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CORRUPTION AND REAL WAGES IN GENERAL EQUILIBRIUM TRADE MODELS

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Abstract:

The present paper explores the impact of corruption on the real wage of informal sector workers in a general equilibrium model of production and trade. The proposed general equilibrium model is a two-sector two-factor framework that models segmented labor market. There is a handful of literature examining the real wages on labor in a segmented labor market framework. This paper has been the first attempt to investigate that gap, the real wages in a segmented labor market with the existence of corruption and a unionized sector. We have come up with the striking finding that a reduction in the degree of corruption may benefit workers in the informal sector if the formal sector is relatively capital intensive in a value sense.

Keywords: Corruption, Informal wage, Unionization, International Trade, Production linkages, Comparative advantage, Institutional quality, Informal sector, Sectoral allocation

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Introduction

International trade and informal wages is a focus area of study for the past two decades. Stimulated by the rising informal sector employment due to trade openness the study has high importance to check the adequacy of the informal wages. The economic reforms that happened in India during

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1991 witnessed an increase in India's trade with other world countries. This has led to a surge in employment and productivity (Mandal & Marji, 2010). Consequently, an increase in the formal sector employment occurred, and through the backward production linkages informal sector employment also expanded. This surge in the formal, as well as informal sector employment, has created wages for workers, and this wage has a positive incidence on reducing urban poverty (Kar & Marjit, 2009). Since a country like India has its major portion of labour force as a part of the informal sector (Mukherjee, 2016) make it's imperative to study the adequacy of informal wages to meet the poverty line specification. The proportion of informal sector employees makes the work relevant. But progressively other factors such as technological progress, institutional quality, unionization emerged and influenced the formal and informal employment and wages and resulted in unanticipated outcomes. This literature is incorporating corruption aspect to a small open economy to analyze the impact of trade reforms and corruption on the informal wage in the presence of a unionized sector where the wages are fixed by prior negotiation with trade unions. The theoretical literature focused on the informal wage, Marjit & Kar (2007), Beladi et al. (2008), Marjit (2003), Marjit et al. (2007), Mukherjee (2014; 2012; 2017), Marjit el al. (2011), Marjit et al. (2007), Marjit et al. (2007) etc limited the works with trade reforms and its impact on informal wages and none has incorporated corruption to the general equilibrium models. Levchenko (2007; 2012) studied the impact of reduction in the degree of corruption on the comparative advantage of countries participating in trade and quality of institutions under trade and autarky. But none of these papers addressed the gap of impact of trade reforms and corruption on the informal wage with the existence of a unionized sector. Corruption, a directly unproductive profit-seeking activity, has negative impact on the growth of a country due to the creation of rents to some economic agents in the economy and is labor-intensive. Due to the rents some economic agents have an incentive to make the equilibrium institutions suboptimal.

Recent literature (Beladi et al., 2012; Marjit & Kar, 2007; Mukherjee, 2016) has put enormous importance on the impact of the technological progress on the informal wages in a segmented labor market setting. So the question that naturally pops in our mind is: why such technological progress is of so much importance? This is so because the impact of technological progress on the formal (i.e., registered or organized) sector and informal (i.e. unorganized) sector workers portray contradicting results. In one sector set up technological improvement, such as labor reducing technological improvement, will decrease the factor rewards of labor including labor and capital,

as the only input factors of production under neoclassical technology. While the same result is hardly observed in a two-sector set-up with labor-intensive sector (e.g., Beladi et al. 2012), i.e., in a two-sector set up labor-saving technological progress will increase the factor rewards of labor in the labor-intensive sector. So it is worth scrutinizing the impact of aspects like technological progress, unionization, and corruption of a sector on the real wages of labor. In the current work, the impact of corruption on the real wages of workers was examined utilizing a two-sector two commodities set up. Mandal and Marjit (2010) modeled the impact of corruption on wage inequality of formal and informal workers, but the model doesn't consider the existence of unionization in one sector.

