FDI in Agricultural Land, Welfare and Unemployment in a Developing Economy

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30 May 2010

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(This version: May 2010)

Abstract: The paper purports to examine the consequences of foreign direct investment (FDI) in agricultural land in a developing economy using a three-sector general equilibrium model with simultaneous existence off unemployment of both skilled and unskilled labour. The analysis finds that FDI in agriculture does not only improve national welfare unequivocally but also mitigates unemployment problem of both types of labour. The paper theoretically justifies the desirability of flow of FDI in agriculture in the developing economies.

Keywords: FDI in agricultural land; national welfare; unemployment; fair wage hypothesis; skilled labour; unskilled labour; general equilibrium.

JEL classification: F10, F13, J41, O15.

FDI in Agricultural Land, Welfare and Unemployment in a Developing Economy

1. Introduction

Over the last decade the flow of FDI in agricultural land has gone up significantly in some of the developing countries, especially those in the Sub-Saharan Africa and South America. As per FAO (2009) the inflow of FDI into agriculture amounted to more than USD 3 billion per year by 2007, compared to USD 1 billion in 2000. The main form of recent investments is purchase or long-term leasing of agricultural land for food production. The area of land acquired in Africa by foreign capitalists in the last three years is estimated at up to 20 million hectares. This has led to a serious controversy among trade and development economists, politicians, social workers and policymakers. It is held that FDI in agricultural land is unethical as it violates property rights, denies access to land and water and threatens food security, poverty reduction and rural development in the capital host countries.

As per the conventional theoretical literature on international trade inflows of foreign capital with full repatriation of foreign capital income and in the presence of tariff protection of the capital-intensive import-competing sector is immiserizing. This literature includes works of Brecher and Alejandro (1977), Khan (1982), Beladi and Marjit (1992a, 1992b), Chandra and Khan (1993) etc. However, despite this welfare-worsening effect of foreign capital the developing countries have been able to attract a substantial amount of foreign capital[1] during the last two decades by adopting liberalized

[1] As per the UNCTAD (2008), the average yearly foreign direct investment (FDI) inflows to developing countries increased from nearly \$20.6 billion during 1980s to \$118 billion during 1990s and then 292 billion dollars per year, on an average, during the first eight years of the new millennium. Average yearly net FDI flows to developing countries increased from nearly \$14.7 billion during 80s to 165 billion dollars per year, on an average, during 2000-2008 (calculation based on UNCTAD 'Statistical Databases On-line' and World Investment Report (2008)). FDI inward stock in the developing countries has increased manifold from \$302.6 billion in 1980 to \$4246.7 billion in 2007. Besides, for the developing countries as a whole, FDI inflow accounts for nearly 13 percent of gross fixed capital formation in 2007, compared to less than 2 percent in 1980.

investment and trade policies. Why developing countries are yearning for foreign capital given the standard welfare deteriorating effects of foreign capital has been explained in the works like Marjit and Beladi (1996), Chaudhuri (2005, 2007) and Chaudhuri et al. (2006) which have demonstrated how foreign capital might produce favourable effects on welfare taking into consideration some essential features of the developing economies e.g. labour market distortion, presence of the vast informal economy and non-traded goods..

On the other hand, the persistence of unemployment of labour has still been a major problem in the developing world. The explanation of unemployment as a general equilibrium phenomenon depends on the type of labour under consideration. The Harris-Todaro (HT hereafter) (1970) type of model is one way to explain unemployment in a general equilibrium framework. However, in such a model unemployment is specific to the urban sector and is suitable to explain unemployment of unskilled labour only. But it does not account for unemployment of skilled labour which is a disquieting problem in the developing economies particularly after the global economic slowdown. The NSSO 61st Round report, *Employment and Unemployment Situation in India 2004-05* has found that the unemployment rate among those educated above the secondary level was higher, in both rural and urban areas of India than those with lesser educational attainments. Serneels (2007) has reported similar finding in the case of Ethiopia.

In order to theoretically explain the existence of unemployment of skilled labour, one has to recourse to the efficiency wage theories. A 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. According to the treatment of the FWH by Agell and Lundborg (1992, 1995), efficiency of a worker is sensitive to the functional distribution of income. Consequently, the return on capital and wage rates of labour and the unemployment rate appear as arguments in the efficiency function.

The objectives of the present paper are as follows. First, as the developing economies are plagued by both skilled and unskilled unemployment[2] it is important to develop an analytical framework that can be useful in analyzing the consequences of different policies on the national welfare and unemployment of both types of labour.[3] We develop a three-sector, specific-factor Harris-Todaro type general equilibrium model where the FWH is valid. Second, we intend to examine the consequences of capital inflows on the unemployment problem of both types labour. Finally and most importantly, we want to show that flow of FDI in agricultural land unequivocally improves social welfare. Moreover, FDI in agriculture also mitigates the unemployment problem of either type of labour. On the contrary, foreign capital inflows into the secondary sectors may be immiserizing. Although many of the developing economies[4] are yet to go far in allowing the entry of foreign capital into agriculture the analysis of the present paper justifies the desirability of FDI flow in agriculture from the perspective of both unemployment and social welfare.

2. The Model

We consider a small open dual economy with three sectors: one rural and two urban. There are four factors of production: land, capital, unskilled labour and skilled labour. The rural sector produces an agricultural commodity using land, capital and unskilled labour. The production technology in agriculture is of the fixed-coefficient type.[5]

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[2] See NSSO (2006) and Agenor (2004) among others.

