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ABSTRACT

This paper considers the apparent conflict between two types of
policy conclusions regarding urban job creation as a response to the urban
unemployment problem: i) because of the Todaro paradox, job creation
will lead to _increased_ unemployment, and hence is not a useful policy;
ii) a subsidy for the employment of manufacturing labour (as shown by
Harris and Todaro) is welfare-improving even in the presence of urban
unemployment. It is argued that these conclusions are based on funda-
mentally different views of the rural-urban migration process in the
two types of models, and a synthesis is proposed.

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I.   INTRODUCTION

In recent years, a large amount of theoretical and empirical work in development economics has been focussed on the issue of rural-to-urban migration in LDCs. One can distinguish several reasons why research in this area is considered a matter of urgency. First, the very high rates of growth of the population in many LDC cities have led to very high rates of urban unemployment as well as problems of general overcrowding and urban squalor, so that stemming the rate of migration has become an important policy objective in itself. Secondly, to the extent that migration results from a non-competitive wage level in the urban labour market, e.g., through the influence of relatively strong labour unions or through deliberate government policy, rural-urban migration may be causing a misallocation of resources in the sense that aggregate real income is reduced as a consequence of migration and urban unemployment.[1]

From a policy point of view, the central question to be raised has typically been whether, in the presence of an unavoidable rigidity in the urban wage level, a strategy of "job creation" constitutes a useful policy, either from the point of view of alleviating the urban unemployment problem as such, or as a means of raising aggregate real income by reducing unemployment and re-allocating labour.

No consensus has so far emerged on this question. On the one hand, in the strand of the literature stemming from the pioneering paper by Michael Todaro (1969), the possibility was raised that an increase in the rate of job creation would result in an _increase_ in the urban unemployment

rate (the so-called "Todaro paradox"). In a recent paper, Todaro (1976a)
surveys some of the empirical estimates of migration functions which have
been undertaken on the basis of the model specified in that paper and claims.
that the evidence strongly supports the existence of his paradox. On the
other hand, in that part of the literature starting with the model formulated
by John Harris and Michael Todaro[2] (1970; henceforth referred to as HT), one
of the main conclusions is that a subsidy for the employment of urban labour
will reduce the urban unemployment rate and increase real income.

One might perhaps argue that the difference between the policy impli-
cations of these two types of analysis stems from the fact that one of the
models explicitly focusses on the dynamics of migration and emphasizes the
short-run effects of job creation on unemployment, whereas the other mainly
considers the long-run implications and deals with the case when urban unem-
ployment has adjusted to the number of urban jobs available. I will attempt
to show in this paper that these are not the main reasons for the differences
in policy implications suggested by the models; I will argue instead that
they follow from the fact that quite different views regarding the interaction
between migration and the urban labour market are incorporated in the two
types of models. I will then suggest a simple model which constitutes a
synthesis between the two, and attempt to show how such a model can be used
to evaluate both the short-run and long-run effects of policies designed
to deal with the urban unemployment problems in a more consistent way than
has so far been possible.

II.   TODARO VS. HARRIS AND TODARO

The general form of the migration function put forward in Todaro (1969) and used in Todaro (1976a) can be written:

(1) $\dfrac{M}{E} = f(w,p)$

where M denotes the flow of rural-urban migration per unit of time, E is the number of <u>employed</u> urban workers,[2a] w is a measure of the urban-rural wage differential, and p is "the probability of getting a job". The measure of p used by Todaro can be written:

(2) $P = \dfrac{\dot{E}}{U} = \dfrac{g\,E}{U}$

where U denotes the number of unemployed members of the urban labour force, and $g = \dot{E}/E$ is the proportional rate of growth in the number of urban jobs.

Strictly speaking, p cannot be interpreted as a probability since (depending on the unit in which time is measured) it can exceed one; a better interpretation is provided by noting that if everybody in the pool of unemployed job seekers has the same chance of being picked for a new job, 1/p is a measure of the expected duration of unemployment for an immigrant arriving in the city; clearly this is a relevant variable in the migration decision. We should further note, however, that the Todaro measure of p implicitly neglects the fact that unemployed workers get jobs not only because new jobs are created, but also because vacancies arise (as a consequence of firings and quits) in existing jobs. Denoting the rate at which vacancies arise as b, a natural generalization of Todaro's measure of the "probability" of getting

a job is

(3) $$p = \frac{(g + b)E}{U}$$

Consider now the HT specification of the migration function (1). In their model, interest is focussed not on the flow of migration, but rather on the static equilibrium at which M = 0. Their condition for M = 0 can be written as

