Occupational Imbalances in Dual Labour Surplus Economy: A Dynamic Analysis

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Abstract:
This paper attempts to study the behavior of occupational imbalances in dual labour surplus economy where industrial production is demand determined. Unlike the usual dual economy model we assume here wage gap is endogenous. Our result shows that the variable profit –wage ratio and the presence of turn over cost in the industrial sector creates a non-linear, deterministic economic structure that may generate fluctuations under some plausible values of the parameters.

Keywords: Occupation, Imbalance, Dual, Labour surplus, Dynamic.

Introduction:
The inherent characteristic of a dual labour surplus economy is the occupational imbalances between the agricultural and the industrial sectors. The occupational imbalance is indexed by the employment ratio of the two sectors. The celebrated paper of Lewis (1957) shows that with the process of industrialization the initial imbalance in the employment structure is self-destroying as surplus labour move from rural to the urban sector. The neo-classical model of Jorgenson (1967) also assumes rural-urban labour transfer in the growth process of industry. The Harris-Todaro (1980) migration model deals with the rural-urban migration in terms of the expected wage equalization between the two sectors. Thus both the classical and the neo-classical models show that the occupational imbalance between the two sectors gradually reduces over time. Rakshit (1989) demand constraint model shows that such imbalance exists due to the wage-gap between two sectors. He also shows that this imbalance remains unchanged due to the constancy of wage-gap and rate of profit. However, in the long run none of these two assumptions is correct.

In a labour surplus economy like India we find both rural-urban and urban-rural labour transfer. Actually excessive out-migration may lead to in-migration in a dual economy. Thus, the initial occupational imbalance may be self-defeating, rather than self-sustaining in nature. In this paper we attempt to study the behavior of occupational imbalance in a dual labour surplus economy that captures the salient features of a demand constraint dual economy model. Throughout this paper it is assumed that wage-gap responds to the occupational imbalances and thus unlike the usual dual economy models the wage-gap is endogenous.

The recent literature on the dynamic models shows that non-linear and deterministic economic system may generate erratic fluctuations in this economy. We also attempt to examine the feasibility of erratic labour transfer in our stylized dual economy model.

The Model:
The model describes a dual economy the two blends of which are agricultural and industrial sectors. Agricultural production is supply determined and industrial production is demand determined. There are four classes of people: agricultural workers, landlords, industrial workers and industrial capitalists.

The demand for the industrial good by the agricultural workers at time t is given by:

$$D_{wt}^1 = \alpha \left(W_1 L_1 \right)_t, 0 < \alpha < 1 \tag{1}$$

Where W_1 is the agricultural wage rate and L_1 is the agricultural employment.

The proportion of landlord's income spent on the industrial product at time t:

$$D_{rt}^1 = \beta\left(X_t - (W_1 L_1)_t\right), 0 < \beta < 1, r_t \text{ is the lanlord income} \tag{2}$$

The demand for industrial product by the industrial workers at time t:

$$D_{wt}^2 = \gamma(W_2 L_2)_t, 0 < \gamma < 1 \tag{3}$$

The capitalist's expenditure on industrial good at t;

$$D_{\Pi t}^2 = \lambda\left(Y_t - (W_2 L_2)_t\right), 0 < \lambda < 1 \tag{4}$$

Thus the industrial production is given by:

$$Y_t = \alpha(W_1 L_1)_t + \beta\left(X_t - (W_1 L_1)_t\right) + \gamma(W_2 L_2)_t + \lambda\left(Y_t - (W_2 L_2)_t\right) \tag{5}$$

From Equation (5) we may get the employment ratio as:

$$\left(\frac{L_2}{L_1}\right)_t = \left(\frac{W_1}{W_2}\right)_t \left[\frac{\alpha + \beta r_t^1}{(1-\gamma) + (1-\lambda) r_t^2}\right] \tag{5a}$$

where r^1, r^2 are the profit wage ratios in the two sectors. Thus,

$$r_t^1 = \frac{X_t - (W_1 L_1)_t}{(W_1 L_1)_t}$$

$$r_t^2 = \frac{Y_t - (W_2 L_2)_t}{(W_2 L_2)_t}$$

Equation (5a) shows that the employment ratio of the two sectors depends on the wage-gap and the profit-wage ratio, given the spending propensities. Assume that industrial wage rate is higher than the rural wage rate and such wage gap at time t responds to changes in the employment ratio of the previous period:

$$\left(\frac{W_1}{W_2}\right)_t = m + n\left(\frac{L_2}{L_1}\right)_{t-1}, 0 < n < 1$$

