REGIONAL INEQUALITY AND MIGRATION IN KENYA: SOME INDIRECT EVIDENCE

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ABSTRACT

This study investigates the characteristics of districts in Kenya which determine the ratio of men to women in the age bracket 20 - 40. It is argued that this ratio is an index of one prominent type of migration in Kenya.

Employment opportunities, the state of smallholder agriculture, education, and land ownership patterns, are all found to be significant in determining the "working age sex ratio."

It is suggested that policy will effectively deal with migration only when it addresses itself to the regional inequalities in opportunity which underlie migration.

The analysis uses statistical multiple regression techniques. An appendix with data accompanies the discussion.

Internal migration between regions of low income countries has been the focus of considerable research in recent years. Migration from rural to urban areas has been of particular interest for researchers and policy makers because the high rate of urban growth has put a serious strain on urban services and housing. Attempts to determine the forces which contribute to migration, therefore, may provide insights into the potential success of policies which aim to modify migration patterns.

In many ways migration can be an economically and socially productive activity. When people leave areas in which their opportunities are limited and make use of better opportunities elsewhere, their lot is improved. Although migration between rural areas may give rise to ethnic and other social tensions, these costs must be weighed against the benefits provided by putting people in a position to generate income for themselves. Migration of this type is likely to be socially beneficial in many cases.

However migration can give rise to other problems. Emigrants can be expected to contribute more to their society than they remove through consumption. This is true in every case where a community as a whole benefits from its members. Since migration is likely to involve ambitious and well trained individuals — those who can benefit most from moving — the community they leave will lose their talents. A significant part of the gain of the in-migration area may be a loss to the out - migration area when the "demonstration effect" of the migrants' potential successes are lost to the "donor" community. Thus the relative backwardness of an area, which leads to out-migration, is likely to be reinforced by the very process of migration. This is part of the larger process which has been called the "development of under-development." Such development, in which the "centre" gains at the expense of the "periphery", is most acute in the case of rural-urban migration.

Rural-Urban migration in a country like Kenya is likely to create great problems. A significant proportion of this migration probably results in a "dead weight loss" to society. This occurs when a person leaves rural work to stay in a town and search for a job. Many migrants leave rural opportunities with relatively little chance of getting an urban job. More people migrate than are in fact able to find work in urban areas. Although each migrant may have low productivity in rural areas, it is likely that the total output lost through urban unemployment is not trivial.

In any case, whether desireable or not, migration is likely

to be viewed as a political problem because it makes visible social inequalities and tensions.

Why Do People Migrate?

In a profound sense it might be said that people's economic and social conditions compel them to migrate; but in a more narrow sense, individuals make decisions to migrate. What determines such decisions? Opinions and theories on this issue vary. At one extreme, economists' models place almost complete emphasis on "rational" decision making to maximize the present value of income. Potential migrants base their decisions on the difference between income streams, the cost of moving, and on the likelihood of employment in each location. Well paying jobs attract more applicants than can be accepted, until the large number of competing job seekers discourages further migration.

At the other extreme, almost mystic models of the "pull of the city" can be found. In such discussions (which are more often casual than rigourous), drift to towns is seen as practically inevitable, reflecting not so much historical as psychological imperatives. Such discussions cannot really be called "theories" of rural-urban migration because they explain any levels of these phenomena. ... If migration is determined purely by "values" which have no root in material conditions, then anything can be explained ex-post-facto.[1]

Between these extreme positions, various other influences on the decision to migrate have been allowed. In particular, the role of education and population pressure on the land have been suggested as important determinants of migration. Both these variables can be interpreted as acting through income differentials and can therefore be reconsiled with the economic model. A high man-land ratio would certainly be expected to reduce returns to labour. Alternatively, a consentrated pattern of land ownership coupled with less labour intensive technology on large scale holdings could have the same effect. Thus population pressure is certainly consistent with a picture of migration determined fundamentally by economic opportunities. Education too, by increasing the range of jobs to which a person has access, can have its effect through income. However, it is entirely possible that education has an effect beyond its impact on potential earnings. Attitudes and values surely are modified by the education process. Moreover, an

~~educated~~ person would be more likely to be able to cope with problems of urban life, for which literacy is certainly an advantage.

Other approaches to predicting migration, not based on the individual decision to migrate, have met with some predictive success. Gravitation models, in which distance and "mass" (population size) determine migration patterns between areas have been used. So too have models in which current migration is taken to be a function of cumulative past migration. Like the "majic of the city" model, however, these models are deficient in that they have no concrete behavioural base which is subject to policy. Neither the distance between areas, nor their populations, nor the history of migration between them can be manipulated by a planner. To the extent that migration is a phenomenon which is sensitive to potential policies, we need models which treat policy instruments explicitly.

The Approach in this Study.

In this study we do not look at characteristics of individuals who migrate but rather at characteristics of districts. We analyse the relationship between characteristics of these districts and an indirect measure of migration, the sex ratio for the ages 20 to 40 . The analysis covers 22 districts in Kenya, including 85% of the population outside Nairobi and Mombasa and all major small-holder districts.

We propose that there are two major types of migration in Kenya, apart from short term movements (to markets, etc.) While we suspect that almost all migration is in response to the same fundamental conditions — lack of opportunities in the out-migration relative to the in-migration region — we suggest that the characteristics of migrants and their behaviour will consentrate in two categories. Some hypothesized characteristics of these two types of migration are set out in Table I below.

TABLE I.

