Corruption in union leadership

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Abstract

This note develops a model of two stage game between a corrupt trade union leader and the management of the firm where the former negotiates for the wage of the workers with the firm. The firm bribes the leader so that he keeps the wage as close as possible to the workers' reservation wage. The analysis leads to some interesting results which are important for anticorruption policy formulation.

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JEL Classification: O16, O17

1 Introduction

The phenomenon of corruption has existed for ages. Over the last few decades, it has become all-pervasive, especially in many developing countries, and is widely believed to be the single most important obstacle to development. Wide spread corruption across organizations, both public and private, surely goes a long way in explaining the poor performance of developing countries.

In this short note we deal with a specific form of corruption viz. the effects of the presence of a corrupt union leader in an unionized industry. The presence of such forms of corruption often contribute to perpetuation of low wages among workers, especially in emerging economies. We try to explore this issue here.

*The authors are deeply honoured to be able to contribute to this volume of essays dedicated to Professor Satish Jain, who is one of the finest minds in our country.

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We develop a model about determination of unionized wage in the presence of a such a corrupt leader who acts as an intermediary between workers and management of a firm. Being the representative of all the workers, he bargains with the management for setting the workers' wages. Since he is corrupt (which is often the case in emerging economies), he receives a bribe from the management of the firm for keeping wages as close as possible to the workers' reservation wage. However, workers are aware that their leader may be taking a bribe and hence the leader has to be careful. In case, he settles for a very low wage (which is very close to the reservation wage), the workers will realize that he has taken a bribe and consequently they may throw him out. We model this story as a two stage game and analyse the equilibrium levels of unionized wage, employment and bribe.

Reated Literature There are a large number of papers dealing with corruption within a hierarchical administrative architecture. We concentrate on a few such papers directly related to our exercise. Following Becker and Stigler (1974), most of the theoretical papers (e.g. Banfield (1975), Rose-Ackerman (1975, 1978) and Klitgaard (1988, 1991) focus on the principal-agent framework of corruption. These models deal with the relationship between the principal, i.e. the top level government and the agent, i.e. an official who takes a bribe from the private individuals interested in some government-produced goods. These studies examine different ways of controlling corruption. Cadot (1987) has analyzed bribery in a model with a hierarchical administration. Basu et al. (1992) have also considered a hierarchical administrative system. In a very different context, but still assuming that the official needs a bribe to make his job, Shleifer and Vishny (1992, 1993) show that increasing the official price leads unambiguously to a reduction in production and has different effects on the bribe depending on the slope of the demand function.

2 The Model

Consider a scenario where there is a corrupt union leader who intermediates between the workers and a firm in a unionized competitive industry. The reservation wage of the workers is $\underline{W}$ (informal wage). The union leader does all the bargaining with the firm as the sole representative of the workers. He receives a bribe Z from the firm for keeping W as close as possible to $\underline{W}$. Production requires only labour (L). The labour market facing the industry is unionized. Each firm in the industry has a separate trade union. Such a scenario is very common in emerging economies. In such a framework we analyse the equilibrium levels of unionized wage W, employment L and bribe Z.

We model this as a two-stage game. In stage 1, the corrupt leader and the firm play a Nash bargaining game and determine the unionized wage, W , and the amount of bribe, Z. In stage 2, the firm takes W and Z as given and chooses the level of employment L.

2.1 Second Stage

The firm's payoff (profit) is given by $\pi = PQ(L) - WL(1+r) - Z$. The firm can sell any amount at price P. It essentially acts as a competitive firm in the output market. $Q(L)$ is the amount of output produced when the firm employs L units of labour. We assume that for all $L > 0$, $Q'(L) > 0$ and $Q''(L) < 0$. This simply means that the marginal product of labour is positive and this marginal product diminishes with increases in output. This assumption is justified when the firm has a fixed stock of physical capital. The wage payment, W, is made in advance which can be regarded as working capital. This means the firm has to incur $W(1+r)$ amount of cost where r is the interest rate.

