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Public Sector, Bribes and Workers from the Unorganized Sector

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Abstract:
This paper grafts a measure of corruption in Shapiro and Stiglitz (1984) formulation. Bribe is calculated for the public sector employees in an economy where there are two organized sectors and one unorganized sector. Corrupt workers fall back to the self-adjusting unorganized wage if apprehended and fired from the public sector. We show that the level of bribe accepted by organized public sector employees fall when the probability of losing jobs in the organized private sector goes up while it rises as the lump-sum transfer (say, bonus) rises. This applies when the public sector seeks replacement for its dismissed workers from the unorganized sector. Conversely, if new jobs open up in the private sector, a rise in private bonuses may or may not raise the level of bribe in the public sector, among other results.

JEL Classification: H32, J21, J45

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1. Introduction

Despite many anti-corruption and sensitization policies, public officials in many countries continue to extract bribes. Recent news from India, for example, points out that poor people in the country pay at least US$ 200 million as bribe every year for rightfully availing of various public services. Since the anti-corruption bureaus are far from sacrosanct (see Basu, Bhattacharya and Mishra, 1992; Marjit and Shi, 1998; Silva, Kahn and Zhu, 2007 and de La Croix and Delavallade, 2010; all suggesting that police also needs to be policed) and have not been able to contain bribery appreciably, is there anything special about dual labor markets which may influence level of bribe accepted? This issue with respect to dual labor markets in developing countries has not been studied so far. We argue that the presence of an unorganized sector significantly influences the scope and level of bribe accepted by public sector workers.

Note that, presence of the unorganized sector and hence dual labor markets, are important distinctions with the well-known formulation by Shapiro and Stiglitz (1984), which we follow closely. Besides, the major difference is the fact that workers in Shapiro-Stiglitz (1984) model do not get fired for taking bribes, but for shirking on the job. We mould this to show that public sector workers in a typical developing country labor market accept bribes and may lose jobs for corruption. In addition to the public sector, the labor market is characterized by a private sector and a large unorganized sector that employs all those who do not have jobs in the organized sectors (see Marjit and Kar, 2011 in support

of this assumption). We intend to find out the level of bribe that workers in the public sector accept in such a labor market. First, we calculate the bribe when the authorities in the public sector punishes a corrupt worker by firing him and a new worker is hired from outside. The fired worker joins the unorganized sector and the unorganized labor market clears by adjusting wages. This is a notable difference compared to the unemployment benefit available to fired workers in Shapiro and Stiglitz. Unlike in developed countries, most poor countries around the world cannot afford unemployment benefits (Tzannatos and Roddis, 2000). Second, we show that even if no change takes place in the public sector, greater job opportunity in the private sector is expected to raise the level of bribe via interactions with the unorganized sector wage. The unorganized sector operates outside formal rules and regulations and freely adjusts wage and employment (Rauch, 1991; Marjit, 2003, etc.), unlike the firm-level competitively determined formal unemployment benefit in Shapiro and Stiglitz. We assume that remaining voluntarily unemployed is not an option.

The existing literature on bribes is very rich although the level of bribe determined via interactions in dual labor markets has not been discussed (see viz., Ryvkin and Serra, 2012; Glinskaya and Lokshin, 2007; Dreher, *et al*. 2007; Gorodnichenko and Peter, 2007 for a measure of bribes; Mocan, 2004; van Rijckeghem and Weder, 2001; Saha, 2000 on bureaucratic red tapes and bribes; Bardhan, 1997 for a survey; Tanzi and Davoodi, 1997; etc).

In our model, the public sector workers alone accept bribes while private sector workers and unorganized workers have no such option. This may not be a realistic depiction for some countries where corruption is really deep-seated. However, recent empirical evidence (Kar, Roy and Saha, 2012) from India shows that public sector workers tend to consume more durable goods compared to private sector workers across similar occupational and income categories. This may be possible via use of 'unreported income' earned by public sector workers. Similar evidence on consumption parity from Ukraine (Gorodnichenko and Peter, 2007) directly quantifies the level of bribes accepted by public sector workers.

Section 2 develops a model for measuring the level of bribe when public sector, private sector and the unorganized labor market interact. We offer a number of comparative static exercises with change in relevant parameters. Section 3 concludes.

