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The Urban Popular Economy  
and Informal Sector Production

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## ABSTRACT

### The Urban Population Economy and Informal Sector Production

Peter H. Henning

The primary purpose of this paper is to present a method of analyzing one aspect of the growing inequity in the distribution of income in many developing countries -- the situation of people living in very low income "squatter communities" in the urban areas of a large number of such countries. The method consists of treating such communities (which are called popular economies in this paper) as semi-autonomous units amenable to analysis by a two-gap type growth model. The paper also indicates how such an analysis can be used as a basis for predicting the growth of "informal sector activities" serving the popular economy.

While these methods are intended to be generally applicable, much of this paper is devoted to the application of the methods to a particular example of the popular economy in Nairobi, Kenya. Because of the differences between popular economies in different areas and countries, this analysis is designed to illustrate the usefulness of the methods of analysis and to present results for one example of the popular economy rather than to search for general conclusions. Following the presentation of these results, some comments upon possible wider uses for the popular economy construct are presented.

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Ce mémoire a pour principal but de présenter une méthode d'analyse, de l'un des aspects de la croissante iniquité de la répartition des revenus dans de nombreux pays en voie de développement -- la situation des personnes vivant dans des "communautés de squatters" à très bas revenu dans les zones urbaines de ces pays. La méthode consiste à traiter de telles communautés (appelées dans cette étude économies populaires) en tant qu'unités semi-autonomes relevant de l'analyse par un modèle de croissance de type à deux déficits. Le mémoire indique également comment une telle analyse peut être utilisée comme base pour prédire la croissance des "activités de secteur nonstructuré" servant l'économie populaire.

Bien que ces méthodes soient destinées à une application générale, la majeure partie de ce mémoire concerne leur application à un exemple particulier de l'économie populaire de Nairobi, au Kenya. Etant donné qu'il existe des différences entre économies populaires de zones et pays variés, cette analyse est conçue pour illustrer l'utilité des méthodes d'analyse et pour présenter des résultats pour un exemple d'économie populaire plutôt que pour chercher des conclusions générales. Après avoir présenté ces résultats, l'auteur fait quelques commentaires sur de possibles utilisations plus étendues pour l'établissement de l'économie populaire.

## I. Introduction

Uncontrolled housing settlements (UHS) provide shelter for a growing percentage of urban residents in the major urban areas of many developing countries.<sup>1</sup> This paper presents an analysis of the situation facing one such settlement (hereafter called Kariobangi). The analysis is based on the assumption that it is appropriate to treat uncontrolled housing settlements not simply as housing estates but instead as semi-autonomous "popular economies"<sup>2</sup> which provide a market for local handicraft and commercial establishments and which depend on the employment and income generated by such establishments. Treating uncontrolled housing settlements as popular economies facilitates examination of the potential role of business enterprises based within the UHS in increasing income and employment in the UHS -- all of which can be considered part of the "informal sector". This is useful given recent interest in the role of informal sector enterprise in increasing urban income and employment, especially given the heavy weight of informal sector activity based in UHS's in total informal sector activity.<sup>3</sup>

In the case of Kariobangi, it seems unlikely that even relatively rapid growth in informal sector output can solve the problem of low incomes and unemployment resulting from the extremely rapid rate of population growth in the area. Nevertheless, informal sector activities do provide a significant and potentially growing source of income and employment in Kariobangi; and certainly such activity provides more promise to Kariobangi residents than the modern sector employment opportunities upon which they depended until recently.<sup>4</sup> Furthermore, the notion emphasized by this approach of encouraging growth of informal sector activity serving a local economy seems potentially useful in

other cases, especially in rural areas,

## II. Characteristics of Uncontrolled Housing Settlements

The characteristics of urban uncontrolled housing settlements, like the names applied to them (squatter settlements, shanty towns, barrios, bidonvilles, etc.), vary from urban center to urban center and from country to country. Such settlements do have common characteristics, however. One is the poverty of their residents. Another is the fact that they are largely made up of recent immigrants from rural areas. This latter characteristic means that UHS's in many ways resemble the rural villages which the immigrants left. However, there are at least two important differences between urban UHS's and rural villages. First, farming, which is the most important source of livelihood of people in rural areas, is at most a marginal activity in urban areas. This means that low-income urban communities cannot be self-sufficient, for they must rely on trade for the major portion of their food supply even if they are capable of self-sufficiency in all other required goods and services. Second, rather than a grouping of people pursuing traditional activities, the community is a mixture of (a) some people pursuing what would be considered modern sector activities, (b) some people pursuing what would be considered traditional sector activities, and (c) some people pursuing activities which would be difficult to place in either of these categories.

Group (a) are those who are working in modern sector establishments outside of the UHS. Group (b) are those who are either urban farmers or others who are supplying "traditional" products to low income urban households.



Group (c) can be subdivided into people pursuing at least two different types of activities. First are people providing goods and services to the local economy which though not traditional products, are made in enterprises which would not be classified as part of the modern sector. Second are people providing a variety of "informal" services and some "informal" goods to people living outside the UHS. Activities in groups (b) and (c) would be defined by most observers as "informal sector" activities. This paper will generally follow such a definition. Specifically, the paper will assume that any independent business activity pursued by a UHS resident is an informal sector activity (without assuming the converse).<sup>5</sup> Of particular interest in the paper are informal sector activities pursued by UHS residents which also serve UHS residents. It is this set of activities which produces "local output" as discussed below. Examples of activities of this type pursued by Kariobangi residents (Type I activities) can be found in Table 1. Table 1 also lists activities pursued by UHS residents serving non-residents. While these activities are at present relatively unimportant, it is hoped that they will become much more important in the future. (See Section VII)

The UHS has links with rural areas and with the greater urban area of which it is a part. Nevertheless, this paper treats the UHS as an independent economic entity suspended between the rural areas from which most UHS residents emigrated and the "modern" sections of the urban areas where many UHS residents search for employment. Treating the UHS as an independent economy is an approach used by at least one economist, and is implicit in much work done by planners concerned with the provision of housing and other services for ever-growing urban populations.<sup>6</sup> Output of such a "popular economy" is

TABLE 1

Examples of Informal Sector Activities

I. In Kariobangi serving local residents:

Traditional -

Traditional Medicine

Gardening

Herbalist

Retail -

Grocery, meats, and fish

General shops (cigarettes,  
soda, soap, etc.)

Housewares

Clothing, shoes,

Fuel, (charcoal, wood)

Construction materials

Other -

Photo Framer

Photographer

Dry Cleaner

Tailor

Knitting Shop

Shoemaker, Shoe Repair

Radio Repair

Bicycle Repair

Tinsmith

General Repair - Metals

Auto Repair

Watch Repair and Sales

Mattress Maker

Carpenter - furniture, con-  
struction

Barber

Prepared Food and Tea

Maize Roaster

Bar (sales of local beverages  
and European beer)

Construction

II. In Kariobangi serving non-residents:

Selling of local beverages and related services

Exporting of "manufactured" products (examples: school uniforms,  
sales of housewares at country bus station)

III. Outside Kariobangi:

Food kiosks

Temporary Shops

Miscellaneous hawking (includ-  
ing door to door selling)

Shoe Shining

Newspaper Delivery

Provision of household services  
(gardening, guard services, mis-  
cellaneous household help).

best thought of as divided between local production (i.e., output produced by Type I informal sector activities listed in Table 1), and exports (i.e., all income earned by UHS residents with "modern sector" employment, and the output of informal sector activities of Types II and III, Table 1).

The model used to analyze alternatives facing such a popular economy is a two-gap growth model similar to ones used for studying entire less developed countries.<sup>7</sup> This type of model is appropriate because such a popular economy in important respects resembles a resource-poor developing country. In particular, like such a country, the popular economy is dependent on the "rest of the world" for (a) many of its basic consumer goods, (b) raw materials for its simple industry, and (c) at least some of its capital goods. Also like such a country, its primary salable export is the service of its labor. Therefore, like such a country, the popular economy is heavily dependent on "foreign exchange," and hence subject to the characteristic foreign exchange constraint to growth of two-gap models.

Such a constraint indicates that there is additional willingness or ability to save, but the income out of which such savings would come cannot be earned because of lack of necessary foreign exchange. That is, there is a redundancy of "ex ante" domestic savings, and additional output is constrained not by an unwillingness to forego additional current consumption but instead by an inability to earn necessary additional foreign exchange. This type of situation seems very possible in circumstances like those facing popular economies in urban areas; for, the poorer in resources an economy is, the more likely it is that the economy will be unable to produce

many of the goods and services necessary to its level of income and output. But popular economies are very poor in resources and therefore are very dependent upon imports of both consumer goods and a wide variety of intermediate and capital goods. The latter include the tools and materials necessary to the production of consumer goods like furniture, metal products, clothing, etc., and to the production of investment goods, especially increases in the housing stock. Furthermore, most of the "foreign exchange" available to the popular economy is earned by directly exporting the services of labor to the modern sector. That is most foreign exchange is earned by those people who live in the popular economy, but work in modern sector activities. But, the slow growth of such employment is the central reason for increased concern about the urban employment problem and the central reason why new analyses (and more specifically the problem facing urban UHS's) and approaches to the problem must be tried.

### III. The Model

The specific two-gap model used in this paper is a simulation model incorporating several different types of arguments (see Table 2). Parameters and initial values represent important characteristics of the popular economy in the initial year of the simulation.

Instrument variables are variables which are assumed to be either directly or indirectly manipulable by government authorities. Within the context of the model, changing the value of these variables changes the relative importance of each of the three constraints to popular economy growth built into the model, and thereby changes the level of output which

the model indicates is attainable in the final year of the simulation. This final level of output is the primary objective variable of the model. Thus, the model is designed to determine final year popular economy income levels corresponding to different sets of values for the instrument variables. "Feasible" income levels are those which correspond to sets of values of the instrument variables in which each of the instrument variables takes a value falling within a predetermined range of values thought to include the "attainable values" of the variable.

The three constraints built into the model include a foreign exchange constraint of the type just discussed, as well as a savings and a labor constraint. The savings constraint is operative in a situation where lack of savings results in an inability to produce investment goods necessary to growth. The labor constraint is binding if a shortage of unskilled labor constrains growth.

Specific assumptions about the characteristics of the Kariobangi popular economy incorporated in the model are discussed below in the descriptions of the equations of the model and in footnotes to those descriptions. These assumptions, in general, are of the sort commonly made in models of this type. However, it does seem worthwhile to briefly discuss the nature of the foreign exchange constraint built into the model, given its importance in the application of the model in the present case.

