CHAPTER 3

THEORETICAL ISSUES RELATED TO TERMS OF TRADE AND SKILLED-UNSKILLED WAGE GAP IN SMALL OPEN DEVELOPING ECONOMIES: A THREE-SECTOR ANALYSIS
CHAPTER 3

THEORETICAL ISSUES RELATED TO TERMS OF TRADE AND SKILLED-UNSKILLED WAGE GAP IN SMALL OPEN DEVELOPING ECONOMIES: A THREE-SECTOR ANALYSIS

3.1 Introduction:

The studies of the impact of openness of trade regime on income inequality in the developed countries are extensive, but studies on such a particular aspect for the developing economies are somewhat neglected. It is only in recent years that some systematic studies have been conducted for developing countries of East Asia and Latin America which examine the impact of liberal trade regime on the 'wage gap' of their skilled and unskilled workers. However, the results of these studies for the two groups of developing countries (East Asia and Latin America) are conflicting. In a series of papers, Robbins (1994a, 1994b, 1995a, 1995b, 1996a, 1996b) and Wood (1997) have demonstrated that despite the success of the liberal trade regime in reducing the skilled-unskilled wage gap in the East Asian countries, Latin American countries in general have experienced an increasing wage gap of the same. Some of these works have been referred to in chapter 2.

At the theoretical level only few attempts have been made to justify the empirical facts related to the impact of liberalised trade regime upon the relative earnings of the unskilled labour vis-à-vis the skilled labour. The conventional trade theoretic models are

---

based on 2x2 Heckscher-Ohlin-Samuelson (HOS) structure and provide the basis for the Stolper-Samuelson results regarding income inequality. It shows a gradual reduction of income inequality in developing countries if it could export its abundant factor intensive product. Wood (1997), however, has argued that a straightforward application of Stolper-Samuelson theorem does not provide meaningful results in the context of an open trade regime. But there is dearth of theoretical structures which should take into account the structural features of these countries relating to the pattern of trade, characteristics of labour markets and structure of production.

Recently Marjit (1997) has constructed a model that incorporates the salient features of developing countries with flavours of both the HOS and the Ricardo-Viner structures. In his model, the production and the trade pattern of the country are consistent with the nation-specific composition of resources. For example, in his model, the country, in question, is an exporter of software (produced with the help of skilled labour) as well as rice (produced with the help of unskilled labour) as we find in case of India. He has shown that the skilled-unskilled wage gap may widen even when unskilled labour-intensive agricultural exports expand and larger inflow of foreign capital takes place.

Marjit (1997) has assumed a production structure in which all factors of production are fully employed. In developing economies, however, we find the existence of unemployment of mainly unskilled labour. The present chapter incorporates this idea and extends the model of Marjit (1997) by introducing Harris-Todaro (1970) (HT hereafter)

---

9 In fact, India is one of the largest exporters of software in the world. Its share as an exporter of several agricultural products in the world market is also significant. Hence, our production structure is also consistent with structural features of the Indian economy. See Marjit (1997) in this context.
type of urban unemployment of unskilled workers. It is, however, to be noted in this context that almost all the existing theoretical works explaining wage gap in LDCs are based on neo-classical full employment structures. For example, Marjit (1999) and Acharyya & Marjit (2000) (following the works of Agenor (1996), Agenor and Montiel (1996) etc.) have considered a labour market in which unskilled workers are fully absorbed in the urban informal and agricultural sectors if they do not find any job in the urban formal sector. The skilled labour force, however, is assumed to be sector specific and is fully employed. In our model the idea behind the introduction of open urban unemployment of unskilled workers follows from the works of Fields (1975), Gupta (1993) and Yabuuchi (1999). Fields (1975) has suggested that in developing economies there always exists a possibility of remaining unemployed while one is looking for a better job. Yabuuchi (1999) has used the model of Fields (1975) to explain the simultaneous existence of open urban unemployment and informal sector as a result of HT migration mechanism from the rural area. Gupta (1993) has also considered the coexistence of open unemployment of the migrants and urban informal sector in a HT framework. These migrants are mainly unskilled workers so that in LDCs we cannot rule out the possibility of open unemployment of unskilled workers. It is true that if full employment is assumed in our model (i.e., when we drop the migration equation and allow agriculture to absorb all unskilled workers who are not absorbed in the unionized urban sector) the major results still remain valid. In fact, this has been discussed by Acharyya and Marjit (2000). However, in this context one should note that in LDCs increasing wage inequality is one way to measure impoverishment, the other way to measure it is through the increase in the level of unemployment. HT structure provides a
framework to capture the additional impact of a liberalised investment regime or an improvement in terms of trade on the rate of urban unemployment. This justifies the significance of the HT structure used in our chapter. The present chapter thus attempts to fill up the lacuna that exists in the literature regarding proper theoretical modelling of developing countries after taking into account all its structural features.

