The Intermediate Sector, Unemployment, and the Employment-Output Conflict: A Multi-Sector Model

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This paper analyzes urban intermediate sector expansion as a policy alternative for labor absorption. Introduction of an intermediate sector into the Harris-Todaro framework demonstrates that the migration and unemployment responses to job creation implied by their model can be avoided. Output as well as employment effects of expanding the modern and intermediate sectors are analyzed to show that both the output-employment trade-off and the Todaro paradox stem from dual economy assumptions. The intermediate sector is distinguished from underemployment in the informal sector, and the model is extended to include both types of activities in rural as well as urban areas. Other extensions of the Harris-Todaro model are incorporated, and policy implications are discussed.

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1. Introduction

The phenomenon of continuing rural-urban migration in the face of rising urban unemployment in less developed countries has been explained in terms of the two-sector expected income model of Harris and Todaro (1970). Several controversies have ensued, regarding the ability of the model to explain observed levels of unemployment; the unemployment-increasing effect of urban job creation; and appropriate wage policies. Their basic approach appears widely accepted in that most criticisms offer extensions and refinements that reflect more on the adequacy of the model than on its essential validity. Although the conclusions of the simple model are sometimes altered by these modifications, insufficient attention has been paid to the implications of its dual economy framework for the validity of the model and its conclusions.

This paper argues that the two-sector assumption overlooks an important policy option, one which may be able to raise both output and productive employment while reducing unemployment. The tendency to associate development with modern, large-scale industry leads to lumping "all those workers not regularly employed in the urban modern sector" into "the urban traditional sector" (Todaro 1969b,p. 139), and to assuming that they add little or nothing to national output. The existence of a wide range of activities other than the agricultural and industrial production represented in two-sector analysis is often acknowledged in such models, and has been observed
and classified (Hart 1973), but the potential importance of some of these activities has been overlooked in formal models. Hymer and Resnick (1969) have attempted to incorporate productive non-agricultural activities into a model of the rural economy, but only limited efforts have been made to articulate the urban economy (Byerlee and Eicher 1972, Steele 1975). There is a growing body of empirical literature (reviewed in Morawetz 1974 and Steel 1977) indicating that small-scale establishments using intermediate technology can utilize both labor and capital productively, often generating more output as well as more employment for a given investment than the modern sector, and that such firms employ an important share of workers in manufacturing and other sectors (Liedholm and Chuta 1976, Mazumdar 1976, Morawetz 1974, Steel 1977, Steele 1975). The potential contribution of non-modern activities is analyzed in this paper by defining an "intermediate sector" which offers a productive employment alternative to modern sector employment, albeit at a lower wage and marginal product. Increased investment in the modern sector is shown to aggravate the unemployment problem, as in the Harris-Todaro model, but investment in the intermediate sector alleviates it, without necessarily reducing output growth. The intermediate sector is presented as a potential resolution to the choice perceived by policy-makers in many less developed countries between policies that maximize output growth and those that maximize employment.

An additional problem of the two-sector framework is that urban unemployment is treated as involuntary, since demand for employment is limited due to restrictions on wages (or entry). Unemployment is involuntary only if workers would like to take a job at prevailing wages but cannot find employment. In reality, job-seekers may refuse employment at market wages in order to search intensively for a more desirable high-paying job, or they may alternate between periods of earning income in available jobs and periods of unemployment-cum-job-search.
Such workers may be defined as voluntarily unemployed with respect to available job opportunities.

"Disguised unemployment" in the form of overcrowded, low-productivity urban activities such as petty trade is as significant a form of labor underutilization in many less developed countries as open unemployment. Increased utilization and productivity of labor—the primary policy objectives of this paper—may be achieved by shifting this labor into moderate-productivity activities. Dualistic models, however, include both types of activities in the "informal" sector (or in unemployment) and therefore ignore this approach, focusing only on inter-sectoral transfer to the high-productivity modern sector.

We begin by introducing an intermediate urban sector into a simple model similar to that of Harris and Todaro, but sufficiently general to allow for differential probabilities of modern sector employment, different time horizons, labor turnover, and costs of migration. In order to focus on the role of this sector, workers are assumed to make a distinct decision between employment in the intermediate sector and unemployment-cum-job search, so that unemployment is voluntary. This model is used to compare the effects of investment in the modern sector to those of intermediate sector expansion, and to analyze the implications for growth of output and employment. The model is then extended to include non-productive "casual" income-earning activities, to integrate the migration and employment decisions, and to permit both voluntary and involuntary unemployment. Further disaggregation provides a parallel breakdown of rural sectors. Finally, we discuss the implications of our analysis for development policy and strategy.
2. Three-sector model

The modern sector is defined to refer to large-scale capital-intensive firms employing wage workers and using advanced technology. The initial assumption here, as in the Harris-Todaro model, is that the modern sector wage is determined institutionally, rather than in the market. The institution could be a legal minimum wage, the desire of multinational corporations to appear progressive, or union pressure. An alternative approach is also discussed.

Activities outside the modern sector are distinguished according to whether the marginal product of labor is close to the market wage or is close to zero. The "market wage" is understood to refer to a structure of wages corresponding to different skills and qualifications which is determined by the interaction of labor demand and supply. The intermediate sector is defined to refer to small-scale enterprises engaging labor at a positive marginal product and using an intermediate technology with moderate amounts of capital per worker. The workers may include purely self-employed owners, family members, apprentices, part-time workers, and/or a limited number of wage employees. The intermediate sector produces marketable goods and services which are substitutable for those of the modern sector. The discussion focuses on manufacturing, but applies to other activities as well. Intermediate production differs from the "traditional sector" of the two-sector model principally in having a positive marginal product of labor rather than representing disguised unemployment, and also in being competitive with rather than complementary to the modern sector.

Urban workers not engaged in the modern or the intermediate sectors are termed "unemployed". For some purposes, it is useful to distinguish between the purely unemployed and those undertaking income-earning activities in which the marginal product of labor is negligible. We use the term "casual" to refer to these activities alone, treating productive small-scale employment separately as the intermediate sector instead of calling all non-modern employment "informal", as much
of the literature does. Casual activities are introduced as a separate sector in the extended model, but are initially included with unemployment. The wage of the unemployed is taken to be zero in analyzing the simple three-sector model. The general model includes a transfer enabling the unemployed to achieve a subsistence level of consumption, for example through support from relatives.

Agriculture is the third sector of production in this model. In order to focus on the implications of introducing the urban intermediate sector, however, agriculture is not explicitly introduced at this point. Rather, it is assumed that surplus agricultural labor is ready to migrate to urban areas as long as the urban expected wage exceeds the rural subsistence wage plus migration costs. The elasticity of supply is assumed to be sufficiently high that the rural wage does not rise significantly in response to migration of the magnitude necessary to achieve equilibrium in the model, nor does agricultural output fall. The implications of relaxing these assumptions will be discussed subsequently.

Production in the modern sector \( (X_1) \) and the intermediate sector \( (X_2) \) is represented by

\[
X_1 = f(N_1, K_1, T_1) \tag{1}
\]

and

\[
X_2 = g(N_2, K_2, T_2) \tag{2}
\]

where \( N \) is the labor engaged in each sector, \( K \) the given capital stock, \( T \) the given level of technology, and \( f' \) and \( g' \) are the derivatives with respect to \( N_1 \) and \( N_2 \) respectively, the only variable factors.

