World Bank Reprint Series: Number Forty-nine

H. N. Barnum
and R. H. Sabot

Education, Employment Probabilities, and Rural-Urban Migration in Tanzania

Reprinted from *Oxford Bulletin of Economics and Statistics* 39 (May 1977)

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Volume 39 May 1977 No. 2

Reprinted from

OXFORD BULLETIN of ECONOMICS and STATISTICS

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ISSN 0305-9049

BASIL BLACKWELL · OXFORD

EDUCATION, EMPLOYMENT PROBABILITIES AND RURAL-URBAN MIGRATION IN TANZANIA*

by H. N. BARNUM and R. H. SABOT

In most LDC's annual increments to the urban labour force have exceeded increases in wage employment despite a secular rise in the proportion of investment allocated to urban areas and consequent high rates of growth of industrial output. Unemployment rates in excess of the level considered tolerable in industrialized countries are a chronic problem and in absolute terms, if not as a proportion of the urban labour force, the numbers of urban unemployed are steadily increasing.[1] The remedial policies adopted by governments do not reflect an understanding of the underlying causal mechanism, and in some instances their effects appear to have been perverse.[2]

Recently a class of models has been developed to explain the coexistence of high levels of urban unemployment and rural-urban migration. These models are characterized by an inflexible wage differential between the rural and urban sectors and by intersectoral labour transfers that continue until there is equality between the expected urban wage—defined as the product of the probability of being employed and the prevailing urban wage—and the rural wage.[3] Far-reaching implications for policy can be deduced. In particular, attention has been directed at the critical importance of wage policies and rural development policies, and it has been shown that accelerated employment creation in urban areas may increase levels of unemployment. At the core of these models is a migration function with urban employment probability as well as rural and urban wages as determining variables. However, the empirical validity of job probability as a determinant of migration in a developing country has yet to be established.

In this paper we estimate an urban migration function for Tanzania, where there is a significant level of urban unemployment (approximately 10 per cent) and an urban sector in which wages are downwardly inflexible. While migration contributed little more than 1 per cent per year to the rate of growth of urban areas in the period 1900–48, in the period 1948–71 its contribution was roughly 75 per cent of total growth, or 4.5 per cent per year. In 1971 over two-thirds of the population in the seven towns covered by this study were migrants from rural areas.[4]

Tests are conducted by means of an analysis of variance in a multiple regression

* We are grateful for financial support from the Development Centre of the OECD and the Rockefeller Foundation and for advice and criticism from participants in seminars at the third World Congress of the Economic Society, Toronto, and the Annual Meetings of the Populations Association of North America, Montreal where we presented earlier versions of this paper.

[1] Turnham; Sabolo.

[2] Harris and Todaro (1968).

[3] The basic ideas regarding the relationship between migration and urban unemployment were first formalized in Todaro. Also see Frank, Green and Wellisz. The model has been extended to allow for the analysis of welfare implications (Harris and Todaro, 1970), for dynamic considerations (Lal, Stiglitz), and for intersectoral capital flows (Corden and Findlay).

[4] Sabot.

framework using data from a 1971 household survey of seven urban areas especially designed for the purpose. They lend confirmation to the hypotheses that urban job probability and rural-urban income differentials are significant explanatory variables. In addition we examine the influence of education on the propensity of rural residents to migrate. Education selectivity is a frequently observed characteristic of urban migrant streams and, at least in Africa where the annual number of school leavers has only recently exceeded the increase in urban employment opportunities, education has been linked with the emergence of chronic urban unemployment.[5] However, whether education's influence on the mobility decisions of rural residents is due to wider differentials in economic opportunities or to greater responsiveness has remained an open question. Of course these hypotheses are not mutually exclusive and our findings lend confirmation to both.

Section I briefly sets forth a conceptual framework in which migrants respond to differences in expected incomes in labour markets where jobs are rationed by means other than the price mechanism. In Section II estimates of the migration function are presented together with the tests of the hypotheses. Section III summarizes our findings and briefly discusses their implications for policy. The Appendix discusses the sources of data for this study which permit the analysis to focus specifically on rural-urban migration (as opposed to inter-regional migration) and allow a more disaggregated view of urban migration than has previously been possible.

I. Conceptual Background

Our analysis is conducted in the spirit of the human capital paradigm.[6] We assume that an individual locates himself spatially so as to maximize the present value of the stream of returns he enjoys, the economic component of which is the difference in the discounted present values of expected incomes between source and receiving areas, net of the direct costs of moving. It follows that the size, demographic characteristics and directions of movement of the migrant stream are the result of rational decision making and not the result of random selection or decisions not taken by the individual migrant. A consideration of this assumption has led us to exclude from the analysis women and children, a high proportion of whom are not, in the Tanzanian context, autonomous decision makers.

The basic 'investment in human capital' view of spatial mobility is easily extended to explain the coexistence of rural-urban migration and significant levels of open unemployment and marginal employment in urban areas.[7] If institutional factors or strong wage-productivity relationships maintain urban wages at a level above the equilibrium supply price of labour, then urban surplus labour becomes the equilibrating factor in intersectoral labour allocation. For some rural residents, the expected net economic returns to migration will be positive even if there is a period immediately after entering the urban labour force when no income is received

[5] Caldwell, Byerlee.
[6] See Sjaastad and Bowles.
[7] See Green; Harris and Todaro (1970); Todaro.

or an income below what they would have received in the rural areas. The hypothesis is that in situations in which there is a positive rural-urban income differential net of the direct and psychic costs of migration, and in which urban incomes are inflexible in a downward direction, an additional factor in migration decisions will be the probability of finding a job.

