TRADE REFORMS AND INFORMAL SECTOR WAGES: A THEORETICAL CONTRIBUTION

Arpita Banerjee
Department of Economics, Heramba Chandra College, Kolkata
Heramba Chandra College, 23/49 Gariahat Road
Kolkata – 700029.
Mobile: 9903063074, Email: arpita.economics@gmail.com

Abstract

The influence of trade reforms on employment conditions is a much researched topic. This paper formulates a four-sector general equilibrium model, to examine the impact of trade liberalization policies on the wages of the informal sector. The novelty of this theoretical exercise is that the informal self-employed (with imputed wage) and the informal subcontracted sectors are incorporated as two separate sectors. A major implication of this paper is that the employment in the self-employed sector and the share of labor in this sector plays crucial role in influencing the informal sector wage, in an environment of diminishing trade barriers.

JEL Code(s): O17, Z13

KEYWORDS: Informal, Self-Employment, General Equilibrium, Trade Reforms

Introduction

It has become increasingly important to understand the responses of various sectors in an economy to liberalized trade. The reason is that a number of developing economies have been adopting trade liberalization policies, and as a result various sectors of the economy have been going through adjustments and rearrangements. The economic performance of an economy depends crucially upon the adjustments the sectors go through. A number of studies have demonstrated that the informal or unorganized sectors of a majority of the developing countries tend to grow in size as a reaction to trade reform policies (Yamada, 1996; Currie and Harrison, 1997; Goldberg and Pavcnik, 2003; Rouse, 2004; Sinha and Harris-White, 2007; NCEUS, 2007). Contrary to the earlier understanding of the sector, the informal sector did not disappear through transferring labour to the formal sector. Instead, economists and social scientists have become convinced of the permanence of its existence (Castells and Portes, 1989; De Soto, 1989; Breman, 1996; Fernandez-Kelly, 2006; Harris-White, 2002, 2003, 2007). A new challenge for the researchers is to study the economic prospects related to the sector. It is necessary to understand how the income of the population working in the informal sector is affected by the policies of trade reforms. This is particularly because an increasing number of developing countries are now promoting privatization, freer trade and financial as well as labour market liberalization. Despite its importance, the impact of trade reforms on the informal sector wages mostly remains an understudied matter.

A contribution of this study is to fill this gap in the literature, by formulating a theoretical model, which examines how a falling tariff rate affects the wages in the informal sector. It builds partly upon the Marjit (2003) model, but shifts away from the specifications by making a novel distinction between the informal subcontracted sector and the informal self-employed sector and incorporating them into a simple general equilibrium model. Despite being the largest employment generating sector in a number of developing countries including India, the self-employed sector has never been incorporated into any proper economic study of the informal sector.
sector, prior to the current paper. Hence its inclusion into the model is an improvement over previously available studies. Such an improvement allows us to better understand the conditions and directions of trade liberalization policies’ impact on the informal sector wages.

The rest of the paper is organized in the following manner. Section II develops the theoretical model. This model is built upon the simple general equilibrium models traditionally used in international trade. Section III develops and makes use of the comparative static analysis to find out the impact of decreasing trade barrier on informal sector wage. Section IV discusses the links between the falling tariff barrier and informal wage, as well as the implications of the results. Section V summarizes the analysis work and concludes by highlighting the contributions of this work.

Theoretical Framework

The economic model incorporating the informal sector has been formulated following the more common general equilibrium framework used by International trade theorists. Such simple general equilibrium models have been used for different purposes by Kar and Marjit (2001), Marjit and Beladi (2001). Marjit (2003) and Marjit and Maiti (2006) has made use of the similar framework for the same purpose of understanding the wage impact of trade reforms. The model generated in this work differs significantly from the previously used version in terms of its dimensions and other specifications, but the underlying assumptions of perfect competition and CRS has remained the common thread. The assumptions of perfectly competitive output markets and the constant returns to scale (CRS hereafter) technology are crucial for this particular modeling exercise. The model in this study consists of four sectors producing four goods. There are four inputs used by the sectors. The production functions in all four sectors are assumed to be increasing, concave and linearly homogenous, and are differentiable up to the necessary order in inputs.

(i) Sector X

Sector X is the formal sector, producing a manufacturing good. This sector is the only import-competing sector in the economy. The production of output follows the production function as described below:

\[ X = K^\alpha L^\beta Y^\gamma \]

Here \( \alpha, \beta, \gamma \) are the output elasticities of capital and labor respectively. This is a common Cobb-Douglas production function, reflecting that that inputs in this sector are used in fixed proportions. A further assumption of \( \alpha + \beta + \gamma = 1 \) implies the use of CRS technology.

