ECONOMIC GROWTH CENTER

YALE UNIVERSITY

Box 1987, Yale Station
New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 199

AGGREGATE DEMAND, THE WAGE GAP AND UNEMPLOYMENT IN LDC'S

Mark Gersovitz

Aggregate Demand, the Wage Gap and Unemployment in LDC's

Mark Gersovitz*

Abstract

This paper begins with the Todaro framework which relates LDC urban unemployment to the existence of an urban-rural wage gap. An explanation of the wage gap is developed from aggregate demand conditions in the urban sector, providing a Keynesian theory of LDC unemployment. Various policies to alleviate LDC unemployment are considered. Aggregate demand policies are most certain of success when the response of urban output to these policies is low, a situation which has usually been held to invalidate demand policies in LDC's. Import substitution policies promote unemployment and should be reversed or even replaced by rural sector subsidization.

Yale University

*Mark Gersovitz
c/o Department of Economics
Yale University
New Haven, Conn. 06520.

A strong tradition exists in the development literature of viewing LDC problems as being primarily supply problems. Demand considerations are rarely emphasized except in discussions of the foreign sector (foreign exchange gaps) and of the trend in output composition (income elasticities of demand). Lewis (1), in discarding neo-classical approaches in favour of a return to classical principles, finds that "from the point of view of countries with surplus labour, Keynesianism is only a footnote to neo-classicism. . . ."

Those economists (2) who have explicitly considered the applicability of demand policies to LDC problems in greater detail have been similarly skeptical. The main thesis, expressed in (3), has been

> . . .that although there is abundant labour, at least of unskilled types, a general increase in demand will not lead to a general increase in output, because other "co-operating factors" are needed to work with labour. The traditional one to take is capital -- i.e., real capital equipment; nothing much can be done with bare hands alone.

While this hypothesis of a low output-investment multiplier is often qualified, it remains the basis for a rejection of demand oriented cures for LDC unemployment. Attention is therefore directed to the need for capital accumulation, especially in labour intensive forms, as the corrective for the capital shortage induced unemployment.

Todaro (4) has presented a model of LDC urban unemployment which relates unemployment to the existence of an urban-rural wage gap. His formulation assumes, rather than explains, the existence of this wage differential. Unemployment is then explained by postulating that the level of unemployment, through its influence on the probability of obtaining an urban job, is such as to equate the expected urban wage with the rural wage.

In our model, the wage differential is determined by the level of

of aggregate demand for urban output. Unemployment is then induced by the Todaro mechanism. Various policies are considered within the context of the model, and it is shown that they are most certain of alleviating urban unemployment when the pessimistic multiplier assumption, usually held to invalidate demand policies in LDC's, is made.

Notation:

A: output of the rural sector

M: output of the urban sector

I: investment in terms of the urban good

S: savings in terms of the urban good

P: price of the rural good in terms of the urban good

w_m: wage in the urban sector in terms of the urban good

w_a: wage in the rural sector in terms of the urban good

L_m: labour employed in the urban sector

L_a: labour employed in the rural sector

U: number of unemployed in the urban sector

u: unemployment rate in the urban sector ($= U/(U+L_m)$)

Specification of the Model:

Output in each sector is determined by a short-run production function. The constant factor in the rural sector is land, that in the urban sector is the stock of capital equipment. Thus:

$$A = A(L_a) \qquad A' \geq 0,\ A'' \leq 0 \qquad (1)$$

$$M = M(L_m) \qquad M' \geq 0,\ M'' \leq 0 \qquad (2)$$

Competitive conditions are assumed to prevail in the urban sector.

Profit maximising behaviour establishes the equality of the urban wage and the short-run marginal product of labour in manufacturing:

$$w_m = M'(L_m) \qquad (3)$$

Agricultural production is undertaken by peasant proprietors. It is assumed that the implicit rural wage is given by the average product in agriculture:[1].

$$w_a = \frac{PA}{L_a} \qquad (4)$$

Equality of the rural wage and the expected urban wage is given by:

$$w_a = (1-u)w_m \qquad (5)$$

where (1-u) is taken as the probability of obtaining an urban job in conformity with the Todaro formulation.

Labour balance is given by:

$$L_a+L_m+U = \bar{L} \qquad (6)$$

where $\bar{L}$ is the total labour force, assumed to be constant.

Savings activity is assumed to be undertaken exclusively by urban capitalists, who save the whole of their profits:[2]

---

1. Alternative models of rural wage determination include equality of the rural wage and the marginal product of labour in agriculture, and the hypothesis of a constant institutional wage in agriculture. Substitution of either of these formulations for the average product hypothesis does not alter the basic properties of the model developed in equations (1) - (10).