Using subscripts r and u to designate rural region of origin and urban destination area respectively, and to indicate the time period, we express the migration relationship as the following function, continuously increasing with WU and UP and decreasing with WR and DIST between the boundaries of zero and one,

$$M_{ru} = F(P_u, \sum \frac{WU_{tu_t}}{(1+i)}, \sum \frac{WR_{tr}}{(1+i)^t}, DIST_{ru}, UP_u, E_{ru}) \quad (1)$$

where M is the propensity to migrate, P is the probability of finding employment, WU is urban income, WR is rural income and i is the applicable discount rate.[8] The manner in which job probability enters the migration function is deliberately left unspecified in equation (1). In most of the regressions in the empirical section we have entered probability and wages jointly as expected wages, thereby assuming that migrants are risk-neutral. We have also entered probability as a separate variable. Though no increase in the explanatory power of the model results from this change in specification, no firm conclusion regarding the manner in which considerations of risk influence migration decisions can be drawn. Precise tests of hypotheses on the relationship between risk and the propensity to migrate would require additional information.

DIST is the geographic distance between source and receiving areas; it serves as a proxy measure of the cost of transport, the efficiency of communication networks, and the level of psychic costs of migration. The greater the distance the greater the psychic costs are likely to be as differences between source and receiving areas of language, dress, food and social practices tend to be accentuated the further the migrant travels from his home area. Time lags and inaccuracies in information regarding the urban labour market, and consequently the level of uncertainty involved in the decision to move, are also likely to increase with distance. A study by Schwartz concludes that in the United States distance is primarily a surrogate for information effects rather than psychic costs. The relatively greater variation of social characteristics among regions in Tanzania than in the United States suggests that the opposite may be the case in Tanzania.

UP is the population of the urban receiving area. It serves as a proxy measure of labour market size, the strength of rural-urban contacts and the level of urban amenities. Stronger contacts with family and friends between rural regions and large relative to small towns would be expected to reduce psychic costs, to reduce the risk component of migration costs as a consequence of better communication, and to reduce the job search component of costs as a consequence of greater availability of short-term support on arrival in town. Higher levels of urban amenities per capita in large cities would be expected to increase real and psychic

[8] See appendix for definitions of variables.

returns of migration. E is an error term included to capture effects on the migration rate arising from imprecision in specification and measurement and is assumed to be orthogonal to the independent variables and to have zero mean and uniform variance.

The discounted value of the rural and urban income streams will be highly sensitive to small differences in the choice of discount rate (i) or time horizon (T) when the level of the former is low and that of the latter is high. Precise information on the level of these components of the model is not available. Thus the choice of discounting parameters may introduce an arbitrary influence on the results. An alternative is to reduce the discounted income variable to a single, undiscounted, average value in source and receiving areas. But this entails assuming either that the time horizon is unlimited and that income differentials and discount rates are constant over time, or that the appropriate time horizon is a period that is sufficiently short that within it significant changes in income differentials and discount rates are not likely to occur.

Either the discounted or the undiscounted income variable is likely to entail a degree of misspecification. In Tanzania the rate of increase of urban wages due to secular increases in the wage level and increases associated with seniority on the job, is likely to exceed rural income increases over the course of an individual's working life. Thus, the former assumption is not strictly valid. In regard to the latter, although it would be convenient analytically to assume, as Todaro does, that potential migrants have a short time horizon, the evidence suggests that this is not the case in Tanzania. During the colonial period migration was circular, and rural males left their families behind while they participated in the wage sector of the economy. In these circumstances the migratory journey was short term as was, it could be assumed, the time horizon of the migrants. Today, with higher urban wages and the stabilization of the labour force, migrants who are successful in finding urban employment tend to bring their families to town and remain in town for the remainder of their working lives. A long time horizon implies both that the second assumption is not entirely accurate and that small errors in the estimation of T will have a significant impact on the discounted value of income streams. Although only the undiscounted version is presented below, we have also estimated the migration function in the discounted form and found that the results are highly consistent.

A second specification problem concerns the probability variable which should be defined as the ratio of the number of non-marginal job openings in the job search period to total urban surplus labour.[9] Data on unemployment but not on employed surplus labour, i.e., employed urban workers who earn less than they would in rural areas, are available for years prior to 1971.[10] The omission of employed

[9] The appropriate definition of probability can vary depending on assumptions regarding changes over time in the probability of an individual getting a job once he has arrived in town. We assume that the probability remains constant over the job search period. For a discussion of alternative definitions of employment probability see Todaro, Stiglitz, and Zarembka.

[10] The allocative efficiency justification for rural marginal product as the income criterion for distinguishing between urban workers who are fully employed and the underemployed is in Sabot (1975).

surplus labour from the migration function results in an upward bias in the estimated probabilities. The significance of the coefficient on the probability variable will be affected only if the ratio of employed surplus labour to unemployment varies markedly over time, among towns and educational sub-groups, i.e. the dimensions by which the model is disaggregated. However, an examination of the data for 1971 revealed that the ratio of employed surplus labour to unemployment does not vary significantly among urban sub-groups.