This is perhaps best accomplished by first explaining what is not true. In the present model, it is not assumed (as it is in McKinnon (1964) for example) that increases in foreign exchange availability will be used exclusively to increase capital formation (either foreign capital in the case of a foreign

TABLE 2

Description of Individual Arguments of the Model

Initial Values (Year Zero):

$Y_0$ - UHS economy product	$L_0^\varepsilon$ - employment outside local economy
$E_0$ - exports of labor services	
$N_0$ - labor force	$S_0$ - savings
$L_0$ - total employment	$K_0$ - capital stock

Parameters:

$k$ - aggregate output-capital ratio, local enterprises	$m_i$ - import content of investment goods
$b$ - aggregate labor-output ratio, local enterprises	$p$ - rate of labor force growth
$a$ - "accelerator" co-efficient	$F_n$ - terminal year foreign exchange inflow

Instrument Variables:

$\alpha$ - marginal propensity to save	$v$ - unemployment rate
$\varepsilon$ - rate of growth of exports of labor services	$\mu_c$ - import content of consumption goods

Objective Variables:

$Y_n$ - UHS economy product, terminal year
$C_n$ - household consumption, terminal year

Other Endogenous Variables:

$I_n$ - net investment
$M_n$ - import of goods and services
$E_n$ - export of labor services
$S_n$ - available savings
$K_n$ - capital stock
$L_n$ - labor demand
$N_n$ - labor supply

capital constraint or a combination of foreign and domestic capital in the case of a savings constraint), Instead, increased foreign exchange availability is used to increase levels of both imported consumption goods and imported investment goods (in the case of a foreign exchange constraint) or the level of investment (in the case of a savings constraint). The latter assumption seems more realistic than the former for the case of an economy like Kariobangi's in which there is no mechanism for regulating the sorts of goods to be imported. An important implication of the assumption is that the standard result, that increased foreign exchange inflow ("foreign aid") will be most beneficial in a situation in which the foreign exchange constraint is binding, does not necessarily hold. Instead, the situation in which increased foreign exchange inflow is most beneficial is determined by the size of the output-capital ratio, the marginal propensity to consume, and the import content of both consumption and investment goods. In fact, in the case of Kariobangi, "foreign aid" will be substantially more effective in raising growth in a situation in which the savings constraint is binding. This is true because the high dependence on both imported investment and consumption goods means that, in the case of a binding foreign exchange constraint, most of any increase in foreign exchange availability is simply used to increase imports. On the other hand, the very high output-capital ratio characteristic of local enterprise means that increased capital availability, in the case of a binding savings constraint, will be very effective in increasing local output.<sup>8</sup>

It should be pointed out that a foreign exchange constraint in these circumstances is very similar to a skill constraint, because the constraint results from the popular economy's inability to produce locally either needed

inputs, some exportable commodity or a wider range of "import substitutes." Presumably, if appropriate human resources were available, local business would be capable of producing one or a combination of these types of goods.<sup>9</sup>

As indicated, further characteristics of the model are indicated in the descriptions of the equations below, and in the associated footnotes.

$$Y_n = Y_o + k (K_n - K_o) + (E_n - E_o) \quad (1)$$

This equation indicates that growth in popular economy product depends upon growth of the capital stock and growth in exports.<sup>10</sup> The only exports considered are exports of direct labor services. The capital-output ratio of such exports is assumed to be zero.<sup>11</sup>

$$L_n = L_o + b [Y_n - E_n] - (Y_o - E_o) + [L_o^\epsilon (1+\epsilon)^n - L_o^\epsilon] \quad (2)$$

This equation indicates that employment in year n is a function of growth of local employment and growth of the export of labor services. It is assumed that the amount of labor employed outside the local economy grows at the same rate as the income of that labor (i.e., that  $L_o^\epsilon$  and  $E_o$  grows at  $\epsilon$ ).<sup>12</sup>

$$M_n = \mu C_n + m_i I_n \quad (3)$$

This equation states that total imports are the same as the direct and indirect proportion of imports in each type of good produced in the economy.<sup>13</sup> As noted in footnote 11, if exports other than pure labor services are to be included in the model, it is necessary to add a term to equation (3) indicating the import content of such exports.

$$S_n = S_o + \alpha (Y_n - Y_o) \quad (4)$$



This is a straightforward saving equation in which  $\alpha$  is a measure of community marginal propensity to save,<sup>14</sup>

$$N_n = N_o (1+p)^n \quad (5)$$

This equation determines the labor supply in year  $n$  using the supply in the initial year and an exogenously determined exponential rate of growth of that initial supply of labor.<sup>15</sup>

$$E_n = E_o (1+\epsilon)^n \quad (6)$$

This is the simplest possible way of determining the level of exports in year  $n$ . Such a formulation is in part a result of the assumption that exports are simply direct labor services. If this is the case, and it is assumed that (a) particular popular economies retain constant shares of modern sector employment, and (b) exports of labor services used directly by modern sector households (security, gardening, etc.) grow proportionally to growth of modern sector employment; then exports can be expected to grow at a rate proportional to the rate of growth of modern sector employment.

$$I_n = S_n + F_n \quad (7)$$

This is the normal equilibrium condition. It also plays the role of a "resource limitation" statement, since it indicates the level of investment which can be supported with given assumptions about the popular economy marginal propensity to save, and the level of foreign exchange inflow. This level of investment in turn determines the availability of capital, one of the scarce resources faced by the community.

$$M_n = E_n + F_n \quad (8)$$

This is a second "resource limitation" statement which indicates the level of imports which can be supported and, indirectly, the availability of foreign exchange--a second scarce resource.

$$L_n = (1-v)N_n \quad (9)$$

This is the final resource limitation statement. It indicates the availability of labor, the last of the necessary inputs of the economy, and therefore the last of the scarce resources with which the model deals.

$$\sum_{i=0}^{n-1} I_i + (K_n - K_o)$$

This is a definitional statement based upon the assumption that the change in capital stock from year  $i$  to year  $i+1$  is equal to the net investment during year  $i$ .

$$I_n = a(K_n - K_o) \quad (10)$$

Some equations such as this is necessary to make the system determinate. It is necessary in order to determine the level of investment in the final year of a finite horizon simulation model - which from the point of view of such a model would be extraneous activity. The value of  $a$ , which is an artificial variable, depends upon the expected rate of growth of the economy and the length of period under study.<sup>16</sup>

$$Y_n = C_n + I_n + E_n - M_n \quad (11)$$

This is the usual accounting definition. A summary of the model can be found below;

- (1)  $Y_n - Y_o + k (K_n - K_o) + (E_n - E_o)$
- (2)  $L_n = L_o + b[(Y_n - E_n) - (Y_o - E_o)] + [L_o^\epsilon (1 + \epsilon)^n - L_o^\epsilon]$
- (3)  $M_n = \mu_c C_n + m_i I_n$
- (4)  $S_n = S_o + \alpha(Y_n - Y_o)$
- (5)  $N_n = N_o (1+p)^n$
- (6)  $E_n = E_o (1+\epsilon)^n$
- (7)  $I_n = S_n + F_n$
- (8)  $M_n = E_n + F_n$
- (9)  $L_n = (1-v) N_n$
- (10)  $I_n = a(K_n - K_o)$
- (11)  $Y_n = C_n + I_n + E_n - M_n$

Solving this model for Kariobangi is a matter of specifying initial values and values for the parameters, and then finding the set of feasible levels of income or "feasible solutions" corresponding to the ranges for the instrument variables which seem appropriate for the case of Kariobangi. A reduced form of the model, along with a graphical technique, is used in determining this set of feasible solutions,

#### 4. Data

The data used to specify the model for Kariobangi come from a number of sources. The most important data sources used were (a) results of a

household survey (the Home Interview Survey) run by the Nairobi City Council and designed to collect information necessary in planning future transportation infrastructural needs, (b) results of a household budget survey in Nairobi administered by the Central Bureau of Statistics of the Kenya Ministry of Finance and Planning, and (c) results of a survey of small businesses done in the popular economy under study as part of a larger unrelated research study.<sup>17</sup> It should be mentioned that these surveys all date to the period around the year 1970. Hence, the data reflect the situation of Kariobangi at that time.<sup>18</sup> The data do have shortcomings. However, the fact that the data used were collected for other purposes (and therefore are likely to be available for examples of popular economies in other developing country urban centers) is a definite advantage of the approach presented in this paper. Following is a short description of how the parameters, initial conditions and instrumental variable ranges were estimated.<sup>19</sup> The actual estimates are presented in Table 3. (It should be noted that unless otherwise indicated, all money magnitudes are in Kenya shillings.)

Estimates of the initial values  $N_0$ ,  $L_0$ ,  $Y_0$  and  $E_0$  were based on data from the transportation survey mentioned.  $L_0$  was available directly.  $N_0$  was estimated with Home Interview Survey population statistics and generally accepted participation rate figures.  $Y_0$  was estimated using an estimate of average household income based on a number of sources and Home Interview Survey information on the number of households in the area. An initial indication of the value of  $E_0$  was available because, in determining transportation needs, the survey determined place of work and place of residence by "traffic district" for all those interviewed. Fortunately, the Kariobangi

area formed one "traffic district" and therefore information about whether those living in Kariobangi worked inside or outside Kariobangi was available. Since  $E_o$  is an estimate of the income earned outside the traffic district, such information yielded the basis for an estimate of  $E_o$ . An estimate of  $L_o - L_o^E$  (i.e., local employment) can be made on the basis of  $Y_o - E_o$  and  $b$  (see below). Such an estimate is also an estimate of  $L_o$  given the estimate of  $L_o^E$  mentioned above. Finally,  $S_o$  was determined using an estimated income distribution for Kariobangi based on information from several sources and estimates of savings rates by income class from the urban expenditure survey.

$k$  and  $b$  were both estimated using information from the Kariobangi business survey, which included information about business capital equipment, labor usage and income (which was used as a proxy for value added; this estimate is based on an assumption that Kariobangi businesses make very little profit). Once again, this basic information was augmented by information from a variety of secondary sources.  $m_1$ , which is probably the least well estimated argument of the model, was based on (a) information about the breakdown of construction costs and (b) the relative size of investment in structures and investment in other types of capital goods. Finally,  $p$  was estimated using figures about population growth in Nairobi estimated using census information.

As indicated in Table 3, both  $F_o$  and  $F_n$  are assumed to be 0. Given the official antagonistic attitude toward the popular economy, and the lack of investment in infrastructure or other public services in such areas this seems a realistic first approximation.  $a$ , as mentioned, is an artificial variable, based on the length of the period under study and the expected rate of growth of local output.