Profit maximization and competition in the labor market are assumed to result in the real modern sector wage \( (\bar{W}_1) \) being equated to the marginal product of labor. This wage cannot, however, fall below the minimum wage \( (\hat{W}_m) \), which is set institutionally (by law, policy, or bargaining):

\[
\bar{W}_1 = f' > \hat{W}_m \tag{3}
\]
We assume a minimum wage high enough to be binding, so that

\[ f' = \bar{w}_m = \bar{w}_1 \] (3')

The intermediate sector is assumed to hire labor until its marginal product equals the real intermediate wage \( \bar{w}_2 \), as in the modern sector, but with the important difference that the wage is market-determined rather than a fixed minimum (and hence presumed to be lower): 7

\[ \bar{w}_2 = g' \] (4)

The initial endowment of labor \( \bar{N} \) must equal rural employment \( N_R \) plus the urban labor force \( N_U \), which includes permanent and temporary migrants. All unemployment \( N_3 \) is treated as being in the urban sector:

\[ \bar{N} = N_R + N_U \] (5)

and

\[ N_U = \sum_{i=1}^{3} N_i \]  
\[ i = 1,2,3 \] (6)

or, dividing by \( N_U \),

\[ l = \sum_{i=1}^{3} n_i \]  
where \( n_i = \frac{N_i}{N_U} \) (6')

The decision to migrate depends on the difference between real urban and rural incomes. This differential is most readily measured by the expected wage differential, although conceptually it includes differences in amenities, social life, and other non-quantifiable benefits and costs of living in the different areas. As in the Harris-Todaro model, migrants do not enter the modern sector immediately upon arrival, but in this model they may choose between unemployment and the intermediate sector as temporary activities.

The expected urban wage \( E(\bar{w}_U) \) can most generally be represented by the present discounted value of wages that a new urban worker can expect to receive. The probability of being engaged in sector \( i \) at time \( t \) is represented by \( \rho_i(t) \), where

\[ \sum_{i=1}^{3} \rho_i(t) = 1 \text{ for all } t = 0,1,\ldots,n. \]  
The results presented below require only that

\[ i=1 \]
the expected wage be an increasing function of all variables other than the probability of being unemployed ($p_3$). The probabilities are a function of the relative sectoral shares of total labor force and their rates of growth (discussed below). Assuming an individual discount rate $r$ and a time horizon of $n+1$ periods,

$$E(W) = \int_{t=0}^{n} \rho_1(t) W_1(t) e^{-rt} dt + \int_{t=0}^{n} \rho_2(t) W_2(t) e^{-rt} dt + \int_{t=0}^{n} \rho_3(t) e^{-rt} dt. \quad (7)$$

The income received by unemployed persons ($W_3$) can be positive if unemployment benefits, support from relatives, or other forms of assistance are counted; or zero if the person is living on past savings or borrowed funds and derives no value from being unemployed. $^8$

Rural-urban migration is economically rational as long as the discounted stream of earnings plus other benefits minus costs in the urban area exceeds that in the rural area. In addition to the initial out-of-pocket cost of migration $C(0)$, we may include a differential $D(t)$ for the extra cost of urban living plus the value of any social/psychological costs of living in a different culture, and a term $A(t)$ for the value of the differential in amenities between urban and rural areas. The migration equilibrium condition then is

$$E(W_U) + \int_{t=0}^{n} A(t) e^{-rt} dt - \int_{t=0}^{n} D(t) e^{-rt} dt - C(0) = \int_{t=0}^{n} W_R(t) e^{-rt} dt. \quad (8)$$

The income that the potential migrant would receive in the rural area is $W_R(t)$. For simplicity, we assume here that the relevant rural wage is at a given level $\bar{W}_R$ with a perfectly elastic supply of migrant labor at that wage, and that migrants perceive a fixed net cost of migration $\bar{C}$. To further simplify the analysis, we assume a short time horizon and a zero unemployment wage ($W_3 = 0$), such that potential migrants expect their urban wage to be an average of the modern and intermediate sector wages weighted by their relative employment shares. $^9$ The simplified migration equilibrium condition is

$$E(W_U) - \bar{C} = W_R. \quad (8')$$

where

$$E(W_U) = n_1 \bar{W}_m + n_2 \bar{W}_2. \quad (7')$$
A new urban worker who is seeking employment in the modern sector first must choose between working in the intermediate sector and remaining unemployed while searching for a modern sector job. This choice is assumed to be made on the basis of the present value of expected income, including possible income earned from future employment in the modern sector. If the present value of intermediate income exceeds that of unemployment, new workers will choose intermediate employment, driving down the intermediate wage until the differential is eliminated. If new workers choose unemployment in response to a higher present value of expected income, the intermediate wage will be unaffected while the decreasing probability of getting a modern sector job will lower expected income more for unemployment than for intermediate employment until the differential is eliminated. Adjustment is assumed to take place primarily through the decisions of new urban labor force entrants. Workers do not move between unemployment and the intermediate sector unless there is a major change in one of the variables. Hence, in equilibrium:

$$E(Y_2) = E(Y_3)$$

(9)

where $E(Y_2)$ is the present value of income from intermediate sector employment and from expected future modern sector employment and $E(Y_3)$ is the present value of income or leisure while unemployed and from expected future modern sector employment. This condition means that unemployment is voluntary with respect to intermediate sector employment and involuntary with respect to the modern sector. Conditions for extending voluntary unemployment will be discussed in the extended model.

The probability of getting a modern sector job may be different for unemployed workers ($\rho_{1,3}$) than for those engaged in some intermediate activity ($\rho_{1,2}$). Given that unemployed workers remain unemployed until they obtain a modern sector job, the present value of expected income for such a worker is most generally represented by:

$$E(Y_3) = \int_{t=0}^{n} \left[1 - \rho_{1,3}(t)\right] W_3(t)e^{-rt}dt + \int_{t=0}^{n} \rho_{1,3}(t)W_1(t)e^{-rt}dt.$$  

(10)
Assuming that $W_3 \equiv 0$ and that $W_1 \equiv \bar{w}_m$ and using a two-period framework for convenience of illustration:

$$E(Y_3) = \frac{\rho_{1,3} \bar{w}_m}{1 + r}.$$  \hspace{1cm} (10')

Similarly, assuming that intermediate sector workers take a modern sector job if one becomes available but do not shift to unemployment:

$$E(Y_2) = \int_0^N [1 - \rho_{1,2}(t)] W_2(t)e^{-rt}dt + \int_0^N \rho_{1,2}(t)W_1(t)e^{-rt}dt$$  \hspace{1cm} (11)

or, in a two-period framework,

$$E(Y_2) = (1 + \frac{1 - \rho_{1,2}}{1 + r}) W_2 + \frac{\rho_{1,2} \bar{w}_m}{1 + r}$$  \hspace{1cm} (11')

The total supply of workers seeking urban modern sector employment is $N_2 + N_3$.

