economic Growth, Wiley, New York.

Marjit, S., and Kar, S. (2005): 'Emigration and wage inequality', *Economics Letters*, 88, 141-145.

Marjit, S., Beladi, H., and Chakrabarti, A. (2004): 'Trade and wage inequality in developing countries', *Economic Inquiry*, 42, 295-303.

Marjit, S. and Acharyya, R. (2003). *International Trade, Wage Inequality and the Developing Countries: A General Equilibrium Approach*. Heidelberg: Physica/Springer Verlag.

Quibria, M.C. (1988): "A Note On International Migration, Non-traded goods and Economic Welfare in the Source Country", *Journal of Development Economics*, 28: 377-87.

Serneels, P.M. (2007): 'The nature of unemployment among young men in urban Ethiopia', *Review of Development Economics* 11(1), 170-186.

Shapiro, C. and Stiglitz, J.E. (1984): 'Equilibrium unemployment as a worker discipline device', *American Economic Review* 74, 433-444.

Udal, A.T. and Sinclair, S. (1982): 'The lluxury unemployment hypothesis: a review of recent evidence', World Development 10(1), 49-62.

Yabuuchi, S. and Chaudhuri, S. (2007): 'International migration of labour and skilled–unskilled wage inequality in a developing economy', *Economic Modelling* 24(1), 128-137.

Appendix I:

Differentiating (5), (8), (9.1) and (7) and using (11), (12) and the modified-Solow condition as given by (14) we obtain, respectively

$$A_1\hat{X}_1 + \varepsilon_3\hat{v} = 0 \tag{A.1}$$

$$\lambda_{L1}\hat{X}_1 + \lambda_{L2}\hat{X}_2 = 0 \tag{A.2}$$

$$\lambda_{K1}\hat{X}_1 + \lambda_{K2}\hat{X}_2 + \lambda_{K3}\hat{W}_S - A_2\hat{v} = (\hat{K} - \lambda_{K3}\hat{S}) \tag{A.3}$$

$$A_3\hat{X}_1 + G\hat{W}_S - A_4\hat{v} = 0 \tag{A.4}$$

where,

$$\left.\begin{aligned} &G=\{E_{11}(\frac{W_S}{W_A})^2 + E_{22}(\frac{W_S}{r})^2\} < 0;\ A_1 = [\varepsilon_1 \frac{(W^* - W_A)}{W_A}] > 0 \\ &A_2 = (\frac{\lambda_{K3}v}{1-v}) > 0\,;\ A_3 = [E_{11}(\frac{W_S}{W_A})^2(\frac{W^* - W_A}{W_A})] < 0 \\ &A_4 = \varepsilon_3 E > 0 \end{aligned}\right\} \tag{A.5}$$

Writing equations (A.1) – (A.4) in a matrix notation one gets

$$\begin{bmatrix} A_1 & 0 & 0 & \varepsilon_3 \\ \lambda_{L1} & \lambda_{L2} & 0 & 0 \\ \lambda_{K1} & \lambda_{K2} & \lambda_{K3} & -A_2 \\ A_3 & 0 & G & -A_4 \end{bmatrix} \begin{bmatrix} \hat{X}_1 \\ \hat{X}_2 \\ \hat{W}_S \\ \hat{v} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ (\hat{K} - \lambda_{K3}\hat{S}) \\ 0 \end{bmatrix} \tag{A.6}$$

Here the determinant of the coefficient matrix is

$$|D| = \begin{vmatrix} A_1 & 0 & 0 & \varepsilon_3 \\ \lambda_{L1} & \lambda_{L2} & 0 & 0 \\ \lambda_{K1} & \lambda_{K2} & \lambda_{K3} & -A_2 \\ A_3 & 0 & G & -A_4 \end{vmatrix} = A_1\lambda_{L2}(A_2G - \lambda_{K3}A_4) - \varepsilon_3(|\lambda|G + \lambda_{L2}\lambda_{K3}A_3)$$