[3] This is essential, especially when the unemployment situation of either type of labour has worsened alarmingly due to recent global financial and economic crisis. See ILO (2009), Alexander (2009) etc. in this context.

[4] For example, in India, FDI in agriculture is only permitted in certain sectors like floriculture, horticulture, development of seeds, animal husbandry, pisiculture, and cultivation of vegetables. Besides, FDI is permitted in tea plantations subject to the Foreign Investment Promotion Board (FIPB) approval. Details are available at http://business.mapsofindia.com/fdi-india/sectors/agriculture-services.html.

[5] Although this is a simplifying assumption it is not completely without any basis. After the advent of the new seed-fertilizer technology in many of the developing economies including India

a_{N1} units of land (N), a_{K1} units of capital (K) and a_{L1} units of unskilled labour (L) together produce one unit of the agricultural output (X_1). Sector 2 is an urban sector that produces a low-skill manufacturing commodity (X_2) by means of capital and unskilled labour. Finally, sector 3, another urban sector, uses capital and skilled labour (S) to produce a high-skill commodity (X_3).

Skilled labour is specific to sector 3. Unskilled labour is imperfectly mobile between sectors 1 and 2 while capital is completely mobile among all the three sectors of the economy. On the other hand, as sectors 2 and 3 produce non-agricultural commodities land is specific to the rural sector (sector 1). Although the amount of agricultural land of the economy is given, the effective land endowment can be increased by allowing the entry of foreign capital in agriculture. Foreign investments may be sought to exploit "surplus" land currently unused or underutilized.[6] One reason land may not be used to its full potential is that the infrastructural investments needed to bring it into production are so significant as to be beyond the budgetary resources of the country. International investments might bring much needed infrastructural investments which in turn could relax the land constraint of the economy. Hence the aggregate land endowment of the economy (N) consists of both domestically-owned (N_D) and foreign-owned (N_F) land and is an increasing function of the amount of FDI in agriculture (I).

Sector 2 faces an imperfect unskilled labour market in the form of a unionized labour market where unskilled workers receive a contractual wage, W^*, while the unskilled

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during the 1960s, agriculture requires inputs which are to be used in recommended doses. The inherent complementarity among the different inputs may justify the use of the fixed-coefficient production technology in agriculture. There are several works including those of Ensminger (2002) and FAO (2003) that have documented the critical role played by the use of various complementary agricultural inputs including land, fertilizer, hybrid seeds, and agricultural labour in enhancing agricultural output in many developing countries. However, even if the inputs are substitutes, the results of the paper still hold under additional sufficient conditions incorporating the partial elasticities of substitution between the three inputs.

[6] See FAO (2009).

wage rate in the rural sector, W, is market determined. The two unskilled wage rates are related by the Harris-Todaro (1970) migration equilibrium condition where the expected urban wage equals the rural wage rate with $W^* > W$. Therefore, there is urban unemployment of unskilled labour. On the other hand, we use the FWH to explain unemployment of skilled labour and the efficiency function is similar to that in Agell and Lundborg (1992, 1995). This function can be derived from the effort norm of the skilled workers, which is sensitive to the functional distribution of income and the skilled unemployment rate. This is the optimal effort function of the utility maximizing skilled workers. The aggregate capital stock of the economy (K) includes both domestic capital (K_D) and foreign capital (K_F) and these are perfect substitutes. Incomes from foreign capital and foreign-owned land are completely repatriated. Sectors 1 and 3 are the two export sectors while sector 2 is the import-competing sector and is protected by an import tariff. Sector 2 uses capital more intensively with respect to unskilled labour vis-à-vis sector 1. Production functions in the two non-agricultural sectors are of the variable-coefficient type and exhibit constant returns to scale with positive and diminishing marginal productivity to each factor. Finally, commodity 3 is chosen as the numeraire.

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

$a_{Ki} =$ amount of capital required to produce 1 unit of output in the ith sector, $i = 1,2,3$;

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

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

$P_i =$ exogenously given relative price of the ith commodity, $i = 1,2$;

$t =$ ad-valorem rate of tariff on the import of commodity 2;

$E =$ efficiency of each skilled worker;

$W_S =$ wage rate of skilled labour;

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

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

$R =$ return to land (both domestically-owned and foreign-owned);

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

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

$v =$ unemployment rate of skilled labour;

$L_U =$ urban unemployment of unskilled labour;

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

$\lambda_{ji} =$ 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.

$$Wa_{L1} + ra_{K1} + Ra_{N1} = P_1 \tag{1}$$

$$W^* a_{L2} + ra_{K2} = P_2(1+t) \tag{2}$$

$$\frac{W_S}{E} a_{S3} + ra_{K3} = 1 \tag{3}$$

Following Agell and Lundborg (1992, 1995) we assume that the effort norms of the skilled labour depend positively on (i) skilled wage relative to average unskilled wage; (ii) skilled wage relative to returns on capital and land; and, positively on (iii) the unemployment rate of skilled labour. It may be mentioned that the average unskilled wage in the economy is the rural sector wage that follows from the 'envelope property' of the HT framework.[7] Therefore, we write

$$E = E\left(\frac{W_S}{W}, \frac{W_S}{r}, \frac{W_S}{R}, v\right) \tag{4}$$

[7] Unskilled workers are employed in the rural and low-skill urban manufacturing sectors where they earn W and W^* wages, respectively. Some of the unskilled workers remain unemployed in the urban sector earning nothing. The average wage income of all unskilled workers in the economy is the rural sector wage. This can be easily shown from equations (10) and (11). So, the efficiency function, given by equation (4), indirectly takes into account the unionized wage and the urban unemployment of unskilled labour as determinants.