Note that W and Z are determined in the first stage. Given this, the firm chooses L to maximise π. The first and second order conditions are as follows.

$$\begin{aligned}
\frac{\partial \pi}{\partial L} &= PQ'(L) - W(1+r) = 0 - - - - (1a) \\
\frac{\partial^2 \pi}{\partial L^2} &= PQ''(L) < 0 - - - - - - (1b)
\end{aligned}$$

From (1a) we get that the profit maximising amount of employment is given by $L^*(W, P, r)$. Clearly

$$L^*(W, P, r) = Q'^{-1}\left(\frac{W(1+r)}{P}\right). - - - - (1c)$$

Routine computations yield the following.

$$\begin{aligned}
L_W^* &= \frac{\partial L^*}{\partial W} = \frac{1+r}{PQ''(L^*)} < 0 - - - - (2a) \\
L_P^* &= \frac{\partial L^*}{\partial P} = \frac{-Q'(L)}{PQ''(L^*)} > 0 - - - - (2b) \\
L_r^* &= \frac{\partial L^*}{\partial r} = \frac{w}{PQ''(L^*)} < 0 - - - - (2c)
\end{aligned}$$

Let us define $\Pi = PQ(L^*) - WL^*(1+r) - Z$. Note that Π gives the maximum profit accruing to the firm when it employs the optimum amount of labour (L^*). Using the envelope theorem, we get the following.

$$\begin{aligned}
\Pi_W &= \frac{\partial \Pi}{\partial W} = -L^*(1+r) < 0 ------ (3a) \\
\Pi_Z &= \frac{\partial \Pi}{\partial Z} = -1 \qquad ------ (3b) \\
\Pi_P &= \frac{\partial \Pi}{\partial P} = Q(L^*) > 0 \qquad ------ (3c) \\
\Pi_r &= \frac{\partial \Pi}{\partial r} = -WL^* \; < 0 \qquad ------ (3d)
\end{aligned}$$

From 3a-3d we also get the following.

$$\begin{aligned}
\Pi_{WW} &= \frac{\partial^2 \Pi}{\partial W^2} = -(1+r) L_W^* > 0 ------ (4a) \\
\Pi_{rW} &= \frac{\partial^2 \Pi}{\partial r \partial W} = -WL_W^* - L^* \qquad ------ (4b) \\
\Pi_{WP} &= \frac{\partial^2 \Pi}{\partial W \partial P} = -L_P^*(1+r) < 0 \;\; ---- (4c) \\
\Pi_{ZZ} &= \Pi_{ZW} = \Pi_{Zr} = 0 \qquad ---- (4d)
\end{aligned}$$

We now proceed to solve the first stage of the game.

2.2 First Stage

In the first stage the firm and the corrupt union leader play a cooperative game and determine W and Z jointly through a Nash Bargaining process. Let $p(W)$ be the probability that the union leader will be detected by other workers for his unethical practice and be removed from his post[1]. Note that $W \geq \underline{W}$. We assume the following.

$$\begin{aligned}
p(.) &: [\underline{W}, \infty) \longrightarrow [0,1] \\
p'(W) &< 0, \; p''(W) \leq 0 \text{ and } p(\underline{W}) = 1
\end{aligned}$$

The above properties of the $p(.)$ function are obvious in our context. If the leader (along with the firm) sets a wage equal to $\underline{W}$, then the workers will clearly realise that there has been a deal struck between the firm and the leader (with kickbacks being paid) and in this case the leader will be removed from his post with certainty. If the chosen W is strictly higher than $\underline{W}$ then the workers are not certain whether such a deal has taken place or not and consequently the probability that

[1] Typically in emerging economies such as India, the workers (or a substantial fraction of them) revolts againts such a leader and he is removed forcibly.

the leader will be caught is less than one. Higher is the chosen wage W, the lower will be the probability of getting caught since with higher wages the workers become less suspicious. If the union leader is detected in resorting to bribe-taking, he will be summarily removed from his post and will loose his formal sector job. In this case he has to fall back upon an informal sector job where the wage rate is $\underline{W}$. The union leader is risk-neutral and his expected income is therefore given by

$$Y = (1 - p(W))(W + Z) + p(W)\underline{W} = W + Z - p(W)(W + Z - \underline{W}). - - - - (5)$$

The following may be noted.

$$\begin{aligned}
Y_W &= \frac{\partial Y}{\partial W} = 1 - p'(W)(W + Z - \underline{W}) - p(W) > 0 \quad - - - - (5a) \\
Y_Z &= \frac{\partial Y}{\partial W} = 1 - p(W) \geq 0 \quad - - - - (5b) \\
Y_{WW} &= \frac{\partial^2 Y}{\partial W^2} = -p''(W)(W + Z - \underline{W}) - 2p'(W) > 0 \quad - - - - (5c) \\
Y_{ZW} &= -p'(W) > 0 \quad - - - - (5d) \\
Y_{ZZ} &= 0 \quad - - - - (5e)
\end{aligned}$$

The union leader has a reservation income, $\underline{Y}$, (say from directly joining politics). He will not be engaged in union leadership unless $Y \geq \underline{Y}$.

