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Firm Heterogeneity, Informal Wage and Good Governance

By

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Abstract: We provide an analysis of enforcement policies applicable to formal sector in dual labor markets. Using a framework with heterogeneous firms, endogenous determination of informal wage and politically dictated enforcement strategies, we show that firms which operate both in the formal and informal sectors do very little to increase employment when faced with the opportunity of hiring workers in the informal labor market. Thus enforcement of labor laws and other regulations should not have aggregate employment effects, particularly when workers are productively homogeneous. For firms operating exclusively in the informal sector, the outcome is different. Taxing the more productive seems to be the optimal strategy.

JEL Classification: J21, J31, J50

Keywords: Informal Labor, Wage, Labor Regulations, Enforcement

Outline

1. *Introduction*
2. *Equilibrium in Segmented Labor Market*
3. *Determination of Informal Wage*
4. *Policy Issues*
5. *Concluding Remarks*

Non-technical Summary

The paper describes the process of employment generation in the formal and informal segments of a typical industry. Firms face higher cost of hiring formal workers relative to informal workers. Given the heterogeneity of firms in terms of productivities, enforcement of minimum wage law is bound to have different employment effects across various firms. One major result is that firms which operate in the formal as well as in the informal sector, do not contribute to total employment when faced with a lower informal wage. Those exclusively engaged in the informal sector respond appropriately as the informal wage changes. This provides the foundation to a policy which suggests that more stringent enforcement of labor laws with respect to more productive, bigger firms is a politically sustainable policy in a developing economy.

Since developed countries have a greater share of firms engaged in the formal sector, it is logical for them to strongly enforce minimum wage law. Thus, our paper provides a theoretical analysis of the limits of enforcement. Further, two issues must be reflected upon. First, throughout the analysis we have assumed that workers are homogeneous but firms are heterogeneous. If we had two sets of workers, one more productive than the other, and to start with high-types match with formal while the low-types match with informal firms, perfect substitution would not be possible if formal or informal wages changed. The same possibility arises if formal workers are given incentive compatible contracts leading to higher formal productivity of labor compared to informal workers. We analyzed the case where workers are potentially identical and effort is insensitive to wages. However, if informal workers are less productive than the formal workers, an increase in the degree of enforcement will reduce employment for firms in the formal as well as in the informal sector. Consequently, the government should be concerned with minimizing the loss in employment due to a rise in the degree of enforcement. We also compared the employment effects in formal and informal sectors subject to enforcement when informal workers are less productive than the formal workers.

If the distribution of firms were heavily loaded in favor of the informal sector or that the productivity difference was not substantial, employment loss would be much higher in the informal segment. As argued in the homogeneous case, the political strategy continues to be one where the government is lenient to the informal segment but strict to the formal sector. At a theoretical level we could determine informal wage from within the system and argue why informal labor market will be inherently Walrasian Stable even if labor supply responds negatively to informal wage. Such apparatus is potentially amenable to many comparative static results. Further extensions may bring in skill differentials among workers, explicit introduction of capital market, uncertainty in terms of labor productivity or state of the economy facing firms and open unemployment.

1. *Introduction*

Informal or unorganized labor markets absorb most of the workforce in the developing world. While workers employed in organized, i.e., the formal segment of the labor market are expected to enjoy trade union rights, stake claims on government mandated minimum wage and other benefits, informal workers typically are excluded from its purview. Consequently, unorganized workers are exposed to day-to-day fluctuations in wages and other conditions in the informal labor market. A simple and generally acceptable characterization of such segmented markets is the difference in wage rates. Formal sector workers normally enjoy higher wages than their informal counterpart.

Recent literature on informal labor market has focused on the impact of liberal economic policies on informal wage and employment. Marjit (2003), Goldberg and Pavcnik (2003), Marjit, Ghosh and Biswas (2007) etc. have discussed the impact of trade policies on the size of the informal sector. In a different context Dasgupta and Marjit (2006), Marjit, Mukherjee and Kolmar (2006) have analyzed the political reasons to promote and perpetuate the existence of “informal” labor market even if such markets undermine the legal jurisdictions. The government in a poor country can choose to overlook irregularities in the ‘informal’ sector because it provides “social security” for the poor and prevents political unrest. These views hold under the presumption that having an informal, i.e. a low wage sector, helps both open unemployment and poverty. In this connection, Kanbur (2009) elegantly summarizes the issue on enforcement of regulations in informal labor markets. In particular, emphasis is given on how the state decides on the limits of enforcement. This paper draws on these observations and

provides a formal model of enforcement. Recent studies by Benjamin and Mbaye (2010), Estrin and Mickiewicz (2010), etc. elaborate the extent of compliance with regulations in different countries. The common evidence in these analyses is the substantial lack of enforcement.