The rate $k$ at which new modern sector jobs open up each period is defined as the net of output growth minus productivity growth, plus turnover (through firing, retirement, and death). The probability of an unemployed worker obtaining such a job is a function of the ratio of these variables:

$$\rho_{1,3} = \phi\left(\frac{kN_1}{N_2 + N_3}\right), \phi' > 0,$$  \hspace{1cm} (12)

Dividing through by $N_U$ and substituting from equation (6'):

$$\rho_{1,3} = \phi\left(\frac{kn_1}{1 - n_1}\right),$$

or, if $k$ is assumed to be constant,

$$\rho_{1,3} = \rho(n_1), \rho' > 0.$$  \hspace{1cm} (12')

The probability of an unemployed worker obtaining a job in the modern sector increases as its relative share of the urban labor force increases. The probability of obtaining a job in the modern sector for an intermediate worker may be greater than, equal to, or less than the probability for someone who is unemployed ($\alpha > 1$):

$$\rho_{1,2} = \alpha \rho_{1,3}$$  \hspace{1cm} (13)
The intermediate sector is sometimes viewed as a conduit to the modern sector, in that it gives workers experience which makes them more desirable to modern sector employers, thereby raising their probability of obtaining modern employment over that for the unemployed \((a>1)\). No systematic empirical verification of this hypothesis is known to us, and in any case a higher observed rate of hiring from the intermediate sector may simply reflect a higher proportion of skilled workers than among the unemployed. On the other hand, evidence exists of relatively well educated workers who have the means to remain voluntarily unemployed in order to maximize their chances of finding a high-paying modern sector job (Berry 1975). Abstracting from skill differentials, an unemployed worker may be expected to have a higher probability of obtaining a modern sector job than a similarly skilled intermediate worker by virtue of being able to devote more time to job search.\(^{13}\)

We assume homogeneous, relatively unskilled labor in the formal model (subsequently modified) in order to abstract from skills and training, and hence adopt this latter assumption \((a<1)\).

Our simplified model has 13 equations \((1, 2, 3', 4, 5, 6, 7', 8', 9, 10', 11', 12', \text{ and } 13)\) in 13 unknowns \([X_1, X_2, N_1, N_2, N_3, N_u, N_R, W_2, E(W_u), E(Y_2), E(Y_3), \rho_1, \gamma, \text{ and } \rho_1, \gamma]\), given the values of \(K_1, K_2, T_1, T_2, W_1(=W_m), W_3(=0), W_R, N, C, r, \gamma, \text{ and } a\). These can be solved for the equilibrium configuration of sectoral output, employment, unemployment, and wages represented in fig. 1. (See Appendix A for stability conditions). Given the minimum wage \((W_m)\) and the modern sector production function, modern sector employment \((OT)\) and output \((X_1 = \text{shaded area under } f')\) are determined at point \(M\), which equates the wage to marginal product \((f')\). The remaining urban labor force \((TR)\) must choose between unemployment and intermediate employment. Given the intermediate production function and marginal product curve \((g', \text{ starting from the line } TM)\), TS workers engage in intermediate employment until the present value of expected income (including probable future income from modern sector employment) for each of the SR unemployed workers just equals that from intermediate employment (including a lower probability of obtaining modern
FIGURE 1 - STATIC EQUILIBRIUM OF THREE-SECTOR MODEL
employment). The intermediate wage \( W_2 \) and output \( X_2 = \text{shaded area under } g' \) are thus determined at point I. The expected urban wage \( E(W_U) \) equals the average wage of all workers, and is normally higher than \( W_2 \).14

If the expected urban wage minus the net cost of migration \( [E(W_U) - C] \) exceeds the rural wage \( W_R \), some of the \( N_R \) workers in the subsistence sector migrate to the urban area. Since the number of modern sector workers is already determined by the minimum wage and the production function, these additional migrants must increase the number of unemployed and/or of intermediate workers. Both the probability of obtaining a modern sector job and the intermediate wage fall, lowering the expected urban wage until the rural-urban expected income differential is eliminated. If the expected urban wage falls below the rural wage minus net costs of return migration, net out-migration occurs, reducing the urban labor force and raising the modern sector share and both the intermediate and the expected urban wages.

3. **Employment effects of expanding the modern and intermediate sectors**

The two-sector model does not indicate very optimistic prospects nor satisfactory policies for alleviating underutilization of urban labor. Although the minimum wage is clearly the culprit of the unemployment equilibrium and welfare loss, it is for the most part politically determined, and cannot readily be removed or lowered without substantial risk to the government. Harris and Todaro (1970, p. 138) show that a combination of wage subsidy and migration restriction is needed to restore the economy to an optimum position, but are concerned about "the problems of taxation, administration, and interference with individual mobility attendant to the policy package". Bhagwati and Srinivasan (1974), however, argue that a general wage subsidy is equivalent and sufficient. Stiglitz (1974) shows that a wage subsidy is likely to have adverse effects on both unemployment and national output, although Mazumdar (1976a) criticizes his failure to include the cost of maintaining job-seekers. Blomqvist (1978) argues that the appropriateness of tax-subsidy policies depends on assumptions about the rural marginal product of labor and job search costs, as well as imperfections in capital markets. In any case,
subsidies and incentives are most often utilized to stimulate capital accumulation in the modern sector. We use our model to demonstrate that continued expansion of the modern sector tends to aggravate the unemployment problem, whereas policies to expand the intermediate sector offer a means of lowering unemployment and raising output.

Expansion of the modern sector may be represented by an increase in the capital stock \( dK_1 \). The implications are summarized in Table 1. Expansion raises the marginal product of labor and increases the number of workers employed at the fixed minimum wage, hired from intermediate and unemployed workers. The increased employment share \( n_1 \) of the modern sector raises both the expected wage facing migrants and the probability of obtaining a manufacturing job, though with less of an increase in the present value of expected income for the intermediate workers than for the unemployed \( [dE(Y_2) < dE(Y_3)] \). Rural workers migrate to the cities until the condition in equation (8') is restored (more than offsetting the employment increase if the supply of rural labor is sufficiently elastic). The improved prospects of a successful job search lead these migrants to choose unemployment rather than intermediate employment, until equation (9) is restored. Modern sector expansion results in a net shift from the intermediate sector to unemployment in urban areas, and its increased output comes partly at the expense of a decrease in intermediate sector output. Comparative statics (see Appendix B) show that both the level and the rate of unemployment increase. The impact on unemployment is worse the greater the rise in probability of obtaining a modern sector job with an increase in its employment share, and the smaller the change in intermediate wage with respect to a change in the number of intermediate workers.

Increased investment in the intermediate sector \( dK_2 \) increases demand for labor and puts upward pressure on the wage in this sector in the short run. Both the present value of expected income in intermediate employment and the expected urban wage rise above their equilibrium levels. Some unemployed workers may respond
### TABLE 1—EFFECTS OF EXPANSION ON EMPLOYMENT AND OUTPUT

<table>
<thead>
<tr>
<th>Expansion in</th>
<th>Increase (+), decrease (-), or no change (0) in variable:</th>
<th>Number of Workers</th>
<th>Unemployment</th>
<th>Intermediate wage</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern sector</td>
<td>+ (^a)</td>
<td>+</td>
<td>-</td>
<td>+ (^a)</td>
<td>+</td>
</tr>
<tr>
<td>Intermediate sector</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>- (^b)</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\)Could be negative if the elasticity of probability change with respect to a change in the modern employment share is sufficiently low and the modern sector is relatively large.

