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Abstract

We provide an analysis of enforcement policies in a framework with heterogeneous firms, endogenous determination of informal wage and politically dictated strategies. We argue that firms which operate both in the formal and informal sectors do very little to increase TOTAL employment when faced with the opportunity of hiring workers in the informal labor market. Thus enforcing labor laws and other regulations in this case should not have aggregate employment effects. For firms operating exclusively in the informal sector, the outcome is different. Such features determine the stringency of enforcement in the context of markets characterized by firms with varying levels of productivity. For example if the formal sector has firms with relatively high levels of productivity enforcement has to be stricter than in the case with relatively large number of low productive firms. This seems to be consistent with observed behavior of the authorities in the developed and the developing world. We also talk about the implications of labor market reforms on informal wage.

JEL Code: D23, K4, O17

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1. Introduction

Informal or unorganized labor markets absorb most of the workforce in the developing world. While workers employed in organized, the formal segment of the labor market are expected to have trade union rights, claims on government recognized wage and other benefits, informal workers do not typically get such benefits and are for more exposed to day to day fluctuations of labor markets. A simple characterization of such segmented markets, that is generally accepted, runs in terms of the difference in the wage rates. Formal sector workers typically enjoy higher wage than their formal counter part.

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), Marjit, Kar and Beladi (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 as the part of the state to promote and perpetuate the “informal” labor market even if such markets undermine the legal jurisdictions. A poor country can choose to look away from 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 labor market helps “employment” situation and the poor.

In a recent paper Kanbur (2009) raises various issues regarding enforcement and informal sector. One particular concern seems to be the applicability of regulations because one may design thousands of regulations but most of them can be operationally infeasible. Also in a typical developing country it is not easy to rule with an iron hand.

This paper seems to follow the lead provided by Kanbur (2009) and tries to provide a somewhat rigorous analysis of optimal design of a relevant policy.

The specific purpose of this paper is to show, in terms of a simple framework, that existence of informal sector may not necessarily increase employment relative to 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 of employment.¹

From a political economic angle our analysis has some new insights to offer. Since more productive firms will not increase the total demand for labor if faced with the opportunity to access informal labor market, political authorities in a democracy will be more inclined to enforce regulations in industries or markets where we observe mostly good firms.

The paper is organized as follows. In the second section we develop the model and discuss the employment effects. The third section looks at the determination of informal wage. The fourth discusses political economic aspect of the problem. The last section concludes.

2. Equilibrium in Segmented Labor Market

Consider an economy with firms having a choice of hiring two kinds of labor, formal and informal at predetermined wage rates $w_1 > w_2$, w_1 being the wage paid to the

¹ Firm heterogeneity has played a key role in contemporary trade theoretic work. For example refer to Melitz (2003), Antras (2003), Helpman (2006) etc.

formal workers and w_2 is paid to the informal workers. Firms are distributed in a continuum indexed by $Z, Z \in [0,1]$

Production functions are given by

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

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

Thus firms higher up in the ladder are more productive.

Formal activities are conducted in a legal environment. Informal labor, if hired, will constitute as an extra legal activity. If audited and apprehended firms will have to pay a fine S (or a bribe to get out of the mess!).

Compensating the benefit derived from lower wage, we assume a convex penalty function.²

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

The auditing probability is assumed to be $0 < q < 1$.

Hence, the profit function of the Z^{th} firm will be given by

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

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

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

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

for determining L_1, L_2

Equating marginal with

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

² For more detailed discussion on this, refer to Marjit, Ghosh and Biswas (2007).

Let \tilde{L}_2 solve (6).

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

(7) implies that for $L > \tilde{L}_2$ hiring informal workers will be more expensive on 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 in the formal sector. If $L \leq \tilde{L}_2$, informal workers will be cheaper to hire.

Now from (4)

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

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

Let us solve for \tilde{Z} such that

$$\tilde{L}_2 = \varphi(\theta(\tilde{Z}), w_1) \quad (9)$$

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

Lemma1: $\forall Z > \tilde{Z}$, $(L_1(Z) - \tilde{L}_2)$ will be the extent of employment in the formal sector.

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

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

Lemma2: $\forall Z \leq \tilde{Z}$, firms will not operate in the formal sector.

