TWO-TIER WAGE SYSTEMS IN RURAL AGRICULTURE: EVIDENCE FROM INDONESIAN MICRO DATA

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ABSTRACT

The subject of wage determination in rural agricultural labor markets has continued to attract debate while remaining totally unresolved. This paper offers an analysis and empirical study of wage determination in a rural (tropical/sub-tropical) agricultural environment, and finds that, based on the notion of efficiency wages, a two-tier situation explains why rural wage rates are known to vary widely among workers and across regions. The study analyzes cross-sectional and time-series data on wage rates (of casual and permanent employment contracts), employment levels, and productivities, from various rural settings, to verify the true nature of these variables. The strength of monopsony control is verified empirically, and policy prescriptions are determined regarding ways for appropriate earning and income policies for rural development.

INTRODUCTION

Rural agricultural employers operate quite a unique type of arrangement that differ markedly from what is ordinarily understood in an industrial setting. This paper analyzes wage determination processes in rural agricultural labor markets, as the process of wage determination in rural agriculture has continued to attract debate while remaining totally unresolved. Chief among the contestants has been Osmani (1991) who postulates that the process of wage formation takes the form of implicit cooperation among workers rather than the form of (explicit) wage offers fixed by employers in the traditional format. Applying a framework of repeated non-cooperative game setting, the model posits that employees and employers tend to enter into a quasi-implicit collective bargaining agreement whereby both parties accommodate each other's wage needs. In the case of the employer, this would yield a wage that equals the value of marginal product of labor; and for the employee, a wage on his/her individual labor supply curve.

This setting contrasts sharply with an efficiency wage case where the employer sets the wage rate at an optimal -- productivity maximizing -- level (Kugler, 2003). This alternative theoretical explanation based on the theory of efficiency wages has been recently stressed in the works of Chang *et al* (2003), Fuess and Millea (2002), and also Fleisher and Wang (2001). Earlier works that highlighted the model abound in studies of Stiglitz (1976), Rodgers (1975), and Ezeala-Harrison (1992). The result of these conflicting theoretical findings is that while the subject has continued to attract debate, agricultural policy makers in large rural agricultural regions have continued endlessly to await pertinent policy prescriptions.

The present study applies a theoretical model which is used as a basis for an empirical analysis involving cross-sectional and time-series data on wage rates (of casual and permanent employment contracts), employment levels, and productivities, from various rural settings, to verify the true nature of these variables. The strength of monopsony control is verified empirically, and justification is made as to whether or not the theory of efficiency wages should apply in understanding the nature and functioning of two-tier labor markets in rural agriculture.

The basic tenets of the efficiency-wage model had been aptly used to model agricultural labor market sectors as early as Leibenstein (1957). This was later amplified by Stiglitz's (1976) study that employed the concept in the analysis of surplus labor in rural agriculture. Other studies that followed in the wake of these include the works of Rodgers (1975), Bliss and Stern (1978); and more recently Spencer (2003), Chen and Edin (2002), and Moretti and Perloff (2002).[1] However, these studies apparently limited themselves to the analysis of the wage-productivity nexus of the model; they did not apply the model to explain the behavior and functioning of agricultural labor markets, especially in regard to wage determination.

The efficiency wage theory which has attracted immense interest for modelling labor market behavior and wage inflexibility has the fundamental postulate that worker productivity is a positive function of the real wage paid, such that employers tend not to reduce wage payments even in the presence of excess labor supply, since such an action is considered to be productivity-diminishing. Current research on the model includes Staffolani (2002), Taylor (2003), Akerlof and Yellen (1990), and Carmichael (1990) among others.[2]

In the next section we draw on the major stylized facts on rural agriculture to set out our working model. The empirical work to test the model is given in the following section, and the final section gives the summary and some policy conclusions of the study.