	"SETTLEMENT" MIGRATION	"CASH" MIGRATION
UNIT	"FAMILY" (SEX RATIO OF) MIGRANTS (.9-1.1)	"INDIVIDUALS", ESPECIALLY YOUNG MEN (SEX RATIO OF MIGRANTS 1.5-2 AND UP)
OBJECTIVE	LAND; HIGH INCOME EMPLOYMENT; SELF EMPLOYMENT	CASH, ESPECIALLY IN LOW WAGE EMPLOYMENT
PERCEPTION OF "HOME"	WEAK; TIES TO IN-MIGRATION REGION	STRONG; TIES TO OUT-MIGRATION REGION
PROBLEMS RESULTING FROM MIGRATION	ETHNIC CONFLICTS IN RURAL IN-MIGRATION REGIONS	UNDERDEVELOPMENT OF RURAL OUTMIGRATION REGIONS; URBAN UNEMPLOYMENT

This brief summary consists of generalizations which could use further discussion. "Family" and "individual" are ill defined terms in Kenya (for an economist in particular) since kinship and age group bonds are still very extensive. It would be absurd to suggest that one sort of migration preserves traditional kinship relation while the other disolves them. The idea behind the terms is simply that "settlement" migration involves men, women, and children, while "cash" migration is likely to involve predominantly young men and to a lesser degree young women and older men. "Settlers" view their move as permanent, although we suspect that their loyalties to the new areas are weak. "Cash" migrants identify strongly with their regions of origin and look upon their destination principally as a place to earn money to be devoted to expenditures "back home". We suspect that relatively few migrants view themselves as permanently alienated from the land. Economic realities in Kenya suggest, however, that increasing numbers of migrants will have to work for increasing numbers of years to earn enough to buy land, all in a context of diminishing likelihood of finding wage jobs. Thus an urban proletariat will emerge in spite of few people's desire to join it. This class will be augmented by second generation immigrants in the city. (See W. Elkan for another discussion of this question [2].)

In view of the cash migrants' desire to devote their cash incomes to developments "back home", it may seem inconsistent to predict

that underdevelopment of the "home" region will be a result of cash migration. Indeed, the alternative hypothesis, that accellerated development of the home areas will result, cannot be rejected out of hand. We expect that the net effect of cash migration on the home area will be negative, however, because we expect that the potential contributions of the migrants to their communities, particularly in terms of their leadership in innovation, would be greater than the value of their cash remittances.

In this study we are unable to test all the conjectures stated above. Most of our effort has been devoted to looking at evidence which may throw light on the causes of "cash" migration. Let us precede that discussion, however with a look at some evidence about the two types of migration drawn from Kenya's four largest ethnic groups.

Table 2 shows the number of resident, by sex, of each of these ethnic groups in the provinces of Kenya outside their "heartland." Also included are the populations of Nairobi and Mombasa of these groups.

TABLE 2 (100's of People)

		KIKUYU	LUO	LUYIA	KAMBA
A. CENTRAL PROV.	MALE FEMALE	-	53 28	55 32	134 106
B. NYANZA	M F	36 23	-	155 135	8 4
C. WESTERN	M F	59 51	96 106	-	5 3
D. EASTERN	M F	138 108	20 12	15 9	-
E. RIFT	M F	1724 1690	430 262	822 668	83 54
F. COAST (LESS MOMBASA)	M	31 15	59 32	27 16	151 134
G. NORTH-EASTERN	M F	6 1	2 1	2 1	4 1
H. TOTAL A-G	M F	1994 1888 = 1.05	660 441 = 1.50	1075 = 1.25 861	389 = 1.28 303
I. MOMBASA	M F	94 55	131 90	92 60	193 101
J. NAIROBI	M F	1131 783	377 252	401 250	412 195
K. TOTAL I.J.	M F	1225 = 1.46 838	508 = 1.49 342	493 1.59 310	605 = 2.04 296
L. TOTAL H.K.	M	3220 2725 = 1.18	1166 782 = 1.49	1568 = 1.34 1171	994 = 1.66 599

TABLE 2 (Cont'd).

	KIKUYU	LUO	LUYIA	KAMBA
M. NON-CITY/ TOTAL OUT	68%	58%	71%	43%
N. OUT/TOTAL THIS GROUP	27%	13%	19%	13%
O. OUT/TOTAL ALL GROUPS OUT	49%	16%	22%	13%

NOTES TO TABLE 2:

A. - L. "Heartlands" are defined as Central Province, Nyanza Province, Western Province plus part of Siaya, and Eastern Province respectively for the four ethnic groups.

M. Total male plus female from row H. divided by male plus female from row L. for each column.

N. Total male plus female row L. divided by entire Kenya population of this group.

O. Total male and female row L. divided by total for all groups row L.

We expect that most of the people in Nairobi and Mombasa are cash migrants, while a larger proportion of the migrants in the less urbanized areas are settler migrants. Except for the case of Luo migrants, the sex ratio is substantially higher for each ethnic group in the "rural" setting (row H) compared to the "urban" setting (row K). This result is consistent with our expectation. Looking more carefully at the Luo case, it turns out that Kericho, Nakuru and Nandi districts are the principle destinations of the migrants. It is likely that most of these Luo migrants are cash migrants: many small holders in Kericho and Nandi employ Luos, while settlement on the land by Luos is not widespread in these districts; in Nakuru, urban jobs may be the magnet.

Table 2 suggests that each type of migration constitutes a substantial proportion of the total. Among Kikuyus, who make up almost half of the total migrants from these groups, almost two thirds of the migrants live outside the two major cities. Among Luyias, over 70% of all migrants are outside these cities. Particularly when we consider that Nyandarua has been treated as part of the Kikuyu heartland, so that migration to there is ignored in Table 2, we feel it is reasonable to guess that somewhere between one half and two thirds of all migration in Kenya's recent past (to the census year of 1969) has been settlement migration. This proportion is probably a declining proportion of current migration since government sponsored settlement has declined very much.

In the analysis which follows, we employ a methodology which by its very nature is limited to cash migration. We think, however, that the essential forces motivating both types of migration are similar and hence we do not rule out the more general applicability of our conclusions.

Methodology

The basic dependent variable for this analysis, as we have mentioned, is not a direct measure of migration but is rather the sex ratio (males to females) for the age group 20-40. We assume that this variable is a good index of the net importance of cash migration in the district. Two attributes of this measure should be pointed out. First, it can only record net migration, not the

composition of migration. Thus, for example, while Kisumu district gives evidence of being involved in relatively little net migration, there may be considerable migration out of as well as into the district. Our index is insensitive to gross flows. Secondly, to the extent that the migration patterns of young women differ markedly from district to district, our measure will be incorrect.

Figure 1 gives a picture of the age specific sex ratio profiles for several districts and for Kenya as a whole. The districts were chosen to illustrate cases of in-migration (Kericho), little net migration (Kisii), high out migration (Machakos) and extremely high out-migration (Siaya). It will be noted that the figure shows a sharp drop in the sex ratio for Kenya as a whole in the age group 25 - 29. This may well be a measurement error rather than a true phenomenon. Nevertheless the patterns of variation for districts of Kenya is very wide and quite consistent. Until the age 20, variation is limited and curves cross each other frequently. Between the ages of 20 and 50 striking and consistent variation appears, and for the age group above 50, the pattern is again more uniform.