2. A Measure of Bribe

We use steady-state Bellman equations as in Shapiro-Stiglitz (1984, and later, Zenou, 2011) to measure the level of bribe accepted by certain groups of workers.[1] We assume that a mass of identical individuals is distributed between the organized (public and private) and the unorganized sectors of an economy. We assume that there is no labor

[1] Effort levels are positive and constant across sectors. The indirect expected lifetime utility function takes the following form: $V = E\int_{t=0}^{\infty} V(w(t))e^{-rt}dt$

mobility between the two organized sectors.[2] We assume $w_P > w_G$ (private and public sector wages, respectively) at comparable occupational types between public and private sectors. But there is mobility between organized and unorganized sectors. The indirect expected lifetime utility functions for those working in the organized sectors and the unorganized sector are given below. Each worker supplies one unit of labor in continuous time and lives forever. The total stock of labor is $\bar{L}$ of which L_I works in the unorganized sector, while $(\bar{L} - L_I = L_G + L_P)$ works in the organized public (*G*) and private (*P*) sectors, respectively.

The indirect lifetime utility obtained from working in the *public sector* with '*r*' as the discount rate (or pure rate of time preference in continuous time) is given by:

$$rV_G^E = w_G + q.B + \beta.w_G + (1-q)[V^I - V_G^E] \qquad (1)$$

where, V_G^E = indirect expected lifetime utility from working in the public sector; B = amount of bribe; w_G = wage in the public sector; q = probability that the individual is *not* apprehended for taking bribes; V^I = expected lifetime utility from working in the unorganized sector (*I*); β = transfers (pensions, provident funds, etc.) as percentage of wage for employees in the public sector. Workers in *G* receive bribes.[3]

Thus, equation (1) states that workers in the public sector accept bribe and if apprehended for corruption with probability (1-*q*), they are fired. For survival they must join the unorganized sector. We assume that the unorganized sector comprises of a large number of workers and from that pool a worker fills up the vacancy.[4] If an individual is fired for taking bribes, his/her indirect utility gain is $(V^I - V_G^E)$ in equation (1).

On the other hand, the discounted expected utility from working in the *private sector* (*P*) is given by:

$$rV_P^E = w_P + M + k[V^I - V_P^E] \qquad (2)$$

[2] As the private sector pays more than the public sector for equivalent jobs and the wage differential takes care of job security in the public sector. The corrupt officials, if fired, cannot join another organized sector where credentials are verified, unlike in the unorganized sector.

[3] Saha (2001) states that individuals entitled to public subsidies pay bribes to government officials in order to lower red tape for subsidies, from its exogenous level.

[4] We also assume that it does not cause truncation of the organized labor force through permanent exclusion of those once identified as corrupt. If such sanctions exist, which is certainly possible, then for every new detected case of corruption, labor supply to the organized sector gets smaller.

where, V_P^E = expected lifetime utility from working in the private sector; w_P = wage in the private sector; M = A lump sum payment as fringe benefits; k = exogenous probability of losing jobs in the private sector; and remaining notations as above.[5]

Before we find out the level of bribe in the system, we have to calculate the expected indirect utility from working in the unorganized sector. First, we determine how the unorganized wage (w_I) adjusts to mobility of labor between organized and unorganized sectors. Workers who do not find jobs in the organized sector join the unorganized sector. We use the Harris and Todaro (1970) rural-urban 'migration' equilibrium (Basu, 1998; Zenou, 2011) to obtain the unorganized wage.

$$w_I = \overline{w}\frac{L_G + L_P}{\overline{L} - L_I} \qquad (3)^6$$

where, $\overline{w} = \frac{w_G L_G + w_P L_P}{L_G + L_P}$ is the average organized wage; (L_G, L_P) are employment levels in G and P respectively. As in Harris-Todaro migration equilibrium, equation (3) makes sense only if $(w_I < \overline{w})$. The probability of finding an organized job is given by $\frac{L_G + L_P}{\overline{L} - L_I}$. Therefore, w_I is determined on the basis of random matching of workers to available jobs in the organized sector. Equation (3) shows that if $(L_G \ or \ L_P)$ falls, it lowers the probability of finding an organized job. Crowding into the unorganized sector lowers wage as a direct consequence. Therefore, with full employment prevailing in the labor market the number of expected job losses (*LHS* of 4) must equal the expected number of jobs created (*LHS* of 5), that is:

$$[(1-q)L_G + kL_P] = a\frac{L_G + L_P}{\overline{L} - L_I} \qquad (4)$$

where '*a*' is the job acquisition rate in the organized sector. *RHS* of (4) is the rate of job creation multiplied by the probability of finding an organized job.