In urban areas education level, occupation level and the wage rate are all positively correlated. When moving from high to low skilled occupations there is a shift from labour scarcity to labour surplus, which suggests a positive relationship between education and urban employment probabilities. In addition, differences among education groups in psychic costs and returns as well as differences in information may influence migrant behaviour. The educational system may be selective of people with utility functions consistently different from those of the rest of the population. It is also conceivable that there is a systematic decrease over the course of an individual's formal education in place attachments and an increased preference for urban occupations and for those urban consumer items not found, or considerably more expensive, in the rural basket of goods and services. If so, this would explain higher levels of mobility among the educated even in a situation in which expected income differentials are the same for all educational groups. Disaggregating the model by educational sub-groups allows us to assess the relative strength of alternative economic and non-economic explanations of the clear association between the education level and the propensity to migrate of rural residents.[11]

To define cross-section migration rates as ratios of total current urban stocks of migrants to current total stocks of rural population in the relevant sub-groups is likely to introduce a bias along the time series dimension implicit in the model. The current stock of migrants arrived in different years. If rural-urban economic opportunity differentials changed over time, as they have in Tanzania, then the estimated model will be biased as net economic returns to migration vary among current age groups. When only contemporary data on the economic variables are available, only recent migrants should be included in the numerator of the migration rate.[12] A preferable procedure, adopted in this study, for minimizing

[11] While Levy and Wadycki, and Bowles have incorporated education into their standard regional models of migrant behavior in this preferable manner, several existing econometric studies, e.g. Beals et al, Sahota, Schultz, introduce the average level of education of the source area population as an independent variable. A significant association between regional average educational levels and migration rates is not sufficient to confirm that the educated have a higher propensity to move to town than the uneducated. The relationship may be due to a relatively higher level of mobility among all members of the regional population, educated and uneducated alike, suggesting that education is serving as a proxy for an unspecified independent variable with which it is highly correlated. Even if it is established independently that the educated have a higher migration propensity there is no way of determining whether it is due predominantly to a higher level of responsiveness to a given rural-urban expected income differential or to wider income differentials for the educated than the uneducated. While in four of the studies the sign of the education variable was as anticipated, Beals, et. al. obtained a negative coefficient. After a consideration of alternative explanations Knight concludes that no helpful implications can be drawn from this study concerning the effects of education on migration.

[12] Examples of one of the problems that arise when this potential bias is ignored are found

the bias is to interpret age-specific migration rates from a time series perspective and to disaggregate the independent variables by time periods.

The specification adjustments yield equation (2) where subscript e indicates education and a indicates time period.

$$M_{ruea} = F(P_{uea}, WU_{uea}, WR_{rea}, DIST_{ru}, UP_{u}, R_{ruea}). \quad (2)$$

II. Empirical Results

The migration function is estimated using the data described in the Appendix. Tables 1A, 1B, and 1C present the rural-urban migration rate, urban wage rate and urban employment probability disaggregated by three times periods and four education levels. The data set used for estimation is also disaggregated into three rural regions and three urban areas; there are in all 108 observations. Comparing the data aggregated over time periods, there is a clear positive association between educational level and migration rates, on the one hand, and between educational level and urban wage rates and employment probabilities, on the other. Given the assumption that rural regional incomes and the direct costs of migration are invariant with regard to education, the implication is that at least part of the explanation of the cross-section differentials in the propensity to migrate of rural residents is that the economic returns to migration are an increasing function of education. A comparison of the data aggregated over educational groups also reveals a strong relationship between the migration rate, urban wages and employment probabilities over time. The ratio of the monthly urban wage to the monthly rural per capita income varies over the sample from 3 for the lowest educational group in the 1955–60 period to 12 for the highest educational group in the 1966–70 period.[13]

We use linear regressions to assess the evidence bearing on the hypotheses regarding cross-section and inter-temporal differentials in income and employment probabilities as factors explaining differentials in rates of urban migration. Section A examines the importance of income differential and employment probability variables in the migration function with the data pooled over all educational groups. Also, the role of an independent education variable as proxy for the economic variables is assessed. Section B presents the results obtained when the migration function is fitted for separate education groups, and assesses the non-economic influence of education on the propensity to migrate.

Ordinary least squares techniques and simple linear forms of the equations were

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in Levy and Wadycki (pp. 379–380), Sahota and Schultz. Sahota and Scultz attribute the relatively higher coefficients on the economic variables for young migrants to factors, such as a longer remaining time in remunerative activities which constitute explanations for a higher degree of responsiveness among young rural residents. However, as a consequence of age selectivity, the young age groups of the urban stock of migrants are comprised predominantly of more recent arrivals. Since in these studies age specific migration rates are all related to economic variables from the same year, it is possible that a significant portion of the differentials in the coefficient is explained by a wider gap between gross and net migration rates among relatively early arrivals and by a widening of income differentials over time.

[13] See Barnum and Sabot for a more detailed discussion.

TABLE 1

A. *Rates of Rural-Urban Migration for Four Education Groups in Three Time Periods: Tanzanian Males*

Current age	*Arrival period*[a]	*Education* None	*Standard* 1–4	*Standard* 5–8	*Form 1 and up*	*Aggregate over education*
20–24	1967–70	0.014	0.047	0.277	0.318	0.085
25–34	1962–66	0.013	0.038	0.144	0.399	0.047
35 and above	1955–61	0.012	0.030	0.106	0.180	0.022
Aggregated over age groups (time periods): 1955–70		0.011	0.032	0.123	0.249	0.035

[a] Period in which the majority of migrants in the age sub-group arrived in town.