We have taken the sex ratio for the age group 20 - 40 (the "working age sex ratio") as the basic dependent variable in our analysis. The 40-50 age bracket was excluded partly because we felt that the pattern among younger men would be more consistent and more trustworthy, and also because we feared that the sex ratio in Central Province districts would be distorted for older men as a result of the many deaths during the struggle for independence. (Nyeri district does in fact show a sharp decline in the sex ratio in the age bracket 40 - 50.)

To give a sense of the geographic pattern of working age sex ratios in Kenya, we have prepared a map. Because sex ratios for pastoral areas in Kenya appear to be substantially above those for other areas, we have adjusted the working age sex ratio by dividing by the over all sex ratio of the district. Thus, while Garissa, for example, has a working age sex ratio of 1.078 and Taita has a ratio of 0.890, Garissa's over all sex ratio is 1.165 while Taita's is 0.968. If we look at the working age sex ratio relative to the over all sex ratio for these two districts, we find that the two districts are almost equal, with Garissa at 0.925 (i.e., 1.078 ÷ 1.165) and Taita at 0.920 (0.890 ÷ 0.968) Both are near the Kenya average of 0.917. The map, then, shows these adjusted sex ratios for all districts. For the districts we analyse latter in depth, the adjusted

sex ratios are very highly correlated to the unadjusted sex ratios (r=.98); the adjustment makes very little difference to this subset in the regression analysis as well.

Let us turn now to the variables we employ in this analysis to explain the variation among working age sex ratios in Kenya. Although we hypothesized that economic conditions are essential to the migration pattern, we did not explicitly treat income data. This is not necessarily a disadvantage because no reliable income figures are available at the district level in Kenya, but more fundamentaly because no single income datum tells much of the economic story of a district. If we assume broadly that economic opportunities within a district are important to the migration decision, then we must include various opportunities relevant to various classes within the population. Not only wage jobs, but opportunities in small holder agriculture are important. These opportunities may depend upon land ownership patterns and the availability of profitable cash crops. Only the income figure reflecting the local opportunities for a potential migrant would be relevant to his decision. Since we do not know a-priori who these people are who are "on the margin" with respect to migration, we do not know which income figure to use. Indeed, it is likely that different groups of potential migrants (i.e., secondary school leavers, the landless, etc.) respond to different elements of the local economic and social conditions when they decide to migrate.

We therefore attempted to get information about two broad catagorice of economic opportunities: opportunities in enumerated wage jobs and opportunities reflected by the state of small holder agriculture in a district. As far as we know, this is the only study of migration in Africa in which employment opportunities rather than income figures were used to describe economic opportunties. Ideally, relevant measures of both types of information should be included. Also considered in our analysis was pressure on the land in the district and the economic distance of the district center from Nairobi, Mombasa, or Kampala (whichever was closest). Finally we considered education as a separate influence on the working age sex ratio.

Both the data and the statistical techniques used in the analysis are simple. The population census of 1969, the Statistical Abstract and the I.L.O. Report provided all the data used. Ordinary

least squares regressions procedures supplied the tools of analysis. Our data and techniques are both open to critisism. The data are in many cases fairly unreliable. (For example, 50 square miles of paw-paw disappear from Kisumu district small holder farms between the 1971 Statistical Abstract and the 1972 edition. Such a number -- 14,000 hectares -- is patently absurd. Thus all figures become suspect.) The use of ordinary least squares is also questionable since the interaction between the state of the small holder economy and outmigration is almost certainly one in which each variable is both cause and effect. Thus a simultaneous model and more sophisticated estimating procedures would have been more appropriate.

The justification for proceding as we have done is basically that it would have been much more costly in terms of both money and time to procede otherwise. With respect to the statistical techniques, any attempt correctly to specify the entire system of socio-economic interaction would have been so formidable that we ruled it out. Any partial analysis will give biased results. So we decided to keep the problem easily manageable.

Results.

Before entering a detailed analysis of the specific way in which we measured each variable and the relations between variables, let us summarize the basis results.

1. Our independent variables together explain about 65% 75% of the total variation among working age sex ratios. (The exact R^2 depends upon specification.)
2. The availability of local enumerated job opportunities consistently explains a large proportion of total variance. Further analysis reveals that jobs on tea plantations and as school teachers (and, by inference, other government jobs) are important in attracting migrants; jobs on sugar, coffee, and sisal plantations have no significant effect at all.
3. Opportunities in small holder agriculture are also significant in determining migration.
4. Education, at least at the primary level, encourages out migration. This result must be qualified, however.

Only when job opportunities were controlled for did education prove significant. Analysis of these results suggests that they occur because the local jobs created by primary education tend to act in the opposite direction from the "pure" education effect. Thus no significant increase in migration is brought about by increasing the educational establishment; but if jobs were held constant and education were increased in a district, out migration could be expected to increase. (In the longer run also, a stagnant stock of jobs with a continuing flow of students might have the effect of increasing migration.)

5. Economic distance struggles to be significant in some specifications, but generally fails. This result may be due more to misspecification of "destination" than to a true relationship.

6. We believe our results warrant the conclusion that land availability measured purely in terms of resources which "could" be exploited in a physical sense does not affect migration, but that the pressure on land measured in terms of ownership patterns (i.e., the proportion of holdings under one hectare) does affect migration. Thus, an area with relatively high physical pressure on the land but relatively few holdings of a very small size is likely to have less outmigration than another district with a larger proportion of tiny holdings but more land in all. This conclusion appears to be true in spite of a high corellation between physical land pressure and land ownership ($r=.7$).

7. The linear form of the regression equations generally performed slightly better than the log-linear forms. Since the constant in the linear form was always positive (setting other variables at their averages) this would suggest that all elasticities are declining functions of the independent variables. That is, the lower an independent variable, the more responsive will be the sex ratio to changes in that variable.

