THE DEMAND FOR AN ILLEGAL COMMODITY: A CASE STUDY OF CHANG'AA CONSUMPTION IN NAIROBI'S MBOTELA ESTATE

BY

VINCENT SHITANDI OMUKOKO

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This Research Paper is my original work and has not been presented for a degree in another University.

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OMUKOKO, VINCENT SHITANDI

This Research Paper has been submitted for examination with our approval as University Supervisors.

DR. ALOYS B. AYAKO

DR. MOHAMMED S. MUKRAS

CONTENTS PAGE

CONTENTS PAGE

LIST OF TABLES

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ABSTRACT

Economic crime is an area which has been accorded low research priority but this trend is changing due to increasing awareness of the important role played by such activities in the provision of goods and services and the distribution of income within controlled and/or regulated economies. The underground economy under which all economic crimes fall, is a feature of virtually all economies the world over. In Kenya, it includes activities prohibited by law, such as the production and consumption of chang'aa.

The trade in chang'aa is not a new phenomenon in the Kenyan economy though substantive studies have not been conducted in this area. Most studies on chang'aa consumption have been carried out by sociologists and the purpose of this paper is to study such consumption from an economic point of view.

The study assumed that the probability of an individual consuming chang'aa and the amount consumed are determined by his socio-economic characteristics like age, sex, level of education, income etc and his perception of both the risk of arrest and the health hazardness inherent in chang'aa consumption. The probability was estimated using the modified version of the logit model while the demand for chang'aa was estimated by the ordinary least squares estimation method.

For this purpose, primary data was collected from a sample of 100 heads of household in Mbotela Estate, Nairobi.

A finding of particular importance was that an increase in the level of perceived risk of arrest for chang'aa consumption decreases the probability of an individual consuming chang'aa. Thus, there is scope for curbing chang'aa consumption through increased and improved law enforcement measures. Whether such measures would be cost-effective is another matter and as we argue at the end, maybe a revision of the Chang'aa Prohibition Act is in order.

CHAPTER I

INTRODUCTION

1.1. THE UNDERGROUND ECONOMY

The Chang'aa (Nubian-gin) market in Nairobi is just part of the underground economy in the city and it is thought to comprise the largest proportion of the trade in illicit liquor both in the city and the country at large.

The underground economy, also known as the 'Unofficial' 'Unobserved', 'Parallel' or the 'black' economy is a global phenomenon which extends from legal to criminal activities like chang'aa production and consumption, transacted outside the limits of the 'formal' or 'official' economy. One suggested proxy for the size or extent of the underground economy is 'the total of incomes earned, but not reported to the tax authorities or as the total of incomes not included in the national accounts.'[1]

Factors which create incentives for increased participation in underground economic activities are taxes, requlation of the economy, prohibition of certain activities, bureaucratic corruption and eroded confidence in government authoritiy.[2] The prohibition of any economic activity, e.g. the trade in chang'aa, increases transaction costs which hold down the quantity of the prohibited good (service) supplied to the market leading to an increase in the price, a decrease in the quantity of the product or both. The end result is to make the business more profitable for those willing to take the risks and rewarding for come corrupt law enforecement officers willing to keep the risk of apprehension and punishment low.

It has not been possible to make an accurate assessment of the magnitude of the underground economy in any country though it has been estimated that in the 1970's the proportion of the monetary underground sector to the gross national product averaged 15% in the United Kingdom, between 14% and 15% in Canada, 16% - 27% in the United States and 14% - 27% in West Germany.[3] These proportions are expected to be higher in less developed countries though actual statistics have not been estimated due to lack of reliable empirical data. This dearth of information has been attributed to low priority accorded research in this area[4] but it could also be due to the unrecorded nature of such activities.

In Kenya, 'pervasive requations'[5] of the economy has generated substantial incentives for illegal economic activities like the production of chang'aa.

At a macro level, undergdround economic activities in general, have several undersirable consequences on the economy. First, they lead to unequal distribution of income since net revenues generated by such activities almost certainly escape taxation. Second, they lead to the distortion of variables that are important in policy making which in turn lead to unrealiable forecasts of real growth, inflation and unemployment by macroeconomic models. Third, resources are misallocated due to reduced efficiency arising from the movement of resources from the official and, to some extent, planned economy to the underground.

When the underground economy expands faster than the official economy 'consumption and saving statistics will be distorted and macroeconomics forecasts would tend to become systematically biased, overpredicting real growth and underestimating inflation.'[6] The biases go in that direction because first, available resources are assumed to be utilized in legitimate and/or licensed production and second, price estimates are based on official and/or controlled prices.

Consequences of chang'aa consumption are discussed below (section 1.4). After seeing where the trade in chang'aa fits in the national economy, we now consider how it has evolved over time.

1.2: A HISTORICAL BACKGROUND OF THE TRADE IN CHANG'AA

The trade in chang'aa in Nairobi owes its existence to the lifestyle of urbanized Africans who were placed in the lowest income group by the unequal distribution of wealth during the colonial era.

In the 1950's and early 1960's cases of Africans being maimed or dying after drinking methylated spirits created a lot of concern for the colonial government which at times resorted to outright bans on the sale of such spirits in the country.[7] Apparently, raw industrial alcohol was the closest substitute to imported whisky and other bottled consumable spirits that most Africans could then afford or had access to since all commercial brewing of traditional 'pombe' was banned by the colonial administration.

Nubian-gin, a product of an indigenous 'pots and pans' technology, started gaining popularity among Africans in the mid 1950's and a decade/so later it had replaced /or methylated spirits as a major distillate consumed in African estates around Nairobi.

This illicit gin is produced and consumed in the three East African countries under different names e.g. 'enguli' or 'Waragi' in Uganda, 'Moshi' in Tanzania and 'chang'aa'in Kenya. Of the three countries only Uganda has legalized and regulated the trade in Nubian-gin. It is bottled by East African Distillery at Port Bell and sold under the brand name 'Uganda Waragi'. The reason for setting up this distillery was, it is worth noting, 'to produce cheap but pure spirit for the poorer people in order to counteract illegal distilling.'[8]

Tanzania's intention of legalizing the trade in 'Moshi' never took off the ground though the government's plans of doing so were explicity expressed in the country's parliament.[9] In Kenya, a motion calling on the government to legalize the production of chang'aa was defeated when put to the vote in parliament in 1972.[10]

Although the production of Nubian-gin was outlawed in 1953 it was not until the Chang'aa Prohibition Act came into effect in 1980 that its consumption was also made illegal.[11] But this only drove it underground where it seems to be flourishing if the number of reported raids on distilleries, arrests of dealers and public pronouncements by administrators and politicians is anything to go by.

1.3 TRANSACTORS

Poverty has often been cited as the major reason for producing and even consuming chang'aa and this may explain why in urban areas, such activities are concentrated in the poorer environs.[12] In Nairobi, the consumption of the gin is usually associated with people of a given socio - economic class; the low income group. The increased level of trade in chang'aa in the city and elsewhere could be attributed to the enlargment of this class both in absolute numbers and as a proportion of the population. On the other hand it is thought that the demand for the gin has moved upmarket due to inflation and/or because of tastes acquired by better off consumers when they had lower incomes.

The prohibition of the trade in chang'aa was probably based on a number of factors though they have not been explicitly stated.

1.4 UNDESIRABLE SOCIO-ECONOMIC EFFECTS OF CHANG'AA PRODUCTION/CONSUMPTION:

Chang'aa is considered unhygienic a factor which coupled with its portency, poses a health hazard to the country's human capital resource. Improperly distilled spirits have also been known to have fatal effects on consumers. Consumption of cheap illicit liquor like chang'aa deprives licenced liquor producers of sales thus depressing the amount of excise duty paid to the government. In fact the question of revenue was one of the most overriding reasons for placing an import ban on 'Uganda Waragi'. It was stated that the importation of this gin from Uganda would:

(a) have a serious effect on the annual revenue earned from high quality liquor imported from overseas.

(b) affect the production of Kenya's distillery which produced high quality gin and brandy.

(c) give many illegal distillers of Nubian-gin more opportunities to bottle their own product and in that way deprive the Kenyan Government of even more revenue.[13]

Economic planners saw the need to discourage the consumption of both legal and illegal liquor as indicated in Kenya's fourth Development Plan. in which it was stated that:

> A problem of particular concern to government is the changing pattern of family expenditure .....in many poor families limited incomes are dissipated on beer and chang'aa while children lack food, medical attention and parental supervision.[14]

In the document, the government committed itself to limiting the consumption of beer by decreasing the number of licensed drinking places and strictly enforcing the number of drinking hours. In the document, planners were decidely silent on what course of action to be taken against chang'aa. However, the subsequent legislation outlawing trade in the gin was in line with the above stated policy.

The observed ineffectiveness of policy and/or the established legal machinery in curbing illegal economic activities (in general) is probably due to lack of knowledge on the nature of such activities or else they have become entrenched in the economy and the trade in liquor more so that a policy reassessment on the part of governments is called for. This is a factor which can be determined best by theoretical and empirical studies of such activities including the demand for chang'aa.

1.5. THE RESEARCH PROBLEM

The trade in illicit liquor remains largely unexplored though it is thought to provide a livelihood for a large number of households especially in the major urban areas like Nairobi. At the same time it ties down resources which could be utilized in more directly productive activities (assuming of course that the opportunity cost of such resources is not zero). On the demand-side, chang'aa is a commodity whose consumption has inherent risks but these do not seem to have deterred its demand from increasing overtime.

From the foregoing, some researchable questions may be raised:

1. What is an individual'a perception of the risk of arrest posed by consuming an illegal commodity like chang'aa ?
2. Is there a perceived risk to his health that a chahg'aa consumer exposes himself to ?

3. How does the perception of the two risks determine an individual's propensity to consume chang'aa?
4. Does the propensity to consume chang'aa and the quantity consumed depend on an individual's socio-economic characteristics like age, sex, level of education, employment or lack of it, income etc.?

1.6. OBJECTIVES OF THE RESEARCH:

The study set out to fulfil three objectives.

1. To formulate an explicit demand function for chang'aa for a given community. An individual's demand for chang'aa is thought to depend on among others, his socio-economic characteristics like age, level of education, income tax etc.and the risk of arrest and the risk to his health posed by chang'aa consumption.
2. To use the model in (i) to estimate the likelihood of an individual in the given community to consume chang'aa.
3. To suggest policy measures with regard to chang'aa consumption.