TABLE 3

Estimates Used in Specifying the Model  
(all money figures in Kenya shillings)

Initial Values

$Y_0 = 18,220,000$	$N_0 = 4,827$
$E_0 = 15,530,000$	$L_0 = 3,848$
$S_0 = 610,000$	$L_0^E = 2,577$
	$F_0 = 0$

Parameters

$k = 2.0$	$F_n = 0$
$b = 0.000464$	$m_i = .80$
$a = 0.20$	$p = .15$

Range of Instrument Variables

$\epsilon = 0.00$ to $0.12$
$\alpha = 0.00$ to $0.05$
$\mu_c = 0.79$ to $0.60$
$\nu = 0.30$ to $0.05$

Estimates of appropriate ranges for the instrument variables are based primarily on informed judgment. Available information about savings rates was used in determining an appropriate range for  $\alpha$ . Since it is assumed that most of  $E$  is earnings in enumerated employment opportunities, growth of enumerated employment opportunities in Nairobi (just over 3 percent per year) was used as a benchmark in setting the range for  $\epsilon$ . Determining the level of unemployment is difficult for a number of reasons, not least of which is the difficulty of estimating the size of the labor force. Nevertheless, there are a variety of estimates of unemployment for Nairobi. These were used in setting the range for  $\nu$ . Finally, in order to estimate a range for  $\mu_c$ , an effort to estimate its level for Kariobangi in the initial year was made. The resulting figure was based upon budget information, knowledge of the types of business activities carried on in Kariobangi, and the income distribution figures already mentioned. It was used as the upper end of the range for  $\mu_c$ . The lower end assumes few final goods and services other than food are imported into Kariobangi.

#### V. Operationalizing the Model

The first step in operationalizing the model presented in Section 3 is to reduce the model to three equations. That each of the resulting equations (see Table 4) is associated with a specific type of constraint to growth is perhaps best illustrated by examining intermediate equations in the process of reducing the model. In particular associated with constraint I:

TABLE 4

Constraint I - Savings Constraint (derived from equations 1, 10a, 7, and 4)

$$Y_n - Y_0 + \frac{F_n + S_0}{\frac{a}{k} - \alpha} + \frac{\frac{a}{k} E_0 [(1+\epsilon)^n - 1]}{\frac{a}{k} - \alpha}$$

<u>Initial Values:</u>	<u>Parameters:</u>	<u>Range of Instrument Variables:</u>
$Y_0 = 18,270,000$	$a = .2$	$\epsilon = 0.00$ to $0.12$
$E_0 = 15,530,000$	$k = 2.0$	$\alpha = 0.00$ to $0.05$
$S_0 = 610,000$	$F_n = 0$	

Constraint II - Foreign Exchange Constraint (derived from equations 8, 3, 6, 10a, 1 and 11)

$$Y_n = \frac{(1-\mu_c)F_n + \left(\frac{m_i - \mu_c}{\frac{k}{a}}\right) (Y_0 - E_0) + E_0 [(1+\epsilon)^n \left(1 + \frac{m_i - \mu_c}{\frac{k}{a}}\right)]}{\left(\frac{m_i - \mu_c}{\frac{k}{a}} + \mu_c\right)}$$

<u>Initial Values:</u>	<u>Parameters:</u>	<u>Range of Instrument Variables:</u>
$Y_0 = 18,270,000$	$a = .2$	$\epsilon = 0.00$ to $0.12$
$E_0 = 15,530,000$	$k = 2.0$	$\mu_c = 0.79$ to $0.60$
	$F_n = 0$	
	$m_i = .8$	

Constraint III - Labor Constraint (derived from equations 9, 2 and 5)

$$Y_n = \frac{(1-v) N_0 (1+p)^n - [L_0^\epsilon + (L_0^f (1+\epsilon)^n - L_0^\epsilon)]}{b} + E_0 (1+\epsilon)^n - E_0 + Y_0$$



TABLE 4 Continued

Initial Values:

$$Y_0 = 18,270,000$$

$$E_0 = 15,530,000$$

$$N_0 = 4,827$$

$$L_0 = 3,848$$

$$L_0^\epsilon = 2,577$$

Parameters:

$$p = .15$$

$$b = .000464$$

Range of Instrument Variables:

$$\epsilon = 0.00 \text{ to } 0.12$$

$$\nu = 0.30 \text{ to } 0.05$$

$$Y_n = Y_0 + \frac{k}{a} [(S_0 + \alpha (Y_n - Y_0) + F_n] + E_0 [(1+\epsilon)^n - 1]$$

Constraint II;

$$E_n + F_n = \mu C_n + m_i I_n$$

and Constraint III;

$$N_0 (1+p)^n (1-v) = b(Y_n - E_0 (1+\epsilon)^n) + L_0^\epsilon (1+\epsilon)^n$$

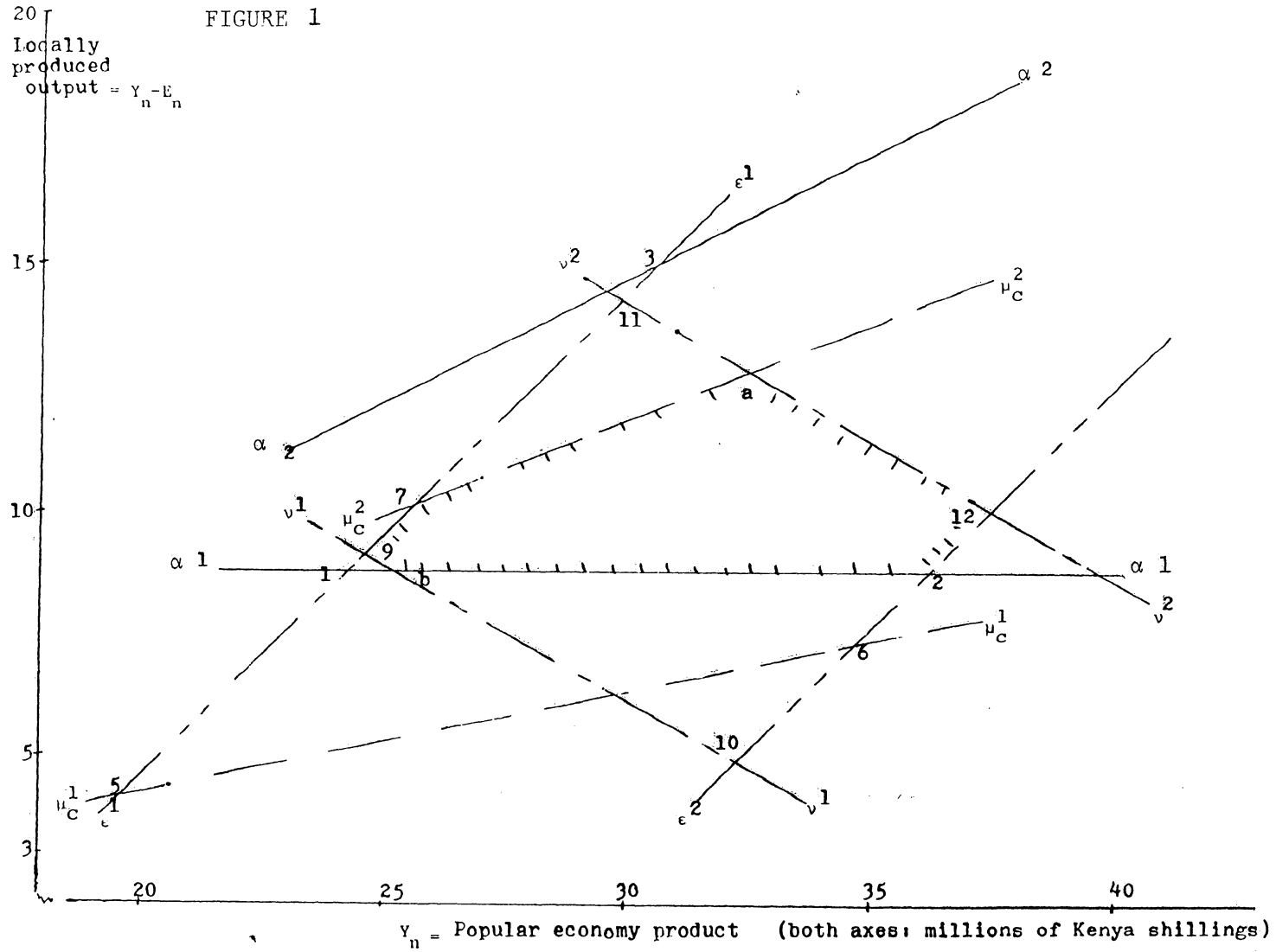
The first equation above expresses  $Y_n$  as a function of the capital available for investment in local enterprise, which can be represented using  $S$  and  $F$  in year  $n$  because of the use of the argument  $a$ , and the output-capital ratio for local production (along with the rate of growth of export of labor services which is a factor in all three constraints). Thus, in Constraint I the level of output attainable in year  $n$  is constrained by the availability of savings (and foreign exchange inflow which is assumed to be 0). The second equation indicates that imports required to sustain any level of total product and income cannot exceed available foreign exchange. Hence, in Constraint II, which is derived from the above using the direct relations between  $I_n$  and  $Y_n - E_n$ ,  $Y_n$  is constrained by the fact that the import content of consumption and investment goods can be no greater than available foreign exchange. Finally, the third equation indicates that the amount of labor required for local production and for export can be no greater than the amount of labor available; i.e., in Constraint III, the attainable level of  $Y_n$  is determined by labor availability. Thus, the three equations embody the operative constraints to growth of the model.

As indicated above, the reduced form of this model is solved by finding the set of all possible feasible solutions, i.e., solutions resulting from sets of values of instrument variables in which the value of each instrument variable falls within its predetermined range. A single solution to the model (not necessarily a feasible one) can be found by assuming one of the constraints, say the saving constraint, is binding. Then an attainable level of  $Y_n$  can be determined by setting values for the instrument variables which are arguments in that constraint (in this case  $\epsilon$  and  $\alpha$ ), and solving constraint I for  $Y_n$ . This value of  $Y_n$  and the value of  $\epsilon$  chosen can then be used with the remaining constraint equations to determine the values of  $\mu_c$  and  $v$  necessary if the foreign exchange and labor constraints are to be met. The resulting solution is "feasible" if the values of each of the instrument variables happen to fall within the predetermined range for that variable.