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

So far we have been silent on the distribution of firms. Let us assume that $\eta(Z)$ represents

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

From Lemmas 1 and 2, aggregate employment 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.

Proposition 1: *If $\eta(Z) = 0 \forall Z \leq \tilde{Z}$ and $\int_{\tilde{Z}}^1 \eta(Z) dZ = 1$, then LE is independent of w_2 .*

Proof: Note that \tilde{L}_2 depends only on w_1, w_2 and q [from(7)]. Here we are considering a situation where all firms are distributed beyond the threshold productivity \tilde{Z} . From Lemma 1 and 2 we know

$$LE = \int_{\tilde{Z}}^1 L_1 \eta(Z) dZ = \int_{\tilde{Z}}^1 \varphi(\theta(Z), w_1) \eta(Z) dZ$$

Which is independent of w_2 . (QED)

Following observations are in order.

First, Proposition 1 implies no matter whatever be the change in aggregate employment of relatively productive firms will not change.

Second, composition of employment will change as \tilde{L}_2 does respond to w_2 .

Employment in the formal sector is given by

$$L_F = \int_{\tilde{Z}}^1 (L_1(Z) - \tilde{L}_2) \eta(Z) dZ \quad (11)$$

It is straightforward to argue that a fall in w_2 will reduce employment in the formal sector by increasing \tilde{Z} .

3. Determination of w_2

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

$$L_I^S = \bar{L} - L_F \quad (12)$$

Recall that \tilde{Z} is defined by

$$\theta(\tilde{Z}) f'(\tilde{L}_2) = w_1 \quad (13)$$

Now,
$$\frac{dL_F}{dw_2} = -L_1(\tilde{Z}) \eta(\tilde{Z}) \frac{d\tilde{Z}}{dw_2} - \frac{dL_2^2}{dw_2} \int_{\tilde{Z}}^1 \eta(Z) dZ + \tilde{L}_2 \frac{d\tilde{Z}}{dw_2} \eta(\tilde{Z})$$

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

Therefore,
$$\frac{dL_F}{dw_2} = -\frac{\partial \tilde{L}_2}{\partial w_2} \int_{\tilde{Z}}^1 \eta(Z) dZ > 0 \quad (14)$$

$$\frac{dL_I^S}{dw_2} = \frac{d\tilde{L}_2}{dw_2} \int_{\tilde{Z}}^1 \eta(Z) dZ < 0 \quad (15)$$

If the informal wage goes up, firms switch to formal employment and more firms

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.

hire both informal and formal workers. Thus total employment in the formal sector goes up. The residual number of job seekers in the formal sector goes down. Thus the labor supply function has a negative relation with w_2 .

In the literature Agenor and Montiel (1996), Marjit (2003) and others have argued with such models. One can explicitly solve for w_1 by constructing Union's objective function and make sure that $w_1 > w_2$.

Let \tilde{w}_2 be defined such that

$$L_2 = L_2(\tilde{w}_2) = \tilde{L}_2 \quad (16)$$

Where $\bar{\theta}f'(\bar{L}_2) = w_1$

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

In this case $L_I^S = \bar{L}$

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}_F .

We assume

$$\bar{L} > \bar{L}_F \quad (17)$$

(17) suggests that even maximum level of formal sector employment will not be able to exhaust entire labor supply. L_I^S looks like the following.

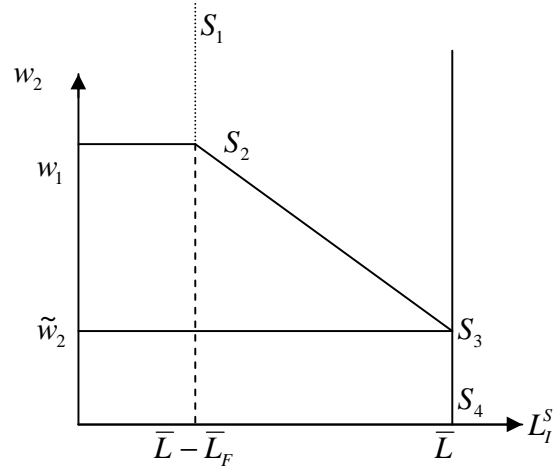


Figure 1

Aggregate demand for informal labor will decline as w_2 moves up. Let us denote the aggregate demand as L_1^D .

$$L_1^D = 0 \text{ for } w_2 \geq w_1.$$

This is obvious from (6).