STYLIZED FACTS AND THE EFFICIENCY WAGE MODEL[3]

Wage-employment in rural agriculture is characterized by monopsonistic power that the employer wields due to the extremely unequal land distribution, low labor mobility, and lack of alternative opportunities that exist (Moretti and Perloff , 2002; Bardhan, 1979). In various studies of rural agriculture, Fleisher and Wang (2001) as well as Bardhan and Rudra (1981) had established that agricultural operations are largely seasonal. Drawing from Osmani's (1991) propositions, Eswaran and Kotwal (1985) argued that in order to save on his hiring costs during the peak cropping and harvesting seasons, the rural agricultural employer tends to enter into explicit and/or implicit contracts with a group of laborers on a permanent basis to ensure steady supply of workers whenever needed. This position is echoed more recently by Fuess and Millea (2002).

The Akerlof-Yellen effort-augmented short-run production function can be stated as:

$$Q = Q[L.e(\omega,u)],\ \ Q'(.)>0,\ Q''(.)<0, \tag{1}$$

where e = the work effort per hour applied by the worker,

L = labor employed,

ω = the real wage rate per hour, and u = the local unemployment rate.

This gives output as a function of actual work effort derived from labor time employed. Work effort is a function of real wage paid, and local unemployment rate:[4]

$$e = e(\omega,u), \tag{2}$$

with effort sensitivity functions (or effort responses):

$$\partial e/\partial\omega = e_\omega(\omega,u) \geq 0,\ \ \partial e/\partial u = e_u(\omega,u) \geq 0;$$
$$\partial^2 e/\partial\omega^2 = e_{\omega\omega}(\omega,u) < 0,\ \ \partial^2 e/\partial u^2 = e_{uu}(\omega,u) < 0,$$
$$\partial^2 e/\partial\omega\,\partial u = \partial^2 e/\partial u\,\partial\omega = e_{\omega u}(\omega,u) = e_{u\omega}(\omega,u) = 0.$$

The two tiers of the agricultural labor market reflect the particular aspect of the effort sensitivity function that applies. Workers employed under permanent or semi-permanent labor-tying arrangements are assumed to have "positive effort-sensitivity" to the wage rate; that is, $e_\omega(\omega,u)>0,\ e_u(\omega,u)>0$. This is because such workers have less incentive to shirk, and the employer can use higher wages (and unemployment) to obtain self-enforcing "monitoring" on employees (that maximizes his profits).

On the other hand, workers employed under casual employment arrangements are assumed to have "null-effort sensitivity" to the wage rate; that is, $e_\omega(\omega,u)=e_u(\omega,u)=0$, because of the very nature of casual labor contractual arrangements, and as there are no disincentives to shirking. In this setting, the employer would not adopt an efficiency-wage policy since there would be no means for him/her to fully utilize the high productivity that would be forthcoming from the workers (as their services would be lost to him/her during the slack season when casual workers are discharged).

The typical monopsonist employer's wage function is

$$\omega = \omega(L),\ \ \omega'(L) > 0,\ \omega''(L) = 0. \tag{3}$$

The employer's objective function is

$$Max\ \Pi(L,\omega) = p(Q(.))\Omega Q[Le(\omega,u)] - (\omega L + \gamma(u,v)[\alpha L]), \tag{4}$$

where: Π = profit,

p = output price, where $p'\{Q(.)\} \leq 0$,

Ω = exogenously determined shift (technological) parameter for the production function,

γ = average incidental labor costs that is negative function of local unemployment level, and a positive function of quasi-fixed labor costs:[5]

$\gamma(u,v) \geq 0;\ \partial(\gamma(u,v))/\partial u = \gamma_1 < 0;\ \partial(\gamma(u,v))/\partial v = \gamma_2 > 0$,

α = fraction of casual labor in total labor employed (i.e. labor turnover rate per time period, $0<\alpha<1$).

