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Working Paper

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Harvard University Migration and Development Program Discussion Paper, No. 44

Suggested Citation: Shukla, Vibhooti; Stark, Oded (1989) : Why are Urban Formal Sector Wages in LDCs above the Market-Clearing Level?, Harvard University Migration and Development Program Discussion Paper, No. 44, Harvard University, Center for Population Studies Cambridge, Massachusetts

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Discussion Paper Series

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WAGES IN LDCs ABOVE THE
MARKET-CLEARING LEVEL?

by

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June 1989

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ABSTRACT

In this paper we link urban labor market dualism and the fixity of formal sector wages in expected income migration models with urban agglomeration economies. A possible productivity- efficiency rationale for the "institutional" wage is identified and explored. In addition, a rationalization for the informal sector is suggested in this context. We propose a motivation for determinating high urban wages as part of a choice-theoretic behavioral framework, perform illustrative simulations of factors influencing an equilibrium urban wage premium, and point out directions for further research delineated by our analytical propositions.

I.

Why is it that in many urban labor markets in LDCs (Less Developed Countries) high wages coincide with considerable unemployment? Suppose labor is perfectly homogeneous and that the urban economy needs to attract workers from rural areas to fill industrial and other positions. If workers are standard income maximizers, then, other things being equal (and ignoring transfer costs), why would not an urban wage larger than the rural wage by a mere $\epsilon > 0$, i.e. $W_U = W_R + \epsilon$ suffice to induce all the requisite rural-to-urban migration? Why do we so often observe $W_U = kW_R$ with $k \gg 1$?

By and large, these simple questions have not been satisfactorily answered in the development literature in general and in the urban and migration literature in particular. The standard approach, adopted and replicated in numerous writings, has been to attribute the high (often very high) urban wages relative to the rural wages to exogenous, institutional factors, in particular labor and wage legislation. But this "explanation" is far from satisfactory.¹ Suppose legislators are familiar with the expected income model of migration and believe that workers act as the model prescribes. They must then realize that the imposed high wage will entail high unemployment, and it ought to concern them that the latter could (should) undermine adherence to, or compliance with, the former. For one thing, in a bid to reduce costs, firms could "cross-over" - switch operations away from the protected (regulated) domain (for example, sub-contract).

And the unemployed would surely attempt to replace the high-paid workers by bidding down the wage rate. What reasons would there be for the legislators and their economic advisers to believe that these reactions will not arise? The easiest explanation may have to do with the fact that productivity is dependent upon wages - the so-called efficiency wage hypothesis: When productivity is raised by increased wages, it is quite plausible for efficiency to mandate equilibrium wages at above market-clearing levels. The unemployed who may offer to work for less than the controlled wage will be turned down since productivity will be adversely affected by more than the fall in the wage rate. Notice that implicitly this assumes that the prevailing productivity-wage combination is at an optimum, which raises the possibility that causality will run in the reverse direction: Firms identify that wage rate which through its functional link with productivity maximizes their profits. They "go to the government", letting it know which wage it should announce as the institutional wage. It should also be noted that pressure from the unemployed to obtain the high paying jobs through means other than wage cutting (viz., rent-seeking behaviour) must also be recognized and addressed. Yet, could it be that in general the unemployed are willing accomplices to the institutional wage fixation, thereby contributing to its stability? Consider the following argument: Workers (who, to simplify, we shall assume are risk-neutral) value and evaluate alternative combinations of pay and leisure. Suppose $W_u = kW_r$ with the jobs paying institutional-wage being periodically shuffled and randomly reallocated among all

labor market participants. This means that whereas in the rural economy a worker needs, say, one unit of work per period to earn W_r , in the urban economy the expected number of work units per period necessary to earn W_r is $1/k$; to each unit of work time, $1 - 1/k$ units of valuable leisure are added - a notable improvement indeed. Firms can also be seen to favor this regime. Suppose firms can either employ given workers several periods in a row paying each W_r per period or alternatively have a worker work for a period, be paid W_u , rest $k-1$ periods and then again be employed for a period and be paid the W_u wage. If there are k workers available, the firm can still have its work schedule uninterrupted yet reap significant efficiency gains if rest in periods $t-(k-1)$, $t-(k-2)$,, $t-[k-(k-1)]$ is strongly complementary to effort exertion in period t - as is quite likely to be the case in occupations and tasks requiring considerable physical strength (e.g. construction, assembly lines, etc.). Hence, a rationale arising from both sides of the market, leading to the "peaceful coexistence" of unemployment and above-clearing level wages, appears to exist.

Notice that this argument contrasts sharply with the conventional turnover argument which hypothesizes that wages are maintained at a high level in order to reduce costly turnover. Here high wages facilitate beneficial turnover. Note also that the assumed turnover does not entail a complete skill depreciation and loss in productivity. Indeed, given a rest-effort enhancing functional relationship, firms may trade-off the effort gains

against the proficiency losses to solve for the optimal k from which the ("invited", not imposed) institutional urban wage is derived as kW_p .