2. A formulation of this nature is only adopted for simplicity. Explicit

$$S = M - w_m L_m \qquad (7)$$

Investment activity is also undertaken only by urban capitalists. The immediate stimulus to investment is the expectation of profits. A myriad of factors determine the expected profitability of investments in LDC's; the rate of interest is only a sub-ordinate consideration.

Investment activity is limited by the ability of entrepreneurs to identify, plan and execute projects. The restrictions imposed on investment by entrepreneurial immaturity are further compounded by a lack of technical and skilled personnel. An underdeveloped infrastructure may limit the availability of inputs and the distribution of output. Considerations of this nature have been stressed in the literature on absorptive capacity (5). In addition to these constraints, which derive from the inherent characteristics of LDC's, are other factors associated with the role of government in most LDC economies. Administrative rationing of credit and/or foreign exchange may block otherwise feasible investment projects while failing to induce alternate investment activity.

The essential conclusion of this view of the investment process, one which is similar to that of Hirschman (6), is that there are no automatic forces which ensure the ex ante equality of savings and investment. The level of investment in any short period may thus be taken as given:

$$I = \bar{I} \qquad (8)$$

In equilibrium, savings must equal investment:

---

consideration of self-contained savings-investment activity in the rural sector (e.g. peasant contruction of irrigation wells) does not alter the relationship between capitalists' saving and investment developed in equations (7) - (9).

$$I = S \tag{9}$$

The economy is assumed to be a small open economy with relative prices given by the world market:

$$P = \overline{P} \tag{10}$$

Equations (1) - (10) provide a determinant system of ten equations in ten unknowns: A, M, I, S, L_m, L_a, U (or u), w_m, w_a and P. The interpretation of the equilibrium generated by this system as a whole is easily presented through its relation to the usual formulation of the dual economy model. Setting U (and hence u) equal to zero in equations (5) and (6) to give equations (5)' and (6)', and dropping equation (8) leaves a model in nine equations and nine unknowns. This remnant model is a possible formulation of equilibrium in a Lewis-type dual economy.

The usual assumption of the traditional dual economy model is the ex ante identity of investment and savings. If this assumption of dependence is replaced by a Keynesian assumption of an independently given volume of investment (by re-instating equation (8)), the system is formally overdetermined. On a formal level, this problem is resolved by introducing a tenth variable, U (or u), into equations (5)' and (6)'.

The economic functioning of the model is presented with the aid of Figure I. Area Q represents industrial profits. Under our assumptions, it also represents total savings. But, in equilibrium, savings must equal the given volume of investment. Hence area Q is given by the level of investment, $\overline{I}$. Area Q in turn determines the equilibrium employment in the urban sector, L_m^*, and the equilibrium urban wage, $w_m^* = M'(L_m^*)$.

Now, if all remaining labour were employed in the rural sector, there is no reason for the rural wage, as determined by (4), to equal w_m^*.

