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Abstract

Informal economy involving unrecorded, unregistered, extra legal activities employs majority of the workforce in the developing world. Such extra legal existence of informal production is facilitated through extortion by agents of political forces in power. Also extortion activities themselves constitute an informal segment. Full scale general equilibrium consequences of such institutions are rarely discussed in the literature. We develop a well specified general equilibrium model to explore the possible consequences of reform. Economic reform may have an expansionary effect on the number of extortionists. Depending on capital mobility and factor intensity assumptions informal output and informal wage may increase.

1. Introduction

Informal sector is an important ingredient of the contemporary world economy particularly in the developing regions as this segment occupies a formidable chunk of the unskilled labor force. This sector covers primarily the non-agricultural employment of unskilled labor. It accounts for 50-80% of total employment in South Asia, 30-50% in South East Asia, 40-50% in Africa, 55% in Latin America and Caribbean, 24% in Southern Europe, 10% in Western Europe, 18% in Canada and 8% in USA (ILO, 2002)[1,2]. Yet, informal sector's jobs are not considered as decent. The main derogatory feature of informal sector is its extra-legality or illegality since it does not conform to government regulations. These units presumably do not abide by labor regulations of the government, and do not pay taxes. In fact a large part of it would have vanished if they had to confront government regulations. The paucity of legal protection makes the informal sector an easy pray for extortion and corruption[3,4].

Existing literature on informal sector conventionally defines informal activity as something which takes place underground, covers smuggling, mafia etc. (Konrad and Skaperdas, 1998). Informal sector is not generally assumed as a segment which provides livelihood to a sizeable amount of mass without doing dangerously harmful illegal activity per se. There are also a few papers (Johnson, Kaufmann and Zoido-Lobaton, 1998; Johnson, Kaufmann and Shleifer, 1997;

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[1] Some other relevant and interesting information regarding percentage share of informal sector in GDP etc. can be found in Schneider (2004).

[2] More than 70% of all employment in countries like Zambia (80.7%), Uganda (83.7%), Thailand (72.1%), Nepal (73.3%), Lithuania (72%), Ghana (78.5%), and Gambia (72.4%) falls in the category of informal sector (ILO, 2010).

[3] It has been reported in Ethiopia that the urban informal sector of this rural country is comprised of almost one million people and is vastly distorted with extortion. While Morocco experiences an annual loss of $ 3.6 billion because of lack of transparency related extortion/corruption/bribe (Drakard, 2009).

[4] In order to reduce extortion in the informal segment countries like Ghana, Senegal, Kenya etcetera have already attempted to facilitate and promote registration and license to informal units. This has resulted in a significant reduction in the degree of extortion (Fjeldstad, 2001).

Gerxhani, 2004; Loayza, 1996; Shneider and Enste, 2000) where it has been shown how the existence of bureaucratic control, corruption and higher tax rates in the formal counterpart induces firm to operate in the informal sector. The interface of contract theory and informal economy is analyzed in Quintin (2008). Quintin (2008) finds that the size of the informal sector has an inverse relation with contract enforcement in the formal sector.[5] In another interesting paper Dijkstra (2006) shows how under different circumstances an economy may end up with good (no informal sector), bad (no formal sector) and mixed (both formal and informal sectors) equilibrium. However, none of these papers recognize the existence of both corruption and production in the informal sector itself. Nonetheless, Friedman, Johnson, Kaufman and Zoido-Lobaton (2000) have found the existence of corruption and production both as separate activities within the informal sector. Their paper is a partial equilibrium one where existence of corruption in the informal sector is slightly touched upon while our model intends to bring in both these issues in a simple general equilibrium framework.

In a very recent paper Ghosh and Robertson (2011) nicely extended the literature on property rights and crime by bringing in general expropriation concept into a general equilibrium factor endowment model of trade. They have argued why under certain factor intensity ranking trade liberalization may reduce expropriation. Their result crucially hinges on the factor intensity of expropriation activity[6]. Though we use similar kind of general equilibrium model, our work is significantly different because of the existence of informal sector which is absent in Ghosh and

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[5] It is noteworthy to mention that by using a competitive framework Amaral and Quintin (2006) has shown why the most talented managers operate with more physical capital and self-select into the formal sector than managers in the informal units. This analysis also emphasizes that most skilled labor work in the formal sector as long as the enforcement gap between formal and informal sector is ample.

[6] The main driving force of Ghosh and Robertson (2011) is that if falling trade cost raises the return to the factor intensively used in expropriation, the potential for efficient expropriation decreases. The paper has been extended further to endogenize the legal services for controlling expropriation.

Robertson (2011). Unlike Ghosh and Robertson (2011) we consider only informal sector to be subject to extortion. Therefore, informal sector itself has two components: informal production and extortion.

In this paper we shall define informal sector as one which does not have to pay the minimum wage. Several papers such as Agenor and Montiel (1997), Carruth and Oswald (1981), Beladi and Chao (1993), Beladi and Yabuuchi (2001), Chaudhuri (2003) etc. have used this interpretation of informal sector. In a recent Oxford University Press volume Marjit and Kar (2011) have thoroughly used the similar notion to talk about various intricacies of the informal sector. But they have not considered the issue that we focus here.

Survival of informal production requires negotiation with administration as this part of the economy is illegal by structure. Sometimes negotiation is done by politically supported intermediaries, the "extortionists". Extortionists take care of legal troubles and other hurdles for the informal producers. They keep the police at bay by paying bribes which in turn are extracted from the informal entrepreneurs, labors, capitalists etc. As we mentioned before, there is a substantial literature on extortion and mafia related activities such as Skaperdas (1992, 2001), Konrad and Skaperdas (1998) etc. Nevertheless, our work is substantially different from the existing literature. First, we presuppose extortion as a facilitating device for organizing production in the informal sector. Extortionists are facilitator in that it 'protects' the extra-legal informal segment of the economy from legal hassles, and in exchange extortionists get pecuniary benefit. It is, however, not pure extortion involving all segments of the society, contrary to other papers on extortion. Second, more significantly, we consider mobility of labor between extortion and informal production. Thus extortionists also have the option to work in informal production.