1.7. JUSTIFICATION OF THE STUDY:

The importance of the demand-side analysis of the chang'aa trade is due to the noticeable ineffectiveness of legal and administrative efforts in curbing the trade by emphasizing supply-side related measures. Examples of such measures include raids and destruction of distilling 'factories' and heavier fines and longer-custodial sentences for producers and retailers.

An individual's perception of the risk of arrest and punishment would to a large extent determine whether or not he participates in illegal activity. Knowledge of the effect of this 'legal risk' factor is of importance in formulating preventive measures against such activities. It is to be expected that the higher the risk of arrest the lower the propensity to commit an offense. Thus the study of the individual's perception of the legal risk of drinking chang'aa and its significance in explaining his consumption behaviour would be helpful in evaluating the effectiveness and suitability of the prohibition against the gin.

The risk posed by chang'aa to consumers health can be used as a factor in deterring consumption of the gin by, say, highlighting it in public education campaigns against the gin. The effectiveness of such a campaign would depend on the significance of the 'health-risk' factor in explaining the likelihood of an individual consuming chang'aa. This study set out to determine how individuals perceive the effect of chang'aa on a consumer's health and whether it played a significant role in the choice of consuming or not consuming the gin.

The estimated demand function for chang'aa may be used for forecasting the level or magnitude of the trade which would in turn allow the estimation of amounts of inputs used and potential government revenue lost in the form of unpaid excise duty etc.

1.8. ORGANIZATION OF THE REMAINDER OF THE PAPER

The remainder of the paper is divided into five chapters. Chapter 2 which follows is devoted to the review of literature on crime and chang'aa consumption. Chapter 3 discusses alternative theoretical frameworks that can be used to study the research problems posed. The way the actual research was carried out in the field is contained in Chapter 4. The data collected is described and regression results analysed in chapter 5. Lastly, chapter 6 contains the summary and conclusion of the study.

NOTES

1. Tanzi, V. 'The underground Economy: The Causes and Consequences of this Worldwide Phenomenon in Finance and Development vol. 20 No. 4 December 1983 p.10.
2. Ibid p. 10 and,
   Feige, E.L. ' Macroeconomic Malaise and the Unobserved Economy.' An adaptation of 'A New Perpective on Macroeconomic Theory: Causes and Implications of the Unobserved Economy,'" a paper presented at the 1980 meeting of the American Economic Association and at the International Conference on Taxation at the Fraser Institute in Vancouver (Mimeo).
3. Ibid p. 57
4. Ayako, A.B. ' Parallel Markets and Development Policy in Kenya.' A discussion paper presented at the Kenyan Economic Association meeting on 29th August 1985 p.2.

5. Ibid p.e.

6. Feige op. cit

7. Such cases were reported in the 'East African Standard' newspapers of 26th October, 1955, 20th July, 1956 (p.7.) and 3rd August, 1959 p.5.

8. The 'E.A. Standard' newspaper of 16th January 1958 p.5.

9. The Tanzania minister for Economic Affairs and Development Planning issued an elaborate plan which included licensing, quality control and the probability of discouraging the importation of gin through high tarrifs. Reported in the 'E.A. Standard' newspaper of 27th May, 1966 p.7.

10. A lively debate on the motion was carried in the 'East African Standard' p.4. and 'Daily Nation' newspapers of 15th April, 1972.

11. The ban on the production, possession and consumption of chang'aa was contained in the Kenya Gazette supplement no. 49 of 15th August, 1980.

12. For example, the 'East African Standard' of 6th March, 1963 reported that about 300 women demonstrated in Nakuru town against police raids on their 'pombe' brewing activities which they claimed were their only source of income for paying rent and sending their children to school.

13. From a ministerial statement by the Minister of Commerce and Industry, reported in the ' Daily Nation' of 25th May, 1966.

14. Republic of Kenya, Development Plan. 1979-83 pp 16-17.

CHAPTER II

LITERATURE REVIEW

2.1. INTRODUCTION:

We are going to review general economic literature on criminal activity and Kenyan literature on chang'aa consumption. As far as is known, no economic study has been carried out on the demand for an illegal commodity. Therefore, the economic literature reviewed below focuses on the supply-side of illegal activity.

2.2. ECONOMIC LITERATURE ON CRIME:

Studies carried out on illegal activities have, in most cases, assumed that the offender engages in crime primarily for some economic gain. Such gain are evaluated vis-a-vis the expected returns from legal activities and time is allocated between the two activities accordingly. The probability of arrest and punishment, however defined, is thought to play a very important part in determining the level of illegal activity.

Becker (1964) considered crime an important economic activity or 'industry' which had been virtually neglected by economists.[1] He noted that an indirect indication of the growth of criminal activity in the United States since 1929 was the increase in the amount of currency in circulation despite urbanization, income growth and the increased use of credit cards and other credits. He attributed this to the use of cash as the main medium of exchange and due to the unrecorded nature of illegal transactions.

To determine the optimal level of criminal activity i.e. that at which the society minimizes social loss from offenses, the author developed a model which assumed that society has a 'social loss from offenses' L, function which denoted the total loss in real income from offenses

convictions and punishments. It was specified as follows:

$$L = D(o) + C(p,o) + bfo \quad \ldots\ldots\ldots\ldots (1)$$

Where:

o is the level of criminal activities

i.e. the number of offenses.

D is the net cost or damage to society from offenses.

C is the cost of apprehension and conviction.

p is the probability of apprehension and conviction.

f is punishment per offense.

bf is thus the social cost of an offense that is cleared by conviction.

Becker used the above model to analyse the social cost minimization problem, theoretically. He concluded that fines conserved resources, compensated society and punished offenders and they were thus preferable to probation, punishment and parole which were costly both to society and the offender.

This model can only be useful in studying illegal activities in which there are victims who incur losses but not such activity as trade in illicit liquor where it can be argued that both producers and consumers gain from the crime and any damages or losses (D(o)) are secondary to the commission of the offense.

Sjoquist (1973) postulated that criminals can be considered as rational beings who behaved in an economic manner that was not different to that of any individual making an economic decision under risk.

To test this hypothesis, he used the following model:

$$\frac{TC}{I} = ar^{b}P^{c}W^{d}L^{f}X^{g} \qquad \text{.....(2)}$$

Where:

TC is the total amount of time spent in illegal activities

I is the population of the community.

r is the probability of arrest, conviction and punishment.

P is the total cost of illegal activities (fines, loss of earnings etc).

W is the total gain from legal activity.

L is the total gain from illegal activity.

X is the index of variables which measure tastes.

a,b.c,d,f,g, are constants

The proxy for TC was the number of crimes against property (defined as robbery, burglary and larceny over $50) reported to the police. Sjoquist log linearized equation (2) and used United States data for regression purposes. He concluded from the results that an increase in both the probability of arrest and conviction and the cost of crime result in a decrease in the level of crime against property.

The limitation of Sjoquist's model to the problem to be studied is that offenses involving the consumption (and to a lesser extent production) of chang'aa are hardly, if ever reported. Thus, data on the dependent variable would be hard to come by.

Ehrlich (1973) developed a one period uncertainty model to theoretically analyse an individual's optimal participation in both legitimate and illegitimate activities. In participating in both legal and illegal activities, only two scenarios are possible; either an individual is apprehended and punished thus increasing the expected cost of illegal activity or he gets away with crime. Ehrlich assumed that an individual's aim is to maximize his utility which is non-decreasing in the net-returns from both legal and illegal activities hence, he allocates his time optimally between the two activities.

This model can be used to study the behaviour of a chang'aa producer who devotes an appreciable amount of time to the illegal task of producing the gin. The time a chang'aa consumer spends on its consumption may be relatively negligible.

Ehrlich went further and constructed the following behavioural model to explain the supply of offenses.

$$\frac{Q}{N} = a \left(\frac{C}{Q}\right)^{b} T^{d} W^{f} X^{g} (NW)^{h} e^{U} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Q is the number of offenses.
N is the number of people in the Community
C is the number of offenders imprisoned
T is the average time served by offenders in state prisons.
W is the median income of families below one-half the median income
X is the percentage of families below one half the median income.
NW is the percentage of non-whites in the population
U is the random disturbance term
a,b,d,f,g,h are constants

Ehrlich log linearized equation (3) for regression purposes and reached the conclusion that people who engage in crime respond to incentives in the same manner as those who engage in legitimate activity. He also found a positive relationship between income inequality and the rate of crimes against property. Law enforcement activity was found to have a deterrent effect that was in no way influenced by preventive effect of imprisonment.

Lack of data on chang'aa consumption cases (none are ever reported to the police) renders Ehrlich's behaviourial model inoperable in a demand side analysis.

Bhagwati and Hansen (1974) did a theoretical study of smuggling to determine the adverse welfare effects of the activity and conditions under which it may improve welfare. This study focuses on an illegal activity which can only be relevant in studying the effects of smuggling 'Uganda Waragi' into Kenya a situation which has not developed and hence warrants no attention.

Richter (1974) discussed the problems facing any research in assessing unrecorded foreign trade with particular reference to Indonesia but this study has the same limitations as the Bhagwati and Hansen one with regard to the study of the demand for chang'aa.

2.3. KENYAN LITERATURE ON CHANG'AA CONSUMPTION:

Studies carried out on chang'aa consumption in Kenya have been sociological in nature though some have dwelt briefly on the underlying economic factors which in a way have a bearing on the demand for the gin.

Ogutu (1976) obtained the following results, on why people consume chang'aa, from a sample of fifty consumers:

1. 46% of the respondents drank chang'aa for leisure to socialize, to 'escape' from problems and to induce sound sleep.
2. 20% drank the gin because they believed that chang'aa was panacea for malaria, headache, colds and sore throat.
3. 20% consumed it to steady their nerves for particular purposes.
4. 8% drank out of idleness i.e. they had no better alternative way to 'pass time'.
5. 6% consumed the gin because all their friends drank it.

All economic aspects pertaining to chang'aa consumption seem to have been overlooked in this study though they are not any less important.

Fransisca (1979) observed that chang'aa was preferred to other liquors by some consumers because it:

(a) made the consumer feel stronger.

(b) was considered safe since germs were thought to have been destroyed by the distillation process.

(c) was readily available

(d) was cheaper and non-bulky

(e) did not cause stomach upsets

(f) helped overcome colds

The noted cheapness of chang'aa explains why it is predominantly consumed by the low income group. Its lack of bulk ensures it can be consumed relatively fast thus saving time, and by implication, decreasing the risk of arrest.

The chang'aa producer in turn requires relatively little storage space (important in low income neighbourhoods where congestion is high) because bulkiness poses a problem of hiding or carrying an illegal commodity effectively.

Fransisca's study did not show the relative importance of the different advantages of chang'aa, a factor of importance in policy formulation.