(6)

Equation (6) shows that there is a minimum wage gap that is inherent in our stylitzed dual economy. The employment induced part shows that wage gap reduces as more and more abourers are transferred to the industrial sector. The speed of wage adjustment is assumed to be low.

We have six equations and seven variables. Let us assume that the wage-profit ratios are constant in order to make the system determinate. Now the occupational imbalance is given by:

$$\left(\frac{L_2}{L_1}\right)_t - \left[\frac{n(\alpha + \beta r^1)}{(1-\gamma) + (1-\lambda) r^2}\right]\left(\frac{L_2}{L_1}\right)_{t-1} = \frac{m(\alpha + \beta r^1)}{(1-\gamma) + (1-\lambda) r^2} \tag{7}$$

This is a first order, first degree, non-homogeneous difference equation in the employment ratio of the two sectors.

The stationary equilibrium of the occupation structure is given by

$$\left(\frac{L_2}{L_1}\right) = \frac{m\left(\alpha + \beta r^1\right)}{\left(1-\gamma\right) + \left(1-\lambda\right)r^2 - n\left(\alpha + \beta r^1\right)} \neq 1 \tag{8}$$

The positive value of the employment ratio implies that

$$\left(1-\gamma\right) + \left(1-\lambda\right)r^2 > n\left(\alpha + \beta r^1\right)$$

(9)

The time path of the employment ratio is given by

$$\left(\frac{L_2}{L_1}\right)_t = \left(\frac{L_2}{L_1}\right) + \left[\left(\frac{L_2}{L_1}\right)_0 - \left(\frac{L_2}{L_1}\right)\right]\left[\frac{n\left(\alpha + \beta r^1\right)}{\left(1-\gamma\right) + \left(1-\lambda\right)r^2}\right]^t \tag{10}$$

Here, employment ratio stabilises over time as Condition (9) holds. Thus the occupational imbalance exhibits a stable and convergent time path. If the initia imbalance deviates from equilibrium, it comes steadily to the equilibrium value over time.

Variable profit-wage ratio:

In this section we relax the assumption of constant profit-wage ratio. As employment ratio changes, wage-gap also changes and this causes the profit-wage ratio to change. Given the assumption that industrial wage rate is more influenced by institutional factors, as employment ratio rises in favour of the industrial sector, wage payment to the industrial sector also rises as industrial wage does not fall so much. So, profit-wage ratio falls in the industrial sector. Again, agricultural wage rises slowly and we may assume total wage payment in the agricultural sector falls and so profit-wage ratio rises in the agricultural sector. Assuming a lag in the agricultural sector we may write the two profit-wage ratios as:

$$r_1^t = b + g\left(\frac{L_2}{L_1}\right)_{t-1}, 0 < g < 1$$

$$r_2^t = h - k\left(\frac{L_2}{L_1}\right)_t, 0 < k < 1$$

Inserting the two profit wage functions the Equation (7) beomes

$$\left(\frac{L_2}{L_1}\right)_t + \left[\frac{k\left(1-\lambda\right)}{\left(1-\gamma\right) + \left(1-\lambda\right)h}\right]\left(\frac{L_2}{L_1}\right)_t^2 = \left[n\left(\alpha + \beta b\right) + gn\right]\left(\frac{L_2}{L_1}\right)_{t-1}$$

$$+ gn\left(\frac{L_2}{L_1}\right)_{t-1}^2 + m\left(\alpha + \beta b\right) \tag{11}$$

This is a non-linear,firstorder,non-homogeneous difference equation in the employment ratio. The non-linearity of the economic structure causes fluctuations in the occupational imbalances. This fluctuation may be regular or erratic depending on the values of the parameters of the system. Thus, labour transfer may be chaotic rather than stable over time even in this simple dual economy model. This theoretical possibility partly explains fluctuations in the rural-urban migration in a labour surplus economy.