Such mobility is then embedded in a general equilibrium structure where capital mobility also plays an important role[7].

The story of the paper runs as follows. We assume that the economy produces three goods out of which two are produced in the formal sector and the rest is produced in the so-called informal sector. All goods are different and only formal goods are traded. Informal good is non-traded. One commodity in the formal set up uses skilled worker as specific factor and the other uses unskilled labor as the same, with capital moving between them. Formal unskilled workers are organized but not the informal workers. This implies that only formal sector has to pay minimum wage. Informal unskilled workers have to face a competitive market. Therefore, unskilled wage in the formal and informal segments are not identical. Formal workers are likely to get higher administered wage than their informal counterpart because of the existence of trade unions that ensure the minimum wage. Furthermore, whoever does not find a job in the formal sector will get one in the informal sector and wage there can have a free fall.

The model we develop is in the tradition of more recent work in trade theory on extensions of the basic Heckscher-Ohlin-Samuelson (HOS) set up drawing from an early work of Gruen and Corden (1970) and from later contributions of Jones and Marjit (2009), Marjit and Beladi (1999) etc.

Before we indicate about the primary predictions of the paper lets us briefly mention the recent economic trend that is observed worldwide and provides with the much required motivation. Following negotiations at the WTO the entire world has moved forward towards

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[7] In this context we need to mention that our work is related to the research area dealing with economics of corruption. Marcoullier and Young (1995) has developed a two sector model on graft and corruption demonstrating tacit political support for informal sector. But they do not model extortion in a general equilibrium framework. Similarly Marjit, Ghosh and Biswas (2007) brings in informal sector and corrupt bureaucrats but does not constitute labor mobility between various informal segments. Te framework they use also does not consider a general equilibrium framework. Dobson and Dobson (2012) is another important reference in this line.

more economic reform and higher degree of liberalization. This point needs no further qualification. Interestingly it is observed simultaneously that the size of the informal sector is also on the rise worldwide along with different economic reform policies. Heintz and Polin (2005) showed that the tendency had been really increasing during the late 20th centuries. Likewise ILO data shows the same trend in all developing regions. However, there is a moderate decline from 52.8% to 49.1% during early 21st century (ILO, 2012a; ILO and WIEGO, 2012). But this moderate decline in percentage is not good enough to restrain the absolute numbers from increasing by almost 23 million since 2009 (ILO, 2012b). During 2000 and 2010 in most of the Central and Eastern European countries incidence of informal employment has gone up with the only exceptions of Turkey and Kyrgyzstan (ILO, 2013). Though Latin American countries experience slight reduction in informal employment, there has been an upsurge in absolute number of people dependent on the sector. Therefore the increasing size of informality is an irrefutable fact. Beside this in the last 15 years we have witnessed a moderate but steady decline in the value of governance pointers reflecting higher corruption or corrupt practices around the globe. Indicators like government effectiveness, regulatory quality, rule of law, control of corruption are found to be decreasing over time during 1996-2012 (World Bank, 2012). Table-1 gives us a snapshot about corruption which is directly reproduced from Worldwide Governance Indicators website.

Table-1
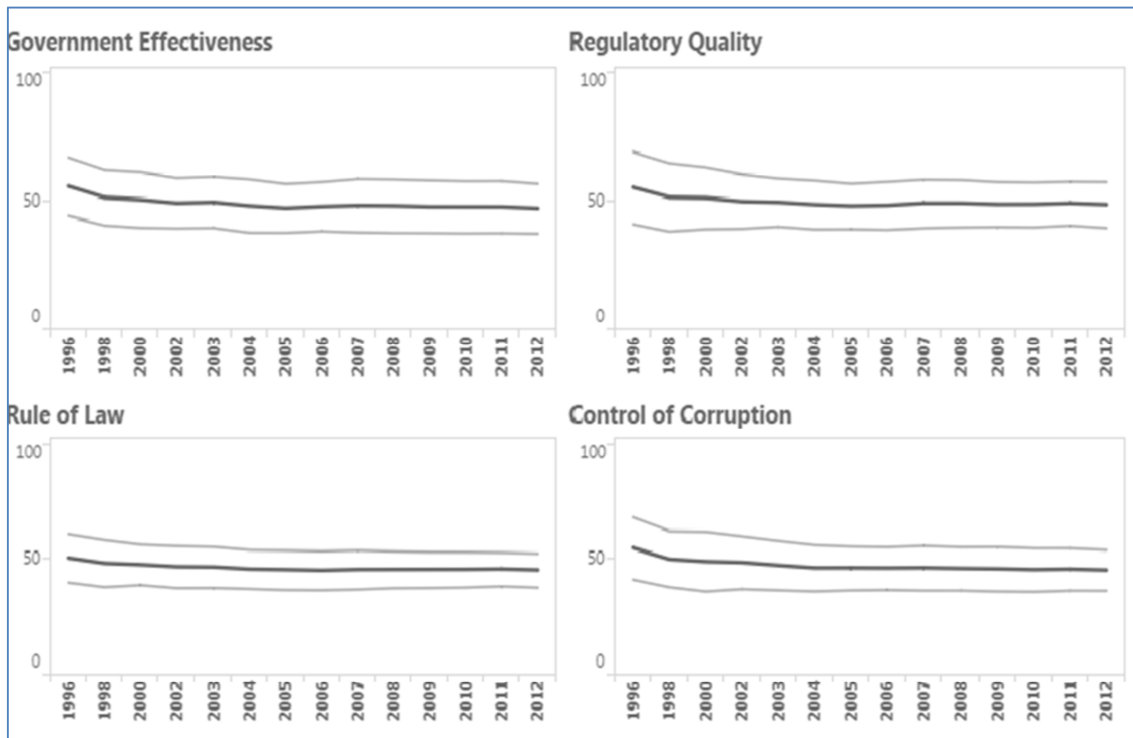
The thick line shows the percentile rank on governance indicators mentioned, and thinner lines indicate margins of error.