(4) $$w_a = w_m \frac{E}{(U + E)}$$

where w_a and w_m measure the wage rate in agriculture and the (institutionally fixed) wage rate in manufacturing, respectively. Consider now the expression $E/(U + E)$. It measures the probability that a randomly selected member of the urban labour force will be holding a job. They justify their use of this probability as a relevant variable for the migration decision by the assumption that all urban jobs are reallocated between workers at each instant in time, and that every member of the urban labour force has the same probability of being picked for a job. But it is easy to see that this is equivalent to postulating that the parameter b just introduced, is infinitely large. If that is the case, however, the Todaro measure of p would go to infinity or, more precisely, the expected duration of unemployment would go to zero; the expression $E/(E + U)$ would then simply measure the (certain) fraction of time that any urban worker would be holding a job. It is variations in this fraction that play an equilibrating role in their analysis of labour allocation, rather than the impact of variations in the expected length of unemployment on the flow of migration, as in the Todaro analysis. Since the HT analysis of the resource allocation effects of migration is carried out by assuming

that (4) always holds, it is clear that they implicitly assume that the speed with which the stock of labour is reallocated following some parameter change is sufficiently great so that a comparison between situations of full stock equilibrium yields a sufficiently good approximation of these effects.

The analysis in Todaro (1976a, 1969) represents the opposite extreme in the sense that attention is focussed exclusively on the equilibrium relation between flows (of migration and the rate of change of urban employment), but it does not deal explicitly with the question of an equilibrium relationship between stocks of urban (employed and unemployed) and rural labour.[3] Contrary to the case for the HT model, Todaro's analysis therefore can be taken as based on the implicit assumption that the speed with which the economy adjusts to full stock equilibrium is sufficiently slow so that the most important policy questions in this area can be answered by looking at flows alone.[4] Clearly the question whether either of these two implicit assumptions is appropriate is an empirical one, and we turn now to the specification of a simple model which explicitly incorporates the speed of adjustment as a parameter, and hence would make it possible to empirically study the validity of these assumptions.

III. A Synthesis

In the alternative model which we propose here, we follow Todaro in assuming that the flow of rural-urban migration is negatively related to the expected duration of unemployment, or positively related to p; we define p as in (3) in order to recognize that the expected duration of unemployment depends not only on the number of new jobs being created but also on the rate of turnover b in existing jobs. We also postulate that there is some critical value of p, say p = π, such that the flow of migration is zero. Following conventional specifications, one would expect that π is a decreasing function of the rural-urban wage differential w. It is also reasonable to assume that it depends on b, the turnover rate. A worker contemplating migration will be interested not only in the expected time he has to wait to get a job and in the wage rate, but also in the question how likely it is that he will be laid off, and hence have to look for another job, or, put differently, in the fraction of time he will be working.[5] Thus the condition for zero migration can be written as

$$(5) \qquad M \gtrless 0 \quad \text{as} \quad \frac{(g + b)E}{U} = p \gtrless \pi$$

where M is the flow rate of migration at a point in time. This condition can also be interpreted as saying that migration will be positive only if the actual number of unemployed job seekers U is less than some critical number $\tilde{U} = \alpha(g + b)E$, where $\alpha(w, b) = 1/\pi$.

Now in order to specify a model which describes the flow of migration at a point in time, some assumption is necessary regarding the speed with

which migrants respond to a difference between the actual number of unemployed job seekers and the critical number. A fairly general specification is given by a partial adjustment mechanism of the form:

(6) $\qquad M = \lambda(\tilde{U} - U) = \lambda(\alpha(g + b)E - U); \quad \lambda > 0,$

or,

(7) $\qquad \dfrac{M}{E} = \lambda(\alpha(g + b) - \dfrac{U}{E}).$

Though a very simple formulation, this model has the advantage that it can be used to study both short-run and long-run effects of various parameter changes in migration and unemployment, in a way that is not possible through the use of the models discussed above. Consider first the short-run behaviour of unemployment. By definition, we have at a point in time,[5a]

(8) $\qquad \dot{U} = M - \dot{E}.$

Substituting (7) into (8) and manipulating, we obtain:

(9) $\qquad \dfrac{\dot{U}}{E} = (\dfrac{U}{E}) \dfrac{\dot{U}}{U} = \lambda(\alpha(g + b) - \dfrac{U}{E}) - g.$

Given the values of the different parameters, and given the unemployment rate U/E at a point in time, this expression may be used to study the impact of parameter changes on the <u>rate of change</u> in unemployment over time. This in fact is what Todaro (1976a) does, though his terminology sometimes suggests that he is considering the level (U) or the rate (U/E) of unemployment.[6]

Given the parameter values and given some initial U/E, it can be demonstrated that as time goes to infinity, the unemployment rate will converge to an equilibrium value (U/E)*; at this equilibrium, we will have $(\dot{U}/U) = (\dot{E}/E) = g,$

from which we obtain

(10) $(\frac{U}{E})^* = \frac{\lambda \; \alpha(g+b) \; - \; g}{\lambda \; + \; g}$.

It can be demonstrated (see the Appendix) that the rate at which the unemploy-ment rate converges to its equilibrium value is given by $(\lambda+g)$.

We now consider the short-run and long-run effects on unemployment of a change in the rate of job creation g. Differentiating (9) with respect to g, we find:

(11) $\frac{d \; (\dot{U}/U)}{dg} = \frac{E}{U}(\lambda\alpha-1).$

This can be intuitively interpreted as follows: an increase in the rate of job creation will raise the rate of growth of unemployment if the product of α, the expected duration of unemployment at zero migration, and λ, the fraction of the gap between the equilibrium number of unemployed job searchers and the actual number that is closed by migration per unit time,[7] is greater than one. The value of λ can, loosely, be associated with the elasticity of migration with respect to the actual probability of finding a job whereas α can be taken as an index of the equilibrium probability of finding a job,[8] and depends on the rural-urban wage differential.

To find the long-run effect of job creation on unemployment, we differentiate (10) with respect to g. The result is:

(12) $\frac{\partial \; (U/E)^*}{\partial g} = \frac{\lambda(\alpha(\lambda-b) \; - \; 1)}{(\lambda \; + \; g)^2}$.

Now consider first the case where b = 0, as Todaro assumes. In that case, the condition for job creation to cause a long-run increase

in the rate of unemployment is the same as the condition for a short-run increase in its rate of change, i.e., $\lambda\alpha > 1$. Thus, Todaro's discussion of the difference between the short-run and long-run effects (p. 220, text and footnote 14) must be characterized as misleading; even when the feed-back of changing unemployment on the probability of finding a job is taken into account, the long-run effect of job creation will still be an increase in unemployment. Upon reflection, this is not very surprising: if the equilibrium stock of unemployed job searchers depends on the number of jobs becoming available per unit of time, one would indeed expect it to rise when the rate of job creation increases unless migration shows very slow response to job opportunities.[9] When $b > 0$, it is possible for the short-run impact of job creation to be an increase in unemployment whereas the long-run impact would be a decrease. This possibility is seen to depend on the magnitude of b relative to λ and α. Intuitively, the long-run impact of job creation on unemployment is more likely to be favourable, the larger the rate of labour turnover in existing jobs, because with a high turnover rate a relatively large proportion of equilibrium unemployment is determined by the level, rather than the rate of growth, of the number of urban jobs.

Turning now to the effect of changes in the rural-urban wage differential, it is easy to show that an increase in this differential will have a positive impact both on the short-run rate of growth of unemployment and on the long-run equilibrium rate. The derivatives are

(13) $\dfrac{\partial (\dot{U}/U)}{\partial w} = \dfrac{\lambda E}{U} \dfrac{\partial \alpha}{\partial w}(g+b) > 0; \quad \dfrac{\partial (U/E)^*}{\partial w} = \dfrac{\partial \alpha}{\partial w} \dfrac{\lambda (g+b)}{\lambda + g} > 0,$

where the inequalities follow from the (reasonable) assumption that the response of the critical expected duration of unemployment to an increase in the wage differential is positive. These conclusions are of course not unexpected: all migration models predict beneficial short-run and long-run effects of reducing the wage differential. What may be slightly less obvious, however, is that a change in the wage differential will have a cross-effect on the impact of job creation on unemployment. Evaluating the cross derivatives, we find:

(14) $\dfrac{\partial^2 (\dot{U}/U)}{\partial g \, \partial w} = \dfrac{\lambda E}{U} \dfrac{\partial \alpha}{\partial w} > 0 \; ; \quad \dfrac{\partial^2 (U/E)^*}{\partial g \, \partial w} = \dfrac{\lambda (\lambda - b)}{(\lambda + g)^2} \cdot \dfrac{\partial \alpha}{\partial w} \; ;$

the latter expression is greater than zero whenever $\lambda > b$, which is a necessary condition for job creation to have the effect of increasing equilibrium unemployment. The fact that the impact of job creation, and hence the presence or absence of the Todaro paradox, depends on the magnitude of the wage differential is perhaps not surprising, but it has been somewhat obscured in the literature by the tendency to treat the elasticity of migration with respect to observed probabilities of getting a job, as a constant parameter.

IV.   Empirical Migration Functions, the Todaro Paradox and the Effects of Employment Subsidies

In the light of the above discussion, we turn now to a specific critique of some existing estimates of the migration response to the probability of getting a job, and the numerical illustrations given in Todaro (1976a) on the basis of those estimates. The empirical work which he discusses consisted of regressing migration on some measures of the wage differential and the probability of finding a job. Elasticities of migration with respect to the latter variable were computed; they ranged from .45 to .65. Using $p \equiv (g+b)E/U$, and denoting the elasticity by η, one may rewrite (7) as

$$(15) \qquad\qquad M = U\ \lambda(\alpha\ p-1),$$

and we find

$$(16) \qquad\qquad \eta = \frac{(g+b)E}{M} \cdot \lambda\ \alpha\ .$$

Todaro's critical condition for job creation to raise unemployment is $\eta > gE/M$, which is equivalent to $\lambda\alpha > 1$ when $b = 0$, as he assumes. Todaro then gives estimates of gE/M for a number of countries, and in a majority of cases finds that this ratio is less than the estimated values of η, and hence concludes that in most countries, the Todaro paradox holds, i.e., increased job creation will worsen the unemployment problem.

In evaluating this conclusion, we will first argue that the empirically estimated values of η are likely to be fairly severe underestimates of the "true" elasticities, and that in fact, under the assumptions made

by Todaro, the Todaro paradox will always hold, both in the short run and in the long run, as a matter of logical necessity. We then argue, however, that if one relaxes the assumption $b = 0$, i.e., allows for a non-zero rate of job turnover, the paradox need not hold. It follows that the rate of labour turnover is a crucial parameter that needs to be incorporated in the estimation procedure along with the responsinvesness of migration to job opportunities if one hopes to make accurate predications regarding the impact of job creation on unemployment.

To show that the values of η discussed above are underestimates, we substitute for M in (16), using (7). We obtain

$$(18) \qquad \eta = \frac{\alpha(g+b)}{\alpha(g+b) - \dfrac{U}{E}}$$

which is greater than unity whenever $U > 0$.[10]

Now Todaro's critical condition is $\eta > gE/M$. In his paper, he computes "normal" values for gE/M based on data for a number of countries and finds values concentrated in the range .3 to .6. We would again argue that these values are severe underestimates: if we interpret "normal" values as equilibrium values, we would have $gE/M = 1/(1 + (U/E)*)$, and since observed unemployment rates in LDCs generally fall in the range from 10 to 20 percent, we would expect to observe values in the range .8 to .9.[11] Even so, since $\eta > 1$, the critical condition will always be met, so that under Todaro's assumptions, the Todaro paradox follows as a matter of logical necessity, as asserted above.

When $b > 0$, the critical condition becomes

$$(19) \qquad \eta > \frac{(g+b)E}{M} \, ,$$

which may or may not be satisfied even for $\eta > 1$, gE/M < 1. Since we believe current estimates of η to be biased downwards,[12] we do not

believe that they can be used to judge the validity of the Todaro paradox with any confidence. However, if one takes the low estimated values as an indication that the "true" value is fairly close to unity, it is evident that the value of the labour turnover rate b need not be very high for the Todaro paradox to be invalid. It should further be noted that the condition (19) is sufficient for job creation to lead to a short-run increase in the rate of change of unemployment. As shown above, it is quite possible for this to be true even if the long-run effect of job creation is to decrease the equilibrium rate of unemployment (see (12)).[13] Again, the value of b plays a crucial role in this regard.

We now turn briefly to the question whether the model proposed here has implications for the central issue addressed in the HT paper and those derived from it, namely that of the effect of job creation on real income and welfare in the economy.