Mukherjee (2017) explores the effect of the international trade-prompted surge in the skill demanding service sector on the factor rewards of the informal sector labor and employment and, most essentially the focus was centered on how this effect is percolated through the presence of finished non-tradable good. A general equilibrium model for studying the relationship between corruption (directly unproductive activities) which enter the framework as transaction costs and wage disparity between skillful and unskilful labor demonstrated that an improvement in the institutional quality would lead to declined real wage and the result is ambiguous (Mandal & Marjit, 2010). Corruption helps to save transaction costs in the production process through a part of the output is lost due to corruption-related transaction costs. Such weakened institutions help the capitalists. Marjit et al., (2014) introduced, a new dimension, corruption into the neoclassical theory of trade by establishing a relationship between the trade openness or pattern of trade with corruption and its impact on the comparative advantage (factor abundance) of countries by using a variant of Jonesian (Jones, 1965) 2-good 2-factor 2-country general equilibrium model of production and trade and empirically proved that low level of trade openness is observed in labor abundant or low-income countries compared to abundant capital countries. The study, however, has not explored the impact of trade reforms in the presence of bad institutions on the wages of urban unskilled workers of informal sector of the domestic country itself. However, in none of these papers, the sectoral allocations of the skilled and unskilled workers, the existence of informal sectors producing internationally non-traded goods, usage of intermediate products in the formal exportable producing sector and therefore the relative importance of institutional complexity in the production of exportable, likewise argued in Nunn (2007) and Levchenko (2007; 2012), have not been addressed neither in Mandal and Marjit (2010), nor in Marjit et al. (2014).

After the 1991 economic reforms, a surge in productivity and employment happened in India; consequently, a rise in the national product occurred though only a nominal portion of labour force is part of the formal and organized sector employment. A considerable portion, i.e., more than 70% of the total informal workforce are associated with unorganised sector. This informal unorganized workforce is producing the finished goods in return to the market-determined wage. Due to the substantial size of the workers, in terms of number, in the informal or the unorganized sector, who receives a meager sum as wage, it is vastly relevant to consider the adequacy of the market-determined wage, understudy to analyze whether the wage is sufficient to meet poverty line specifications. A similar study by Mukherjee (2017) in which the impact of trade reforms particularly input trade reforms on the wage disparity between the skillful and unskillful workers and on the work conditions has been made emphasizing the non-traded goods in a developing country like India. But none of these works has focused the implications of trade reforms and corruption in a two-sector set up in the presence of a unionized sector with fixed wages on the informal or the unregistered workers.

The current work differs from the extant literature in the aspect of the presence of corruption in the sectors and the impact the corruption on the real wages of the workers along with unionization of a sector. It is imperative to note that our paper is different from that of Beladi et al. (2012) by the existence of corrupted sectors in the economy. The model is framed in such a way that the organized (i.e., formal) sector is unionized, and the wage is fixed by the prior negotiations with the trade unions. The workers who are unable to secure employment in the organized sector will move to the unorganized sector where a large number of relatively unskilled laborers find a job since it is impossible for them to live without a job as a relatively large number of workers come from a poor economic background. Those who moved from the formal sector to the informal sector could find a job in the latter since it absorbs all the workers. The previous literature substantiates the factor that critically low levels of unemployment among the poor (Mukherjee 2016, Beladi et al. 2012). Despite the fact that the meager wages in the unorganized sector, open unemployment amongst relatively low-skillful and unskilled poverty-stricken workers is probably to be minimal. Thus, the setting with a substantial informal sector is well suited for scrutinizing the real wages of informal workers in an open small developing economy incorporating corruption into the different sectors. A striking result obtained from the current study that a reduction in the degree of

corruption will benefit the workers in the informal sector labor if the other sector is capital intensive in a two-sector economy.

The remainder of the work is organized as follows. The general equilibrium model followed by the comparative statistical analysis is the next two sections. The next section is the discussion section, and finally, we draw our conclusions.