Source: Reproduced from WGI website
http://info.worldbank.org/governance/wgi/index.aspx#reports

Given this backdrop and the set up described before reformatory policy may have counterintuitive outcomes with unintended expansion of the informal segment, extortion activity etc. The basic results that we derive in this paper are as follows: (i) following reform informal workers would be worse off in money terms; (ii) reform amplifies the informal output; (iii) a policy of reform is more likely to increase the extortion activity.[8]

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[8] It is also interesting to note that a better quality of administration may bring about more informal production though corruptive activity shrinks. The effect of such a change is outlined in Appendix B. Readers are advised to check this result only after having a fair idea about the structure of the model that is developed in Section 2.

Remaining paper is arranged as follows. Section 2 discusses the basic model and the equilibrium. Section 3 deals with the impact of tariff cut on outputs, informal wage, the size of the extortion sector and informal good's price. Section 4 briefly discuses the role of capital mobility. The last section concludes the paper. However, the detailed mathematical derivations are relegated to the Appendix.

2. The Basic Model and Solutions

There are three goods *X, Y* and *Z* produced in the neo-classical framework using four factors such as skilled labor (S), unskilled labor (L) and two types of capital (K and T). K is perfectly mobile across X and Y but T is specific to Z. The specificity assumption of capital needs a bit of qualification. In general credit markets for formal and informal sectors are not identical. Formal sector can avail government/legal credit whereas informal units are shunned from accessing this market as they are illegal by nature. They have to rely on local money lenders who usually charge high return for capital. In addition return to capital in the informal sector is not necessarily linked with that of in the formal sector. Hence we assume formal and informal sector capital as specific. We will, however, relax this assumption in a later section of the paper. S is specific to X and gets Ws as wage. L is mobile between Y and Z. Unskilled labors (L) are unionized in Y. They get $\overline{W}$ as their wage. K gets identical return r across X and Y while T gets R in Z. Who are not fortunate enough to work in Y, have to go out of the formal segment. Because of their livelihood they need to find out alternative workplace. This is provided by Z[9]. Producers of Z, however, need to comply with some institutional and political menace as it is an extra-legal, if not illegal, activity. To combat such menace producers obtain service of

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[9] Z can not be produced by these two factors only. It requires the service of another factor that actually negotiates between producers and administrators since Z is not permitted to be produced legally. But if Z is never produced some labor must remain unemployed and they will not survive. Therefore Z is a necessity for perfectly competitive full employment framework.

intermediaries. Intermediaries are unproductive in that no additional output is produced by them. Their marginal productivities in terms of the volume of goods are zero though they get positive return for their work[10]. However, without such an arrangement production of Z could not have taken place. We call sector Z as informal productive sector.

We further assume that intermediation is done only by unskilled labor. As we have already stated, people engaged in intermediation activities get pecuniary benefit without producing goods. Let L_N be the people and N be the sector representing intermediation/extortion. The return to extortionist, W_N, must be greater than competitive informal wage, W. The difference between P_Z and sum of the return to productive factors in Z goes to extortionists as a payment for intermediation activities. N people also have to take care of the police personnel who are supposed to go for evicting these informal production units as these are illegal from government's perspective. The informal units survive with the probability of being caught in act is q and under this condition intermediators need to pay b fraction of W_N as bribe. After paying out for the police the return to L_N must be equal to W since labor is mobile between Z and N. Here it is worth mentioning that L_N people always receive W_N as return irrespective of whether administration can identify the informal units or not. Thus here both, a part of administration and N people are involved in corrupt practices. N people pay bribe to police not only for the informal production units but also for their own existence. If there are no informal production the return to N people goes down to zero. And on the other hand whether Z survives or not that crucially depends on how many people are involved in extortion activities or how much is paid

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[10] We can coin this sort of intermediations as directly unproductive profit-seeking activities (Bhagwati, 1982). This is the concept of corruption and/or related extortion that we are going to use in our model.

to these extortionists. Say α is the fraction of the value of informal output that is lost due to intermediations or extortion. Precisely speaking α represents the fee of extortion[11].

Here, we have a small open economy with competitive markets for production as well as for extortions related intermediation or corruption. Competitive corruption market implies that the lost output due to intermediation is fully exhausted in paying out extortionists out of which a part (may be fixed or variable) goes to police. Moreover, we have the standard neo-classical assumptions of constant returns (CRS) to scale and diminishing return to factors. The following set of equations describes the model and the interpretations of symbols are usual and well used in trade models (Jones, 1965, 1971)[12]. Let the prices of X and Y be normalized to unity. Y is the importable commodity and subject to protection. Protection of any kind, tariff or tax or subsidy, is merely reflected by an increase in the effective price of Y. In case of tariff price goes up straightaway as tariff inclusive price of import should be equal to the domestic price. Whereas, if we consider a production subsidy (or tax) either effective cost of production goes down (in case of production subsidy) or producer gets less than the market price (in case of production tax). A reduction in subsidy or an increase in tax acts like removing protection of any sort which is quite similar with tariff reform. Hence the implications should be identical with that of tariff-case. Therefore a carefully designed subsidy rate or tariff rate or tax rate are in fact indistinguishable in nature. Here we consider protection in form of tariff t[13].

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[11] Here it is advisable not to confuse between "fee" and "wage": fee means the fraction or the value of per unit of output that is lost due to extortion whereas extortionist's wage is the return to a single extortionist for his service.

[12] The symbols that would be used extensively in this paper are: $P_j \Rightarrow$ price of the jth commodity ($j= X, Y, Z$); $W_S \Rightarrow$ skilled wage; $\overline{W} \Rightarrow$ unskilled formal wage; $W \Rightarrow$ unskilled informal wage; $r \Rightarrow$ rate of return to K; $R \Rightarrow$ rate of return to T; $a_{ij} \Rightarrow$ production requirement of the ith factor in one unit of jth commodity ($i = S,L,K,T$ and $j = X,Y,Z$); $S \Rightarrow$ total supply of skilled labor; $L \Rightarrow$ total supply of unskilled labor; $L_N \Rightarrow$ number of unskilled labor employed in extortion; $K \Rightarrow$ total supply of capital, K; $T \Rightarrow$ total supply of capital, T.