The intermediate good \( Y \) is produced in the informal sector, which is described in the following subsection. The firm sells its output at price \( P_X \). Capital is paid according to the value of its marginal product. The rental rate of capital is \( r \) and \( Y \) is paid its per unit price \( P_Y \). The value of labour is determined in a slightly different way. Since this sector operates according to the Cobb-Douglas production function \( I \), there is entry restriction for the workers. Labour is hired until the point where the marginal product of labour equals the institutionally determined wage \( W_F \). The institutional determination of the wage in this sector could be due to the

1 The institutionally determined wage in the modern (formal) sector is considered in the Harris and Todaro (1970), where the workers are paid according to their value of marginal product until the point where the marginal product is equal to the politically determined minimum urban wage. This implies the existence of unemployment in the urban sector. But in the model formulated in this research there exists free entry of labour into the informal sectors, which in effect absorbs all those who wants to work.
presence of labour unions, minimum wage law, public sector pay policies or any other reason.\textsuperscript{2} No differentiation among labour types is assumed in this model. As a result, those who can find work in sector X get paid a wage that is higher than that is of other sectors, without being qualitatively different from workers working in those other sectors. In other words, labour is imperfectly mobile between sector X and the rest of the economy.

Since this is the import competing sector, the domestic market supply of X is shared by the domestic producers of X and the imports of X. Thus the demand-supply balance follows the relationship as stated below:
\[ X_d(P_X) = X_s(P_X) = X' + X_{IM} \] \hspace{1cm} \text{(2)}
\[ X' \] is the domestically produced output and \( X_{IM} \) is the amount of X imported. It is assumed that a \( P_X > 0 \) exists for which the market clears. The price \( P_X \) is determined internationally, implying that the economy in question is a small open economy.

The usual economic implication of cost-minimization is assumed here, hence there is the scope of substitution between the inputs if any of the inputs become relatively expensive to the firm. This is not applicable to the intermediate good Y. A fixed amount of the intermediate good is essential for the production of each unit of output X. The assumption of zero substitutability between the intermediate good and other inputs is a simplifying but not an unrealistic assumption. For example, if sector X is assumed to be an industry such that it subcontracts sector Y to produce items like shoes, apparels or processed food items and labels and markets the good as a final product, then a fixed proportional use of the intermediate good (i.e. those items produced by sector Y) is possible. This analogy can include various different types of goods.

The unit cost function for the firm is as the following:
\[
C_X(W_F, r, P_Y) = \min \left[ a_{LX}W_F + a_{KX}r : F_X(a_{LX}, a_{KX}) \geq 1 \right] \hspace{1cm} \text{(3)}
\]

The solution values of \( a_{LX} \) and \( a_{KX} \) are the cost-minimizing unit factor requirements for sector X. Since production of output in this sector takes place under the condition of perfect competition, the price of the output will be equal to the unit costs of the inputs. This implication generates the following relationship:
\[
a_{LX}W_F + a_{KX}r + a_{YX}P_Y = P_X \hspace{1cm} \text{(4)}
\]

Without the loss of generality, \( a_{YX} = 1 \) is assumed, so that the above relationship can be re-written as,
\[
a_{LX}W_F + a_{KX}r + P_Y = P_X \hspace{1cm} \text{(4)'}
\]

Since this is the import-competing sector, a fall in the tariff rate will be reflected through the price of this sector. Thus equation 3 can be rewritten as follows:
\[
a_{LX}W_F + a_{KX}r + a_{YX}P_Y = P_X + t = P_X \hspace{1cm} \text{(5)'}
\]

Here t denotes the ‘per-unit’ tariff imposed on the imported part of the output X. this is the sector that first captures any change in the tariff rate. Therefore, a trade liberalization policy will result in a fall in the price of output X.

(ii) Sector Y

\textsuperscript{2} For example, some larger Indian firms are not allowed to lay off workers, resulting in low employment and economic efficiency level (Besley and Burgess, 2004). Also, the resolutions of the Indian trade unions (which are almost always affiliated with the political parties) indicate the similar restrictions.
This is a non-traded informal sector, producing the intermediate good Y. It is subcontracted by the formal manufacturing sector for the supply of intermediate good Y. The production takes place according to the following production function:

\[ Y = f_Y(K,L) \]  \hspace{1cm} (6)

Since this is the informal sector and there exists free entry, the labour working in this sector receives the competitive informal wage, \( W_I \), where \( W_I < W_F \), by assumption.

The entire output of Y is sold to the formal manufacturing sector X as an intermediate commodity. Therefore, a change in the size of the output in sector X impacts Y directly. The demand-supply balance in sector Y follows the relationship as stated below:

\[ Y = Y_d = Y_s = a_{YX}X = X \]  \hspace{1cm} (7)

Any arbitrary price of Y may lead to excesses in the Y market. In order for equation 6 to hold, \( E(P_Y) = (Y_d - Y_s) = 0 \) is required. This is assumed to take place for \( P_Y \) and that a \( P_Y > 0 \) exists.

The cost minimization condition implies substitutability between capital and labour in this sector. The unit cost function looks like the following:

\[ C_Y(W_I, r) = \min \left[ a_{LY}W_I + a_{KY}r : F_Y(a_{LY}, a_{KY}) \geq 1 \right] \]  \hspace{1cm} (8)

Perfectly competitive environment produces the following:

\[ a_{LY}W_I + a_{KY}r = P_Y \]  \hspace{1cm} (9)

In this study, contrary to the considerations of earlier studies, sector Y is not the only informal sector. This study takes into account the other, usually neglected part of the informal sector, the self-employed sector. Incorporation of the self-employed sector as a separate independent sector is crucial, given its vast size, unique economic characteristics and the difference with sector Y, i.e. the informal subcontracted sector.