The mechanism through which an urban labor force significantly larger than the pool of the employed confers productive efficiency gains may, however, arise from considerations external to the individual firms. These considerations relate to agglomeration economies - economies of external scale which confer efficiency advantages to factors of production employed in activities carried out in locations characterized by populations of large absolute size and high density. There are several reasons for these economies of scale. One reason which is of particular interest to us can be explained as follows. Unless output demand is known to be perfectly stable or is anticipated with perfect foresight, costly inventories and slacks - lost profit opportunities - are bound to arise. Retaining our assumption of labor homogeneity, the immediate presence of a readily available (i.e. low cost) labor pool from which extra workers can be drawn and into which redundant workers can be laid off is costless to the individual firm and, hence, constitutes a superior alternative to costly inventories and slacks. Note that since there will always be $k-1$ times more productive workers in the urban economy than the number of workers actually employed, the reserve ratio to allow for sudden upsurges in demand will remain, throughout, exactly the same. (The adjustment in absolute numbers will, of course, arise from rural-to-urban in-migration or from urban-to-rural out-migration). The

regulated (protected wage) sector of the urban economy thus benefits from having a large labor force at its access or disposal, at no direct cost to itself.

For nearly two decades now, a vastly popular paradigm for rural-to-urban migration in LDCs within a two-sector framework has been a model closely associated with Harris and Todaro.² The conclusions of this model and its variants critically depend upon the assumption of a rigid urban institutional wage, which in combination with the postulated expected income migration response produces urban unemployment in the intersectoral labor market equilibrium. Extensions and refinements of the model (e.g., the introduction of the informal sector) have tempered its prediction of substantial urban unemployment; they all, however, retain the distinguishing high-wage feature and continue to yield the comparative static outcome of the unemployment-augmenting consequences of additional urban job expansion, and the welfare implications of the economy-wide inefficiency arising from the apparent wage fixity.³

Allowing a functional link between the institutional wage and urban scale economies makes it possible to model the urban economy such that firms indeed select a wage rate which brings their profits to a maximum by conferring upon them the associated productivity-enhancing scale economies. If scale economies cannot arise unless the urban labor force is larger than the protected labor force (that is, the labor force earning the institutional wage) then, the wage rate must be above the clearing level. Seen

in this light, an urban institutional wage is not an impediment to productive efficiency but rather a means to bring it about.

In the literature pertaining to urban growth and equilibrium city size, agglomeration or external scale economies are hypothesized to encompass large city advantages of low input prices, better input availability, and several informational, communication and amenity advantages - including benefits of public good availability - that positively impinge on productive efficiency. These economies contribute to the "pull" that attracts and retains many migrants in the cities of developing countries. Recently their direct impact upon total factor productivity in developed and developing countries alike has been documented with considerable success.⁴ Further, there is reason to believe that many of the stipulated advantages may occur in the form of firms' access to large site-specific urban labor markets where a large labor pool serves to perform an insurance, inventory or, when the labor force is less than perfectly homogeneous, a "matching" function. In line with the arguments offered above, the high institutional wage, irrespective of how it comes about, seems to operate so as to foster more efficient urban production. To formalize our ideas we shall develop a model for determining the size of the urban work force and employment in the context of rural labor flows to an urban area characterized by an institutional rigid wage and agglomeration economies.

The plan of the rest of this paper is as follows. Section II sets out an equilibrium urban size formulation with a standard

expected income migration model; a noteworthy feature of this formulation is that the urban production function has as arguments two types of labor - production-enhancing employed labor and scale economies - enhancing total urban labor. Section II also adds a layer of realism to the model by accommodating the possibility of an informal sector. With the aid of a simple model a possible agglomeration-efficiency rationale for this sector is offered in Section III. Section IV sets out a choice framework wherein the high urban wage is determined as an equilibrium response. Section V provides illustrative simulations of factors influencing the urban wage premium and presents our conclusions.

II.

Assume that a city's "basic" output is produced in the formal sector under an aggregate relationship given by:

$$Q = G(N)F(N), \quad \text{where } G', F' > 0; F'', G'' < 0 \quad . \quad (1)$$

N enters the aggregate production function $F(\cdot)$ as total urban employment in the formal sector activity, and the $G(\cdot)$ function as the total urban area workforce. If formal sector employment is the only urban productive employment then, under full employment, urban employment is equal to the total urban workforce. The external scale shifter $G(\cdot)$ incorporates the agglomeration influence. Urban wage level in this production activity is the equilibrium economy-wide wage, W , parametric to individual firms.