8. The variation between districts in Kenya with regard to all these variables appears to be very large indeed. The working age sex ratio in the regression sample ranges from .53 (Siaya) to 1.20 (Kericho), or from about one young men for every two young women in Siaya to six young men for every five young women in Kericho. In Nairobi this ratio is 1.93, or almost two young men for every young woman. The employment ratio varies also, from .0034 (one job for every 300 inhabitants) in Siaya to .0937 (more than one job for every eleven inhabitants) in Kiambu. The proportion of small holder area in "subsistence" crops varies from over 70% in several districts to under 29% in Nyandarua. The proportion of the population in primary school ranges from 7% in Kwale to 24% in Nyeri.

With the exception of education, each of the other variables promotes out-migration in the least advanced or privileged districts. Thus our results suggest that a very large proportion of total variation in the working age sex rating and hence, by inference, in migration, is the result of regional inequalities in opportunities to earn a living. Inequalities in local opportunities in small holder agriculture and enumerated jobs explain between 50% and 60% of inter-district variation in working age sex ratios. The absence of plots of land of economic size, another aspect of inequality, in ownership, explains an additional 5 to 10 percent of the variation. It is thus roughly correct to assert that two thirds of the variation in working age sex ratios in Kenya small holder districts is the result of unequal distribution of opportunities to earn income within and between districts.

Let us now examine these results in more detail. We shall consider the variables by type. We will begin with the "core" regression result which we will then proceed to analyse in more detail. (For all regression results, Students t statistic appears in brackets.)

(1) $W = 1.0787^{(*)} + 4.0375^{(*)}E - .0038^{*}S - .0149^{(*)}Ed \quad R^2 = .663$
(7.93) (5.00) (2.13) (2.99)

W = Working age sex ratio
E = Enumerated employment per capita
S = Percent of small holder acres under subsistence crops.
Ed = Pecent of population in primary school
(*) = Significantly different from zero at 99% confidence level.
* = Significantly different from zero at 95% confidence level.

Enumerated Employment.

Per capita enumerated employment within a district is the most significant variable affecting the working age sex ratio of that district. It explains slightly less than half the variation between districts. The regression slope (which is much greater than the other slopes only because of units — elasticities for all variables are the same order of magnitude) suggests that an increase of one job per hundred people in the district will increase the sex ratio by about .04. An increase of 10% in the number of jobs in the "average" district should increase the sex ratio by one to two percent.

We can divide the jobs between urban and rural by taking the jobs in the major towns of Kenya and subtracting these, district by district, from the total number of jobs in the district. If we now regress the sex ratio on both sources of employment, we get a somewhat surprising result.

(2) $W = 1.0770^{(*)} + 3,8915\ EU + 4.0698^{(*)}ER - .0037^{+}S - .0148^{*}Ed.$
(7.43) (1.19) (3.75) (2.00) (2.84)

$R^2 = .661$

EU = urban employment per capita
ER = rural employment per capita
\+ = significant at 90% confidence level

We did not expect to find urban job opportunities to be insignificant. Note however the similarity of the coefficients of the two types of employment.

Pursuing the sources of rural employment, we can get more deeply into the effect of types of jobs on migration. We ran regression to explain the number of rural jobs in an area.

(3) $RJ = 1.6436 + .2151^{*}T + .1385^{(*)}C + .0653^{(*)}Su + .0174\ Si + .0691^{(*)}P$
(1.30) (10.28) (5.74) (3.77) (1.46) (3.38)

$R^2 = .943$

RJ = Rural jobs.
T = Hectares of Plantation tea (100's)
C = Hectares of Plantation Coffee (100's)
Su = Hectares of Plantation Sugar (100's)
Si = Hectares of Plantation Sisal (100's)
P = Number of Primary School students

This surprisingly powerful regression suggests that tea, coffee, and sugar plantations, together with opportunities represented by the number of primary school pupils explain 94% of the variation in the number of enumerated rural jobs. These jobs explain slightly less than half the variation in sex ratios. The coefficients appear plausible. The figures of 22, 14, and 6 employees per hectare for Tea, Coffee, and Sugar respectively (in June) can be checked. The insignificant result for sisal makes sense because most up country plantations were not in production in 1969. The figure of seven jobs per hundred primary school students is probably about twice as high as it should be, but it is definitely the right order of magnitude. Since other administrative and teaching jobs are probably closely corellated to the number of primary school students, we are

no doubt picking up some of these jobs in the coefficient for primary education.[2]

We can now replace the figures for rural enumerated jobs with the figures for the sources of these jobs to analyse the effect on migration still further.

$$(4)\quad W = \underset{(7.68)}{1.0110^{(*)}} + \underset{(3.45)}{1.2039^{(*)}}T + \underset{(0.16)}{.0756C} - \underset{(0.07)}{.0184Su} + \underset{(0.38)}{.0230Si} + \underset{(2.41)}{8.5982^{*}}EU$$

$$- \underset{(2.03)}{.0039^{+}}S - \underset{(1.11)}{.0080}\,Ed \qquad R^2 = .730$$

The regression including only the subset of significant variables (plus education) yields.

$$(5)\quad W = \underset{(7.80)}{1.0689^{(*)}} + \underset{(4.49)}{1.2306^{(*)}}T + \underset{(3.12)}{8.4454^{(*)}}EU - \underset{(2.46)}{.0041^{*}}S - \underset{(1.76)}{.0087^{+}}Ed$$

$$R^2 = .718$$

(It should be noted that the plantation acres of various crops are entered on a per capita basis in regressions (4) and (5). This is done to make them consistent with the rural employment variable which they represent. Acreage, without population deflators, gives similar results in terms of significance).

These regressions suggest that not all rural jobs affect migration. Particularly dramatic is the case of coffee, which is highly significant in predicting jobs, but completely insignificant in its relation to the working age sex ratios. In fact, only tea, of all plantation crops, provides jobs which affect migration. The effect of teaching and other government jobs on migration cannot be evaluated explicitly, because our education variable would stand for both students and teachers. As we shall discuss shortly, this should explain the lower value of the coefficient of the Ed term and its lower significance in equations (4) and (5). Some other rural jobs are no doubt also picked up in the urban jobs coefficient in this equation. This coefficient has more than doubled compared to equation (2).

Since economic theories of migration often assume that it is not the stock of jobs, but the new job openings which affect the

decision to migrate, we also tried to test this variable. Here we encountered the dificulty that no information on job turnover was available. Thus we were forced to use the net rates of new job creation rather than the gross rate of job creation (net plus replacement) in our analysis.