The efficiency function satisfies the following mathematical restrictions:

$E_1, E_2, E_3, E_4 > 0$; $E_{11}, E_{22}, E_{33} < 0$; $E_{12} = E_{13} = E_{14} = E_{23} = E_{24} = E_{34} = 0$.[8]

The unit cost of skilled labour in sector 3, denoted by ϖ, is given as

$$\varpi = \left(\frac{W_S}{E(.)}\right) \tag{5}$$

Each firm in sector 3 minimizes its unit cost of skilled labour as given by (5). The first-order condition of minimization is

$$E = \frac{W_S}{W}E_1 + \frac{W_S}{r}E_2 + \frac{W_S}{R}E_3 \tag{6}$$

where: E_i s are the partial derivatives of the efficiency function with respect to $\left(\frac{W_S}{W}\right)$, $\left(\frac{W_S}{r}\right)$ and $\left(\frac{W_S}{R}\right)$, respectively. Equation (6) can be rewritten as

$$\varepsilon_1 + \varepsilon_2 + \varepsilon_3 = 1 \tag{6.1}$$

where ε_i is the elasticity of the $E(.)$ function with respect to its i th argument. This is the modified Solow condition as obtained in Agell and Lundborg (1992, 1995).

The amount of foreign-owned (N_F) land is considered to be an increasing function of the amount of FDI in agriculture (I) i.e.

$N_F = N_F(I); N_F' > 0$.

Full utilization of land[9] and capital, respectively entail

$$a_{N1}X_1 = N_D + N_F(I) = N \tag{7}$$

[8] Mathematical derivation of the efficiency function from the rational behavior of a representative skilled worker and explanations of the mathematical restrictions on the partial derivatives are available in Agell and Lundborg (1992, 1995).

[9] Note that the aggregate land endowment of the economy (N) is an increasing function of the amount of FDI in agriculture (I).

$$a_{K1}X_1 + a_{K2}X_2 + a_{K3}X_3 = K \tag{8}$$

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

$$a_{S3}X_3 = E(1-v)S \tag{9}$$

In the migration equilibrium there exists urban unemployment of unskilled labour. The unskilled labour endowment equation is given by

$$a_{L1}X_1 + a_{L2}X_2 + L_U = L \tag{10}$$

In a Harris-Todaro framework the unskilled labour allocation mechanism is such that in the labor market equilibrium, the rural wage rate, W, equals the expected wage income in the urban sector. Since the probability of finding a job in the urban low-skill sector is $(a_{L2}X_2 / (a_{L2}X_2 + L_U))$ the expected unskilled wage in the urban sector is $(W * a_{L2}X_2 / (a_{L2}X_2 + L_U))$. Therefore, the rural-urban migration equilibrium condition of unskilled labour is expressed as

$$(W * a_{L2}X_2 / (a_{L2}X_2 + L_U)) = W ,$$

or equivalently,

$$(W*/W)a_{L2}X_2 + a_{L1}X_1 = L \tag{11}$$

Using (7) and (9) equations (11) and (8) can be rewritten as follows.

$$(\frac{W^*}{W})a_{L2}X_2 + \frac{a_{L1}}{a_{N1}}N = L\text{; and,} \tag{11.1}$$

$$[(\frac{a_{K1}}{a_{N1}}N) + a_{K2}X_2 + \{\frac{a_{K3}E(1-v)S}{a_{S3}}\}] = K \tag{8.1}$$

In this general equilibrium model there are ten endogenous variables; namely, W, r, R, W_S, E, v, L_U, X_1, X_2 and X_3 and the same number of independent equations; namely, (1) – (4), (6), (7), (8.1), (9), (10) and (11.1). The endogenous variables are determined as follows. The system does not possess the decomposition property. r is found from (2) as W^* is given exogenously. W, R, W_S, v and X_2 are simultaneously solved from equations (1), (4), (6), (8.1) and (11.1). E is then found from (3). X_1 and X_3 are solved from equations (7) and (9), respectively. Finally, L_U is obtained from (10).

A close look at the price system reveals that given the value of R, sectors 1 and 2 can be conceived to form a Heckscher-Ohlin subsystem (HOSS) as they use two common inputs: unskilled labour and capital. It is sensible to assume that sector 2 is more capital-intensive than sector 1 in value sense with respect to unskilled labour. This implies that $(a_{K2} / W^* a_{L2}) > (a_{K1} / W a_{L1})$.

We measure welfare of the economy by national income at world prices, Y, and is given by

$$Y = WL + RN_D + rK_D + W_S(1-v)S - tP_2X_2 \tag{12}$$

It is assumed that incomes from foreign capital and foreign-owned land are completely repatriated. In equation (12), WL and $W_S(1-v)S$ give the aggregate wage incomes of the unskilled and skilled workers, respectively. RN_D is the rental income from domestically-owned land endowment[10] while rK_D denotes rental income from domestic capital. Finally, tP_2X_2 measures the supply side distortionary cost of tariff protection of the import-competing sector.