In conventional formulations, with the urban export good price normalized to unity, firms' private employment decisions, derived

in the aggregate from

$$\text{Max. } [G(N)F(N) - WN] \quad (2)$$

will lead to equilibrium (formal) sector employment N^e given by:

$$G(N^e)F'(N^e) = W, \quad (3)$$

where the external $G(\cdot)$ factor is viewed as parametric. By contrast, the socially optimal solution which recognizes the productivity shifts associated with each employment decision, will lead to urban employment at the level N^* arising from a first order condition incorporating the variability of $G(N)$:

$$G(N^*)F'(N^*) + G'(N^*)F(N^*) = W \quad . \quad (4)$$

Under our assumptions regarding the sign of $G'(\cdot)$, we conclude that the private urban labor force and employment are suboptimal in size, i.e., $N^e < N^*$. Also, the policy implication is that optimal migration to cities should be greater than it is.⁵

This result does not intuitively tally with the popular perception that rural-to-urban migration is excessive since migrants cannot be gainfully absorbed at LDCs' prevailing rates of industrial expansion. The expected income model of intersectoral labor supply implies that urban employment, N_M , is determined through

$$G(N_M)F'(N_M) = \bar{W} \quad (5)$$

where \bar{W} is the "institutionally" set high urban wage (and the $G(\cdot)$ function reflects, as before, the presence of agglomeration economies). However, in this model, urban workforce, N_U , is determined through a distinct process wherein, given the rural wage W_R , cityward migration is in response to an N_M/N_U probability of

receiving a \bar{W} -paying urban job, i.e.

$$W_R = \bar{W} (N_M/N_U). \quad (6)$$

In other words, migration takes place so as to equalize the rural wage with the expected urban wage, the latter being given by \bar{W} times the urban employment rate. The employment rate - the probability of obtaining urban formal sector employment - will subsequently be referred to as p_1 .

The wedge introduced between formal sector urban employment and the total urban work force (which, in the context of the formulation above, implies that $N^e \neq N_M \neq N_U$ - the first inequality arises from $W_R \neq \bar{W}$) is reflected in $p_1 < 1$, characterizing non-clearance of the urban labor market. The discrepancy between urban work force and urban employment $U = N_U - N_M$, represents equilibrium unemployment.

Given our hypothesis about the operation of the labor agglomeration advantage, might it not be that N_U in fact approaches N^* whereas N_M falls short of N^* , and the urban workforce as a whole, not just formal sector employment, enters the agglomeration specification $G(\cdot)$? An appealing possibility is that in developing countries, where fairly uniform low skill levels make labor highly substitutable, N_U is the appropriate argument⁶ of the external productivity function $G(\cdot)$. The private urban employment decision then implies

$$G(N_U) F'(N_M) = \bar{W}. \quad (7)$$

Following this line of thinking, there might be a need for a mechanism to sustain an N_U sufficiently larger than N_M while not

actually employing the $N_U - N_M$ workers within the formal sector. Put differently, if the desired N_U is relatively so large as to entail prohibitively high labor costs for firms, could the desired N_U be sustained through alternative means?

Assume that urban production takes place with two factors, labor and capital, the latter being available at a nationally determined equilibrium price common to all sectors and regions. As before, the urban product is sold at a parametric "world" price, normalized in our model to unity. Formal sector production takes place under

$$Q = G(N_U) F(N_M, K), \quad \text{where } G' > 0, \quad (8)$$

and $F(\cdot)$ is characterized by decreasing returns to scale. Suppose first, as before, that labor supplied to the urban economy is determined through the migration equilibrium condition:

$$W_R = p_1 \bar{W} \quad (9)$$

where, with unemployment the only alternative to absorption in the formal sector, $p_1 = N_M/N_U < 1$, and W_R is the prevailing rural wage. Private maximization by firms takes the form

$$\text{Max. } [G(p_1^{-1} N_M) F(N_M, K) - \bar{W} N_M - rK], \quad (10)$$

leading to the first-order conditions that yield N_M^e and K^e :

$$G(p_1^{-1} N_M^e) F_N(N_M^e, K^e) = \bar{W} \quad (11)$$

and

$$G(p_1^{-1} N_M^e) F_K(N_M^e, K^e) = r \quad (12)$$

However, a formulation incorporating the "external" productivity factor leads to an alternative first-order condition for labor as follows

$$G(p_1^{-1}N_M^*) F_N(N_M^*, K^*) + p_1^{-1}G'(N_M^*) F(N_M^*, K^*) = \bar{W} \quad (13)$$

generating optimal urban sector employment N_M^* along with K^* which arises from a condition analogous to (12).