B. *Average Urban Wages (Shillings per Month) for Four Education Groups in Three Time Periods: Tanzanian Males*

Time period	*Education* None	*Standard* 1–4	*Standard* 5–8	*Form 1 and up*	*Aggregated over education*
1966–70	230	246	322	448	288
1960–66	179	194	247	336	213
1955–60	106	121	150	200	125
Aggregated over time periods: 1955–70	181	196	253	347	221

C. *Average Probabilities of Finding an Urban Job (Within Four Months) for Four Education Groups in Three Time Periods: Tanzanian Males*

Time period	*Education* None	*Standard* 1–4	*Standard* 5–8	*Form 1 and up*	*Aggregated over education*
1966–70	0.10	0.19	0.47	1.0	0.33
1960–66	0.16	0.21	0.71	1.0	0.34
1955–60	0.12	0.22	0.78	1.0	0.25
Aggregated over time periods: 1955–70	0.14	0.20	0.56	1.0	0.30

employed in all regressions.[14] Except where specifically noted, the first figure below the coefficient estimate in the tables is the standard error and the second figure is the elasticity calculated at mean values (see Table 2), of the variables. An asterisk indicates that the coefficient is significant at the five percent level using a one-tailed t test.

TABLE 2

Variable	*Mean Values*[a] M	WU	WR	P	P.WU–WR	DIST	UP
Mean	0.437	231.1	34.6	0.419	81.7	67.6	11.4

[a] The migration rate has been rescaled by a factor of ten (actual, .0437), WU and WR are in shillings per month, observations on P lie in the interval between zero and one, DIST is an index based on a map scale, UP is in tens of thousands.

[14] An analysis of the residuals ranked by source area population, R_{rea}, did not reveal marked heteroskedasticity. Regressions in which the observations of all variables were divided by $\sqrt{R_{rea}}$, and $\sqrt{R_{rea}}$ was also included as an additional variable, are fully consistent with the results reported below.

A. The Migration Function Using Pooled Data

The wage variables are introduced into the migration function in four different forms. Rural and urban wages, WU and WR, are entered separately or as an absolute differential, WU–WR.[15] The results are presented in Table 3. The estimated coefficients of all the wage variables have the correct sign and, with the exception of WR in regression 1, the coefficients are significant at a 5 per cent level.

TABLE 3

Regression Explaining Migration Rates –Including Wages as Explanatory Variables (108 Observations—3 × 3 × 4 × 3)

UNDISCOUNTED WAGES

Regression No.	*Constant*	WU	WR	(WU-WR)	DIST	UP	$\bar{R}^2$	SSR[a]
1	0.15	0.0040*	−0.0106		−0.0085*	0.027*	0.48	22.621
	(0.40)	(0.0005)	(0.0067		(0.0039)	(0.004)		
		(2.09)	(0.83)		(−1.31)	(0.71)		
2	−0.14							
	(0.26)			0.0039*	−0.0073*	0.027*	0.49	22.836
				(0.0005)	(0.0037)	(0.004)		
				(1.76)	(−1.13)	(0.70)		

[a]SSR is the sum of the squares of the estimated residuals. The total sum of the squares for all regressions in tables 2 through 5 is 45.06.

The urban probability variable is first added to the migration function as a component of the expected wage, calculated as the product of job probability and the urban wage. This form of the equation, in which the elasticities of the two variables are constrained to be the same, would be appropriate if potential migrants are risk-neutral and evaluate their income possibilities in terms of a simple actuarial value. Migrants may respond differently to a wage differential when there is a risk of unemployment than to the same differential when there is assurance of finding a job. Therefore the wage and probability variables are also entered separately. Table 4 presents the resulting regressions. In both forms of the

TABLE 4

Migration Regressions Including Employment Probability

UNDISCOUNTED WAGES

(1) EXPECTED WAGES — *Regression coefficients*

Regression No.	*Constant*	P(WU)-WR	DIST	UP	$\bar{R}^2$	SSR
3	0.43	0.0030*	−0.0074	0.022*	0.55	19.820
	(0.23)	(0.0003)	(0.0035)	(0.004)		
		(0.57)	(−1.14)	(0.58)		

(2) PROBABILITY ENTERED SEPARATELY

Regression No.	*Constant*	P	WU	WR	WU-WR	DIST	UP	$\bar{R}^2$	SSR
4	0.11	0.666*	0.0024*	−0.0077		−0.0077*	0.023*	0.55	19.429
	(0.37)	(0.163)	(0.0006)	(0.0063)		(0.0036)	(0.004)		
		(0.64)	(1.26)	(−0.56)		(−1.20)	(0.60)		
5	−0.09	0.676*			0.0023*	−0.0069*	0.023*	0.55	19.534
	(0.24)	(0.162)			(0.0006)	(0.0035)	(0.004)		
		(0.65)			(1.05)	(−1.07)	(0.59)		

[15] A relative wage ratio, WU/WR was also tried and gave regressions consistent with those reported below in which an absolute wage differential was employed.

regression where the probability variable is entered separately (regressions 4 and 5), its coefficient is significant at above a 5 per cent level. Similarly the coefficient of the expected wage variable (equation 3) is significant at a 5 per cent level. Comparing equations 1 and 4 or 2 and 5, we find that the addition to the explained sum of squares in moving from the specification without probability to the specification including probability as a separate variable is significant at a 99 per cent confidence level.