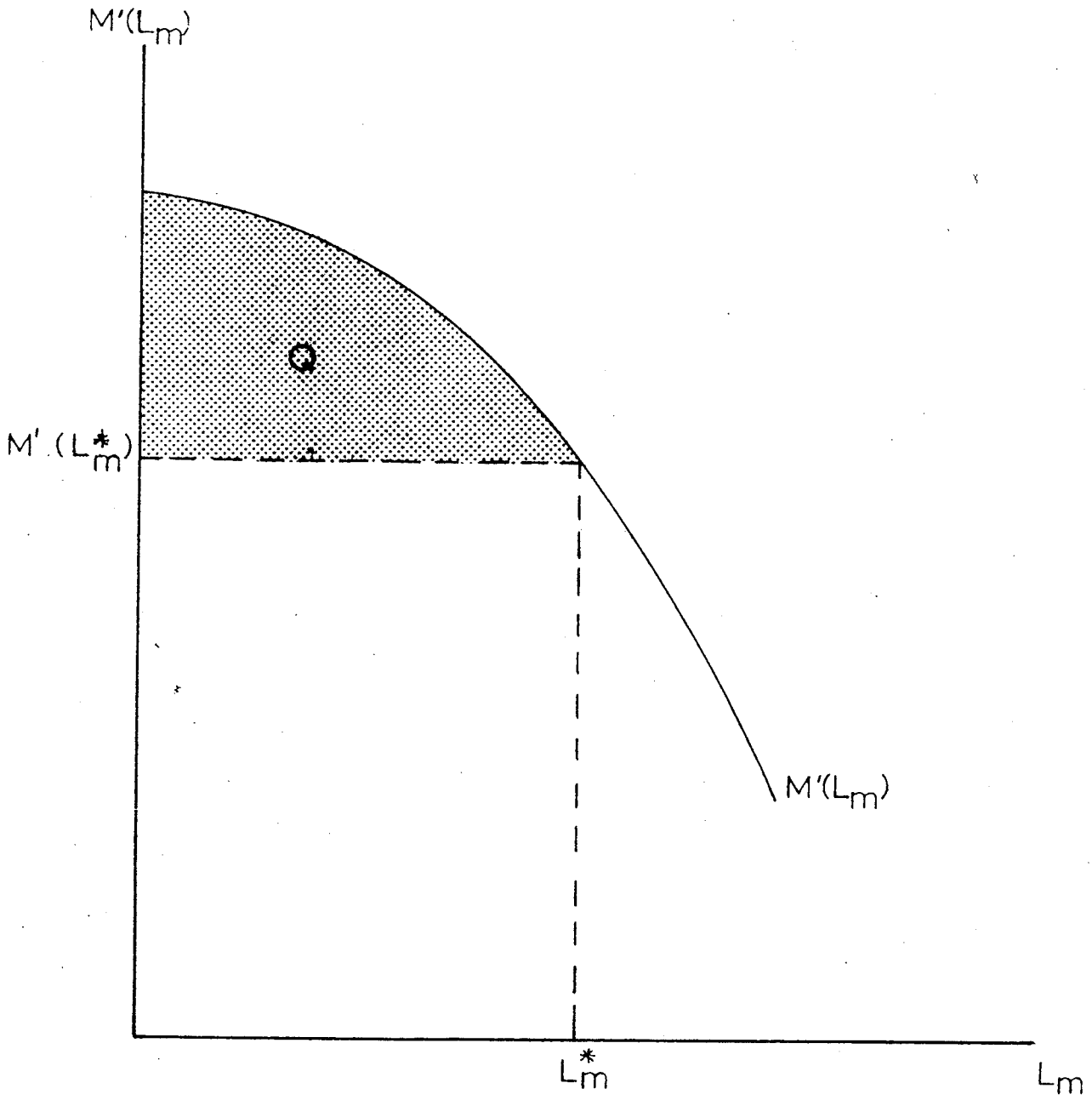

FIGURE I

Assume that investment is deficient in the sense that $\bar{I}$ is less than the equilibrium level of savings as determined by the remnant model, i.e. by equations (1) - (4), (5)', (6)', (7), (9) and (10). In this case, the urban wage exceeds the rural wage when $L_a = \bar{L} - L_m^*$, and urban unemployment fulfills two roles. By making it less certain that a migrant to the urban sector will obtain a job, urban unemployment lowers the expected value of the urban wage toward the value of the rural wage. At the same time, by removing labour from the rural sector, urban unemployment raises the rural wage. Equilibrium is attained when a level of unemployment (U^*) sufficient to equate the expected urban wage with the rural wage has been induced (Figure II).[3]

(It should be clear from Figures I and II that the equilibrium determined by the model is unique. There exists one and only one level of investment such that U equals zero.)

---

3. In the language of the absorption literature, unemployment is induced by a tendency for a country's saving capacity to exceed its absoption capacity at full employment.

