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dissertation entitled

THE SHEBEEN QUEEN
OR
SORGHUM BEER IN BOTSWANA:
THE IMPACT OF FACTORY BREWS ON A COTTAGE INDUSTRY

presented by

Steven J. Haggblade

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Economics

Carl Liedholm
Major professor

Date January 4, 1984

THE SHEBEEN QUEEN

OR

SORGHUM BEER IN BOTSWANA: THE IMPACT OF FACTORY BREWS ON A COTTAGE INDUSTRY

By

Steven J. Haggblade

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Economics

1984

ABSTRACT

THE SHEBEEN QUEEN
OR
SORGHUM BEER IN BOTSWANA:
THE IMPACT OF FACTORY BREWS ON A COTTAGE INDUSTRY

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This thesis revolves round the case study of sorghum beer in Botswana. Home brewing of sorghum beer has been an important part of the social life and diet in Botswana for many centuries. Within the last 50 years, this age-old craft has become commercialized; and today cash brewing is the most important female-dominated business activity in the country. In the last 15 years, factory-brewed sorghum beer has become available in large quantities in Botwana, and it has been making steady inroads in the market share formerly held by home brewers.

A primary purpose of the thesis is to describe the transition that is taking place in Botswana's soghum beer market and to asess its economic impact. Policy implications are drawn for Botswana as well as for the numerous other African countries whose sorghum beer markets have not become mechanized to the extent Botswana's has. A final objective is to use the case study to evaluate conventional views on industrial evolution, particularly the common belief that household and artisanal firms will normally diminish in importance as

industrialization proceeds, since they are unable to compete with large factory producers.

The major finding of the case study is that the rise of factory brewing has brought with it economic tendencies that run directly counter to every major economic objective of the Government of Botswana: economic returns to capital, aggregate employment and national income have all declined substantially, and the county's income distribution has become increasingly skewed. Policy intervention is called for, and a number of specific recommendations are made.

This disssertation is dedicated to Helen.

ACKNOWLEDGEMENTS

I have benefited from the assistance of numerous friends and colleagues in the course of preparing this dissertation. The field work in Botswana would never have been possible without the exceptionally capable services of my two enumerators, Julia Phadi and Kaone Kentshitswe. The interviewing that took place in Maun was ably assisted by the Rural Industrial Officer (RIO), Mark Hopkins and the Assistant RIO, Moses Mahpti. In preparing for the field work, I received sage counsel from Brian Egner, Derek Hudson, Carol Kerven, Emery Roe and Bonnake Tsimako. All respondents - the shebeen queens, licensed retailers, factory brewers, trade maltsters, millers and retailers - were extremely cooperative and cordial. The tribal authorities were uniformly helpful and greatly facilitated the survey work. Both the Ministry of Commerce and Industry and the Ngamiland Production Development Committee were supportive of the study and offered valuable feedback on the preliminary policy reports filed with them prior to my departure from Botswana.

During the data analysis and write-up stage in Lansing, I received much valuable assistance and advice. I am extremely grateful to the Small Enterprise Approaches to Development Project

for financial support during the thesis write-up. My thesis advisor, Carl Liedholm, offered direction, rapid turn-around on ponderous drafts and was a constant source of encouragement and assistance. Michael Weber provided detailed commentary - both analytical and editorial - which was extremely helpful and thought provoking. Bruce Allen and W. Paul Strassmann, my other two committee members, were likewise extremely helpful, and I benefitted on numerous occasions from their input. Peter Schmidt offered good-natured and authoritative guidance on frontier production functions. Don Mead read several sections of the dissertation as well as the detailed outline and provided me with the benefit of his good judgement on both. Garret, Michelle, Laura and Matthew Peaslee provided invaluable professional word processing facilities and bore my unusual working hours with good grace and congeniality. My colleagues at the Cleo Institute - Drs. Stephen Davies, Steven Franzel and John Halloran - were a constant source of intellectual and moral support. Finally, I am deeply indebted to my wife, Helen, who bore the full weight of the lengthy thesis timetable yet remained understanding and supportive throughout.