Consider the logic of the HT model. First, their methodology is one of comparative statics, i.e., in the terminology of the present paper, they confine their analysis to cases where the unemployment rate has reached its equilibrium level,[14] and analyze the effects of varying E, the number of urban jobs, but set $\dot{E} = gE$ equal to zero. Second, they assume that the rate of turnover b goes to infinity; if everybody has an equal chance at being picked for a job, this means that the probability that an unemployed person will find a job in a given period of time goes to unity (i.e., the expected duration of unemployment goes to zero). On the other hand, any urban worker will, on the average, be employed only a fraction of the time, given

by $E/(E+U)$. Hence his expected labour earnings will be $w_m E/(E+U)$. Because of the infinite turnover assumption, the <u>variance</u> of a worker's earnings will go to zero. Under these assumptions, and neglecting moving costs, the HT equilibrium condition, given by $M = 0$ when $w_a = w_m E/(E+U)$, follows as a natural conclusion. Consider now the effect on real income of creating one additional urban job. At a <u>given</u> marginal product of labour in agriculture equal to w_a, the loss in agricultural output will be $w_a(E+U)/E$, whereas the gain in manufacturing output will be w_m, the marginal product of labour in manufacturing. Thus, if w_a is taken as given, the net gain in real income is zero, so that it follows that the appropriate shadow price of urban labour is equal to the market wage and the optimal subsidy for employment to urban labour is zero. We may note that this corresponds to the famous result in Harberger (1972). The HT conclusion that an employment subsidy for manufacturing employment is welfare improving rests entirely on the assumption of diminishing returns to labour in agriculture; when this assumption is valid, a transfer of labour from the agricultural sector will raise the marginal product of labour in agriculture and hence reduce the rural-urban wage differential and urban unemployment, and real income will rise.

Consider now the effect of relaxing the assumption of an infinite turnover rate, while still staying within the comparative static framework. While it will still be true that expected urban labour income will be equal to $w_m E/(E+U)$, from the point of view of an individual worker the variance of earnings will no longer be zero. Furthermore, the expected duration of unemployment will also be greater than zero, or equivalently, the probability that a newly arrived immigrant will find a job during the first year, say, will be less than one. Both because of the greater variance in urban income

and because of the expectation of an initial period of unemployment, one would expect that migration would be reduced to zero at an expected value of urban labour income higher than the wage in agriculture, i.e., we would expect

(20) $M = 0 \Rightarrow w_a < w_m E/(E+U).$

But it is easy to show that under these circumstances, an increase in the number of urban jobs would increase real income, so that the shadow price of labour should be below the market wage, and an employment subsidy would be welfare improving even with a given and constant marginal product of labour in agriculture. Based on existing evidence from LDCs, we believe that this inequality would generally hold, so that the accounting price of urban labour at the equilibrium unemployment rate would be substantially less than the market wage.[15]

The discussion so far has remained within the framework of comparative statics, however. Suppose now that we instead consider the question of job creation in the context of a model in which migration responds only gradually to employment opportunities, and in which $\dot{E} = g\,E > 0$. From the formulae presented above, it then becomes obvious that the rate at which agricultural output is foregone as a result of labour employment in the urban manufacturing sector depends not only on the level of manufacturing employment but also on the number of hirings. Therefore, a second-best tax-subsidy policy designed to offset the distortion effect on efficient resource allocation of urban unemployment must be so constructed that it controls both the number of hirings and the level of manufacturing employment.

A full solution to the problem of an optimal rate of urban job creation, it thus appears, would require the specification of a dynamic optimization model, and one could argue that it should be formulated in such a way as to also include the question of the optimal allocation over time of investment between the rural and urban sectors, which must surely be at least an equally important problem in LDCs. A formulation of such a model falls outside the scope of this paper.