The purpose of this paper is to show, with the help of a simple framework, that existence of informal sector may not necessarily increase aggregate employment relative to a situation when there is no such sector. In other words, a change in the informal wage may not affect aggregate employment when firms employ both formal and informal workers. Employment effects of changes in informal wage will depend critically on the distribution of firms along the productivity spectrum. Degree of heterogeneity of firms matters in determining the aggregate effects on employment.¹ Particularly, from a political economy angle, our analysis has some new insights to offer. Since more productive firms will not increase their *total* demand for labor if an opportunity to access informal labor market presents itself, political authorities in a democracy should be more concerned with enforcement of regulations in markets where formal firms have large presence.

The paper is organized as follows. In section 2 we develop the model and discuss the employment effects. The third section looks at the determination of informal wage. Section 4 discusses policy aspect of the problem and the last section concludes.

¹ Firm heterogeneity has played a key role in contemporary trade theory. For an elegant survey refer to Helpman (2006).

2. *Equilibrium in Segmented Labor Market*

Consider an economy with firms having a choice of hiring two kinds of workers; formal and informal, at predetermined wage rates $w_1 > w_2$, w_1 being the wage paid to the formal (denoted with subscript 1) workers and w_2 to the informal (denoted with subscript 2) workers. Labor (L) is homogeneous and difference in wage rates is the only guiding factor differentiating the formal and informal sectors. Labor productivity is measured in terms of exogenous efficiency units. The rule of law suggests that the firms hiring from the formal labor market are legally bound to pay w_1 to each and are liable to be punished in case of violations. w_1 should be interpreted as wages plus benefits i.e. the effective hiring cost of labor in the formal market.²

Firms are distributed in a continuum of *formality* (degree of adherence to legal mandates) indexed by Z , $Z \in [0,1]$. Production functions are given by

$$F = \theta(Z)f(L_i), i=1, 2 \quad (1)$$

With $\theta'(Z) > 0$, $\theta(0) = \underline{\theta}$, $\theta(1) = \bar{\theta}$. $f' > 0$, $f'' < 0$, and $f(0) = 0$.

Thus, firms higher up in the ladder are more productive, i.e. *greater compliance* with labor regulations make formal firms more productive. If firms hire workers on informal basis, it will be deemed as extra legal activity compared to a purely legal employment regime. If audited and apprehended, such firms will have to pay a fine S . Formal sector firms that hire on the basis of extra-legal or informal contracts and pay w_2 are liable to

² w_1 will be held fixed in the major part of the analysis while w_2 will be eventually determined with the system. Later, we provide an outline of a method to endogenize w_1 as well. We do not prove that a rise in w_1 leads to a rise in w_2 . Instead, we show that a lower hiring and firing costs reflected in a decline in w_1 will increase w_2 . However, labor market reforms and its impact on informal wage with capital mobility yields opposite results (see, Marjit, Kar and Maity, 2009).

be punished if apprehended. The probability of audit is q ($0 < q < 1$) and the penalty function S has the following characterization:

$$S = S(L_2) , S' > 0, S'' > 0 \quad (2)$$

The penalty function is increasing in the number of informal employments made.

However, it can be easily substituted by a constant penalty and convex audit probability q with respect to the size of informal employment. The point is, in the presence of q and S bigger firms find it increasingly difficult to implement informal hiring practices.

One can even interpret S as *perceived* penalty due to loss of reputation if violation of labor laws by the firm is exposed in the media, for example. Therefore, S is essentially a loss function, however interpreted.³ If total employment of Z^{th} firm is given by L , it can be distributed between L_1 and L_2 . Hence, the profit function of the Z^{th} firm is given by

$$\pi(Z, L_1, L_2) = \theta(Z)f(L_1 + L_2) - w_1L_1 - w_2L_2 - qS(L_2) \quad (3)$$

$$\frac{\partial \pi}{\partial L_1} = 0, \text{ and } \frac{\partial \pi}{\partial L_2} = 0, \quad \text{imply}$$

$$\theta(Z)f'(L_1) = w_1 \quad (4)$$

$$\theta(Z)f'(L_2) = w_2 + qS'(L_2) \quad (5)$$

For determining optimal L_1, L_2 equate marginal productivities of L_1 and L_2 in (4-5):

$$w_1 = w_2 + qS'(L_2) \quad (6)$$

Let \tilde{L}_2 solve (6) as the optimal informal labor contract chosen by the firm.

$$\text{Or, } \tilde{L}_2 = \phi(w_1, w_2, q) \quad (7)$$

³ For related discussion refer to Marjit, Ghosh and Biswas (2007) which explicitly relates S to a Nash-Bargaining problem involving bribes and generates similar marginal cost of hiring informal workers.

(7) implies that for $L > \tilde{L}_2$ hiring informal workers will be more expensive at the margin.

Therefore, if the firm decides to hire L number of workers and $L > \tilde{L}_2$, then $(L - \tilde{L}_2)$ will be hired from the formal sector. If $L \leq \tilde{L}_2$, informal workers will be cheaper to hire.