(iii) Sector S

Sector S is the informal self-employed sector, producing output S, a combination of petty consumer goods and services. The consumer goods and services produced with meager input and sold at a lower price is often termed as petty consumer goods and services (Hart 1973, Breman 1996, Harris-White 2002, Power 2006). The usual assumption of CRS technology and a perfectly competitive market is also used here.\(^3\) The inputs and output have the usual relationship according to the following production function:

\[ S = f_S(L, C) \]  \hspace{1cm} (10)

C denotes social capital. The reason behind using a social capital is the meager amount of various other types of capital used in this sector and the difficulty of conceiving the rental rates of each types of capital. For example, a street food vendor produces her/his product using own/family labour and a mix of different other inputs including the utensils, the ingredients, the fuel, the cooking space etc. all of which could either be bought or rented with or without the assistance of family or community. Again, a maid-servant sells her service which includes labour, transportation, community network as social capital etc. The difference between various types of capital can be ambiguous. Moreover, calculating the little amounts of capital used by the workers in this sector poses a technical challenge (Jellineck, 1997; Harris-White, 2002; Power, 2006). It is more appropriate to use social capital that determines the availability of all the inputs.

\(^3\) The assumption of perfect competition is assumed here for the purpose of convenience and simplicity.
...of production, however small in amount it is. A well-networked or socially well-connected (with the neighbourhood, village, town or language/religion/caste groups) worker is assumed to have the access to the various other capitals and equipment required to engage in the production process. It lends clarity to the study without taking any significant insights away.

The price of output S is considered to be P_S. The output S is consumed domestically, as this is a non-tradable sector. A particular value of P_S>0 is assumed to exist for which the market for the consumption goods produced by the self-employed sector clears. The demand-supply balance is given as:

\[ E_S(P_S) = S_d (P_S) - S_s (P_S) = 0 \] ...(11)

for P_S> 0.

The labour working in this sector is essentially informal; earning the informal wage W_I (this can be considered as some imputed wage). The rental rate of the social capital is r_C.

Substitutability between labour and the social capital implies the following unit cost function:

\[ C_S(W_I, r_C) = \min \left( a_{LS}W_I + a_{CS}r_C : F_S(a_{LS}, a_{CS}) \geq 1 \right) \] ...(12)

The assumption of perfect competition yields:

\[ a_{LS}W_I + a_{CS}r_C = P_S \] ...(13)

(iv) Sector A

The fourth sector of the model economy of this study is the agricultural sector producing output A. It is the export sector, producing agricultural commodities using labour, capital and land.\(^4\) The following is the production function of this sector:

\[ A = f_A (L, K, T) \] ...(14)

T stands for land input. Since this is the export sector, the total produce of A is divided among the domestic and the world market. The demand-supply balance is obtained for a positive price P_A> 0:

\[ A_d + A_{EX} = A_S \] ...(15)

where A_d and A_{EX} are sold in the domestic and international markets, respectively, and A_S is the supply of the agricultural products.

For P_A = P_A> 0,

\[ E_A(P_A) = A_d (P_A) - A_s (P_A) = 0 \] ...(16)

The rental rate of land is denoted by R. The labour working in the agricultural sector is predominantly informal; hence the wage rate in this sector is W_I. Substitutability between the inputs land and labour is reflected by the unit cost function:

\[ C_A(W_I, R) = \min \left( a_{LA}W_I + a_{TA}R + a_{KA} r : F_A(a_{LA}, a_{KA}, a_{TA}) \geq 1 \right) \] ...(17)

Here a_{LA}, a_{KA}, a_{TA} denotes the cost minimizing unit factor requirements of this sector. The price setting equation is obtained as follows:

\[ a_{LA}W_I + a_{KA} r + a_{TA} R = P_A \] ...(18)

Hence, equations 4, 9, 13 and 18 generate the following price system:

\[ a_{LX}W_{F^*} + a_{KK}r + a_{YY}P_Y = P_X^* + t = P_X \] ...(4)

\^4\ The agricultural trade data available from the Indian Ministry of Agriculture annual reports show that the agricultural export is substantial, both in terms of volume and money value, although the composition of agricultural export has changed to become predominantly cash crops.
A crucial assumption in the work is of full employment. Therefore we have:

\[ a_{KX} X + a_{KY} Y + a_{KA} A = K \] (19)
\[ a_{LX} X + a_{LY} Y + a_{LS} S + a_{LA} A = L \] (20)
\[ a_{CS} S = C \] (21)
\[ a_{TA} A = T \] (22)

The above equations reflect that the sums of the cost minimizing derived demand for the inputs are equal to the respective stock of inputs available in the economy. CRS and inter-sectoral factor mobility are the two important assumptions underlying the existence of the full employment conditions. It is to be remembered here that labour is not perfectly mobile between sector X and the rest of the economy. However, workers who cannot get absorbed in the formal manufacturing sector are assumed to move into the informal sectors. All those workers are assumed to get absorbed into the informal sectors, leading to the clearing of the labour market.