Using (A.5) and simplifying we get

$$|D| = [(\lambda_{K3}\lambda_{L2})(\frac{W^* - W_A}{W_A})\{\frac{\varepsilon_1 Gv}{1-v} - \varepsilon_3(E\varepsilon_1 + E_{11}(\frac{W_S}{W_A})^2\} - |\lambda|\varepsilon_3 G] \tag{A.7}$$

or, $|D| = [(\lambda_{K3}\lambda_{L2})(\frac{W^* - W_A}{W_A})\beta - |\lambda|\varepsilon_3 G]$ (A.7.1)

where $\beta = [\frac{\varepsilon_1 G v}{1-v} - \varepsilon_3(E\varepsilon_1 + E_{11}(\frac{W_S}{W_A})^2] < 0$ as $(E\varepsilon_1 + E_{11}(\frac{W_S}{W_A})^2) > 0$ (see (21)) (A.7.2)

Solving (A.6) by Cramer's rule the following expressions are obtained.

$$\hat{X}_1 = (\frac{\varepsilon_3\lambda_{L2}G}{|D|})\hat{K} + (\frac{-\varepsilon_3\lambda_{L2}\lambda_{K3}G}{|D|})\hat{S} \quad \text{(A.8)}$$

$$\hat{X}_2 = (\frac{-\varepsilon_3\lambda_{L1}G}{|D|})\hat{K} + (\frac{\varepsilon_3\lambda_{L1}\lambda_{K3}G}{|D|})\hat{S} \quad \text{(A.9)}$$

From (A.8) and (A.9) the following results are obtained.

$$\left.\begin{array}{l} (\frac{\hat{X}_1}{\hat{K}}) = (\frac{\varepsilon_3\lambda_{L2}G}{|D|});\ (\frac{\hat{X}_1}{\hat{S}}) = (\frac{-\varepsilon_3\lambda_{L2}\lambda_{K3}G}{|D|}); \\ (\frac{\hat{X}_2}{\hat{K}}) = (\frac{-\varepsilon_3\lambda_{L1}G}{|D|});(\frac{\hat{X}_2}{\hat{S}}) = (\frac{\varepsilon_3\lambda_{L1}\lambda_{K3}G}{|D|}). \end{array}\right\} \quad \text{(A.10)}$$

Hence, using (A.5) from (A.10) we find that

$$\left.\begin{array}{l} \text{(1) When } \hat{K} > 0, \hat{X}_1 < 0\text{; and, } \hat{X}_2 > 0 \text{ iff } |D| > 0\text{; and,} \\ \text{(2) When } \hat{S} < 0, \hat{X}_1 < 0\text{; and, } \hat{X}_2 > 0 \text{ iff } |D| > 0 \end{array}\right\} \quad \text{(A.11)}$$

Differentiating (5), (8), (9.1) and (7), considering $\hat{L} \neq 0$ and solving by Cramer's rule one can obtain the following expressions: $(\frac{\hat{X}_1}{\hat{L}}) = (\frac{1}{|D|})[\lambda_{L2}\lambda_{K3}(\frac{W^* - W_A}{W_A})\beta - \varepsilon_3\lambda_{K2}G] > 0$ iff $|D| > 0$ (note that $\lambda_{K2} > |\lambda| = (\lambda_{L1}\lambda_{K2} - \lambda_{L2}\lambda_{K1}) > 0$); and, $(\frac{\hat{X}_2}{\hat{L}}) = \frac{1}{|D|}[\lambda_{L2}\lambda_{K3}(\frac{W^* - W_A}{W_A})\beta + \lambda_{K1}\varepsilon_3 G] < 0$ iff $|D| > 0$.

So the output levels respond normally (i.e. as per the relative factor intensities) to changes in factor endowments under the necessary and sufficient condition that $|D| > 0$. This is the Rybczynski effect. We assume that this condition ($|D| > 0$) holds.

