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URBAN JOB CREATION AND UNEMPLOYMENT IN LDCs

Todaro vs. Harris and Todaro

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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 fundamentally different views of the rural–urban migration process in the two types of models, and a synthesis is proposed.

1. 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]

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[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 impoverishment 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).

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 which starts 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 implications 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 unemployment 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.

2. 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:

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

[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).

where M denotes the flow of rural–urban migration per unit of time, E is the number of *employed* urban workers,[3] w is a measure of the urban–rural wage differential, and p is 'the probability of getting a job.' Using a continuous time formulation, the measure of p used by Todaro can be written:

$$p = \frac{\dot{E}}{U} = \frac{gE}{U}, \tag{2}$$

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 turnover rate, i.e. the rate at which such vacancies arise, as b, a natural generalization of Todaro's measure of the 'probability' of getting a job is

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

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

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

[3]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 in eq. (6) below 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. It should be noted, however, that Todaro (1976a) uses M/L as the left-hand side variable, where L is the *rural* labour force.

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.[4] 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.[5] 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.

3. A synthesis

In the alternative model which we propose here, we follow Todaro in assuming

[4]A key parameter in the Todaro analysis is η, the elasticity of migration flows with respect to p defined as in (2). If η 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 is to be taken as constant, neither does he discuss how it might change with the levels of E and U.

[5]This implicit assumption is recognized and discussed by Todaro (1976a, p. 220, fn. 14).

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 $p = \pi$, 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.[6] Thus the condition for zero migration can be written as

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

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:

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

or,

$$\frac{M}{E} = \lambda\left(\alpha(g+b) - \frac{U}{E}\right). \tag{7}$$

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 on 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,[7]

$$\dot{U} = M - \dot{E}. \tag{8}$$

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

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

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

$$\frac{\dot{U}}{E} = \left(\frac{U}{E}\right)\frac{\dot{U}}{U} = \lambda\left(\alpha(g+b) - \frac{U}{E}\right) - g. \tag{9}$$

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 *rate of change* 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.[8]

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

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

It can be demonstrated (see the Appendix) that the rate at which the unemployment 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:

$$\frac{\mathrm{d}(\dot{U}/U)}{\mathrm{d}g} = \frac{E}{U}(\lambda\alpha - 1). \tag{11}$$

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,[9] 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,[10] and depends on the rural–urban wage differential.

[8]Of course, given an initial rate of unemployment, if it can be demonstrated 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 (1976a, p. 220, fn. 14) recognizes 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.

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

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

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

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

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 may still be an increase in unemployment. Upon reflection, this is not very surprising: if the equilibrium stock of unemployed job searchers depends only on the number of new 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.[11] When $b > 0$, it is possible for the short-run impact of job creation to be an increase in the rate of change of unemployment whereas the long-run impact would be a decrease in its equilibrium level. 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

$$\frac{\partial(\dot{U}/U)}{\partial w} = \frac{\lambda E}{U}\frac{\partial\alpha}{\partial w}(g+b) > 0$$

$$\frac{\partial(U/E)^*}{\partial w} = \frac{\partial\alpha}{\partial w}\frac{\lambda(g+b)}{\lambda+g} > 0, \tag{13}$$

[11]It is worth noting that in order for job creation to reduce equilibrium 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 $\lambda\alpha \geqq 1$.

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:

$$\frac{\partial^2(\dot{U}/U)}{\partial g \partial w} = \frac{\lambda E}{U}\frac{\partial \alpha}{\partial w} > 0,$$

$$\frac{\partial^2(U/E)^*}{\partial g \partial w} = \frac{\lambda(\lambda - b)}{(\lambda+g)^2}\cdot\frac{\partial \alpha}{\partial w}; \tag{14}$$

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.

4. Empirical migration functions, the Todaro paradox and the effects of employment subsidies

In the light of the foregoing discussion, we now turn to a specific critique of Todaro's proposed 'simplified empirical test' for the presence of the so-called Todaro paradox (1976a). The critical condition for additional job creation to raise the *level* of unemployment, according to this test, is

$$\eta > gE/M, \tag{15}$$

where η is the elasticity of the rural-urban migration flow with respect to the 'probability' of finding a job p, where Todaro defines $p = gE/U$, i.e. neglecting job openings arising from turnover in existing urban jobs[12] by implicitly assuming $b = 0$.

[12]Todaro actually defines p using the unemployment rate lagged one time period (see his eq. (2)). His subsequent definition of changes in p (his eq. (4)) is strictly valid only if the unemployment rate is constant; but if that is the case, increasing the growth rate of the number of urban jobs *necessarily* implies an increased growth rate of unemployment, so that the Todaro paradox would be trivially true, and the subsequent analysis of changes in the unemployment *rate* would be meaningless. While the question of time lags in the migration process may be important in its own right, the logical inconsistency in Todaro's approach is most easily removed by reformulating his model in continuous time, neglecting lags, as we have done here.