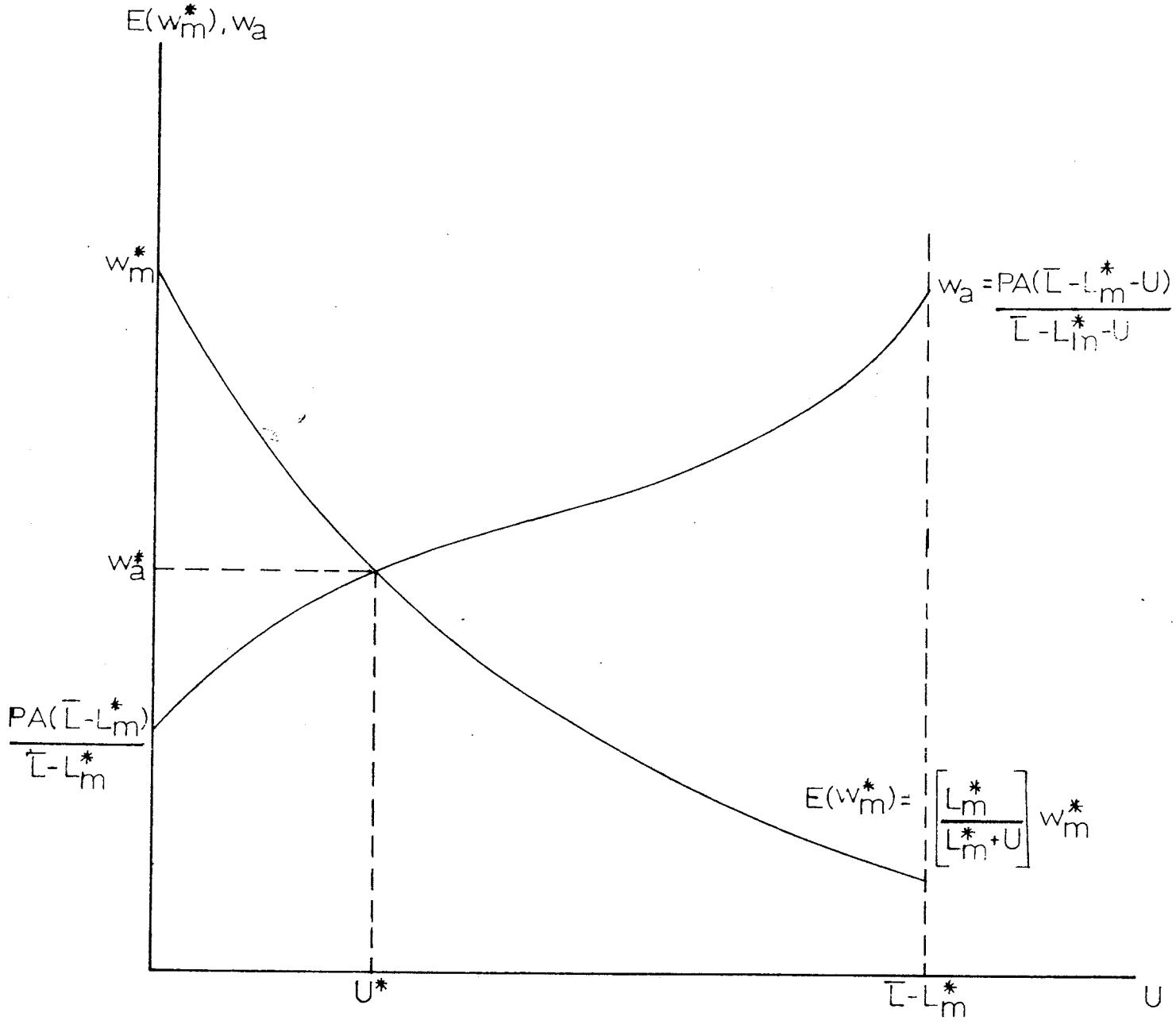

FIGURE II

Policy Issues:

A wide variety of policy instruments is available to alter the level of urban unemployment. Among the options are: programs to increase the level of private urban investment, government expenditure programs in the urban or rural sectors, foreign aid financed programs in the urban or rural sectors, tariffs/export subsidies, wage taxes/subsidies, and profit taxes/subsidies.

An important distinction among the programs derives from the extent to which they must be applied before unemployment is reduced. Some policies, regardless of the extent to which they are pursued, will always have an unambiguous impact on unemployment. In this class are foreign aid financed rural projects and tariff/export subsidies.

In Figure III, the impact of a foreign aid financed rural project on employment is illustrated. Programs of this nature leave w_m^* and L_m^* unchanged since the expenditure on domestic manufactures is constant at $\bar{I} + w_m L_m$. Hence, the $E(w_m^*)$ curve does not shift. Assigning workers to rural investment programs effectively lowers $\bar{L}$ and raises the w_a curve; unemployment is decreased.

A tariff on manufactures (agricultural subsidy) raises (lowers) unemployment. This result is depicted as a downward (upward) shift of the w_a curve consequent on a decrease (increase) in P. Rural employment is made less (more) attractive at any level of unemployment. Other policies designed to squeeze the export sector (multiple exchange rates and export taxes) have similar effects. Labour is squeezed out of the rural sector into the pool of urban unemployed.

Thus, the traditional cluster of import substitution policies have a bias toward creating unemployment. If policies are adopted to shift the