Model and Analysis

The current study exhibits an alternative of the basic Jones (1965) 2×2 neoclassical general equilibrium model. In the present simple 2×2 general equilibrium model of trade, commodities X and Y are produced, with labor (L) and capital (K) with the basic neoclassical technology and under the perfect competitive conditions. X is manufactured in the urban organized sector where the workers receive a contractual wage $\overline{W}$ which is fixed by the prior unionized negotiation of trade unions with the employers? We are not modeling this wage-fixation explicitly here. A formal derivation of unionized wage through collective bargaining is shown in the Appendix, based on a simplified version of (Chaudhuri, 2003; Mukherjee, 2016). If people are not able to secure a job in the formal unionized sector, they move to the other sector, i.e., Y for a job where they certainly find employment. So the full employment of both the factors is achieved. Both X and Y exhibits CRS (constant returns to scale) and diminishing marginal productivity. Prices of the goods are settled by small open economy assumptions, i.e., and the economy is a price taker. Factors, capital, and labor move freely between sectors. The substantial portion of the labor supply is engaged in producing X and Y, while the remaining portion of the workers delivers their service for avoiding the numerous institutional complications and intricacies engrossed in international trade. These institutional intricacies or the poor quality of institutions leads to corruption. Let L_Z represent the amount of labor involved in corrupt actions. A portion of the output is diverted for corruption activities. Consequently, a loss of factors and productivity happens. Suppose, $\alpha \in [0,1]$ denotes the portion of each of X and Y dropped as a result of institutional complications. Thus, $\alpha(P_X X + P_Y Y)$ denotes the total value of the commodities lost due to the corruption and which can be spent on the economic agents who are capable of manipulating the system and their position and earn the rents due to their corrupt activities. It is assumed to have a perfectly competitive

market setting for corruption sector to be in line with the standard-setting of the competitive general equilibrium model.

The model can be explained in terms of the following equations. The following characters have typical elucidations. Zero-profit conditions or perfect competition setting in the two sectors, i.e., sector X and Y, can be expressed as:

$$\bar{W}a_{LX} + ra_{KX} = P_X(1 - \alpha) \qquad (1)$$

$$Wa_{LY} + ra_{KY} = P_Y(1 - \alpha) \qquad (2)$$

where, $\bar{W}$ is the fixed-wage through the unionized negotiations and is exogenous to the model, W is the wage in the informal sector which is less than $\bar{W}$. α is the degree of institutional quality or degree of corruption. Higher the value of α greater will be the corruption, and poorer will be the institutions. α, P_X, P_Y are the parameters of the structure. a_{ji} $(j = L, K; i = X, Y)$ are functions of $\left(\frac{W}{r}\right)$ & $\left(\frac{\bar{W}}{r}\right)$ and r is the return to capital, which is endogenous to the model.

The maximum total value of goods that are transferred to the corrupt economic agents and the fraction of labor associated with it with the economic rents is expressed in the following equation.

$$\alpha(P_X X + P_Y Y) = WL_Z \qquad (3)$$

Full employment settings for X and Y correspondingly can be stated as follows:

$$a_{LX}X + a_{LY}Y = \bar{L} - L_Z \qquad (4)$$

$$a_{KX}X + a_{KY}Y = \bar{K} \qquad (5)$$

where, $\bar{L}$ and $\bar{K}$ denote the factor endowments, i.e., labor and capital, in the country, and L_Z denotes the portion of workers involved in corrupt transactions. Regarding the demand side, this setting also makes the standard assumption of homothetic demand function:

$$\frac{X_D}{Y_D} = f\left(\frac{P_X}{P_Y}\right), f'(.) < 0 \qquad (6)$$

Where X_D and Y_D refers to the quantities demanded. $\overline{W}, \overline{L}, \overline{K}$ are exogenous in our modeling environment. Since α, P_X, P_Y are the parameters of the structure, it is known, and so the equilibrium rates of W and r can be obtained from equations (1) and (2). The values for X and Y can be obtained in terms of, r and L_Z and a_{ji} $(j = L, K; i = X, Y)$ which are functions of $\left(\frac{W}{r}\right)$ & $\left(\frac{\overline{W}}{r}\right)$ from equations (4) and (5). Now the final equation, i.e., equation (3) is in terms of L_Z only and can be solved, and the equilibrium value can be obtained.

Comparative Statistics Analysis: Corruption and Real wage

Differentiating and working on equations (1) and (2) will provide:

$$(-)\hat{a}.\frac{\alpha}{(1-\alpha)} = \hat{r}\theta_{KX} \qquad (7)$$

$$(-)\hat{a}.\frac{\alpha}{(1-\alpha)} = \widehat{W}\theta_{LY} + \hat{r}\,\theta_{KY} \quad (8)$$

From equation (7)

$$\hat{r} = \frac{1}{\theta_{KX}}[(-)\hat{a}\frac{\alpha}{(1-\alpha)}]$$

Let $(-)\hat{a}\frac{\alpha}{(1-\alpha)} = \beta$, then the above equation will be $\hat{r} = \frac{\beta}{\theta_{KX}} > 0$, as $\hat{a} < 0$.