Now, from (4) we can directly write

$$L_1 = \phi(\theta(Z), w_1) \quad (8)$$

It is easy to show that $\frac{\partial L_1}{\partial Z} > 0$ as $\theta' > 0$ and $f'' < 0$.

Let there be a (interior) threshold productivity \tilde{Z} such that

$$\tilde{L}_1 = \phi(\theta(\tilde{Z}), w_1) \quad (9)$$

\tilde{Z} is the threshold productivity above which all firms hire formal workers along with informal workers. Those below the threshold, hire only in the informal sector.

From (8) and (9) following are immediate.

Note that, $\forall Z > \tilde{Z}$, $[L_1(Z) - \tilde{L}_2]$ will be the extent of employment in the formal sector.

$$L_1(\tilde{Z}) = \tilde{L}_2, \frac{\partial L_1}{\partial Z} > 0, \forall Z > \tilde{Z}$$

Therefore, $w_2 + qS'(L_2) > w_1$ (QED)

In other words, for higher productivity firms the cost of hiring in the informal market exceeds the wage cost of formal employment.

Also, $\forall Z \leq \tilde{Z}$, firms will not operate in the formal sector.

Since, $\forall Z \leq \tilde{Z}$, $w_2 + qS'(L_2) < w_1$

This implies that firms with loose adherence to labor laws find informal employment profitable.

So far, we have been silent on the distribution of firms. Let us now assume that

$\eta(Z)$ represents the density function with $\int_0^1 \eta(Z) dZ = 1$

It follows from the above discussion that aggregate employment (LE) is given by,

$$LE = \tilde{L}_2 \int_{\tilde{Z}}^1 \eta(Z) dZ + \int_{\tilde{Z}}^1 [L_1(Z) - \tilde{L}_2] \eta(Z) dZ + \int_0^{\tilde{Z}} L_2(Z) \eta(Z) dZ \quad (10)$$

Relatively productive firms ($Z \geq \tilde{Z}$) hire both formal and informal workers. Firms with lower productivities ($Z \leq \tilde{Z}$) hire only informal workers. Rauch (1991) gets similar separation results on a different model with varying firm sizes.

One interesting implication of the equilibrium generated in the above framework is as follows. Consider a change in w_2 and the allocation problem of those firms that continue to employ workers from the formal as well as informal sectors. For those firms, the total number of workers they hire will *not change*. This follows directly from (8), i.e., $L_1 = \phi(\theta(Z), w_1)$, which is independent of w_2 . Note that, those firms which move in and out of the formal segment, employment gets affected by changes in w_2 . However, for firms whose productivity is beyond the cut-off point, a change in w_2 only changes the composition of employment, not the aggregate level. This is demonstrated in figure 1.

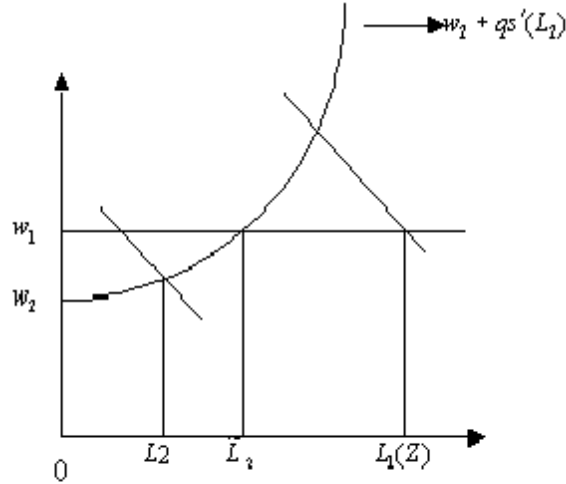


Figure 1

Figure1. Informal wage and composition of employment

where, OL_2 – Informal employment in a firm operating only in the informal sector

$L_1(Z) - \tilde{L}_2$ – Formal employment in a firm operating in both formal and informal sector.

Note that, as w_2 changes, $L_1(Z)$ does not change while \tilde{L}_2 changes.

3. *Determination of Informal Wage*

Suppose aggregate labor force is given by \bar{L} . People look for jobs in the informal sector if they do not find one in the formal sector, with $w_1 > w_2$.³ Therefore, effective supply of labor in the informal sector is given by

$$L_2^S = \bar{L} - L_1 \quad (11)$$

³ w_1 is assumed to be given through negotiations with the trade unions, a feature of the organized labor market. Endogenous w_2 must be lower than w_1 , otherwise everyone will go for informal job. While there is no explicit mechanism by which w_1 adjusts under such circumstances, we assume away such possibilities for focusing on our main interest. In the literature Agenor and Montiel (1996), Marjit (2003) and others have worked with such models. One can explicitly solve for w_1 by constructing the union's objective function to ensure $w_1 > w_2$. One may also refer to Carruth and Oswald (1984) in this context. The appendix provides a sketch of a proof of how w_1 can be endogenized.