The employer chooses the optimal values L* and ω* to satisfy equation (4); yielding the optimal wage rate -- the efficiency wage:[6]

$$\omega^* = p(.)\Omega Q'(.)e(\omega,u) - \{\omega'(L)L + \alpha\gamma(u,v)\}. \tag{5}$$

The slope of the labor demand curve (equation (5)) may now be verified to determine the nature of wage setting in the two tiers of the labor market. Assuming constant technology, total differential of (5) and simplification gives:

$$d\omega^*[1-p\Omega Q'e_\omega L\{pLQ''e+pQ'+p'Q'^3Le\}/pQ'L] =$$
$$dL[p\Omega e\{eQ''+Q'^2ep'/p\}-(\omega''(L).L+\omega'(L))]$$
$$+$$
$$du(p\Omega e\{Q''Le_u+Q'e_u^2/e+p'Q'^2L/p\}-\alpha\gamma_1)-\alpha\gamma_2 dv,$$

from which we obtain

$$\frac{\partial \omega^*}{\partial L} = \frac{p(.)\, e^2\, \Omega Q''(.) + e^2 (Q')^2\, \Omega p'(.) - (\omega' + \omega''.L)}{1 - p'Q\Omega\, e_\omega L[(p''LQe + p'Q + p'(Q')^3 eL)]/(p'QL)} \qquad (6)$$

Substituting $e'(.)=e_\omega(\omega,u)=e_u(\omega,u)=0$ for the casual labor market sector, we have

$$\partial\omega^*/\partial L = p(.)\Omega e(\omega,u)[e(\omega,u)Q''(.)-(\omega'(L) + \omega''(L).L) + Q'^2 e(\omega,u)p'(.)/p(.)] << 0. \qquad (7)$$

This suggests that flexible wages would induce labor market clearing in this tier, which is the normal situation expected.

However, allowing for $e_\omega(\omega,u)>0$, and $e_u(\omega,u)>0$ for the quasi-permanent labor-tying tier of the labor market, the sign of equation (6) is ambiguous. This suggests that as the efficiency wage rule is practised by the employer under labor-tying conditions, the optimal (efficiency) wage level would be inflexible downwards and the labor market would not clear. At this wage, any excess labor supply will result in unemployment as profit- maximizing employers would not hire workers at that or lower wage levels since it is believed that lower productivity would result from such employees.

LEMMA:

A representative rural agricultural employer i, operating with state of technology Ω_i (a proxy for Sattinger's (1983) capital intensity parameter), and employing L workers of whom αL are under casual labor arrangements (L^0), and $(1-\alpha)$L are under semi-permanent labor-tying arrangements (L*), maintains different wage levels for his employees:

$\omega^*_i\{p,\Omega^*_i,Q'(.),e_i,\gamma_i(u,v)\} > \omega^0_i\{p,Q'(.)\}$,

where ω^* = efficiency wage paid to L*, and is invariant to market conditions, and
ω^0 = wage paid to L^0, which is flexible.

EMPIRICAL ANALYSIS

Previous empirical studies on rural agriculture have concluded that the wage formation process is mainly determined by the employer's disposition at wage offers, especially in the casual sector, subject to worker productivity and availability requirements (Chang *et al.*, 2003; Binswanger and Rosenzweig, 1984; Bardhan and Rudra, 1981). The present study looks beyond casual employment arrangements that is a feature of just one tier of the rural agricultural labor market. Quasi-permanent employment in labor-tying arrangements are also examined, with a view to the explanation of how involuntary unemployment is consistent with rigid wage levels in the agricultural sector.

The wage equations (based on equation (5) of the model) are specified respectively for labor-tying employment:

$$\omega^*_i = \omega^*_i\{p,\Omega^*_i,Q'(.),e_i,\gamma_i(u,v)\}; \qquad (8a)$$

and for casual employment:

$$\omega^0_i = \omega^0_i\{p,Q'(.)\}. \qquad (8b)$$

The output equations are also specified respectively for labor-tying employment:

$$Q^*_i = Q^*\{L^*,\omega^*,p,\Omega^*_i,\gamma_i(u,v)\}, \qquad (9a)$$

and for casual employment:

$$Q^0_i = Q^0\{L^0,\omega^0,p,\gamma_i(u,v)\}. \qquad (9b)$$

The linear regression equations formulated in conformity to the theoretical results of equations (8a) and (8b) [for wages in Tier 1 and Tier 2, respectively], and (9a) and (9b) [for output in Tier 1 and Tier 2, respectively], are:[7]