We suggested that disaggregating both the dependent and independent variables by education will increase the explanatory power of the economic variables relative to regressions in which the educational level is entered as an independent variable. If the significance of the independent education variables derives at least in part from the fact that they serve as surrogates for rural-urban wage differentials by education and educational differentials in urban employment probability, then the significance of dummy shift variables representing each of the four educational groups, would be expected to decrease with the introduction of the wage or probability variables. Table 5 reveals that this is what occurs. The F statistic

TABLE 5

Migration Regressions with Education Entered as a Separate Variable
(Wages are not Discounted)

A. ACTUAL WAGES (NON PROBABILITY MODEL)

Regression No.	*Constant*	WU-WR	DIST	UP	D1	D2	D3	R^2	F *Value*[a]	SSR
6	1.19*		0.0075*	0.027*	−0.94*	−0.87*	−0.40*	0.51	25.81	20.75
	(0.25)		(0.0036)	(0.004)	(0.12)	(0.12)	(0.12)			
7	0.57*	0.0022*	−0.0074*	0.027*	−0.64*	−0.58*	−0.22*	0.57	8.54	18.216
	(0.28)	(0.0006)	(0.0034)	(0.004)	(0.14)	(0.14)	(0.14)			

B. EXPECTED WAGES (PROBABILITY MODEL)

Regression No.	*Constant*	P.WU-WR	DIST	UP	D1	D2	D3	$\bar{R}^2$	F *Value*[a]	SSR
8	0.65*	0.0022*	−0.0074	0.023*	−0.33	0.29	−0.01	0.56	2.03	18.691
	(0.29)	(0.0007)	(0.0034)	(0.004)	(0.22)	(0.21)	(0.17)			

[a] In each case the value of F tests the hypothesis that the dummy variables are jointly insignificant

testing the joint significance of the educational dummies is markedly lower for equation 7, in which wage variables are included, than for equation 6, in which there are no economic variables. A comparison of equation 8, in which employment probability has been included, with equation 7 reveals a further reduction of the F statistic.

B. *The migration function using data for separate educational levels*

The relationships between the two components of the economic returns to migration and education do not necessarily explain all of the associations between education and the propensity of rural residents to migrate. The analysis of dummy variables in the preceding section is extended in this section to assess whether, independent of the influence of education on the economic returns to migration, there is a positive association between educational level and the propensity to migrate.

The estimated regressions, 1–8, have as in equation 3, all constrained the coefficients on the independent variables to be the same for each education sub-group, implying that the responsiveness of rural residents to the hypothesized determinants of migration is invariant with regard to educational level.

$$M_{ruea} = a_o + a_1 \overline{W}_{ruea} + a_2 UP_u + a_3 DIST_{ru} + E_{ruea} \qquad (3)$$
$$u = 1 \ldots 3; \quad r = 1 \ldots 3; \quad e = 1 \ldots 4; \quad a = 1 \ldots 3$$

where $\overline{W}$ signifies the various forms of the economic opportunity differential utilized.

Alternatively the migration function can be specified so that coefficients can vary among educational groups.

$$M_{ruea} = a_{oe} + a_{1e} \overline{W}_{ruea} + a_{2e} UP_u + a_{3e} DIST_{ru} + E_{ruea} \qquad (4)$$
$$u = 1 \ldots 3; \quad r = 1 \ldots 3; \quad e = 1 \ldots 4; \quad a = 1 \ldots 3$$

Equation (4) is actually four separate equations, one for each value of e.

Education may alter the nature of the rural resident's utility function, in effect changing the structure of what we have called the psychic costs and returns to urban migration, or the education system may be selective of people with utility functions of a distinct nature. Rural residents with higher education may, perhaps because of better urban contacts or because of occupational differentials in the way in which jobs are advertised, have better knowledge of urban commodities and labour market conditions. The influence of differences among educational groups in tastes, risk aversion and information on the propensity to migrate could be reflected in the coefficients of either the age or non-wage variables. Thus in equation (4) a_{oe}, a_{2e}, and a_{3e} could increase with educational level if education is associated with a greater preference for urban amenities or lower risk aversion. A non-mutually exclusive alternative, is that owing to better information the response to expected income is affected by education, such that the coefficients a_{1e} increase with educational level. Finally, the association between migration rates and education may be predominantly the direct result of increases in economic opportunities, in which case the coefficients would be constant over educational groups for all variables.

The three possibilities can be rephrased in the form of the following null hypotheses:

(a) The coefficients on all variables do not vary by education group.

(b) The coefficients on non-income variables do not vary by education group.

(c) The coefficients on income variables do not vary by education group.