[13] One can effortlessly disagree to argue that Y should not be the importable commodity for any developing economy as it uses unskilled workers. But we do not find any harm in assuming this. Here skilled good (X) is

Competitive commodity market guarantees the following equalities:

$$W_S \, a_{SX} + r \, a_{KX} = 1 \tag{1}$$

$$\bar{W} \, a_{LY} + r \, a_{KY} = (1 + t) \tag{2}$$

$$W a_{LZ} + R \, a_{TZ} = P_Z (1 - \alpha) \tag{3}$$

Note that, $\alpha \in [0,1]$; a low α will mean lower fee of extortion and conversely.

The production function for Z is represented by

$$Z = Z(T, L_Z) \tag{4}$$

The expected wage for extortionist satisfies the following equation

$$(1 - b \, q) W_N = W \tag{5}$$

The labor mobility between informal production and extortion segments ensures the equality in equation (5). This has to hold true. If the LHS (RHS)[14] of equation-5 becomes greater than RHS (LHS) everyone would find it more worthy to be involved in extortion (production) related activities and would eventually result in non-feasibility of both the informal segments. The reason is the complementarity between extortionists and productive workers in the informal sector. And equation (5) further makes informal workers, essentially, indifferent between extortion and production.

Therefore, $W_N = \dfrac{W}{(1 - b \, q)}$ where $0 < b < 1$ and $0 \le q \le 1$ (6)

Equation (6) always ensures that $W_N > W$ except the extreme case where $q = 0$. We further, sensibly, assume that $\bar{W} > W_N > W$.

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exportable and Z is non-traded. In order to avoid the possibility of complete specialization we have taken the remaining good (Y) as importable. Introduction of any other commodity as importable, instead of Y, would not matter much to the basic results of the paper.

[14] LHS = Left Hand Side of the equation, RHS = Right Hand Side of the equation.

We have mentioned earlier that N people are paid out of the amount lost from the value of Z. And in a competitive set up the value of output lost in Z must be identical to the payment made for extortionists. Thus,

$$\alpha. P_Z. Z = W_N L_N \tag{7}$$

Plugging (6) into (7)

$$\frac{\alpha. P_Z. Z(T, L_Z)}{L_N} = \frac{W}{(1 - b\,q)} \tag{8}$$

Full employment conditions ensure the following:

$$a_{SX}. X = S \tag{9}$$

$$a_{KX}. X + a_{KY}. Y = K \tag{10}$$

$$a_{TZ}. Z = T \tag{11}$$

$$a_{LY}. Y + a_{LZ}. Z = L - L_N \tag{12}$$

We further assume that the demand for Z follows standard Cobb-Douglas preference where β fraction of consumers' income is spent on the informal good. Therefore demand-supply equilibrium in the informal sector entails

$$\beta\{X + (1 + t)\,Y\} = (1 - \beta)P_Z. Z \tag{13}$$

This completes the structure of the model. Now let us solve for the unknown variables. Note that $\{t, \alpha, \overline{W}, K, T, L, S\}$ are exogenously given and we need to solve for $\{W_S, W, r, R, P_Z, X, Y, Z, L_N\}$ from equation (1) - (3) and (8) – (13). We have nine equations and nine unknown variables. Thus the system is solvable. Given the tariff rate, we solve for r from (2) as $\overline{W}$ is exogenously determined by workers' union. Equation (1) would determine Ws for already determined r. Thus a_{SX}, a_{KX}, a_{LY} and a_{KY} are determined through CRS assumption. Hence (9) gives us the value of X and given this value of X we can solve for Y from (10) as endowment of S and K are constants. However, $W, R, P_Z,$ Z and L_N are still to be determined.

Substituting from (9) and (10) equation (12) can be rewritten as

$$L_Z + L_N = L - \frac{a_{LY}}{a_{KY}}\left(K - \frac{a_{KX}}{a_{SX}}S\right) \qquad (14)$$

Given the commodity prices we know the values of $a_{LY}, a_{KY}, a_{KX}, a_{SX}$ and L, K and S are given. Thus RHS of (14) is constant. This implies a negative relationship between L_Z and L_N.

Again equation (8) can also be represented as

$$\frac{\alpha.Z(T,L_Z)}{L_N} = \frac{W}{P_Z}.\frac{1}{(1-b\,q)} \qquad (15)$$

Here $\frac{W}{P_Z}$ is the real wage of informal workers; bq and α are given. Following an increase in L_Z the RHS of (15) would fall as the marginal productivity of Lz falls. And simultaneously the numerator of the LHS must go up as the supply of variable factor increases. Thus to bring back equality in (15) L_N has to increase. Therefore, L_N and L_Z are positively related following equation (15).

In what follows we can represent equation (14) and (15) in L_N and L_Z space (Figure-1) to determine the equilibrium values of L_N^* and L_Z^*.