The particular chapter is divided into two different parts. In the first part of the chapter we would like to examine the impact of an improvement in terms of trade on the skilled-unskilled wage gap of developing countries on the basis of a three-sector HT framework. We have shown that in the presence of urban unemployment of unskilled workers improvement in terms of trade, in the form of rise in the price of the agricultural product, reduces the skilled-unskilled wage gap and also reduces the urban unemployment rate of unskilled labour. We have also shown that improvement in terms of trade, in the form of a rise in the price of the skilled manufacturing product, widens the wage gap and raises the urban unemployment rate of unskilled labour. In the second part we have extended the model by introducing disguised unemployment in the rural sector. On the basis of an analysis we have concluded that the results of the basic (original) model do not change even if we introduce unemployment in the rural sector.

We organise this chapter in the following way. Section 3.2 describes the basic model and section 3.3 examines some comparative static results of this model. These two sections constitute the first part of this chapter. Section 3.4 extends the model by
introducing rural unemployment, which constitutes the second part. We conclude the chapter in section 3.5.

3.2 The Model:

We consider a three sector small open economy that is basically of HT type. The three sectors are: the urban manufacturing sector, x, producing product X with the help of skilled labour; the urban manufacturing sector, y, producing product Y with the help of unskilled labour and the rural sector, z, producing an agricultural product Z. Skilled labour is specific to sector x whereas unskilled labour is used by sectors y & z. Capital, however, is mobile between sectors x and y. Sector z uses land as a specific factor (instead of capital) along with unskilled labour. We assume that sector x produces skilled labour-intensive product, like softwares; sector z produces agricultural product, like rice; and sector y produces unskilled labour intensive manufacturing product, like toys for children. Due to the small open economy assumption the product prices are internationally given.\(^{10}\) Again, we can express the input-output ratios as functions of factor prices.\(^{11}\)

Unskilled labourers migrate from the rural sector to the urban area on the basis of HT mechanism. The unskilled urban manufacturing wage rate is assumed to be institutionally fixed. The economy exports X & Z, but imports Y\(^ {12}\). Production takes place under CRS (Constant Returns to Scale) and competitive market conditions. The

\(^{10}\) It implies that terms of trade is internationally given to the economy.
\(^{11}\) The input-output ratios imply unit demand for the inputs. As (unit level) input demand functions are homogeneous of degree zero, the input-output ratios can be expressed in terms of ratios of factor prices.
\(^{12}\) It is a fact that in recent years India imports toys from China.
product of sector $y$ is considered as the numeraire and its price has been set equal to unity.

We use the following notations in our model:

$P_j$ – world price for the product of the $j$-th sector, $j = x,y,z$

$S$ – stock of skilled labour

$L$ – stock of unskilled labour

$K$ – total capital stock

$T$ – stock of land

$a_{ij}$ – quantity of $i$-th input required for the production of one unit of the $j$-th sector’s product; where $i = S,K,L,T$ and $j = x,y,z$

$\lambda$ – urban unemployment rate of the unskilled labour

$w_{sx}$ – wage rate of the skilled labour

$\overline{w}_{L_y}$ – wage rate of the unskilled labour in the urban sector, which is institutionally fixed

$w_{L_z}$ – wage rate of the unskilled labour in the rural sector

$r$ – rate of return on capital

$R$ – rental on land

We now consider the equational structure of the model. The competitive equilibrium conditions are given by the equations (3.1) to (3.3).

$$P_x = w_{sx} a_{sx} \left( \frac{w_{sx}}{r} \right) + r a_{kx} \left( \frac{w_{sx}}{r} \right) \quad (3.1)$$

$$1 = \overline{w}_{L_y} a_{ly} \left( \frac{\overline{w}_{L_y}}{r} \right) + r a_{ky} \left( \frac{w_{Ly}}{r} \right) \quad (3.2)$$

$$P_z = w_{Lz} a_{lz} \left( \frac{w_{Lz}}{R} \right) + R a_{Tz} \left( \frac{w_{Lz}}{R} \right) \quad (3.3)$$
HT migration equilibrium condition in this model requires the equality between expected (unskilled) urban wage rate and actual rural wage rate of the unskilled labourers. Thus we have:

$$\bar{w}_{Ly} = (1 + \lambda) w_{Lz} \quad (3.4)$$

Factor market equilibrium gives us the following equations:

$$a_{sx} \left( \frac{w_{sx}}{r} \right) X = S \quad (3.5)$$

$$a_{Kx} \left( \frac{w_{sx}}{r} \right) X + a_{Ky} \left( \frac{w_{Ly}}{r} \right) Y = K \quad (3.6)$$

$$(1 + \lambda) a_{Ly} \left( \frac{w_{Ly}}{r} \right) Y + a_{Lz} \left( \frac{w_{Lz}}{R} \right) Z = L \quad (3.7)$$

$$a_{Tz} \left( \frac{w_{Lz}}{R} \right) Z = T \quad (3.8)$$

Equations (3.5) to (3.8) ensure that there is full employment of the factors of production, except for the unskilled labourers. Our model consists of 8 equations with 8 endogenous variables: $w_{sx}$, $w_{Lz}$, $r$, $R$, $X$, $Y$ and $Z$.