Asikoya (1984)carried out a case study on the effects of chang'aa consumption on rural development and concluded that chang'aa consumers, when compared to non-consumers, were less likely to:

(a) undertake improvement of their land and livestock by using fertilizers and cattle-dip facilities.

(b) take an active interest in educating their children.

(c) save and undertake some form of investments or contribute to harambee projects:

The above observation can be explained by the fact that either chang'aa drinkers are a relatively poor lot since such undertakings require an income substantially over and above the subsistence level or the gin has a debilitating effect on limb and mind which distorts consumers' priorities.

2.4. OVERVIEW

Virtually no economic analysis has been done on the demand for illegal commodities in general and illicit liquor in particular. The reviewed economic literature mainly use econometric models to study the determinants of individual's participation in crime, the supply of offenses in given communities and to a lesser extent, illegal international trade. Such models dwell on crimes against property because such offenses have the following statistical advantages:

1. they provide adequate data on the level of such activity since crimes against property tend to be reported to the police and records kept.
2. they accord tangible measurable economic returns to the offender at the expense of the victim (or insurance company).

Offenses related to the production and consumption of such illicit goods as liquor and drugs (and services like prostitution) have a peculiar characteristic in that at transaction both parties gain. The producer earns an income while the consumer gains some utility. Such transactions thus pose a problem of determining the 'losers' because the 'victim' of the offense, if he can be so called, is himself an offender who, it can be argued, is the best judge of his own welfare. In most cases the consumer is aware of the transaction costs (which include the expected cost of arrest and punishment) arising from the illegality of the good and the possible health hazard inherent in a consumer good not subjected to any quality controls by a benevolent authority i.e. the government.

The major point of departure between the above reviewed studies and this one is that the former deal with the supply of offenses and their effect on economic or social welfare while the latter focuses on the demand side of an illegal activity i.e. the consumption of an illegal commodity.

Sociological studies reviewed above attempt to explain factors which have a bearing on chang'aa consumption without considering factors which influence non-consumption.

This can only be done by a cross-sectional study of both consumers and non-consumers as this research set out to accomplish.

Alternative theoretical and econometric models for the demand for an illegal commodity such as chang'aa are the subject of the next chapter.

Notes:

1. Becker attributes this neglect to the general belief that a criminal activities were too immoral to merit serious study.

CHAPTER III

THEORETICAL FRAMEWORK

3.1. INTRODUCTION:

The study assumes that individuals have a notional demand for chang'aa which is not necessarily realized or demonstrated in the market.[1] This assumption is supported by the observation that there was a dramatic increase in demand for chang'aa when Kenyans were assured that it was (then) legal to consume it.[2]

An individual makes a dichotomous choice of either consuming or not consuming chang'aa depending on a number of factors and the probability of this choice being made can be determined by the use of a discrete choice model.[3]

3.2. THEORETICAL AND ECONOMETRIC MODEL SPECIFICATION:

Discrete models are used to determine the probability of an event occuring or not occuring e.g. determining whether an individual will consume chang'aa or not. In dischotomus choice models the dependent variable is assigned a value of one if the event occurs and zero if it does not. The probabilit of occurence depends on one or more explanatory variables.

Univariate dischotomus models, with regard to chang'aa consumption can be expressed in the following general form.

$$P_i = P(Y_i = 1) = F(X_i B) \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Where:

P_i is the probability of an individual consuming chang'aa.

Y_i is a dummy variable: $Y_i = 1$ if the individual consumes chang'aa and $Y_i = 0$ if he does not.

X_i is the vector of independent variables.

B is the vector of unknown parametres.

Such models take different explicit forms which are briefly discussed below.

3.2.1. EXAMPLES OF PROBABILITY MODELS

(i) The linear probability (LP) model:

$$P_i = F(X_iB) = X_iB \quad \ldots\ldots\ldots\ldots(2)$$

The LP model has analytical limitation in that X_iB does not necessarily lie between 0 and i which should be a must for any probability. This problem is corrected by imposing the following constraint:

$F = 1$ if $F(X_iB) > 1$

$F = 0$ if $F(X_iB) < 0$

These constraints result in unrealistic kinks as limits 0 and 1 are approached.

The LP model is mainly used for preliminary results.

(ii) The Probit Mode

$$P_i = F(X_iB) = \int_{-\infty}^{Y_i} \frac{1}{2\pi} e^{-\frac{1}{2}U^2} \, du \quad \ldots\ldots\ldots(3)$$

Where

$$Y_i = X_iB + u_i$$

The probability function used for the probit model is the standard normal distribution function, symmetric around 0 bounded between 0 and 1 and having a variance of 1.

(iii) The Logit Model:

Assuming that constant changes in X_i's will result in relative changes in P_i (see function (1) then log P_i and by implication log $(1-P_i)$ can be expressed as linear functions of X_i's.

$$\text{Log } P_i = X_i A + E_i \ldots\ldots (4)$$

$$\text{Log } (1 - P_i) = X_i C + e_i \ldots (5)$$

Where A and C are vectors of unknown parameters and e_i and E_i are vectors of error terms.

By virtue of (4) and (5), log P_i / $(1 - P_i)$ can be expressed as a linear function of X_i.

$$\text{Log}\frac{P_i}{1 - P_i} = X_i B + U_i$$

Solving for P_i

$$\frac{P_i}{1 - P_i} = e^{Y_i} \qquad \text{Where } Y = X_i B + U_i)$$

$$P_i = e^{Y_i} - e^{Y_i} P_i$$

$$P_i = \frac{1}{1 + e^{Y_i}}$$

Which is the logit model

The parameter B in the logit are estimated by the method of maximum likelihood estimation.

The probability function of the logit model is a logistic distribution function symmetric around 0 and bounded between 0 and 1 and having a variance of $\frac{\Pi^2}{3}$. Hoever a transformed logistic distribution:

$$\frac{e^{1.6Y}}{1+e^{1.6Y}}$$

has been found to closely approximate the standard normal distribution with a mean 0 and variance 1. Probit and logit models are statistically similar and they yield more or less the same results except in cases where data is densely distributed in the tails.

Whereas the reviewed models can be used to determine the probability of an individual consuming chang'aa they cannot be made flexible enough to formulate a demand function for chang'aa. Hence there is need for a more flexible analytical model such as Tobin's normit (Tobit) model.

3.2.2. THE EMPIRICAL MODEL

Suppose the demand function for chang'aa is a linear regression model:

$$Q = \theta_o + \theta_1 X_1 + \theta_2 X_2 + \ldots\ldots \theta_n X_n + E \ldots\ldots (8)$$

Where:

Q = Quantity of chang'aa consumed

X_i = explanatory variables

E = a random term

The dependent variable will only be observed for $Q > 0$ i.e. where there are no limit responses, the limit being zero.

Thus the model will be;

$Q = \theta_0 + \theta_1 X_1 + \ldots\ldots\ldots\ldots\ldots\theta_n X_n + E$ if

$\theta_0 + \theta_1 X_1 + \ldots\ldots\ldots\ldots\ldots\ldots + \theta_n X_n + E > 0$ or

$E > -(\theta_0 + \theta_1 X_1 + \ldots\ldots\ldots\ldots\ldots + \theta_n X_n)$ and

$Q = 0$ if otherwise

Assuming that E is normally distributed with a mean zero and variance σ^2 the MLE method can be used to estimate the parameter using the Tobit model:[4]

$$L(\theta,\sigma) = \prod_1 \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{2\sigma^2}(Q_i - \theta' X_i)^2\right] \prod_2 \left[\int_{-\infty}^{0} \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{2\sigma^2}(Q_j - \theta' X_j)^2\right] dQ\right] \quad \ldots\ldots(9)$$

The first term with i subscripts denotes consumption for which $Q > 0$ and the second term with j subscripts denotes observations for which $Q = 0$.

The above equation is a non-linear joint cumulative probability function which will be maximized to determine the parameters - which will in turn be substituted into equation (8) to form regression equation for chang'aa demand that is expected to be free of the limit response.

The likelihood of an individual consuming chang'aa will be determined once the values of parameters and the variance are known.

Variables to be used in equation (9) are as follows:

1. Q - Quantity of chang'aa consumed in litres
2. X_1 - Price per litre in Kenya Shillings.
3. X_2 - Age in years.
4. X_3 - Dummy variable: X_3 = 1 if person is male
   = 0 otherwise

5. X_4 - Dummy variable: X_4 = 1 if person is married.
6. X5 - Number of years of formal education.
7. X6 - Dummy variable: X_6 = 1 if the house has a radio.
   = 0 otherwise
8. X7 - Dummy variable: X_7 = 1 if the house has electricity.
   = 0 otherwise
9. X_8 - Dummy variable: X_8 = 1 if the person is employed.
   = 0 otherwise
10. X_9 - Income in Kenya Shillings per month.
11. X_{10} - Number of dependants.
12. X_{11} - Level of perceived risk of arrest inherent in the act of chang'aa consumption.
13. X_{12} - Level of perceived hazardness of chang'aa consumption to a consumer's health.
14. X_{13} - Dummy variable: X_{13}= 1 if the person knows someone who has been adversely affected by chang'aa consumption or 0 Otherwise.
15. X_{14} - Dummy variable: X_{14}= 1 if source of chang'aa in Nairobi is known or 0 Otherwise.
16. X_{15} - Dummy variable: X_{15} = 1 if other liquors apart from chang'aa are consumed or otherwise

See Appendix II for detailed coding and measurements of variables. Data sources and methodology for collecting data on the above variables will form the subject of next chapter.

NOTES:

1. The concept of notional (as opposed to realized) demand, supply and income is explained in Clower, R' 'The Keynesian Counter-revolution: A Theoretical Appraisal' in The Theory of Interest Rates, by Hahn, F. H. and Brechling, F.P.R. (editors) MacMillan/St. Martins press, New York 1966) pp.103-175.

2. On 2nd May, 1978 the Attorney General informed parliament that the consumption of chang'aa, though hazardous was not illegal. Reported on the front pages of both the 'Daily Nation' and the 'Standard' newspaper of 3rd May, 1978. Three days later the 'Standard' reported on its front page that it had carried out a survey which showed that the drinking of chang'aa had tripled after the A.G.'s statements. This was an indication that either individuals whose notional demand for chang'aa was previously unobservable was now realised/observable or else 'veteran' consumers were drinking much more.

3. The section on discrete choice models is mainly drawn from (a) Amemiya T. 'Qualitative Response Models: A Survey' in Journal of Economic Literature Vol. xix (December 1881) pp. 1423 - 1536 and (b) Wonnacott R.J. and Wonnacott T. H. Econometrics (John Wiley and Sons, New York 1979.)