Given the equilibrium values of L_Z^* and L_N^* one can easily calculate Z from (15) as all the remaining variables are given. In fact, the equilibrium value of L_N can also be calculated for any given value of Lz .
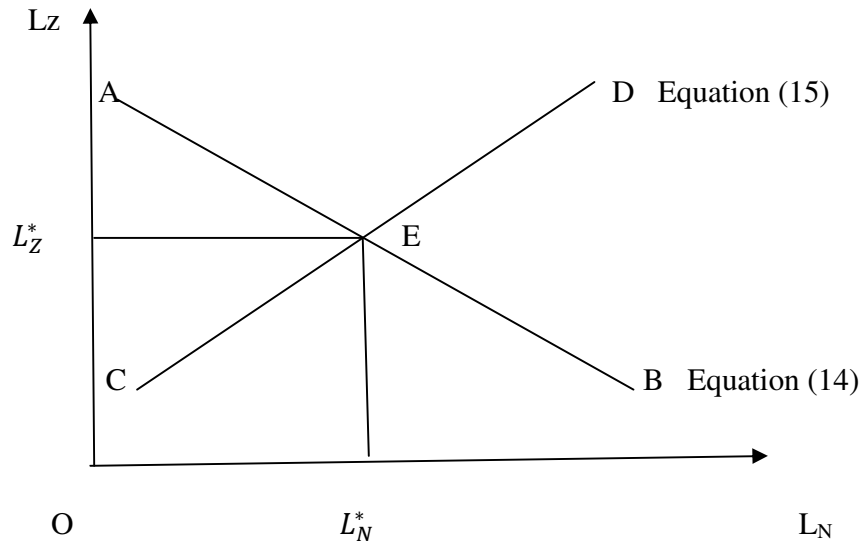
Figure –1
Determination of equilibrium L_N and L_Z.

Once Z is determined, the Cobb-Douglas preference function helps in solving P_Z. It is apparent from (13) that given the values of X and Y, demand for Z coming from the formal sector remains constant. Hence, on the one hand, if Pz goes up Z has to fall in the RHS of (13), signifying the standard negative relationship. On the other hand an increase in Pz must be followed by a rise in the return to informal workers and the specific factor T. The return to specific factor would increase more compared to informal labor[15]. Therefore, producer will try to economize on the usage of dearer factor, implying a rise in Z. This explains the positive supply side relationship between Pz and Z. This is precisely how, the equilibrium Pz is determined in this model. Therefore, given the equilibrium value of Pz, W is determined from (8). And eventually using Pz and W we can calculate the value of R. Thus the entire system is solved. However, it is worth mentioning that once W is determined, W_N is calculated from (6) without any apprehension.

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[15] For a detailed mathematical derivation see Appendix A.

3. Effects of Reform

There is no wonder that restrictive policies are gradually becoming an issue of past. An era of reform has set in and the entire developing world in some form or the other has responded to such transformation thanks to the negotiations at the WTO. Therefore to start the analysis of reform we assume that the government has initiated the liberalization strategy and accordingly opted for a tariff cut or reduction in subsidy in the importable sector. Setting $\hat{\hat{W}} = 0,$ we derive

$$\hat{r} = \hat{t}.\frac{t}{\theta_{KY}} < 0 \text{ and } \widehat{W}_S = -\frac{\theta_{KX}}{\theta_{SX}}.\frac{t}{\theta_{KY}}.\hat{t} > 0 \qquad (16)^{16}$$

Given the values α and P_Z equation (3) gives us

$$\widehat{W}\,\theta_{LZ} + \hat{R}\,\theta_{TZ} = 0 \qquad (17)$$

Since W_S and r change, the possibility of substitution of factors of production arises. Applying the elasticity of substitution we obtain[17]

$$\left.\begin{array}{c} \hat{X} = (-)\sigma_X.\frac{\theta_{KX}}{\theta_{SX}}.\frac{t}{\theta_{KY}}.\hat{t} \; > 0 \; ; \text{ as } \hat{t} < 0 \\ \hat{Y} = \sigma_X.\frac{\theta_{KX}}{\theta_{SX}}.\frac{\lambda_{KX}}{\lambda_{KY}}.\frac{t}{\theta_{KY}}.\hat{t} \; < 0 \; ; \text{ as } \hat{t} < 0 \\ \hat{Z} = (-)\sigma_Z.\theta_{LZ}\left(\widehat{W} - \hat{R}\right) \end{array}\right\} \qquad (18)$$

In the following segments as and when required we shall discuss the economic arguments behind such results derived above. This would keep us away from repetitive discussions.

3.A Informal Wage and Informal Output

Using the full employment condition of unskilled labor and plugging the value of change in the number of extortionists from equation (8) we have

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[16] Note that throughout the paper a circumflex over a variable represents proportional change; θs signify the distributive share of a factor in a particular good or service e.g. $\theta_{LZ}=\frac{W a_{LZ}}{P_Z}$, $\theta_{TZ}=\frac{R a_{TZ}}{P_Z}$ and so on; and λs imply employment share of factor in any commodity such as $\lambda_{LZ} = \frac{Z a_{LZ}}{L}$ etc.

[17] Elasticity of substitution for X, Y and Z are represented, respectively, by $\sigma_X = \frac{\hat{a}_{KX}-\hat{a}_{SX}}{\widehat{W}_S-\hat{r}}$, $\sigma_Y = \frac{\hat{a}_{KY}-\hat{a}_{LY}}{\widehat{W}-\hat{r}}$ and $\sigma_Z = \frac{\hat{a}_{TZ}-\hat{a}_{LZ}}{\widehat{W}-\hat{R}}$.

$$\hat{Z} = (-) \left\{ (-) \frac{\lambda_{LN}}{\lambda_{LZ}} \hat{W} - \frac{\lambda_{LN}}{\lambda_{LZ}} \sigma_Z . \theta_{LZ} (\hat{W} - \hat{R}) + \sigma_X . \frac{\lambda_{LY}}{\lambda_{LZ}} . \frac{\theta_{KX}}{\theta_{SX}} . \frac{\lambda_{KX}}{\lambda_{KY}} . \frac{t}{\theta_{KY}} . \hat{t} \right\} \quad (19)$$