The net rate of job creation turned out in fact to be utterly useless in predicting the sex ratio. This however constitutes no real test of alternative formulation of the probability of getting a job, because the data are too crude to make a real test.[2]

In fact, our regressions are only distantly related to strict theoretical models of unemployment so that it may be unwarranted to speculate on their applicability. Yet it is tempting to treat the different effects of different sorts of rural jobs on the sex ratio as reflecting the rates of return to these jobs. The general assertion that people respond differently to different types of jobs in making migration decisions is certainly consistent with the results we have obtained. And this assertion is a close relative of the claim that the likelihood of getting a job plus the return from that job are both important to the migration decision.

Small Holder Agriculture

The major difficulty in assessing the effect of opportunities in small holder agriculture on the working age sex ratio is that the data for smallholder agriculture are so bad. Data on wage employment, livestock holdings and land use are available, but they vary precipitously from year to year. As we mentioned earlier, the fluctuations and levels of figures are so absurd in some cases, that the basic understanding of some enumerators must be questioned. Moreover, data for the same period and the same district vary greatly from one edition of the Statistical Abstract to the next. Since no explanation of these changes are given, we can only surmise that someone "cleaned-up" the data to conform to an idea of what they should look like. Thus we are faced with the choice of data which contain a great deal of random error, or the "next edition" version which probably contain substantial bias. In fact, ever the revised figures often look rather strange.

The particular application of this data problem which we faced involved the Small Farm and Settlement Scheme Land Use survey for 1969/70. Our analysis was conducted initially on the basis of the figures published in the 1971 Abstract. In the 1972 Abstract the data

are radically altered. Thus, for example, the percentage of cultivated area under "subsistence" crops in Kirinyaga district increased from 42% to 71% between the two Abstracts. The revisions in the data between the two Abstracts increase the variance of our "subsistence" measure by over 70%.

In order to deal with the data problem we tried a variety of measures of the conditions in small holder agriculture. In general, the variables which worked best contained a relatively broad "portfolio" of individual entries from the 1969/70 Land Use survey. These measures usually hovered between the 80% and the 99% significance levels in our regressions. The coefficients were fairly stable when specification was changed. Altogether, we believe that the status of small holder agriculture is significant determinant of the sex ratio, and that better measures of the conditions in small holder agriculture would give better results. The cash earnings per-capita from the sale of smallholder crops ought to be a good measure of the "drawing-power" of a district. Such data can be generated for a number of crops, but the data are not easily accessible and thus the effort to use them was not made for this study.

Below is a table listing our measures of small holder agricultural development roughly in the order of their success in predicting sex-ratios in our analysis. Also listed is the correlation coefficient of each measure with the working age sex ratio and some probable sources of error in the measure. Needless to say the greatest source of difficulty is the unreliability of the figures themselves.

TABLE 3

NAME OF MEASURE	DEFINITION	PROBLEMS WITH MEASURE	CORRELATION
SUBSISTENCE 1	CEREALS EXCEPT WHEAT AND IMPROVED MAIZE; BEANS; CASSAVA; SWEET POTATO; YAM. ACREAGE IN THESE CROPS AS % OF TOTAL CULTIVATION* 1971+	CASSAVA CAN BE CASH CROP.	- .34
SMALL HOLDER COFFEE, TEA	SMALL HOLDER COFFEE AND TEA ACREAGE PER CAPITA 1971	BIASED TO HIGHLANDS	+ .08
SUBSISTENCE 3	SAME AS SUBSISTENCE 1 EXCEPT THAT COCONUTS AND CASHEW NUTS ARE EXCLUDED FROM TOTAL CULTIVATION 1972	EXCLUSION OF CROPS QUESTIONABLE	- .35
SUBSISTENCE 2	SAME AS SUBSISTENCE 1 BUT FROM 1972 ABSTRACT	MASSIVE UNEXPLAINED CHANGES FROM 1971 STAT. ABSTRACT. LARGE INCREASES IN COCONUT AND CASHEW ACREAGE HURT EFFICIENCY	- .25
SMALL HOLDER CASH CROPS 1	WHEAT, COTTON, S/CANE, PYRETHRUM GROUND NUTS, IRISH POTATOES, VEGETABLES, COFFEE, TEA, COCONUTS, CASHEW NUTS AS % OF TOTAL CULTIVATION 1971	GREAT VARIABILITY IN YIELD PER ACRE. S/CANE, POTATOES, CABBAGES CAN BE SUBSISTENCE. OTHER CROPS CAN BE CASH CROPS.	+ .15
SMALL HOLDER CASH CROPS 2	SMALL HOLDER COFFEE, TEA, PYRETHRUM, COTTON ACREAGE PER CAPITA 1971	GREAT VARIABILITY IN YIELD PER ACRE	- .20 (WRONG SIGN)

* The I.L.O. Report measures, derived from Gwyer [4], divide acres cultivated in certain crops by "Total Cultivation". We divide by "Aggregate Area of Crops." The difference is that Gwyer counts double-cropped or inter-cropped areas once whereas we count them as often as they are cropped. Gwyer's measure has the disadvantage that it can give rise to areas which rank high both in cash crop and in subsistence crop density, which makes it difficult to rank areas by "progressiveness."

+ Dates refer to the edition of the Statistical Abstract. All data are reputedly for the same year, namely 1969/70.

The basic regression result (equation (1)) contains the result for the variable "Subsistence 1". Of the other measures, both "Subsistence 3" and "Small Holder Tea, Coffee" are significant at the 90% confidence level when regressed on the working age sex ratio in conunction with the employment rate and education. The other measures are not significant above the 80% level.

We conclude, therefore that the state of small holder agriculture is a significant determinant of the sex ratio. If better measures were available, we expect that they would show a stronger tendency for out migration from areas with underdeveloped small holder agriculture.

Education

Education can be expected to increase a person's mobility. Information, skills and perhaps also values are imparted by education which turn a person's attention towards opportunities outside his home region. To test whether education does indeed have the expected effect, we would need to know the education level of the people who are moving. By looking at characteristics of a district, however, we can see only what is the state of affairs after migration has taken place. Thus, for example, it would be misleading to look at the level of educational attainment of men in the district, because migrants would be excluded from out-migration regions, and added into the population of in-migration regions.