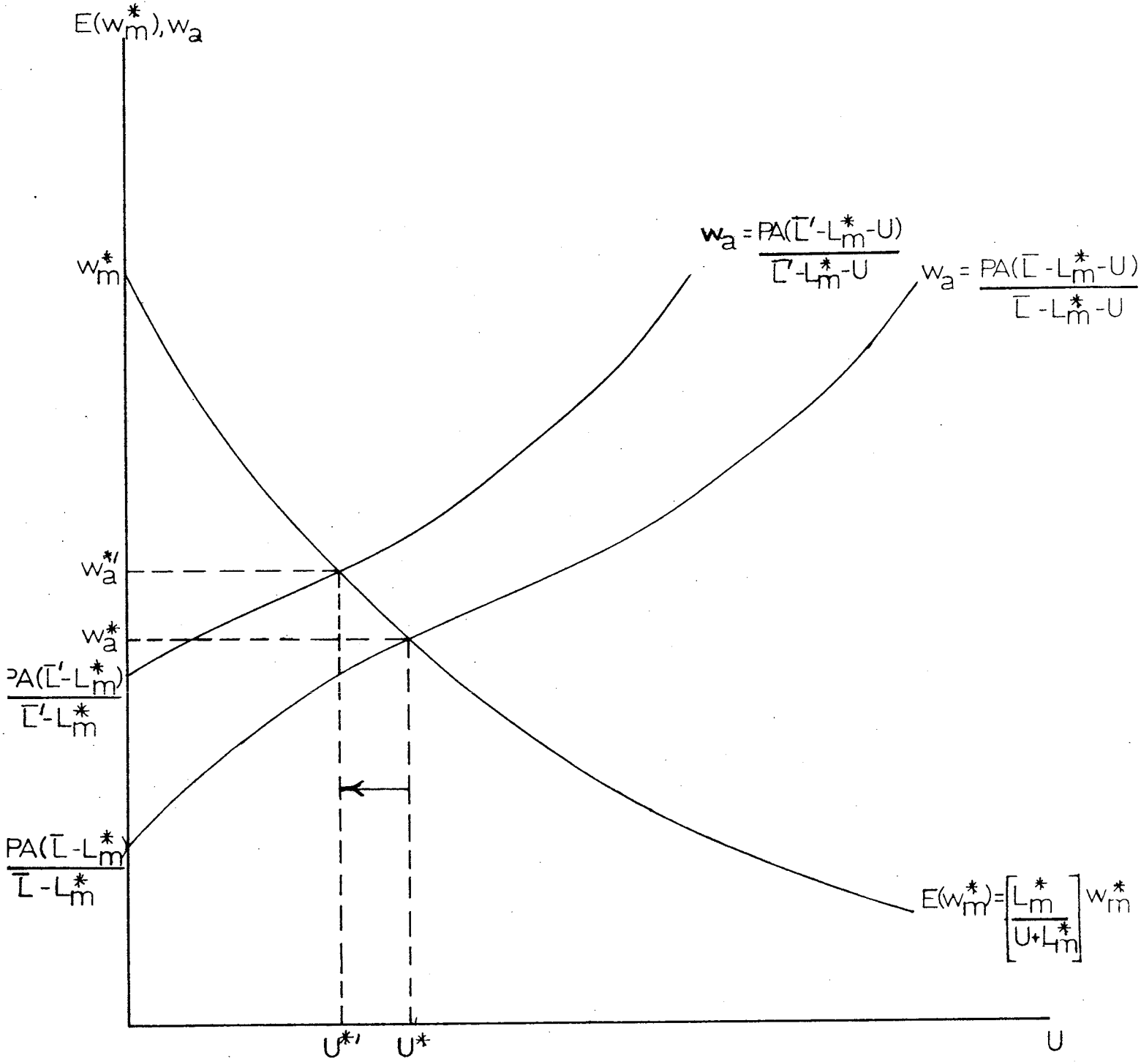
E(w*m), wa
w*m
w*a'
w*a
PA(L̄'-L*m)/(L̄'-L*m)
PA(L̄-L*m)/(L̄-L*m)
wa = PA(L̄'-L*m-U)/(L̄'-L*m-U)
wa = PA(L̄-L*m-U)/(L̄-L*m-U)
E(w*m) = [L*m/(U+L*m)] w*m
U*'
U*
U

FIGURE III

income distribution in favour of savers, but the level of investment is unchanged, unemployment will be induced. Trade poliices of this type may, however, affect the level of investment through their impact on entrepreneurial optimism. Note, however, that trade policies do not increase profits unless investment is first increased, a result which differs from that of traditional partial equilibrium analysis. If trade policies do affect the level of investment, the magnitude of their final effect depends on the induced change in investment and on the unemployment-investment multiplier; the net result is ambiguous.

A second set of policies, if not pursued to the point where unemployment is completely eliminated, may actually raise the level of unemployment. An important second best issue is encountered. If programs cannot be undertaken on a sufficient scale to eliminate unemployment, they possibly should not be initiated. Indeed, the second best policy may be to run the program in reverse, moving the policy variable away from its zero unemployment value. These issues are clearly illustrated in an examination of the effect of increased investment on the level of unemployment.