Regression 9 in Table 6 presents estimates of a migration equation, using the undiscounted expected earnings differential as the wage variable,[16]

$$M_{ruea} = \alpha_0 + \alpha_0' D_1 + \alpha_0'' D_2 + \alpha_0''' D_3 + \alpha_1 \overline{W}_{ruea} + \alpha_1' \overline{W} \cdot D_1 + \alpha_1'' \overline{W} \cdot D_2 + \alpha_1''' \overline{W} \cdot D_3 + \alpha_2 DIST + \alpha_2' DIST \cdot D_1 + \alpha_2'' DIST \cdot D_2 + \alpha_3''' DIST \cdot D_3 + \alpha_4 UP + \alpha_4' UP \cdot D_1 + \alpha_4'' UP \cdot D_2 + \alpha_4''' UP \cdot D_3 + E_{ruea} \qquad (8)$$

where

$D_1 = 1$ if the observation is in education group 1 (the lowest educational level) and is zero otherwise.

[16] The inclusion of other formulations (discounted as well as undiscounted) of the expected wages variable yielded results similar to those given below.

TABLE 6

Migration Regression with Coefficients Unrestrained by Educational Group[a]

n = 108

Regression No.	*Constant*	D_1	D_2	D_3
9	0.32	−0.14	0.03	0.76
	(0.77)	(−0.25)	(0.05)	(1.3)
	W*	W D_1	W D_2	W D_3
	0.0015	−0.0010	−0.0011	0.0019
	(2.46)	(−0.18)	(−0.19)	(1.04)
	DIST	DIST.D_1	DIST.D_2	DIST.D_3
	−0.0049	0.0025	0.0002	−0.0121
	(−0.82)	(0.29)	(0.08)	(−1.43)
	UP	UP.D_1	UP.D_2	UP.D_3
	0.052*	−0.49*	−0.045*	−0.021*
	(7.45)	(−4.37)	(−4.18)	(−2.01)
	$R^2 = 0.66$	RSQ = 12.918		d.f. = 92

[a] The figures in parentheses beneath the coefficients estimates are t values.

$D_2 = 1$ if the observation is in education group 2 and is zero otherwise.
$D_3 = 1$ if the observation is in education group 3 and is zero otherwise.

This allows all coefficients to vary among education groups.

The first null hypothesis was tested by examining, via an F test, the reduction in the residual sum of squares in moving from the aggregate regression (equation 3, Table 4) to the unrestrained regression (equation 9, Table 6). The resulting F value of 4.10 is well above the critical value of $F_{12,92} = 1.85$ for a 5 per cent significance level. Therefore the null hypothesis—no difference in equation by educational level—is rejected.

The second hypothesis, that of constancy on the non-wage variables, is equivalent to the hypothesis that the coefficients on the non-wage variables involving dummy shifts are jointly zero, i.e. there will be no significant reduction in the residual sum of squares when moving from an equation in which coefficients on each variable are constrained to be the same to one in which the coefficients on the non-economic variables are free to vary by educational sub-group. The F statistic for this hypothesis is 4.406 which is, once again, above the critical value of $F_{9,92} = 1.97$ for a 5 per cent significance level. Therefore, the second null hypothesis is rejected.

Finally, the third hypothesis, that of constancy of coefficients on the wage variable, is equivalent to the hypothesis that the coefficients on the wage variables involving dummy shifts are zero. It is apparent trom the t statistics on the separate wage shift variables in equation 9 that the wage responses for the individual groups are not, taken one at a time, significantly different. Further, when comparing the equation in which the coefficients on each variable are constrained to be the same to one in which the coefficients on the economic variables are free to vary by educational sub-group, the F statistics for the null hypothesis of simultaneous constancy for the four coefficients was .397. Since this is below the critical

value of $F_{3,92} = 2.13$ for a 10 per cent significance level, the hypothesis of uniformity among the four coefficients is accepted.

III. Policy Implications

Our analysis supports the hypothesis that expected income has a significant influence on the decision of Tanzanian rural residents to migrate to town, thus providing an empirical basis for the new class of models that view urban unemployment as a phenomenon resulting from an inter-sectoral misallocation of labour. This suggests that narrowing the gap between rural and urban real incomes is a potentially effective means of reducing urban labour market imbalance and—since they influence the spatial distribution of income—that government wage, tax, tariff, and investment policies may be used to this end. The estimated elasticity implies that a 10 per cent decline in urban real wages, accomplished either by lowering money wages or holding them constant while prices rise, induces a 7 to 20 per cent decrease in the migration rate. Rough calculations suggests that, given the low average annual net rate of migration and the large existing pool of unemployed workers; a wage cut of at least 40 per cent would be necessary to achieve the desired balance between job openings and job seekers.

The political feasibility of such a policy is doubtful. Also it may be that in some urban sub-sectors, high wages are the consequence, not of institutional factors, e.g. government wage policy or union pressures, but of a positive relationship between the wages paid to a worker and his productivity, so that the wage which minimizes costs per efficiency unit of labour for employers exceeds the market clearing wage. In this case to lower wages it is not sufficient to remove institutional constraints on downward flexibility. Wage levels would have to be legislated and while their reduction would lower the level of unemployment and hence improve the allocation of labour, it would also impose x-efficiency costs. Raising rural incomes is an alternative means of narrowing the income gap, but increases sufficient to eliminate urban labour market imbalance are likely to be economically feasible only over a considerably longer period than that required to implement a reduction of urban wages.