While such a technique does yield solutions, a graphical technique is actually used to solve the model. The solution is in the form of a "feasible area" the points of which correspond to the set of all possible feasible solutions. The graph used is one with local output on the vertical axis ( $Y_n - E_n$ ) and total UHS product ( $Y_n$ ) on the horizontal axis. (See Figure 1). On this graph are lines associated with each of the constraint equations - Constraint I:  $\alpha^1 - \alpha^1$  and  $\alpha^2 - \alpha^2$ , Constraint II:  $\mu_c^1 - \mu_c^1$  and  $\mu_c^2 - \mu_c^2$ , Constraint III:  $v^1 - v^1$  and  $v^2 - v^2$ . These lines locate all pairs of  $Y_n$  and  $Y_n - E_n$  attainable under the constraint in question if the instrument variable unique to the constraint (and for which the line is named) is held constant, and  $\epsilon$  is allowed to vary. The superscript 1 indicates that the instrument variable being held constant is at its least expansionary value (the upper limit for  $\mu_c$  and  $v$ , the lower limit for  $\alpha$ ); the superscript 2 indicating

FIGURE 1

Simulation of Kariobangi Popular Economy Circumstance



that the variable is held at its most expansionary value. The fact that the slope of each of these lines is constant is very useful since it means that they can be located with two points,<sup>20</sup> The solutions of the model corresponding to each of the points (1-12) used can be found in Table 5. As can be seen, for each line, the solutions used were those which result when the instrument variable for which the line is named is held constant at either its least or most expansionary value, and the value of  $\epsilon$  is set (1) at its least expansionary value (=0.0) and (2) at its most expansionary value (=0.12).

Also on the graph are two lines  $\epsilon^1 - \epsilon^1$  and  $\epsilon^2 - \epsilon^2$ . Along these lines  $\epsilon$  is held constant at its least and most expansionary output (hence, the slopes of these lines must be 1) and the values of the other instrument variables vary.

The feasible area on the graph (indicated by crosshatching and including the boundary) is the area where  $.79 > \mu_c > .6$ ,  $.30 > v > .05$ ,  $0.0 > \alpha > 0.05$  and  $0.0 > \epsilon > 0.12$ . In fact, within this feasible area  $\alpha$  is never greater than at point a (.03), and  $\mu_c$  is never greater than at point 2 (.76). Thus availability of savings is never a constraint to growth; and the maximum import content of consumption goods either requires a rate of growth of exports outside  $\epsilon$ 's predetermined range, (i.e., at a point along  $\mu_c^1 - \mu_c^1$  above  $\alpha^1 - \alpha^1$ ) or results in a negative marginal savings rate (i.e., at a point on  $\mu_c^1 - \mu_c^1$  below  $\alpha^1 - \alpha^1$ ). This is simply another way of saying that given the stated values of the parameters (in particular the high dependence on imports and the very high output-capital ratio) the savings constraint to growth is unimportant, while the foreign exchange is very important.<sup>21</sup>

This is a useful result and, given the relative weakness of the data base, it may be more important than a more detailed examination of the characteristics of the feasible area. Nevertheless, it is worthwhile to examine further the

TABLE 5

Solutions Used in Determining Feasible Region

(all solutions except 4 and 8 appear as points on Graph 1, feasible solutions are starred (\*))

Solutions attainable under each constraint, given extreme values of instrument variables:

Savings Constraint

	(1)	(2)*	(3)	(4)
$Y_n$	24,360,000	36,200,000	30,460,000	54,130,000
$Y_n - E_n$	8,840,000	8,840,000	14,930,000	26,770,000
$\epsilon$	0.00	0.12	0.00	0.12
$\alpha$	0.00	0.00	0.05	0.05
$\mu_c$	.63	.76	.50	.49
$u$	.31	.11	.02	- .74

Foreign Exchange Constraint

	(5)	(6)	(7)*	(8)
$Y_n$	18,650,000	34,630,000	25,630,000	45,100,000
$Y_n - E_n$	4,130,000	7,270,000	10,110,000	17,740,000
$\epsilon$	0.00	0.12	0.00	0.12
$\alpha$	- 0.33	- 0.009	0.03	0.03
$\mu_c$	.79	.79	.60	.60
$u$	.54	.18	.25	- .32

TABLE 5 (Cont.)

	<u>Labor Constraint</u>			
	(9) <sup>*</sup>	(10)	(11)	(12)
$Y_n$	24,620,000	32,220,000	29,850,000	37,450,000
$Y_n - E_n$	9,090,000	4,860,000	14,320,000	10,090,000
$\epsilon$	0.000	0.12	0.00	0.12
$\alpha$	0.004	- 0.03	0.05	0.007
$\mu_c$	0.63	0.85	0.51	0.73
$\nu$	0.30	0.30	0.05	0.05

Solutions derived from graphical analysis:

	(a) <sup>*</sup>	(b) <sup>*</sup>
$Y_n$	32,530,000	25,200,000
$Y_n - E_n$	12,810,000	8,840,000
$\epsilon$	0.05	0.01
$\alpha$	0.03	0.00
$\mu_c$	0.60	0.66
$\nu$	0.05	0.30

results of the simulation. Given the prospects for low income urban residents which overall urban population and employment growth rates seem to portend, it is particularly useful to examine the circumstances under which per capita income in Kariobangi can be maintained. Because of the importance of the foreign exchange constraint to growth, the relationships to examine are those between per capita income (assuming in this case that  $p = .1$ ), the rate of growth of exports, and the import content of consumption goods (i.e., between per capita income and efforts at "export promotion" and "import substitution"). Table 6 indicates sets of values of  $\epsilon$  and  $\mu_c$  compatible with maintaining per capita income at the initial level in Kariobangi. These values were determined by setting  $\mu_c$  at different values and solving constraint II for  $\epsilon$  (using the value of  $Y_n$  necessary to maintain per capita incomes).

This information is discouraging. For example, exports must grow at a rate of 5.6 percent even if the local value added of consumption goods ( $1 - \mu_c$ ) is increased by 50 percent (i.e., if  $1 - \mu_c$  is increased from .21 to .31 or  $\mu_c$  is reduced from .79 to .69). The necessary rate of growth of exports of 5.6 percent per year can be compared to a rate of growth of wage employment in Nairobi of 3.16 percent between 1964 and 1972.<sup>22</sup> The situation grows proportionately worse as the rate of population growth is assumed to increase.<sup>23</sup>

## VI. Informal Sector Production

Despite increased interest in informal sector activities in recent years, there has been little effort to predict analytically the expected growth of such activities. This may in part be because of problems



TABLE 6

Sets of Values of  $\epsilon$  and  $\mu_c$  Compatible with Maintaining Per Capita Income,  
Year 0.

1.  $\epsilon = .028, \mu_c = .60$
2.  $\epsilon = .038, \mu_c = .63$
3.  $\epsilon = .047, \mu_c = .66$
4.  $\epsilon = .056, \mu_c = .69$
5.  $\epsilon = .065, \mu_c = .72$
6.  $\epsilon = .073, \mu_c = .75$
7.  $\epsilon = .079, \mu_c = .77$
8.  $\epsilon = .084, \mu_c = .79$

inherent in predicting growth of activities operated by entrepreneurs who, many investigators feel, are characterized by the flexibility with which they use indigenous resources to meet changing urban needs. However, while informal sector entrepreneurs do exhibit flexibility and imagination, it must be remembered that the especially high level of skill necessary in creating new types of informal sector activities is very scarce. This is particularly true for informal sector activities producing products for sale outside the popular economy (i.e., "exports"). For this reason, predictions about growth in informal sector employment based upon expectations about growth in demand for informal sector products now consumed, or potentially consumed in the popular economy (i.e., local output) are likely to be useful. Figure 1 indicates the level of such local output expected in the target year under different assumptions about values taken by the instrument variables. Table 7 indicates rates of growth of such informal sector employment associated with selected points from Figure 1.

The most notable feature of this information is that higher informal sector employment growth is associated not only with lower values of  $\mu_c$ , but also with higher values of  $\epsilon$ . This is because growth of local activities can be encouraged either by encouraging the production of a wider range of local products, or by encouraging the growth of exports, thereby increasing popular economy income and the demand for local products presently being produced. Perhaps more to the point, growth of local output is constrained both by the narrow range of products produced, and by slow growth of export of labor services, i.e., by the foreign exchange constraint.

TABLE 7

Selected Points, Table 5 , Figure 1:

	<u>5</u>	<u>1</u>	<u>7</u>	<u>c</u>	<u>6</u>	<u>2</u>
Local Output	4,130,000	8,840,000	1,110,000	6,270,000	7,270,000	8,840,000
Local Employment	1,903	4,102	4,691	2,909	3,373	4,101
Growth of Local Employment	.084	.264	.298	.180	.216	.264
$\mu c$	.79	.63	.60	.79	.79	.76
$\epsilon$	0	0	0	.09	.12	.12

## VII. Easing the Foreign Exchange Constraint

As indicated, in the case of Kariobangi, the foreign exchange constraint is important in constraining popular economy growth as a whole and in constraining proliferation of an important group of informal sector activities. There are a variety of ways of easing such a constraint. One policy which might seem to recommend itself is to indiscriminately increase the size of the modern sector, thus increasing the availability of modern sector employment to popular economy residents. This is essentially the policy adopted in the past, and if such a policy were adequate there would be little need for the kind of approach used in this paper. However, there is mounting evidence indicating that even very rapid rates of growth of modern sector output result in at best modest rates of growth of modern sector employment. Furthermore, it is very likely that a variety of modern sector industries which have in other countries been promoted early in the process of industrialization have also been industries replacing the output of informal sector activities. Prime examples are the shoe industry, the soft drink industry, and the furniture industry.<sup>24</sup> Thus, dependence on modern sector growth is not a viable way of attacking the problems facing popular economy residents (the bulk of the "working poor" in Nairobi).

This is the basic reason for increased interest in informal sector activities. Unfortunately, proliferation of the types of informal sector activities currently being pursued is constrained by popular economy growth as a whole--which is constrained by foreign exchange shortage. It is this face of the foreign exchange constraint which most resembles a skill constraint. Operationally, the constraint manifests itself as a

shortage of working capital. However, increasing loans to local businesses (increasing  $F_n$ ) has relatively little effect on growth of local output. This is because increases in output (and income) resulting from such loans must largely be in the form of increased imports given the heavy dependence of the Kariobangi economy on foreign goods and services.<sup>25</sup> Hence, the underlying constraint is the inability of local Kariobangi enterprises to produce more than a relatively narrow range of goods and services used in Kariobangi.