$$WGE = INT + \alpha_1 LND + \alpha_2 DEP + \alpha_3 TYE + \alpha_4 BUSY + \alpha_5 LEAN + \alpha_6 UNEMP + \alpha_7 IRR + \alpha_8 \mathrm{PRICE} + \alpha_9 \mathrm{COST} + \varepsilon_1 \qquad (10a)$$

$$logQ = INT + \beta_1 log(WGE) + \beta_2 \, log(LND) + \beta_3 \, TYE + \beta_4 \, log(L) + \beta_5 \, IRR + \beta_6 \, log(COST) + \varepsilon_2 \qquad (10b)$$

where

WGE = daily wage received by the laborer within the week;
INT = intercept term;
LND = per capita land cultivated by laborer's family;
DEP = number of the laborer's dependents;
TYE = dummy variable: 1 if labor-tying, 0 if casual;
BUSY = dummy variable: 1 if busy season, 0 if not;
LEAN = dummy variable: 1 if lean season, 0 if not;
UNEMP = average unemployment rate in the region;
IRR = dummy variable: 1 if irrigated land, 0 if not;
PRICE = general price level of output;
COST = all other costs;
Q = yield of rough rice in bushels (1 bushel = 20.5 kg.);
L = labor input in man-days of 8 hours;
α_i's, β_i's = parameter estimates, (i=1,2,..9);
ε_j's = error terms, (j=1,2).

It is important to indicate the sign expectations of the various explanatory variables of the empirical wage and output equations (10a) and (10b), respectively. This is especially important for those variables that are crucial in the verification of the central hypothesis of the paper -- variables such as DEP,TYE, BUSY, LEAN, IRR, and COST.

For the wage equations (in both Tier 1 and Tier 2), it is expected that the parameter estimate for:

- LND be negative (as more land ownership means the worker works less hours for the employer).
- DEP be positive (in accord with the nutritional variant of the efficiency wage theory).
- TYE be positive (as permanently employed workers receive wage incentives in accord with the
efficiency wage rule).
- BUSY be positive (since workers earn higher wages during the busy cropping seasons).
- LEAN be negative (as workers earn lower wages during the slack cropping seasons).
- DEP be positive (in accord with the nutritional variant of the efficiency wage theory).
- IRR be positive (as application of higher technology enables workers receive higher wages).
- COST be negative (since higher quasi-fixed costs results in lower wage offers).

For the output equations (again, in both Tiers), it is expected that the parameter estimate for:

- WGE be positive for Tier 1 (according to the efficiency wage rule).
- TYE be positive for Tier 1 (since permanently employed workers produce higher

output due to higher wage offers).
- BUSY be positive (since worker output increase during the busy cropping seasons).
- IRR be positive in Tier 1 (of higher technology results in greater output).

The Data Set and Estimation

The data was collected from a cross-section survey of workers in different agricultural farm establishments in Indonesia, carried out by the author on field research activity in Indonesia during 2000. Additional survey data were obtained from the Indonesian Department of Agriculture and Rural Development. As a result of the vastness of the data set, the sample size covered were quite large. We anticipate a possible source of weakness in the data, in that they were collected only twice during each cropping period of the year. Also, there is the ever present inaccuracies that inevitably accompany statistical reports from Indonesia's government Departments. This may raise some question of how reliable the data would be. However, after comparing the data obtained from the Indonesian Department of Agriculture and Rural Development with those we collected directly from field research surveys, we noticed some degree of similarity and correspondence. This strengthened our faith on the reliability of the data set.

The data set comprises daily wages and output of permanent (Tier 1) and casual (Tier 2) workers in different rice farms, the average unemployment rate in the region, the general price level, and the number of dependents of each worker (a proxy for the worker's nutritional or subsistence requirements). A measure of some reasonable level of other non-wage costs as well as the average number of hours worked per worker during the week, are included. Table 1 provides the descriptive statistics of the variables used in the study. The sample means of the non-dummy key variables (DEP, LND, IRR, WGE, COST, Q, L) are shown for the full sample as well as for each of the Tiers. The sample size (N) is also shown for each case.