We tried two measures of education in the district. On the assumption that education of males and females is closely correlated and that educated females are less likely to migrate than males, we took the proportion of females aged 20-40 with standard seven education or above as a measure of the level of education. Our second measure of education derived from the assumption that past and current levels of education are closely correlated. If this assumption is correct, then the current proportion of the population in school should reflect the level of education for older people as well. On this assumption, then, we took the proportion of the population in primary school as our second measure of education. (Using population as the base the oroportion involves the effects of migration.

However, since outmigration would tend to raise the proportion and in-migration to reduce it, these effects should reinforce the effect of education. They should bias the coefficient of the education variable away from zero rather than towards zero and thus increase its significance.)

The proportion of females aged 20-40 with at least standard seven education was useless in predicting the sex ratio. It consistently failed to give significant results, and the coefficients it did give varied in sign depending on the company they were in. We attribute this failure to the idea that female education probably is closely related to female migration, and thus the sex ratio is poorly predicted by a measure of education dependent solely on female education.

Our other measure of education, the proportion of the population in primary school, was a much better predictor of the sex ratio. Although the simple correlation between the sex ratio and this measure of education is quite small ($r = -.2$), the measure performed well when employment opportunities were controlled for in our multiple regression analysis. This is due, we believe, to the fact that education creates cash jobs while it also pushes people to seek cash jobs. Unless the employment creating effect of the education establishment are controlled for, education has no significant net effect.

This can be shown formally as follows:

(a) $W = f(E, S, Ed)$

(b) $$dW = \underbrace{\frac{\partial W}{\partial E}\frac{dE}{dEd}}_{\text{Term 1}} + \underbrace{\frac{\partial W}{\partial S}\frac{dS}{dEd}}_{\text{Term 2}} + \underbrace{\frac{\partial W}{\partial Ed}}_{\text{Term 3}}$$

If the equation(s) above "correctly" specifies the determination of the sex ratio, then the total effect of education on the ratio should include not only term 3 (the "pure" education effect) but also term 1 (the indirect effect of education operating through employment)

and term 2 (the indirect effect of education operating through the state of small holder agriculture. Both indirect effects can be expected to be positive while the "pure" effect can be expected to be negative. Our results shed some light on the magnitude of terms 1 and 3. Equation (1) implies that term 3 is about -.015. Term 1 can be estimated using equations (1) and (3). Together these imply the following as a minimum estimate of term 1.

It must be noted that this estimate takes account only of "rural" jobs created by education and not of other jobs attracted to an area by an educated work force. Thus our minimum estimate of term 1 suggests it is about one fifth the size of term 3 and has the opposite sign. It is easy to see how other indirect effects, or changes in the values of parameters could make the total effect of education zero or even positive.

It is noteworthy that none of the other studies of migration based on census data, in which education had the "wrong"sign, controlled for the effect of education on employment. It may well be that misspecification is the cause of the unexpected result. (See Beals et al [1] or Greenwood [3].)

We may conclude then, that education on the primary level at least — probably has less effect on migration than one might believe. Expansion of the primary education establishment is unlikely to have very strong effects on migration.

Land Scarcity

It is widely believed that land scarcity is a principle determinant of migration in Kenya. This is not an easy proposition to test, in our framework, because we expect land oriented "settlement" migration to be invisible in our analysis since males and females migrate together. However, to the extent that land scarcity is a determinant of "cash" migration we may be able to catch the effect in our regressions.

Land can be scarce either because it is physically unavailable or because owrership patterns make it inaccessible

to the dispossessed. We tried to test for the effect of both sorts of scarcity on the sex ratio.

Three measures of physical scarcity were used. First, from the I.L.O. report, a land per capita measure was taken which tried also to correct for land quality. Then the ratio of land cultivated by small holders relative to the land available for small holder cultivation was used. Finally the cultivated small holder land per-capita was tested.

The first of these measures performed very badly in predicting the sex ratio, and also looked suspicious. We doubt that the rainfall data on which it is based are trustworthy for many districts. Nor can average rainfall alone be considered an adequate measure of land potential.

The proportion of possible land actually cultivated does rank districts in an order much closer to that which we expected. It also correlates fairly highly with land pressure measured by ownership ($r=.7$). However it too was completely insignificant in explaining the sex ratio.[5]

Land pressure resulting from ownership patterns, in contrast, was significant in explaining the sex ratio. The sample was limited to 14 observations because of data problems.

$$(6)\quad W = \underset{(6.78)}{1.0832^{(*)}} + \underset{(5.97)}{4.6819^{(*)}}E - \underset{(1.46)}{.0029}\,S - \underset{(2.37)}{.0134^{*}}Ed - \underset{(2.30)}{.0036^{*}}L \qquad R^2 = .863$$

L = proportion of holdings under one hectare

This subsample for which ownership data are available behaved as follows in the "basic" regression

$$(7)\quad W = \underset{(6.26)}{1.1655^{(*)}} + \underset{(4.67)}{4.2356^{(*)}}E - \underset{(1.90)}{.0042}\,S - \underset{(3.10)}{.0189^{(*)}}Ed \qquad R^2 = .783$$

The number of hectares of land cultivated per capita is significantly related to the sex ratio, but with a negative sign. A scatter diagram reveals this to be the result of a few districts in the Coast and Eastern provinces. We believe this result is due to the fact that these districts (Kitui, Kilifi and Kwale in particular) are rather arid, and hence we may be measuring the ecological

conditions which force people to farm extensively, rather than land availability. It is also entirely possible that these data are inaccurate, since no districts lying west of Eastern Province show any tendency to form a pattern on the scatter diagram.

Thus while the unavailability of economic sized plots appears to be a significant determinant of cash migration, physical land pressure does not appear to cause such migration to any significant degree.

Distance

Distance to the nearest major city (specified as Nairobi or Mombasa, and also as Nairobi Mombasa or Kampala) was measured in shillings bus fare. This variable is almost never significant except in odd combinations of other variables which make little theoretical sense. When we add it to our "core" equation we get this:

$$(8)\quad W = \underset{(6.47)}{.9863^{(*)}} + \underset{(5.24)}{4,2634^{(*)}}E - \underset{(2.10)}{.0037^{+}}S - \underset{(2.51)}{.0129^{*}}Ed + \underset{(1.27)}{.0041}\,D \qquad R^2 = .692$$

D = distance (measured in shillings)

We believe that a more careful specification of distance, to include for example, Kericho as a destination, would make the variable significant. The insignificance of the variable is probably due to misspecification of the destinations rather than to the non-existence of a significant relationship.