4. As illustrated in Madalla, G. S. Econometrics (McGraw-Hill Book Co. New York 1977) pp. 163.

RESEARCH METHODOLOGY

4.1. DATA SOURCES AND DATA TYPE

The study obtained primary cross-sectional data from respondents by means of direct interviews using prepared questionnaires. A simple random sample of 100 dwelling units in Nairobi's Mbotela Estate was chosen by means of random number tables. In each dwelling unit sampled the respondent was the head of the household, here defined as the leader of a family (nuclear or extended) or a group of families living collectively in one house. On average, such a person is the main, if not sole, income earner of the household, makes major expenditure decision and is the formal occupant of the family dwelling unit.

The head of the household was chosen as the respondent because he/she was expected to provide complete responses in that more often than not he/she would:

(a) Be over 18 years of age, the lower age limit for purchasing liquor legally and the upper limit for juvenility.

(b) Have completed his/her formal education.

(c) Be able to make independent consumption choices.

Primary data was collected from each respondent on the following variables.

1. Personal characteristics

(a) Age.

(b) Sex.

(c) Marital Status.

(d) Years of formal education.

(e) Employment status.

(f) Type of employer.

(g) Income.

(i) Types of Liquor, if any, consumed.

2. The household characteristics:

(a) Ownership of a radio.

(b) Accessibility to electric power.

3. Chang'aa consumption characteristics:

(a) Present and past consumption of chang'aa.

(b) Perception of the risk of arrest inherent in chang'aa consumption.

(c) Perception of the health hazard of chang'aa consumption.

(d) Knowledge of sources of chang'aa in Nairobi.

(e) Knowledge of others adversely affected by chang'aa consumption (per se)

(f) Distance to the nearest sources of chang'aa in Nairobi.

(g) Transport costs to such sources.

(h) Frequency of chang'aa consumption in a week.

(i) Quantity (in litres) of chang'aa consumed in a week.

(j) Expenditure on chang'aa in a week.

(k) knowledge of legal penalties in fines and custodial sentence for chang'aa consumers.

(l) The proportion of income spent on chang'aa as opposed to other liquors.

4.2. JUSTIFICATION OF THE STUDY AREA:

As had already been mentioned, this study is based on Mbotela estate in Nairobi. The choice of this study area was based on various considerations.

First, Mbotela is one of the older estates of Nairobi which during the colonial era was an exclusively African residential area. As mentioned above, the drinking of illicit liquor during this period was largely confined to African estates. It would be expected that the consumption of chang'aa in this particular estate has a long historical tradition.

Second, the area has experienced the development of modern dwelling units and an influx of new residents since the early 1970's a phenomenon which makes the inhabitants of the estate truly heterogeneous in terms of types of employment, incomes, consumer tastes, cultural backgrounds etc.

Finally,with a few exceptions, Mbotela estate can generally be classified as a low income area, going by the type of dwellings.

4.3. SAMPLING STRATEGY

Except for the city commission rental houses and Government Quarters the list of dwelling units in the study area was not readily available. This was compiled by the author.

The number of dwelling units totalled 2,898 a figure which excludes lodgings, unoccupied houses (there were several blocks being renovated or awaiting demolition) and guest houses. All dwelling units are located either in a block or in a series of identical blocks containing between 4 units per block and 904 units per series of blocks. Each block (or series of identical blocks) was assigned a numbered cataloque card and the number of people in the blocks noted on the card. After calculating the total number of dwelling units, each unit was assigned a unique number ranging from 1 to 2,898. For example, Nairobi City Commission numbers 1A was assigned No. 1, 1B assigned No. 2,2A assigned No. 3 etc. At the other end, house number 5 of Block 4844/123 on Mwea Road was assigned No. 2,897 and numbers 6 of the same block assigned the last number 2,898.

Generally, the dwelling units can be categorized as follows:

TABLE 1: DWELLING UNITS IN MBOTELA ESTATE (NAIROBI) BY CATEGORY OF OWNERSHIP

1 ZONE	2 OWNER	3 NO. OF UNITS	4 % OF TOTAL	5 % OF SAMPLE
1	GOVERNMENT OF KENYA	378	13.04	13
2	KENYA POSTS & TELECOM CO.	469	16.11	14
3.	NAIROBI CITY COMMISSION	939	32.40	39
4.	PRIVATE COMPANIES & INDIVIDUALS	1,114	38.40	34
	TOTAL	2,898	99.99	100

A simple random sample of 100 units was chosen using random number tables and their distribution is shown

in column 5 of Table 1, above.

This sampling design was used because the sampling units were not related to the units of analysis in such complex a manner as to require multi-stage sampling and neither was the sample and/or its residents so structured as to have an economic basis for stratified sampling. Simple random sampling was thus expected to yield a truly representative sample.

4.4. DATA COLLECTION STRATEGY:

Collection of data was carried out between 13th and 20th February (both days inclusive) between 6 and 9.30 p.m. on weekdays and between 2 and 6 p.m. on two weekend days using questionnaires (see Appendix 1).

Information was sought on, inter alia, whether a respondent consumed or did not consume chang'aa. If he/she was a consumer the author further sought to know the number of times the respondent bought chang'aa and the quantity consumed in the seven days immediately prior to the date of interview. A week was perceived as not too long a period for a respondent's memory to be blurred about his/her consumption pattern and not too short for some regularly consumed good not to have been consumed.

Given the dates of the research the relevant period of consumption would therefore be between 6th and 19th. This period is assumed to represent the fortnight (give or take away two days) in any given month when consumption expenditure on a commodity not bought in bulk is regular for an average 'end-of-the-month-income-earning' individual. For such an individual, consumption is relatively high before

the 6th of a given month and relatively low after the 19th (or approximately the third week) of the month. This observation is poignantly reflected in the sales of licensed liquor which seem to be very high during the former period and very low during the latter.

For the data collection exercise the author obtained the services of a well-known resident of the study area who possessed ample knowledge of the area and its residents.

The first area to be covered was zone 3 (see table 1 above) which contains Nairobi City Commission houses. For this purpose, three more assistants were recruited using the following criteria.

1. Ability to communicate well and translate the questions in the questionnaire from English to Kiswahili (and vice-versa for answers) with relative ease and clarity.
2. Familiarity within the community i.e. all were residents of this particular zone.
3. Lastly, they could all be classified as chang'aa consumers and hence there was a probability that they had at one time or another come face to face with some of the consumers at retailing outlets.

The second criterion was expecially important when the research was carried out at night because this particular zone had no electric lights either in the streets or in houses. The last aspect was an asset while interviewing consumers because the familiar face (in some cases) of a fellow drinker would put the respondents at ease and this helped in yielding reliable responses.

After familiarizing themselves with the questions and how to note answers, all four assistants were given a practical demonstration of interviewing before being allocated dwelling units.

The author was accompanied by a local resident who acted as an informant because of his familiarity with the layout of the area, and numbering of dwelling units and was in turn known by the occupants.

After Zone 3 the author and one assistant collected data from respondents in most zone 4 and minor parts of of zones 1 and 2. Most of the housing blocks in zone 4 contain 3 or less dwelling units in the sample so the author was able to closely supervise his assistant and more effective use of informants made. An extra assistant was employed when the rest of the area was covered. Houses in zones 1 and 2 are grouped together and each zone fenced off. Each interviewer would be allocated a number of houses to visit and assigned an informant to accompany him.

The main criterion for choosing an informant was his familiarity with and to the would-be respondents while his main task was to introduce the interviewer to the respondents and to request their cooperation in the whole exercise. Such an introduction was deemed essential for allaying any fears or suscpicion on the part of respondents so as to elicit truthful responses.

In most cases where informants were not used and assistants were not familiar to respondents, it took a lot of explanation and persuasion before information could be elicited.

Respondents were assured that any information given would be treated in strict confidence and their anonymity was guaranteed in that neither names nor house numbers were noted on the respective questionnaires.

After collection, the data was coded, tabulated and then analysed. Data analysis is discussed in the next chapter.

CHAPTER V

DATA DESCRIPTION AND ANALYSIS

5.1. INTRODUCTION:

We set out to interview 100 heads of households residing in dwelling units in the sample. Only ten of these respondents were not available during the research period. De facto heads of these households namely, persons who were for all intents and purposes the heads in the absence of the actual heads, were interviewed. Thus our data description and analysis will be based on the data obtained from both actual and defacto heads of households i.e. 100 respondents.

It is noteworthy that information on some variables notably age and price was either inaccurate or incomplete. First, for the old and illiterate the recorded ages were based on information on national identification cards but this was sometimes disputed by respondents. For example one man who did not know his date of birth claimed that ID card registration clerks assessed his age, which was 57 years at the time of interview, by just looking at him. He insisted that he was not yet 53 years old though he seemed to be, at least, 60 years old.

Secondly, the price of chang'aa was calculated from the information given on the quantity of chang'aa bought and consumed. Thus, it was possible to calculate the price for only those who had made purchases of the commodity during the relevant period.

Lastly, the distance to various sources of chang'aa could only be recorded for those respondents who knew where the gin was obtainable.

5.2. DATA DESCRIPTION:

24% of all respondents were currently consuming chang'aa and 71% of these consumers had consumed the commodity in the seven days prior to the interview. Again, 24% of the respondents had at one time or another consumed (or tasted) chang'aa. Thus, 52% of the respondents had never tasted the gin..

This proportion of chang'aa consumers is lower than expected, a priori, given the characteristics of the sample area. The low proportion could be attributed to several factors including the following:

1. No chang'aa is produced in the area. Prices tend to be lower in production areas and the risk of arrest is less.
2. The influx of new relatively better off residents in recent years and the decrease in the population of 'first generation' residents who may have developed a taste for chang'aa during the colonial period.
3. Inflation and lower real incomes per head. Some middle-aged and older respondents who used to consume chang'aa claimed they had stopped consuming all types of liquor due to the rising cost of living and especially the cost of educating their children.

Most of the respondents were male (81%) married (77%) and employed (89%). A relatively small proportion of households in the sample (32%) had access to electric power though a majority of them (72%) had a radio (See Table 2 below).