Table 1
Descriptive Statistics (Sample Means) By Tier

Variable	Full Sample	Tier 1	Tier 2
LND	4.26	3.94	3.88
PRICE	117.00	117.00	117.00
DEP	5.60	6.20	5.81
UNEMP	14.92	14.92	14.92
WGE	8.66	12.20	5.90
COST	121.00	119.52	116.60
L	18.00	23.00	13.00
Q	89.48	110.12	76.40
N	436	191	245

Notes: Tier 1 = Permanent (labor tying) contract employment
Tier 2 = Casual (seasonal) employment
Full Sample = a pooled sample (Tier 1 plus Tier 2)
N = Sample size.

It is presumed that the workers tend to compare the money wage and non-monetary attributes offered by the farm enterprise, with the prospective earnings from the alternatives, as a way of reaching their decisions as to whether or not to work for a particular agricultural farm enterprise. Further, the enterprise also decides and selects which workers should be given permanent contracts and which to give casual contracts. For example, the enterprise may have preference for a worker who has many children, and offer him or her a permanent contract, over a worker who has no dependents, to whom it would offer a casual contract. Marital status, and tribal affiliation with the manager of the enterprise may also be a determining factor in employing a worker on a permanent contract.

Table 2
Regression Estimates Of Agricultural-Wage Effects
Of Labor-Tying And Casual Employment Contract

Variable	ω^*_i	ω^0_i	Log Q^*_i	Log Q^0_i
INT	1.4986	1.0625	-1.019	0.0175
	(0.2101)	(0.1132)	(0.0116)	(0.1104)
LND/log LND	-0.9062**	-0.2801**	0.1005***	1.2081
	(2.0811)	(2.1521)	(1.9163)	(1.6168)
PRICE	0.0103***	0.0281***	1.1402**	0.1056
	2.8804)	(3.6901)	(2.0892)	(1.9671)
DEP	1.3021**	0.0105**		
	(3.0544)	(2.009)		
TYE	1.6110**		0.5209**	
	(4.1242)		(2.1061)	
BUSY	0.9921**	0.5994***	1.3091**	0.9308**
	(4.0254)	(2.7332)	(2.9921)	(2.1103)
LEAN	-0.8168***	-1.0881***		1.4090**
	(2.8615)	(3.8842)		(3.1031)
UNEMP	-0.9023	-1.067		
	(4.0223)	(3.1147)		
IRR	1.8816**	0.0032**	0.9891**	
	(2.3013)	(4.0024)	(2.0402)	
WGE			0.6214**	0.1131
			(2.9071)	(0.1662)
COST/log COST	-1.5422**	-1.092***	0.3112	
	(3.4340)	(1.8280)	(2.1102)	
L/log L	0.0018**	1.4811**	0.4278**	0.6918
	(2.1160)	(3.1071)	(2.0351)	(1.9903)
R^2	0.209	0.211	0.180	
F	42.1	39.4	33.7	29.6

Notes: t-statistics in parentheses.
** Significant at 5% level
*** Significant at 10% level
(Wages used in regression are cross-sectional averages).

Table 2 gives a tabulation of the regression results. All the equations are estimated using the 2-stage least squares method. The parameter estimates appear to be consistent with what the theoretical analyses suggest. Use of the *t*-test indicates that most of the estimated coefficients are significant. The values of the *F*-ratios also confirm an overall significance. The low values of R^2 seem to be due to the reliance on cross-sectional data for the variables concerned. Also, despite the high *F-ratios*, a pairwise correlations test of the presence of multicollinearity is performed -- especially among the variables: LND, DEP, and UNEMP -- to ascertain the reliability of their estimated coefficients. A weak *correlation coefficient* (0.2104) is found among these three variables. However, because dropping these variables from the regression model does not significantly change the magnitudes of the original parameter estimates, we reckon that the presence of multicollinearity has not posed a serious problem.