Policy Implications

The fundamental relationship which emerges from this analysis is that migration, as indicated by the working age sex ratio, is a response to inequalities in opportunities between districts and inequalities in ownership within districts. It seems, then, that migration is a symptom of basic inequalities and that it is necessary to confront those inequalities if migration is to be redirected.

It must be noted again, that migration is a useful response to inequality, to a degree. The best way to increase incomes in two regions may be to move people from one to the other. Ecological conditions dictate that some areas can support a large population at a high level of income at a considerably lower cost, in other inputs, than is possible in other regions. It is sensible

to redistribute the population within the given physical constraints as well as to work to modify these constraints. However it is also clear that migration has many social costs. Just how much migration is optimal is essentially a political and social as well as an economic decision.

At the present time the amount of "cash" migration taking place in some regions seems to us to be higher than we would expect to be optimal. Sex ratios of .5 and .6 for the ages 20-40 seem to be indicative of mass desertion of an area by its young men rather than selective relocation.

Assuming that policy makers want to reduce regional inequality and subsequent migration, we believe the following policy conclusions are warranted by the analysis.

a) The creation of jobs in the rural areas should attract migrants to those areas. Since tea plantation jobs do appear to attract migrants, while coffee jobs do not, we suggest that longterm employment at a monthly rate of shs.100/- to 200/- (with housing, it should be noted) will attract migrants, while seasonal employment in the range of shs.100/- per month will not attract migrants. This conclusion must be qualified however. It may be that seasonal work in the agricultural off-seasons would be considerably more attractive than work in the planting or harvesting season.

b) Efforts to improve the returns to small holder agriculture should attract people into this sector. In particular it may be worth while to devise schemes in which the government employs a significant number of people at relatively low wages to undertake projects which raise the potential of small holder agriculture. Such projects would affect migration through local employment and small holder opportunities simultaneously.

c) Land reform can reduce migration.

d) Since the working age sex ratio appears to be a good indicator of regional inequality, we suggest that this variable be used to determine the allocation of resources aimed at countering such inequality. The ratio is simple, it is easy to calculate, and therefore it would be relatively easy to use.

Footnotes

1. Although the present study can in no way confirm the conclusion, we believe that the "pull of the city" arguments are quite inappropriate for Kenya. There is certainly a substantial and growing group of people for whom cinemas, "boogies", and sophisticated" life are a big attraction. But/believe that there is a far larger group for whom city life with its anonymity, social tensions, alienation from the land, and general rootlessness, is unappealing. In the aggregate, we believe that a vast majority of Kenyans would prefer to have a city income (even corrected for cost of living) in the country to the same income in the city. I believe that a pure "city life" effect would influence migration negatively, if it could be measured.

2. We should note that an index of the state of small holder agriculture — the proportion of acreage under cash crops — would also be significant at the 99% level in explaining the number of enumerated rural jobs. We have not included the variable because we believe its theoretical connection to enumerated rural jobs is tenuous. Here is the regression, however.

$$RJ = -1.1573 + .2169^{(*)}T + .1398^{(*)}C + .0711^{(*)}S_u + .0811^{(*)}P + .1357^{(*)}K$$
$$(0.92) \quad (13.70) \quad (8.90) \quad (5.35) \quad (5.08) \quad (3.89)$$
$$R^2 = .966$$

K = Proportion of small holder land under cash crops.

3. Todaro and Harris [8] assume that the probability of getting a job is the employment rate. Other authors (Todaro [7] and Tobin [6], for example) assume that the probability is the gross number of new jobs divided by the number of job seekers. If we assume that people leaving jobs voluntarily are leaving the work force (perhaps temporarily), but that the participation rate is constant (hence other people are entering the labour force) then the "true" probability of getting a job will be:

$$T_1 = \frac{N}{fP} \quad \text{Harris–Todaro formulation}$$

$$T_2 = \frac{(r+g)N}{fP-N} \quad \text{Todaro formulation}$$

where N = enumerated employment
P = population
f = participation rate
g = net growth of employment
r = replacement rate

3. (Cont'd).

Now, we are approximating these expressions with two others

$A_1 = \frac{N}{P}$ Employment per capita

$A_2 = \frac{\Delta N}{P}$ Net employment growth per capita

It will be noted that A_1 will always underestimate T_1, but that its relation to T_2 is uncertain (because it overestimates both numerator and denominator). A_2 will underestimate T_1 by more than A_1 in all cases because it is always smaller than A_1. A_2 will also always underestimate T_2 (because its numerator is smaller and its denominator larger than that of T_2). Thus A_1 will always be a better approximation to T_1 than will A_2. Although it is not certain that A_1 is also a better approximation to T_2, for all "reasonable" values of the parameters this appears to be so.

For example, if:

$r = .2$
$g = .03$
$p = .4$
$P = 100$
$N = 3$ (Rural Area)

then our measures will have the following values:

$T_1 = .075$
$T_2 = .019$
$A_1 = .030$
$A_2 = .009$

As can be seen, the employment per capita figure is a much better approximation of either "true" measure than is the net employment growth per capita figure. Hence a comparison of the statistical significance of A_1 and A_2 is useless in determining whether T_1 or T_2 provides the better model of the probability of getting work.