The unemployment-investment multiplier, obtained by total differentiation of equations (1) - (10), is given by:

$$\frac{dU}{d\bar{I}} = \frac{1}{(\sigma-1)w_m}\left[\frac{L_a\sigma + L_m\alpha - (1-u)L_a}{L_m\alpha - uL_a}\right] \qquad (11)$$

where $\sigma = \frac{\delta w_m L_m}{\delta L_m}\frac{L_m}{w_m L_m} < 1$ and $\alpha = \frac{\delta w_a}{\delta L_a}\frac{L_a}{w_a} < 0$

are the elasticity of the urban sector wage bill with respect to an increase in urban employment and the elasticity of the agricultural wage with respect to an increase in the agricultural labour force. On an assumption of con-

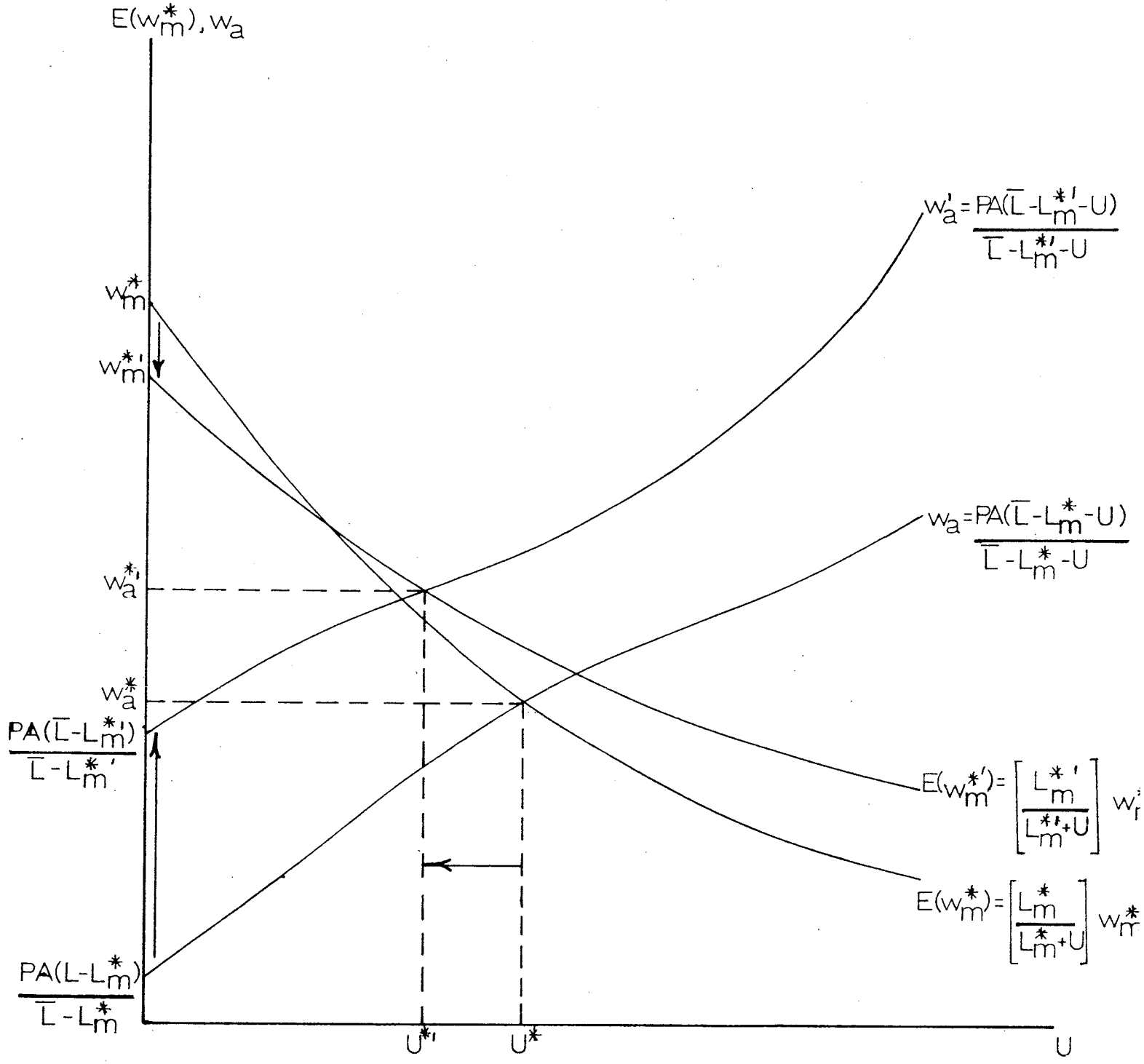
E(w*m), wa
w'a = PA(L̄ - L*m' - U) / (L̄ - L*m' - U)
w*m
w*m'
wa = PA(L̄ - L*m - U) / (L̄ - L*m - U)
w*a'
w*a
PA(L̄ - L*m') / (L̄ - L*m')
E(w*m') = [L*m' / (L*m' + U)] w
E(w*m) = [L*m / (L*m + U)] w*
PA(L - L*m) / (L̄ - L*m)
U*'
U*
U

FIGURE IV

stant returns to scale in agriculture, $\alpha<0$. Hence unemployment decreases (increases) as $[L_a\sigma + L_m\alpha - (1-u)L_a]$ is less (greater) than zero. A sufficient condition for a decrease in unemployment is $\sigma<0$. Note that about $u=0$, the unemployment-investment multiplier is unambiguously negative.