In order for the *rate* of unemployment to rise, the critical condition is given as

$$\eta > g(E+U)/M. \tag{16}$$

Todaro then discusses some empirical work on rural–urban migration and finds estimated values of η ranging from 0.45 to 0.65. He further gives estimates of gE/M and $g(E+U)/M$ for a number of countries, and in a majority of cases finds that these ratios are below 0.5 and 0.6 respectively. Hence he concludes that in most countries, the Todaro paradox holds, at least with respect to the level of unemployment, i.e. increased job creation will worsen the unemployment problem.

In interpreting these conclusions, we again note that they do not strictly speaking refer to the impact on the 'level' and 'rate' of unemployment, but rather to the impact of job creation on the *rates of change* of those variables; it is easy to show that condition (15), for example, is equivalent to the condition $dM/dg > d(\dot{E})/dg$; from (8) above it is evident that this is equivalent to $d\dot{U}/dg > 0$, and similarly for (16). We should also note that Todaro's analysis only refers to a *small* change in the rate of job creation. If large changes are possible, the conclusion may be reversed. Consider, for example, Todaro's critical elasticity gE/M; the values he gives imply that in all the countries he studied, this ratio is less than unity, i.e. $M > gE$ so that unemployment is rising.[13] As long as $\eta < 1$, as the evidence discussed by Todaro appears to indicate, an increase in g (given E) will increase M less than in proportion to gE, so that (with a constant η), we will ultimately have $M = gE$; but when this equality holds, the level of unemployment is no longer rising! A similar argument can be made with respect to the *rate* of unemployment. While it may reasonably be objected that rates of job creation high enough to prevent unemployment from rising are administratively or fiscally impossible in the short run, the question whether a higher rate of job creation is the 'best' policy over time depends on just *how* fast new jobs can be created, and cannot be answered without an explicit consideration of the nature of these constraints, the time horizon of the policy-makers, the net real income gains from transferring labour from agriculture to manufacturing, etc.

Finally, and perhaps most importantly, the foregoing discussion was carried out on the assumption that the rate of turnover, b, was equal to zero. If this assumption is relaxed, the critical conditions (15) and (16) are no longer valid, because a given change in the rate of job creation g will no longer create a

[13]This in itself is a somewhat suspect finding. One can speculate that it may be due to the fact that the procedures used for measuring the urban labour force were fairly carefully designed to avoid the inclusion of people not in the labour force; as Todaro himself notes this is less likely to be the case for the measurement of migration. While Todaro refers to a likely offsetting bias in the other direction, he does not specify its nature.

proportional change in p (defined as in (3)). It can be shown that the left-hand sides of the critical conditions should now be replaced by $\eta g/(g+b)$. Since this expression will be less than η, this modification will make it even less likely that the critical conditions were fulfilled, i.e. it would tend to weaken the support for the Todaro paradox and strengthen the case for increased job creation as the best policy.

Thus, we have two basic criticisms of Todaro's simplified empirical test. The first is that it is a test only of the *short-run* impact of *small* changes in the rate of job creation on the rates of change in the level or rate of unemployment; if the time horizon is extended beyond the immediate future, and sufficiently large changes in the rate of job creation are possible, the empirical evidence indicating that $\eta < 1$ would rather tend to support the opposite of the Todaro paradox, i.e. the highest possible rate of job creation may be the best way to reduce the unemployment problem over time, even in the very short-run.[14] The second is the neglect of the turnover rate in existing urban jobs which biases the analysis in favour of the Todaro paradox: if the equilibrium unemployment rate is positively related to the fraction of unemployed workers who find jobs during a given time interval, and if this fraction is proportional to the number of *new* jobs only, one would clearly expect an increase in the number of new jobs to increase the unemployment rate. Indeed, as was demonstrated above (see footnote 11), if $b = 0$ and there exists a positive equilibrium unemployment rate, both the rate of change of unemployment and the equilibrium unemployment rate are *necessarily* increasing functions of the rate of job creation g in the framework of the model proposed in section 3.

It may finally be worth noting in this context that, against the background of our model, the empirical estimates of the migration elasticities discussed by Todaro are likely to be biased downwards as a result of specification error. Using $p = (g+b)E/U$, one may rewrite (7) as

$$M = U\lambda(\alpha p - 1), \tag{17}$$

and we find

$$\eta = \frac{(g+b)E}{M}\cdot\lambda\alpha = \frac{\alpha p}{\alpha p - 1}, \tag{18}$$

which is greater than one whenever $M > 0$. The empirical work discussed here includes p but not U as an explanatory variable, and one can argue that this

[14]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)].

is likely to bias the estimates of η downwards.[15] Because of this, we do not believe that existing empirical estimates are very useful in evaluating the validity of the Todaro paradox either in the short run or the long run. In addition, little evidence is available on the value of the turnover rates b; since this is an important variable both in the estimation of the parameters of a migration function such as we propose here and in assessing the long-run impact of job creation on unemployment, we would argue that collection of such evidence is an important task in future empirical work on rural–urban migration.