Tier 1 Wage Rates

The wage rate of semi-permanently employed, labor-tying agricultural labor (ω^*_i), is positively affected by the general price level of agricultural output, the worker's level of (nutritional) subsistence requirements (i.e. indicated by the number of dependents), labor-tying contractual arrangement (indicating higher productivity of experienced farm workers who are permanently employed under labor-tying agreements), the relatively busy seasons of farming, and the level of technology (proxied by the amount of irrigation facility). The positive coefficients of IRR and BUSY support the effects of technology (implied by changes in the parameter Ω, of the model) -- IRR being the measure of farm irrigation facilities and equipment employed; and BUSY capturing the ability of the enterprise to engage modern cultivation techniques that allow uninterrupted production to continue even through the so-called slack season.

Tier 1 wage is negatively influenced by the relatively lean cropping season, the level of the worker's own household land cultivation, the current unemployment rate in the region, and the size of quasi-fixed labor costs. The estimate for labor demand effects of Tier 1 wage is not significantly different from zero, implying that this wage is invariant to market forces.

The negative coefficient of LND implies that the larger the per capita land area cultivated by each worker's household, the more difficult and hence costly it would be to recruit workers (the higher is v) and hence the lower would the wage rate be.[8]

Tier 2 Wage Rates

In Tier 2, the casual labor market sector, while the estimated coefficients of the technology variable, and number of dependents the worker has, are both not significantly different from zero, that of the labor market demand is. These indicate that whereas the labor-tying wage is influenced by productivity-related factors such as technology and nutrition while not responsive to changes in labor demand, the casual wage rate exhibited competitive traits, as argued in the theoretical model.

Productivity Effects

We utilize the productivity estimates to calculate the marginal productivities of labor and output-elasticities of labor in the two tiers. These estimates will be used also to verify the phenomenon of monopsony wages in rural agriculture.

In Tier 1, for a given area of land and a given level of miscellaneous costs, we can write, from the output equation:

$$log\ Q = log\ k + 0.4278\ log\ L, \ \ \text{k = constant} \tag{11a}$$

The output-elasticity of labor is given from this:

$$\sigma = d(logQ)/d(logL) = 0.4278. \tag{11b}$$

Further, $log\ Q = log\ (kL^{0.4278})$, or $Q = kL^{0.4278}$,

from which we obtain the marginal product of labor:

$$MPL = AL^{-0.4278}$$

where $A = 0.4278k$ = constant.[9]

To verify monopsony wage in this sector,

$$log\ MPL = log\ A - 0.4278\ log\ L.$$

Using this equation for known values of A and L we have obtained the marginal product of labor as *0.57 kilograms* of rough rice per man-hour. This value we compared to the going real wage in 2001 of about *0.39 kilograms* per man-hour in the region. The going (subsistence) wage rate was *12.25 Ruppiah* per man day equivalent of rough rice. Thus, the 0.57 kilograms per man-hour marginal product which yields 4.56 kilograms per man-day (0.57 times 8-hour working day) translates to an amount of money wage:

$\{12.25 \times 3.12\}/4.56 = 8.38$ *Ruppiah.*[10]

This daily wage rate of 8.38/day is lower than the marginal product of 12.25 per day. Thus the marginal product of labor is higher than the wage rate in the sector, an evidence that verifies a monopsony setting.

SUMMARY AND POLICY CONCLUSIONS

This study has verified the existence of a two-tier labor market in a typical rural agricultural setting. Efficiency wage behavior characterize a primary sector (Tier 1) of the labor market in which factors such as technology and productivity tend to influence the wage rate, and in which market supply and demand forces do not seem to play significant roles in wage determination. A market-clearing (secondary, Tier 2) sector of the market also exists in which the wage rate is flexible and the market clears in the expected fashion. It has also shown that involuntary unemployment is consistent with equilibrium (or disequilibrium) in the labor market as employers stick to their optimal employment levels at the efficiency wage and only hire from the casual labor pool during the peak seasons under competitive conditions.