Now, we also have

$$\frac{dM}{d\bar{I}} = \frac{1}{(1-\sigma)} \qquad (12)$$

The urban output multiplier is an increasing function of σ. Hence, the lower the urban output multiplier, the lower is σ and the lower is the unemployment-investment multiplier. As originally asserted, a pessimistic assessment of the urban output multiplier leads to an optimistic assessment of the unemployment multiplier, i.e., of the decrease in unemployment which may be expected to accompany an increase in investment.

An interpretation of the effects of an increase in investment is given with the aid of Figure IV. Graphically, the increased investment affects unemployment by changing the positions of both the w_a and $E(w_m^*)$ curves, and the shape of the $E(w_m^*)$ curve. By raising L_m^*, an increase in investment shifts the w_a curve upward.[4] By lowering w_m^*, an increase in investment drops the intercept of the $E(w_m^*)$ curve. Except at this point, the new $E(w_m^*)$ curve may be above or below the old $E(w_m^*)$ curve. If, at any given value of U, σ is less than zero, the new curve will lie below the old one.[5] As previously derived, unemployment may increase or decrease

---

[4] $\frac{dw_a}{dL_m^*} = \frac{-\alpha w_a}{L_a} > 0$, for any given value of U.

[5] $\frac{dE(w_m^*)}{dL_m^*} = \frac{\sigma w_m^*}{L_m^*+U} - \frac{w_m^* L_m^*}{(L_m^*+U)^2}$. Hence, even if $\sigma>0$, the new $E(w_m^*)$ curve may lie below the old one.

with an increase in investment; if $\sigma<0$ unemployment unambiguously decreases. (The case with $\sigma>0$ but falling unemployment is illustrated.) Intuitively, this ambiguity derives from the conflicting influences which a lower urban wage and higher urban employment have on the attractiveness of migration. The net impact of these two factors is summarized in the parameter σ.

This ambiguity is only relevant to small increase in investment. There is always some level of investment sufficiently high to eliminate unemployment. Graphically, this result is illustrated by the unambiguous movement of the intercepts of the w_a and $E(w_m^*)$ curves toward each other, a process that can be continued until the point of intersection of the two curves is at the intercepts. This convergence of the intercepts (i.e., of the rural and urban wages) in response to increased investment is the touchstone of a demand deficient model of LDC unemployment.

While successive increases in investment will ultimately eliminate unemployment, an increase in investment of the required size may be impractical. In this case, an increase in investment toward its full employment level may, as already indicated, increase unemployment. A policy of reducing investment may be necessary if unemployment is to be somewhat mitigated. A trade-off between growth (through investment) and unemployment is then present.

Government expenditure fulfills a role similar, but not identical, to that of investment. Expenditure on government employees, under our savings assumptions, is entirely reflected in increased demand for domestic manufactures. From this point of view, government expenditure has effects identical to those of investment.

With government expenditure, however, there is the additional question of the increase in government employees. Whether these employees are

employed in the rural sector at the rural wage or in the urban sector at the manufacturing wage, the effect is to lower L_a at any level of U. The w_a curve shifts up even further than it would for an increase in investment equal to the increase in government expenditure. This secondary effect on the rural wage ensures that the unemployment-government rural expenditure multiplier is unambiguously lower than the unemployment-investment multiplier. Government rural expenditure is always somewhat more likely to decrease unemployment than is investment.

In the case of urban sector expenditure, however, the $E(w_m^*)$ curve is also shifted above the position it would occupy if investment, rather than government expenditure, were increased. This shift occurs because an increase in government urban employees increases the probability of obtaining an urban job at any level of L_m^*, w_m^* and U. This shift in the $E(w_m^*)$ curve works to increase unemployment and may overwhelm the effect of the upward shift in the w_a curve. The unemployment-government urban expenditure multiplier may be greater or less than the unemployment-investment multiplier; it certainly is greater than the unemployment-government rural multiplier. Both types of government expenditure, if undertaken on a sufficient scale, can be used to eliminate unemployment.