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DEFINITIONS

Currency: 1 Pula = 100 thebe = $ .90 U.S.

Batswana: the people of Botswana

CHAPTER 1

INTRODUCTION

A. BACKGROUND

Sorghum beer has been a mainstay of the local diet in Southern Africa for at least five centuries (Bryant, p.279). Originally, it was entirely produced at home by women who brewed for their own families' consumption and for friends. Increasingly, however, women have taken to selling the beer outside the family circle as a means of earning cash income. In fact, during the past 50 years the brewing of sorghum beer for cash sale has become the most important female-dominated business activity in Botswana, accounting for 62% of rural manufacturing income (survey data; Rural Income Distribution Survey, p.52). Women who sell sorghum beer regularly have become known as "shebeen queens"; and their residences, from which they retail the beer, have become known as "shebeens".[1]

Factory-brewed sorghum beer was first introduced into Botswana fifteen years ago; and since that time, sales have increased

[1]The term "shebeen queen", technically, refers to a woman who regularly retails any liquor from the home. Infrequent home retailers are not always referred to as shebeen queens. But the regular brewers and retailers account for the great bulk of the home retailing of sorghum beer. Therefore, as a simplifying convention, the term "shebeen queen" will be used in this thesis as a shorthand for all home retailers of alcoholic beverages. It should be emphasized, as well, that shebeen queens sometimes retail alcoholic beverages other than sorghum beer; and some retail both home- and factory-brewed varieties of alcohol. Sorghum beer, however, represents about 83% of the volume and 80% of the value of liquor sold in shebeens (survey data).

steadily. A system of licensed retail outlets has developed in tandem with this growth in sales. Shebeen queens have responded to the inceasing sales of factory-brewed sorghum beer in a number of ways: some have gone out of business, some continue to brew and sell home-made sorghum beer, and others have taken to retailing factory-brewed sorghum beer.

The overall effect of these adjustments is imperfectly understood. It is obvious that since the introduction of factory-brewed sorghum beer the relative proportion of sorghum beer retailed by shebeen queens has decreased - from a 100% market share to something less. Policy makers and other interested observers, however, are less clear about what has happened to absolute levels of home-retailed sorghum beer, what the driving forces are in the rise of factory-brewed sorghum beer and what the overall effect has been in terms of equity and economic efficiency.

B. OBJECTIVES OF THE THESIS

This thesis aims to investigate the changes currently taking place in Botswana's sorghum beer market. In particular, the thesis has three major objectives:

1. to describe the dynamics of the increasing predominance of factory-brewed sorghum beer in Botswana and to analyze its economic impact;

2. to use that case study to evaluate common views on industrial evolution, particularly long-term trends in the size distribution of manufacturing firms; and

3. to provide policy guidelines:
   a. to the Government of Botswana (GOB) and

   b. to the many other African countries who will shortly face the same questions about sorghum beer that are now being addressed in Botswana.

The first objective, that of description and analysis, constitutes the core of the thesis. It fills a major empirical gap; because although numerous researchers have commented on the importance of home brewing, few have examined urban as well as rural sorghum beer markets, and none has explored the economic interaction between home- and factory-brewed sorghum beer. The filling of this descriptive and analytical void provides the basic platform from which the other two thesis objectives can be attained.