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[5] In many developing countries, the organized private sector workers are entitled to super-annuation benefits such as provident funds, gratuity and post-retirement pension. However, the trend seems to be going down rapidly in recent times. Also, the private sector officials often accept bribes from various agencies and intermediaries. For modeling purpose one can assume that workers in both sectors accept bribes, but the private sector accepts less on average. This should not change our results.

[6] In the Harris-Todaro Model (see, Basu, 1998), $w_R = w_M \frac{L_M}{L - L_R}$ is the equilibrium condition at which labor migration from rural (*R*) to urban (*M*) areas stops. At that point, the rural wage equals the urban wage times the probability of obtaining a job in the urban area.

Conversely, $$a = \frac{[(1-q)L_G + kL_P]}{L_G + L_P}.(\bar{L} - L_I) \qquad (5)$$

Using (5), the asset equation describing the discounted expected indirect utility from working in the unorganized sector is given by

$$rV^I = a[V_j^E - V^I] \qquad (6)$$

V_j^E is the expected lifetime utility from employment in the organized sector $j = G, P$. If the organized employment (equation 5) is very low, $L_I \to \bar{L}$ and $a \to 0$. Conversely, if $L_I \to 0 \Rightarrow a \to [(1-q)L_G + kL_P]$.

With low organized employment, the unorganized wage and hence the expected utility from working there is low as well. On the other hand, if employment in the organized sector is high, the unorganized wage gets close to the average organized wage.

Now, rearranging equation (1),

$$V_G^E = \frac{w_G(1+\beta) + q.B + (1-q)V^I}{1+r-q} \qquad (7)$$

Similarly, from (2)

$$V_P^E = \frac{w_P + M + kV^I}{r+k} \qquad (8)$$

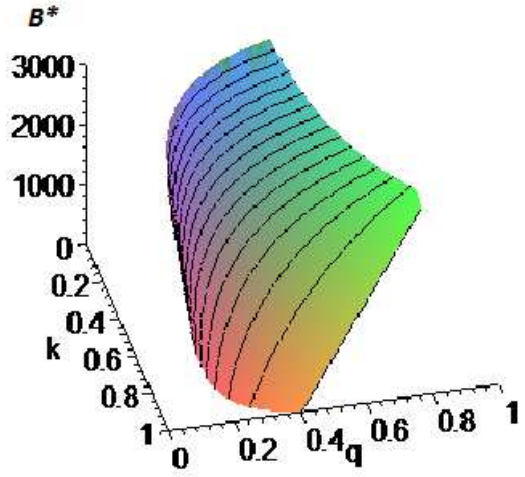
An individual prefers *public sector* to *private sector* if, $V_G^E \geq V_P^E$. One can solve for the minimum level of bribe (B^*) by equating $V_G^E = V_P^E$. So,

$$B^* = \frac{(1-q+r)}{(k+r)q}(w_P + M) - \frac{1}{q}w_G(1+\beta) + \frac{k+q-1}{(k+r)q}rV^I$$

or, $$B^* = \frac{1}{(k+r)q}[(1-q+r)(w_P + M) - (k+r)(1+\beta)w_G] + \frac{k+q-1}{(k+r)q}rV^I \qquad (9)$$

Equation (9) states that the bribe accepted by public sector employees is the weighted wage difference between the two sectors plus the (adjusting) outside option in the unorganized sector. The relation between three key variables in (9), namely, q (*not* apprehended for taking bribes), k (exogenous job loss in the private sector) and B^* can be depicted in a three-dimensional relationship which shows that the bribe falls to zero at critical values of q and k. For given values of parameters $(w_G = 200, w_P = 300, M = 50, \beta = 12\%, r = 0.1, V^I = 50)$, it can be shown that at q=0.4 (i.e., 1-q = 0.6) and k = 0.6, the level of bribe falls to zero. The level of bribe is naturally expected to rise if k and 1-q are both quite low (figure 1). This is the steady-state description of the labor market in the presence of bribes.