Substituting the value for $\hat{r}$ and $(-)\hat{a}.\frac{\alpha}{(1-\alpha)}$ in equation (8) will give $\widehat{W}\theta_{LY} + \frac{\beta}{\theta_{KX}}\,\theta_{KY} = \beta$

$$\widehat{W} = \frac{\beta(1 - {\theta_{KY}}/{\theta_{KX}})}{\theta_{LY}},$$

Or,

$$\widehat{W} = \frac{\beta\,(\theta_{KX} - \theta_{KY})}{\theta_{KX}\theta_{LY}}$$

Since $\hat{\alpha} < 0$, $\widehat{W} > 0$ if and only if $\theta_{KX} > \theta_{KY}$. If $\theta_{KX} > \theta_{KY} \implies \frac{ra_{KX}}{P_X} > \frac{ra_{KY}}{P_Y}$. Therefore $\widehat{W} > 0$ sector X is more capital intensive in value sense compared to sector Y. This leads us to the following proposition.

Proposition 1: If the formal sector (sector X) is more capital intensive than the informal sector (sector Y) in value terms then a reduction in the degree of corruption (an improvement in the quality of institutions) will lead to an increase in the wage of the informal sector (the factor rewards of the workers engaged in sector Y will be increased).

Discussion

If $\theta_{KX} > \theta_{KY} \implies (1 - \theta_{KX}) < (1 - \theta_{KY})$

But $1 - \theta_{KX} = \theta_{LX}$. Therefore $\theta_{LX} < \theta_{LY}$.

The usage of labor per unit of production of X in value terms is less than labor per unit of production of Y. If sector X, which is an organized sector, is more capital intensive than the sector Y, which is an unorganized sector, then a reduction in the degree of corruption will benefit the employees in the unorganized sector. The rate of return the labor in the unorganized sector will rise. Due to unionization, stricter norms, and improved institutions, the employees who are being retrenched from the formal sector move from the formal sector to informal sector, and if the informal sector is using more labor-intensive techniques of production then it will create a demand for labor. So the retrenched workers from the formal sector can easily find employment in the informal sector. This means there exists a demand as well as supply for labor in the informal sector. The demand for labor will dominate if and only if the labor usage per unit of production of good Y in value terms in sector Y is greater and the other sector is a capital intensive sector.

We have seen two major institutional reforms like withdrawal of higher denomination currency and implementation of GST in India recently. Even after these reforms, informal workers are less adversely affected (NSSO, Economic survey, and ASI are showing results), and the real wage of informal workers is improving. The institutional reforms are the appropriate example of the reduction in the degree of corruption or improvement in the institutional quality. Informal employees are benefitting from such improvements in the domestic institutions. During the liberalization also, a similar result has been observed, i.e., the post-liberalization regime witnessed

no harm to the informal sector since the informal sector relies more on labor than on capital, and instead of adverse effects informal employees benefitted through the surge in employment and wage happened in the informal sector.

Table: 1. Attributes of the model

Number of Sectors	Sector Descriptions		Factor Markets		Relative Factor-intensity Ranking
	Formal sector	Informal sector	Labour Market	Capital Market	
2	Sector $X \rightarrow$ • Finished good X manufacturing sector; signifies labor activities with the usage of capital (similar to Beladi et al. 2012). • CRS with diminishing marginal productivity.	Sector $Y \rightarrow$ • Finished Y producing sector, utilize labor and capital (similar Beladi et al. 2012). • CRS with diminishing marginal productivity.	**'Formal' Labour Market in Sector X** $\rightarrow$ Competitive labor market with fixed wages through unionized negotiation. **'Informal' Labour Market in Sector Y** with market-determined wages, which are less than the formal labor market wages.	No imperfection in the capital market. However, following Caballero and Hammour (1998) and Levchenko (2007; 2012), I assume that when skillful labor and capital are joined, because of contracting imperfections, a share φ of capital's investment becomes specific to the relationship. Given our model environment, it is reasonable to assume that Sector X and Y are sensitive to the institutional imperfections,	Applicable for the traded sectors, i.e., Sectors X & Y – that is, the sectors using two common factors –Labour & Capital – hence, modeling the essential Heckscher-Ohlin 'Nugget'. • No factor-intensity reversal.