3. Comparative Statics

We are now going to analyze the consequences of inflows of foreign capital on national welfare and unemployment of both skilled and unskilled labour. An inflow of foreign

[10] If a part of the FDI in agriculture takes the form of long-term rental contracts of existing land by foreign capitalists the amount of domestically-owned land (N_D) falls but the aggregate rental income (including that from leased out land) does not fall if the leasing out of land takes place at the market determined rental rate, R. On the contrary, N_D does not change if the FDI is made to exploit "surplus" land currently unused or underutilized.

capital into the primary export sector is captured by an increase in I which in turn raises the aggregate endowment of land of the economy. On the other hand, an FDI in the secondary sectors including the tariff-protected import-competing sector of the economy is demonstrated through an increase in the endowment of K.[11]

Differentiating equations (1), (4) (6), (11.1) and (8.1) the following expressions are derived, respectively.[12]

$$\theta_{L1}\hat{W} + \theta_{N1}\hat{R} = 0 \tag{13}$$

$$\varepsilon_1\hat{W} + \varepsilon_3\hat{R} - \varepsilon_4\hat{v} = 0 \tag{14}$$

$$B_1\hat{W} + B_2\hat{R} - B_3\hat{W}_S + \varepsilon_4\hat{v} = 0 \tag{15}$$

$$-\lambda^*_{L2}\hat{W} + \lambda^*_{L2}\hat{X}_2 = -M_1\hat{I} \tag{16}$$

$$\lambda_{K2}\hat{X}_2 + \lambda_{K3}\hat{W}_S - B_4\hat{v} = \hat{K} - M_2\hat{I} \tag{17}$$

where:

$$\left.\begin{aligned}
&B_1 = \frac{E_{11}}{E}(\frac{W_S}{W})^2 < 0\ ; B_2 = \frac{E_{33}}{E}(\frac{W_S}{R})^2 < 0\ ;\\
&B_3 = \left[(\frac{W_S}{W})^2\frac{E_{11}}{E} + (\frac{W_S}{r})^2\frac{E_{22}}{E} + (\frac{W_S}{R})^2\frac{E_{33}}{E}\right] < 0\ ; B_4 = (\frac{\lambda_{K3}v}{1-v}) > 0\ ;\\
&e = ((\frac{dN_F}{dI})(\frac{I}{N_F})) > 0; \lambda^*_{L2} = (\frac{W^*}{W})\lambda_{L2} > 0; \lambda_{NF} = (\frac{N_F}{N}) > 0;\\
&M_1 = \lambda_{L1}\lambda_{NF}e > 0; M_2 = \lambda_{K1}\lambda_{NF}e > 0.
\end{aligned}\right\} \tag{18}$$

Arranging (13) – (17) in a matrix notation one obtains

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[11] Although over the last two decades the investment policy has significantly been liberalized in the developing economies like India, there still exists a considerable degree of restriction in the process of free inflow of foreign capital into these countries. For example, in India, barring some sectors kept under the automatic route foreign investors are required to secure prior permissions or approvals from the Government of India or the Reserve Bank of India (RBI), or the FIPB for the purpose of making investment. There are also sectoral caps in many sectors limiting the maximum levels of foreign investment that can be made in those sectors. Besides, capital is not permitted to move freely from one approved FDI project to another.

[12] Note that a_{L1}, a_{N1} and a_{K1} are technologically given. See footnote 5 in this context.

$$\begin{bmatrix} \theta_{L1} & \theta_{N1} & 0 & 0 & 0 \\ \varepsilon_1 & \varepsilon_3 & 0 & -\varepsilon_4 & 0 \\ B_1 & B_2 & -B_3 & \varepsilon_4 & 0 \\ -\lambda_{L2}^* & 0 & 0 & 0 & \lambda_{L2}^* \\ 0 & 0 & \lambda_{K3} & -B_4 & \lambda_{K2} \end{bmatrix} \begin{bmatrix} \hat{W} \\ \hat{R} \\ \hat{W}_S \\ \hat{v} \\ \hat{X}_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ -M_1\hat{I} \\ \hat{K} - M_2\hat{I} \end{bmatrix} \tag{19}$$

The determinant to the coefficient matrix is

$$|D| = \lambda_{L2}^*[-\varepsilon_4 B_3 \theta_{N1}\lambda_{K2} + (\varepsilon_4\lambda_{K3}J - B_3 B_4 H)] \tag{20}$$

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where

$$\left. \begin{aligned} &J = \{\theta_{L1}(B_2+\varepsilon_3) - \theta_{N1}(B_1+\varepsilon_1)\}\,; \\ &H = (\theta_{L1}\varepsilon_3 - \theta_{N1}\varepsilon_1)\,. \end{aligned} \right\} \tag{21}$$

As the production structure is indecomposable an increase in the land endowment of the economy that results from an increase in foreign investments in agriculture (I) must lower its rate of return, R i.e. $(\hat{R}/\hat{N}) < 0$. Thus, solving (19) by Cramer's rule it can be easily proved[13] that

$$|D| > 0 \tag{22}$$

For determining the signs of J and H we need to impose some restrictions on the relative responsiveness of the $E(.)$, E_1 and E_3 functions with respect to their two arguments: $(\frac{W_S}{W})$ and $(\frac{W_S}{R})$. The efficiency function, given by equation (4), is assumed to satisfy the following two special properties.

Property A: The responsiveness of $E(.)$ with respect to $\frac{W_S}{R}$ is greater than that with respect to $\frac{W_S}{W}$ such that $(\frac{\varepsilon_3}{\theta_{N1}}) > (\frac{\varepsilon_1}{\theta_{L1}})$.

[13] This has been shown in Appendix I.