Equation (17), (18) and (19) together help deriving the values of $\hat{W}$ and $\hat{R}$ as follows:

$$\left. \begin{array}{l} \hat{W} = \dfrac{\lambda_{LZ} . \lambda_{LY} . \sigma_X . \frac{\theta_{KX}}{\theta_{SX}} . \frac{\lambda_{KX}}{\lambda_{KY}} . \frac{t}{\theta_{KY}} . \hat{t} . \frac{\Delta . \theta_{TZ}}{\lambda_{LN}}}{1 + \Delta . \theta_{TZ}} \\[4mm] \hat{R} = (-) \dfrac{\theta_{LZ}}{\theta_{TZ}} \dfrac{\lambda_{LZ} . \lambda_{LY} . \sigma_X . \frac{\theta_{KX}}{\theta_{SX}} . \frac{\lambda_{KX}}{\lambda_{KY}} . \frac{t}{\theta_{KY}} . \hat{t} . \frac{\Delta . \theta_{TZ}}{\lambda_{LN}}}{1 + \Delta . \theta_{TZ}} \end{array} \right\} \text{ where, } \Delta = \frac{\lambda_{LN}}{\lambda_{LZ} + \lambda_{LN}} \quad (20)$$

It is evident from (20) that $\hat{W} < 0$ as t falls. Therefore, $\hat{R} > 0$ since there is no change in the price of informal good and extortion-fee. Any benefit of informal capital has to be offset by tantamount loss to other complementary factor. Hence, $(\hat{W} - \hat{R}) < 0$. This inequality guarantees an increase in Z. Therefore,

Proposition I: *Consequent upon reform:*
      (a) Informal wage and return to extortionists would fall;
      (b) Informal output will increase.

Economic argument behind this outcome is very easy to follow. Due to liberalization, as Y shrinks, the supply of unskilled labor increases in the informal sector. This depresses W as the supply of complementary factor, T is fixed. The fixity of T causes a decrease in the marginal productivity of labor in informal sector. This corroborates our claim on informal wage. Extortionists' return also goes down because W_N and W are positively related with the condition that $W_N > W$. The exact relation is defined in (6). Again, notice that, when W falls, R must increase. This induces a_{TZ} to decline implying factor substitution in Z. A decrease in per unit requirement of T in Z ensures unambiguous expansion of Z, informal output.   ■

3.B Number of Extortionists

In this subsection we focus on a striking issue of this paper – number of extortionists. Extortion activity N shares informal workers with Z. Z shares unskilled workers with Y, and again Y shares K with X. Notice that same unskilled workers can work as either formal labor or

informal labor or extortionist. This inter-linkage forces us to look at all the issues simultaneously.

Results for X and Y (recall equation (18)) are quite obvious as both *X* and *Y* share same mobile capital, *K*. As *Y* shrinks some unskilled labor would be released. They would immediately rush to the informal fragment. Therefore, informal activity must expand. Note that informal activity consists of both production and extortion. This implies an unequivocal increase in $(L_N + L_Z)$. Whether output of *Z* would spread out that depends on as to where these relinquished labors get employed: in production *(Lz)* or in extortion related intermediation *(L_N)* or in both. Thus the interesting question is what happens to L_N and *Lz* separately.

Proposition II: *L_N will increase due to reform if unskilled labor using formal sector's share of expenditure on informal good is not insignificant.*

Proof: From equation (14) the RHS must increase as labor employed in *Y* dwindles and simultaneously the LHS has to go up. This is portrayed in figure-2. It is evident from the diagram that *Lz* will increase coupled with an increase in L_N. Hence output of *Z* should rise as *T* remains fixed at an exogenously given level.

Yet there are some other possibilities regarding L_N and L_Z. Keep *Lz* fixed by assumption. This will ensure an increase in L_N. In figure-2 CD has to shift right along with an upward shift of AB. Thus the prime point of concern is, as a consequence of such assumption
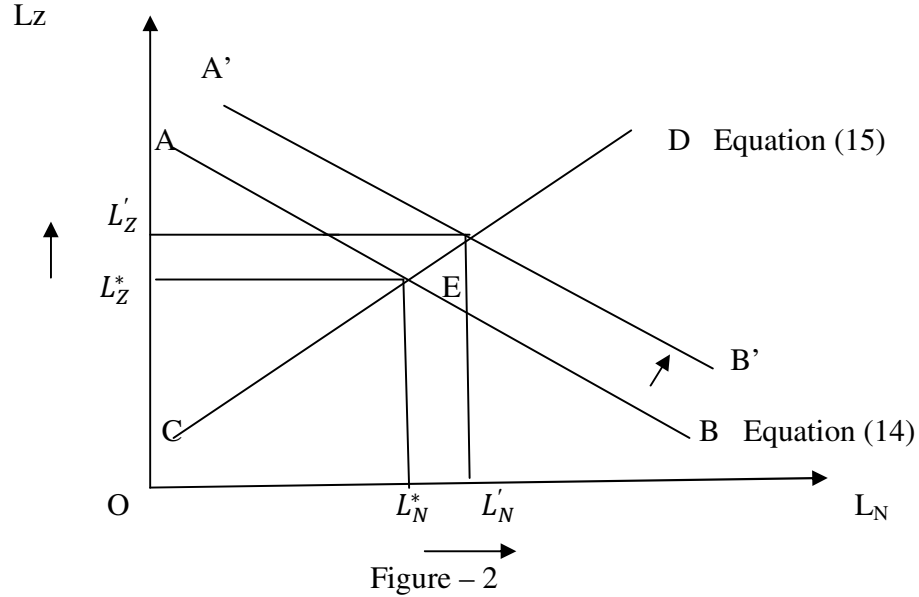
Figure – 2

Determination of equilibrium L_N and L_Z due to a fall in t

how much likely that Lz will remain unchanged. Lz would stay unaffected if "in equilibrium" Z remains impervious. From the Cobb-Douglas preference it is apparent that (a) as Y falls demand for Z should fall; (b) as X increases demand for Z should rise; and (c) demand for Z also rises because of an increase in L_N (note that to start with Lz is kept frozen). "In equilibrium" if (a) is offset by the (b) and (c), informal production does not change and hence an unchanged Lz. This underwrites an unconditional expansion of L_N as total amount of informal labor has already risen. However, if (a) is strong enough Lz must fall and if positive demand effect is sufficiently strong both L_N and L_Z are likely to expand. This state has been described in figure-2. Therefore it is more likely that L_N or extortion activity will increase due to reform.