In addition, the description of the sorghum beer business in Botswana will add to what is currently a rather limited number of

detailed, industry-specific studies in developing countries. While a significant amount of aggregate and cross-section industrial work has been done in the Third World, individual industry studies are not numerous. Commenting on the penchant for cross-section studies, Schmitz (1982, p.442ff) has strongly recommended a reorientation to what he calls "branch-specific" studies of individual production/ distribution systems. Currently, Kilby's study of the Nigerian bread industry (Kilby 1965), White's study of industrial organization in Pakistan (White 1974), Schmitz' study of weaving in Brazil (Schmitz 1982) and Boomgard's study of furniture in Thailand (Boomgard 1982) represent some of the few such studies available. In carrying out the analysis and description of the sorghum beer business in Botswana, this thesis will utilize the subsector framework, a variant of the standard industrial organization approach which emphasizes vertical stages in a production/distribution system.

The second objective of the thesis is to comment on long-term trends in industrial evolution, particularly on the shifting size distribution of manufacturing firms over time. Because of the cost advantages conferred by economies of scale, most observers believe that, over the long-run, home industries around the world decline in the face of competition from larger scale factory producers. The case study of sorghum beer in Botswana provides the opportunity to examine an industry in the very midst of such a competitive confrontation. A close-up view such as this one should make it

possible to identify the causal forces at work in such a situation.

The third objective of the thesis, the policy objective, is an important one. Over the past three years, the sales of factory-brewed sorghum beer have been rising rapidly in Botswana; and the Government of Botswana (GOB) has been attempting to strike a responsible policy stance but on the basis of information that is far from complete. One prime motivation for the present study was, in fact, to provide the key sorghum-beer-related informtion required by policy makers, particularly those in Botswana's Ministry of Commerce & Industry (MCI).

In addition, results of this policy analysis can be of substantial use to many other African countries who will shortly be facing the same questions that are currently under discussion in Botswana. The second part of this policy objective is, therefore, to outline explicitly the lessons from Botswana that will be important for those other countries. At least 23 of the 39 countries in Sub-Saharan Africa house large sorghum beer markets. In about five of these countries, factory brewing dominates in supplying sorghum beer to consumers. But in the remaining 18 or so countries, factory brewing has either not yet been introduced or its introduction has been recent and its market share remains small. In these 18 countries, home brewers still supply the predominant share of the sorghum beer market. Botswana is rapidly moving towards the smaller group in which factory brewers supply the majority of the

sorghum beer market. Because its progress can be followed along what appears to be a common transitional path, the lessons learned from the current dynamics in Botswana are extremely important, especially for the 18 countries whose sorghum beer markets have not yet evolved as far as Botswana's.

C. RESEARCH METHODS

The core of information on which this thesis is based was collected in Botswana during five months of intensive field work which took place from March to July 1982. During that period, interviews were arranged with participants at all levels of the sorghum beer business - home brewers, factory brewers, licensed retailers, council licensing officers, maltsters and grain millers. In addition, two visits were made to the Sorghum Beer Unit in Pretoria, South Africa. The Sorghum Beer Unit is a government-funded laboratory devoted to doing the technical research necessary to support factory brewing of sorghum beer in South Africa, a country where all such factories are government run. Finally, correspondance with four different countries yielded information on policies and situations outside Botswana.

The interviewing of all participants and observers was open-ended, except in the case of the home retailers and home brewers. After sampling, a detailed questionnaire was administered to 304 households representing home brewers, home retailers of sorghum beer and other liquors, and non-retailing households which served as a control group. The details of the sampling and survey procedures are described in Appendix A.

The field work took a total of five months to complete. The

first month was devoted to obtaining a research permit and to preparatory reviews of existing literature. The actual interviewing and survey work took about three months. The fifth month was devoted to writing up a final report for the government and briefing officials on the findings. It should be noted that, even though three months of actual interviewing seems short, the study benefited considerably from the author's two prior years of close observation of Botswana's sorghum beer business. This long-term interest not only provided many useful longitudinal observations but also the familiarity necessary to focus the field work on areas of particular importance. Because of this, the field work was very much in the spirit of what the Farming Systems literature refers to as a "verification" or "formal" survey (CIMMYT, p.33). That is, the purpose of the field work was to obtain statistically valid data for testing previously formulated hypotheses that had been developed based on an understanding of the technology, economics, sociology and history of the sorghum beer business.