Concluding Remarks

The inducement that happened in the informal sector as a result of trade policy relaxations is a hot topic under study. Growths in informal sector employment, as well as wages, are the two favorable

results that happened post-trade reforms in India. The present study intended to depict the impact of the corruption on the informal wages in the context of trade reforms as well as unionization is one of the sectors. This paper searches the general equilibrium effect of unionization in one sector and corruption in the context of trade reforms on the real informal wages. A reduction in the degree of corruption will benefit the workers in the informal sector labor if the other sector is capital intensive in a two-sector economy. The current model can be re-looked, incorporating the sectoral output composition and what will happen if national income defined in terms of world price (international prices).

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Appendix

Derivation of The Unionised Wage Function (based on Chaudhuri 2003, Chaudhuri, Mukhopadhyay 2010 and Mukherjee 2016)

Consider that the urban sector comprises only the organized formal manufacturing sector (sector M). Production in M sector needs two factors of production: capital (K) and labor (L). We have perfect capital market but a unionized labor market that the industry is facing. Assuming that each firm of sector has a separate labor union, the unionized wage function may be derived as a solution to the Nash bargaining game between the representative firm and the representative union in the industry. Labour is our variable factor of production here.

The representative firm's profit function is given by

$$\pi = P_M \, Q(L, K) - W^* L \qquad \text{A.1}$$

$P_M \left(= P_M^*(1 + t) \right)$ is taken as exogenous by the organized sector producers. The representative labor union maximizes the aggregate wage-income of its members net of their opportunity wage-earnings.

$$\Omega = (W^* - W) \qquad \text{A.2}$$

Here the competitive wage is the opportunity wage to the workers in the industry. This is because any worker unable to receive a job in the formal (organized) sector has only the best option is to go back to the unorganized sector for not to be remained unemployed.

We consider a co-operative game between the firm and the labor union leading to the determination of the unionized wage and the employment level, given by W^* and L respectively. If the two players can't reach an agreement, the game won't be played. In that case organized sector production would be zero as the workers have to accept jobs in the unorganized sector. So given the above two objective functions, the disagreement payoff is just [0,0].

The Nash bargaining solution is derived from the following maximization problem:

$$\underset{W^*, L}{Max} J = [P_M \, Q(L, K) - W^* L]^{(1-U)} \times [(W^* - W)L]^{U} \qquad \text{A.3}$$

Where U is the bargaining power of the labor union.

The first-order conditions are:

$$(1 - U)[(W^* - W)L] = U[P_M \, Q(.) - W^*L] \qquad\qquad \text{A.4}$$

And

$$(1 - U)(P_M Q_L -)L = -U[P_M Q - W^*L\,] \qquad\qquad \text{A.5}$$

Using equations A.4 and A.5 we will obtain

$$P_M Q_L = W \qquad\qquad\qquad \text{A.6}$$

Differentiating A.5 yields

$$\left(\frac{\partial L}{\partial W}\right) = \frac{1}{P_M Q_{LL}} < 0; \ \left(\frac{\partial L}{\partial P_M}\right) = -\frac{1}{P_M Q_{LL}} > 0 \qquad\qquad \text{A.7}$$

Simplifying equation A.4

$$W^* = U\frac{P_M Q(.)}{L} + (1 - U)W \qquad\qquad \text{A.8}$$

Equation (A.8) is the unionized wage function which can be written in the general form as

$$W^* = f(P_M, W, U) \qquad\qquad \text{A.9}$$

$$\frac{dW^*}{dU} = \left(\frac{1}{L}\right)(P_M Q(.) - WL) > 0$$

$$\frac{dW^*}{dW} = \left\{(1 - U) + \frac{U\big(WL - P_M Q(.)\big)}{L^2 P_M Q_{LL}}\right\} > 0$$

Thus we have proved that the unionized wage is a positive function of both the competitive wage and the bargaining power of the labor union.

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