The firm's payoff is $\Pi = PQ(L^*) - WL^*(1 + r) - Z$. We assume that if the bargaining process breaks down no production will take place and consequently the firm's profit in this case would be zero. The disagreement payoff vector is thus $(\underline{Y},\ 0)$.

2.2.1 The Nash Bargaining Solution

To arrive at the Nash Bargaining solution we maximise $B = (Y - \underline{Y})\Pi$ w.r.t W and Z. The first order conditions are given as follows.

$$\begin{aligned}
B_W &= \Pi Y_W + (Y - \underline{Y})\Pi_W = 0 - - - - (6a) \\
B_Z &= \Pi Y_Z + (Y - \underline{Y})\Pi_Z = 0 \quad - - - - (6b)
\end{aligned}$$

Note that from (6a) and (6b) the equilibrium levels of wage and bribe, W^* and Z^* can be obtained as functions of r, P and $\underline{Y}$.

We now write (6a) and (6b) as implicit functions in the following way.

$$\begin{aligned} F^1(W, Z; r, P, \underline{Y}) &= 0 \\ F^2(W, Z; r, P, \underline{Y}) &= 0 \end{aligned}$$

Just note that $F^1(.) = B_W$ and $F^2(.) = B_z$. We now report the following computations.

$$\begin{aligned} F^1_W &= \frac{\partial F^1}{\partial W} = \Pi Y_{WW} + 2\Pi_W Y_W + (Y - \underline{Y})\,\Pi_{WW} - - - - (7a) \\ F^1_Z &= \frac{\partial F^1}{\partial Z} = \Pi Y_{WZ} + \Pi_W Y_Z + Y_W \Pi_Z \qquad - - - - (7b) \\ F^2_W &= \frac{\partial F^2}{\partial W} = \Pi Y_{WZ} + \Pi_W Y_Z + Y_W \Pi_Z \qquad - - - - (7c) \\ F^2_Z &= \frac{\partial F^2}{\partial Z} = 2Y_Z \Pi_Z \qquad - - - - (7d) \end{aligned}$$

Note that since $Y_{WW} > 0$ (5c), $\Pi_{WW} > 0$ (4a), $\Pi_W < 0$ (5a) and $Y_W > 0$ (5a) we cannot sign F^1_W. But if Π is high enough then $F^1_W > 0$. In fact, we will assume this throughout our exercise. Note that Π will be high if P (the price that the firm faces in the market) is very high. Note that from (7b) and (7c) we have $F^1_Z = F^2_W$. By a similar logic when Π is high enough, since $Y_{WZ} > 0$ (5d) we get that $F^1_Z = F^2_W > 0$. Since $Y_Z \geq 0$ (5b) and $\Pi_Z = -1$ (3b) we have $F^2_Z \leq 0$.

We now provide some reasons as to why Π can be high enough. Consider the case where the firm is an exporting one. Then it can receive a very high price (P) for its product in the international market vis-à-vis the domestic market where demand for the product might be lacking. If the income elasticity for such a product is very high in the international market, P can indeed be very high. On the other hand, since the firm operates in the formal sector, it can receive loans from the organized credit market at low and competitive interest rate. Besides, exporting firms often receive export subsidies from the government as part of export promotional measures, which makes the credit cost even lower and this can also push up Π.

We summarise our findings below.

Lemma 1 *If in equilibrium, the firms profit, Π, is high enough then $F^1_W > 0$, $F^1_Z = F^2_W > 0$ and $F^2_Z \leq 0$.*

$$\text{Let } D = \det \begin{vmatrix} F^1_W & F^1_Z \\ F^2_W & F^2_Z \end{vmatrix}$$

Note that if Π is high enough then from lemma 1 we get that

$$D = F^1_W F^2_Z - F^2_W F^1_Z = F^1_W F^2_Z - \left(F^1_Z\right)^2 < 0.$$

We now report another set of computations. These will be required for our results later.

$$\begin{aligned}
F^1_r &= \frac{\partial F^1}{\partial r} = \Pi_r Y_W + (Y - \underline{Y})\,\Pi_{Wr} \quad ----(8a) \\
F^2_r &= \frac{\partial F^2}{\partial r} = \Pi_r Y_Z \quad ----(8b) \\
F^1_P &= \frac{\partial F^1}{\partial P} = \Pi_P Y_W + (Y - \underline{Y})\,\Pi_{WP} \quad ----(8c) \\
F^2_P &= \frac{\partial F^2}{\partial P} = Y_Z \Pi_P \quad ----(8d) \\
F^1_{\underline{Y}} &= -\Pi_W \quad ----(8e) \\
F^2_{\underline{Y}} &= -\Pi_Z = 1 \quad ----(8f)
\end{aligned}$$

3 The Main results

We now analyse the effects of changes in r, P and $\underline{Y}$ on the equilibrium levels of wage (W^*), employment (L^*) and (Z^*). It may be noted that our results will depend on the magnitude of ($Y - \underline{Y}$). There are situations, where this magnitude can be low enough and situations where this can even be high enough. We illustrate them briefly below.