This situation is often recognized by small industry advisors who recognize that little good is done by extending loans to existing small businesses serving local markets. These businesses strongly feel the need for such loans because of a continual shortage of working capital. But that shortage at the firm level is an indication of a shortage of foreign exchange at the popular economy level. It is therefore not surprising that many businesses make goods to order. This is just a way of economizing on working capital. In these circumstances, a loan to a particular business may enable the business to enlarge stocks or to buy "necessary" equipment. However, most of this investment will be made in products made outside the popular economy and therefore the loan will have little effect on output. Further, insofar as it does not increase the range of products produced in the popular economy for local use, the loan will not change the situation which results in the importance of the foreign exchange constraint to growth.

One obvious policy implication of such a situation is to encourage "import substitution" of different sorts. In particular, there seems to be a variety of consumer goods not currently produced in Kariobangi which could be produced in very small-scale enterprises. Furthermore,

there may well be a place for enterprises producing rudimentary tools. Encouraging such import substitution, in part by offering training programs and provision of necessary facilities, is especially attractive because quality and uniformity requirements are presumably less stringent in the local Kariobangi market than in larger markets. Thus, initial efforts aimed at production for this market might eventually result in skill creation and creation of enterprises capable of serving "export" markets.

Such "exports" are another way of easing the foreign exchange constraint. In the case of an urban popular economy like Kariobangi, such manufactured "exports" may have more eventual promise than import substitution. As indicated, an indirect way of encouraging exports is simply to encourage the production of a broader range of products, some of which may eventually be able to be sold in other (generally higher income) markets. Another way of promoting such exports is to encourage relationships like one found in Nairobi between Asian shopkeepers selling school uniforms and African tailors producing the uniforms. Such subcontracting arrangements are particularly desirable because they bring together marketing skill--a skill which many potential African entrepreneurs currently lack--with already existing production skills. Furthermore, such arrangements could be used to encourage current enterprises to produce goods of higher and more uniform quality which are capable of competing outside low-income markets.

Unfortunately, the scope of this paper does not allow a more detailed examination of policies and programs useful in encouraging skill creation and individual entrepreneurship among Kariobangi residents. Rather, the paper is designed to outline the circumstances in Kariobangi. As argued above, the primary constraint facing Kariobangi is a foreign exchange

constraint which in many ways resembles a "skill constraint." Despite the outstanding importance of this constraint in the Kariobangi case, it is impossible to draw general conclusions about the importance of this constraint in other circumstances. The study of Kariobangi is instead designed to cast light on a particular case, and to indicate the kind of insights which a study of the above type, based upon fairly readily available data collected for other uses, yields. It is hoped that approaches of this type can eventually be applied in other cases of urban and also rural popular economies. Such analyses would certainly yield interesting factual information, as well as confirming or rejecting possible hypotheses about similarities or differences among popular economies. It seems at least possible that they could also lead to theories about "patterns" of popular economy development which could be of invaluable aid to planners and policy-makers concerned with individual popular economies.

#### VIII. Conclusion

As indicated above, the situation of Kariobangi (and presumably other UHSs in Nairobi) is somewhat discouraging. In particular, while there does seem to be some scope for import substitutes, Kariobangi must remain heavily dependent on "exports" given the fact that households in the area spend from 40-50 percent of their total expenditures on food alone. Given this situation, and the slow rate of growth of modern sector employment, some form of "export promotion" scheme designed to increase production of informal sector goods and services for nonpopular economy households seems advisable. Unfortunately, it does not seem

implausible to assume that (a) above some minimal level of income, as urban household income rise, demand for informal sector products meeting current quality standards will fall, and (b) given current circumstances most of the increase in expenditure in Nairobi over time will be by households with incomes above this minimum.<sup>26</sup> Thus it seems unlikely that, given current circumstances, informal sector activities can be depended upon to "solve" the expected unemployment problem in Kariobangi.

Despite such discouraging conclusions, however, informal sector activities do seem to have substantial potential for improving well-being in a number of types of popular economies in many developing countries. Even in the case of an urban popular economy like Kariobangi, it must be remembered that informal sector activities currently provide a significant amount of employment and income in Kariobangi, and it is not impossible to increase the skills of those working in informal sector enterprises and thereby raise the quality and range of products produced for both local and "export" markets. The potential in "rural popular economies," i.e., rural trade centers and the areas they serve, seems even greater. This is because households in such rural popular economies in general (a) are quite poor, (b) need a variety of rudimentary consumer and capital goods which could be produced by very small scale business, and (c) are less likely to demand Western style goods as incomes rise.

Because of this potential, studies of a variety of types seem warranted. In particular, studies of currently successful informal sector activities, studies of household characteristics associated with consumption of informal sector products, and studies of the "import substitution" and "export promotion" possibilities of a variety of types of popular



economies seem likely to be useful to appropriate government and banking officials, and to potential entrepreneurs.

Studies of this sort would hopefully have an immediate practical effect on the ability of developing countries to foster informal sector activities and raise income levels within particular popular economies. It also seems likely that such studies would (at least implicitly) point out the potential role of policies encouraging informal sector activity and local self-reliance in easing a number of problems facing many developing countries, especially: (a) problems of national dependence and income inequity resulting from industrialization policies heavily dependent on direct foreign investment and use of capital-intensive Western technology, and (b) the distressingly slow growth of agricultural output, particularly of foodstuffs for home consumption. However, this larger role of informal sector activities at the popular economy level can only be discovered with more study.

Footnotes

<sup>1</sup>The term uncontrolled housing settlement has been used because of its generality. In Nairobi, the term was used to emphasize the fact that the housing in question did not meet city codes or permit requirements; though it was in general located on private land with the permission of the owners of the land, and hence could not really be called "squatter housing." The basic reason for the growth in importance of such housing is the very rapid rates of urbanization facing many developing countries. This phenomenon, as well as the associated problem of growing unemployment in urban areas, is reviewed in Turnham (1971). See also, Henning and House (1975).

<sup>2</sup>The term "popular economies" was introduced to me by Bruce Creager, Faculty of Architecture, University of Nairobi.

<sup>3</sup>There is a growing literature on the informal sector, much of it based on work of people associated with the International Labour Office. Early references can be found in International Labour Office (1972) and Hart (1973). The former work describes informal sector activities as "the way of doing things, characterized by: (a) ease of entry; (b) reliance on indigenous resources; (c) family ownership of enterprises; (d) small scale of operation; (e) labour-intensive and adapted technology; (f) skills acquired outside the formal school system; and (g) unregulated and competitive markets. Informal-sector activities are largely ignored, rarely supported, often regulated and sometimes actively discouraged by the Government." The primary reason for the concentration of such enterprise in UHS is the fact that UHSs house the bulk of low income people who form the most important market for informal sector output.

<sup>4</sup>In fact, sluggish growth in modern sector unemployment, even in areas where modern sector output has grown quite rapidly, is an important reason for interest in informal sector activity. See Turnham (1971) for information on the growing urban "employment problem."

<sup>5</sup>There is some controversy as to how to define informal sector activities. Part of the problem is that while most observers feel that "you know an informal sector activity when you see one," it is difficult to find a definition which allows inclusion of all such activities, and also enables a clear line to be drawn between informal sector activities and other business activities. Despite these problems, it seems likely that most observers would agree that business activities located in or operating from uncontrolled housing settlements, i.e., those run by UHS residents, are virtually all part of the informal sector. For a further discussion of definitional problems, see Setherraman (1976).

<sup>6</sup>See Frankenhoff (1967). Abrams (1977), and Turner and Ficter (1972) review attitudes of planners toward low-income settlements.

<sup>7</sup>Early articles presenting two-gap models include Chenery and Bruno (1962), and Chenery and Strout (1966). See also Lal (1972) and McKinnon (1964). The model and graphical method of solution used in this paper resemble the approach of Chenery and Bruno (1962).

<sup>8</sup>See footnote 25 for further discussion.

<sup>9</sup>It should be pointed out that the above approach resembles the "export base" approach in urban planning literature, in that both are

concerned with the availability of export earnings. The most important difference between these approaches is the emphasis of the approach used in this paper on the possibility of "import substitution," i.e., of growing UHS economy self-sufficiency. For a discussion of the pros and cons of the export base concept and further references, see Thompson (1968).

<sup>10</sup> A fixed coefficient aggregate production function has been used to describe the UHS economy primarily because of the simplicity of such an approach. The price of this simplicity is implicit acceptance of the existence of fixed coefficient production functions for individual firms and acceptance of an assumption that each firm type uses the same input mix.

<sup>11</sup> While not now important, the significance of exports of goods and services which do require inputs of non-labor factors of production hopefully will grow in the future. One way of handling such exports might be to assume that the aggregate capital-output ratio for such goods and services is the same as that ratio for local production. It also might be possible to create a new term on the right-hand side of equation (1) similar to the second term of the present equation, but with a different value for  $k$ . In either case, some way of determining the breakdown of investment into "local" or "export" industries must be found in order to determine the overall rate of growth of exports. A different approach would be to assume that a constant (or constantly growing) percentage of new output is exports (thereby implicitly assuming that the capital-output ratio of processes for producing exports and products for the local market are the same). In any case, a new term

indicating the import content of such exports must be included in equation (3). While changes required to alter the model are undoubtedly possible, they do seem likely to make it more complicated and more difficult to specify.

<sup>12</sup>This assumption is accurate if either (a) the mix of exported services stays the same over time, or (b) a changed mix of exported services results in an unchanged average level of remuneration. If a shortage of labor is a binding constraint, equation (2) can be thought of as a production function while (1) would be considered a demand for capital equation. However, implicitly it is assumed that labor will not be the binding constraint.

<sup>13</sup>If fixed coefficient production functions can be assumed, the actual value of the import coefficients could be determined from the solution of an input-output model which separated inputs into those produced domestically and those imported. However, because a large number of cells of an input-output table for Kariobangi would be empty, an approach based on analysis of (a) consumption patterns of Kariobangi residents, and (b) knowledge of the output mix of the Kariobangi economy has been used, and should be adequate.

<sup>14</sup>It seems likely that  $\alpha$  is related not only to growth in per capita income but also to the way that income is distributed. However, as is often done in models like the one being presented, this complication will be ignored.

<sup>15</sup>It would be better to determine  $p$  endogenously. This is because the rate of migration to urban areas, and presumably to sub-areas within

urban areas, is in large part determined by relative economic conditions in rural and urban areas. See, for example, Harris and Todano (1970). However, for the sake of simplicity,  $p$  is assumed to be exogenously determined.

<sup>16</sup>See Porter (1970) for a thorough discussion of the implications of simplifying the model in this way.