Mathematically, from (8)

$$\hat{L}_N = \hat{Z} - \widehat{W} = (-)\sigma_Z \cdot \theta_{LZ}\big(\widehat{W} - \hat{R}\big) - \widehat{W} \tag{21}$$

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Simple manipulation delineates $\hat{L}_N = (-)\widehat{W}\left\{\frac{\sigma_Z.\theta_{LZ}(\theta_{LZ}-\theta_{TZ})}{\theta_{TZ}} - 1\right\}$ (22)

Equation (21) is relatively easy to explain the outcome. $\widehat{W}$ itself is negative and $(\widehat{W} - \widehat{R})$ is also negative. Thus, $\hat{L}_N$ has to be positive. Careful investigation explores that and positive $\widehat{R}$ has a tendency to increase Z and to reduce L_N. This is precisely why we had different possibilities in theoretical explanation. ∎

3.C Informal Price

What happens to the informal price consequent upon a reformatory policy that is not very undemanding as liberalization conventionally raises the formal income[18]. The increased income induces higher demand for informal good, the supply of which has already been raised. In what follows the eventual impact on Pz relies on the relative strength of these two effects.

Differentiating and manipulating equation (13) we get

$$\hat{P}_Z = (-)S_X\sigma_X\frac{\theta_{KX}}{\theta_{SX}}\frac{t}{\theta_{KY}}\hat{t} + S_Y\sigma_X\frac{\theta_{KX}}{\theta_{SX}}\frac{\lambda_{KX}}{\lambda_{KY}}\frac{t}{\theta_{KY}}(1+t)\hat{t} + S_Y t\hat{t} + \sigma_Z\frac{\theta_{LZ}}{\theta_{TZ}}\left(\frac{\lambda_{LZ}.\lambda_{LY}.\sigma_X.\frac{\theta_{KX}}{\theta_{SX}}\frac{\lambda_{KX}}{\lambda_{KY}}\frac{t}{\theta_{KY}}.\frac{\Delta.\theta_{TZ}}{\lambda_{LN}}}{1+\Delta.\theta_{TZ}}\right).\hat{t}$$

(23)

$$\text{where, } S_X = \frac{\beta.X}{(1-\beta).P_Z.Z} \; ; S_Y = \frac{\beta.Y}{(1-\beta).P_Z.Z}$$

Proposition III: *Following reform informal price would fall if $\lambda_{KX} > \lambda_{KY}$.*

Proof: A closer look at (23) reveals that if S_Y is sufficiently large than S_X, it is more likely that $S_Y\sigma_X\frac{\theta_{KX}}{\theta_{SX}}\frac{\lambda_{KX}}{\lambda_{KY}}\frac{t}{\theta_{KY}}\hat{t} > S_X\sigma_X\frac{\theta_{KX}}{\theta_{SX}}\frac{t}{\theta_{KY}}\hat{t} \Rightarrow S_Y \lambda_{KX} > S_X \lambda_{KY}$. Even if S_X and S_Y are identical, the inequality holds true if $\frac{\lambda_{KX}}{\lambda_{KY}} > 1 \Rightarrow \lambda_{KX} > \lambda_{KY} \Rightarrow \lambda_{SX} < \lambda_{LY}$. In this situation all the remaining values are negative. This confirms that P_Z must fall.

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[18] One special case under this situation could be the unchanged income from X and Y together. It is not impossible possible as X goes up and Y falls in tandem.

Benefitted workers' share is less in X. These people are not likely to spend much on Z as $S_X < S_Y$ (assumed). Despite that there would be some positive demand effect for Z as X expands and a small fraction of increased income will be directed towards informal good. On the other hand whose expenditure share on Z is much higher that shrinks indicating a negative demand effect. On top of this, a positive demand effect is also generated through an increase in L_N. Coupled with this supply of Z goes up which has a tendency to push down P_Z. Therefore, it is more likely that informal price should fall owing to reform.   ∎

4. Capital Mobility between Formal and Informal Sector

In the basic model we have not allowed the capital to move from formal to informal sector since informal producers did not have access to legal credit market. This, essentially, acted as a restraint for capital mobility between formal and informal sector. If we relax this assumption and allow both formal and informal producers to get hold of required capital from same market, we can imbibe the essence of capital mobility in the structure that we have developed before. Allowing capital mobility simplifies the structure and solution of the model a bit. Under this condition the formal sector represents the standard specific factor model whereas sector Y and Z in concert resembles the Heckscher-Ohlin (HO) structure. Therefore the output effects and the change in factors' return crucially depend on the factor intensity comparison between Y and Z.

The initiation of liberalization policy forces a fall in the return to capital which is perfectly mobile across all sectors. So capital also gets relatively less return in informal sector. This promises an increase in informal wage, W. Extortionists' income will increase as well. Note that return to skilled workers must go up. Factor substitution follows in both skilled formal sector and informal sector. Skilled formal output increases. This draws capital from other sectors. Capital from both unskilled formal and informal sectors has equal probability to move to X. In what

follows whether Y or Z will expand that depends on factor intensity assumption. Formal sector is traditionally capital intensive than informal one. Thus Y contracts and Z expands. As Y contracts, some unskilled labors are released and instantaneously rush to either Z or N. Z spreads out with immediate effect. This also calls for an increase in L_N. However, increased W influences L_N otherwise (see equation (7) for any given Pz) therefore, eventual effect is uncertain. Here introduction of capital mobility completely reverses the effect on informal wage though L_N is indeterminate

5. Concluding Remarks

In this paper our endeavor is to propose an apt extension of HOS framework where both formal and informal sectors work in tandem. Formal goods are produced in the fair segment of the economy while informal sector is affected by extortion. But informal good is never unwarranted. Under these circumstances a policy of reform leads to: a fall in informal wage and return to extortionists; informal output rises; number of extortionists in economy is more likely to go up. However, if we allow capital to move between formal and informal sectors, informal wage would escalate.