\(^b\)Could be positive if \(E(W_u) < W_2\) (see note 14).
by shifting into intermediate employment. More importantly, rural-urban migration occurs, lowering the modern sector's share of the urban labor force and thereby decreasing the probability of getting a modern sector job. Modern sector employment does not expand, given the fixed minimum wage. The decreased probability lowers the value of expected income from unemployment more than from intermediate employment, reinforcing the tendency of the unemployed to shift to the intermediate sector, and leading the new migrants to choose the intermediate sector rather than unemployment. The decreased attractiveness of unemployment results in a long-run increase in intermediate employment until the wage falls sufficiently below its original level to restore equilibrium conditions \((8')\) and \((9)\). The urban unemployment rate falls. Assuming that the intermediate wage is below the expected urban wage, the level of unemployment also falls and the increase in urban labor force from additional migration is less than under an equivalent investment in the modern sector. The improvement in unemployment is greater the less labor's marginal product in the intermediate sector falls as it absorbs additional workers, and the more the probability of obtaining a modern sector job falls as its employment share decreases.

The effects of expanding the two sectors are compared in figs. 2a and 2b, with net employment changes indicated by arrows. Expansion of modern sector employment (by \(TT'\)) in fig. 2a results in a net decrease in intermediate sector employment \((SS' < TT')\) and an increase in unemployment \((RR' > SS')\). Investment in the intermediate sector (fig. 2b), on the other hand, increases productive employment by more than the increase in the urban labor force \((SS* > RR*)\), thus decreasing unemployment.

4. **Employment-output trade-off**

The choice between investment in the modern sector as against the small-scale intermediate sector is typical of situations often referred to as involving a "trade-off". Large-scale manufacturing tends to be relatively capital-intensive (often in response to capital-based investment subsidies), limiting its ability to absorb
FIGURE 2 - EFFECTS OF EXPANDING MODERN AND INTERMEDIATE SECTORS

2a. Modern sector expansion

2b. Intermediate sector expansion
surplus labor but implying a high potential for output growth. The craft-oriented
techniques of the intermediate sector enable it to employ more workers for a given
investment, but low labor productivity is presumed to limit its ability to generate
output growth. Thus the output-maximizing policy is seen to conflict with the
employment-maximizing policy.

Table 1 and fig. 2a indicate, however, that the output advantage of large-
scale manufacturing may not be as great as presumed. Its expanded output (shaded
area in fig. 2a) comes at the expense of decreased output in the intermediate
sector (cross-hatched area in fig. 2a).\(^{19}\) The net output gain may even be smaller
than the output increase generated by intermediate sector investment (shaded area
in fig. 2b), which brings more workers into productive employment (albeit with a
lower marginal product than in the modern sector).

Expansion of the intermediate sector may resolve the trade-off problem
in two ways. First, it provides a means of both decreasing unemployment \((n_3<br>negative in Table 1)\) and increasing output \((X positive)\). This is represented in
fig. 3a by upward movement along the curve tt, which shows combinations of the
two variables resulting from different levels of capital invested in the inter-
mediate sector. It thereby contributes to both objectives, whereas increasing
output through expansion of the modern sector \((X positive in Table 1)\), represented
by upward movement along the corresponding curve mm in fig. 3a, involves a cost
in terms of increased unemployment \((n_3 positive)\).\(^{20}\) Secondly, intermediate
sector expansion may maximize both employment and output. Let the point \(t_1<br>represent the position of the intermediate sector after a given amount of investment, starting
from the initial equilibrium point \(E_0\). If an equivalent investment in the modern
sector moves it only to some point between \(E_0\) and \(m_1\), then expansion of the inter-
mediate sector maximizes both the output increase \((X_0X_{1})\) and the unemployment
decrease \((u_0u_{1})\).
FIGURE 3 - EMPLOYMENT-OUTPUT TRADE-OFF

3a. Sectoral expansion paths

3b. Trade-off for given investment
A policy trade-off occurs only when the manufacturing investment equivalent to $t_1$ produces output at some point $m_2$ beyond $m_1$, so that maximum output ($OX_2$) and minimum unemployment ($OU_1$) cannot be achieved simultaneously. If investment in both sectors is continuously divisible, the economy can achieve any combination of output and unemployment along the curve $t_1m_2$ (shown separately in fig. 3b). Choice of the appropriate allocation of investment or subsidy funds (point $E_3$) should be made on the basis of a social welfare function, i.e., by maximizing an objective function that assigns particular values to increases in output and to decreases in unemployment. The implication is that policy-makers promoting the modern sector in order to stimulate output growth must recognize the undesirable implications for unemployment and urbanization, and divert some resources to intermediate sector expansion if the expected unemployment increase is viewed as too costly relative to the output gain. A prior question for research is whether a trade-off in fact exists; that is, can investment in the intermediate sector maximize the output increase as well as reduce unemployment?  

5. Extended model

The model can be made more realistic through further disaggregation of employment activities and by abandoning some of the simplifying assumptions, without changing the qualitative results presented in the preceding sections. Open unemployment by Western definitions tends to underestimate labor underutilization in less developed countries because of the many casual income-earning opportunities that technically count as "employment", even though they may add little or nothing to national output. In petty trade, for example, the addition of another trader at an already crowded location may serve only to reduce the incomes of those already there, rather than to increase aggregate earnings. Income in this sector is assumed to be shared, rather than equated to marginal product. In this sense, it corresponds to agricultural systems such as family farms and landlord-tenant relationships which result in zero marginal product of labor and "disguised unemployment". The urban
casual sector is introduced here; further extension to include rural agricultural and non-agricultural activities is suggested below. This sector roughly corresponds to activities variously termed "informal", "traditional", "unorganized", and even "murky", except that these terms are often used more comprehensively to include our "intermediate" sector.

The relevant casual sector equations for production \( X_4 \), wage determination \( W_4 \), expected income \( E(Y_4) \), and probability of obtaining a modern sector job are:

\[
X_4 = h(N_4, \overline{K}_4, \overline{T}_4), \quad h' > 0, \\
W_4 = X_4 / N_4, \\
E(Y_4) = \int_{t=0}^{n} [1-\rho_{1,4}(t)] W_4(t)e^{-rt}dt + \int_{t=0}^{n}\rho_{1,4}(t)W_1(t)e^{-rt}dt, \\
\rho_{1,4} = \alpha \beta \rho_{1,3}, \quad \beta \leq 1.
\]

Casual activities are defined as involving negligible fixed capital investment, so that \( \overline{K}_4 \) represents working capital. Income in this sector is shared in the sense that total income both in the sector and in the individual economic unit is shared (though not necessarily equally) among the participants, so that the average wage equals average product. In addition, we assume that casual employment \( N_4 \) is sufficiently large that \( h' = 0 \), so that total sectoral income is fixed and the average wage declines in proportion to any increase in the number of workers in the sector. The present value of expected income for a new worker entering the casual sector is a function of that sector's wage and the probability \( \rho_{1,4} \) of obtaining a high wage job in the modern sector. This probability is closely related to the probability of intermediate workers obtaining a modern sector job, equalling it \((\beta = 1)\) unless the experience gained by intermediate workers gives them higher employability \((\beta < 1)\).
Assuming homogeneous labor ($\alpha \leq 1, \beta = 1$) and no restrictions on entry into the casual and intermediate sectors, workers choose the sector with the higher expected income until expected incomes are equalized:

$$E(Y_4) = E(Y_2)$$ \hfill (18)

Alternatively, we may assume non-homogenous labor ($\alpha > 1, \beta < 1$) such that intermediate workers have a higher probability of attaining modern sector employment than either casual or unemployed workers, as a result of the skills and experience they gain in the intermediate sector. In addition, restrictions on entry into the intermediate sector may be imposed, to avoid a solution with either no unemployment or an intermediate wage below the unemployment wage. The intermediate wage would then be determined exogenously, represented by an urban subsistence wage floor $\bar{W}_s$:

$$g' = \bar{W} = \bar{W}_s = \bar{W}_2.$$ \hfill (4*)

Under these assumptions, equation (18) would not be included in the model, and $E(Y_2) > E(Y_4) = E(Y_3)$ in equilibrium.