TABLE 2: THE DISTRIBUTION OF RESPONDENTS BY VARIOUS DICHOTOMOUS VARIABLES

	VARIABLES	% OF ALL RESPONDENTS
1.	SEX-MALE RESPONDENTS	81
2.	MARITAL STATUS - MARRIED RESPONDENTS	77
3.	EMPLOYMENT - RESPONDENTS WITH JOBS	89
4.	RESPONDENTS WITH KNOWLEDGE OF PEOPLE ADVERSELY AFFECTED BY CHANG'AA CONSUMPTION	49
5.	RESPONDENTS WITH KNOWLEDGE OF SOURCES OF CHANG'AA	72
6.	RESPONDENTS WHO CONSUME OTHER LIQUORS APART FROM CHANG'AA	54
7.	RESPONDENTS WHO HAVE AT ONE TIME OR ANOTHER CONSUMED CHANG'AA	48
8.	RESPONDENTS WHO CURRENTLY CONSUME CHANG'AA	24
9.	HOUSEHOLDS WHICH HAD	
10.	RADIOS	72
11.	ACCESS TO ELECTRICITY	32

Most of the respondents (72%) knew where chang'aa could be obtained in Nairobi and marginally less than half of the respondents (49%) personally knew of people who had been adversely affected by chang'aa consumption per se. Over half of the respondents (54%) consumed liquor apart from chang'aa while only 2% consumed chang'aa exclusively.

On average, the head of household in Mbotela is 35 years old, has had 7½ years of formal education has seven dependants and an income of between KShs.1,001 and 1,500 per month (see table 3 below). Average attributes can be misleading because of high variations from the means especially with regard to income, number of dependants, years of formal education and to a less extent, age. These disparities are brought out in the frequency distribution tables discussed below.

TABLE 3: MEASURES OF CENTRAL TENDENCY AND VARIATION OF SOME ATTRIBUTES OF RESPONDENTS:

VARIABLE	MODE	MEAN	STD. DEV	COEFFICIENT OF VARIATION
1. AGE (YEARS)	28	34.8	11.8	.34
2. FORMAL EDUCATION (YEARS)	11	7.5	4.1	.55
3. NUMBER OF DEPENDENTS	3	6.8	4.6	.68
4. INCOME (KSHS. PER MONTH)	1,250.5	1,330	955	.71

The mode is less than the mean for age, number of dependants and income which indicate that the distribution of respondents by these variables are all positively skewed while the distribution of respondents by years of formal education is negatively skewed given that the mean is less than the mode.

TABLE 4: DISTRIBUTION OF RESPONDENTS BY AGE GROUPS

AGE GROUP	% OF TOTAL	CONSUMERS AS A % OF TOTAL	% OF CONSUMERS
1. 18-28 years	40	10	41.6
2. 29-39 years	31	9	37.5
3. 40-50 years	16	4	16.7
4. 51-61 years	12	0	0
5. 62 years and over	1	1	4.2
TOTAL	100	24	100.0

A majority of households in the study area were headed by people under 40 years of age (see Table 4 above). In fact 56% of respondents were below the average age of 35 years. The oldest respondent was a 64 year old male consumer while the youngest was an 18 year old female who had never tasted chang'aa.

The distribution of consumers by the age group tended to conform to the distribution of all respondents except the 51 - 61 years group for which there were no consumers.

15% of respondents never had formal education while only 3% had post secondary schooling (see Table 5 below).

TABLE 5: DISTRIBUTION OF RESPONDENTS BY YEARS OF FORMAL EDUCATION

LEVEL OF EDUCATION	YEARS	% OF TOTAL	CONSUMERS AS A % OF TOTAL	% OF CONSUMERS
1. NONE	0	15	3	12.5
2. PRIMARY	1 - 7	28	6	25.0
3. SECONDARY	8 -11	54	13	54.2
4. HIGH SCHOOL	12 -13	2	1	4.2
5. UNIVERSITY	14 and over	1	1	4.2
TOTAL		100	24	100.1

Of the 3 respondents who had post secondary education 2 were current chang'aa consumers (of which one was a University graduate) while the other had consumed it, at least once, before. There were more respondents with a least secondary education and this was true for consumers too.

Generally, the distribution of consumers by level of education bears similar characteristics to that of the whole sample.

More than half of all respondents were permanently employed by the private sector while only a few were employed casually (see Table 6 below). The public sector, here defined as the central and local government, was the second major employer.

TABLE 6: DISTRIBUTION OF RESPONDENTS BY TYPE OF EMPLOYMENT:

TYPE OF EMPLOYMENT	% OF TOTAL	CONSUMERS AS A% OF TOTAL	% OF CONSUMER
1. By Private firm	52	14	58.3
2. By Public Sector	19	3	12.5
3. Self-Employment	11	2	8.3
4. Casual Employment	7	3	12.5
5. Unemployed	11	2	8.3
TOTAL	100	24	99.9

A relatively higher proportion of the casually employed and those employed by private firms consumed chang'aa while the reverse could be said of public employees and the self-employed. Some explanation may be offerred. First, of all workers, casual employees earn the least(on average) and chang'aa could be the liquor that most of them can easily afford. Second, most self-employed people in such a low income area engage in income generating activities like hawking, running Kiosks, Jua Kali garages, carpentry etc. which require face to face interaction with customers. Such activities are also carried out at hours including and extending beyond the normal 8 a.m. - 5 p.m. schedule, seven days a week. Thus the consumption of chang'aa may be incompatible with a self-employed person's means of earning a livelihood. Third, Public service employees may be, generally, more law abiding.

The highest recorded number of dependants was 20 though 81% of all respondents had less than 11 dependants (see Table 7 below).

TABLE 7:- DISTRIBUTION OF RESPONDENTS BY NUMBER OF DEPENDANTS

NUMBER OF DEPENDANTS	% OF RESPONDENTS	CONSUMERS AS % OF ALL RESPONDENTS	% OF CONSUMERS
1. 0 -	11	3	12.5
2. 1 - 5	30	8	33.3
3. 6 - 10	40	10	41.6
4. 11 - 15	14	3	12.5
5. 16 - 20	5	0	0
TOTAL	100	24	99.9

On average, chang'aa consumers had less dependants than all the respondents and the highest number of dependants of a consumer was 12. In a number of cases respondents were either staying with just a few of their dependants or none at all. This trait was most noticeable among middle-aged or old respondents with large numbers of dependants.

As indicated in Table 3 above, the average income of all respondents ranged between KShs. 1,0001 and 1,500 per month but there were wide variations from this mean (see Table 8 below).

92% of all respondents earned less than KShs. 2,501 per month while only 3% of the respondents earned over KShs. 4,500. All the top (3%) income earners were chang'aa consumers and the highest earner also consumed the largest amount of chang'aa over the specified time period.

TABLE 8: DISTRIBUTION OF RESPONDENTS BY INCOME CATEGORIES

INCOME CATEGORY KSHS/IN MONTH	MEDIAN INCOME (KSHS)	% OF RESPONDENTS	CONSUMERS % OF TOTAL	% OF CONSUMERS
1. 0 - 500	250.0	17	2	8.3
2. 501 - 1000	750.5	20	7	29.2
3. 1001 - 1500	1250.5	31	7	29.2
4. 1501 - 2000	1750.5	19	3	12.5
5. 2001 - 2500	2250.5	5	2	8.3
6. 2501 - 3000	2750.5	2	0	0
7. 3001 - 3500	3250.5	2	0	0
8. 3501 - 4000	3750.5	1	0	0
9. 4001 - 4500	4250.5	0	0	0
10. 4501 - 5000	4750.5	2	2	8.3
11. 5001 and over	5250.5	1	1	4.2
TOTAL		100	24	100.0

As noted above, the distribution of respondents by income is positively skewed.

Given the above distribution our classification of the study area as a low income one seems valid.

TABLE 9: DISTRIBUTION OF RESPONDENTS BY PERCEIVED RISK OF ARREST

LEVEL OF RISK	% OF TOTAL	CONSUMERS AS % OF TOTAL	% OF CONSUMERS
1. NO RISK	5	1	4.2
2. A SLIGHT RISK	12	3	12.5
3. A HIGH RISK	47	13	54.2
4. A VERY HIGH RISK	36	7	29.2
TOTAL	100	24	100.1

From Table 9 above, only 5% of all respondents perceived no risk of arrest inherent in the act of consuming Chang'aa. Most consumers as well as non-consumers of chang'aa perceived that there was a high risk of arrest.

A majority of respondents (72%)perceived chang'aa consumption to be very hazardous to a consumer's health (see Table 10 below). A few chang'aa consumers contended that, contrary to public opinion, the gin has some positive effects on a consumer's health if it is taken in Moderation.

TABLE 10: DISTRIBUTION OF RESPONDENTS BY PERCEIVED HAZARDNESS OF CHANG'AA CONSUMPTION

LEVEL OF HAZARD	% OF TOTAL	CONSUMERS AS % OF TOTAL	% OF CONSUMERS
1. NOT HAZARDOUS	9	5	20.8
2. HAZARDOUS	19	8	33.3
3. VERY HAZARDOUS	43	10	41.6
4. EXTREMELY HAZARDOUS	29	1	4.2
TOTAL	100	24	99.9

A higher proportion of consumers (20.8%) thought that chang'aa consumption was not hazardous to a consumer's health than did the proportion of all respondents (9%) who held the same view. At the other end, 29% of all respondents considered Chang'aa consumption to be extremely hazardous to a consumer's health as opposed to 4.2% of consumers who shared the same sentiments. Hence, concern for one's health may have a deterring effect on chang'aa consumption.

Many respondents especially the older generation tended to link the hazardous effects of chang'aa consumption with the lack of a proper diet on the part of most consumers. They observed that those adversely affected by chang'aa consumption tended to waste away before some of them died.

In general, the hazardous effects of chang'aa consumption can be attributed either to the fact that most consumers are so poor that they cannot afford a proper diet (which makes for worsened health) or that chang'aa consumption acts as a de-appetizer which puts most consumers off (adequate) food, with dire consequences.

61% of respondents who knew of particular people who had been adversely affected by chang'aa consumption claimed that the victim(s) died as a result of consuming the gin. Apart from death, the other often cited adverse effect of chang'aa consumption was loss of weight and weakening of the body, a development linked, by some, to poor dietary habits.

Although quite a number of respondents professed to know the maximum legal penalty for being convicted of chang'aa consumption, none gave the correct sentence, either custodial or in fines.[1] However, most stated that, generally, a convicted producer or dealer receives a more severe punishment than does a consumer.

In any given month, 54% of chang'aa consumers spend less on chang'aa than on other liquors, 21% spend more on chang'aa and 25% could not determine their comparative expenditure on chang'aa and other liquors. These figures lend credence to the observation that chang'aa is a relatively cheap liquor but they are not conclusive at all.

We will now briefly discuss the difference in means of several variables for consumers and non-consumers of chang'aa. This information is summarized in Table 11 below.