Another important assumption is about the relative factor intensities of the sectors. The formal manufacturing sector is expectedly a more capital intensive sector, than the subcontracted informal sector. Again, the informal subcontracted sector is assumed to be more capital intensive than the agricultural sector. The self-employed sector is labour intensive. This is in line with the majority of the self-employed works undertaken in India, which is usually labour intensive. The points of interest here are the following:

\[ K_X/L_X > K_Y/L_Y > K_A/L_A. \]

The general equilibrium model formulated above can now be determined as follows. The point of entry can be the tariff rate, which is given by government policy. Given \( t \), the price equations can determine the factor prices \( W_i, r, r^C \) and \( R \). Formal wage \( W_F \) is institutionally determined. The factor coefficients are determined from the price system. Then, equation 21 determines \( S \) and 22 determines \( A \). Similarly, \( X \) and \( Y \) are determined from equations 19 and 20. Hence, the entire model is determined in this way.

The next section presents the comparative static analysis and its implications. For the sake of convenience, the agricultural commodity can be considered as the numeraire, since the economy concerned is a small open economy. Hence, the price \( P_A = 1 \). Also, the prices of the petty consumer goods and services do not change much, therefore is assumed to remain largely fixed. This is particularly true if we consider the urban self-employed workers, such as the street vendors, hawkers, maid-servants, recyclers as parts of this sector. Their earnings do not change easily. These assumptions help to find the link(s) between a declining tariff rate and informal sector wage.

**Modeling the Links between Trade Reforms and Informal Sector Wages**

Trade liberalization policies are reflected through a fall in the exogenous tariff rate, \( t \). Since the price of the formal import-competing sector was protected by the tariff, a liberalized trade regime results in a fall in \( P_X \).

(i) **The Price System**

Total differentiation of equations 4, 9, 13 and 18, collecting terms and the use of envelope theorem give the following set of equations:

\[ \bar{W}_F \theta_{LX} + \bar{r} \theta_{KX} = \bar{P}_X - \theta_{LX} \bar{P}_Y \]
\[ \bar{W}_I \theta_{LY} + \bar{r} \theta_{KY} = \bar{P}_Y \]
where $\theta_{ji} = \frac{\text{factor price}_j}{p_j}$ = share of factor j in sector i.

The formal sector wage has been assumed to be institutionally given as $W_F$. Hence $\bar{W}_F = 0$. Using Cramer’s rule, the factor prices can be solved from the above set of equations.

\[
\bar{W}_I = -\frac{1}{|\theta|} \left[ (\bar{P}_X - \theta_{YX} \bar{P}_Y) \theta_{KY} \theta_{CS} \theta_{TA} + \bar{P}_Y \theta_{KK} \theta_{CS} \theta_{TA} \right]
\]

\[
\bar{r} = -\frac{1}{|\theta|} \left[ (\bar{P}_X - \theta_{YX} \bar{P}_Y) \theta_{LY} \theta_{CS} \theta_{TA} \right]
\]

\[
\bar{r}_C = -\frac{1}{|\theta|} \left[ \theta_{KK} \theta_{LY} \theta_{CS} \bar{P}_S + (\bar{P}_X - \theta_{YX} \bar{P}_Y) \theta_{KY} \theta_{CS} \theta_{TA} \right]
\]

\[
\bar{R} = -\frac{1}{|\theta|} \left[ \theta_{KK} \theta_{LY} \theta_{CS} \bar{P}_A + \theta_{KK} \theta_{LA} \theta_{CS} \bar{P}_Y - (\bar{P}_X - \theta_{YX} \bar{P}_Y) \theta_{LY} \theta_{CS} \theta_{KA} \right]
\]

where $|\theta| = -\theta_{KK} \theta_{LY} \theta_{CS} \theta_{TA}$. Since the formal manufacturing sector is capital intensive, $|\theta| < 0$.

(ii) The Full Employment Conditions:

Similar to the price system, the full employment conditions are differentiated totally, and after collecting terms and using envelope theorem, the following set of equations are obtained:

\[
\lambda_{KK} \bar{X} + \lambda_{KY} \bar{Y} + \lambda_{KA} \bar{A} = \bar{R} - (\lambda_{KK} \bar{a}_{KK} + \lambda_{KY} \bar{a}_{KY} + \lambda_{KA} \bar{a}_{KA})
\]

\[
\lambda_{LY} \bar{X} + \lambda_{LY} \bar{Y} + \lambda_{LA} \bar{S} + \lambda_{LA} \bar{A} = \bar{L} - (\lambda_{LY} \bar{a}_{Ly} + \lambda_{LY} \bar{a}_{Ly} + \lambda_{LA} \bar{a}_{La} + \lambda_{LA} \bar{a}_{La})
\]

\[
\lambda_{CS} \bar{S} = \bar{C} - \lambda_{CS} \bar{a}_{CS}
\]

\[
\lambda_{TA} \bar{A} = \bar{L} - \lambda_{TA} \bar{a}_{Ta}
\]

where $\lambda_{ji} = \frac{a_{ji}}{\sum_j a_{ji}}$ = fraction of factor j employed in sector i.