Property B: The algebraic value of the elasticity of E_3 with respect to $\frac{W_S}{R}$ is not less than that of E_1 with respect to $\frac{W_S}{W}$ i.e. $(\frac{E_{33}W_S}{E_3 R}) \geq (\frac{E_{11}W_S}{E_1 W})$.

The implications of the above two properties are as follows. Although the efficiency of skilled workers depends on the relative income distribution, they are expected to have different attitudes towards the earnings of different factors of production. So changes in incomes of different factors should affect the efficiency of skilled labour in different degrees. It is reasonable to assume that the average unskilled wage is substantially lower than the skilled wage so that the skilled workers may be expected to be compassionate towards their unskilled counterparts. On the contrary, they are likely to feel significantly deprived if the returns on land and capital increase relative to the skilled wage, adversely affecting their work morale. Therefore, it may be logical, to assume that increases in incomes of the capitalists engender more negative response among the skilled workers and lower their efficiency than that resulting from an increase in the average unskilled wage.

Properties (A) and (B) of the efficiency function together imply that[14]

$$\left.\begin{array}{l} (\frac{\theta_{L1}}{\theta_{N1}}) > (\frac{\varepsilon_1}{\varepsilon_3}) \geq (\frac{\varepsilon_1 + B_1}{\varepsilon_3 + B_2});\ \text{and,} \\ J = \{\theta_{L1}(B_2 + \varepsilon_3) - \theta_{N1}(B_1 + \varepsilon_1)\} > 0; H = (\theta_{L1}\varepsilon_3 - \theta_{N1}\varepsilon_1) > 0 \end{array}\right\} \qquad (23)$$

Differentiating (2) and (3) it is easy to show that

$$\hat{E} = \hat{W}_S \qquad (24)$$

This leads to the following corollary.

[14] This has been proved in Appendix II.

Corollary 1: The efficiency of skilled labour, E, and the skilled wage rate, W_S, always change in the same direction and in the same proportion.

From (13) we can write

$$\hat{W} = -(\frac{\theta_{N1}}{\theta_{L1}})\hat{R} \tag{25}$$

This establishes the following corollary.

Corollary 2: W and R are negatively correlated.

Using (25) equation (14) can be rewritten as follows.

$$\hat{v} = \frac{(\varepsilon_3\theta_{L1} - \varepsilon_1\theta_{N1})\hat{R}}{\varepsilon_4\theta_{L1}} \tag{26}$$

Using (23) from (26) the following corollary is imminent.

Corollary 3: R and v are positively related.[15]

Adding (14) and (15) and substituting for $\hat{W}$ from (13) we get

$$\hat{W}_S = [\frac{\theta_{L1}(\varepsilon_3 + B_2) - \theta_{N1}(\varepsilon_1 + B_1)}{\underset{(-)}{\theta_{L1}B_3}}]\hat{R} \tag{27}$$

With the help of (23) from (27) the following corollary immediately follows.

Corollary 4: R and W_S are negatively related.

Solving (19) by Cramer's rule the following proposition can be easily established.[16]

Proposition 1: Under assumptions A and B, an inflow of foreign capital to either of the two broad sectors of the economy leads to (i) an increase in the rural unskilled wage (W); (ii) a decrease in the return to land (R); (iii) an increase in the skilled wage (W_S);.(iv) a fall in the unemployment rate of skilled labour (v); and, (v) an expansion of sector 3. Furthermore, (vi) sector 1 expands (remains unaffected) while sector 2 contracts

[15] As the rural sector unskilled wage and the return on land are negatively related (corollary 2) there is a negative relationship between the average (rural) unskilled wage and skilled unemployment rate.

[16] See Appendix III for mathematical derivations of the results.

(expands) owing to inflows of foreign capital into the primary (secondary) sector of the economy.

An inflow of foreign capital in agriculture (I) raises the effective land endowment of the economy thereby lowering its return (R). This raises the rural unskilled wage, W in order to satisfy the zero-profit condition in sector 1 (see equation (1)). A fall in R lowers the skilled unemployment rate, v (corollary 3) and raises the skilled wage, W_S (corollary 4) and hence their efficiency, E (corollary 1). As employment of skilled labour rises in efficiency unit (also in physical unit) sector 3 expands. Sector 1 also expands as the endowment of the sector-specific input, land, has increased. Both sector 1 and sector 3 draw capital from sector 2 leading to a contraction of the latter.

On the other hand, an inflow of foreign capital in the non-agricultural sectors does not affect its return, r , since it is determined from equation (2). Both sector 2 and sector 3 expand as they use capital. The output and the employment in sector 1 do not change because the endowment of the sector-specific input, land does not change and the production technology is of the fixed-coefficient type. As sector 2 expands the expected urban unskilled wage for a prospective rural unskilled worker rises. This lures the rural workers to move into the urban sector. But as the output and the employment in agriculture do not change the workers can be kept in the rural sector only if the rural sector unskilled wage (W) rises sufficiently. An increase in W lowers the return to land (R) which in turn raises W_S (corollary 4) and hence E (corollary 1) and lowers the skilled unemployment rate, v (corollary 3). As the employment of skilled labour rises in both efficiency and physical units, sector 3 expands.

We now intend to examine the welfare consequences of FDI flows into the different sectors of the economy. Differentiating the national income expression (equation 12) the following proposition can be proved.[17]

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[17] This has been proved in Appendix IV.

Proposition 2: An inflow of foreign capital in agriculture is unambiguously welfare-improving[18] while inflows of foreign capital in the secondary sectors may fail to boost social welfare.