We are now ready to incorporate the urban informal sector. Predictions of urban unemployment rates based on a relationship such as (6) have consistently yielded overestimates. In addition, many urban labor market studies have documented a formal-informal dichotomy along with a residual unemployment mitigating subsector. The combined effect of a high wage, rural workers' migration response and the presence of a low-wage informal sector to "hold" these urban labor market entrants presents a situation conducive to reaping agglomerative benefits by formal sector firms.

We model the informal sector through a simple postulated multiplier relationship between it and the formal sector, so that the number of jobs it offers is θN_M where θ is a linkage coefficient. Such linkages are conceptualized as occurring, for example, when a modern large-scale capital-intensive sector is serviced by small-scale labor-intensive enterprises using traditional methods.⁷ The employment structure which results affects the behavior of migrants' who now respond to the equilibrium condition:

$$W_R = \bar{W}(N_M/N_U) + W_I(\theta N_M/N_U) \quad (14)$$

where W_I is at- or near-subsistence informal sector wage. Hence

$$N_U = [(\bar{W} + W_I\theta)/W_R]N_M \quad . \quad (15)$$

We designate $[W_R/(\bar{W} + W_I\theta)]$ as p_2 . Note that $p_2 < p_1$.

It is important to note that unlike p_1 , p_2 does not represent the

levels. We shall then compare the "private" employment level to the "social" employment level, first under a scenario of full employment and then under a scenario of unemployment arising from expected income induced migration. With the insights generated by these comparisons we shall turn to comparisons admitting the presence of the informal sector. Table I clarifies the full range of possibilities:

Table I: Alternative Formal Sector Employment Levels

Scenario	<u>PRIVATE</u>	<u>SOCIAL</u>
<u>FORMAL SECTOR ALONE</u>		
Full Employment	[1] $N_M^e (p_1 = 1)$	[2] $N_M^* (p_1 = 1)$
Migration-induced Unemployment	[3] $N_M^e (p_1 < 1)$	[4] $N_M^* (p_1 < 1)$
<u>FORMAL AND INFORMAL SECTOR</u>		
Full Employment	[5] $N_M^{le} (p_2 = 1)$	[6] $N_M^{I*} (p_2 = 1)$
Migration-induced Unemployment	[7] $N_M^{le} (p_2 < 1)$	[8] $N_M^{I*} (p_2 < 1)$

To facilitate pairwise comparisons, in the next section we shall utilize a specific version of the model.

III.

We specify the model⁸ as follows: $G(.) = (N_U)^\tau$, and $F(.) = (N_M)^\alpha (K)^\beta$, where $0 < \alpha, \beta, \tau < 1$, and $h = \alpha + \beta + \tau < 1$, to ensure finite city size. The ratio of formal sector urban employment to the urban workforce is p_1 , implying that $N_U = p_1^{-1} N_M$. Formal sector

urban production is then given by:

$$Q = (N_U)^\tau (N_M)^\alpha (K)^\beta \quad . \quad (17)$$

Equilibrium formal sector employment will be determined through a private decision-making calculus that yields the following first-order conditions for maximum profit corresponding, respectively, to (11) and (12):

$$(\alpha/N_M) (p_1^{-1} N_M)^\tau N_M^\alpha K^\beta = \bar{W} \quad (18)$$

and

$$(\beta/K) (p_1^{-1} N_M)^\tau N_M^\alpha K^\beta = r \quad . \quad (19)$$

Substituting (17) in (18) and (19), we get

$$Q = (\bar{W}/\alpha) N_M \quad (20)$$

and

$$K = (\beta/r) Q \quad . \quad (21)$$

By resubstituting (21) in (17), we obtain

$$Q = (p_1^{-1} N_M)^{[\tau/(1-\beta)]} N_M^{[\alpha/(1-\beta)]} (\beta/r)^{[\beta/(1-\beta)]} \quad (22)$$

and finally, by substituting (22) in (20), the equilibrium formal sector employment, N_M^e is derived, for the general (urban unemployment admitting) case where $p_1 < 1$,

$$N_M^e = (\alpha/\bar{W})^{[(1-\beta)/(1-h)]} p_1^{[-\tau/(1-h)]} (\beta/r)^{[\beta/(1-h)]} \quad (23)$$

and, for the special full employment ($N_M = N_U$) case of $p_1=1$,

$$N_M^e = (\alpha/\bar{W})^{[(1-\beta)/(1-h)]} (\beta/r)^{[\beta/(1-h)]} \quad . \quad (24)$$

A solution satisfying the altered first-order condition for labor likewise emerges from an expression corresponding to (13). The conditions for social optimization and subsequent derivations are similar, with the exception that (20) is now replaced by the expression below

$$Q = [\bar{W}/(\alpha + \tau)] N_M \quad . \quad (25)$$

The procedure now yields N_M^* , which, for the general case wherein a hypothetical planner addresses just the externality but not the unemployment problem, is given by

$$N_M^* = [(\alpha + \tau)/\bar{W}]^{[(1-\beta)/(1-h)]} p_1^{[-\tau/(1-h)]} (\beta/r)^{[\beta/(1-h)]} \quad (26)$$

and for the special case where the planner's objective is also to secure full urban employment would be:

$$N_M^* = [(\alpha + \tau)/\bar{W}]^{[(1-\beta)/(1-h)]} (\beta/r)^{[\beta/(1-h)]} \quad . \quad (27)$$