The working of the model can be explained by dividing the equations into two groups. $w_{sx}$, $r$, $X$ and $Y$ are determined from the first group of equations consisting of (3.1), (3.2), (3.5) & (3.6). We can determine $r$ from (3.2). As $r$ is already determined we can determine $w_{sx}$ from (3.1). Once $w_{sx}$ and $r$ are determined, $a_{sx}$ is known since input-output ratios are functions of the ratios of factor prices. Hence from (3.5), $X$ is determined. Again as $w_{sx}$, $r$ and $\bar{w}_{Ly}$ are known, we know $a_{Kx}$ and $a_{Ky}$. Thus equation (3.6) determines $Y$. Once $Y$ is determined, the rest of the variables $w_{Lz}$, $R$, $\lambda$ and $Z$ are determined from the second group of equations consisting of (3.3), (3.4), (3.7) and (3.8). It is thus to be noted that $w_{sx}$, $r$, $X$ and $Y$ are determined independently of $w_{Lz}$, $R$, $\lambda$ and
We express $R$ and $\lambda$ in terms of $w_{LZ}$ from equations (3.3) and (3.4) respectively as $P_z$ and $\overline{w}_{LY}$ are given.

The equation (3.7) can be rewritten as
\[
\{1 + \lambda( w_{LZ})\} a_{Ly} (\overline{w}_{LY} / r) Y + a_{Lz} ( w_{LZ} / R( w_{LZ}, P_z)) Z = L
\]

or, $H a_{Ly} Y + a_{Lz} Z = L \quad (3.7.1)$

where $H = 1 + \lambda( w_{LZ})$, with $H' = \lambda' < 0$

Again, equation (3.8) can be rewritten as
\[
a_{Tz} ( w_{LZ} / R( w_{LZ}, P_z)) Z = T \quad (3.8.1)
\]

Since $Y$ is already known, equations (3.7.1) and (3.8.1) solve the equilibrium values of $w_{LZ}$ and $Z$. From equation (3.7.1), we find that as $w_{LZ}$ rises, the level of unskilled unemployment $\lambda(w_{LZ}) a_{Ly} Y$ falls. The level of employment of sector $y$, however, remains unchanged. Hence the level of employment of sector $z$ must rise. But due to a rise in $w_{LZ}$, there will be a fall in $a_{Lz}$. So the output of $Z$ rises.

The locus of $w_{LZ}$ and $Z$, which maintains equilibrium in the market for unskilled labour is given by the LL curve in Figure-3.1. The slope of this curve as obtained from (3.7.1) is given by
\[
dw_{LZ} / dZ \bigg|_{LL} = - a_{Lz} / (H' a_{Ly} Y + a'_{Lz} Z), \text{ where } a'_{Lz} = (d a_{Lz} / d w_{LZ})
\]

We know that $H' < 0$ and $a'_{Lz} < 0$. So, the LL curve is positively sloped.

From equation (3.8.1) we find that as $w_{LZ}$ rises, the land-output ratio rises too. Hence $Z$ must fall to maintain equilibrium in the land market. The locus of $w_{LZ}$ and $Z$ that maintains equilibrium in the land market is given by the TT curve in Figure – 3.1.
The slope of TT curve as obtained from (3.8.1) is
\[
\frac{dw_{LZ}}{dZ} \bigg|_{TT} = -\frac{a_{Tz}}{a_{Tz}} \frac{a_{Tz}}{a_{Tz}}, \text{ where } a_{Tz} = \frac{da_{Tz}}{dw_{LZ}}
\]
Given \( a_{Tz} > 0 \), the TT curve is negatively sloped. The intersection of the two curves gives us the equilibrium values of \( w_{LZ} \) and \( Z \). Once \( w_{LZ} \) is determined, \( R \) and \( \lambda \) are determined from equations (3.3) and (3.4) respectively. This completes the working of the model.\(^{13}\)

3.3 Comparative Static Exercises:

In a liberal trade regime, it is interesting to examine some comparative static effects with respect to the growth of exports. Let us assume that there is a boost in the exports of the agricultural products due to a rise in the demand for it in the international market. It leads to a rise in the price of agricultural product.\(^{14}\)

\(^{13}\) In our model, the factor prices \( r \) and \( w_{SX} \) are determined independently of \( K_F, L, T \) and also \( P_z \).