Now the elasticities of substitution are defined as follows:

\[
\sigma_X = \frac{a_{XK} - a_{XL}}{\bar{W}_F}\frac{\bar{P}_X}{\bar{P}_Y} \quad ; \quad \sigma_Y = \frac{a_{YK} - a_{YL}}{\bar{W}_F}\frac{\bar{P}_Y}{\bar{P}_X} \quad ; \quad \sigma_X = \frac{a_{XL} - a_{CS}}{\bar{P}_C - \bar{W}_I} \quad ; \quad \sigma_A = \frac{a_{KA} - a_{TA}}{\bar{W}_I - \bar{P}_X} \quad ; \quad \sigma_K = \frac{a_{KL} - a_{LA}}{\bar{W}_I - \bar{P}_X} \quad .
\]

Due to the zero substitutability between labour and the intermediate good, or between capital and the intermediate good,

\[
\sigma_X = \frac{a_{XK} - a_{XL}}{\bar{W}_F}\frac{\bar{P}_X}{\bar{P}_Y} = 0.
\]

The elasticities of substitution are used to solve for the change in the unit factor requirements, $a_{LA}$ from the cost minimization conditions:

\[
\theta_{LK} \bar{a}_{LK} + \theta_{KK} \bar{a}_{KK} + \theta_{YX} \bar{a}_{YX} = 0
\]

\[
\theta_{LY} \bar{a}_{LY} + \theta_{KY} \bar{a}_{KY} = 0
\]

\[
\theta_{LA} \bar{a}_{LS} + \theta_{CS} \bar{a}_{CS} = 0
\]

\[
\theta_{LA} \bar{a}_{LA} + \theta_{KA} \bar{a}_{KA} + \theta_{TA} \bar{a}_{TA} = 0
\]

The above conditions are obtained using the envelope theorem from the first order conditions of cost minimization.

Equations 2.27 – 2.30 now can be rewritten as follows:

\[
\lambda_{KK} \bar{X} + \lambda_{KY} \bar{Y} = \bar{R} - \left[ -\lambda_{KK} \sigma_X \bar{a}_{LK} \bar{P}_X + \lambda_{KY} \sigma_Y \bar{a}_{LY} \bar{P}_Y \left( \frac{\bar{W}_I - \bar{P}_X}{\bar{P}_X} \right) - \lambda_{KA} \bar{a}_{LA} \bar{P}_X \left( \frac{\bar{W}_I - \bar{P}_X}{\bar{P}_X} \right) \right]
\]
Cramer’s rule is used to solve the above system of equations for $\tilde{X}$, $\tilde{Y}$, $\tilde{S}$, $\tilde{A}$. The expressions are as follows:

\begin{align*}
\lambda_{LA}\tilde{X} + \lambda_{LY}\tilde{Y} + \lambda_{LS}\tilde{S} + \lambda_{LA}\tilde{A} &= \tilde{L} - \left(-\lambda_{LX} \frac{\sigma_{X} \theta_{XX}}{(\theta_{LX} + \theta_{XX})} - \lambda_{LY} \frac{\sigma_{Y} \theta_{XY} \left(\tilde{W}_1 - \tilde{R}\right)}{(\theta_{LY} + \theta_{XY})} + \lambda_{LS} \frac{\sigma_{S} \theta_{CS} \left(\tilde{C} - \tilde{W}_1\right)}{(\theta_{CS} + \theta_{LS})}\right) \\
&\quad + \lambda_{LA} \frac{\sigma_{A} \theta_{KA} \left(\tilde{W}_1 - \tilde{R}\right)}{(\theta_{LA} + \theta_{KA})} \\
\lambda_{CS}\tilde{S} &= \tilde{C} + \lambda_{CS} \frac{\sigma_{S} \theta_{LS} \left(\tilde{C} - \tilde{W}_1\right)}{(\theta_{CS} + \theta_{LS})} \\
\lambda_{TA}\tilde{A} &= \tilde{T} - \lambda_{TA} \frac{\sigma_{A} \theta_{KA} \left(\tilde{R} - \tilde{C}\right)}{(\theta_{KA} + \theta_{TA})}
\end{align*}

Now the expressions for the factor prices obtained as equations 23, 24, 25 and 26 are used to find the following expressions for $\tilde{X}$ and $\tilde{Y}$. Also, according to the assumptions of this model, the agricultural good is the numeraire good, and the price of the self-employed good takes longer than the prices of the other goods to change. Therefore, $\tilde{P}_A = 0$ and $\tilde{P}_S = 0$. 