Likewise, equilibrium formal sector employment in the presence of the informal sector will be

$$N_M^{le} = (\alpha/\bar{W})^{[(1-\beta)/(1-h)]} p_2^{[-\tau/(1-h)]} (\beta/r)^{[\beta/(1-h)]} \quad (28)$$

which is similar to (23) above, except that p_2 replaces p_1 . Finally, the social planner's optimum in the presence of the informal sector is the appropriate modification of (26):

$$N_M^{I*} = [(\alpha + \tau)/\bar{W}]^{[(1-\beta)/(1-h)]} p_2^{[-\tau/(1-h)]} (\beta/r)^{[\beta/(1-h)]} \quad . \quad (29)$$

Each of these two expressions will reduce to their "formal-sector-only" counterparts (24) and (27) under full employment.

We now have all the expressions necessary to perform the appropriate comparisons. From expressions (24) and (23) above, entailing comparisons between entries [1] and [3] in Table I, we note that

$$\begin{aligned} (A) \quad [N_M^e | (p_1 = 1)] / [N_M^e | (p_1 < 1)] \\ = p_1^{[\tau/(1-h)]} \\ < 1, \quad \text{since } h < 1. \end{aligned}$$

Again, from equations (27) and (26), we can compare entries [2] and [4] in Table I:

$$\begin{aligned}
\text{(B)} \quad [N_M^* | (p_1 = 1)] / [N_M^* | (p_1 < 1)] \\
= p_1^{\tau/(1-h)} \\
< 1, \quad \text{since } h < 1.
\end{aligned}$$

From equations (27) and (24), a comparison of [2] and [1] in Table I gives:

$$\begin{aligned}
\text{(C)} \quad [N_M^* | (p_1 = 1)] / [N_M^e | (p_1 = 1)] \\
= [(\alpha + \tau)/\alpha]^{[(1-h)/(1-h)]} \\
> 1, \quad \text{since } h < 1.
\end{aligned}$$

And similarly, from evaluating entries [4] and [3] in Table I,

$$\begin{aligned}
\text{(D)} \quad [N_M^* | (p_1 < 1)] / [N_M^e | (p_1 < 1)] \\
= [(\alpha + \tau)/\alpha]^{[(1-h)/(1-h)]} \\
> 1, \quad \text{since } h < 1.
\end{aligned}$$

Whereas results (C) and (D) nicely square with intuition, (A) and (B) are counterintuitive: they suggest that in a state of unemployment arising from an expected income induced migration more workers are actually employed in the formal sector than in a state of full employment. In the full employment neoclassical scenario, when the wage rate is allowed to adjust, urban formal sector employment is expected to increase. But here in the absence of the expected income mechanism including the institutional wage (i.e., with $p_1 = 1$), not as many workers migrate as in its presence, and the $G(\cdot)$ function is denied the productivity-enhancing effects of a larger urban workforce. Hence, less employment can be privately sustained. In other words, if agglomeration benefits that enter

through the external productivity specification arise from the size of the total workforce, then the expected income migration mechanism, in conjunction with a high institutional wage, makes for a more productive urban environment facilitating higher levels of employment.

In fact, it would be quite instructive to observe the effects of equating entries [2] and [3] in Table I. These bear values given by (27) and (23) respectively. Suppose we assume:

$$(E) \quad N_M^* | (p_1 = 1) = N_M^e | (p_1 < 1) \quad .$$

This implies $p_1 = [\alpha/(\alpha + \tau)]^{[(1-\beta)/\tau]}$. Since $\alpha/(\alpha + \tau) < 1$ and $(1-\beta)/\tau > 0$, it follows that

$$p_1 < 1$$

which is a necessary condition for the existence of urban unemployment due to the fixed institutional wage!

What we have just observed is that equivalence of the effects of private maximization with social optimization is consistent with a necessary condition for the existence of urban unemployment due to the high "institutional" urban wage, under the assumption that agglomeration benefits stem from the presence of the overall regional workforce. Within the informal sector scenario, we can perform an analogous exercise and will similarly find that a departure from full employment, viz., $p_2 < 1$, will be necessary so that the benefits from unaided private decisions in the presence of the institutional wage approach the benefits of full employment social optimization by an omniscient planner.