Figure1: Relationship between *B, *q* and *k*[7]**



It follows that $(\delta B^* / \delta r) < 0$ from equation (9). Further, as V^I changes, *B** should change. We argue that if apprehended for corruption, a worker in the pubic sector loses job and that he/she is replaced by a worker from the unorganized sector. Thus, rV^I depends on V_G^E and in equation (6) we substitute $V_j^E = V_G^E$. This gives rise to a different *B** compared to (9).

First, substituting '*a*' in equation (6), we get

$$rV^I = \frac{w_G L_G + w_P L_P}{\bar{L} - L_G - L_P} \frac{(1-q+k)(L_G + L_P)}{\bar{L} - L_G - L_P}[V_j^E - V^I] \qquad (10)$$

Let us denote $\bar{\Delta} = \frac{[w_G L_G + w_P L_P](L_G + L_P)}{(\bar{L} - L_G - L_P)^2} > 0$ (11)

And $\Delta = (1-q+k)\bar{\Delta}$ (12)

$\bar{\Delta}$ is the organized-unorganized employment ratio in the economy multiplied by the weighted organized wage per unorganized worker.

We solve for rV^I and rV_G^E simultaneously for $V_j^E = V_G^E$.

Substituting $V_j^E = V_G^E$ from (7) in (10) and rearranging,

$$rV^I = \frac{\Delta}{1-q+r+\Delta}[w_G(1+\beta) + qB] \qquad (13)$$

and $rV_G^E = \frac{\Delta + r}{1-q+r+\Delta}[w_G(1+\beta) + qB]$ (14)

[7] This figure is based on following values: V^I=50, $w_G = 200, w_P = 300, \beta = 0.12$, *M*=100.

Substituting rV^I from (13) in B^* (equation 9) we get,

$$B^* = \frac{(1-q+r)}{(k+r)q}(w_P + M) - \frac{1}{q}w_G(1+\beta) + \frac{k+q-1}{(k+r)q}.\frac{\Delta}{1-q+r+\Delta}[w_G(1+\beta) + qB^*]$$

$B_G^*\big|_G$ is the level of bribe accepted by workers in the public sector when one unorganized worker replaces a fired public sector employee. Rearranging,

$$B_G^*\big|_G = \frac{(1-q+r+\Delta)}{(k+r+q\Delta)}(w_P + M) - \frac{1}{q}w_G(1+\beta) \qquad (15)$$

Substituting $\Delta = (1-q+k)\bar{\Delta}$ in (15) we get

$$B_G^*\big|_G = \frac{[1-q+r+(1-q+k)\bar{\Delta}]}{[k+r+q(1-q+k)\bar{\Delta}]}(w_P + M) - \frac{1}{q}w_G(1+\beta) \qquad (16)^8$$

Equation (16) determines the level of bribe in the public sector, essentially as the difference between private and public sector wages and benefits, but also interacting with the return in the unorganized sector when public sector workers are fired for corrupt behavior. $B_G^*\big|_G$ should undergo change if the parameters change, of which loss of jobs in the private sector is an important factor.

Proposition 1: *$B_G^*\big|_G$ falls when k and β rise, but it rises when M rises. However, if $(1-q) > k$, higher r raises $B_G^*\big|_G$.*

Proof of Proposition 1 is obtained from the following comparative static results.

From (16), $\frac{\delta B_G^*\big|_G}{\delta k} < 0,\ since, [-\bar{\Delta}(1+q-r)-1] < r$ ***, while*** $\frac{\delta B_G^*\big|_G}{\delta M} > 0$ ***,*** $\frac{\delta B_G^*\big|_G}{\delta \beta} < 0$

and $\frac{\delta B_G^*\big|_G}{\delta r} \gtrless 0,\ iff, (\frac{1-q}{k})[\bar{\Delta}(1-q+k)+1] - 1 \gtrless 0.$

If *k* rises, it implies that workers are driven into the unorganized sector from the private sector and lowers wage there. As return in the unorganized sector falls, it in turn dissuades public sector employees from taking bribes. If *M* (lump-sum payments to the private sector) rises *ceteris paribus*, the private-public wage gap rises further and influences public sector workers to take more bribes. If β rises, it implies that the public sector workers stand to lose more than before if they are apprehended for taking bribes. Thus, it also lowers equilibrium bribe. Finally, if (1-*q*) is strictly greater than *k* but people discount their future heavily, they continue to accept high bribes $B_G^*\big|_G$. As stated

8 Gelb, Knight and Sabot (1991), Rodrik (2000), and others previously suggested that excessive public sector employment has been a result of rent seeking behaviour as also the desire to create social safety nets. However, it drove down productivity close to zero.

above, this is no longer unconditional as obtained from the direct relationship between *B** and *r* previously. These results lead to proposition 1.