4. The results are

$$W = \underset{(7.55)}{1.0297^{(*)}} + \underset{(4.83)}{4.0575^{(*)}}E - \underset{(1.73)}{.0027^{+}}S3 - \underset{(2.61)}{.0129}\,Ed \qquad R^2 = .638$$

$$W = \underset{(12.08)}{.8571^{(*)}} + \underset{(5.48)}{4.5159^{(*)}}E + \underset{(1.78)}{.4481^{+}}Ca - \underset{(2.91)}{.0166^{(*)}}Ed \qquad R^2 = .642$$

S3 = Subsistence 3

Ca = Small Holder Coffee, Tea

5. The land pressure regression is:

$$W = \underset{(6.47)}{1.1075^{(*)}} + \underset{(5.05)}{4.5259^{(*)}}E - \underset{(1.87)}{.0036^{+}}S - \underset{(3.17)}{.0189^{(*)}}Ed + \underset{(0.27)}{.0582}P \qquad R^2 = .771$$

P= Cultivated land as a proportion of possible cultivation

This regression was run on a subset of 17 observations. For the remaining five districts (Kilifi, Kwale, Taita, Meru, and Elgeyo - Marakwet) the estimates of land area suitable for farming varied so wildly that we excluded them. Thus the high R^2 is simply a result of this change in the observation set. Throughout, whenever the observation set was changed due to data problems (that is, in this case and in the land ownership case) a check was made to confirm that changes in significance were not simply due to changes in the observation set. All results reported to be significant appear to be so in all relevant sub sets.

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APPENDIX

District[1]	Working Age Sex Ratio[2]	Adjusted Sex Ratio[3]	Per Capita Employment[4]	Per capita Urban Emp.[5]	Per capita Rural Emp.[6]	Subsistence 1[7]	Subsistence 2[8]	10x Per capita Small Holder Tea/Coffee Hectares[9]	Primary Students Population%[10]	Land Pressure I.L.O.[11]	Land Pressure % Farm land cultivated[12]	Land Pressure Ownership[13]	D C
KERICHO	1.1991	1.1240	.0817	.0086	.0716	60.2%	54.6%	.0605	11.2%	.8	12.5%	6.7%	
NANDI	1.0659	1.0200	.0708	0	.0708	34.1%	42.4%	.0622	9.7%	1.1	10.8%	4.4%	
KISUMU	.9998	.9650	.0711	.0312	.0399	64.2%	85.0%	0	10.8%	.6	23.8%	48.9%	
KIAMBU	.9668	.9883	.0937	.0168	.0769	41.5%	66.7%	.1429	20.9%	.4	24.7%	33.8%	
ELGEYO-MARAKWET	.8995	.8550	.0113	0	.0113	35.9%	68.2%	0	9.7%	.7	-	-	
TAITA	.8902	.9200	.0766	.0099	.0667	44.2%	54.3%	.1441	16.7%	.5	-	44.6%	
MERU	.8830	.9129	.0204	.0069	.0136	47.2%	48.9%	.2261	13.3%	.4	-	-	
KISII	.8823	.8748	.0140	.0027	.0113	41.1%	44.4%	.2069	12.6%	.3	35.1%	26.6%	
BUNGOMA	.8689	.8948	.0151	0	.0151	39.8%	55.6%	.0267	16.8%	.7	22.1%	3.1%	
NYANDARUA	.8666	.8665	.0655	.0118	.0537	24.1%	22.3%	0	19.5%	1.5	14.1%	-	
KIRINYAGA	.8541	.9030	.0171	0	.0171	41.6%	71.0%	.3038	14.5%	.5	51.6%	-	
KWALE	.8239	.8404	.0316	0	.0316	61.1%	52.5%	0	7.1%	.8	-	-	
EMBU	.7835	.8602	.0229	.0067	.0162	55.1%	59.7%	.1955	17.2%	.6	15.4%	6.0%	
S.NYANZA	.7721	.7864	.0107	0	.0107	73.3%	80.0%	.0151	7.2%	.9	17.8%	14.9%	
NYERI	.7529	.8242	.0443	.0147	.0296	39.4%	60.1%	.2659	23.8%	.4	22.6%	35.9%	
MACHAKOS	.7359	.7957	.0235	.0048	.0187	48.7%	60.1%	.0453	17.8%	.4	21.0%	-	
KAKAMEGA	.6938	.7491	.0139	.0014	.0125	44.3%	52.0%	.0958	12.4%	.4	35.2%	26.7%	
KILIFI	.6807	.7466	.0234	.0088	.0146	52.2%	40.0%	0	7.6%	.5	-	-	
MURANG'A	.6682	.7559	.0402	.0025	.0378	49.9%	69.0%	.2360	21.9%	.5	44.9%	46.5%	
KITUI	.6550	.7367	.0099	.0023	.0076	53.4%	59.5%	0	12.4%	.9	11.6%	-	
SIAYA	.5322	.6273	.0034	0	.0034	72.9%	81.8%	0	12.9%	.6	22.1%	38.2%	
BUSIA	.6279	.6953	.0150	0	.0150	73.9%	78.8%	0	13.9%	.8	25.7%	16.6%	
NAIROBI	1.9331	1.3137											
MOMBASA	1.6449	1.1827											
NAKURU	1.2115	1.0780											
LAIKIPIA	1.1681	1.0492											
ISIOLO	1.0998	1.0217											
MARSABIT	1.1447	.9967											
WAJIR	1.1843	.9890											

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District[1]	Working[2] Age Sex Ratio	Adjusted[3] Sex Ratio
WASIN GISHU	1.0581	.9361
MANDERA	1.1459	.9471
LAMU	.9124	.9327
GARISSA	1.0776	.9247
TURKANA	.9839	.8793
KAJIADO	.9120	.8694
BARINGO	.8517	.8514
TRANS NZOIA	.9299	.8482
TANA RIVER	.8294	.8310
WEST POKOT	.7727	.8024
SAMBURU	.8289	.8005
NAROK	.7743	.7964

Footnotes

1. In our sample districts are ranked by "Working Age Sex Ratio". Other districts are ranked by "Adjusted Sex Ratio"
2. 1969 Population Census Vol.III
3. 1969 Population Census Vol.III
4. 1972 Statistical Abstract Tables 223 and 13
5. 1972 Statistical Abstract Tables 225 and 13
6. Derived from 4, and 5.
7. 1971 Statistical Abstract Table 82 (See text for definition)
8. 1972 Statistical Abstract Table 90
9. 1971 Statistical Abstract Tables 82 and 13
10. I.L.O. Report Table 28

pte/..... 3.

Appendix (Cont'd)

Footnotes

11. I.L.O. Report Table 1.
12. 1971 Statistical Abstract tables 82 and 13
13. I.L.O. Report Table 49 and Statistical Abstract 1970. Figures for Kisumu, Taita and Embu are more unreliable than the rest.
14. East African Road Services fare schedule.