The extended model uses the 13 equations of the original model, with the following modifications:

$$i = 1, 2, 3, 4;$$ \hfill (6)

$$E(W_U) = E(Y_3);$$ \hfill (7*)

the two-stage decision process of the simplified model is avoided in (7*) by letting the migration decision depend on the expected income facing new urban labor force entrants, so that

$$E(Y_4) = E(Y_3);$$ \hfill (9*)

equations (8), (10), and (11) are used instead of (8'), (10'), and (11').
The extended model has 18 equations (1, 2, 3', 4, 5, 6, 7*, 8, 9*, 10, 11, 12', 13, 14, 15, 16, 17, and 18) and 18 variables \(X_1, X_2, X_4, N_1, N_3, N_4, N_U, N_R, W_2, W_4, E(W_U), E(Y_2), E(Y_3), E(Y_4), \rho_1, \rho_2, \rho_3, \rho_4\), given the values of \(K_1, K_2, T_1, T_2, T_4, W_1, W_3, W_R, N, A, D, C, r, k, \alpha, \text{and } \beta\).

These equations may be solved for the equilibrium configuration of sectoral output, employment, unemployment, and wages represented in the left-hand side of fig. 4.

Unemployment exists in the equilibrium configuration if the assumption is retained that the probability of obtaining a modern sector job increases with the time spent searching (\(\alpha<1\)). The unemployment "wage" may be taken as zero, meaning that the unemployed are living off past savings or borrowed money, so that \(W_4 = W_2 > W_3\). Alternatively, this assumption may be relaxed by introducing a subsistence wage (\(W_s\)) for the unemployed, consisting of support from relatives and friends or of welfare payments. This positive benefit of remaining unemployed will permit an unemployment equilibrium even without the job search effect (\(\alpha=1\)). In this case, the urban labor supply may become large enough to drive the intermediate and casual wages down to the unemployment subsistence level. In either case, unemployment is voluntary with respect to both the intermediate and casual sectors.

Under the assumptions of non-homogenous labor and exogenously given intermediate wage, equation 18 and variable \(W_2\) would be dropped to leave 17 equations and 17 variables, with equation 4 being replaced by 4* and \(W_s\) being added to the list of givens. Casual sector employment then represents a form of involuntary unemployment with respect to the intermediate (as well as the modern) sector, since \(E(Y_2) > E(Y_4)\).

Pure unemployment is then involuntary with respect to the modern and intermediate sectors, but must be voluntary with respect to the casual sector (assuming unrestricted entry) for there to be unemployment in equilibrium. Unemployment exists either if there is some job search effect (though not enough to offset the training effect of intermediate employment, so that \(\alpha \beta < 1, \alpha > 1\) and \(W_2 > W_4 > W_3\)), or if there is a subsistence
FIGURE 4 - STATIC EQUILIBRIUM OF EXTENDED MODEL, WITH TWO RURAL SECTORS

Notes

Shaded areas = total output in each sector.

$z'$ = marginal product of labor in the rural non-agricultural sector.

$q'$ = marginal product of labor in the rural agricultural sector.

$P_A q / N_5$ = average product in the rural agricultural sector, measured in manufactures
(tot al output $q$ divided by the number of workers $N_5$, times the relative agriculture/manufacturing price $P_A$).
wage ($\bar{W}_S$) applicable to the urban unemployed ($\alpha_4=1$ and $W_2=W_4=W_3=\bar{W}_S$ if there is no job search effect).

The analysis of expansion of the modern and intermediate sectors in the extended model is virtually identical to that in the simple model, and is not presented in detail. Indeed, when casual and intermediate sector wages are equalized, they can be treated as a single sector in terms of the labor market, so that the intermediate sector of the simple model could be redefined to include both the intermediate and casual sectors of the extended model. The important difference is that expansion of the intermediate sector now means expansion of casual employment with zero marginal product as well as of intermediate employment with positive marginal product. Thus the impact on output of expanding the intermediate sector is less with the casual sector included than would be expected with the intermediate sector alone. In addition, the ability of intermediate sector expansion to reduce the number as well as the percentage of unemployed depends on having a relatively large intermediate sector and a sufficiently large gap between the rural wage and the urban minimum wage. If the minimum wage is close to the rural wage and the intermediate sector is small relative to unemployment, then intermediate sector expansion could fail to alleviate unemployment, while modern sector expansion could lower the unemployment rate (though not the number of unemployed). The trade-off represented in fig. 3b remains applicable even if $\theta\theta$ in fig. 3a has a negative slope, as long as it is not flatter than $tt$.

6. Further extension and modification

The supply of labor from the rural sector has been assumed perfectly elastic at the prevailing wage, in order to focus on the implications of sub-dividing the urban sector. This assumption can be dropped without qualitatively affecting the results. Indeed, a corresponding sub-division may be applied to the rural sector, given the increasing recognition of the importance of rural non-agricultural activities (Byerlee and Eicher 1972; Liedholm and Chuta 1976). The agricultural sector corresponds
to the casual sector, with shared income and a marginal product of labor close to zero, so that its production and wage determination equations resemble equations 14 and 15 (with the addition of land in 14 and a relative agriculture/manufacturing price in 15). Rural non-agricultural production is equivalent to the urban intermediate sector, with production and wage determination equations corresponding to equations 2 and 4. The relative price is an increasing function of total non-agricultural to agricultural production, assuming all non-agricultural goods to be homogeneous. The rural labor force is divided between agricultural and non-agricultural activities (all unemployment being treated as urban) in such a way that the wage in both sectors is equal (represented by $W_R$) in equilibrium. These two rural sectors then introduce seven equations and seven variables (output, employment, and wage in each sector, plus a relative price), with an equilibrium configuration represented in figure 4 (above).

The implications of introducing these rural sectors are that the rural wage rises as workers migrate and that the opportunity cost of their departure is positive. The resulting decrease in the rural-urban wage differential mitigates the impact of modern sector expansion on urbanization and unemployment, but also reduces the net output growth benefit of investment in the modern sector. Expansion of the rural intermediate sector offers a means of minimizing the migration effect of urban investment, and it has desirable employment and output effects corresponding to those of the urban intermediate sector.

The conclusions of the model presented here may be approached from a more complex, but perhaps more realistic, set of assumptions, treating the output and labor input of the modern and intermediate sectors as non-homogeneous rather than as substitutable. The modern sector may be assumed to produce high-quality goods for a limited high-income market, using labor with more education, training, and experience than the average worker (and hence paying a higher wage). A minimum
wage is not essential in this version, although it may serve to ensure that modern sector employers use these characteristics as criteria for selecting out the most productive workers. The intermediate sector produces low-quality goods which are substitutes for modern sector products only in the sense that its low-income customers cannot afford to buy the higher quality version. It serves as a training ground in which workers may gain the skills and experience necessary to qualify for the modern sector. The relative price of intermediate to modern goods falls the greater is intermediate relative to modern output, so that an increase in the number of workers seeking entry to the modern sector via intermediate employment tends to depress incomes in the intermediate sector. If, however, intermediate production expands in response to increased demand, then it can achieve the positive employment and output effects described in the original model. This suggests that the close association between the modern sector and the upper-income elite is central to the problem of rapid urbanization with inadequate expansion of productive employment. Stagnation is a likely consequence if modern sector workers can only afford intermediate products so that modern sector production does not generate sufficient additional income to maintain rapid growth of its market. A redistribution of income could generate a self-sustaining expansion of the intermediate sector, since additional workers employed to meet the increase in demand among lower-income consumers would spend their additional income on intermediate products. As before, the intermediate sector would serve to absorb labor without losing output in the short run, while laying the foundation in terms of both income and labor skills for eventual sustained expansion of the modern sector.