2.1 Employment Opportunity in the Private Sector

Suppose exogenous employment opportunities open up in the private sector. We will assume that there has been no case of apprehension in the public sector owing to corruption. Consequently, there is no job opening in the public sector to be filled. Should it then affect the level of bribe in equilibrium? The expected utility of a worker in the unorganized sector now depends on the expected utility of working in the private sector. This affects the aggregate employment level as distributed between organized and unorganized labor markets. Consequently, the workers in the public sector re-adjust the level of bribe ($B_G^*\big|_P$) because, with more employment opportunities available in the private sector, the unorganized wage improves and this should affect the level of bribe as discussed previously. We substitute $V^E = V_P^E$ from (8) in (10) and rearranging,

$$rV^I = \frac{\Delta}{r(1+\Delta)+k}(w_P + M) \tag{17}$$

and, $$rV_P^E = \frac{r}{r+k}(w_P + M)\left[\frac{2k + r^2(1+\Delta)}{k + r^2(1+\Delta)}\right] \tag{18}$$

Substituting rV^I from (17) in *B** (equation 9) we get

$$B_G^*\big|_P = \frac{(1-q+r)[r(1+\Delta)+k] + \Delta(k+q-1)}{(k+r)[r(1+\Delta)+k]}(w_P + M) - \frac{1}{q}w_G(1+\beta)$$

or,

$$B_G^*\big|_P = \frac{(1-q+r)[r\{1+(1-q+k)\overline{\Delta}\}+k] - \{(1-q)^2 - k^2\}\overline{\Delta}}{(k+r)[r\{1+(1-q+k)\overline{\Delta}\}+k]}(w_P + M) - \frac{1}{q}w_G(1+\beta) \tag{19}$$

From (16) and (19) we can compare the level of bribes depending on where the job is created (condition 20):

$$B_G^*\big|_P > B_G^*\big|_G \quad iff \quad \Delta > \frac{(1-q^2+2q+qr-r)(k+r)}{(r-q)(r+k-qr) - q(1-q)} \tag{20}$$

If condition (20) is satisfied, job opening in the private sector may lead to a level of bribe accepted by public sector employees that exceeds the level when public sector seeks replacement for dismissed workers. The condition is mainly governed by a combination of *k*, *q*, *r* and the average organized wage.

Comparative Static

We derive the impact of change in the rate of old-age benefit, the private sector lump-sum compensation and the rate of time preference of the public sector worker on the level of bribe accepted by themselves.

From (19), $\frac{\delta B_G^*\big|_P}{\delta \beta} = -\frac{1}{q} w_G < 0$, but

$$\frac{\delta B_G^*\big|_P}{\delta M} \gtrless 0 \text{ iff } \frac{(1-q+r)}{(1-q+k)} . \frac{(r+k)}{[(1-r)(1-q)-k-r^2]} \gtrless \Delta \qquad (21)$$

Unlike in the previous case, a rise in *M* no longer raises *B** unambiguously. It is so because on the one hand a rise in *M* means more bribes to compensate for lower pay in the public sector, but on the other it means lower demand for labor in the private sector. More fringe benefits should lower profit in the private sector and therefore lower labor demand. This was not the case previously because public sector itself was seeking replacements for retrenched workers.

Next, we show that, $\frac{\delta B_G^*\big|_P}{\delta r} > 0$ if

$$\left[(1-q+r)(r\theta+k) - (\theta-1)(1-q-k)(w_P+M) - \frac{1}{q} w_G (1+\beta) \right] < 0$$

or, $\Delta < \left[\frac{(1/q) w_G (1+\beta) - (k+r)(1-q+r)}{r(1-q+r) - (1-q+k)(w_P+M)} \right]$ (22)

The proof is presented in the appendix.