We explain proposition 2 in the following fashion. In proposition 1 we find that an inflow of foreign capital to either of the two broad sectors of the economy raises the aggregate unskilled wage, aggregate skilled employment and hence the aggregate skilled wage but lowers the domestic rental income on land. The domestic capital income, however, remains unchanged. It is easy to show that the increase in the aggregate unskilled wage income outweighs the fall in domestic rental income on land.[19] Hence in both the cases the aggregate factor income unambiguously rises. Besides, an inflow of capital in agriculture leads to a contraction of the tariff protected import-competing sector. Hence the cost of protection of the import-competing sector falls. Social welfare unequivocally improves in this case. But in the case of foreign capital inflow to the non-agricultural sectors the protected sector expands. Hence there is no guarantee that it improves social welfare unless the positive aggregate factor income effect is strong enough to dominate over the negative supply side distortionary effect of tariff protection of the import-competing sector.

Our next task is to analyze the outcomes of foreign capital inflows in different sectors on the unemployment of unskilled labour in the urban area. Subtraction of equation (10) from (11) yields

$$L_U = a_{L2} X_2 \left(\frac{W^* - W}{W}\right) \tag{28}$$

[18] Here foreign capital inflow takes place into the economy's primary export sector. There are other papers in the literature like Beladi and Marjit (1992) that have examined the welfare consequence of foreign capital into the export sector of a small open economy. However, they have found the inflow of foreign capital to be immiserizing.

[19] This has been shown in Appendix IV.

Totally differentiating equation (28) one can establish the final proposition of the model.[20]

Proposition 3: An inflow of foreign capital to either of the two broad sectors of the economy unambiguously improves the urban unemployment problem of unskilled labour.

We explain proposition 3 in the following manner. In the migration equilibrium the expected urban wage for a prospective unskilled rural migrant equals the actual unskilled rural wage. An inflow of foreign capital of either type affects the migration equilibrium in two ways. First, the low-skill urban manufacturing sector expands or contracts. This leads to a change in the number of jobs available in this sector. The expected urban wage for a prospective rural migrant, $[W^*/\{1+(L_U/a_{L2}X_2)\}]$, changes as the probability of getting a job in this sector changes for every unskilled worker. This is *the centrifugal force*. If the expected urban wage rises (falls) *the centrifugal force* is positive (negative).This paves the way for fresh migration (reverse migration) from the rural (urban) to the urban (rural) sector. On the other hand, an inflow of foreign capital of either type raises the rural unskilled wage (see proposition 1). This is *the centripetal force* that prevents rural workers from migrating into the urban sector. Thus, there are two opposite effects that determine the size of the unemployed urban unskilled workforce. In the case of an inflow of foreign capital in agriculture the low-skill urban manufacturing sector contracts both in terms of output and employment. The expected urban unskilled wage falls. So the centrifugal force is negative and drives the unemployed urban workers to return to the rural sector. Thus, both the negative centripetal force and the centrifugal force work in the same direction and cause the urban unemployment of unskilled labour to decline. On the contrary, in the case of an inflow of foreign capital in the secondary sectors the low-skill urban sector expands and raises the expected urban unskilled wage. This lures the rural workers to move into the urban sector. But as the rural sector output and employment do not change the workers can be kept in the rural sector only if the rural sector unskilled wage rises sufficiently. Given that the employment of unskilled labour in agriculture does not change and that the employment in the low-skill urban

[20] See Appendix V for mathematical proof of this proposition.

sector (sector 2) has increased, the aggregate employment of unskilled labour in the economy increases thereby improving the urban unemployment problem.

4. Concluding remarks

This paper has developed a three-sector general equilibrium model that can explain the unemployment phenomenon of both skilled and unskilled labour. The unemployment of unskilled labour is explained in terms of the Harris-Todaro (1970) type rural-urban migration mechanism while that of skilled labour is shown using the FWH. There are four factors of production: land, capital, unskilled labour and skilled labour. The land endowment of the economy can be increased by allowing the entry of foreign capital in agriculture. Inflows of foreign capital may take place also in the secondary sectors of the economy. Consequences of foreign capital inflows in different sectors of the economy have been studied on national welfare and unemployment of either type of labour. The most important finding of the paper is that flow of FDI in agriculture unambiguously improves social welfare. Furthermore, it lowers the magnitude of unemployment problem of each type of labour. On the contrary, an inflow of foreign capital into the secondary sectors may affect social welfare adversely. The paper, therefore, justifies the desirability of FDI flow in agricultural land in the developing world from the viewpoint of both unemployment and social welfare. These results shed some new light on a long-standing policy debate as to whether priority should be given to agriculture or to secondary or services sector for achieving a decent economic growth and eradicating poverty in a developing economy. Montalvo and Ravallion (2009) have discussed this issue in details by citing both the Chinese and the Indian experiences. Although India could achieve a high rate of economic growth during the liberalized regime giving high priority to the tertiary sector she has not performed well on the poverty front.[21] On the contrary, China has been amply successful in both economic growth and poverty fronts by giving top

[21] The World Bank (2008) estimates that 456 million Indians (42% of the total Indian population) in 2005 lived under the global poverty line of $1.25 per day (Purchasing power parity). This means that a third of the global poor in 2005 lived in India. Besides, the number of poor people living under $1.25 a day has increased from 421 million in 1981 to 456 million in 2005. Further details are available at http://go.worldbank.org/DQKD6WV4T0

priority to agriculture. After witnessing China's exemplary success on the agricultural front the developing economies like India are of late toying with the idea of permitting foreign investment in agriculture.[22, 23, 24] The analysis of the paper provides a theoretical foundation of such a move by the developing nations.