When supply exceeds demand, prices fall. This conventional equilibrating mechanism does not appear to apply in Tanzania's urban labour market. Rather the urban wage which is in excess of the supply price of labour appears to be downwardly inflexible and it is the length of the queue for jobs, the number of unemployed, that equilibrates the market, with expected income negatively related to the number of unemployed. The influence of the probability of finding a job on the flow of migrants implies that an increase in the demand for labour will elicit an increase in supply. Of course, if it is possible to provide an urban job at the prevailing wage for all rural residents who desire one, which is likely to be a multiple of the total of job seekers already in the urban market, then this interaction will not frustrate the attempt to eliminate urban surplus labour by demand augmentation. In Tanzania the scope for increasing investment and the labour intensity of production are insufficient to generate, within a short period, the demand necessary

for this solution to the problem of labour market imbalance. On the contrary, feasible increases in demand are more likely to aggravate than alleviate the problem. Given the estimated elasticity, a 10 per cent increase in the employment growth rate and hence in employment probability would stimulate a 6 per cent increase in the migration rate. Because the base for the urban employment growth rate is much smaller than the rural base for the migration rate, the absolute increment to the urban labour force will exceed the increment to urban employment, despite a higher rate of employment growth than of migration.

Our analysis also supports the hypothesis that the increase in the economic returns to migration with educational level contributes to the explanation of the higher propensity to migrate among educated rural residents. Compressing the urban wage structure by reducing real wages in occupations at the top of the hierarchy is likely to lower both the aggregate rate of unemployment and the educated as a proportion of the total number of unemployed. Reducing the advantage that educational credentials afford in competing for preferred jobs, thereby lowering the urban expected wages of those with more education and raising it for those with less, is likely to reduce the educated as a proportion of the unemployed, but will only reduce the aggregate rate of unemployment to the extent that migration elasticities are a positive function of educational level.

Finally, the analysis supports the hypothesis that, for a given differential between rural and urban incomes, workers with relatively more education have a higher propensity to migrate than workers with less. However, it is not possible to determine whether this finding is explained by the influence of the educational process on perceptions of the non-economic costs and benefits of moving, or by the selection by schools of students who are more open to change. Thus, while we are not in a position to assess the frequently heard recommendation that redesign of the school curriculum to reduce its urban bias is a means of reducing the emigration of educated rural residents and the rate of urban unemployment among school-leavers, we do reaffirm the importance of the issue.

University of Michigan
Institute of Economics and Statistics, Oxford
and International Bank for Reconstruction and Development

APPENDIX: DATA

This appendix presents the data sources and discusses the generation of the dependent and independent variables.

A. *Migration Rates*

The study analyzes the migration behaviour of males born in the countryside who moved to town after the age of thirteen. The dependent variable in the equation is defined as an average net propensity to migrate; it is the ratio of the estimated number of urban residents in given age and educational groups born in a given source area to the corresponding source area population. Numerators were derived

from the National Urban Mobility Employment and Income Survey of Tanzania,[17] (NUMEIST), while denominators were taken from the 1967 population census. The addition of four educational and three age dimensions stretches the sample too thin when it is taken to its highest level of disaggregation of 17 regions of origin and seven urban receiving areas. To increase average cell size and the significance of a value of zero in any cell both the regions and the urban areas are aggregated into three relatively homogeneous structural groups.[18] A random allocation of the total sample over all of the resulting 108 cells would have less than a 1 per cent probability of leaving an empty cell.

Data on year of arrival for the current migrant age groups are used to link temporally the dependent variable and the income and probability variables. The mean date of arrival for the 20–24 current age group was mid-way through 1967. The majority of the migrants within this group arrived during the 1967–70 period, and it is with average estimates of the independent economic variables for this period that the migration rates of the youngest age group are linked. Similarly, the 25–34 migrant age group, for whom the mean date of arrival was 1964, is linked to observations for the independent variables for the period 1962–66 and the age group comprised of migrants over 34, for whom the mean date of arrival was 1957, is linked to the 1955–61 period.

B. *Urban Incomes*

To measure the income component of the returns to migration a wage variable disaggregated by education and time period was constructed. Wage series for three occupational groups for 1957–71 were derived from aggregate average real wage series and occupational differentials for the end-years. On the assumption that occupational wage ratios changed smoothly over time the aggregate wage series is related to the occupational wages by

$$W_t = \sum_{0=1}^{3} W_{tl}\delta_{to}\lambda_{to} \qquad t = 1955 \ldots 1971 \tag{5}$$

where W_{tl} are unskilled wages and δ_{to} are the occupational wage ratios, with unskilled wages as a base, obtained for intervening years from the ratios for the two end-years in the series by interpolation. NUMEIST yielded estimates of λ_{to}, the proportion of the labour force in each occupational category. For each year in the series the sum of all 1971 non-migrant labour force members who arrived in town prior to that year and of all 1971 non-migrant labour force members whose current age implied they were 14 or older in the given year was distributed by occupational level. Given the values for δ_{to} and W_t, equation (5) was solved for unskilled wages, W_{+1}, and the wages for the other occupational groups were derived.[19]

[17] The National Urban Mobility, Employment and Income Survey of Tanzania is a random sample consisting of 5500 respondents covering seven urban areas. A detailed discussion of the conceptual background and methodology of the survey is found in M. A. Bienefeld and R. H. Sabot.