Differentiating (9), using (A.10) and (A.11) and simplifying we find

$$\left.\begin{aligned} &(\frac{\hat{X}_3}{\hat{K}}) = (\frac{\lambda_{L2}(W^* - W_A)\beta}{W_A|D|}) < 0; \text{ iff } |D| > 0 \text{ and,} \\ &(\frac{\hat{X}_3}{\hat{S}}) = -(\frac{\varepsilon_3 G|\lambda|}{|D|}) > 0 \text{ iff} |D| > 0 \end{aligned}\right\} \quad (A.12)$$

Appendix II:

From (A.6)

$$\hat{W}_S = -\frac{\lambda_{L2}\varepsilon_3}{|D|}(\frac{W^* - W_A}{W_A})\{\varepsilon_1 E + E_{11}(\frac{W_S}{W_A})^2\}\hat{K}$$

$$+\frac{\lambda_{L2}\lambda_{K3}\varepsilon_3}{|D|}(\frac{W^* - W_A}{W_A})\{\varepsilon_1 E + E_{11}(\frac{W_S}{W_A})^2\}\hat{S} \quad (17)$$

$$\left.\begin{aligned} &\text{So } \hat{W}_S < 0 \text{ when } \hat{K} > 0 \text{ iff } |D| > 0 \text{ (as } \{\varepsilon_1 E + E_{11}(\frac{W_S}{W_A})^2\} > 0\text{); and,} \\ &\hat{W}_S < 0 \text{ when } \hat{S} < 0 \text{ iff } |D| > 0 \end{aligned}\right\} \quad (A.13)$$

Using (A.8) from (12) we find that

$$\hat{W}_A = -(\frac{\varepsilon_3\lambda_{L2}G}{|D|})(\frac{W^* - W_A}{W_A})\hat{K} + (\frac{\varepsilon_3\lambda_{L2}\lambda_{K3}G}{|D|})(\frac{W^* - W_A}{W_A})\hat{S} \quad (18)$$

Subtraction of (18) from (17) yields the following results.

$$\left.\begin{aligned} &\frac{(\hat{W}_S - \hat{W}_A)}{\hat{K}} = \frac{\varepsilon_3\lambda_{L2}}{|D|}(\frac{W^* - W_A}{W_A})\{E_{22}(\frac{W_S}{r})^2 - \varepsilon_1 E\} < 0 \text{ iff } |D| > 0 \\ &\frac{(\hat{W}_S - \hat{W}_A)}{\hat{S}} = \frac{\varepsilon_3\lambda_{L2}\lambda_{K3}}{|D|}(\frac{W^* - W_A}{W_A})\{\varepsilon_1 E - E_{22}(\frac{W_S}{r})^2\} > 0 \text{ iff } |D| > 0 \end{aligned}\right\} \quad (A.14)$$

From (A.14) it follows that the skilled-unskilled wage inequality improves following an inflow of foreign capital and/or an emigration of skilled labour iff $|D| > 0$.

Solving (A.6) once more one obtains

$$\hat{v} = [-\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}G}{|D|}]\hat{K} + [\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}\lambda_{K3}G}{|D|}]\hat{S} \quad (19)$$

(19) yields the following results.

$$\left.\begin{aligned} \frac{\hat{v}}{\hat{K}} &= [-\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}G}{|D|}] > 0 \text{ iff } |D| > 0 \text{ and,} \\ \frac{\hat{v}}{\hat{S}} &= [\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}\lambda_{K3}G}{|D|}] < 0 \text{ iff } |D| > 0 \end{aligned}\right\} \quad (A.15)$$

Skilled unemployment is, $U = vS$ (23)

Differentiating (23) we get

$$\hat{U} = \hat{v} + \hat{S} \quad (A.16)$$

Use of (A.15) and (A.16) and simplification yield

$$\frac{\hat{U}}{\hat{K}} = \frac{\hat{v}}{\hat{K}} = [-\varepsilon_1(\frac{W^* - W_A}{W_A})\frac{\lambda_{L2}G}{|D|}] > 0 \text{ iff } |D| > 0 \text{ and,} \quad (24)$$

$$\frac{\hat{U}}{\hat{S}} = (\frac{\hat{v}}{\hat{S}} + 1) = \frac{1}{|D|}[\lambda_{L2}\lambda_{K3}(\frac{W^* - W_A}{W_A})\beta + G\{\varepsilon_1(\frac{W^* - W_A}{W_A})\lambda_{L2}\lambda_{K3} - |\lambda|\varepsilon_3\}] \quad (25)$$

$$< 0 \text{ if (i) } (\frac{W^* - W_A}{W_A}) \geq (\frac{|\lambda|\varepsilon_3}{\lambda_{L2}\lambda_{K3}\varepsilon_1})\text{; and,}$$

$$\text{(ii) } |D| > 0.$$