APPENDIX A

Given all other variables except Pz, differentiating equation (3) and using the standard notations for general equilibrium trade model we get

$$\widehat{W} \, \theta_{LZ} + \widehat{R} \, \theta_{TZ} = \widehat{P}_Z(1 - \alpha) \tag{A.1}$$

Note that, nothing would happen to X and Y as $\widehat{\overline{W}} = \widehat{W}_S = \hat{r} = \hat{t} = 0$. Factor substitution is not permitted due to non-changing factor prices and in addition to this, unchanged factor supply confirms constancy of X and Y.

Mathematically, using the elasticity of substitution for Z one gets the value of change in Z as

$$\hat{Z} = (-)\sigma_Z . \theta_{LZ}(\widehat{W} - \widehat{R}) \tag{A.2}$$

Assume no change in L. From the full employment condition of unskilled labor

$$\hat{Z} = (-)\hat{L}_N \frac{\lambda_{LN}}{\lambda_{LZ}} \tag{A.3}$$

Plug $\hat{L}_N$ from (8) and modify equation (A.3)

$$\hat{Z} = (-) \, \frac{\lambda_{LN}}{\lambda_{LZ}}(\widehat{P}_Z + \hat{Z} - \widehat{W}) \tag{A.4}$$

Comparing (A.2) and (A.4) and then manipulating a bit

$$\widehat{W} = \widehat{P}_Z \left\{ 1 - \frac{\alpha . \sigma_Z . \theta_{LZ}}{\sigma_Z . \theta_{LZ} + \Delta . \theta_{TZ}} \right\} \tag{A.5}$$

Here, $\Delta = \frac{\lambda_{LN}}{\lambda_{LZ} + \lambda_{LN}}$ and $0 < \alpha < 1$. Hence $\widehat{W}$ is unambiguously positive if $\widehat{P}_Z > 0$ and $(\sigma_Z . \theta_{LZ} + \Delta . \theta_{TZ}) > \alpha . \sigma_Z . \theta_{LZ}$.

Equation (A.5) asserts that $(\widehat{W} - \widehat{P}_Z) = (-)\widehat{P}_Z \left(\frac{\alpha . \sigma_Z . \theta_{LZ}}{\sigma_Z . \theta_{LZ} + \Delta . \theta_{TZ}} \right) \tag{A.6}$

Therefore, for $\widehat{P}_Z > 0$, $(\widehat{W} - \widehat{P}_Z) < 0$ Or, $\widehat{W} < \widehat{P}_Z$ \hfill (A.7)

Equation (A.7) coupled with the argument of (A.1) ensures a positive $\widehat{R}$ and $\widehat{R} > \widehat{W}$. Therefore, $(\widehat{W} - \widehat{R}) < 0$ which indicates a positive $\hat{Z}$ due to an increase in Pz through equation (A.2).

APPENDIX B

An increase in monitoring or bq

An improvement in the quality of administration (may be due to an institutional/administrative reform) in presence of kleptocracy is straightway reflected by an

increase in monitoring /auditing probability of identifying the people who defy laws. Here the law breakers are informal units. Therefore a better administration would be followed by an increase in bq.

Differentiating the price equation of Z

$$\widehat{W}\,\theta_{LZ} + \widehat{R}\,\theta_{TZ} = 0 \qquad\qquad (B.1)$$

Output of X and Y would not change as $\widehat{\overline{W}} = \widehat{W_S} = \hat{r} = \hat{t} = 0$.

From the full employment condition of labor and substituting (8)

$$\hat{Z} = (-)\,\frac{\lambda_{LN}}{\lambda_{LZ}}\left((1 - \widehat{bq}) + \hat{Z} - \widehat{W}\right) \qquad\qquad (B.2)$$

Simple mathematical manipulation yields

$$\widehat{W} = \frac{\Delta.(1 - \widehat{bq})}{(\Delta.\,\theta_{TZ} + \sigma_Z.\theta_{LZ})} \qquad\qquad (B.3)$$

Therefore, $\widehat{W}$ is unambiguously negative as $(1 - \widehat{bq}) < 0$. In that case $\widehat{R} > 0$. This is obvious from equation (B.1). This guarantees $(\widehat{W} - \widehat{R}) < 0$ which in turn makes sure that $\hat{Z} > 0$. Basically this takes place through relocating adjustments of Lz and L$_N$. Here Lz increases and L$_N$ falls.

The exact value of $\widehat{R}$ is denoted by

$$\widehat{R} = (-)(1 - \widehat{bq})\left\{1 - \frac{\Delta}{(\Delta.\,\theta_{TZ} + \sigma_Z.\theta_{LZ})}\right\} \qquad\qquad (B.4)$$

We have already argued that $\widehat{R} > 0$, which implies an automatic and obvious satisfaction of the inequality: $\frac{\Delta}{(\Delta.\,\theta_{TZ} + \sigma_Z.\theta_{LZ})} < 1$. Under this circumstance the effect on Pz is straight and simple. It must decrease as supply goes up without changing the demand. However, for a given T an increase in Lz ensures a decline in real wage of informal workers. Nevertheless, what happens to the money or real wage of extortionists that is not yet clear. From equation (6) we get,

$$\widehat{W}_N = \widehat{W} - (1 - \widehat{bq})$$

In the RHS of the above equation, W has already fallen and $(1 - \widehat{bq})$ is also negative. Thus W$_N$ would decrease if W falls at a rate faster than *(1-bq)*. Accordingly, extortionists are relatively less worse-off than informal workers, if they lose at all. Symbolically,

$$\widehat{W}_N \lessgtr 0 \text{ iff } |\widehat{W}| \gtrless |(1 - \widehat{bq})| \qquad\qquad (B.5)$$

However, when monitoring probability increases, except W$_N$ all factors' return would remain unaffected if we allow for capital mobility across all sectors. W$_N$ goes up. L$_N$ must fall and hence

L_Z and Z would increase. The increase in Z would squeeze Y because of Heckscher-Ohlin structure.

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