Recall, that \tilde{Z} is defined by

$$\theta(\tilde{Z})f'(\tilde{L}_2) = w_1 \quad (12)$$

Now

$$\frac{dL_1}{dw_2} = -L_1(\tilde{Z})\eta(\tilde{Z})\frac{d\tilde{Z}}{dw_2} - \frac{d\tilde{L}_2}{dw_2} \int_{\tilde{Z}}^1 \eta(Z)dZ + \tilde{L}_2 \frac{d\tilde{Z}}{dw_2} \eta(\tilde{Z})$$

Also $L_1(\tilde{Z}) = \tilde{L}_2$

$$\text{Therefore, } \frac{dL_1}{dw_2} = -\frac{\partial \tilde{L}_2}{\partial w_2} \int_{\tilde{Z}}^1 \eta(Z)dz > 0 \quad (13)$$

$$\frac{dL_1^s}{dw_2} = \frac{d\tilde{L}_2}{dw_2} \int_{\tilde{Z}}^1 \eta(Z)dz < 0 \quad (14)$$

If the informal wage goes up, firms switch to formal employment and more firms initially hiring only informal workers start hiring from both formal and informal labor markets.

Thus, total employment in the formal sector goes up. The residual number of jobseekers in the formal sector goes down. In other words, the labor supply function has a negative relation with w_2 .

Let \tilde{w}_2 be defined such that

$$L_2 = L_2(\tilde{w}_2) = \tilde{L}_2 \quad (15)$$

$$L_1 = 0$$

Hence for $w_2 \leq \tilde{w}_2$, $L_1 = 0$

In this case $L_2^s = \bar{L}$

Suppose $w_2 \geq w_1$ then all firms will hire formal workers and formal sector employment will hit the maximum level say \bar{L}_1 .

We assume

$$\bar{L} > \bar{L}_1 \quad (16)$$

(17) suggest that even the maximum level of formal sector employment will not be able to exhaust labor supply. L_2^S accounts for $S_1 S_2 S_3 S_4$ in Figure 2.

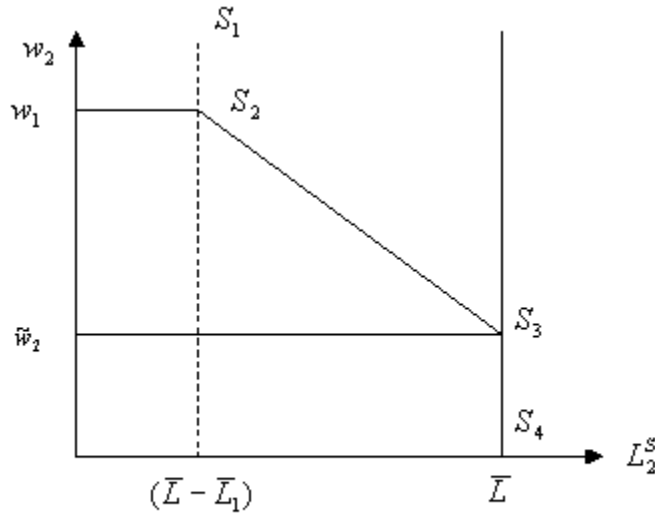


Figure 2 Labor supply and formal employment

Aggregate demand for informal labor will decline as w_2 moves up. Let us denote the aggregate demand as L_2^D . Note that, $L_2^D = 0$ for $w_2 \geq w_1$.

This is obvious from (6). It is also straightforward to argue that L_2^D will continue to increase with decline in w_2 . Let the following be true.

$$\lim_{w_2 \rightarrow 0} L_2^D(w_2) > \bar{L} \quad (17)$$

(17) guarantees that for a low enough w_2 aggregate informal employment can exhaust the entire supply of labor. This will ensure a positive equilibrium w_2 .

Given the nature of demand and supply function, we can infer the following. Let w_2^* be the equilibrium wage.

Proposition 1: Two possible equilibria will emerge either: $w_1 > w_2^* > \tilde{w}_2$ or $w_2^* \leq \tilde{w}_2$.