\begin{align*}
\tilde{X} &= \frac{\lambda_{CS} \lambda_{TA} \left[\tilde{R} \lambda_{LX} \alpha_{XX} + \lambda_{LY} \lambda_{KY} \alpha_{LX}\right] - \left(\tilde{W}_1 - \tilde{R}\right) \lambda_{CY} \lambda_{CS} \alpha_{CS} - \lambda_{LX} \lambda_{KA} \alpha_{KA} + \lambda_{LY} \lambda_{CS} \alpha_{LS} + \lambda_{LA} \lambda_{KY} \alpha_{LA} - \left(\tilde{C} - \tilde{W}_1\right) \lambda_{LS} \lambda_{KA} \alpha_{LS} + \lambda_{LS} \lambda_{KY} \alpha_{CS} - \left(\tilde{R} - \tilde{C}\right) \lambda_{LA} \lambda_{KA} \alpha_{TA} + \lambda_{LY} \lambda_{KA} \alpha_{TA}]}{|\lambda|} \\
\tilde{Y} &= \frac{-\lambda_{CS} \lambda_{TA} \left[\tilde{C} - \alpha_{LS} \left(\tilde{C} - \tilde{W}_1\right)\right]}{|\lambda|} \\
\tilde{S} &= \frac{\lambda_{TA} \left(\lambda_{KL} \lambda_{LY} - \lambda_{LX} \lambda_{KY}\right) \left[\tilde{C} - \alpha_{LS} \left(\tilde{C} - \tilde{W}_1\right)\right]}{|\lambda|} \\
\tilde{A} &= \frac{\lambda_{CS} \left(\lambda_{KL} \lambda_{LY} - \lambda_{LX} \lambda_{KY}\right) \left[\tilde{T} - \alpha_{LA} \left(\tilde{W}_1 - \tilde{R}\right)\right]}{|\lambda|}
\end{align*}

where $|\lambda|$ is the determinant of the matrix $\lambda$.

The factor prices can now be calculated as follows:

\begin{align*}
\alpha_{LX} &= \sigma_{X} \theta_{LX} \delta_X; \quad \alpha_{XX} = \sigma_{X} \theta_{XX} \delta_X; \quad \alpha_{KY} = \sigma_{Y} \theta_{XY} \delta_Y; \quad \alpha_{LA} = \sigma_{Y} \theta_{LY} \delta_Y; \\
\alpha_{TA} &= \sigma_{A} \theta_{KA} \delta_{TA}; \quad \alpha_{LA} = \sigma_{A} \theta_{KA} \delta_{LA}; \quad \alpha_{KA} = \sigma_{A} \theta_{KA} \delta_{KA}; \quad \alpha_{CS} = \sigma_{A} \theta_{CS} \delta_{S}; \\
\alpha_{LS} &= \sigma_{S} \theta_{LS} \delta_{S}; \quad \delta_X = \frac{1}{\theta_{LX} + \theta_{XX}}; \quad \delta_Y = \frac{1}{\theta_{LY} + \theta_{XY}}; \quad \delta_S = \frac{1}{\theta_{CS} + \theta_{LS}}; \quad \delta_{KA} = \frac{1}{\theta_{LA} + \theta_{KA}} \\
\delta_{KT} &= \frac{1}{\theta_{TA} + \theta_{KA}}
\end{align*}
From equation 7, the demand-supply balance in sector Y has been obtained as follows: 
\[ Y = Y_d = Y_s = a_{YX}X \]

Differentiating totally and rearranging terms the following expression can be derived:
\[ \bar{Y} = \frac{1}{|\lambda||\theta|} \lambda_{CS} \lambda_{TA} \left[ (\theta_{KY} + \theta_{LY}) (\lambda_{KY} \lambda_{LA} a_{KL} - \lambda_{KY} \lambda_{LA} a_{KL} - \lambda_{CS} \lambda_{LY} a_{CS} - \lambda_{CS} \lambda_{LY} a_{CS}) \right] \]

Using this relationship, equations 35 and 36 can be interpreted as follows:
\[ \bar{Y}_s = \frac{1}{|\lambda||\theta|} \lambda_{CS} \lambda_{TA} \left[ (\theta_{KY} + \theta_{LY}) (\lambda_{KY} \lambda_{LA} a_{KL} - \lambda_{YY} \lambda_{LA} a_{KL} - \lambda_{CS} \lambda_{LY} a_{CS} - \lambda_{CS} \lambda_{LY} a_{CS}) \right] \]

Therefore, the relationship between \( \bar{Y}_s \) and \( \bar{Y}_d \) generates the following:
\[ \bar{Y}_d = \bar{Y}_s = \frac{1}{|\lambda||\theta|} \lambda_{CS} \lambda_{TA} \left[ (\theta_{KY} + \theta_{LY}) (\lambda_{KY} \lambda_{LA} a_{KL} - \lambda_{CS} \lambda_{LY} a_{CS} - \lambda_{CS} \lambda_{LY} a_{CS}) \right] \]