A tax on profits effectively lowers savings for any given level of L_m^* and w_m^*. Since investment is given by $\bar{I}$, equilibrium in manufacturing requires an increase in savings and profits, and hence an increase in L_m^* and a decrease in w_m^*. Both the w_a and the $E(w_m^*)$ curves are shifted as described in the section on the effects of increased investment. For small changes, the effect of an increase in the profits tax is ambiguous; if the tax is increased sufficiently, unemployment can be eliminated. The increased profits tax may, however, decrease investment by depressing entrepreneurs'

expectations of profits. In this case, the analysis is complicated considerably.

A final class of policies is represented by the wage subsidy. Not only are small changes in the wage subsidy an ambiguous method of obtaining decreases in unemployment, but it is also uncertain whether unemployment can be eliminated by a large scale program of subsidies. A zero unemployment equilibrium may require a wage tax rather than a subsidy. This confusion over the appropriate direction of a wage tax/subsidy derives from its uncertain effect on the level of urban sector employment and wages. A wage subsidy may lower L_m^* and raise w_m^*, moving the intercept of the $E(w_m^*)$ curve upward and that of the w_a curve downward.[6]

---

[6] Letting t be the rate of wage subsidy and totally differentiating

$$\bar{I} = M - w_m^* L_m^* \tag{13}$$

$$M'(L_m^*) = (1-t)w_m^* \tag{14}$$

yields

$$\frac{dL_m^*}{dt} = \frac{L_m^*}{(\sigma-1+t)(1-t)} \tag{15}$$

$$\frac{dw_m^*}{dt} = \frac{-tw_m^*}{(\sigma-1+t)(1-t)} \tag{16}$$

both of which are ambiguous, although dw_m^*/dt and dL_m^*/dt are of opposite sign.

Conclusions:

While the Todaro mechanism provides an explanation of unemployment given a wage gap, any proposals for unemployment policy must be founded on an explanation of the wage gap itself. A demand deficient model provides a theory of the wage gap, one that is based on the fundamental assumption of the inequality of savings and investment at full employment. Once this context of urban unemployment is established, it becomes clear that a wage subsidy policy is the least appropriate of employment programs. Not only is its impact uncertain, but a wage subsidy sacrifices the opportunity to stimulate future growth offered by policies to increase investment.

Various investment and government expenditure programs can be used to eliminate unemployment. In practice, these policies will not be alternatives, but can be used in combination. If full advantage is to be taken of these policies, however, stress must be placed on careful project planning. Arbitrary expenditure will fail to benefit from the growth gains which unemployment reduction through increased investment can have. The presumption is that employment and growth can be complementary objectives.

A reduction in the discrimination against the rural sector can also be expected to lower unemployment. Import substitution policies which only elicit low levels of investment (and slow growth) despite greatly favouring savers are likely to be associated with high rates of unemployment.

Under the most pessimistic assumptions, i.e. $M' = A' = 0$, no policy can secure an increase in output consequent on a reduction in unemployment. In this case, labour is redundant in both sectors. Unemployment policies merely substitute rural disguised unemployment for urban open employment. Of course, urban social and political problems associated with open unemployment may make even this trade-off of considerable interest. Except

under improbable assumptions of this nature, a successful unemployment policy will increase output. And, as already emphasized, some pessimism over the increased output deriving from increased urban sector employment makes for optimism regarding the ease with which unemployment can be reduced.

References:

I am indebted to Robert E. Evenson, Joseph E. Stiglitz and James Tobin for their valuable comments on earlier drafts of this paper. All residual errors remain the responsibility of the author.

(1) W. A. Lewis, Economic development with unlimited supplies of labour, in: A. N. Agarwala and S. P. Singh, eds., The Economics of Underdevelopment (Oxford University, London, 1970) 401.

(2) A. Peacock and G. K. Shaw, Fiscal policy and the employment problem in less developed countries (OECD, Paris, 1971) especially 31-43, V. K. R. V. Rao, Investment income and the multiplier in an under-developed economy, in: A. N. Agarawala and S. P. Singh, eds., The Economics of Underdevelopment (Oxford University, London, 1970) and W. B. Reddaway, The economics of under-developed countries, The Economic Journal 73 (1963).

(3) W. B. Reddaway, The economics of under-developed countries, The Economic Journal 73 (1963) 4.

(4) M. P. Todaro, A model of labour-migration and urban unemployment in less developed countries, The American Economic Review 59 (1969).

(5) J. H. Adler, Absorptive capacity and its determinants (Brookings Institution, Washington, 1965) especially 31-35 and G. M. Meier, The international economics of development (Harper and Row, New York, 1968) 98-100.

(6) A. O. Hirschman, The strategy of economic development (Yale University, New Haven, 1961) chapter 2, especially 32-38.