Proof: First, note that equilibrium always exists. Given (17) holds such $\exists w_2^* \rightarrow$

$L_2^D(w_2^*) = \bar{L}$. Also $L_2^D(w_2^* \geq w_1) \leq L_2^S(w_2^*)$. Given continuity of L_2^D , $\exists w_2^*$ such that

$L_2^D = L_2^S$. It is also shown that the equilibrium wage w_2^* has to be less than w_1 . But w_2^*

cannot be less than \tilde{w}_2 . (QED)

As Figure 3 suggests both *A* and *B* are stable

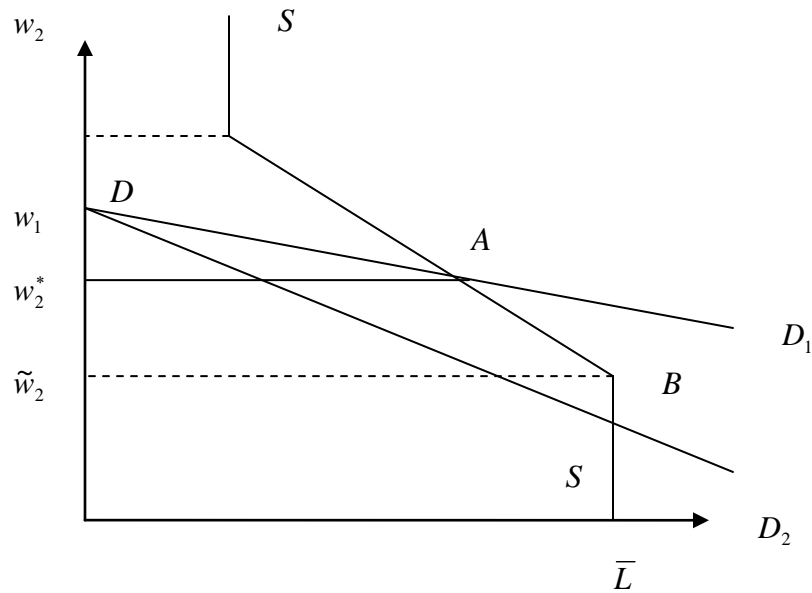


Figure 3. Employment and stability of equilibria

equilibrium. From $w_2^* > \tilde{w}_2$, employment in the formal sector. At *B*, there will be no formal sector employment. Also note that both *A* and *B* are Walrasian-stable equilibria. As w_2 goes down at *A*, better firms will increase demand for informal labor and so does the worse firms operating only in the informal

sector. As better firms increase demand for labor, they retrench formal workers who then join the informal sector. So, the net employment effect for the formal firms is zero. The residual left is the increase in demand by the informal firms. So D_2 responds to a greater extent than does S_2 . Thus, the excess demand increases with a drop in w_2 and stability is guaranteed. Finally when w_1 is endogenous, a rise in w_2 must raise w_1 (see Appendix 1) cutting back the increase in employment in the formal sector. In effect, it raises the supply L_2 more than in the case with exogenous w_1 .

Similarly, demand for L_2 falls further as w_1 also increases following a rise in w_2 . Both these effects will reduce w_2 relative to w_2^* when w_1 is endogenous. Such endogeneity introduces flexibility in w_1 , hurting the informal workers.

4. Policy Issues

In this section we are going to discuss two specific policies: one often discussed in the public forum and other never discussed in public perhaps owing to profound political implications it carries.

a. Labor Market Reform

If hiring and firing is costly or if exiting from an industry is difficult, it may hurt employment in the formal sector. These rigidities justify labor market reform policies prescribed for the developing countries. However, such policies are undertaken with respect to the formal sector only and apply to a meager share of total employment in most developing countries. If one reduces effective wage cost in the formal sector, it will have some impact on the informal wage, an indicator of the purchasing power of millions of

poor people working outside formal labor contracts. In the set up developed so far, changes in w_1 will affect both demand and supply in the informal sector.

Consider an initial equilibrium w_2^* . To show what happens to w_2^* subsequent to a change in w_1 we need to check the impact on L_2^D (labor demand) relative to L_2^S (labor supply) for a change in w_1 .

Let us look at the impact on the supply side first. From (11) we know

$$\begin{aligned}
L_1 &= \int_{\tilde{Z}}^1 L_1(Z)\eta(Z)dZ - \int_{\tilde{Z}}^1 \tilde{L}_2(Z)\eta(Z)dZ \\
\frac{dL_1}{dw_1} &= -L_1(\tilde{Z})\eta(\tilde{Z})\frac{dZ}{dw_1} - \frac{d\tilde{L}_2}{dw_1} \int_{\tilde{Z}}^1 \eta(Z)dZ + \tilde{L}_2 \frac{d\tilde{Z}}{dw_1} \eta(\tilde{Z}) + L_1(\tilde{Z})\eta(\tilde{Z})\frac{dL_1}{dw_1} \\
&= -\frac{d\tilde{L}_2}{dw_1} \int_{\tilde{Z}}^1 \eta(Z)dZ + L_1(\tilde{Z})\eta(\tilde{Z})\frac{dL_1}{dw_1}
\end{aligned} \tag{18}$$

Again, from (5) and the fact that $S'' > 0$. $\frac{d\tilde{L}_2}{dw_1} > 0$ and $\frac{dL_1}{dw_1} < 0$