We may nevertheless observe that in principle, a tax-subsidy system (or a set of shadow prices) corresponding to an optimal solution along these lines could be constructed on the basis of a subsidy for the employment of manufacturing labour à la HT and a once-and-for-all tax on the hiring of labour; the latter tax would be based on the present value of agricultural output foregone as a consequence of present and future urban unemployment resulting from labour migration in excess of the number of jobs being created, and would depend on the speed with which unemployment would return to its equilibrium level once the hiring had stopped.[16]

V.   Conclusion: Is Job Creation Good or Bad?

The principal conclusion from the above analysis, from the point of view of policy recommendations, must be an agnostic one: because of problems of model specification (in addition to the ubiquitous data problems), existing empirical results regarding rural-urban migration in LDCs cannot yet be used to judge the validity or otherwise of the Todaro paradox, neither in the short run nor in the long run. Further empirical

work is warranted, and we hope to have shown that the type of model we
have proposed here may provide a better framework for this purpose than
do most existing specifications.[17]

With respect to the HT analysis of the resource allocation effects
of migration and the problem of a second-best optimal tax-subsidy scheme for
urban employment, we hope to have shown that their results are based on
a very special view of the nature of rural-urban migration, and that the problem
becomes quite different once it is explicitly recognized that migration is
a dynamic phenomenon, and hence that the resource allocation effects of
job creation are not capable of being systematically analyzed through the
use of a comparative statics methodology. In particular, it is not possible
to design an optimal tax-subsidy package to deal with urban unemployment
unless one has some knowledge of the dynamic response of migration and un-
employment to the rate of net and gross hiring of labour.

We finally note that our discussion of subsidization of manufacturing
employment and urban job creation so far has entirely neglected the possibility
that there may be imperfections also in markets other than that for labour.
If one relaxes this assumption and recognizes the fact that social rates of
return on capital in the agricultural sector are typically much higher than
the (often subsidized) rates in urban manufacturing, the conclusions may be
quite different. At given relative prices of agricultural and manufacturing
goods,[18] the effect of an urban employment subsidy would probably be to raise
private profits and capital investment in the (low-social-return) manufacturing
sector.[19] Rural development through investment in agriculture might then be
a better policy from a resource allocation point of view, in addition to its
effect of narrowing the rural-urban wage differential and hence reducing the urban
unemployment problem.

[*]I would like to thank Peter Howitt, Charles Stuart and Kul Bhatia

for comments on an earlier draft. I alone am responsible for remaining

errors.

[1]There has recently been an increasing concern over the possibility

that migration tends to be selective in the sense that the more highly

productive (because of age or education) members of the rural labour force are

the most likely ones to migrate, which may tend to cause progressive im-

poverishment in the countryside; see, for example, Michael Lipton (1976).

By the same token, it has also been argued that the urban unemployment

problem in LDCs may not constitute as severe a social problem as one might

think, if one takes into account that the unemployed urban job seekers tend

to be relatively young and well educated. See Albert Berry (1975).

[2]Among recent papers in this mold, the ones by Fields (1975), Stiglitz

(1974), and Bhagwati and Srinivasan (1975), are particularly interesting.

An excellent survey is contained in Lucas (1975). For a recent survey of the

work along the lines of Todaro (1969), including numerous references to

empirical work, see Todaro (1976b).

[2a]There has been a good deal of discussion of the question whether the

size of the migration flow depends on the relative size of the rural to

urban population (Zarembka (1970), Todaro (1970).) If one regards the entire rural

population as being homogeneous with respect to tastes, degree of risk aversion,

and as having the same amount of information, then the relative size of the two

population groups clearly would matter, and λ should be regarded as a function of this relative size. If, on the other hand, the potential migrants are principally rural dwellers who have some contact with and knowledge of previous migrants, then the size of the flow would be more likely to be proportional to the number of people already in the city. We will adopt the second assumption here and treat λ as a constant during the period of analysis, even though we recognize that in the very long run, it will generally be a function of the relative size of the rural and urban population.

[3] A key parameter in the Todaro analysis is η_p, the elasticity of migration flows with respect to p defined as in (2). If η_p is taken as constant, the zero-migration condition in Todaro's analysis becomes $g = \dot{E} = 0$, which is independent of E and U. Whereas Todaro (1976a) nowhere states that η_p is to be taken as constant, neither does he discuss how it might change with the levels of E and U.

[4] This implicit assumption is recognized and discussed by Todaro in (1976a); see footnote 14, p. 220.

[5] As noted above, this is the variable implicitly stressed in the HT model.

[5a] For simplicity, we abstract from the natural rate of increase in the urban labour force.

[6]Of course, given an initial rate of unemployment, if it can be demon-
strated that a given policy raises its rate of change over and above what it
otherwise would have been, it follows that in the short run the unemployment
rate will be higher than it otherwise would have been. Todaro recognizes
(footnote 14, p. 220) that the short-run and long-run impacts may be different,
but the difference is not analyzed formally, and no indication is given how
short the short run is.