Finally, plugging the expression obtained above into equation 24, the expression for the informal sector wage is reached:
\[ W_I = \frac{1}{|\theta|} \theta_{CS} \theta_{TA} \bar{Y}_X \left[ \frac{\theta_{KK} \theta_{KY} \theta_{LY} + (\theta_{LY} \theta_{KY} + \theta_{KK}) (\theta_{KY} + \theta_{LY}) \varphi}{\theta_{KK} \varphi} \right] \]
Further simplification gives,
\[
\overline{W}_1 = \frac{1}{\theta_{CS} \theta_{TA}} \left[ \theta_{XX} \theta_{KY} \phi \right] \left[ (\theta_{LY} \theta_{KY} + \theta_{XX}) (\theta_{KY} + \theta_{LY}) \right] \left[ \sigma_\phi (\lambda_{LA} \lambda_{KY} - \lambda_{KA} \lambda_{LY}) \right] \\
- \sigma_s (\lambda_{LY} \lambda_{CS} - \lambda_{KY} \lambda_{LS}) \]
\]

\[\text{…………………(41)}\]

The stability condition for the market of Y is, \[\frac{d(Y_d - Y_s)}{dP_Y} < 0\] \[\text{…………………(42)}\]

This implies that \(Y_d = Y_s\) around equilibrium. Therefore, \[\overline{\overline{\overline{W}}}_1 - \overline{W}_1 < 0\] \[\text{…………………(43)}\]

Equations 35 and 36 are differentiated with respect to \(P_Y\) and then the growth rate expressions \(\left(\overline{\overline{\overline{W}}}_1\right)_{P_Y}\) and \(\overline{W}_1\) are obtained, which is \(\phi\). Therefore, equation 43 implies that the denominator of equation 39 is negative.

Again, \(|\theta|\) is defined as negative, since the formal manufacturing sector is capital intensive.

Hence the sign of \(\overline{W}_1\) depends upon the signs of numerator.

**Discussion**

In this section, the following two propositions demonstrate the two possible outcomes of the above modeling exercise. In order to derive the outcomes, equation 41 can be rewritten as the following.

\[
\overline{W}_1 = \frac{1}{\theta_{CS} \theta_{TA}} \left[ \theta_{XX} \theta_{KY} \phi \right] \left[ (\theta_{LY} \theta_{KY} + \theta_{XX}) (\theta_{KY} + \theta_{LY}) \right] \left[ \sigma_\phi (\lambda_{LA} \lambda_{KY} - \lambda_{KA} \lambda_{LY}) \right] \\
+ \left[ \sigma_s (\lambda_{LS} \lambda_{KY} - \lambda_{LY} \lambda_{CS}) \right] \]
\]

\[\text{…………………(44)}\]

**Proposition I** : A fall in \(P_X\) due to falling tariff, \(t\), may lead to \(\overline{W}_1 < 0\) if the following is true:

*The ratio of the fractions of labour and social capital employed in the self-employed sector is greater than the ratio of the fractions of labour and capital employed in the informal subcontracted sector.*

The formal manufacturing sector is more capital intensive than the informal subcontracted sector, for which \(\frac{1}{\phi} < 0\). The stability condition 43 implies that \(\phi < 0\). The share of social capital in the self-employed sector, the share of land in the agricultural sector, the share of capital in the formal manufacturing sector and the informal subcontracted sector and the share of labour in the informal subcontracted sector are all positive. The elasticity of substitution between labour and social capital in the self-employed sector and that between capital and labour in the agricultural sector are both positive. Hence, \(\overline{W}_1 \leq 0\) if and only if \((\lambda_{LA} \lambda_{KY} - \lambda_{KA} \lambda_{LY}) > 0\) and \((\lambda_{LS} \lambda_{KY} - \lambda_{LY} \lambda_{CS}) > 0\). In other words, a decreasing informal sector wage requires that \(\frac{\lambda_{LA}}{\lambda_{KA}} > \frac{\lambda_{LY}}{\lambda_{KY}}\) and \(\frac{\lambda_{LS}}{\lambda_{CS}} > \frac{\lambda_{LY}}{\lambda_{KY}}\).

This proposition can intuitively be explained as the following. The decrease in tariff rate due to the trade liberalization policies lead to a contraction of the formal manufacturing sector, which is the import-competing sector. As a result, labour is released from this sector, a section of them enter the self-employed sector. The agricultural sector may also absorb a section of the
labour released from the formal sector. This also leads to the release of capital from the formal sector, which may end up either in the informal subcontracted sector or the agricultural sector. The relative labour intensity of the agricultural sector compared to the informal subcontracted sector results in \( \frac{L_A}{K_A} > \frac{L_Y}{K_Y} \).

On the other hand, the significant extent of internal displacement of people in India leads to a decline in the employment of social capital in the self-employed sector. This takes place through buying and/or leasing the natural resources, such as land, water, forest, and mines etc. resulting in significant dispossession of the people depending upon the resources for their subsistence. This gives rise to an influx of self-employed workers, both in the rural and in the urban areas. The extent of internal displacement in India is significant, especially in the last two decades. The big development projects have led to mass exodus from the areas where local people had established networks to access social capital. As a result, the self-employed sector can be understood as the sector that employs more labour compared to social capital. Reports of the Indian Population Council, the Internal Displacement Monitoring Center state that. Evictions due to large factories and various special economic enclosures are frequent in India.