<sup>17</sup>These sources are respectively: Nairobi City Council (1970), Government of Kenya (1968), Thomas Weisner.

<sup>18</sup>A number of other sources were used to verify (and sometimes indicate necessary adjustments to) the estimates made using the above primary sources. Among them were Child (1973), Creager, Etheton, et al. (1970), Waters (1973), and Lewis (1973).

<sup>19</sup>See Henning (1976) for a more lengthy description of argument estimation.

$$\begin{aligned}
 \text{20} \quad \frac{dY_n - E_n}{dY_n} &= 1 - \frac{dE_n/d\varepsilon}{dY_n/d\varepsilon} = 1 - \frac{(a/k - \alpha)}{a/k} \quad (\text{Constraint I}) \\
 &= 1 - \frac{(\mu_c + \frac{m_i - \mu_c}{k/a})}{(1 + \frac{m_i - \mu_c}{k/a})} \quad (\text{Constraint II}) \\
 &= 1 - \frac{E_0}{(E_0 - \frac{L_0^\varepsilon}{b})} \quad (\text{Constraint III})
 \end{aligned}$$

<sup>21</sup>It is worth noting that this result holds for fairly wide ranges of values of  $k$ , given large values of  $\mu_c$  and  $m_i$ . See footnote 25 below.

<sup>22</sup>Government of Kenya (1973).

<sup>23</sup>While 10 percent per annum is an extremely high rate of growth of population, rates of growth of this magnitude seem to be facing Nairobi, as well as other cities both in Kenya and other developing countries. Therefore, great efforts seem to be called for if Kariobangi (and other low-income areas in Nairobi) is to avoid what the ILO calls involuntary growth, i.e., rapid worsening of welfare of the residents of Kariobangi.

<sup>24</sup>An interesting model of the replacement of traditional products with products made with modern technology, and an application to the case of Columbia can be found in Nelson (1968).

<sup>25</sup>This situation can be seen by determining the partial derivatives of  $Y_n$  with respect to  $F_n$  assuming the foreign exchange constraint is binding, and assuming the savings constraint is binding. The former is

$$\frac{\partial Y_n}{\partial F_n} = \frac{1 - \mu_c}{\frac{m_i - \mu_c}{k/a} + \mu_c} = .44$$

assuming  $\mu_c$  is in the middle of its range (.695). The latter is

$$\frac{\partial Y_n}{\partial F_n} = \frac{1}{a/k - \alpha} = 13.3$$

assuming  $\alpha$  is in the middle of its range. As can be seen by the partial derivatives, the relative effect of increasing  $F_n$  under the savings constraint as compared to increasing  $F_n$  under the foreign exchange constraint depends upon the size of  $k$ ,  $m_i$ ,  $\mu_c$  and  $a$  and cannot be determined a priori.

<sup>26</sup>See Felix (1974) for an interesting discussion of the overall effects of such consumption patterns, and a comparison of developing countries with the situation in the 19th century in developed countries of today.



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## Appendix A - Initial Conditions

$N_0$  - The estimate of the size of the labor force in Kariobangi, like estimates of other initial conditions, is based primarily on the 1970 Home Interview Survey. This was a survey run by the Nairobi Urban Study Group (operating from within the Nairobi City Council) which was designed to collect information necessary to predict transportation infrastructure requirements for Nairobi.<sup>1</sup> The survey used a geographical frame, and the data collected were used in conjunction with population information from a 1969 national population census to estimate important socio-economic variables for a number of "traffic districts" -- which for the most part correspond with different city neighborhoods. Fortunately, Kariobangi corresponds with traffic district 073. Unfortunately, there are no data about the number of people in the "labor force" as it is commonly defined. In fact, it is extremely difficult to adequately define the "labor force" in an area like Kariobangi, because while many people would quickly and gladly accept almost any kind of employment, there are undoubtedly a large number of "discouraged workers" (especially women). In any case, from the Home Interview Survey we do know the following. First, the total population in the area is 12,995; with 8,784 of those being people over 6. Further, there are 4,235 males between the ages of 17 and 64; and 2,009 females in the same age group. It is logical to think that virtually all males between 17 and 64 are looking for work. Therefore, it is estimated that 95 percent of such males are "in the labor force." Also, it is estimated that 40 percent of the females in that age group should be considered in the labor force. These figures imply a labor force for the area

of 4,827 (approximately 37 percent of the total population). Therefore  $N_o$  is equal to 4,827.

$Y_o$  - The most straightforward way of estimating  $Y_o$  would be to multiply the Home Interview Survey estimate of average household income times that survey's estimate of the number of households in the area. Unfortunately, there is reason to believe that the Home Interview Survey consistently undersampled low-income households. The problem is exacerbated in Kariobangi by the selection of a sample grid square which was located in a small part of that community which is architecturally superior to the bulk of the community, and houses families with higher incomes than most Kariobangi residents. Because of this, information from surveys by Neils Jorgenson then of the Housing Research and Development Unit, University of Nairobi and by Bruce Creager of the Faculty of Architecture, University of Nairobi were used along with the Home Interview Survey information to create what seems to be a realistic distribution of income for Kariobangi.<sup>2</sup> This distribution is presented in Appendix C. It was used in determining available savings, realistic levels of  $\mu_c$ , as well as average household income.

Using this value for average household income, which turned out to be £277.5 per annum (or 5550 K. sh. per annum), and the Home Interview Survey estimate of 3,291 households in Kariobangi,  $Y_o$  is estimated as 18,226,200/ = per annum.

TABLE 3-2

AVERAGE INCOME PER HOUSEHOLD: DIFFERENT ESTIMATES

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H.I.S.: Kariobangi £348.4 p.a.

10 low income traffic districts in eastern  
Nairobi: £320 p.a. Lowest: £240.2 p.a.  
Highest: £379 p.a.

Creager Data: Squatters £125.6 p.a.  
Kariobangi £222.8 p.a.

Jorgenson Data:

£246.2 using H.I.S. assumptions about break-down of  
houses with incomes over 800/=p.m.

£249.9 using Creager average income of households over  
800/= per month

"Fabricated" Average Income: £277.5 p.a.

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$E_0$  - In order to determine  $E_0$ , it is necessary to break income into income earned inside Kariobangi and income earned from the export of labor services. There are several sources of evidence about this breakdown. First, the Home Interview Survey includes information on where people work and where they live (see Table 3-3). Unfortunately, this information once again seems biased. This is because the area chosen contains a large number of city council employees who are listed as being employed in Kariobangi. It is not clear exactly what they all do in Kariobangi. However, the fact that over 80 percent of those working in the area indicated they were in some type of government service clearly destroys the notion that most of them were working in what are normally thought of as informal sector activities.

This does not mean, however, that had the survey been administered to a more representative group of households it would not have discovered a substantial number of people working in such activities. It seems likely, in fact, that people working in jobs of the type available in Kariobangi are systematically undercounted in many government-sponsored surveys. This is because many of the activities in question are outside of the law and in some cases illegal. Therefore, people working in and running such businesses can be expected to say as little as possible about themselves to interviewers known to be working for the government. Despite this fact, about 15 percent of those interviewed who were living in 1 of 10 low-income residential districts reported working in 1 of 16 low-income residential districts in Eastern Nairobi (see last part of Table 3-3). This is interesting because in these districts virtually all available employment is in the type of enterprises which make up the local economy of Kariobangi. Perhaps the best data on this score, however, are Creager's (see Table 3-3). This is because that survey was not in any way connected to the government and therefore people were probably more open about discussing their occupations with the interviewers administering the survey. The data listed for Kariobangi is the data which concerns us. The data labeled "squatters" is for a small group of households living in mud and wattle huts just east of the main part of Kariobangi. I have included those figures to indicate what percentage of income earned by the lowest income people in Nairobi might be expected to be earned in "popular economy" type occupations.

TABLE 3-3

INCOME EARNED WITHIN POPULAR ECONOMY, DIFFERENT ESTIMATES

Creager Data	Income Earned in Popular Economy as a % of Total Income	Employment in Popular Economy as a % of Total Employment
Kariobangi	15.3	30.0
Squatters	21.9	48.7
Home Interview Survey Data		
<u>Traffic District</u>	<u>% of Income Earned in Total Which is Earned by Those Living and Working in Traffic District</u>	
073 (Kariobangi)	28.4	
Living in Given Traffic District and Working in 1 of 16 Low-Income Residential Districts In Eastern Nairobi		
<u>Traffic District</u>	<u>Living in Given Traffic District and Working in 1 of 16 Low-Income Residential Districts In Eastern Nairobi</u>	
006	5.5	
059	22.6	
061	12.1	
075	8.5	
076	14.2	
079	7.6	
080	2.0	
082	27.1	
083	20.0	
084	20.0	
Average for above 10 districts (weighted by traffic district population)		
	15.0	



Considering this information, I have estimated that 15 percent of total income earned by Kariobangi residents is earned in the Kariobangi "popular economy." Then  $E_0$  is equal to  $(.85 \times Y_0) = 15,526,270$ .

It is interesting to note that if it is assumed that 15 percent of the income of Kariobangi is created locally, and 30 percent of total employment is local employment, the aggregate labor output ratio implied by this is close to the one estimated below. (.00042 as opposed to the estimate from Weisner's data of .000454). The figure of about 15 percent also seems fairly sensible given estimates of  $\mu_c$  of .79 and  $m_i$  of .80 (implying that about 20 percent of the value added of goods and services bought for consumption and investment purposes is added locally). The fact that the figure for income earned in the area is less than income spent there may result from undercounting of local earnings.

$S_0$  - Estimating the flow of savings available for investment is a problem for two reasons. First, no information on the nature of the financial system in Kariobangi is available. Therefore it is impossible to determine what proportion of reported savings of Kariobangi residents are actually available for investment in Kariobangi businesses. Without this basic information, the role of the savings constraint is indeterminate even if completely accurate household savings data were available. I will not, however, be the first to assume that there is an effective financial system at work which transfers funds from savers to investors. (This problem is less serious in Kariobangi than in other types of economies because in many cases in Kariobangi, savers and investors are the same people.) The second problem is simply lack of data about the savings behavior of people in Kariobangi. Nevertheless, some estimates can be made.