[7]Note that it is possible for λ to be greater than one.

[8]Recall that α is the inverse of that ratio of job openings to
unemployment at which migration is zero.

[9]It is worth noting that in order for job creation to reduce equi-
librium unemployment, we must have $\lambda\alpha < 1$. But inspection of (10) makes
clear that if that inequality holds, and if b = 0, the equilibrium unemployment
rate is negative. A situation with negative equilibrium unemployment can
be interpreted as one in which the wage differential is too small to induce the
amount of migration necessary to fill available vacancies whenever g > 0. One
would then expect the urban wage rate to rise until we would again have $\lambda\alpha \geq 1$.

[10]From (15), we can write M = $f(U,p,\alpha(w))$. The empirical specifications
discussed here exclude U as a separate variable. Since U and p are negatively
correlated, and since the partial effect of U (with positive migration) on
M is positive (see (15)), it follows that the coefficient of p would tend to
be underestimated when this is done. This would explain the low estimated
values of η.

[11] The observed measures of migration used by Todaro probably include large numbers of people who are not in the labour force (p. 222, note to column 2, Table 1). This may explain the discrepancy between the computed values and those expected in an equilibrium situation.

[12] While η is not a constant parameter in the present version of the model, we might still consider estimating its value at the equilibrium level of unemployment; this is the sense in which we can talk about the bias in existing estimates.

[13] In the light of the fact that the rate at which the unemployment rate converges to its equilibrium value is given by $(\lambda+g)$ (see above), one may argue that the higher is λ, the less important the short-run effects of policy relative to the long-run effects. On the other hand, the higher is λ, the more likely it is that the Todaro paradox holds! Thus, one must conclude that there is a degree of inconsistency in arguing that a) the Todaro paradox holds in most LDCs, and b) because the short run may be very long, long-run analysis is relatively unimportant (Todaro, 1976a).

[14] Perhaps they can be interpreted as assuming that the value of λ is "very high" as a justification for this procedure.

[15] The precise value of the accounting price can be found from a knowledge of w_a and of the parameters determining $(U/E)^*$ as given by (10) with $g = 0$.

[16] It might be argued that such a scheme would be unnecessarily complicated, and that the same effect could be obtained by reducing the basic employment subsidy. The advantage of a once-and-for-all hiring tax applicable to gross hiring, however, is that it would also constitute an incentive for business firms to reduce labour turnover and replacement

hiring; since the rate of replacement hiring as well as net increases in urban jobs influence urban unemployment, such an incentive is seen to be appropriate once it is recognized that turnover is to some extent subject to choice by firms.

[17] While it is true that empirical work based on the type of specification proposed here gives rise to a non-linear (both in variables and parameters) estimation problem, we would not regard that as a major difficulty. Non-linear estimation routines are available in some of the regression packages most frequently used by economists today (e.g., TSP); alternatively, the equation can be approximated, through a first-order Taylor expansion, in a form which makes it linear in the parameter.

[18] This assumption is reasonable in an open economy.

[19] The HT analysis effectively neglects this by assuming that the capital stocks in agriculture and manufacturing are given and fixed.

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Appendix

In this appendix we formulate the differential equation describing the time path of the unemployment rate U/E. We have

(A1) $\qquad \dfrac{d(U/E)}{dt} = \dfrac{E\overset{\circ}{U} - U\overset{\circ}{E}}{E^2} = \dfrac{\dot{U}}{E} - g\dfrac{U}{E}$

Substituting from (5) in the text, we obtain

(A2) $\qquad \dfrac{d(U/E)}{dt} = \lambda\alpha(g{+}b) - g - (\lambda{+}g)\dfrac{U}{E}$.

From this, we find the equilibrium unemployment rate as:

(A3) $\qquad \left(\dfrac{U}{E}\right)^{*} = \dfrac{\lambda\alpha(g{+}b) - g}{\lambda + g}$

which is (6) in the text. We may thus rewrite (A2) as

(A4) $\qquad \dfrac{d(U/E)}{dt} = -(\lambda{+}g)\left(\dfrac{U}{E} - \left(\dfrac{U}{E}\right)^{*}\right)$

which proves the assertion following (6) in the text that the rate at which the unemployment rate converges to its equilibrium value is $(\lambda{+}g)$.