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[22] India's total cultivable area is 1,269,219 sq. km. in 2009 (56.78% of total land area) (see www.indiastat.com). So, there is ample scope for further increase in cultivable land by allowing FDI in agriculture.

[23] See Deshpande (2007) for details.

[24] The above policy implications are relevant for Sub-Sahara African or South American countries as well. See FAO (2009) and Görgen et al. (2009) in this context.

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Appendix I:

Solving (19) by Cramer's rule the following result is obtained.

$$\frac{\hat{R}}{\hat{I}} = \frac{|\lambda^*|}{|D|}(\theta_{L1}\varepsilon_4 B_3 \lambda_{NF} e) \tag{A.1}$$

(+)(–)

where:

$$|D| = \lambda_{L2}^*[-\varepsilon_4 B_3 \theta_{N1}\lambda_{K2} + (\varepsilon_4 \lambda_{K3} J - B_3 B_4 H)] \tag{20}$$

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$$\left.\begin{aligned} &J = \{\theta_{L1}(B_2 + \varepsilon_3) - \theta_{N1}(B_1 + \varepsilon_1)\}\ ; \\ &H = (\theta_{L1}\varepsilon_3 - \theta_{N1}\varepsilon_1)\ ;\ \text{and,} \\ &|\lambda^*| = (\lambda_{L1}\lambda_{K2} - \frac{W^*}{W}\lambda_{L2}\lambda_{K1}) > 0 \end{aligned}\right\} \tag{A.2}$$

(Note that $|\lambda^*| > 0$ as sector 1 is more unskilled labour-intensive vis-à-vis sector 2 in value sense.)

In an indecomposable production structure like this it is sensible to assume that R falls (rises) if I (hence N) rises (falls) i.e. $(\frac{\hat{R}}{\hat{I}}) < 0$. From (A.1) it then follows that

$$|D| > 0 \tag{22}$$

From (20), (A.2) and (22) it follows that two sufficient conditions for $|D| > 0$ are: $J, H > 0$.

Appendix II:

As $E_1 = (\frac{\partial E}{\partial(\frac{W_S}{W})}); E_3 = (\frac{\partial E}{\partial(\frac{W_S}{R})}) > 0$ and $E_{11}, E_{33} < 0$ we must have

$[\varepsilon_1 E + E_{11}(\frac{W_S}{W})^2] > 0$; and,

$[\varepsilon_3 E + E_{33}(\frac{W_S}{R})^2] > 0$. Using (18) one can write

$$\left.\begin{aligned} &(\varepsilon_1 + B_1) > 0\text{; and,} \\ &(\varepsilon_3 + B_2) > 0. \end{aligned}\right\} \tag{A.3}$$

From Assumption A it follows that

$$(\frac{\theta_{L1}}{\theta_{N1}}) > (\frac{\varepsilon_1}{\varepsilon_3}) \tag{A.4}$$

That $H > 0$ is a direct consequence of Assumption A. We are going to prove that $J > 0$ if Assumption B holds.

From (23)

$$J > 0 \Rightarrow (\frac{\theta_{L1}}{\theta_{N1}}) > (\frac{\varepsilon_1 + B_1}{\varepsilon_3 + B_2}) \tag{A.5}$$

Now

$$[\frac{\varepsilon_1}{\varepsilon_3} - \frac{(B_1 + \varepsilon_1)}{(B_2 + \varepsilon_3)}] = [\frac{(\varepsilon_1 B_2 - \varepsilon_3 B_1)}{\varepsilon_3 (B_2 + \varepsilon_3)}] = (\frac{\varepsilon_1}{B_2 + \varepsilon_3})[\frac{B_2}{\varepsilon_3} - \frac{B_1}{\varepsilon_1}]$$

Substituting the values of B_1 and B_2 from (18) and simplifying we can obtain the following expression.

$$[\frac{\varepsilon_1}{\varepsilon_3} - \frac{(B_1 + \varepsilon_1)}{(B_2 + \varepsilon_3)}] = (\frac{\varepsilon_1}{\varepsilon_3 + B_2})[\frac{E_{33} W_S}{E_3 R} - \frac{E_{11} W_S}{E_1 W}] \tag{A.6}$$

Now if $(\frac{E_{33} W_S}{E_3 R}) \geq (\frac{E_{11} W_S}{E_1 W})$ i.e. if Assumption B holds from (A.3) and (A.6) it follows that

$$\frac{\varepsilon_1}{\varepsilon_3} \geq \frac{(B_1 + \varepsilon_1)}{(B_2 + \varepsilon_3)} \tag{A.7}$$

From (A.4) and (A.7) we can write

$$(\frac{\theta_{L1}}{\theta_{N1}}) > (\frac{\varepsilon_1 + B_1}{\varepsilon_3 + B_2}) \Rightarrow J > 0.$$

Combining (A.4) and (A.7) and using (21) one can write

$$(\frac{\theta_{L1}}{\theta_{N1}}) > (\frac{\varepsilon_1}{\varepsilon_3}) \geq (\frac{\varepsilon_1 + B_1}{\varepsilon_3 + B_2}) \Rightarrow J, H > 0. \tag{23}$$

Appendix III:

Solving (19) by Cramer's rule, using (18), (22) and (23) and simplifying the following results can be obtained.