7. Conclusions

The presence of an intermediate sector, which produces manufactured goods in small-scale establishments combining moderate amounts of capital with labor, substantially alters the traditionally invoked two-sector analysis of the urban unemployment problem. When labor can choose only between agriculture, the modern
sector, and unemployment, any attempt to reduce urban unemployment by expanding modern job opportunities is likely only to aggravate it, through increased rural-urban migration. Traditional treatment of this unemployment as involuntary has directed attention away from improving alternative employment that is unattractive under current policies but that might absorb surplus labor productively. Although many countries have pursued industrialization in hopes that the output growth generated would eventually require enough labor to absorb the surplus, the employment problem has become acute before the industrial sector has grown sufficiently large. This paper demonstrates that unemployment can nevertheless be reduced without sacrificing output (or at worst with very little cost, in a static framework), through expansion of the intermediate sector.

Our analysis shows that introduction of an intermediate sector alternative to urban unemployment and modern sector employment significantly changes the policy conclusions of the simple Harris-Todaro model. This intermediate sector distinguishes those non-modern activities in which the marginal product of labor is moderately high from those in which it is close to zero, whereas much of the literature on the "informal" (or "traditional") sector does not. Our model shows that if this distinction is valid (as the growing literature on small-scale production suggests), then urban employment can be increased and productivity raised without the unfavorable consequences for rural-urban migration and urban unemployment implied by two-sector analysis. The model can be adapted to various assumptions about the determinants of migration and job search behavior, which are appropriate subjects for empirical investigation. The model is well suited to analysis of the employment problem in less developed countries because it allows for both voluntary and disguised unemployment, phenomena which limit the usefulness of the Western concept of unemployment.

Analysis of the comparative statics of the model provides a basis for empirical findings that a shift of capital from the modern to the intermediate sector could
increase output as well as employment. Analysis of the interrelationship of capital markets for the two sectors is a topic for further extension of our model and for empirical investigation. The model suggests that policies influencing the allocation (and price) of capital to different sectors are likely to have important implications for the employment problem and its solution.

Intermediate sector expansion is a particularly promising short-run strategy for employment and growth because it can be promoted through passive as well as active policies and because it need not (and probably should not) involve a substantial commitment of capital. Reduction of capital-based subsidies and import privileges given to large-scale manufacturing industries is likely to improve the ability of small-scale establishments to compete for capital and materials. Provision of market information and services can also assist small businesses without direct involvement in their operations. Laws promoting cooperatives, and government officials responsive to them, can similarly help entrepreneurs in the intermediate sector to help themselves. In the longer run, the government should attempt to learn the needs of the intermediate sector businesses, and assist them as necessary in obtaining credit, materials, and managerial assistance. Direct involvement with small firms, however, is a risky undertaking, and creation of a climate in which they can compete effectively with larger firms is a more appropriate strategy.

Increased income for those who consume intermediate products is critical if any supply side assistance is to be effective, so that redistribution of income may be necessary in order to initiate self-sustaining growth in both the intermediate sector and the economy. Lowering the modern sector wage does not accomplish this, and has only marginal impact on employment and output growth. A more appropriate method for reducing rural-urban income differentials would be to create conditions for more rapid expansion of small-scale industries in rural as well as urban areas, in order to raise rural cash income opportunities.
In order to analyze the sectoral interrelationships and the policy options affecting the growth of employment and output in less developed countries, the intermediate sector model may be extended to include urban "disguised unemployment" in the casual (informal) sector and to disaggregate the rural sector into agricultural and non-agricultural production. This five-sector model allows for employment choices between sectors with different marginal productivities within both rural and urban areas, as well as for migration between areas.

The notion of having to trade off some potential output in order to decrease or minimize unemployment arises largely out of exclusive focus on modern manufacturing and either the agricultural or the informal sector. Analysis of the role of the intermediate sector, in both urban and rural economies, points toward an "intermediate strategy" as a means of increasing and maximizing both output and productive employment. A policy of absorbing surplus labor in productive employment must focus on the intermediate sector in both urban and rural areas, and a policy of industrialization at minimum cost in unemployment must include a strategy of supporting these intermediate sectors as well as investing in the modern sector.
APPENDIX A

LOCAL STABILITY

We make the following dynamic assumptions:

\[
\begin{align*}
\dot{N}_U &= \lambda_1 \left[ n_1 \bar{W}_m + n_2 \bar{W}_2 - \bar{C} - \bar{W}_s \right] \\
\dot{N}_1 &= \lambda_2 \left[ f - \bar{W}_m \right] \\
\dot{N}_2 &= \lambda_3 \left[ g - W_2 \right] \\
\dot{N}_3 &= \lambda_4 \left[ (N_U - N_3) - (N_1 + N_2) \right] \\
\dot{W}_2 &= \lambda_5 \left[ \frac{\rho \bar{W}_m}{1+r} - \frac{\alpha \bar{W}_m + (1-\alpha)W_2}{1+r} \right] \quad \text{A.1}
\end{align*}
\]

where \( \lambda_i \)'s represent speeds of adjustment and all are positive.

Necessary conditions for local stability are that the Jacobian determinant of the right-hand side of equations (A.1), evaluated at the equilibrium point, is negative and that the trace of the Jacobian is negative. Let \( J \) be the Jacobian which does not include \( \lambda_i \)'s.

\[
J = \begin{bmatrix}
J_{11} & J_{12} & J_{13} & J_{14} & J_{15} \\
J_{12} & J_{22} & J_{23} & J_{24} & J_{25} \\
J_{13} & J_{23} & J_{33} & J_{34} & J_{35} \\
J_{14} & J_{24} & J_{34} & J_{44} & J_{45} \\
J_{15} & J_{25} & J_{35} & J_{45} & J_{55}
\end{bmatrix}
\]

\[
\begin{bmatrix}
E(N_U) & \bar{W}_m & W_2 & 0 & n_2 \\
N_U & N_U & N_U & 0 & 0 \\
0 & f_{NN} & 0 & 0 & 0 \\
0 & 0 & g_{NN} & 0 & -1 \\
1 & -1 & -1 & -1 & 0 \\
- \frac{\bar{H}}{N_U} & \bar{H} & 0 & 0 & - \frac{2+\rho-\rho_1}{1+r}
\end{bmatrix}
\]

where,

\[
\bar{H} \equiv \frac{2+\rho}{1+r} \left( \frac{\rho}{\rho_1} N_1 \right) W_2
\]

The trace of \( J \) is negative, because:
trace of $J = J_{11} + J_{22} + J_{33} + J_{44} + J_{55} < 0$, \([f_{NN}, g_{NN} < 0]\)

The Jacobian determinant is:

$$J = (-f_{NN})^N \left[ \frac{\partial}{\partial N} (g_N + g_{NN} N^2) + g_{NN} \frac{\partial}{\partial N} \left( \frac{2 + r - \alpha \delta}{1 + r} \right) \right] = (-f_{nn})^N \frac{1}{N_u} S$$

The negativity of $J$ requires the normal assumptions of diminishing marginal returns to labor in both the modern and intermediate sectors, and a relatively small modern sector, as may be expected in less developed countries.