We can now ask whether any useful consistency relationships

obtain between the "formal sector alone" and "formal and informal sector" scenarios. That is, can it now be demonstrated that the private informal sector serves as a repository of labor that achieves the same productivity results as social optimization internalizing agglomeration economies does in the absence of this sector? Two relevant expressions that may be chosen for comparison in order to isolate the effect of the informal sector are those from entries [4] and [7] in Table I. Naturally, the case $p_2 < 1$ rather than the case $p_1 = 1$ is selected for the exercise of comparison because the latter case precludes the existence of any unemployment outside the formal sector at all, making the informal sector, as it were, redundant.

Equating the relevant expressions,

$$(F) \quad N_M^* | (p_1 < 1) = N_M^I | (p_2 < 1)$$

we obtain equality of expression (26) with (28):

$$(\alpha/\bar{W})^{[(1-B)/(1-h)]} p_2^{[-\tau/(1-h)]} = [(\alpha + \tau)/\bar{W}]^{[(1-B)/(1-h)]} p_1^{[-\tau/(1-h)]}$$

implying

$$(p_1/p_2)^\tau = [(\alpha + \tau)/\alpha]^{1-B} \quad . \quad (30)$$

Since $\tau > 0$, the right hand side, and hence the left hand side of (30) are greater than unity, implying $p_1 > p_2$, which, under our assumptions, is a necessary condition for the informal sector to exist. Thus we derive a rationalization for the informal sector emerging from comparison of the respective expressions for what we have designated "optimum" employment, and equilibrium formal sector employment in the presence of the informal sector. What the implication confirms is that the presence of a complementary

informal sector allows proportionally fewer employees to be sustained in formal sector employment as a fraction of the total urban workforce. The rationalization demonstrates that the urban informal sector serves to restore efficiency to a situation which otherwise, under conditions of agglomeration economies and expected income induced migration, would have yielded a suboptimal urban workforce.

IV.

While the foregoing analysis serves to establish the consistency of the dualistic urban wage structure postulated in the expected income migration model with an agglomeration economies explanation, it stops short of fully explaining the formation of the institutional wage. To model the determination of the institutional wage it is necessary to cast the problem in terms of a rational firms' choice framework. Here the distinction between private outcome and social optimum vanishes as the urban wage is sustained as an efficient equilibrium wage. In the present section we develop an argument along these lines, utilizing the general model of Section II.

Assume the urban wage is defined as $W_U = kW_R$, where w_R is the given rural wage level. $k \neq 0$ is a factor of proportionality that can now be regarded as a choice variable from the viewpoint of profit maximizing urban formal sector firms. Since this maximization takes place in the context of an expected income migration framework, the migration condition is

$$W_R = (N_M/N_U) W_U \quad (31)$$

implying, in light of $W_U = kW_R$

$$N_M/N_U = W_R/W_U = 1/k \quad . \quad (32)$$

Hence it follows that

$$N_U = kN_M \quad . \quad (33)$$

Note that the migration condition (31), which posits an intersectoral equilibrium labor allocation, represents the rural labor supply faced by urban producers in the formal sector.

Firms now maximize the following objective function:

$$\text{Max. } [G(kN_M)F(N_M, K) - (kW_R)N_M - rK] \quad (34)$$

where it is apparent that they choose both employment, N_M and the wage factor, k , as well as the desired capital stock, K . It is evident that substituting (31) and (33) in (34), an equivalent characterization of this problem can cast the decision in terms of choosing N_M , N_U and K :

$$\text{Max. } [G(N_U)F(N_M, K) - W_R(N_U/N_M)N_M - rK] \quad . \quad (35)$$

Recognizing that they operate under the economies of urban agglomeration, and recognizing their control over city size - the size of the total urban resident work force that can be commanded through manipulation of the urban wage given the rural labor supply response, formal sector firms will act as if they can choose the magnitudes both of internal employment, N_M , as well as the overall labor pool, N_U , from which this N_M is drawn. Of the three ensuing necessary first order conditions implicitly defining the equilibrium values of N_M , N_U and K , (36) is with respect to N_M - with urban wage (and city size) treated as parametric, (37)

explicitly chooses N_U , or total urban workforce, while (38) is with respect to capital employed:

$$G(N_U)F_N(N_M, K) = W_U = kW_R \quad , \quad (36)$$

$$G'(N_U)F(N_M, K) = W_R \quad , \quad (37)$$

$$G(N_U)F_K(N_M, K) = r \quad . \quad (38)$$

Dividing condition (36) by (37), it becomes apparent that the optimal k emerging in this high wage - high productivity tradeoff must satisfy

$$\frac{G(N_U)F_N(N_M, K)}{G'(N_U)F(N_M, K)} = N_U/N_M = k \quad . \quad (39)$$

Essentially, k represents the formal sector wage premium - the relative price of internally employed to "external" urban labor. In profit-maximizing producer equilibrium, k is equated with the marginal rate of substitution between the two types of workers. That is to say, if the premium to formal sector employment is high, the marginal product of "internal" relative to "external" labor is high, and fewer persons will be hired formally while more are utilized in the indirect manner.