To make these estimates, the savings rate implied by figures for income and expenditure for different expenditure categories from the 1968-1969 Urban Expenditure Survey, and the savings rates reported by the Mathare Valley Report for a similar but lower income area on the eastern side of

Nairobi, have been used.<sup>3</sup> These rates are reported for households in different expenditure categories. By using these income categories' rates and the "fabricated" income distribution for Kariobangi mentioned above (see Appendix C), it is possible to make estimates of the flow of savings available to Kariobangi. (See Table 3-4) As usual, a decision about what the most appropriate numbers are must be made. While the information from the Urban Expenditure Survey seems to indicate extreme savings rates, the fact that Jorgenson's Mathare Valley data indicates no dissaving on the part of those at the bottom of the distribution of income also seems unrealistic. Therefore, in making an estimate of initial year savings it has been assumed that the top three income classes have savings rates of 13.5 percent (Jorgenson's Mathare Valley figure). The other classes are assumed to have the savings rates indicated by the urban household expenditure survey. These assumptions result in an estimate of  $S_0 = \text{K.sh. } 609,588$  per year.

$L_0^e$  - Making this estimate is not difficult since we already have estimated that 15 percent of income earned in Kariobangi is earned within Kariobangi and that the labor-output ratio for local enterprises is .000464. Since we have estimated local income we can estimate local employment. But since we know total employment (which is estimated by the Home Interview Survey as 3,848), we also can determine the number of people employed outside of Kariobangi. This number is 2,577 (about two-thirds of the people employed).

TABLE 3-4

SAVINGS DATA BY INCOME CATEGORY: DIFFERENT ESTIMATES PLUS  
ESTIMATES OF TOTAL SAVINGS (per month)

	0- 199	200- 299	300- 399	400- 499	500- 699	800- 999	1000- 1399	1400- 1999
<u>Savings Rate</u> (Urban Ex- penditure Survey)	-121.4%	-21.9%	7.2%	8.5%	13.5%	19.5%	20.4%	22.3%
<u>Implied savings</u> given "fabricated income distribution" (per month)	-47,701	-41,190	10,629	17,606	31,960	43,616	40,279	37,406
<u>Savings Rate</u> (Combination U.F. Survey, Jorgenson)	-121.4	-21.9	7.2	8.5	19.5	13.5	13.5	13.5
<u>Implied savings</u> given "fabricated income dis- tribution" (per mo.) Total: 50,799/=per month	-47,701	-41,190	10,629	17,606	31,960	30,196	26,654	22,645

Jorgenson's Mathare Valley Date: Income categories (sh. per month)

	0- 149	150- 249	250- 299	300- 399	400- 499	500- 699	700+
<u>Savings Rate</u>							
<u>Implied savings</u> given "fabricated income distribution" (per month)	2.9 640	4.7 4,629	8.0 8,673	3.3 8,351	4.8 9,942	8.9 21,072	13.5 78,907
Total	132,214/= per month						

## Appendix B - Parameters

n - The period over which the performance of the Kariobangi popular economy is analyzed is five years. This is a relatively short period for models of this type. However, given the great uncertainty about the behavior of a number of variables affecting the performance of the popular economy, a short period seems appropriate.

k - This is the incremental output-capital ratio. It is estimated using a variety of information. The most important source used is information from a survey of small businesses in Kariobangi and the Kariobangi Market. This survey was directed by Tom Weisner, then of the Child Development Research Unit of the University of Nairobi, in 1970.<sup>4</sup> Among a large number of other questions he asked the following: "How much capital is invested in this business altogether?"; "How much money did the property cost which is in your shop now?" and "How much profit do you earn each month from this shop?" Unfortunately, while the survey seems to have been well designed and administered, the answers to these particular questions were not of primary interest. As a result, it is not clear exactly what the answers to the Weisner questions mean. In the case of commercial establishments, however, the answers to the first two questions were very often identical and can probably be considered a fairly reliable estimate of the necessary working capital for the business in question. In the case of "manufacturing enterprises" the answer to the first question often include some estimate of the cost of relevant equipment, which should be added to the estimate of working capital obtained from the answer to question 2. These assumptions were used. The final significant part of the capital cost of starting a business is the cost of the required premises. Information on this question was gathered from the Mathare Valley Report, a paper about costs of different construction techniques written

for the Nairobi Urban Study Group, and from interviews with materials salesmen in Nairobi.<sup>5</sup>

Information from these sources made it possible to estimate costs of constructing different types of business premises. Estimates of the breakdown of businesses according to the type of premises they occupied were based in part on Weisner's survey (which indicated whether businesses were located in the market area or in residential rooms), in part on an informal census of the businesses in the Kariobangi market administered by me in the Spring of 1974 (which indicated the numbers of businesses in the Kariobangi market which occupied premises of different types), and in part on personal observation (which allowed me to categorize particular types of businesses by premises type).<sup>6</sup>

Using these estimates, the capital cost of premises was determined. Adding this to estimates of working capital requirements and cost of capital equipment yielded an estimate of the value of total capital.

Output or value added is defined as the value of sales minus the value of purchased inputs. Then output is the value of labor inputs, capital inputs, land (or building) inputs, and inputs of entrepreneurial skill. Return to the labor of the entrepreneur and return to his entrepreneurial skill and capital invested was estimated using answers to "How much profit do you earn each month from this shop." Such an estimate was used because it seems unlikely that the businessmen involved are sophisticated enough to calculate profit as something other than the amount of money left over at the end of the month after costs have been met. Answers to questions about the number of employees and the amount of rent being paid were used to estimate the value of output contributed by labor and business premises. An estimate of the value added of employees was

obtained by assuming a salary of between 100/= and 300/= per month, depending on the type of skill required of the employee or employees. Skill levels were estimated by me depending on the nature of the business in question. For businesses not operating out of residential rooms, the contribution of the business premises to value added can be determined by rent payments. This is not possible for businesses operating from residential rooms for two reasons. First, it seems likely that some businessmen would subtract the cost of rent before giving a profit figure and some would not. Also, as noted above, rooms used as business premises are commonly used as living quarters as well. It was finally decided to add one-fourth of the value of rent paid to the sum of labor and profit estimates in order to determine total value added. This is on the assumption that one-half of the businessmen answering the questions do assume rent is a cost and report profit net of rent, and one-half do not. Also, it is estimated that one-half of the total rent paid for rooms is paid for the value of premises as a residence and one-half of the total rent is a contribution of the premises to the value of the output of the business. Using this information,  $k$  was estimated to be very close to 2.0.

It is interesting to compare this to estimates of output capital ratios for other businesses. One comparison might be with the so-called "cottage industries" run by the National Christian Council of Kenya. I estimated the O/K ratios for three such enterprises using information supplied to me by the N.C.C.K. The businesses for which the calculations were made included a small toy factory, a craft workshop making jewelry and hand-woven bags and hangings (among other hand-made articles), and a workshop making baskets and mats from the leaves of banana plants (a traditional activity). The O/K ratios for these businesses were: Furaha Toys 1.28,

Malaika Crafts 1.89, and Ofafa Banana Leaf Workshop 3.57.

Another comparison for the non-commercial premises would be data from a study by Child of 87 firms in 4 rural centers in Kenya.<sup>7</sup> Child's average O/K for all firms was 1.23, which a range of ratios from greater than 10 to .25 or less. Interestingly, a ratio of approximately 2.2 was the most frequently encountered ratio in Child's study. Then, both Child's figures (which are from a very recently revised version of Working Paper No. 127) and the N.C.C.K. figures are close to the estimates used in this study. In any case, the enterprises being studied are very labor-intensive. Furthermore, the results indicated by the model are quite insensitive to wide changes in k.

b - This parameter is a labor-output ratio for businesses in Kariobangi. Estimating this using Weisner's data is a straightforward matter. This is because, as indicated above, Weisner's questionnaire did gather information on the number of people working in the businesses surveyed. Using Weisner's data and the output data already compiled, the value of b can be estimated as .000464 man-years per shilling of output. This figure is arrived at by assuming that there are 1.18 employees per enterprise--Weisner's average for the 270 enterprises interviewed.

Once again it is interesting to compare this figure, which implies a monthly output per man figure of about 180/=-, to figures obtained from the N.C.C.K. and by Child. For N.C.C.K. businesses, this ratio ranged from .00019 for Furaha Toys to .00040 for the Ofafa Banana Leaf Workshop. Child found an aggregate labor-output ratio of .000222. Furthermore, Child found that the most frequently encountered K/L ratio was from

K.sh. 2000/= to K.sh. 2999/= per man. Such a K/L ratio implies a L/O ratio of .000370 to .000405. Then once again, figures from other sources tend to confirm the estimates made for this study.

$a$  - The problem in assigning a value to  $a$  has already been mentioned. In general, higher values of  $a$  are associated with higher rates of growth under a given savings constraint. On the other hand, the greater the value of  $a$ , the lower the attainable rate of growth under the foreign exchange constraint. Because of the relative importance of the foreign exchange constraint, it seems sensible to choose a relatively low value of  $a$ . A value of  $a$  of .2 has been used. (This is the appropriate value of  $a$  if the savings constraint is binding and the marginal propensity to save is 0.)

$m_i$  - In order to estimate  $m_i$ , investment goods have been divided into three categories--working capital, equipment and buildings. On the basis of first-hand observation, it has been estimated that all working capital is "imported." On the same basis, it has been estimated that businesses have an equal amount of working capital and fixed equipment. Finally, given personal knowledge of the types of products produced in Kariobangi, and the types of products used as fixed equipment, it has been estimated that 30 percent of the value of equipment used by businesses in Kariobangi is value added in Kariobangi.

Using (a) information about construction cost breakdowns from various sources,<sup>8</sup> (b) personal estimates that all labor and transportation inputs into construction are locally supplied, and all material and other inputs are imported, and (c) information about the breakdown of business premise types from a count of businesses administered by me in the Spring



of 1974, the value added locally in the construction of premises has been estimated. Finally, using Weisner's data about the breakdown of investment between premises and other types of business investment, the proportion of the total value of the capital stock in-place produced locally is estimated at 20 percent for Kariobangi. It is assumed that the same proportion of new investment is also produced locally. Then  $m_i$  is estimated to be .8.

$F_n$  - This argument indicates the size of the inflow of "foreign capital" into the Kariobangi economy. The most important components of such a flow seem likely to be: (a) government transfers to residents of self-help organizations in the area, (b) government investment in businesses or city services in the area, or (c) private investment in businesses in the area. Because the first two components of the flow are directly under the control of government policy makers, it might seem logical to treat this argument as an instrument variable. However, given the very heavy dependence on imported goods of all sorts in Kariobangi, and also given the very high output-capital ratios prevailing in the businesses there, changing  $F_n$  very much more significantly changes the level of income allowed by the savings constraint than by the foreign exchange constraint. In fact,

$$\frac{\partial Y_n}{\partial F_n} \text{ for constraint II} = .6 \text{ and for constraint I} = 3.4$$

even assuming  $\mu_c$  is very low and  $k$  is also very low.