APPENDIX B

COMPARATIVE STATICS

Let us consider expansion due to capital accumulation (technological progress can be analyzed in a similar manner):

**Modern sector expansion**

$$\begin{bmatrix}
\frac{dN_U}{dK_1} \\
\frac{dN_1}{dK_1} \\
\frac{dN_2}{dK_1} \\
\frac{dN_3}{dK_1} \\
\frac{dW_2}{dK_1}
\end{bmatrix} = \begin{bmatrix}
0 \\
-f_{NK} \\
0 \\
0 \\
0
\end{bmatrix} \equiv \begin{bmatrix}
J_6
\end{bmatrix}$$
\( \frac{\text{d}N_U}{\text{d}K_1} = \frac{\left| J_6 J_2 \cdots J_5 \right|}{|J|} f_{NK} \frac{H}{N_U N} (g_N + g_{NN} N_2) + g_{NN} N_m \left( \frac{2+r-\alpha_p}{1+r} \right) > 0 \)

\( \frac{\text{d}N_1}{\text{d}K_1} = \frac{\left| J_6 \right| J_6 J_3 J_5}{J} = -\frac{f_{NK}}{f_{NN}} > 0 \)

\( \frac{\text{d}N_2}{\text{d}K_1} = \frac{1}{|J| N_U N_1} n_2 W_2 < 0 \)

\( \frac{\text{d}N_3}{\text{d}K_1} = \frac{1}{|J| N_U N_1} [S(N_U N_1) + \frac{2+r-\alpha_p}{1+r} n_2 W_2^2 \{g_N n_2(2+r) + \eta \}] > 0 \)

where,

\( H \) and \( S \) are defined in Appendix A,

and,

\[ \eta_g \equiv \frac{-g_{NN}}{g_N} N_2 \quad \text{and} \quad \eta_p \equiv \frac{\rho}{n_1} \]

Hence, if \( \eta_p \geq \eta_g \frac{2+r-\alpha_p}{n_2(2+r)} \) then \( \frac{\text{d}N_3}{\text{d}K_1} > 0 \)

but if \( \eta_p < \eta_g \frac{2+r-\alpha_p}{n_2(2+r)} \) then \( \frac{\text{d}N_3}{\text{d}K_1} \geq 0 \).

\( \frac{\text{d}n_3}{\text{d}K_1} = \frac{\text{d}(N_3/N_U)}{\text{d}K_1} = \frac{f_{NK} H g_{NN}(n_2)^2}{|J| N_U N_1} > 0 \)

\( \frac{\text{d}W_2}{\text{d}K_1} = \frac{1}{|J| N_U N_1} n_2 W_2 > 0 \)
Intermediate sector expansion

\[
[J_1 \ldots J_5] \begin{bmatrix}
\frac{dN_1}{dK_2} \\
\frac{dN_2}{dK_2} \\
\frac{dN_3}{dK_2} \\
\frac{dW_2}{dK_2}
\end{bmatrix} = \begin{bmatrix}
0 \\
0 \\
0 \\
0
\end{bmatrix} \equiv [J_7]
\]

(a) \( \frac{dN_1}{dK_2} = \frac{|J_7 J_2 \ldots J_5|}{|J|} \frac{g_{NK}}{N_U} f_{NN} \frac{W_2}{N_U} \frac{2+r-\alpha \rho}{1+r} > 0 \)

(b) \( \frac{dN_2}{dK_2} = 0 \)

(c) \( \frac{dN_3}{dK_2} = \frac{g_{NK}}{|J|} f_{NN} \left[ \frac{W_U}{N_U} \frac{2+r-\alpha \rho}{1+r} + n_2 \frac{H}{N_U} \right] > 0 \)

(d) \( \frac{dW_2}{dK_2} = \frac{g_{NK}}{|J|} \left( -f_{NN} \right) \left[ n_2 \frac{H}{N_U} + \frac{E(W_2)}{N_U} - \frac{W_2}{N_U} \frac{2+r-\alpha \rho}{1+r} \right] \leq 0 \)

Hence, \( \frac{dN_3}{dK_2} < 0 \) if \( H W_U > W_2 \).

(e) \( \frac{dN_3}{dK_2} = \frac{g_{NK}}{|J|} \left( -f_{NN} \right) \left[ n_2 + n_1 \left( \frac{E(W_2)}{N_U} - \frac{W_2}{N_U} \right) \frac{2+r-\alpha \rho}{1+r} \right] < 0 \)

(f) \( \frac{dW_2}{dK_2} = \frac{g_{NK}}{|J|} f_{NN} \frac{W_2}{N_U} \frac{-H}{N_U} < 0 \)

For a discussion of the basic model, extensions, and criticisms, see Todaro (1976a). Collier (1975) does offer an alternative explanation for a positive correlation between rural-urban migration, unemployment, and modern sector expansion by introducing transfer payments to the unemployed as a function of modern sector earnings. He also introduces an urban traditional sector and shows that the general equilibrium properties of the model are changed.

"Intermediate technology" is broadly defined here to refer to machinery and methods of production other than those predominantly in use in industrialized countries. It may include traditional hand-crafting techniques, tools adapted for local use, and imported second-hand machinery.

The "educated unemployed" are a case in point (Berry 1975, Blaug et al 1969, Callaway 1963, Edwards and Todaro 1973). See Feldstein (1973) and Doeringer and Piore (1975) for discussions of job search and dual labor market explanations of unemployment in more developed countries. Collier (1975), Fields (1975) and Harris and Sabot (1978) focus on the choice between unemployment and low-wage employment in the Harris-Todaro context. Tidrick (1975) provides evidence of the voluntary nature of much unemployment in Jamaica and discusses ways in which the "unemployed" may support themselves; our model extends and generalizes his analysis of the wage gap between urban sector.
These characteristics commonly are associated with low interest rates and other capital-based subsidies or incentives adopted to attract foreign investment. They could also result from limited choice of production techniques, although our model implicitly rejects the strict "fixed coefficients" arguments by assuming that the product could be produced using more labor-intensive "intermediate technology". The association of large scale with the modern sector and small scale with the intermediate sector is illustrative and is not a critical part of our model. "Scale" is a relative term, usually based on the number of workers and/or the cost of investment, and the division between "large" and "small" varies between countries.

The intermediate sector (urban and rural) is sometimes viewed as complementary to the modern sector in the sense of providing training and experience to workers who may later be employed by the modern sector. If promoting the modern sector is not viewed as an end in itself, however, then the two sectors are competitive in terms of both products and labor. The intermediate sector generally produces lower-quality, lower-price versions of modern sector goods for the lower-income market. Hence the substitution between them is imperfect, although the simplifying omission of relative prices in the formal model strictly implies perfect substitution.

If the intermediate sector produces different goods from the modern sector, then their relative price \( P_2 \) must be inserted: \( W_2 = P_2 g' \). This would modify the outcome slightly, but would not affect the qualitative results. The extended model introduces the possibility that the intermediate wage may be constrained by the subsistence wage or to some extent by the minimum wage.

See Collier (1975) and Harris and Sabot (1978) for analysis of the implications of a positive transfer payment under different utility and perception functions.
Urban-rural migration before the end of the nth period will not occur unless the right-hand side is larger than the left-hand side with the sign of \( C(0) \) changed to positive.