Admitting the informal sector, the ensuing migration equilibrium condition is

$$W_R = W_U(N_M/N_U) + W_I(\theta N_M/N_U) \quad . \quad (40)$$

This implies

$$W_U = W_R(N_U/N_M) - W_I\theta \quad . \quad (41)$$

The formal sector firms' problem analogous to (35) now becomes

$$\text{Max.} [G(N_U^I)F_N(N_M^I, K^I) - [W_R(N_U^I/N_M^I) - W_I\theta] N_M^I - (rK^I)] \quad (42)$$

from which it follows that the expression analogous to (39) is

$$\frac{G(N_U^I)F_{N_M}(N_M^I, K^I) + w_I\theta}{G'(N_U^I)F(N_M^I, K^I)} = N_U^I/N_M^I = k^I \quad (43)$$

where k^I is the analogous formal sector wage premium over migrant rural wage in the presence of an urban informal sector.

V.

The magnitude of the wage premium depends in general on features of the productive environment - relative factor prices, technology and linkages, and will differ, as such, from context to context. The examples presented in Table II simulate the roles of agglomeration economies, urban subsectoral linkages, factor substitution possibilities and rural labor availability in the determination of the urban formal sector wage, given the behavioral model of Section IV. Functional specification enables illustration of the directional effects of selected parametric characterizations of these influences upon k .

The production function of Section III, $Q = N_U^\tau N_M^\alpha K^\beta$ is employed in Part (A) of Table 2 to examine, in particular, the effects of the agglomeration elasticity, τ , given plausible parameter values.⁹ As expected, the magnitude of k increases with the strength of the external economy, reflecting the greater return to assembling a large urban labor pool. Part (B) uses the same specification augmented with the formal-informal employment linkage mechanism¹⁰ to simulate effects of the latter's intensity on the wage premium.

TABLE II: PARAMETRIC SIMULATION OF INFLUENCES ON THE URBAN WAGE PREMIUM

(A) Agglomeration and Output Elasticities:

A.1	$\alpha = 0.5;$	$\beta = 0.5;$	$r = 0.5;$	$Q = 1$
	γ	$k (W_R=0.05)$	$k (W_R=0.10)$	$k (W_R=0.25)$
	0.1	11.49	5.00	1.66
	0.2	17.41	6.60	1.83
	0.3	29.30	9.67	2.23
A.2	$\alpha = 0.6;$	$\beta = 0.4;$	$r = 0.5;$	$Q = 1$
	γ	$k (W_R=0.05)$	$k (W_R=0.10)$	$k (W_R=0.25)$
	0.1	11.61	5.17	1.78
	0.2	16.42	6.51	1.92
	0.3	25.33	8.96	2.27
A.3	$\alpha = 0.4;$	$\beta = 0.6;$	$r = 0.5;$	$Q = 1$
	γ	$k (W_R=0.05)$	$k (W_R=0.10)$	$k (W_R=0.25)$
	0.1	12.51	5.26	1.67
	0.2	21.03	7.44	1.88
	0.3	40.32	11.99	2.41

(B) Formal - Informal Sector Linkages:

$\gamma = 0.1; \alpha = 0.5; \beta = 0.5; W_R = 0.10; r = 0.5; Q = 1$						
θ	$k(W_I=.05)$	kW_R/W_I	$k(W_I=.10)$	kW_R/W_I	$k(W_I=.25)$	kW_R/W_I
0.1	5.05	10.1	5.10	5.1	5.25	2.1
0.2	5.10	10.2	5.20	5.2	5.50	2.2
0.3	5.15	10.3	5.30	5.3	5.75	2.3
0.4	5.20	10.4	5.40	5.4	6.00	2.4
0.5	5.25	10.5	5.50	5.5	6.25	2.5
0.6	5.30	10.6	5.60	5.6	6.50	2.6
0.7	5.35	10.7	5.70	5.7	6.75	2.7
0.8	5.40	10.8	5.80	5.8	7.00	2.8
0.9	5.45	10.9	5.90	5.9	7.25	2.9

(C) Internal vs. External Labor Substitution Possibilities:

$\gamma = 0.1; \alpha = 0.5; Q = 1$			
σ	$k (W_R=0.10)$	$k (W_R=0.25)$	$k (W_R=0.50)$
0.1	9.61	3.24	1.17
0.2	10.42	3.55	1.36
0.3	11.59	3.98	1.59
0.4	13.32	4.62	1.91
0.5	16.20	5.67	2.41
0.6	21.73	7.66	3.34
0.7	35.47	12.59	5.59
0.8	94.48	33.75	15.23
0.9	1785.23	641.51	293.52