$$\left.\begin{aligned}
&\frac{\hat{W}}{\hat{I}} = -(\frac{\varepsilon_4\theta_{N1}B_3\lambda_{NF}e\left|\lambda^*\right|}{|D|}) > 0\,; \quad \frac{\hat{W}}{\hat{K}} = -\frac{\varepsilon_4\theta_{N1}B_3\lambda^*_{L2}}{|D|} > 0\,;\\
&\frac{\hat{R}}{\hat{I}} = \frac{\left|\lambda^*\right|}{|D|}(\theta_{L1}\varepsilon_4B_3\lambda_{NF}e) < 0\,; \quad \frac{\hat{R}}{\hat{K}} = \frac{\lambda^*_{L2}(\theta_{L1}\varepsilon_4B_3)}{|D|} < 0\\
&\frac{\hat{W}_S}{\hat{I}} = \frac{\left|\lambda^*\right|}{|D|}\varepsilon_4J\lambda_{NF}e > 0\,; \quad \frac{\hat{W}_S}{\hat{K}} = \frac{\lambda^*_{L2}}{|D|}\varepsilon_4J > 0\\
&\frac{\hat{v}}{\hat{I}} = \frac{\left|\lambda^*\right|}{|D|}B_3H\lambda_{NF}e < 0\,; \quad \frac{\hat{v}}{\hat{K}} = \frac{\lambda^*_{L2}}{|D|}B_3H < 0\\
&\frac{\hat{X}_1}{\hat{I}} = \mathrm{e}\lambda_{\mathrm{NF}} > 0\,;\\
&\frac{\hat{X}_1}{\hat{K}} = 0\,; \frac{\hat{X}_2}{\hat{K}} = -(\frac{B_3\varepsilon_4\theta_{N1}\lambda^*_{L2}}{|D|}) > 0\\
&\frac{\hat{X}_2}{\hat{I}} = \frac{1}{|D|}[-M_1(\varepsilon_4\lambda_{K3}J - B_3B_4H) + M_2\varepsilon_4B_3\theta_{N1}\lambda^*_{L2}] < 0
\end{aligned}\right\} \tag{A.8}$$

Results presented in (A.8) have been verbally stated in proposition 1.

Appendix IV:

Totally differentiating (12), using (A.8), (18), (22) and (23) and simplifying the following two expressions can be derived

$$Y(\frac{\hat{Y}}{\hat{I}}) = -\frac{\varepsilon_4 B_3 \lambda_{NF} e\left|\lambda^*\right|}{|D|}(\theta_{N1}WL - \theta_{L1}RN_D) + \frac{W_S S \lambda_{NF} e\left|\lambda^*\right|}{|D|}\{(1-v)\varepsilon_4 J - vB_3 H\}$$

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$$-\frac{tP_2 X_2}{|D|}[M_1(B_3 B_4 H - \varepsilon_4 \lambda_{K3} J) + M_2 \varepsilon_4 B_3 \theta_{N1} \lambda^*_{L2}] \qquad \text{(A.9)}$$

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and,

$$Y(\frac{\hat{Y}}{\hat{K}}) = -\frac{\varepsilon_4 B_3}{|D|}(\theta_{N1}WL - \theta_{L1}RN_D)\lambda^*_{L2} + \frac{W_S S \lambda^*_{L2}}{|D|}\{(1-v)\varepsilon_4 J - vB_3 H\}$$

(–) (+) (+) (–)(+)

$$+(\frac{\varepsilon_4 B_3}{|D|})tP_2 X_2 \theta_{N1} \lambda^*_{L2} \qquad \text{(A.10)}$$

(–)

Now

$$(\theta_{N1}WL - \theta_{L1}RN_D) = W\theta_{N1}(L - a_{L1}\frac{N_D}{a_{N1}}) > 0 \qquad \text{(A.11)}$$

(as from (7) $\frac{N_D}{a_{N1}} \le X_1$; and, $N_D \le N$)

From equation (A.11) we find that the increase in the aggregate unskilled wage income outweighs the fall in the domestic rental income on land.

Using (A.11) from (A.9) we can conclude that

$(\frac{\hat{Y}}{\hat{I}}) > 0$.

However the sign of $(\frac{\hat{Y}}{\hat{K}})$ is ambiguous which follows from (A.10).

Appendix V:

Total differentials of equation (28) yield

$$\lambda_{LU}\hat{L}_U = \lambda_{L2}[(\frac{W^* - W}{W})\hat{X}_2 - (\frac{W^*}{W})\hat{W}] \tag{A.12}$$

where $\lambda_{LU} = (\frac{L_U}{L})$

Using (A.8) and simplifying from (A.12) the following expressions can be derived.

$$(\frac{\hat{L}_U}{\hat{I}}) = (\frac{\lambda_{L2}}{\lambda_{LU}|D|})[[(\frac{W^* - W}{W})[M_1(B_3B_4H - \lambda_{K3}\varepsilon_4 J) + M_2\varepsilon_4 B_3\theta_{N1}\lambda^*_{L2}]$$

(+) (+)(–)(+)(+) (+)(+) (+)(+)(–)

$$+(\frac{W^*}{W})(\theta_{N1}\varepsilon_4 B_3\lambda_{NF}e)|\lambda^*|]] < 0. \tag{A.13}$$

(+)(–) (+) (+)

$$(\frac{\hat{L}_U}{\hat{K}}) = (\frac{\lambda_{L2}}{\lambda_{LU}})[\frac{B_3\varepsilon_4\theta_{N1}\lambda^*_{L2}}{|D|}] < 0. \tag{A.14}$$