Analysis of the survey data included the estimation of important population values (such as the total annual production of home-brewed sorghum beer), cross-tabulations and multiple regression analysis. Hand tabulations of the key population values and averages were undertaken in Botswana in the course of preparing the report for the Government of Botswana (GOB). The cross tabulations and regressions were performed in the U.S. by computer.

D. ORGANIZATION OF THE THESIS

This thesis centers around the case study of sorghum beer in Botswana. Before launching into that case study, however, Chapter 2 supplies background information on two of the main areas, outside of Botswana, in which the present study has a contribution to make. In particular, Chapter 2 describes: a) the status of sorghum beer markets throughout Sub-Saharan Africa; and b) general views on the forces shaping long-term industrial evolution. These two major subject areas form a backdrop on which the findings of the case study can most appropriately be framed.

The case study itself is housed in Chapters 3 through 7, which consitute the core of the thesis. Chapters 3 through 5 furnish descriptive information about the sorghum beer business in Botswana. Chapter 3 presents an overview of Botswana, its economy and the role of sorghum beer there. Chapter 4 provides basic background on the structure of the supply side of the sorghum beer market, and Chapter 5 follows with an analysis of the demand issues relating to sorghum beer.

It is Chapters 6 and 7 that house the bulk of the economic analysis. Chapter 6 analyzes the economics of production and retailing from the perspective of the individual firm. Enterprise-

level finances highlight the incentives facing firms; and this analysis, therefore, flows into a discussion of the conduct of key participants in the subsector. Chapter 7 evaluates the economics of the subsector from an economy-wide perspective. Home and factory brewing technologies are compared in terms of aggregate employment- and income-generating capabilities. Shadow prices are then applied to budgets to compare economic returns in both home and factory brewing. The chapter concludes with a discussion of the overall potential for boosting incomes through increased technical efficiency among home brewers.

Chapter 8 provides the synthesis. It ties together a number of common themes that have been woven throughout the case study and the broad contextual analyses. The chapter begins by drawing out the implications of the case study for general trends in industial evolution. The broad diagnosistic and prescriptive analysis from this overview leads into a discussion of policy recommendations specifically related to sorghum beer. These recommendations are provided both for Botswana and for other countries in Sub-Saharan Africa. The chapter next presents a short methodological commentary on the gains derived from adoption of the subsector frame of analysis. The chapter concludes with a summary of the thesis findings.

CHAPTER 2

BROAD CONTEXT OF THE CASE STUDY

Although this thesis revolves around the case study of sorghum beer in Botswana, the implications that can be drawn from it are not limited to sorghum beer, nor are they limited to Botswana. In addition to a methodological foray to be discussed in Chapter 4, the thesis makes two major contributions that extend beyond the confines of Botswana. The first of these concerns sorghum beer markets throughout Sub-Saharan Africa. At least 23 of the 39 countries in Sub-Saharan Africa house sizeable home sorghum beer brewing industries; and probably 18 do not yet have a significant market share supplied by factory brewers of sorghum beer.[1] Since Botswana is significantly further down the road to capital intensification of sorghum beer production than most, there is much other countries can learn from Botswana about the economic implications and potential pitfalls accompanying the rise of factory-brewed sorghum beer.

A second contribution made by this thesis relates to current general understanding of industrial evolution. Numerous observers

[1]The group of 18 includes Mali, Upper Volta, Nigeria, Benin, Togo, Ghana, Ivory Coast, Chad, Sudan, Rwanda, Burundi, Cameroon, Central African Republic, Kenya, Tanzania, Uganda, Lesotho and Botswana. The 5 that appear to have over a 50% market share supplied by factory-brewed sorghum beer are Malawi, South Africa, Swaziland, Zambia and Zimbabwe.

of industrial history believe that, as industrialization proceeds, there is a strong tendency for household and other small manufacturing units to decline in the aggregate at the expense of large factory producers. However, most observers also believe that, in some product lines, the very small-scale manfacturers flourish, while in others fields they atrophy. The present case study is in a position to contribute to these discussions. It provides a current, close-up view of a home industry coming to grips with serious competition from factory producers. The case study can, first of all, supplement existing empirical evidence on which home industries decline and which do not. More important, the availability of good technical, institutional and economic data make it possible to provide some firm indications as to which factors are driving the observed changes in the size distribution of manufacturing firms.