It is noted that, *ceteris paribus*, the premium is higher in the presence of an informal sector than in its absence, due to the superior productive efficiency of firms under the circumstances. Moreover, k increases with θ as these productivity benefits are multiplied. Finally, Part (C) employs the constant elasticity specification $Q = [\tau N_U^{-\delta} + \alpha N_M^{-\delta}]^{-1/\delta}$ to explicitly explore the effects of substitution possibilities between internal and external labor in urban production.¹¹ Not surprisingly, the greater the opportunity of substituting "costless" external workers without having to employ them formally to maintain production, the higher is an optimal k . Through simulation under alternative scenarios, we find much that mirrors developing country phenomena. In particular, we note the association between lower rural wage rates and steeper urban wage premia. Similarly, the less remunerative the informal sector, the higher the formal sector premium and the sharper are urban wage disparities. Developing regions feature, too, the higher degree of agglomeration benefits, significant informal sector presence and technological levels permitting easy substitutability between slightly differentiated labor that entail the higher wage premia demonstrated by our examples. On these grounds, our hypothesis merits inspection as an alternative to conventional explanations of LDC urban labor market structures.

The relationships suggested above relating the urban wage premia to the internal production or agglomeration efficiency parameters of the urban production structure constitute testable propositions. Their examination for a cross-section of regional

economies for which production parameters and the wage structure are known should be possible. In addition, if the behavioral hypothesis underlying the above model holds, these conditions may be used to recover unknown production and linkage parameters in any given city over time.

Several related empirical questions also arise at the microeconomic level. One set of questions involves ascertaining the quantitative importance of the relevance of the urban agglomeration advantages to the operation of urban labor markets in a variety of productive contexts. A related task consists of establishing the dominance of urbanization (total workforce) over localization (own-industry employment) economies in agglomeration effects.¹² Another important set of issues relates to the empirical verification of various facets of the informal sector's role within an integrated labor demand and supply framework. A study of differential migration propensities in response to alternative compositions of the urban employment structure is likewise warranted.

In conclusion, our current paper provides a synthesis and an "explanation" of stylized LDC urban labor market phenomena such as dualism and institutional wage rigidity. It implies new directions for further research in these areas which we plan to undertake and report on in future papers. Ultimately, such research should facilitate more enlightened policies towards cityward migration, urban growth, the informal sector and urban labor markets in developing countries.

NOTES

1. The notion that in LDCs government and "big industry" are sufficiently divorced so that the former unilaterally imposes wage restrictions on the latter appears quite far-fetched. It seems to be much more realistic for wage legislation to reflect and serve the interests of those whose support a typical LDC government may find crucial, or who even constitute part of the government.
2. The best known model appears in Harris and Todaro (1970).
3. See Shukla (1988b).
4. Early U. S. empirical studies include Segal (1976) and Sveikauskas (1975); In the developing countries context, one such exercise for Brazil is reported in Henderson (1986); The findings of a study using Indian data, viz., Shukla (1988a), are illustrative. Estimates obtained therein imply average total factor productivity increases of 10% with each doubling of city size within a realistic range of city sizes. This contrasts with the typically lower values - 0.04 to 0.06 - for "agglomeration elasticities" reported for developed countries.
5. See Shukla and Stark (1986).
6. In production function-based estimations of agglomeration economies it is necessary to use an aggregate proxy for the hypothesized agglomeration effect. If such economies are those of "urbanization", the relevant variable is city population; if "localization" economies are assumed, this proxy is industry-specific employment. The Shukla study for India cited in [4] found urbanization economies to dominate. This would support specifying N_u as an argument of $G(\cdot)$.

7. Stark (1982) develops arguments emphasizing this linkage aspect of the role of the informal sector.
8. The specification follows that used in Shukla and Stark (1989).
9. Setting $Q = 1$ as numeraire, profit maximization with this specification leads to $k = (\alpha/W_R)[(\tau/W_R)^{\tau/\alpha} (\beta/r)^{\beta/\alpha}]$.
10. Amending firms' profit maximizing calculus to substitute $[k^I W_R - \theta W_I]$ as formal sector wage in the informal sector's presence yields $k^I = (\alpha/W_R)[(\tau/W_R)^{\tau/\alpha} (\beta/r)^{\beta/\alpha} + (\theta/\alpha)W_I]$.
11. Here, $k = (\alpha/W_R)[\{1 - \tau(W_R/\tau)^{1-\sigma}\}/\alpha]^{1/(1-\sigma)}$, where $\sigma = 1/(1+\delta)$ represents the two-factor elasticity of substitution between the labor types.
12. See Shukla (1989a) for empirical evidence that agglomeration effects may be labor-augmenting and Shukla (1989b) for a discussion of the urbanization-localization debate.

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