TABLE 11: A SUMMARY OF RESULTS OF THE TESTS OF HYPOTHESES OF DIFFERENCES BETWEEN MEANS

	CONSUMERS (=24)			NON-CONSUMERS (=76)				
1	2	3	4	5	6	7	8	9
VARIABLE	MEAN	STD.DEV	3/2	MEAN	STD.DEV.	6/5	2/4	T-STAT.
AGE IN YEARS	33.5	10.09	.30	35.26	12.29	.35	-1.76	-0.705
FORMAL EDUCATION YEARS	8.25	4.20	.51	7.25	4.06	.56	1.00	1.024
NUMBER OF DEPENDANTS	5.92	3.84	.65	7.16	4.78	.67	-.124	-1.298
INCOME (KSHS.MONTH)	1,625	1,377	.82	1,237	761	.62	378	1.336

On average, a chang'aa consumer is younger than a non-consumer by about 1.75 years, has had one extra year of formal education, has one less dependant and earns about 31% more income. But none of these differences in means is statistically significant from zero at the 95% level of confidence. Relative variations from the means as shown by coefficients of variations (columns 4 and 7 for consumers and non-consumers respectively) tend to be slightly higher for non-consumers in all variables except income.

Incomes of consumers vary greatly from the mean and this can also be deduced from the positively skewed distribution of income (see Table 8 above) which shows that about 68% of all consumers earn less than the average income (of all respondents).

Viable conclusions on the determinants of the propensity to consume chang'aa can only be arrived at after regressing the variables. Analysis of regression results is the subject matter of the following section.

5.3. ANALYSIS OF REGRESSION RESULTS

5.3.1. INTRODUCTION

Owing to computer hardware and software problems, the Tobit model specified in Chapter 3 was not estimated. However, a modified version of the logit model was estimated, the results of which we present and discuss in this chapter. Given the logit function;

$$\text{Log}\ \frac{P_i}{1 - P_i} = X_i B + U_i$$

an approximation of P_i was observed by dividing all 100 cases into groups such that in each group at least one respondent consumed chang'aa while no group consisted entirely of consumers. Hence, $0 < P_i < 1$.

The grouping was conducted by systematically following the list of respondents which, in turn, was arranged in the order of interviews in the field. There were 22 groups in all with each containing between 2 and 9 respondents.

The modified logit function was thus specified as follows:

$$\log \frac{P_i}{1-P_i} = \log \frac{r_i/n_i}{1-r_i/n_i} = X_i B + U_i$$

Where:

r_i is the number of respondents in group i who consume chang'aa.

n_i is the total number of respondents in group i

$\text{Log} \frac{P_i}{1-P_i}$ was regressed on the following explanatory variables using ordinary least squares:

1. SEX_i - The proportion of respondents in group i who are male.
2. MS_i - The proportion of respondents in group i who are married.
3. ED_i - The average number of years of formal education of respondents in group i
4. RAD_i - Proportion of household in group i with radios.
5. EMP_i - The proportion of respondents in group i who are employed.
6. ELE_i - Proportion of households in group i with access to electric power.
7. DEP_i - The average number of dependants of each respondent in group i
8. INC_i - The average monthly income of respondents in group i in Kenya shillings.
9. LRK_i - The proportion of respondents in groups i who perceived that a very high risk of arrest was inherent in chang'aa consumption.

10. HAZ_i - The proportion of respondents in group i who perceived that chang'aa consumption posed an extremely hazardous threat to a consumers health

11. EFF_i - The proportion of respondents in group i who knew of particular people who had been adversely affected by chang'aa consumption.

12. CL_i - The proportion of respondents in group i who consume other liquors apart from chang'aa.

5.3.2. LOGIT REGRESSION RESULTS

TABLE 12: below contains a summary of the regression results:

TABLE 12: A SUMMARY OF REGRESSION RESULTS

DEPENDENT VARIABLE: Log $\frac{P_i}{1-P_i}$

VARIABLE	REGRESSION COEEFICIENT	STANDARD ERROR	T-STATISTIC d.f. = 9	LEVEL OF STAT SIGNIFI-CANT	PARTIAL r^2
1. SEX	3,0831	.9465	3.258	1%	.4511
2. MS	1.9580	.7333	2.670	5%	.4420
3. ED	-.0201	.0511	-.394	-	.0169
4. EMP	-.4765	.6739	-.707	-	. 526.
5. RAD	-.6332	.5139	1.232	-	.1445
6. ELE	-.5828	.3800	-1.534	10%	.2072
7. DEP	-.3070	.0809	-3.794	1%	.6153
8. INC	.0004	.0003	1.368	-	.1721
9. LRK	-3.1769	.7976	-3.983	1%	.6380
10. HAZ	.8058	.7248	1.113	-	.1210
11. EFF	.4950	.3931	1.259	-	.1498
12. CL	.5781	.9732	1.222	-	.1423

CONSTANT = -2.0497. STD. ERROR OF ESTIMATE = .393

R^2 = .920

F ratio = 8.568

DURBIN - WATSON STAT = 1.9515

$\bar{R}^2$ = 0.813

(CRITICAL F (12,9) = 4.39

92% of the variation in the log of the odd ratio is explained by all variables in the model jointly. The F ratio, which is statistically significant from zero at the 1% level indicates tha the joint effect of all explanatory variables on the log of the odds ratio is statistically significant from zero.

The value of the Durbin-Watson statistic, which is approximately 2, means that the regression function is free of serial correlation hence the coefficients are efficient estimates of the population paremeters. The autonomous probability of an individual in the study area to consume chang'aa is 11%.[2]

For any group of individuals:

1. An increase in the proportion of men (variable SEX), ceteris paribus, leads to a relative increase in the odds ratio.[3] This suggest that, on average, men are more likely to consume chang'aa than women. The influence of an individual's sex on the log of the odds ratio is statistically significant from zero at the 0.01 level of significance.
2. An increase in the proportion of married persons (var. MS), ceteris paribus, increase the log of the odds ratio. It can thus be inferred that the likelihood of a married person consuming chang'aa is much higher than that of a single person. This effect of marital status on the log of the odds ratio is statistically significant from zero at the 0.05 level of significance.

3. An extra year of formal education (Var.ED), ceteris paribus, has a negative effect on the relative change in the odds ratio.

   We may thus infer that the more educated a person is, the less likely it is that he consumes chang'aa. It can be argued that the attainment of higher levels of education incalculates in the individual a taste for more refined values and increases his socio-economic standing in the community. These attributes would be expected to lessen his likelihood of indulging in such illegal activities as chang'aa consumption which may compromise his social status.

   However, the effect of education on the log of the odds ratio is not statistically significant from zero at the 10% level of significance.

4. The higher the proportion of people employed (Var. EMP), ceteris paribus, the lower the percentage change in the odds ratio i.e. as more people are employed the odds of consuming chang'aa decrease. Employment probably increases an individual's responsibilities and lessens the amount of time that can be devoted to illegal activities unrelated to the employee's work. Foregone earnings derived from such employment increases the opportunity cost of being arrested for (or one's health being affected by) chang'aa consumption.

   But the effect of employment on the log of the odds ratio is not statistically significant from zero at the 10% level of significance.

5. An increase in the proportion of households with radios (var. RAD), ceteris paribus, leads to a decrease in the log of odds ratio. By inference a person with a radio is less likely to consume chang'aa than one without it. It may be argued that a radio sometimes relays information on those adversely affected healthwise because of chang'aa consumption or those arrested for the same reason. The possession of a radio thus increases an individual's awareness of the negative consequences of chang'aa consumption, a factor which would in turn be expected to have a deterring effect. However, such an effect seems to play a negligible role in the individual's choice to consume or not consume chang'aa because RAD's negative influence on the log of the odds ratio is not statistically significant from zero at the 10% level of significance.

6. The higher the proportion of households with access to electricity (var. ELE), ceteris paribus, the lower the odds ratio. This implies that a person living in a house with electricity has a less probability of consuming chang'aa than one staying in a house without it. Such an observation can be attributed to the fact that availability of electricity in a house enables dwellers to engage in such engrossing activities as reading, sewing, writing (all light-intensive activities), using audio-visual gadgets for general household chores and entertainment etc. Such activities would in turn lessen the incentive for seeking social/leisure activities obtainable outside the home like chang'aa consumption.

The effect of ELE on the log of the odds ratio is statistically significant from zero at the 1% level of significance.

7. An increase in the number of dependants (var. DEP), ceteris paribus, leads to a decrease in the odds ratio. It can be inferred that the greater the number of dependants an individual has, the lower the probability that he is a chang'aa consumer. The reason could be that as the number of a person's dependants rise, he is less likely to indulge in illegal activities which may jeopardize his ability to care for them i.e. he is more responsible and probably more cautious. In addition, a larger number of dependants decrease the share of disposable income available for such non-essential commodities as chang'aa. The negative impact of DEP on the log of the odds ratio is statistically significant from zero at the 1% level of significance.

An increase in the average level of income (var. INC), ceteris paribus, increases the odds ratio i.e. the more income one has the more likely he is to consume chang'aa.

It can be argued that a chang'aa consumption habit, once acquired at a lower level of income, tends to be perpetuated over time. Indeed one of the two people who consumed the highest amount of chang'aa also earned the highest income recorded in the sample and has been a resident of the study area since his childhood. It can also be argued that an increase in one's income increases the share of disposal income that can be spent on non-essential commodities like chang'aa or that it enables one to meet such contingencies as payment of fines on arrest and conviction (or bribes to escape such arrest).

However, the effect of income on the log of the odds ratio

is not statistically significant from zero at the 10% level significance.

9. An increase in the proportion of people who perceive that chang'aa consumption carries a very high risk of arrest (var.LRK), ceteris paribus, leads to a decrease in the odds ratio. This implies that the greater the perceived risk of arrest the less the probability of an individual consuming chang'aa.
The effect of LRK on the log of the odds ratio is statistically significant from zero at the 1% level of significance.

10. An increase in the proportion of individuals who percive chang'aa consumption as extremely hazardous to the consumer's health (Var. HAZ), ceteris paribus, leads to an increase in the odds ratio.
We would expect that the higher the level of perceive hazardness, the lower the probability of consuming chang'aa. This result is contrary to our a priori expectation and can be explained in several ways. First, people who consume chang'aa probably have such limited options (i.e. they cannot afford most other liquors) that they do not find the risk to their health a deterring factor. Second, consumers are quite confident that they can minimize any such risk or deal with it effectively. Third, consumers may have exaggerated the level of such a risk during the interview.
The effect of HAZ on the log of the odds ratio was not statistically significant from zero at the 10% level of significance.