The goal of this chapter is to provide the general background information necessary for placing the current case study within these two broader contexts. Background is first provided on sorghum beer throughout Sub-Saharan Africa. A review of conventional views on industrial evolution then follows.

A. SORGHUM BEER THROUGHOUT SUB-SAHARAN AFRICA

1. Definition of Sorghum Beer

Sorghum beer is a soured, fermented drink made with malted sorghum.[1] The sorghum malt is combined with a starchy adjunct - usually sorghum, maize or millet flour - to produce a beer, although one significantly different from that with which U.S. consumers are acquainted. One of the most striking differences between the two types of beer is the distinctive sour taste of sorghum beer. It is the production of lactic acid during sorghum beer brewing that accounts for its tangy sour taste. There is a significant difference, too, in alcohol content, with sorghum beer normally containing about 3% alcohol by weight compared with 4.5% in the standard beer consumed in the United States (see Rural Income Distribution Survey, p.48; Novellie 1968, p.27; Schwartz, p.101; Hulse, Table 5.132; Deacon, p.70 and Lender & Martin, p.197).

[1] Americans may be puzzled since they commonly associate malt with the grain barley. While barley malt is the malt most commonly used in producing beer in the U.S and Europe, any grain can, in fact, be malted. Malting involves nothing more than the germination of a grain for several days then the drying and milling of it. The importance of malt in brewing stems from the fact that, during germination, enzymes not present in the original grain are synthesized. The enzymes created during malting have the property of being able to break down starches into simple sugars, the necessary first step in beer production. It is these sugars, of course, which are subsequently converted into alcohol. Malting is described in much greater detail as part of the technical discussion in Chapter 4.

In addition to its sour taste and low alcohol content, sorghum beer is distinguished from U.S. beer by its cloudy appearance. Sorghum beer is an opaque drink, generally pinkish brown in color. Its murky texture results from the large quantity of solid particles and yeast suspended in the beer (Novellie 1968, p.17). While a coarse filtration is performed as part of the production process, the filters used are not nearly of high enough resolution to completely filter out all solid materials present in solution. Because of the solid materials and yeast in it, sorghum beer is a very nutritious drink. It is particularly high in B-vitamins (Novellie 1963, p.29).

In order to differentiate between sorghum beer and the more alcoholic, more highly refined beer drunk in the United States, the beer consumed in the U.S. will henceforth be referred to as "clear beer". Clear beer is of only very minor importance in this thesis; and the term "beer", if used without a qualifier, will refer to sorghum beer.

2. Sorghum Beer and its Close Relatives Throughout Sub-Saharan Africa

Sorghum beer and its very close relatives are brewed throughout Sub-Saharan Africa. Common to all these beers is a production process involving the use of malted grain to break down starches into fermentable sugars. The beers differ, however, in the type of grain that is malted as well as in the nature of the starchy adjunct

used. For malting, sorghum and millet are the two most widely used grains. Maize is sometimes employed, but it does not malt as well as sorghum or millet (National Chemical Research Laboratory, p.24); and maize malt is, therefore, normally only used when sorghum or millet are not available (Bryant, p.274 and Rosenthal, p.55). For the starchy adjunct, unmalted sorghum, millet and maize are most commonly used. On a very localized basis, however, other starches - such as cassava and plantain bananas - are sometimes used. Although by no means exhaustive, Table 2.1 provides an overview of the characteristics of various sorghum and other related grain beers produced by African home brewers. Table 2.2 provides similar information for factory-brewed sorghum and millet beers. For economy of exposition, the plural "sorghum beers" will henceforth be used to refer the full range of beers described in these two tables.