\(^{14}\) The prospects for the rise in the demand for agricultural exportables and hence the rise in its prices in the international market is justified in the context of the recent move in the WTO to reduce subsidies given by
As $P_z$ rises, for given value of $w_{lz}$, there will be a rise in the rent of land. It reduces the relative price of unskilled labour ($w_{lz} / R$). This results in a rise in the unit requirement of labour and a fall in the unit requirement of land in the rural sector. Given the value of $w_{lz}$ and thus for given value of $\lambda$, a rise in $a_{lz}$ requires a fall in the production of $Z$ to maintain the equilibrium in the unskilled labour market. The reason is that $Y$ is determined independently of $R$ and hence it remains unaffected due to changes in $R$. So, LL curve, in Figure-3.1, shifts to the left. Again, for given value of $w_{lz}$, a fall in $a_{tz}$ requires a rise in the production of $Z$ to maintain equilibrium in the land market. This shifts the TT curve in Figure-3.1 to the right. The shift of LL and TT curves necessarily increase the wage rate of the unskilled labour, $w_{lz}$, which can be represented as the average wage rate for the unskilled labour.\textsuperscript{15} But the effect on the production of $Z$ remains indeterminate.

An increase in $w_{lz}$ due to a rise in $P_z$ implies a reduction in $w_{sx} / w_{lz}$, as $w_{sx}$ remains unchanged. Again, a rise in $w_{lz}$ implies from equation (3.4) that $(w_{ly} / w_{lz})$ falls. Hence a rise in $P_z$ will reduce $\lambda$. The level of urban unemployment of unskilled labour, i.e., $\lambda a_{lY}$ $Y$ also falls. We summarise our results in the form of the following proposition (for mathematical derivations see the appendix).

\textsuperscript{15} $w_{lz}$ represents the average wage rate for the unskilled workers in the economy. This is because total wage bill of unskilled workers is given by: $\bar{w}_{LY} a_{LY} Y + w_{lz} a_{lz} Z = w_{lz} (1 + \lambda) a_{lY} Y + w_{lz} a_{lz} Z = w_{lz} L$. Hence, average wage rate for the unskilled workers in the economy is $w_{lz}$.
Proposition 3.1: An improvement in terms of trade in the form of a rise in the price of the agricultural product reduces the skilled-unskilled wage-gap and also leads to a fall in the level and the rate of urban unemployment of unskilled labour.

A rise in the price of exportables produced by skilled workers, however, widens the skilled-unskilled wage-gap. The wage rate for skilled labour increases as the international price of good X rises. It follows directly from equation (3.1), for a given level of $r$. Thus unit requirement for skilled labour falls and that of capital rises in sector ‘x’. As $a_{sx}$ falls, the equilibrium in the market for skilled labour requires a rise in the production of good X. When $a_{kx}$ and X both rises, the requirement of capital in sector y (i.e., $a_{ky}$ Y) must fall. But $a_{ky}$ ($\tilde{w}_{ly} / r$) cannot fall as $\tilde{w}_{ly}$ is fixed and $r$ remains unchanged when there is a change in $p_x$. So the production of good Y falls. The fall in the production of good Y will have a definite impact upon the LL curve since it is drawn on the basis of a given value of Y. When Y falls, for given value of $w_{lz}$, $(1+\lambda)a_{ly}Y$ also falls. Given the endowment of unskilled labour, a rise in the agricultural output is obvious. So the LL curve shifts rightward, but the TT curve remains unchanged. The new equilibrium gives a lower wage for the unskilled labour and a higher level of agricultural output. Thus, $(w_{sx} / w_{lz})$ increases. Again, a lower value of $w_{lz}$ increases migration from the rural sector to urban area and thus raises the rate of urban unemployment ($\lambda$) [see equation (3.4)]. The effect on the level of urban unemployment, $\lambda a_{ly}Y$, however, is indeterminate, because

---

16 Terms of trade, here, is interpreted as the ratio of the prices of the exportables to importables. Given that the price of the product of sector y is unity, terms of trade, in our model, is equivalent to $p_x$ or $p_z$.

17 $r$ is independent of changes in $p_x$. See equation (3.2).
when $\lambda$ rises but $Y$ falls and $a_{L,Y}$ remains unchanged. We summarise our results in the form of the following proposition (for mathematical derivations see the appendix).

**Proposition 3.2:** An improvement in terms of trade in the form of a rise in the price of skilled manufacturing product widens the wage-gap and also raises the urban unemployment rate of unskilled labour. However, the effect on the level of urban unemployment of unskilled labour is ambiguous.