Therefore,

$$\frac{dL_2^S}{dw_1} = \frac{d\tilde{L}_2}{dw_1} \int_{\tilde{Z}}^1 \eta(Z)dZ - \int_{\tilde{Z}}^1 \frac{dL_1}{dw_1} \eta(Z)dZ > 0 \tag{19}$$

If w_1 goes up, formal sector employment shrinks leading to a rise in informal labor supply. If labor reform pushes w_1 down, L_1^S will shift inward.

$$\text{Now, } L_2^D = \int_0^{\tilde{Z}} L_2(Z)\eta(Z)dZ + \int_{\tilde{Z}}^1 \tilde{L}_2\eta(Z)dZ$$

$$\begin{aligned}
\frac{dL_2^D}{dw_1} &= \int_0^{\tilde{Z}} \frac{dL_2}{dw_1} \eta(Z)dZ - L_2(\tilde{Z})\eta(\tilde{Z})\frac{d\tilde{Z}}{dw_1} + \tilde{L}_2\eta(\tilde{Z})\frac{d\tilde{Z}}{dw_1} + \int_{\tilde{Z}}^1 \frac{d\tilde{L}_2}{dw_1} \eta(Z)dZ \\
&= \int_{\tilde{Z}}^1 \frac{d\tilde{L}_2}{dw_1} \eta(Z)dZ
\end{aligned} \tag{20}$$

Therefore combining (19) and (20) we get,

$$\frac{dL_2^D}{dw_1} - \frac{dL_2^S}{dw_1} = \int_{\bar{z}}^1 \frac{dL_1}{dw_1} \eta(Z) dZ \quad (21)$$

Since, $\frac{dL_1}{dw_1} < 0$, $\frac{d(ED_2)}{dw_1} < 0$ where $ED_2 \equiv L_2^D - L_2^S$.

Proposition 2: Since informal labor market is Walrasian stable, labor market reform will improve informal wage.

Proof: A decline in hiring and firing cost of the organized sector labor i.e. L_1 will increase excess demand for labor in the informal labor market as

$$\frac{d(ED_2)}{dw_1} < 0 \text{ [from (21)]}$$

By Walrasian stability, $\frac{d(ED_2)}{dw_2^*} < 0$.

Hence w_2^* must rise. (QED)

Figure 4 below discusses these effects graphically with an example of four different types of firms with varying employment practices. As \bar{w}_1 drops to w_1^0 , at a given w_2 , type IV firms undergo a net increase in employment from $OA_7 \rightarrow OA_8$, although the extent of formal employment for them now is A_2A_8 much higher than A_4A_7 . For type I firms, however, nothing changes and they continue with OA_1 level of employment. For those at the margin, such as firm type III, a net increase in employment of A_5A_6 is visible. Similarly, for type II firms, who move into the formal segment a net

increase in demand of A_3A_4 takes place. The pressure of such excess demand increases w_2 .

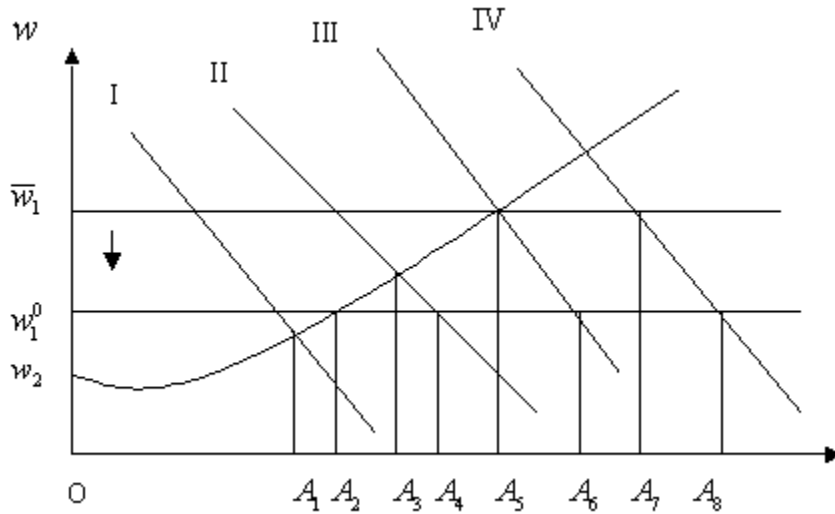


Figure 4. Variety of firms and employment practices

The intuition behind the result is as follows. If w_1 goes down because hiring and firing costs decline, the existing set of firms which operate both in the formal and the informal sectors must increase total employment creating greater demand for labor at the aggregate. Those who continue to operate only in the informal sector do not alter their demand at a given w_2 as w_1 does not affect them in any way. Those who switch from informal to formal substitute informal workers by formal workers, but hire more than before as w_1 goes down. All these effects lead to a net increase in demand for workers in the informal segment and raise w_2 .

b. Political Economy of Informal Sector

As we have already discussed the informal labor market provides employment to a vast pool of workers who do not find jobs in the so called organized formal sector. In many ways this acts as a cushion for poor people in the developing countries. But the activities which employ informal workers tend to be outside the domain of legal boundary. These transactions are often unrecorded, unregistered and overall extra legal.