This form is equivalent to that used by Harris and Todaro (1970) and to the Stiglitz (1974) models when there is no growth, adjusted for introduction of the intermediate sector. A more general form which integrates the probabilities determining sectoral choice with those affecting the migration decision is used below in the extended model.

Since the intermediate sector includes self-employment, entry is limited only by the amount of capital and skills necessary to establish a business. In the informal sector of the expanded model, there is no barrier to entry, since personal services, petty trade, and even begging and illegal activities may be included.

Detailed discussion of different models for determining probabilities may be found in Stiglitz (1974) and Collier (1975). Harris and Todaro (1970) use the simplest form of this function \( \rho = \frac{N_1}{N_u} \). Their formulation is somewhat unrealistic in that it implicitly assumes that all modern sector jobs are randomly redistributed among all urban workers every period. Nevertheless, it is closely related to the general function in equation (12'), as well as to Stiglitz’s simple turnover model with no growth. Harris and Sabot (1978) introduce a subjective probability function and analyze its implications for job-search behavior.

Fields (1975) adopts this view in the absence of an efficient labor exchange that does not require physical presence, while Collier (1975) argues for a model that does not depend on differential probabilities. Time spent is especially important where obtaining a job depends on being in the employment office of the company personnel office at the particular time that a new position becomes available. The assumption made in this section is more appropriate in situations where
on-the-spot hiring predominates over ranking of candidates by experience and contacting the top candidates. It would also apply to educated unemployed who must actively pursue their contacts in order to get a desired job.

14 The expected wage exceeds the intermediate wage as long as the manufacturing sector is sufficiently small that \( \rho(n_1) \) is less than the ratio \( \frac{2 + r}{1 + (1 - \alpha)N_3/N_1} \), since \( E(W_u) - W_2 = \frac{\bar{w} N_1 \{ (2 + r) - [1 + (1 - \alpha)N_3/N_1] \cdot \rho \}}{N_1 (2 + r - \alpha \rho)} \). The ability of the intermediate sector to reduce unemployment depends partly on the expected wage exceeding the intermediate wage.

15 Capital is treated as a parameter rather than an endogenously determined variable because our focus is on labor markets and because segregated capital markets typify many LDCs (large firms have access to institutional loans at subsidized rates; small firms provide their own capital or borrow from moneylenders). Realistically, however, some competition for capital is likely to exist, and hence an appropriate policy to aid the intermediate sector may be to reduce the diversion of capital (and especially its subsidization) to the modern sector.

A neutral change in technology gives similar results (assuming elastic demand) to increasing capital, since it raises the marginal product of labor. Development of intermediate technology is another means of assisting intermediate sector growth.

16 The rate could fall if the supply of rural labor is sufficiently inelastic. Todaro (1976b) states the conditions for this to occur and shows that they are empirically unrealistic.

17 Modern sector output is unaffected by intermediate sector expansion in this simple supply-side model, which implicitly assumes that product demand is perfectly elastic. An increase in demand for the intermediate sector's expanded production could also be explained in a more complex model by increased urban income as
labor costs. If the latter effect is sufficiently strong, substitution of intermediate for modern sector products could result in a net decline in modern sector output.

18 The general "conflict" between employment and output is largely an illusion, boiling down at most to a fiscal problem of transferring income from the output-maximizing sector to "engage" surplus workers in a static framework (Peacock and Shaw 1971), or to a question of "the weight given to current as against future employment" (Stewart and Streeten 1971) in a dynamic setting. The constraints of a particular situation, however, may result in a policy level trade-off between a particular measure that has a relatively greater impact on output and a specific alternative that has a greater effect on employment.

19 If the opportunity cost of agricultural labor is positive, expansion of manufacturing also causes a greater loss in agricultural output than does intermediate sector expansion.

20 An unemployment increase might be avoided if the expansion has little effect on perceived probability of obtaining modern sector employment, e.g., if the modern sector is relatively large and if the supply of rural migrant labor is relatively inelastic. Even if manufacturing sector expansion can generate a net decrease in unemployment, however, an equivalent investment in the intermediate sector would have greater impact.

21 Evidence provided in studies of small-scale enterprises in urban Ghana (Steel 1977) and rural Sierra Leone (Liedholm and Chuta 1976) indicate that the intermediate sector produces no less output and potentially more output than the modern sector for a given investment, under import substitution policies favoring capital intensity in the modern sector. The framework here is, of course, static. Which sector has a greater dynamic impact on output growth cannot be determined a priori. The intermediate sector may provide an outlet for family savings that would otherwise remain outside the financial system or be consumed; hence it may be
as effective as the modern sector in raising the investment rate. The modern sector provides labor training and new techniques, while the intermediate sector provides a training and proving ground for entrepreneurs.

The casual sector is implicitly assumed to produce close substitutes for the modern sector. This assumption is less defensible than for the intermediate sector, especially for manufactures—though a case for substitutability may be made for sales and services. Although it would be appropriate to introduce relative prices at this point, prices are omitted because their introduction would complicate the urban side of the model without clarifying the relationships investigated. This may be justified by assuming that all goods are traded with prices determined in world markets, though again this assumption is least appropriate for the casual sector. Alternative assumptions are discussed below under "further extension and modification."

It would be possible, though complicated, to allow shifts between non-modern sectors for situations in which restrictions on entry (especially to the intermediate sector) mean that expected incomes differ. For example, equation (16) could be modified by changing \([1-\rho_{1,4}(t)]\) to \([1-\rho_{1,4}(t) - \rho_{2,4}(t)]\) and by adding the term: \(\int_{t=0}^{\tau} \rho_{2,4}(t)W_2 e^{-rt} dt\).

Another approach would be to assume a close relationship between the intermediate and the minimum wages, implying that intermediate wage employment is sufficiently similar to modern sector employment to be somewhat bound by the latter's rules. Equation (4*) could be replaced by: \(g' = \gamma W_2 / W_m \leq W_2, 1 > \gamma > W_4 / W_m\).

We are indebted to John Knight for this suggestion. An alternative approach would be to expand equation (7) by adding the term: \(\int_{t=0}^{\tau} \rho_4(t)W_4(t)e^{-rt} dt\). The probabilities \(\rho_i\) would then have to be related to the probabilities \(\rho_{i,j}\) of
moving from one sector to another, including from unemployment to the casual and intermediate sectors and from the casual to the intermediate sector, if desired. Equation (7*) is considerably simpler, and equally consistent with the expected income approach.

26 Perceived probability may in fact decline with time, so that a migrant who arrives with high expectation of obtaining high-wage modern sector employment may eventually become discouraged and enter the casual or the intermediate sector. See Harris and Sabot (1978) for a discussion of adjustments in subjective probability estimates.

27 Relative prices could also be introduced for the intermediate sector (urban and rural), to distinguish its output from that of the modern sector.

28 If migrants are disproportionately from nonagricultural activities, farmers may have to buy an increasing share of manufactured products from the cities at higher prices, raising the possibility that migration may decrease rural real income and thereby raise the incentive to migrate.

29 We are indebted to Frank Child for this suggestion.

30 Liedholm and Chuta (1976:59,117) find "extremely high expenditure elasticity coefficients for the products of small-scale industry" (1.6) among rural Sierra Leoneans, whereas "the increased income generated by an expansion of large firms would have relatively little effect on the demand for the products of small-scale industry."
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