Although in this model, there is only one union leader doing all the wage bargaining with the firm, in reality there are quite a few number of people in the race for the prime post in the labour union so that they can appropriate the cut money from wage bargaining. Competition among union leaders ultimately keeps Y as close to $\underline{Y}$ (payoff to the union leader from directly joining politics). The higher the competition the smaller would be the difference between Y and $\underline{Y}$. On the other hand, the payoff from taking direct part in politics may be quite high, which is presently the case in India, where scams after scams are unfolding frequently, so that the difference ($Y - \underline{Y}$) may be sufficiently low. It is also possible for ($Y - \underline{Y}$) to be quite high if there is a single union with a party dictated leader at the top (implying no competition among union leaders for the top post). In some industrial sectors in India, where certain political party trade union is dominant, this may indeed be the case.

3.1 Effects on W^*

Using the implicit function theorem we get the following.

$$W_r^* = \frac{\partial W^*}{\partial r} = -\frac{\det\begin{vmatrix} F_r^1 & F_Z^1 \\ F_r^2 & F_Z^2 \end{vmatrix}}{D} = -\frac{F_r^1 F_Z^2 - F_r^2 F_Z^1}{D}$$

Since $D < 0$ (provided Π is high enough) the sign of $\frac{\partial W^*}{\partial r}$ is the same as the sign of $\left(F_r^1 F_Z^2 - F_r^2 F_Z^1\right)$. Similarly the signs of $W_P^* = \frac{\partial W^*}{\partial P}$ and $W_{\underline{Y}}^* = \frac{\partial W^*}{\partial \underline{Y}}$ are the same as the signs of $\left(F_P^1 F_Z^2 - F_P^2 F_Z^1\right)$ and $\left(F_{\underline{Y}}^1 F_Z^2 - F_{\underline{Y}}^2 F_Z^1\right)$ respectively.

To analyse the effect of an increase in r, P and $\underline{Y}$ on equilibrium wage (W^*) we observe the following. Since $\Pi_r < 0$ (3d), $Y_W > 0$ (5a) and the sign of Π_{Wr} is ambiguous (4b) we get from (8a) that if Y is close enough to $\underline{Y}$, then $F_r^1 < 0$. We also have $F_Z^2 \leq 0$ (use 7d, 5b and 3b) and $F_r^2 \leq 0$ (from 8b, 3d, 5b). Since $Y_{WZ} > 0$ (from 5d) using (7b) we get that if Π is high enough $F_Z^1 > 0$. This implies that $F_r^1 F_Z^2 - F_r^2 F_Z^1 \geq 0$ if Π is high enough and if Y is close enough to $\underline{Y}$. Using similar logic we can show that if Π is high enough then $F_P^1 F_Z^2 - F_P^2 F_Z^1 < 0$ and $F_{\underline{Y}}^1 F_Z^2 - F_{\underline{Y}}^2 F_Z^1 < 0$. We summarise these results in terms of a proposition provided below.

Proposition 1 *(i) If Π is high enough and if Y is close enough to $\underline{Y}$ then $W_r^* \geq 0$. That is, an increase in r leads to an increase in the equilibrium wage W^*. (ii) If Π is high enough then $W_P^* < 0$ and $W_{\underline{Y}}^* < 0$. That is the equilibrium wage W^* decreases with increases in P and $\underline{Y}$.*

3.2 Effects on L^*

We now proceed to analyse the effects of increases in r, P and $\underline{Y}$ on the equilibrium level of employment L^*. Using 1a-1c we get the following.

$$\begin{aligned} \frac{dL^*}{dr} &= L_W^* W_r^* + L_r^* ---- (9a) \\ \frac{dL^*}{dP} &= L_W^* W_P^* + L_P^* ---- (9b) \\ \frac{dL^*}{d\underline{Y}} &= L_W^* W_{\underline{Y}}^* \qquad\quad ---- (9c) \end{aligned}$$

From 2a-2c we know that $L_W^* < 0$, $L_r^* < 0$ and $L_P^* > 0$. From proposition 1 we know that if Π is high enough and if Y is close enough to $\underline{Y}$ then $W_r^* \geq 0$. Also, if Π is high enough then $W_P^* < 0$ and $W_{\underline{Y}}^* < 0$. Using this we come to our next proposition.