Since under most assumptions the foreign exchange constraint turns out to be the binding constraint, in most cases changing  $F_n$  will only marginally increase output, while directly lowering the demand for domestic

savings.

For this reason,  $F_n$  has been "demoted" to the rank of parameter (though it can be changed in different solutions of the model to determine the effect of a change in  $F_n$  on the predicted "feasible" area).

There is at present no government program designed to make transfers to the Kariobangi popular economy, nor is there any government investment in businesses or city services in the area.

In fact, I pursued the matter of setting up such a program for a site and service scheme to be established east of Kariobangi with a number of people in the Ministry of Commerce and Industry. It turns out that there is political pressure in that ministry to concentrate funding for such programs on rural programs. Given problems already caused by rural-urban migration, that may not be a completely unfortunate circumstance.

On the other hand, there are some kinds of private investment occurring. In particular, some African tailors in the area are receiving working capital from Asians in the city center. However, the scale of such investment is small. In any case,  $F_n$  is estimated, on the basis of personal observation, to be of insignificant importance and therefore the value of  $F_n$  used is  $F_n = 0$ .

$p$  - This is the rate of growth of the labor force. It is somewhat difficult to estimate because it depends on the success of the Kariobangi popular economy both in comparison to rural areas of Kenya and in comparison to other popular economies in Nairobi. Because of this dependence of  $p$  on the growth in  $Y$ , in some ways it would be preferable to determine  $p$  endogenously. This has not been done for at least two

reasons. First, such a change would make the model substantially more complicated, as well as making it more difficult to specify. This is undesirable because part of the usefulness of the approach being presented is its simplicity. Also,  $p$  appears only in constraint III. Because of surplus of labor in Nairobi, this constraint is unlikely to be significant in determining the actual growth of income of the popular economy. Therefore, in large part the level of  $p$  simply determines the expected level of unemployment in Kariobangi. In any case, a value of  $p$  of .15 is used. This compares with estimates for the rate of growth of population of Nairobi as a whole of between 7 and 11 percent.<sup>9</sup>

## Appendix C - Instrument Variables

The ranges established for the instrument variables are largely a matter of judgment. The following ranges have been chosen for each of the instrument variables.

$\alpha$  - This variable is the popular economy marginal propensity to save. It is assumed to take values between 0 and .05. This range is selected in a somewhat arbitrary way. However, as it turns out, the savings constraint is a relatively unimportant one in the case of Kario-bangi even if a community marginal savings rate as low as .05 is assumed.

$\epsilon$  - This variable is the rate of growth of exports of labor services. The lower limit of  $\epsilon$  chosen for this study is a zero rate of growth. This, hopefully, is a pessimistic assumption. There is no record of growth of the number of people with regular modern sector employment from particular low-income areas, but it seems a logical first approximation to estimate that individual areas retain their share of total modern sector employment over time, at least on average. In this case, growth of employment from particular areas will be the same as overall growth of wage employment which seems recently to have averaged approximately 3 percent.<sup>10</sup> A 12 percent rate of growth of export of labor services is the upper limit chosen. This compares to a rate of growth of output of 13.2 percent in manufacturing and repair, and of 13.2 percent in money economy activities other than agriculture, forestry and fishing.<sup>11</sup>

$u$  - This variable is the level of unemployment in the popular economy. A minimum level of .05 percent has been assumed. This level can be thought of as an optimistic "target" rate of unemployment, especially given the levels chosen for the other arguments in the employment

constraint equation. A maximum level of  $\nu$  of .30 has been assigned. This figure was chosen as a hoped-for maximum value.

$\mu_c$  - The final variable to be discussed is  $\mu_c$ --the import content of community consumption.

While  $\mu_c$  has been assumed to be an instrument variable, it is necessary to get some idea of its value in Kariobangi, as of 1970. This value was estimated using expenditure patterns for different expenditure groups, an estimate of the distribution of income by household in Kariobangi, and guesses about the percentage of expenditure in different categories which is made on goods and services produced in Kariobangi.

Table 1 presents an estimate of the percentage of households earning incomes in eight different income classes. This distribution is an average of three others prepared from three sets of data. The first is from data gathered in the Home Interview Study run by the Nairobi City Council (in collaboration with a private consulting firm) in 1970. The second is from a survey run by Nils Jorgenson of the Housing Research Development Unit in 1971 as cited in a paper written by K. J. Lewis for use by the Nairobi City Council. The third is from a small nonrandom ("informally stratified") sample survey run by Bruce Creager of the Architecture Department.<sup>12</sup> The final distribution is heavily influenced by my judgments about how to combine this information.

Table 1  
INCOME DISTRIBUTION - KARIOBANGI

Households in Income Group (shill./month)	Percent of Sample (Number of Workers)		Cumulated	
(1) 0 - 199	(99.5)	12	(349.9)	12
(2) 200 - 299	(249.5)	24	(789.9)	36
(3) 300 - 399	(349.5)	22	(724.1)	58
(4) 400 - 499	(449.5)	14	(460.8)	72
(5) 500 - 699	(549.5)	12	(294.9)	84
(6) 700 - 999	(849.5)	8	(263.3)	92
(7) 1000 - 1399	(1199.5)	5	(164.6)	97
(8) 1400 - 1999	(1699.5)	3	(98.7)	100
		3291.2		462.5
				Avg. Inc.

Assuming that the income distribution is as presented in Table 1, the next step is to determine the percentage of income in Kariobangi as a whole spent on goods and services in various expenditure categories. The obvious method is to use information about the percentage of income spent on goods and services in different expenditure categories as reported in data from the 1968-69 Urban Household Expenditure Study. Since the expenditure data is presented by the same income groups as used for the Income Distribution in Table 1, this information can be weighted using the above percentages.

Table 2 presents the percentage of income spent on different goods and services in Kariobangi estimated using this technique.

Table 2  
INCOME SPENT ON GOODS AND SERVICES

Expenditure Type	Percentage	Expenditure Type	Percentage
Food	37.4	Household durables	1.7
Clothing	4.3	Medical expenditures	.6
Housing	16.2	Toilet goods	.8
Transport	2.8	Recreation	.9
Savings	6.9	Cleaning and washing	1.0
Cash Gifts	7.2	School fees	4.5
Beverages	1.0	Miscellaneous	4.3
Drinks and tobacco	3.5	Taxes	3.5
Fuel, light and water	3.7		

It is estimated that 10 percent of the value added of goods purchased is value added at the retail level. It is further estimated that 90 percent of all expenditures on Food, Clothing, Beverages, Drinks and Tobacco, Fuel, light and water, Household durables, Toilet goods, Recreation, Cleaning and washing, Miscellaneous purchases, are made in the commercial sector in Kariobangi. (The 10 percent seems

reasonable since approximately 16 percent of the GNP produced in the private monetary sector is produced in the wholesale and retail sectors of the economy, and at least in Kariobangi the retailing function would seem likely to add more value to products being marketed than the wholesale function.) But if we assume that all workers in the retail establishments serving Kariobangi live in Kariobangi, then 5.27

percent of the income spent in Kariobangi is spent on services of Kariobangi residents. (Since the items enumerated amount to 58.6 percent of total expenditures by residents of Kariobangi, 90 percent of those expenditures are assumed made in Kariobangi, and it is assumed

that 10 percent of that total is earned by Kariobangi residents.)

We will also assume that 50 percent of the expenditures of Kariobangi residents on housing is made to other Kariobangi residents, 50 percent of the expenditure on drinks and tobacco is made on drink produced in Kariobangi (1.58) (notice we must avoid double counting the part of this expenditure which is a return to the retail sector in this case and several others below), 50 percent of the expenditures on clothing goes to Kariobangi tailors (1.93), 100 percent of expenditures on household durables is on goods produced in Kariobangi (1.53), 50 percent of expenditure on recreation is spent on goods and services provided by residents of Kariobangi (.41), 25 percent of expenditure on cleaning and washing is on services provided by residents of Kariobangi (.23), and 33 percent of expenditure on miscellaneous goods and services is on goods and services produced in Kariobangi by Kariobangi residents. Then we assume that 21 percent of the income spent by Kariobangi residents is on goods and services produced by Kariobangi residents. But then 79 percent of income spent is spent on goods and services "imported" into the Kariobangi economy.

Then  $\mu_c = 79.0$  percent approximately. This will serve as a maximum value of  $\mu_c$ . The lower value has somewhat arbitrarily been set at .60.



### Appendix Footnotes

<sup>1</sup>Nairobi City Council, Town Planning Section, unpublished results of the Home Interview Survey of 1970.

<sup>2</sup>The Jorgenson data is from: K. J. Lewis, "Income Distribution in Nairobi," Town Planning Section, Nairobi City Council, 1973. The Creager data is from unpublished results of a survey by Creager, who is a member of the Faculty of Architecture, University of Nairobi.

<sup>3</sup>Government of Kenya, Ministry of Finance and Planning, Central Bureau of Statistics, unpublished results of the 1968-1969 Urban Expenditure Survey.

<sup>4</sup>The Weisner data is from unpublished results of a survey done by Tom Weisner for the Child Development Research Unit, University of Nairobi.

<sup>5</sup>David Etherton, et al., Mathare Valley: A Case Study of Uncontrolled Settlement in Nairobi, Housing Research and Development Unit, University of Nairobi, 1970; and Brian Waters, "The Potential for Murram Blocks." Technical Paper E22, Nairobi Urban Study Group, August, 1973. Also involved was a survey by me of several contractors in Nairobi which attempted to gather information about the breakdown between labor and non-labor costs of construction for different types of projects, as well as a phone survey to collect information on costs of different construction materials, as of the spring of 1975.

<sup>6</sup>The census of businesses was run in the spring of 1974. It included a simple count of businesses of different types which were located in residential rooms, and the administration of a short questionnaire to all of the businesses found in the Kariobangi market.

<sup>7</sup>See Frank C. Child, "An Empirical Study of Small Scale Rural Industry in Kenya," Working Paper No. 127, Institute for Development Studies, University of Nairobi, November, 1973. The numbers actually reported here are from an as yet unavailable later draft of this work.

<sup>8</sup>See footnote 5.

<sup>9</sup>Statistical Abstract, Republic of Kenya, Central Bureau of Statistics, Ministry of Finance and Planning, 1973.

<sup>10</sup>Statistical Abstract.

<sup>11</sup>Economic Survey, Central Bureau of Statistics, Ministry of Finance and Planning, 1974.

<sup>12</sup>See footnotes 1 and 2, above.