Turn-over Cost:

Now we assume that there is quit and re-employment in the industrial sector. Thus, turn-over cost is included only in the industrial cost structure. Unlike Stiglitz (1974) it is assumed that quit rate is different from re-employment rate and there eexists a time lag between the two rates. As quit is neither exactly nor timely matched with the re-employment rate the industrial sector may face labour shortage during labour transfer.[1] The turn-over rate at time t, which is the difference between the quit rate in period t-1 and the replacement rate is given by

$$T_t = q_{t-1} - z_t$$

(12)

The labour turn-over cost at t is

$$C_t^T = \mu \left(q_{t-1} - z_t \right) L_{2t}$$

(13)

Where μ is the average turn-over cost per unit change in the industrial labour force. Now, the firm has two costs: the wage cost and the turn-over cost. Thus industrial profit at time t is given by:

$$\Pi_t = Y_t - \left(W_2 L_2 \right)_t - \mu \left(q_{t-1} - z_t \right) L_{2t}$$

(14)

So Equation (4) becomes

$$D_{\Pi t}^2 = \lambda \Pi_t = \lambda \left(Y_t - \left(W_2 L_2 \right)_t - \mu \left(q_{t-1} - z_t \right) L_{2t} \right)$$

(15)

So, industrial production at time t is

$$Y_t = \alpha \left(W_1 L_1 \right)_t + \beta \left(X_t - \left(W_1 L_1 \right)_t \right) + \gamma \left(W_2 L_2 \right)_t + \lambda \left(Y_t - \left(W_2 L_2 \right)_t - \mu \left(q_{t-1} - z_t \right) L_{2t} \right)$$

(16)

From (16) we get

$$\left(\frac{L_2}{L_1} \right)_t = \left(\frac{W_1}{W_2} \right)_t \left[\frac{\alpha + \beta r_t^1}{(1-\gamma) + \left\{ 1 + (1-\lambda) r_t^2 \right\} \left(\frac{C^T}{C^W} \right)_t} \right]$$

(17)

Salop and Salop (1976) argue that firms pay higher wages to cut down labour turn-over. Thus, given industrial employment, if wage cost rises labour turn-over cost falls. So, the ratio of turn-over cost to wage cost is an increasing function of wage gap:

$$\left(\frac{C^T}{C^W} \right)_t = a + b \left(\frac{W_1}{W_2} \right)_t , a > 0, 0 < b < 1$$

(18)

Combining Equations (6),(17) and (18) we get the difference equation of the employment ratio as

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[1] See Kaushik Basu (1984).

$$(1-\gamma)\left(\frac{L_2}{L_1}\right)_t + \{1+(1-\lambda)r_2\}\left[(a+bm)+bn\left(\frac{L_2}{L_1}\right)_{t-1}\right]\left(\frac{L_2}{L_1}\right)_t = (\alpha+\beta r_1)\left[m+n\left(\frac{L_2}{L_1}\right)_{t-1}\right] \qquad (19)$$

This is also a non-linear, first order, non-homogeneous difference equation in the employment ratio. Here, non-linearity arises even if the profit-wage ratio is constant. So, the presence of turn-over cost may exhibit irregularities in the structure of employment in a dual labour surplus economy.

Conclusion:

This paper is just an attempt to examine the occupational imbalances in a dual labour surplus economy over time. Our studies derive the following results:

Firstly, if profit-wage ratios are constant, employment induced wage adjustment leads to a stable and steady time path of occupational imbalance in our simple dual economy model.

Secondly, the variable profit-wage ratio in both sectors causes non-linearity in the occupation structure which generates irregularities in the occupational imbalances under some plausible values of the parameters.

Thirdly, the presence of turn-over cost in the industrial sector where each quit is not matched exactly and instantaneously by replacement, exhibits non-linearity in the employment structure even if profit-wage ratios are constant. The complex non-linear difference equation may also create chaos in the occupation structure in our hypothetical model.

Finally, the present study needs much more detailed analysis regarding the nature of fluctuation in the occupational imbalances caused by non-linearity in the employment structure of our dual economy model.

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