Proposition 2 *(i) If* Π *is high enough and if* Y *is close enough to* $\underline{Y}$ *then* $\frac{dL^*}{dr} < 0$*. The equilibrium level of employment decreases with an increase in* r*. (ii) If* Π *is high enough then* $\frac{dL^*}{dP} > 0$ *and* $\frac{dL^*}{d\underline{Y}} > 0$*. That is, equilibrium level of employment decreases with increases in* P *and* $\underline{Y}$*.*

3.3 Effects on Z^*

We now analyse the effects of increases in r, P and $\underline{Y}$ on the equilibrium level of bribe Z^*. We show that the effects on Z^* will crucially depend on Π, W and $(Y - \underline{Y})$.

Using the implicit function theorem and some routine computations we can show that the sign of $\frac{\partial Z^*}{\partial r}$, $\frac{\partial Z^*}{\partial P}$ and $\frac{\partial Z^*}{\partial \underline{Y}}$ are the same as the signs of $\left(F^1_W F^2_r - F^2_W F^1_r\right)$, $\left(F^1_W F^2_P - F^2_W F^1_P\right)$ and $\left(F^1_W F^2_{\underline{Y}} - F^2_W F^1_{\underline{Y}}\right)$ respectively. If Π is high enough then F^1_W, $F^2_W > 0$. Also, $F^2_r \leq 0$. Note that the sign of $F^1_r = \Pi_r Y_W + (Y - \underline{Y})\,\Pi_{Wr}$ is ambiguous (as the sign of Π_{Wr} is ambiguous). But from (4b) we get that since $L^*_W < 0$, $\Pi_{Wr} > 0$ if W is high enough. This implies, that if W is high enough and if $(Y - \underline{Y})$ is high enough (i.e. the union leader's payoff is much higher than his reservation payoff) then $F^1_r > 0$. This would imply that if Π, W and $(Y - \underline{Y})$ are high enough then $\frac{\partial Z^*}{\partial r} < 0$. Using a similar logic we can show that if Π and $(Y - \underline{Y})$ are high enough then $\frac{\partial Z^*}{\partial P} > 0$ and $\frac{\partial Z^*}{\partial \underline{Y}} > 0$. We summarise these results in terms of another proposition.

Proposition 3 *(i) If* Π*,* W *and* $(Y - \underline{Y})$ *are high enough then* $\frac{\partial Z^*}{\partial r} < 0$*. That is, an increase in* r *would lead to a decrease in equilibrium level of bribe* (Z^*)*. (ii) If* Π *and* $(Y - \underline{Y})$ *are high enough then* $\frac{\partial Z^*}{\partial P} > 0$ *and* $\frac{\partial Z^*}{\partial \underline{Y}} > 0$*. That is, the equilibrium bribe* Z^* *increases with increases in* P *and* $\underline{Y}$*.*

Comments We now provide some intuition behind our main results.

1. A decrease in the interest rate on loans, r , lowers the real effective cost of hiring labour, which in turn induces the firm in employing more labour, L^*, than before. Besides as r falls, Π rises and hence the maximized joint income of the two players. The firm and the union leader grab this opportunity by lowering W^* and raising Z^*. But in the case of Z^*, $(Y - \underline{Y})$ must be high if Π is high enough. This is clear from (6a).

2. If P rises, the total revenue and the level of profit of the firm increase, and hence the maximized joint income of the two players. This enables the two players to hike both W^* and Z^*. In the case of Z^*, once again $(Y - \underline{Y})$ must be high enough if Π is high (6a). An increase in P raises the VMP of labour which induces the firm to employ more labour, L^*.

3. If $\underline{Y}$ rises, ceteris paribus, the opportunity income of the union leader from alternative source i.e. income from directly joining the politics rises. As the maximand of the bargaining game falls, both the players would be trying to increase their maximized joint income which is possible by raising Z^* and lowering W^*. As W^* decreases, the real cost of hiring labour by the firm decreases which in turn raises the employment of labour, L^*.

4 Conclusion

This theoretical note builds up a model of two stage Nash bargaining game between a corrupt trade union leader and the firm. Being the representative of all the workers, he is entrusted with the task of bargaining for the workers' wage with the management of the firm. Since he is corrupt he receives a bribe from the firm for keeping wages as close as possible to the workers' reservation wage. But in case of detection of the bribery he would be removed from his post. The analysis leads to some interesting results. For example, an increase in the interest rate on loans (product price) leads to an increase (a decrease) in the equilibrium unionized wage. On the other hand, the equilibrium employment level decreases with an increase in the interest rate on loans/product price. These results are important for designing appropriate policies to fight against corruption in trade union leadership.

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