### 3.4. The Extended Version of the Model: Introduction of Unemployment of Unskilled Labour in the Rural Sector

So far in our model we have assumed that there exists full employment of unskilled workers in the rural sector. It is only in the case of the urban sector that we have assumed there exists unemployment of unskilled workers. This is a standard assumption that we find in the works based on HT framework. In developing economies, however, the existence of open rural unemployment and disguised unemployment of unskilled rural workforce cannot be denied. So, we can extend our model by introducing unemployment in the rural sector. However, it can be shown that reformulation of the above model in such a manner does not disturb the robustness of the model with respect to its major conclusions.

We start with the case of involuntary unemployment existing among the rural unskilled workforce. To capture this idea we assume that the wage rate in the rural sector,
\( w_{LZ} \) is fixed. This has been done on the basis of 'efficiency wage hypothesis'. It is assumed that output depends not on the hours of labor but on the number of efficiency units of labor used.\(^{18}\) We denote this wage rate as \( \hat{w}_{LZ} \) and refer to it as 'efficiency wage' of unskilled workers.\(^{19}\) On the basis of this theory, we find that at wage rate \( \hat{w}_{LZ} \) there exists involuntary unemployment of unskilled workers in the rural sector.

The equational structure of this extended version of the model can now be elaborated upon. We retain the competitive equilibrium conditions, given by equations (3.1), (3.2) and (3.3) of section 3.2 here. The only difference is that \( w_{LZ} \) is replaced by \( \hat{w}_{LZ} \) here. We replace equation (3.4), the migration equilibrium condition, by the following relation

\[
\frac{\bar{w}_L / (1+\lambda)}{1+(\lambda)} = \frac{\hat{w}_{LZ}}{(1+\mu)} \quad (3.4')
\]

In equation (3.4') \( \mu \) is the rural unemployment rate. It shows the equality between expected (unskilled) urban wage rate and expected (unskilled) rural wage rate.\(^{20}\)

Equations (3.5), (3.6) and (3.8) of section 3.2 are retained here with the only difference that \( w_{LZ} \) is replaced by \( \hat{w}_{LZ} \). We, however, replace equation (3.7) by the following relation

\[
(1+\lambda) a_L (\bar{w}_L / (1+\lambda)) Y + (1+\mu) a_L (w_{LZ} / R) Z = L \quad (3.7')
\]

\(^{18}\) For 'efficiency wage hypothesis' see the works of Leibenstein (1957), Mirrless (1975), Stiglitz (1976), Bliss and Stern (1978), Agarwala (1979), Basu (1984), etc.

\(^{19}\) From the 'efficiency wage theory' it follows that \( w_{LZ} = \hat{w}_{LZ} \) is the solution to equation \( h' (w_{LZ}) (w_{LZ} / h(w_{LZ})) = 1 \), where \( h \) is the total number of efficiency units produced by each labourer. While \( w_{LZ} \) is the cost of buying one labor unit, \( (w_{LZ} / h(w_{LZ})) \) is the cost of buying one efficiency unit. Efficiency wage is that which minimizes the cost of efficiency units. See Basu (1984), pp.-98 in this connection.

\(^{20}\) In equation (4') we interpret \( (1 / (1+\mu)) \) as the probability of getting a job in the rural sector and \( (\hat{w}_{LZ} / (1+\mu)) \) as the expected rural wage rate.
In equation (3.7') $a_{i2} Z$ implies the level of rural unemployment of unskilled workers.

Our model now consists of 8 equations [equations (3.1), (3.2), (3.3), (3.4'), (3.5), (3.6), (3.7') and (3.8)] with 8 endogenous variables: $w_{sx}$, $r$, $\lambda$, $\mu$, $X$, $Y$ and $Z$. The working of the model is simple. From equation (3.2) we can determine ‘r’. Putting this value of $r$ in equation (3.1), for given value of $P_x$, we can determine $w_{sx}$. So $a_{sx}$ is known. As $w_{lz}$ is known, from equation (3.3) we can determine $R$, for the given value of $P_z$. Hence all $a_{ij}$’s are known. Thus from equation (3.5) we can determine $X$ and from equation (3.8) we can determine $Z$. Using the value of $X$, we can determine $Y$ from equation (3.6). Finally from equations (3.4') and (3.7') we can solve for the equilibrium values of $\lambda$ and $\mu$. From equation (3.4') we find that there exists a proportional relation between $(1+\lambda)$ and $(1+\mu)$. This is shown in Figure-3.2 by the positively sloped straight

---

![Figure - 3.2](image_url)
line MM from the origin. Again from equation (3.7') we find that \((1+\lambda)\) and \((1+\mu)\) are inversely related. This is shown by the negatively sloped straight line NN in Figure-3.2.