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, 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 of 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 *variance* 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 *given* 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 of 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.

[15]Since U and p are negatively correlated, and since the partial effect of U (with positive migration) on M is positive (see (17)), it follows that the coefficient of p would tend to be underestimated when this is done. This might explain the low estimated values of η.

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

$$M = 0 \Rightarrow w_a < w_m E/(E+U). \tag{19}$$

On the assumption that there are no divergences between private and social opportunity costs in the system other than in the market for urban labour, it would follow that 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. The precise value of the shadow price could be found from a knowledge of w_a, w_m, and of the parameters determining $(U/E)^*$ as given by (10) with $g = 0$. If there are other divergences between social and private opportunity costs in the system (e.g. if the market wage in agriculture differs from the marginal product, or if labour transfer to manufacturing increases consumption and decreases savings and the shadow price of savings exceeds that of consumption, as suggested by Little and Mirrlees), this procedure will of course not be strictly valid. Nevertheless, it seems to us that the empirical evidence on the rural–urban market wage differential and the urban unemployment rate suggests that w_a is substantially less than $w_m E/(E+U)$ in most LDCs, so that the indirect effects of distortions in other markets would have to be quite major in order to reverse the qualitative conclusion that the shadow price should be less than the market wage.

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 $\dot{E} = gE > 0$. From the formulae presented above, it then becomes obvious that the rate at which agricultural output is forgone as a result of labour employment in the urban manufacturing sector depends not only on the *level* of manufacturing employment but also on the rate of job creation g and the rate of labour turnover b; put differently, it depends on the number of *hirings* per unit of time. With this view of the rural–urban migration process, the question of a second-best tax-subsidy policy becomes considerably more complicated.

One may first note that if search costs are taken into account, it is not even obvious that *any* tax-subsidy policy is warranted. If a pool of job seekers in the urban areas reduces the search costs that would otherwise have to be incurred by employers in the manufacturing sector in filling available vacancies, a positive urban-rural wage differential and a positive unemployment rate might be compatible with a competitive labour market and might be economically efficient. The evidence of significant influence of unionization and government minimum wage policies in LDCs appears to be fairly strong, however, so that it is reasonable to assume that urban wages in LDCs are frequently above their competitive levels. Under those circumstances, an employment subsidy designed to raise the level of manufacturing employment would appear warranted, ceteris paribus. But if the level of unemployment depends on the rate of job creation and the rate of labour turnover, it would also appear that a second-best tax subsidy scheme should be designed taking into account the *rate of hiring* of labour as well as the level of 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 á 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 forgone 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. It might be argued that such a scheme would be unnecessarily complicated, and that the same effect could be obtained by simply having a lower 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.

5. Conclusions: 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.[16]

With respect to the HT analysis of the resource allocation effects of migration and the problem of a second-best 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 unemployment 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, the immediate effect of an urban employment subsidy would be to raise private profits in the manufacturing sector. If the taxes necessary to finance the subsidy are levied on the agricultural sector (directly, or indirectly through the levying of tariffs on imported manufactured goods, say), or if agricultural savings are attracted to the manufacturing sector, the net result may be a higher rate of capital formation in the (low-social-return) manufacturing sector and a lower one in the (high-social-return) agricultural sector than would otherwise have taken place.[17] Under those circumstances, fiscal measures to subsidize (or directly finance) investment in the agricultural sector through taxes on (or reduced subsidies to) manufacturing profits may be as beneficial, from a resource allocation point of view, as would measures to subsidize employment in manufacturing. In the end, the choice between the two types of strategies, or some

[16]While it is true that empirical work based on the type of specification proposed here gives rise to a nonlinear (both in variables and parameters) estimation problem, we would not regard that as a major difficulty. Nonlinear 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 parameters.

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

combination of them, will heavily depend on political, administrative, and government revenue constraints, and it is not clear that a policy focussing primarily on employment subsidization will necessarily be the best one when these constraints are taken into account in addition to the effects on resource allocation.

Appendix

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

$$\frac{\mathrm{d}(U/E)}{\mathrm{d}t} = \frac{E\dot{U} - U\dot{E}}{E^2} = \frac{\dot{U}}{E} - g\frac{U}{E}. \tag{A.1}$$

Substituting from (5) in the text, we obtain

$$\frac{\mathrm{d}(U/E)}{\mathrm{d}t} = \lambda\alpha(g+b) - g - (\lambda+g)\frac{U}{E}. \tag{A.2}$$

From this, we find the equilibrium unemployment rate as:

$$\left(\frac{U}{E}\right)^* = \frac{\lambda\alpha(g+b)-g}{\lambda+g}, \tag{A.3}$$

which is (6) in the text. We may thus rewrite (A.2) as

$$\frac{\mathrm{d}(U/E)}{\mathrm{d}t} = -(\lambda+g)\left(\frac{U}{E} - \left(\frac{U}{E}\right)^*\right), \tag{A.4}$$

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

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