Proposition 2: *A rise in* β *lowers* $B_G^*\big|_P$ *unambiguously, but rise in M and r may or may not increase* $B_G^*\big|_P$ *when the private sector alone recruits from the unorganized sector.*

Proof: See Appendix.

3. Concluding Remarks

This short paper offers a measure of the level of bribes accepted by workers in the public sector. The measurement is based on two distinct assumptions. First, we assumed that there are three sectors in the economy, namely, two organized and one large unorganized sector. Second, we assumed that workers in the public sector alone take bribes and may be apprehended for corruption leading to dismissal. There is no unemployment benefit available in the country and the workers are forced to join the unorganized sector. However, the unorganized workers also get the opportunity to join the organized sector depending on where the opening takes place. For the first case we show that the public sector seeks replacement for a dismissed worker, and for the second case, we consider that the private sector recruits for exogenous reasons. We followed the modeling structure as in Shapiro and Stiglitz, where workers are fired for shirking on the job and are entitled to unemployment benefits. The public and private firms in our model differ in terms of the exogenously given wage and benefit offers. Workers may also lose jobs for exogenous factors while working in the private sector.

The private firms offer higher wages compared to the public sector. The unorganized sector accommodates all those who do not find jobs in the organized sectors. Given these specifications, we found the level of bribe accepted by public sector workers under two possible situations. At this level of bribe, the marginal worker is indifferent between a public sector job and a private sector job. We showed that the level of bribe accepted by public sector workers fall when the probability of losing jobs in the private sector goes up while it rises as the lump-sum transfer (say, bonus) in the private sector rises. This is true when the public sector seeks replacement for dismissed workers from the unorganized sector. Conversely, however, if the jobs open up in the private sector, a rise in private bonuses may or may not raise the equilibrium bribe. In the relevant literature a lot has been written on factors that influence corrupt behavior among a section of the population. Here we used a simple tool to show that the level of bribe may depend on the interactions between the organized and the unorganized sectors. Policies for reducing the level of bribes are also available from these derivations. As we have shown earlier, extraction of bribe falls even if the future (subjective) discount rate rises when the rate of labor turnover in the private sector exceeds the apprehension rate in the public sector. An influx of labor in the unorganized sector will also have a dampening effect on bribes, but a rise in corporate bonuses is likely to raise bribery among public sector employees.

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Appendix

Relation between $B_G^*\big|_P$ *and r.*

$$\frac{\delta B_G^*\big|_P}{\delta r} = \frac{1}{(k+r)} + .\frac{\theta(1-q+r)}{(k+r)(\theta r+k)} - \left[\frac{1}{(k+r)^2(\theta r+k)} + \frac{\theta}{(k+r)(\theta r+k)^2}\right]\times$$
$$\left[(1-q+r)(r\theta+k) - (\theta-1)(1-q-k)(w_P+M) - \frac{1}{q}w_G(1+\beta)\right]$$

where $\theta = [1 + (1 - q + k)\overline{\Delta}] = (1 + \Delta)$

(21) suggests that $\frac{\delta B_G^*\big|_P}{\delta r} > 0$ if and only if,

$$\frac{1}{(k+r)} + .\frac{\theta(1-q+r)}{(k+r)(\theta r+k)} > \left[\frac{1}{(k+r)^2(\theta r+k)} + \frac{\theta}{(k+r)(\theta r+k)^2}\right]\times$$
$$\left[(1-q+r)(r\theta+k) - (\theta-1)(1-q-k)(w_P+M) - \frac{1}{q}w_G(1+\beta)\right] \quad \text{(A.1)}$$

However, since the left hand side of (A.1) and $\left[\frac{1}{(k+r)^2(\theta r+k)} + \frac{\theta}{(k+r)(\theta r+k)^2}\right]$ are both positive, $\frac{\delta B_G^*\big|_P}{\delta r} > 0$ if

$$\left[(1-q+r)(r\theta+k) - (\theta-1)(1-q-k)(w_P+M) - \frac{1}{q}w_G(1+\beta)\right] < 0$$

Or, $\Delta < \left[\frac{(1/q)w_G(1+\beta) - (k+r)(1-q+r)}{r(1-q+r) - (1-q+k)(w_P+M)}\right]$.