Again, employment data on the informal sector clearly shows (NCEUS 2007) that more labour is employed in the self-employed sector than the informal subcontracted sector. Hence the following situations arise:

The labour employment in the self-employed sector grows; the social capital employment in the self-employment sector falls; the labour employment in the informal subcontracted sector grows but less than that in the self-employed sector; and, capital employment in the informal subcontracted sector grows. It can be concluded that the ratio of the labour and social capital employment in the self-employed sector is greater than the ratio of labour and capital employment in the informal subcontracted sector. In other words, \( \frac{L_S}{K_S} > \frac{L_Y}{K_Y} \).

The intuition behind the above analysis can be summarized as the following: The declining price of the import-competing manufacturing sector due to the declining tariff decreases the labour employment in this sector and more labour is absorbed in the agricultural and self-employed sector. Along with labour, the formal manufacturing sector releases capital as well, which end up in the agricultural sector. The newly absorbed labour force in the self-employed sector faces a reduction in the access to the social capital due to the growing dispossession of the resources and social network. Such dispossession can result from the rearrangement of property rights by the formal import-competing manufacturing sector, which buys/leases resources as an alternative method of reducing cost of production (the first one being the contraction in the formal workforce). Thus, the labour employment in the self-employed sector grows as the social capital dwindles. On the other hand, the labour employment in the informal subcontracted sector is lower than that in the self-employed sector. As a result, the ratio of the labour and social capital employment in the self-employed sector is greater than the ratio of labour and capital employment in the informal subcontracted sector, i.e., \( \frac{L_S}{K_S} > \frac{L_Y}{K_Y} \) is possible.

**Proposition II**: A fall in \( P_X \) due to falling tariff, \( t \), may lead to \( \bar{W}_l > 0 \) if the following is true:

The ratio of the fractions of labour and social capital employed in the self-employed sector is less than the ratio of the fractions of labour and capital employed in the informal subcontracted sector.
In other words, the trade liberalization policy may lead to a rise in informal sector wage if and only if \( \frac{\lambda_{LS}}{\lambda_{CS}} < \frac{\lambda_{LY}}{\lambda_{KY}} \). This is possible only when one the following two conditions are met. First, the employment of social capital falls below that of labour in the self-employed sector because the social or community ties are stronger. This may stem from a lower rate of out-migration from the villages or the states. The second condition is that the share of labour employment is higher in the subcontracted sector than that in the self-employed sector. The first condition can be examined using the available migration data from India. The latest population census data of India (2001) shows that the rural out-migration, both inter and intra-state are comparable and has not decreased over the previous periods (UNDP urban Poverty report 2009, Mitra and Murayama 2008). Therefore it is tough to find intuitive support in favor of a lower employment of labour compared to that of social capital in the self-employed sector. Moreover, the internal displacement data, as discussed above, contradicts this condition. Again, the employment data obtained from the NCEUS (2007) report does not support the second condition. Therefore it is hard to find logical or data support for proposition II.

Both the propositions demonstrate the significance of the self-employed sector in determining the informal sector wage. The outcome of the modeling exercise done in the previous section is clearly dependent upon the employment of labour in the self-employed sector (along with that in the subcontracted sector) and also, on the employment of social capital in the self-employed sector. This intriguing result is relevant from the policy perspective. Since the vast self-employed sector holds a crucial key to the improvement of the working conditions, precisely the wages of the informal workers, there is ample scope for the policymakers to rethink development policies for the self-employed sector.

**Conclusion**

India, like a lot of other developing countries, has started implementing liberalization policies in the early 1990s. Since the liberalization policies influenced the Indian economy very much, it is very important to understand the adjustments different sectors undergo and the costs associated with the adjustments. The goal of this research was to understand how the wages of the informal sector adjusts in response to the trade liberalization policies. This paper has developed a four-sector simple general equilibrium model, where there are two types of informal sector, the informal subcontracted sector and the informal self-employed sector, along with the formal manufacturing sector and the agricultural sector. Unlike the previous economic studies, this research gives both types of informal sector their due importance in a neoclassical modeling exercise. The trade liberalization policies are represented by a fall in the tariff rate and therefore a fall in the price of the import competing manufacturing sector. The expression for the change in informal sector wage is obtained by solving the price system and the full employment system with the use of Cramer’s rule and envelope theorem. The resultant expression for informal sector wage indicates the importance of the self-employment sector. Despite certain level of subjectivity, the result shows that a fall in the tariff rate (reflected through the falling price of the import-competing formal manufacturing sector) can lead to a fall in the informal sector wage, if the fraction of labour employed in the self-employed sector compared to that of social capital in this sector is greater than the fraction of labour employed compared to capital in the informal subcontracted sector. Incorporating the self-employed sector as a sector separate from the informal subcontracted sector is an original contribution of this chapter. It allows one to understand the role of the self-employed sector in affecting the working condition of the workers in both types of informal sectors. This is the fundamental way in which this research parts ways
with the previous studies in informal sector. This is the first economic research where the self-employed sector has been considered as a separate and independent sector, and through the general equilibrium modeling exercise, this research emphasizes the requirement for a better understanding of the self-employed sector.

Bibliography of References


Harriss-White, B. and A. Sinha (eds.) (2007). Trade Liberalization and India’s Informal Economy, Oxford University Press, Delhi.