If the state has to preserve the sanctity of legal institutions and rules of law, strictly speaking, it becomes difficult to ignore informality completely and wish away extra legal activities. On the other hand, poor countries have to care for employment and income earning capacity of the huge unskilled population.

In our framework, q represents an index of the monitoring intensity or stringency of the legal structure in place. Higher q affects informal wage by restricting demand. If the government cares about aggregate employment as well as the importance of the legal institution, one may propose the following object function of the state.

$$\Omega = \Omega(q, E) - C(q) \quad (22)$$

With $\Omega_1 > 0$, $\Omega_2 > 0$, $\Omega_{11} < 0$, $\Omega_{22} < 0$, $\Omega_{12} = \Omega_{21} = 0$, $C' > 0$, $C'' > 0$

where $C(q)$ denotes cost of preserving law or rules of law and regulatory framework.

In this framework we are assuming that both w_1 and w_2 are given and we take employment as the welfare indicator. However, one could easily substitute E by a measure of average wage in a framework where informal labor market clears as in the case of labor market reforms. Such an average wage, given a fixed w_1 will depend on w_2 , the informal wage. Thus we could have worked with w_2 instead of E and since it is nothing but demand for total employment at a given (w_1, w_2) , a rise in E will imply a rise

in w_2 when w_2 is a variable.

Note that the objective of the government is related to those one used in Marjit, Kolmar and Mukherjee (2006). But in the latter the explicit role and working of the informal labor market was not introduced. In Marcouiller and Young (1995) a Leviathan State allowed informal activities or corruption to sustain itself for material gains. But ours is drawn from a more welfarist perspective.

Aggregate employment E is defined as

$$\begin{aligned}
 E &\equiv \int_0^{\tilde{z}} L_2(Z)\eta(Z)dZ + \int_{\tilde{z}}^1 \tilde{L}_2\eta(Z)dZ + \int_{\tilde{z}}^1 (L_1(Z) - \tilde{L}_2)\eta(Z)dZ \\
 &= \int_0^{\tilde{z}} L_2(Z)\eta(Z)dZ + \int_{\tilde{z}}^1 L_1(Z)\eta(Z)dZ
 \end{aligned} \tag{23}$$

One way to classify societies is to do it according to the distribution of firms.

First note that

$$\frac{dE}{dq} = L_2(\tilde{z})\eta(\tilde{z})\frac{d\tilde{z}}{dq} + \int_0^{\tilde{z}} \frac{\partial L_2(Z)}{\partial q}\eta(Z)dZ - L_1(\tilde{z})\eta(\tilde{z})\frac{d\tilde{z}}{dq} + \int_{\tilde{z}}^1 \frac{\partial L_1(Z)}{\partial q}\eta(Z)dZ \tag{24}$$

As discussed earlier [from (4)] q does not affect $L_1(Z)$. The only term that is relevant is given by

$$\frac{dE}{dq} = \int_0^{\tilde{z}} \frac{\partial L_2(Z)}{\partial q}\eta(Z)dZ \tag{25}$$

With $\frac{\partial L_2(Z)}{\partial q} < 0$

From (25) let us define an implicit function

$$E = E(q), E' < 0 \tag{26}$$

Therefore from (21) and (25) we get

$$\Omega = \Omega(q, E(q)) - C(q) \quad (27)$$

$$\frac{d\Omega}{dq} = 0 \Rightarrow \Omega_1 + \Omega_2 E' - C' = 0$$

$$\Rightarrow \Omega_1 = C' - \Omega_2 E' \quad (28)$$

Note that the LHS represents the marginal benefit from upholding the sanctity of legal institutions, rules of law, punishing the illegal and extra legal etc. Right hand side represents the direct cost of monitoring and the indirect cost in terms of a reduction in employment in the informal sector.

Let q^* solve (28).⁴ Economies may be classified in terms of quality of firms those operate in the economy. Think of a situation where all firms operate in the formal sector with $\eta(Z) = 0 \forall Z < \tilde{Z}$ and $\eta(Z) > 0$ for $Z \geq \tilde{Z}$. We know that $E' = 0$ in that situation. This will imply a higher q^* compared to where there are firms operating only in the informal sector. Since more productive firms do not change their level of employment following changes in q , they just substitute informal by formal, the government should not have the incentive to protect the extra legal sector because the marginal cost of implementing higher levels of q is relatively low, on the other hand for firms who are operating only in the informal sector, this is an additional cost. It lowers the level of employment.