11. An increase in the proportion of persons who know particular people who have been adversely affected by chang'aa consumption (var. EFF), ceteris paribus, has a positive effect on the log of the odds ratio.
It would be expected that such knowledge would act as a deterrent by 'example'. The above results suggest to the contrary i.e. a person with such information is more likely to consume chang'aa than a person without it. The reason could be that possessing information about a 'chang'aa victim' and, by implication, the circumstances that led to the victim's fate, enables a person to consume chang'aa with greater confidence that he can avoid the pitfalls of the victim. Likewise, lack of concrete knowledge on the adverse effects of chang'aa consumption (thus depending on hearsay) may create uncertainity which in itself may act as a deterrent (through fear of the unknown).
The impact of EFF on the log of the odds ratio is not statistically significance from zero at the 10% level of significance.

12. An increase in the proportion of individuals who consume other liquors (var. CL), ceteris paribus, increases the log of the odds ratio.
It can be inferred that a person who consumes other liquors is more likely to consume chang'aa than one who abstains from consuming all types of liquors.

Chang'aa is a cheap substitute to other liquor and where accessible, it is expected to be in a consumer's liquor portfolio. Whether it is consumed or not is another matter but its mere presence in the range of consumables increases the probability that it will be consumed.

However, this positive effect of CL on the log of the odds ratio is not statistically significant from zero at the 10% level of significance.

5.3.3. THE DEMAND FOR CHANG'AA

Data collected from the 24 chang'as consumers in the sample was used to study the effect of various variables on the quantity demanded. The amount of chang'aa consumed was regressed on the explanatory variables using the ordinary least squares (OLS) estimation method. The estimation results are summarized in Table 13 below.

TABLE 13: THE REGRESSION FUNCTION FOR THE DEMAND FOR CHANG'AA

DEPENDENT VARIABLE: Q, QUANTITY OF CHANG'AA CONSUMED

VARIABLE	REGRESSION COEFFICIENT	STANDARD ERROR	T-STATISTIC d.f. = 9	LEVEL OF STAT. SIGNIFICANCE	PARTIAL r^2
1. AGE	-.1489	.0835	-1.783	10%	.2811
2. SEX	4.7923	3.0550	1.569	10%	.2147
3. MS	.5325	1.6252	.328	-	.0118
4. ED	-.3771	.1961	1.922	5%	.2911
5. EMP	1.1063	2.0992	.527	-	.0299
6. RAD	-3.1698	1.4538	-2.180	5%	.3456
7. ELE	1.3020	1,6927	.769	-	.0617
8. DEP	-.1190	.1470	-. 809	-	.0678
9. INC	.0004	.0005	. 923	-	.0864
10. LRK	-.8616	1.1231	-. 767	-	.0614
11. HAZ	.0653	.9937	-. 066	-	.0005
12. EFF	-1.4257	1.6691	-. 854	-	.0750
13. KM	-. 6815	.8112	-. 840	-	. 727
14. P	. 5488	.4729	1.161	-	.1002

CONSTANT = -13.2901

STD. ERROR OF EST. = 1.550

F. RATIO = 1.130

R^2 = .637

F(14,9) = 3.01 (at 5% level of significance)

DURBIN - WATSON STATISTIC = 1.995

Where:

1. Q is the guantity of chang'aa consumed, in litres.
2. AGE is the consumer's age in years.
3. SEX is a Dummy variable, SEX = 1 if male
   = 0 if female
4. MS is a Dummy variable, MS = 1 if the consumer is married
   = 0 if otherwise
5. ED are years of formal education.
6. EMP is a Dummy variable, EMP = 1 if the person is employed.
7. RAD is a Dummy variable, RAD = 1 if the household has a radio
   = 0 if otherwise
8. ELE is a Dummy variable; ELE = 1 if the household has access to electricity
   = 0 if otherwise
9. DEP is the number of dependants
10. INC is the consumer's monthly income, in Kenya Shillings.
11. LRK is the perceived level of the risk of arrest inherent in chang'aa consumption.
12. HAZ is the perceived level of hazardness to the consumer's health posed by chang'aa consumption.
13. EFF is a Dummy variable, EFF = 1 if the consumer knows someone in particular who has been adversely affected by chang'aa consumption.
    = 0 if otherwise.

14. KM is the distance in kilometres from the consumer's house to the nearest source of chang'aa.

15. P is the price of a litre of chang'aa.

64% of the variation in the quantity of chang'aa consumed, Q is explained by all the explanatory variables jointly. However, the low F ratio, which is not statistically significant from zero at the 5% level of significance, indicates that we cannot reject the null hypothesis that "there is no relationship between Q and all explanatory variables in the function."

Autonomous consumption is less than zero (-13.3 litres). Since there is no observed negative consumption the minimum amount of chang'aa that can be consumed is zero, hence, the function for Q will be relevant in the $Q \geq 0$ range only.

A consumer's age (variable AGE), ceteris paribus, has a negative effect on the amount of chang'aa consumed i.e. the older one is the less quantity of chang'aa he consumes. The effect of age on Q is statistically significant from zero at the 10% level of significance.

Holding all else constant, a man (var. SEX) consumes more chang'aa than a woman. The difference in the amount of chang'aa consumed by the different sexes is statistically significant from zero at the 10% level of significance. The higher a person's level of education (var. ED), ceteris paribus, the less the amount of chang'aa he consumes.

This relationship between ED and Q is statistically significant from zero at the 5% level of significance.

A consumer whose household has a radio (var. RAD), ceteris paribus, consumes less chang'aa than one whose household has none. This difference is statistically significant from zero at the 5% of significance.

None of the other explanatory variables has a statistically significant effect from zero on the amount of chang'aa consumed at the 10% level of significance. However:

1. A married person (var. MS), ceteris paribus, consumes more chang'aa than one who is single.
2. An employed person (var. EMP), ceteris paribus, consumes more than one who is unemployed.
3. A chang'aa consumer living in a house with electricity (var.ELE), ceteris paribus, consumes more than one who stays in a house without electricity.
4. A chang'aa consumer with knowledge of people in particular who have been adversely affected by chang'aa consumption (var.EFF), ceteris paribus, consumes less than a consumer without such knowledge.
5. The amount of chang'aa consumed, ceteris paribus:
   (a) decreases as the number of dependants (var.DEP) increases,
   (b) increases with income (var. INC),
   (c) decreases as the perceived risk of arrest increases (var.LRK),

(d) increases with the perceived level of hazardness (var. HAZ),

(e) decreases as the distance between the consumer's house and the nearest source of chang'aa (var. KM) increase,

(f) increases with price.

Regressing the quantity of chang'aa consumed on its price yielded the following results.

$$Q = 9.54 - 0.215P$$

(Std.Error) (0.2267)

$$r^2 = .039$$

T (at 22 d.f.) = -.95

The null hypothesis that price has no effect on the quantity of chang'aa consumed is not rejected at the 10% level of significance. The main reason is that the observed price of chang'aa was constant at KShs. 40 per litre for 63% of consumers, less than that for 8% of them and assumed to be KShs.40 for 29% of consumers all of who did not purchase chang'aa in the given time period (explained above) but some who professed to know that it was indeed KShs. 40.

We cannot attach a lot of weight to the above demand function because of the low F ratio. However, the results may be used merely as a guide to the effect of some socio-economic factors on the quantity of chang'aa demanded.

Conclusions that can be drawn from these regression results are the subject of our next chapter.

NOTES:

1. A person convicted for manufacturing, selling, supplying, consuming or being in possession of chang'aa is liable to a fine not exceeding KShs. 10,000 or to imprisonment not exceeding 2 years or both such fine and imprisonment - Laws of Kenya, The Chang'aa Prohibition Act Capter 70, of 15th August 1980.

2. $\text{Log } \frac{P}{1-P} = Y = -2.0497$

$$P = \frac{1}{1+e^{-Y}} = \frac{1}{1+e^{2.0497}} = 0.11408$$

3. An absolute change in the natural log of any attribute is the same as the relative change in the attribute such that:

$$d(\log X) = \frac{DX}{X}$$

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1. SUMMARY:

The production and consumption of chang'aa are economic activities whose origin can be traced back to pre-independent Kenya. The consumption of cheap illicit liquor like chang'aa leads to some undersirable socio-economic consequences, which in turn are factors that may have contributed to its prohibition. This prohibition, in turn, only pushed these activities underground where they seem to be flourishing.

Some economic studies have been done on the underground economy and criminal activities in general but none so far on the demand for an illegal commodity. In Kenya, sociological studies have been conducted on the trade in chang'aa but none lends itself to the use of econometric tools for reliable inferences.

This study has tried to determine how an individual's socio-economic factors and his perception of both the risk of arrest and hazardness of chang'aa consumption affect his choice to consume or not consume chang'aa. Due to hardware and software constraints, we analysed the likelihood of an individual consuming chang'aa in a roundabout manner; by first grouping the observations and then drawing inferences on the individuals from the results of the groups.

The study also tried to determine how changes in the quantity of chang'aa consumed varies with the above factors but the results were not reliable enough for viable conclusions to be made.

In drawing conclusions, our major concern will be the results of the logit model for several reasons. First, the observations in the sample are representative of the total population. Second, the results are statistically significant (the F ratio is significantly greater than zero at the 5% level of significance) and third, the demand equation is not based on a representative sample of consumers and the results are not very reliable. In addition, drawing on the concerns of planners to reduce the level of alcohol consumption (Development Plan 1979-83 pp. 16-17) our major concern at the moment is minimizing chang'aa consumption by decreasing the probability of an individual consuming the gin.

6.2 CONCLUSIONS AND POLICY IMPLICATIONS

In this section/summarize the major conclusions of the /we study and discuss their policy implications for the reduction/ eradication of chang'aa consumption.

There were four main conclusions of the study and these are discussed as follows:-

1. Increasing households' accessibility to electric power decreases the probability of chang'aa consumption. Provision of such an amenity can be done through the following:

(i) Electrification programs; more than 30% of house in the study area were not connected to electricity supply lines, though some of the dwellers could afford this type of energy.

(ii) Subsidized provision for those who cannot afford the prevailing rates. Examples of such households are those whose current has been cut-off due to perpetual non-payment of bills.

Electricity should thus be supplied in order to uplift the people's standard's of living. The reduction in chang'aa consumption will be a secondary effect.

2. The odds of a person drinking chang'aa decreases as the level of perceived risk of arrest increase. In order to minimize chang'aa consumption there should be increased law enforcement activity with emphasis on the demand-side of the chang'aa trade. A crackdown on consumers and relatively stiffer penalties for those convicted together with media exposure of such arrest and convictions will have a significant effect in lowering the level of chang'aa consumption.