The point of intersection of MM and NN gives us the equilibrium values of \((1+\lambda)\) and \((1+\mu)\). In this model the average wage rate of unskilled workers is given by \(\hat{w}_{LZ}/(1+\mu)\).

Hence, our measure of skilled-unskilled wage-gap is \((1+\mu)\) \(w_{SX}/\hat{w}_{LZ}\).

In this extended model, an increase in the price of agricultural product, \(P_Z\), leading to an improvement in the terms of trade implies from equation (3.3) an increase in \(R\) as \(\hat{w}_{LZ}\) is given. Hence \(\psi_{LZ}/R\) falls, i.e., the relative prices of land increases. It implies a reduction in \(a_{TZ}\). From equation (3.8) we can thus conclude that the level of output of the agricultural product, \(Z\), increases. Again reduction in \(\psi_{LZ}/R\) implies increase in \(a_{LZ}\), as the relative price of unskilled labour falls, leading to an increase in \(a_{LZ}Z\). Given the value of \(\lambda\), by equation (3.7'), it can be said that there will be a fall in the value of \(\mu\).

Hence the NN curve of Figure-3.2 shifts to the left. An increase in \(P_Z\), however, causes no shift of the MM locus. Hence there is a fall in the equilibrium levels of \((1+\lambda)\) and \((1+\mu)\) (and also of \(\lambda\) and \(\mu\)). As \(w_{SX}\) and \(\hat{w}_{LZ}\) are undisturbed we find that reduction in \(\mu\) implies reduction in the skilled-unskilled wage gap \((1+\mu)\) \(w_{SX}/\hat{w}_{LZ}\) due to a rise in \(P_Z\).

Reduction in the urban unemployment rate, \(\lambda\), again implies reduction in the level of urban unemployment \(\lambda a_{LY}Y\). Reduction in the rural unemployment rate, \(\mu\), however,

\[\text{The total wage bill of unskilled workers is given by } \bar{w}_{LY}a_{LY}Y + \hat{w}_{LZ}a_{LZ}Z = (1+\lambda)/(1+\mu) \hat{w}_{LZ}a_{LY}Y + \hat{w}_{LZ}a_{LZ}Z = (\hat{w}_{LZ}/(1+\mu))[(1+\lambda) a_{LY} Y + (1+\mu) a_{LZ} Z] = (\hat{w}_{LZ}/(1+\mu))L. \text{ Hence average wage rate of unskilled workers in the economy is } (\hat{w}_{LZ}/(1+\mu))L / L = (\hat{w}_{LZ}/(1+\mu)).\]
cannot enable us to predict the movement in the rural unskilled unemployment, μ_LZ

The results are summarised in the form of the following proposition.

Proposition 3.3: An improvement in terms of trade in the form of a rise in the price of the agricultural product in the extended version of the model reduces the skilled-unskilled wage gap and also leads to reduction in both the level and rate of urban unemployment of unskilled labour. The rate of rural unemployment of unskilled labour also falls though the effect on the level of rural unemployment of unskilled labour is indeterminate.

Rise in the price of the exportable product produced by skilled labour, P_X, raises w_{sx} without affecting r. From equation (3.5), we find that it reduces a_{sx} and raises X. Increase in (w_{sx} / r) raises a_{kx} and hence raises the demand for capital in sector 'x', i.e., a_{kx}x. This leads to a reduction in a_{ky}Y. As \( \frac{w_{ly}}{r} \) and r are independent of changes in P_X, we find that a_{ky} remains fixed. Hence reduction in a_{ky}Y actually implies reduction in Y. As \( w_{lz} \) is given and R & Z are independent of changes in P_X, we find that reduction in Y in terms of equation (3.7') implies an increase in \( \mu \), for given value of \( \lambda \). Hence equation (3.7') implies that there is a rightward shift of the NN locus in Figure-3.2. The MM locus, however, remains unaffected due to an increase in P_X. Thus we find increase in the equilibrium values of the urban unemployment rate, \( \lambda \), and the rural unemployment rate, \( \mu \), of unskilled labour. Increase in \( \mu \) and increase in w_{sx}, with no change in \( \hat{w}_{lz} \), implies an increase in the wage gap \( (1+\mu) \frac{w_{sx}}{\hat{w}_{lz}} \). Here the effect on the level of urban unemployment of unskilled labour is indeterminate though the level of rural
unemployment of unskilled labour increases. The following proposition summarises our results.