It is also straightforward to argue that L_1^D will continue to increase with decline in w_2 . Let the following be true.

$$\lim_{w_2 \rightarrow 0} \lim L_1^D(w_2) > \bar{L}$$

(18) 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 2: *Two possible equilibria will emerge: either $w_1 > w_2^* > \tilde{w}_2$ or, $w_2^* \leq \tilde{w}_2$.*

Proof: First note that an equilibrium always exists.

Given (18) holds such $\exists w_2^*$ such $L_t^D(w_2^*) > \bar{L}$.

$$\text{Also } L_t^D(w_2^* \geq w_1) \leq L_t^S(w_2^*)$$

Given continuity of L_t^D , $\exists w_2^*$ such that $L_t^D = L_t^S$

This also shows that the equilibrium wage w_2^* has to be less than w_1 . But w_2^* can be less than \tilde{w}_2 . (QED)

Figure 2 depicts the equilibrium.

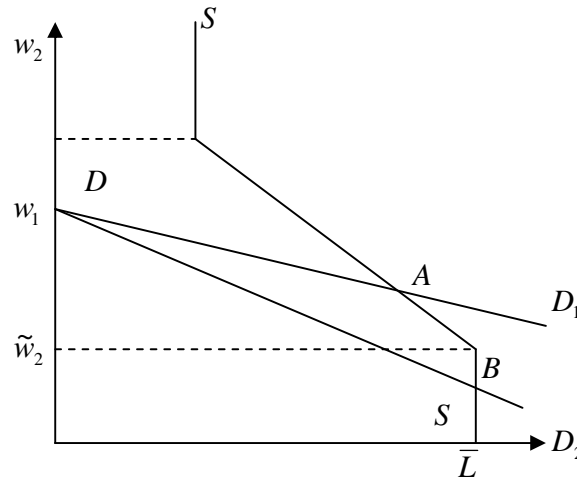


Figure 2

As figure2 suggests both A and B are stable equilibrium. From the definition of \tilde{w}_2 , at A, there will be some employment in the formal sector. At B there will be no formal sector employment. Also note that both A and B are Walrasian stable equilibrium.

4. Theory and Policy Issues

In this section we are going to discuss two specific policies one discussed in public forum and other never discussed in public but has profound political implications.

(a) Labor Market Reform

If hiring and firing is costly, if exiting form industry is difficult, that may hurt employment in the formal sector. That is the reason labor market reform policies are prescribed for the developing countries. But such policies are undertaken with respect to the formal sector. 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 the poor people.

In our 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_I^D relative to L_I^S .

Let us look at the impact on the supply side first.

From (11) we know

$$\begin{aligned}
 L_F &= \int_{\tilde{Z}}^1 L_1(Z)\eta(Z)dZ - \int_{\tilde{Z}}^1 \tilde{L}_2(Z)\eta(Z)dZ \\
 \frac{dL_F}{dw_1} &= -L_1(\tilde{Z})\eta(\tilde{Z})\frac{dZ}{dw_1} - \frac{d\tilde{L}_2}{dw_1} \int_{\tilde{Z}}^1 \eta(Z)dZ + \tilde{L}_2 \frac{d\tilde{Z}}{dw_1} \eta(\tilde{Z}) + L_1(\tilde{Z})\eta(\tilde{Z})\frac{dL_1}{dw_1} \\
 &= -\frac{d\tilde{L}_2}{dw_1} \int_{\tilde{Z}}^1 \eta(Z)dZ + L_1(\tilde{Z})\eta(\tilde{Z})\frac{dL_1}{dw_1} \quad (19)
 \end{aligned}$$

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

Therefore,

$$\left. \frac{dL_I^S}{dw_1} \right|_{w^*} = \frac{d\tilde{L}_2}{dw_1} \int_{\tilde{Z}}^1 \eta(Z) dZ - \int_{\tilde{Z}}^1 \frac{dL_1}{dw_1} \eta(Z) dZ \quad (20)$$