3. The hazardness of chang'aa consumption whether real or imagined does not decrease the likelihood of an individual consuming chang'aa. The same is true for people who possess knowledge of particular people who have been adversely affected by chang'aa consumption. Consequently, all

exhortations on the negative aspects of chang'aa do not make any headway in the campaign to eradicate the consumption of the gin. Rather, more effort should be made in educating the public about the bad effects of excessive drinking in general and the extra costs of being arrested while consuming chang'aa which include the maximum penalty in fines and custodial sentence. No single respondent knew the magnitude of this penalty which is quite stiff compared to those handed out by courts.

A few respondents pointed out that there are a few licenced cheap beers whose adverse effects on the consumer's health may be worse than chang'aa's. Studies on such liquors would be in order, especially since their production and consumption is sanctioned by the government.

4. Increased levels of employment and education decrease the propensity to consume chang'aa, but marginally. Macroeconomic policies that increase the two would be a boost to the economy in general and will contribute to the effort to decrease chang'aa consumption.

Those then are the conclusions with regard to the eradication/minimization of chang'aa consumption. It is in order now to ask whether it is indeed desirable, let alone feasible, to eradicate chang'aa consumption.

Assuming that the production and consumption of chang'aa is totally curbed, it would be naive to expect that money which would normally be spent on chang'aa will now be used to purchase anything else but liquor. We would expect more beer to be consumed and in fact, former chang'aa consumers would be spending a higher proportion of their incomes on liquor than formerly because it takes much more beer (and costs much more too) than chang'aa to reach the same level of intoxication. Beer also happens to be time intensive thus increased drunkeness on beer may be more costly to society in terms of decresed nutrition intake and level of education among households (due to the increased share of income that goes to beer purchases), increased output foregone (on time-consuming beer consumption) etc. The increased demand for beer will only lead to higher employment if the producers are not, initially, operating at excess capacity while at the same time there will be the increase in open unemployment created by the curb on chang'aa production to cope with.

Another possible consequence of eradicating chang'aa consumption is reversion to habits of the bad old days of drinking methylated spirits with predicably dire consequences. Kenyans may also borrow a leaf from the Soviet Union where the campaign against vodka consumption has increased the sale of shampoos and after-shave lotions from which are concocted intoxicating drinks.[1] Another alternative is the cheap licenced variants of traditional

'pombe' which are mainly sold in 'clubs' in the poorer residential estates of urban areas. As mentioned above these liquors have adverse effects on consumers' health but proper studies are needed before reliable conclusions can be made.
However, the eradication of chang'aa production and consumption may not be feasible, but if it is, then it may not be cost effective, given that more serious crime are plaguing society and there are limited resources for combating them.

The government should thus seriously consider reversing its policy on chang'aa consumption and production. Studies should be conducted on the feasibility of the Ugandan experiment to enable chang'aa to be hygienically produced, its alcohol content standardized, the gin packaged and then sold on the open market at a price competitive enough to upstage illegal distilling.

6.3. LIMITATIONS OF THE STUDY

Our inability to use the Tobit model for regression analysis imposed some limitations on this study:

1. A small sample had to be used for the modified logit model hence the results are not as accurate as those which would have been obtained from a large sample.
2. We are unable to predict the probability of an individual consuming chang'aa, given his socio-economic attributes, because the logit model used grouped data.

3. The study has not fully identified variables which explain changes in the quantity of chang'aa consumed. Such variables can be manipulated (where possible) to decrease the level of chang'aa consumption.

Given these limitations and the narrow focus of this study further areas of research may be suggested.

6.4. SUGGESTIONS FOR FURTHER RESEARCH

1. A study focussing on chang'aa consumers only would determine better the factors explaining changes in the quantity of chang'aa consumed. Results of such a study can be used to formulate a strategy for minimizing the quantity of chang'aa consumed.

2. There is need for estimating the alcoholic content of a given volume of chang'aa. It is only with such information that a precise comparison of the prices of chang'aa and other liquors can be made.

3. A study on the supply-side of the chang'aa trade would establish whether indeed producers have no other sources of income or have taken advantage of the existing economic rent created by the prohibition of the gin. If the results show the former, then eradicating chang'aa production and consumption will lead to increased open unemployment and poverty.

NOTES

1. See, for example, 'The Economist' of 14-20 December 1985 pp. 51.52.

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APPENDIX I

QUESTIONNAIRE

1. Age: .....Years
2. Sex:.....(a) Male .....(b) Female .....
3. Marital Status (a) Single.....(b) Married .....
   (c) Divorced.....(d) Widowed.....
4. What is your level of Education?
   Indicate the number of years of formal education.
   (a) None (o) .....Years
   (b) Primary (1-7) .....Years
   (c) Secondary (8-11).....Years
   (d) High School (12-13).....Years
   (e) University (14 and over).....Years
5. (a) Are you employed? 1. Yes.....2. No.....
   (b) If yes, what sort of employment is it?
   (1) Self employment.....
   (2) Casual employment.....
   (3) By a Private Company.....
   (4) By a Public body.....
   (5) In (our) Family business.....
   (6) Other .....(Please explain.....
   .....)
6. (a) Do you have any other sources of income apart from the above employment? 1. Yes.....2 No.....
   (b) If yes, what are they?.....

7. (a) Do you have a radio? 1. Yes .....2. No. .....
   (b) Does the house have electricity? 1. Yes..... 2. No. ....

8. How many people depend on you for their food, shelter, clothing etc.?.....

9. What is your monthly income? KShs.....

   (Alternatively, under which of the following groups does your income fall.

   (a) 0 - 500.....
   (b) 501 - 1000 .....
   (c) 1001 - 1500 .....
   (d) 1501 - 2000 .....
   (e) 2001 - 2500 .....
   (f) 2501 - 3000 .....
   (q) 3001 - 3500 .....
   (h) 3501 - 4000 .....
   (i) 4001 - 4500 .....
   (j) 4501 - 5000 .....
   (k) 5001 and over .....

10. Which of the following drinks do you consume ?

   (a) Beer.....
   (b) Whisky, Gin, Vodka.....
   (c) Table Wine, Sherry etc.....
   (d) Chang'aa.....
   (e) Other Traditional brews (Busaa, Muratina, Miti, Chibuku, Nyuki etc.)
   (f) None of the above.....

	INCOME GROUP	MEDIAN INCOME
10.	4,501 - 5,000	4,750.5
11.	5,001 - and above	5,250.5

10. LRK - Proxy for the individual's perception of the risk of arrest inherent in the act of chang'aa consumption.

LEVEL OF RISK	PROXY
No Risk	0
A Slight Risk	1
A High Risk	2
A very High Risk	3

11. HAZ - Proxy for the individual's perception of the hazardness of chang'aa to a consumer's health.

LEVEL OF HAZARDNESS	PROXY
No Hazard	0
Hazardous	1
Very Hazardous	2
Extremely Hazardous	3

12. EFF - Dummy variable; EFF = 1 if the individual knows someone, in particular who has been adversely affected by chang'aa consumption.
= 0 if otherwise

13. KM - The distance, in kilometres, from the individual's house to the nearest known source of chang'aa.

14. R - Dummy variable; R = 1 if the individual consumes chang'aa
= 0 if otherwise

15. If the individual consumes chang'aa:

(a) How many different times have you bought Chang'aa in the past seven days.?.....

(b) About how much of it did you consume in:

1) Fives.....2. Full glasses..... 3. Jiks.....

4).Other measurement(s).....

16. How much did the above quantity cost you ? KShs.....

17. What is the proportion of your monthly expendire on Chang'aa when compared to toehr liquors (if any) ?

(1) I spend more on Chang'aa.

(2) I spend an equal amount on Chang'aa as on other liquors.

(3) I spend less on Chang'aa.....

(4) I cannot determine the proportions .....

18. If the individual does not consume Chang'aa:

(a) Have you at any other time consumed Chang'aa ?

1. Yes..... 2. No. .....

19. (a) How far is your house from the nearest place where Chang'aa is sold ? 1, ... metres or 2 ..... kilometres.

(b) Would you consider this distance as:

1. Short.....or 2. Long

(c) If long, what is the cost of transport ?

KShs.....

11. From your own observation what is the chance of someone bei arrested while consuming chang'aa ?

There is:

(a) No risk.....

(b) A slight risk.....

(c) A high risk .....

(d) A very high risk.....

12. (a) Do you know the maximum legal penalty, in fines and Prison sentence, for being convicted of drinking chang'aa ?

1) Yes.....2. No. .....

(b) If yes, Do you consider such a penalty

(1) Lenient.....

(2) Adequate.....

(3) Heavy .....

(4) Excessive .....

13. From your own observation or understanding what is the effect of chang'aa on a consumer's health ? It is:

(a) Not hazadous.....

(b) Hazardous.....

(c) Very Hazardous .....

(d) Extremely Hazardous .....

14. (a) Do you know of anyone (you included) who has been adversely affected after consuming chang'aa ?

(1) Yes .....(2). No. .....

(b) If yes, please explain.....

APPENDIX II

VARIABLE CODES AND MEASUREMENT

VARIABLE		MEASUREMENT
1.	AGE	The individual's age in years
2.	SEX	Dummy variable; SEX = 1 if the individual is male = 0 if female
3.	MS	Dummy variable; MS = 1 if the individual is married 0 if otherwise
4.	ED	Years of formal education
5.	EMP	Dummy variable; EMP = 1 if the individual is employed = 0 if otherwise
6.	RAD	Dummy variable; RAD = 1 if the household has a radio = 0 if otherwise
7.	ELE	Dummy variable; ELE = 1 if the house has electric power = 0 if otherwise
8.	DEP	Number of dependants
9.	INC	The individual's monthly income in Kenya Shillings. The following income groups were used to measure income and their corresponding medians used in all calculations involving individuals' incomes:

	INCOME GROUP	MEDIAN INCOME
1.	0 - 500	250.0
2.	501 - 1,000	750.5
3.	1,001 - 1,500	1,250.5
4.	1,501 - 2,000	1,750.5
5.	2,001 - 2,500	2,250.5
6.	2,501 - 3,000	2,750.5
7.	3,001 - 3,500	3,250.5
8.	3,501 - 4,000	3,750.5
9.	4,001 - 4,500	4,250.5

15. Q - Quantity of chang'aa (in litres) consumed 7 days prior to the interview.

16. P - The price per litre of chang'aa paid by the consumer (in Kenya Shillings)

17. CL - Dummy variable; CL = 1 if the individual consumes other liquors apart from chang'aa

= 0 if otherwise