Firms which operate in formal as well as in the informal sector tend to substitute one type of employment with the other. If q goes up, they will substitute informal employment with formal employment and that helps good governance. It discourages informal activities without much of an impact on aggregate employment. Thus, if either through a

⁴ SOC is satisfied provided $|\Omega_{11} - C'' + \Omega_2 E''| > \Omega_2 E''$

growth in labor productivity or through any set of factors that shift the labor demand curve upward, the need for pampering informal sector gradually declines. It follows that since the employment effect of bad governance is not so significant developed countries do not need to be protective about the informal segment.

5. *Concluding Remarks*

The paper describes the process of employment generation in the formal and informal segments of a typical industry. Firms face higher cost of hiring formal workers relative to informal workers. Given the heterogeneity of firms in terms of productivities, enforcement of minimum wage law is bound to have different employment effects across various firms. One major result is that firms which operate in the formal as well as in the informal sector, do not contribute to total employment when faced with a lower informal wage. Those exclusively engaged in the informal sector respond appropriately as the informal wage changes. This provides the foundation to a policy which suggests that more stringent enforcement of labor laws with respect to more productive, bigger firms is a politically sustainable policy in a developing economy. Since developed countries have a greater share of firms engaged in the formal sector, it is logical for them to strongly enforce minimum wage law. Thus, our paper provides a theoretical analysis of the limits of enforcement.

Two issues must be reflected upon. First, throughout the analysis we have assumed that workers are homogeneous but firms are heterogeneous. If we had two sets of workers, one more productive than the other, and to start with high-types match with formal while the low-types match with informal firms, perfect substitution would not be

possible if formal or informal wages changed. The same possibility arises if formal workers are given incentive compatible contracts leading to higher formal productivity of labor compared to informal workers as in Mookherjee and Esfahani (1995). In this paper, we are interested in analyzing the case where workers are potentially identical and effort is insensitive to wages. However, if informal workers are less productive than the formal workers, an increase in the degree of enforcement will reduce employment for firms in the formal as well as in the informal sector. Consequently, the government should be concerned with minimizing the loss in employment due to a rise in the degree of enforcement. Appendix 2 provides a short discussion on comparing the employment effects in formal and informal sectors subject to enforcement when informal workers are less productive than the formal workers.

If the distribution of firms is heavily loaded in favor of the informal sector or that the productivity difference is not substantial, employment loss will be much higher in the informal segment. As argued in the homogeneous case, the political strategy continues to be one where the government is lenient to the informal segment but strict to the formal sector. At a theoretical level we could endogenize informal wage and argue why informal labor market will be inherently Walrasian Stable even if labor supply responds negatively to informal wage. Such apparatus is potentially amenable to many comparative static results. Further extensions may bring in skill differentials among workers, explicit introduction of capital market, uncertainty in terms of labor productivity or state of the economy facing firms and open unemployment.

Appendix 1

Determination of w_1 (theoretical variations of this wage determination is also available in Chaudhuri and Mukhopadhyay, 2009)

The trade union maximizes the sum of income (u) from formal sector and also the income the union members receive as informal workers when they do not find a job in the formal sector.

Therefore,

$$u = w_1 L_1 + w_2 (\lambda \bar{L} - L_1) \quad (\text{A1})$$

Where λ is the fraction of \bar{L} determining the size of the union.

$$\frac{du}{dw_1} = 0 \Rightarrow L_1 + (w_1 - w_2) \frac{dL_1}{dw_1} = 0$$

Assuming S.O.C is satisfied we get,

$$w_1 = \frac{w_2}{1 - \frac{1}{\varepsilon}} \quad (\text{A2})$$

Where $\varepsilon = -\frac{\partial L_1}{\partial w_1} \cdot \frac{w_1}{L_1} > 0$ and for a meaningful w_1 , $\varepsilon > 1$

Thus $w_1 > w_2$

Therefore, $w_1 = \phi(w_2)$, $\phi' > 0$ (A3)

We have already derived in the text that

$w_2 = \phi(w_1)$, $\phi' < 0$ (A4)

Analytically one can solve for (A3) and (A4) to get (w_1^*, w_2^*) as equilibrium values.

Appendix 2

If one informal worker is an α - fraction less productive than the formal sector, then a rise in q has the following net aggregate effect on *employment in the formal sector* (under reasonable mathematical properties).

$$A = \int_{\bar{z}}^1 (1 - \alpha) \left| \frac{dL(Z)}{dq} \right| dZ \quad (\text{A5})$$

On the other hand, for the informal sector, it is, $B = \int_0^{\bar{z}} \left| \frac{dL(Z)}{dq} \right| dZ$ (A6)

The case that is discussed here hold for $\alpha = 1$. However, when $\alpha < 1$, B can easily dominate A and the same policy generates asymmetric implications in this dual labor

market. The value of α close to 1 or \tilde{Z} close to 1 will induce the government to enact more stringent policy for the formal sector to minimize employment loss. Yet, the fact that for $\alpha = 1$ there is zero employment effect in the formal sector continues to be a strikingly simple and novel contribution.

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