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

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

$$\frac{dL_I^D}{dw_1} = \int_0^{\tilde{Z}} \frac{dL_2}{dw_1} \eta(Z) dZ - L_2(\tilde{Z}) \eta(\tilde{Z}) \frac{d\tilde{Z}}{dw_1} + \tilde{L}_2 \eta(\tilde{Z}) \frac{d\tilde{Z}}{dw_1} + \int_{\tilde{Z}}^1 \frac{d\tilde{L}_2}{dw_1} \eta(Z) dZ$$

$$= \int_{\tilde{Z}}^1 \frac{d\tilde{L}_2}{dw_1} \eta(Z) dZ \quad (21)$$

Therefore combining (20) and (21) we get,

$$\frac{dL_I^D}{dw_1} - \frac{dL_I^S}{dw_1} = \int_{\tilde{Z}}^1 \frac{dL_1}{dw_1} \eta(Z) dZ \quad (22)$$

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

Proposition 3: *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. w_1 will increase

excess demand for labor in the informal labor market as $\frac{d(ED_I)}{dw_1} < 0$

(from (22)). By Walrasian stability $\frac{d(ED_I)}{dw_2^*} < 0$.

Hence w_2^* must rise. (QED)

(b) Political Economy of Informal Sector

Informal labor market provides employment to a vast pool of workers who would never find a job 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 can be 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 shy away from extra legal activities. On the other hand poor countries have to care for employment and income earning capacity of the huge of 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 objective function of the state.

$$\Omega = \Omega(q, E) - C(q) \quad (23)$$

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.

Note that the objective of the government is related to those one used in Marjit, Kolmar and Mukherjee (2006). But in the latter there explicit role and working of the informal labor market was not introduced. In Marcoullier and Young (1995) a Leviathon

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

$$\begin{aligned} E &\equiv \int_0^{\tilde{Z}} L_2(Z) \eta(Z) dZ + \int_{\tilde{Z}}^1 \tilde{L}_2 \eta(Z) dZ + \int_{\tilde{Z}}^1 (L_1(Z) - \tilde{L}_2) \eta(Z) dZ \\ &= \int_0^{\tilde{Z}} L_2(Z) \eta(Z) dZ + \int_{\tilde{Z}}^1 L_1(Z) \eta(Z) dZ \end{aligned} \quad (24)$$

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

First note that

$$\frac{dE}{dq} = L_2(\tilde{Z}) \eta(\tilde{Z}) \frac{d\tilde{Z}}{dq} + \int_0^{\tilde{Z}} \frac{\partial L_2(Z)}{\partial q} \eta(Z) dZ - L_1(\tilde{Z}) \eta(\tilde{Z}) \frac{d\tilde{Z}}{dq} + \int_{\tilde{Z}}^1 \frac{\partial L_1(Z)}{\partial q} \eta(Z) dZ \quad (25)$$

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

$$\frac{dE}{dq} = \int_0^{\tilde{Z}} \frac{\partial L_2(Z)}{\partial q} \eta(Z) dZ \quad (26)$$

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

From (26) let us define an implicit function

$$E = E(q), E' < 0 \quad (27)$$

Therefore, from (22) and (26) we get

$$\Omega = \Omega(q, E(q)) - C(q) \quad (28)$$

$$\begin{aligned} \frac{d\Omega}{dq} = 0 &\Rightarrow \Omega_1 + \Omega_2 E' - C' = 0 \\ &\Rightarrow \Omega_1 = C' - \Omega_2 E' \end{aligned} \quad (29)$$

Note that the LHS represents the marginal benefit from upholding the sanctity of legal institutions, rules of law, punishing the illegal and extra legal. 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 (29)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 , 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 there are firms which are operating only in the informal sector, higher q has 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 growth in labor productivity or through any set of factors that shift the labor demand curve, the need for pampering informal sector gradually declines. That is why in the developed countries need to be productive about the informal segment is not there, because the employment effect of bad governance is not so significant.

⁴ SOC is satisfied provided $|\Omega_{11} - C'' + \Omega_{22}E'| > \Omega_2 E''$

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