**Proposition 3.4:** *An improvement in terms of trade in the form of a rise in the price of skilled manufacturing product widens the skilled-unskilled wage-gap and also leads to increase in the values of urban and rural unemployment rate of unskilled labour. It also raises the level of rural unemployment of unskilled labour though the effect on the level of urban unemployment of unskilled labour is ambiguous.*

Comparing propositions 3.1 and 3.3 and propositions 3.2 and 3.4, we find that the results of the extended model remain basically the same as obtained from the original version of the model. Our major contribution in introducing the reformulated model is to look into the additional effect on the level of rural unemployment.

In order to capture the idea of surplus unskilled labour (and hence disguised unemployment) in the rural sector, we can assume that agricultural output, $Z$, is fixed at the level $\hat{Z}$ and the labour endowment of unskilled labour, $L$, is variable (instead of being fixed) in the original model. We assume that open unemployment of unskilled workers exists only in the urban sector. In the rural sector there is only disguised unemployment of unskilled agricultural workers. The idea of fixed agricultural output emerges from the fact that even as a result of withdrawal of unskilled labour force from the rural sector there is no reduction in the level of output of the agricultural product implying the existence of disguised unemployment of unskilled workers. The working of the model
when \( Z = \hat{Z} \), is basically similar to that of the original version of the model. The variables \( w_{sx}, r, X \) and \( Y \) can be determined in a manner which is similar to the process described in section 3.2. Here \( w_{lz} \) and \( R \) can be determined from equations (3.3) and (3.8) as \( P_Z \) and \( (T/\hat{Z}) \) are given. Once \( w_{lz} \) is known we can determine \( \lambda \) from equation (3.4). Putting the values of \( \lambda, Y, w_{lz} \) and \( R \) we can determine \( L \) from equation (3.7) as \( \hat{Z} \) is known.

3.5 Concluding Remarks:

In this chapter, we have considered a small open economy having resource specific production structure. Our economy is characterised by rural-urban migration and the existence of urban unemployment of the unskilled workers. It shows that improvement in terms of trade resulting from growth in exports of agricultural products produced by unskilled workers lead to reductions in both the skilled-unskilled wage-gap and the urban unemployment rate of unskilled workers. An improvement in terms of trade resulting from growth in exports of skilled manufacturing products, however, widens the wage-gap and also raises the urban unemployment rate of unskilled workers. The major results of the model remain unaffected when open or disguised unemployment is introduced in the rural sector. Our model also shows that the impact of an improvement in terms of trade on open rural unemployment rate is exactly the same as that of the open urban unemployment rate.

Wood (1997) has cited the Latin American experience regarding the impact of open trade regime on wage-gap and has criticised the conventional wisdom (associated with
the Stolper-Samuelson result) that larger exports from developing countries should improve the relative wage of the unskilled workers vis-à-vis the skilled workers. Marjit (1997, 1999) has considered a reasonable production structure on the basis of which he has provided a theoretical rationale behind the work of Wood (1997). He has considered a full employment structure to derive these results. The criticism of the conventional result, however, loses its sharpness once we introduce urban unemployment of unskilled workers in the framework of Marjit (1997). Our framework here is much more general.

In a production structure [similar to the work of Marjit (1997)] which is consistent with the Indian scenario, we have introduced urban and rural unemployment of unskilled workers in order to provide some additional insights on the ongoing debate regarding the impact of liberalised trade regime on the wage-gap of the developing countries. Herein lies the significance of the present exercise. This study shows that the impact of an improvement in terms of trade on the wage-gap, however, is not so obvious. It depends upon the source of this improvement.

We have felt that in the presence of urban unemployment and rural-urban migration the impact of an improvement in terms of trade on skilled-unskilled wage gap and the rate of urban unemployment would have been more interesting if we could take into account the role of foreign capital in developing economies. An attempt has been made in this regard in the next chapter by using a four-sector economy.
From equation (3.1) of the text we find that
\[ w_{sx} = w_{sx} \left( r, P_x \right) \]  \hspace{1cm} (A.3.1)
where \( \frac{\partial w_{sx}}{\partial P_x} > 0 \)

Substituting (A.3.1) in equation (3.5) of the text we get
\[ a_{sx} \left( \frac{w_{sx} \left( r, P_x \right)}{r} \right) \cdot X = S \]  \hspace{1cm} (A.3.2)
As \( r \) can be determined from equation (3.2), we can determine the values of \( w_{sx} \) and \( X \) [from equations (A.3.1) and (A.3.2) respectively], when the value of \( P_x \) is given.