The evidence in this study appears to aptly explain the stylized facts on rural agricultural wage formation. In particular, the notion of an equilibrium wage achieved through "implicit cooperation" among workers while employers respond passively by merely choosing the level of employment (Osmani, 1991), seem only to apply to the competitive Tier 2 (casual) sector of the rural labor market.

This study provides an alternative approach for explaining why rural wage rates are known to vary widely among workers and across regions. It has important policy implications for improvement of employment and earnings in rural agriculture. As employment and wages of permanently employed farm workers are dependent on technology, policy makers can devise alternative ways of improving rural employment, through adoption of varied technology. As for casual farm workers, authorities can rely on the workings of the labor market forces to set the appropriate wage and employment levels.

It must be noted that some limitations may attach to the above conclusions because of some weaknesses associated with the data used in this study (they were collected only twice during each cropping period of the yea), and also because of possible inaccuracies in the data figures themselves. The presence of some multicollinearity in the regression model (although very weak) also raises some concern about the reliability of the parameter estimates. These limitations compel us to suggest that the results and conclusions of this study need to be taken with some caution; although, overall, they indicate that a two-tier explanation of wage earnings in rural agriculture contributes remarkably in understanding the phenomena of earnings differentials among rural agricultural workers.

ENDNOTES

1. Osmani (1991) credits Dreze and Mukherjee (1987) as well as Binswinger and Rosenzweig (1984) for excellent critical evaluations of the early theories on rural wage determination that draw on the notion of efficiency wages.
2. Among the works of Akerlof (1984), Krueger and Summers (1988), and Raff and Summers (1987), and more recently Taylor (2003), and Spencer (2002), several applications have been made of the model in explaining such attributes of the labor market as involuntary unemployment, market segmentation, and wage vagaries for identical job skills. For these, see Shik-Heo (2003), Chen and Edin (2002), Weiss (1990), and Akrlof and Yellen (1986).
3. Several variants of the efficiency wage model are fully explored in Kugler (2003) as well as Weiss (1990); therefore we simply adhere to the general notion of the employer's bid to stick to an optimizing wage rate, without delving into particular aspects and versions of the model.
4. This introduces unemployment as a shirking-deterrent, at least from the employer's viewpoint [see Spencer (2002); Carmichael (1989, 1990)]. The employer therefore has advantages in higher unemployment rates which serve as "worker discipline device" in the Shapiro and Stiglitz (1984) frame.
5. Incidental labor costs are lesser under higher unemployment rates and higher under lower unemployment rates, as suggested by Stiglitz's (1974) "Labor Turnover model" whereby a higher unemployment rate reduces turnover as employees face lesser alternative job openings. Costs, however, increase as additional workers are contracted for replacement and/or expansion. These costs (e.g. transportation and feeding costs) represented by γ, are said to be <u>incidental</u> because they are incurred only if the employer

needs to augment his/her employment levels.

6. The optimal wage ω* is not only the profit-maximizing wage, it also satisfies the "Solow condition" (see Fleisher and Wang (2001), or Akerlof and Yellen (1986)) -- the unitary wage-elasticity of effort property of efficiency wages.

7. Note that while the empirical wage equation (10a) is expressed in its regular form, the empirical output equation (10b) is expressed in natural log form. This is done to simplify the estimation of output-elasticity of labor to be carried in a subsequent section below.

8. In the absence of the v factors, the wage rate would be higher instead -- the employer has to pay higher wages in order to attract workers who would otherwise be engaged in their own farms. Ahmed's (1983) established a positive coefficient for tenancy (explained as the proportion of leased land to the total cultivable land owned by a farm worker).

9. This reveals an interesting feature about the Cobb-Douglas property of the production function in rural agriculture.

10. Monetary unit is Indonesian Ruppiah, the source of the data used in the study. The 0.39 kg./man-hr x 8 hrs/day yields 3.12kg./day.

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