[18] The three urban groups are (1) Dar es Salaam, (2) Tanga and Mwanza, (3) Arusha, Dodoma, Mbeya and Tabora. The three regional groups are (1) Arusha, Kilimanjaro, Morogoro, Mtwara, Mwanza, and Tanga, (2) Singida, Shinyanga, Dodoma, Mara, Kigoma, and West Lake, (3) Coast, Iringa, Mbeya, Ruvuma and Tabora.

[19] Rather than reconstructing a picture of past occupational and educational wage labour

The second step in generating the wage variable involved expressing the wage by educational group as a weighted average of the wage in each occupational category such that,

$$W_{ute} = \sum_{0=1}^{3} \rho_{uteo} W_{to} \qquad (6)$$

$$t = 1955 \ldots 1971; \quad e = 1 \ldots 4; \quad u = 1 \ldots 3$$

where W_{ute} is the wage in urban area u, for each educational group e, at date 5. The proportion ρ_{uteo}, of the labour force for each urban area in each educational and occupational category, was derived from NUMEIST by further disaggregation λ_{to} by education.

C. *Rural Incomes*

The opportunity cost of urban migration is measured by rural per capital income in Tanzania's seventeen regions for each of the three time periods. Annual incomes, both monetary and subsistence, derived from agriculture, hunting, forestry and fishing were estimated from district data.[20] These series were deflated by a price index comprised of a weighted average of separate indices for each of the components of rural income.[21] Lack of data precluded disaggregating rural incomes by education. However, occupational homogeneity, lack of institutional rigidities in income determination and an apparently weak correlation between formal education and rural productivity, suggest that intra-regional rural income differentials among educational sub-groups are, if they exist at all, considerably narrower than urban differentials.[22]

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force characteristics from a contemporary sample it would be better to use data generated in the years in question. In particular the procedure has two shortcomings which fortunately do not appear to pose a serious problem in Tanzania. The first is the implicit assumption that individual education and occupation levels remain constant over time. However, in Tanzania this is justified in regard to education by the scarcity of opportunities to acquire additional formal education for adult labour force participants and in regard to occupation by the current high level of employment stability of the urban labour force, and the fact that job ladders extending across our broad occupational categories are rare. The second shortcoming is the implicit assumption that rates of return-migration have been uniform over all subgroups of the employed. However, while the aggregate rate of return-migration is high, the urban-rural stream of migrants is composed predominantly of migrants who were unsuccessful in their search for urban non-marginal employment. Among wage employees return migration (other than for brief visits) is infrequent. Workers who have reached retirement age could comprise a second significant component of the urban-rural migrant stream, but the recent rapid growth of urban employment and the fact that migrants were young on arrival have meant a young average age of wage employees, contributing to low rates of retirement.

[20] Our selection here was determined by data availability. The accuracy of this proxy for the migrant's opportunity cost depends in part on the rural institutional framework within which incomes are determined and labour allocated among alternative uses. See Knight.

[21] While rural and urban income time series were deflated by production and consumption price indices respectively, no account was taken of rural-urban cost-of-living differentials. Even if the appropriate data were available the fact that there are marked differences in patterns of consumption of goods, services and leisure between rural villages and urban areas due in part to price differentials and in part to preferences implies that there is likely to be a serious index number of problem. The magnitude (and perhaps even the sign) of the cost-of-living differential will vary significantly depending upon whether urban or rural quantity weights are used. Thus under the best of circumstances there is unlikely to be one unique construct of the rural-urban income differential. Nevertheless, it is probable that such an adjustment would reduce the differential. See Knight for estimates for Ghana.

[22] Survey work by H. Thias and M. Carnoy confirms this supposition in Kenya.

D. *Urban Employment Probabilities*

The probability that a migrant of educational group e arriving in town u in time period t will find a job within four months of arriving in town is:

$$P_{ute} = \frac{\gamma_{ute}\,(1-U_{ute})}{U_{ute}} \qquad 0 < P < 1 \tag{7}$$

where U is the unemployment rate and γ is the net rate of growth of employment. The two available sample surveys yielded the education specific unemployment rates for 1971 and 1965.[23] For 1957 estimates made by the Tanganyika Department of Labour were used. Observations for interim years were obtained by interpolating the trend for each educational sub-group. Employment growth rates for four month periods, the estimated average time spent in job search,[24] were calculated from annual data for aggregate male employment in town.[25] To disaggregate these rates by educational sub-group the educational distribution of total employment in each urban area in each year over the 1955–71 period was estimated by aggregating P_{ute} (see equation (6) above) over occupational categories. W_{uea} and P_{uea} were obtained from W_{ute} and P_{ute} respectively by averaging annual observations within each of the three time periods by which the model was disaggregated.

E. *Distance and Urban Population*

The distance variable $DIST_{ru}$ is an average of the linear distances between each receiving town and regional center weighted by town and regional population. Urban population, UP_u, is the average of the town populations in each aggregate urban area.

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[23] M. Bienefeld and R. Sabot, and R. Ray.

[24] Since no information is available on return migration, the length of the job search-period was estimated from the length of time and unemployment and the length of time to find a job of the current urban stock of migrants. Estimating the equations with alternative job search periods of three months, six months, eight months, and one year had little impact on the results.

[25] For dates prior to 1965 the data are only available for Dar es Salaam, Tanga and Mwanza. For the four smaller towns, estimates of the total male employment were made using the ratio of male employment to male population for Tanga and Mwanza to estimate the employed proportion of the male population for Arusha, Dodoma, Mbeya and Tabora.

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