From relation (A.3.2) we can express \( X \) in terms of \( P_x \) \( \left( \frac{\partial X}{\partial P_x} \right) > 0 \)

Again, we can rewrite equation (3.6) as
\[ a_{kx} \left( \frac{w_{sx} \left( r, P_x \right)}{r} \right) \cdot X \left( P_x, \cdot \right) + a_{ky} \left( \frac{w_{ly}}{r} \right) \cdot Y = K \]  \hspace{1cm} (A.3.3)
From equation (A.3.3) we can write
\[ Y = Y \left( K, P_x \right) \]
with \( \left( \frac{\partial Y}{\partial K} \right) > 0 \) and \( \left( \frac{\partial Y}{\partial P_x} \right) < 0 \)

Again using equation (3.3) of the text we can write
\[ R = R \left( w_{lz}, P_z \right) \]  \hspace{1cm} (A.3.4)
Using equation (A.3.1) and (A.3.4) we can rewrite equation (3.7.1) of the text as
\[ \varphi \left( w_{lz} ; K, P_x \right) + a_{lz} \left( w_{lz}, P_z \right) Z = L \]  \hspace{1cm} (A.3.5)
where \( \varphi \left( w_{lz} ; K, P_x \right) = \left( 1 + \lambda \left( w_{lz} \right) \right) a_{ly} \left( \frac{w_{ly}}{r} \right) \cdot Y \left( K, P_x \right) \)
and \( a_{lz} \left( w_{lz}, P_z \right) = a_{lz} \left( w_{lz} / R \left( w_{lz}, P_z \right) \right) \)
with \( \varphi_1 = \left( \frac{\partial \varphi}{\partial w_{lz}} \right) < 0, \quad \varphi_2 = \left( \frac{\partial \varphi}{\partial K} \right) > 0, \quad \varphi_3 = \left( \frac{\partial \varphi}{\partial P_x} \right) < 0, \quad \varphi_{lz} / \partial w_{lz} < 0 \) and \( \varphi_{lz} / \partial P_z > 0 \)

Using equation (A.3.4) we can rewrite equation (3.8.1) as
\[ a_{TZ} (w_{LZ}, P_Z) = T \]  
(A.3.6)

where \( \partial a_{TZ} / \partial w_{LZ} > 0 \) and \( \partial a_{TZ} / \partial P_Z < 0 \)

From the total differential of equations (A.3.5) and (A.3.6) we get

\[
(\varphi_1+Z(\partial a_{LZ} / \partial w_{LZ}))dw_{LZ} + \varphi_2 dK + \varphi_3 dP_X + Z (\partial a_{LZ} / \partial P_z) dP_Z \\
+ a_{LZ} (.) dZ = 0 
\]  
(A.3.5.1)

and \( Z (\partial a_{TZ} / \partial w_{LZ}) dw_{LZ} + Z(\partial a_{TZ} / \partial P_z) dP_Z + a_{TZ} (.) dZ = 0 \)  
(A.3.6.1)

**Proof of Proposition 3.1:**

Putting \( dK = dP_X = 0 \) in equation (A.3.5.1) and (A.3.6.1) we solve for \( (dw_{LZ} / dP_Z) \) and \( (dZ / dP_Z) \)

\[
\text{Now,} \frac{dw_{LZ}}{dP_Z} = (1/\Delta)[a_{LZ}(\partial a_{TZ} / \partial P_z) - a_{TZ}(\partial a_{LZ} / \partial P_z)] \quad Z \]  
(A.3.7)

and \( \frac{dZ}{dP_Z} = (1/\Delta)Z[\partial a_{TZ} / \partial w_{LZ} (\partial a_{LZ} / \partial P_z) - (\partial a_{TZ} / \partial P_z)(\varphi_1 + Z (\partial a_{LZ} / \partial w_{LZ}))] \)  
(A.3.8)

where \( \Delta = [\varphi_1+Z (\partial a_{LZ} / \partial w_{LZ})) a_{TZ} - Z(\partial a_{TZ} / \partial w_{LZ}) a_{LZ}] < 0 \)  
(A.3.9)

Here we find that \( (dw_{LZ} / dP_Z) > 0 \), but the sign of \( (dZ / dP_Z) \) is ambiguous.

The results of proposition 3.1 follow from relations (A.3.7) and (A.3.8).

**Proof of Proposition 3.2:**

Putting \( dK = dP_Z = 0 \) in equation (A.3.5.1) and (A.3.6.1) we solve for \( (dw_{LZ} / dP_X) \) and \( (dZ / dP_X) \)

\[
\frac{dw_{LZ}}{dP_X} = (1/\Delta)(- \varphi_3 a_{TZ}) < 0 
\]  
(A.3.10)

and \( \frac{dZ}{dP_X} = (1/\Delta)(- \varphi_3 Z(\partial a_{TZ} / \partial w_{LZ})) > 0 \)  
(A.3.11)

where \( \Delta \) is given by the relation (A.3.9).

The results of proposition 3.2 follow from relations (A.3.10) and (A.3.11).