3. The Current Economic Importance of Sorghum Beers

Those uninitiated in the joys of drinking sorghum beer will likely be unaware of its considerable economic importance in Sub-Saharan Africa. Originally, sorghum beer occupied a central social and religious role in the grain producing societies of Sub-Saharan Africa. As those economies became increasingly monetized, the production and distribution of sorghum beer has passed largely into the cash segment of the economies. Conditioned by centuries of sorghum beer consumption, the palate of todays

Table 2.1

Characteristics of Home-brewed
Sorghum and Related Grain Beers Produced in Sub-Saharan Africa

Location	Local Name of Beer	Type of Malt	Source of Starch
1. Southern Africa			
Botswana	bojalwa ja setswana	sorghum	sorghum or maize
Malawi	-	maize	maize
South Africa	utshwala joula	sorghum sorghum	sorghum or maize sorghum or maize
Zambia	7-day beer katata	sorghum or millet millet	sorghum or millet maize
Zimbabwe	zezuru	sorghum or millet	maize
2. West Africa			
Benin	chapalo	millet	millet
Ghana	pite	sorghum or millet	sorghum or millet
Ivory Coast	dolo	sorghum or millet	sorghum or millet
Mali	dolo	sorghum or millet	sorghum or millet
Niger	dolo	sorghum or millet	sorghum or millet
Nigeria	pito	sorghum or millet	sorghum or millet
Togo	dam	sorghum	sorghum
Upper Volta	raam, dolo	sorghum or millet	sorghum or millet
3. Central Africa			
Angola	-	maize	maize
Central African Rep.	-	sorghum or maize	sorghum or maize
Chad	-	millet	millet
Rwanda	-	sorghum	plantain
Zaire	-	sorghum, maize or millet	sorghum, maize, manioc or millet
4. East Africa			
Ethopia	talla	sorghum or millet	sorghum or millet
Kenya	busaa, pombe	millet	sorghum
Sudan	merissa, marisa	sorghum	sorghum
Tanzania	pombe	sorghum or millet	sorghum or millet
Uganda	busaa	millet	sorghum

Note: - indicates no information obtainable.

Sources: Botswana - survey interviews; Malawi - Miracle 1965, p.137; South Africa - Novellie 1961, p.1; Zambia - Vogel & Graham, p.39; Zimbabwe - May, p.84; Benin - Sorel, p.166; Ghana - Vogel & Graham, p.39; Ivory Coast, Mali & Niger - Saul, p.1; Nigeria - Vogel & Graham, p.39; Togo - Hulse, et. al., pp.456,809; Upper Volta - Saul, p.1; Angola & Central African Republic - Miracle 1965, pp.136,137; Chad - O'Laughlin, p.152; Rwanda - Miracle 1965, p.139 and National Plan, p.216; Zaire - Miracle 1965, pp.136,138; Ethopia, Kenya, Sudan, Tanzania and Uganda - Vogel & Graham, pp.39,41 and Govt. of Kenya, p.3.

Table 2.2

CHARACTERISTICS OF FACTORY-BREWED
SORGHUM BEERS PRODUCED IN SUB-SAHARAN AFRICA

Location	Local Brand Name	Type of Malt	Source of Starch
1. Southern Africa			
Botswana	Chibuku	sorghum	maize
Malawi	Chibuku	(sorghum)	(maize)
South Africa	Tlokwe and many others	sorghum	maize
Swaziland	Imvelo	-	-
Zambia	Chibuku	(sorghum)	maize
Zimbabwe	Chibuku, Ngwebu and others	sorghum	maize
2. West Africa			
Ghana	-	-	-
3. Central Africa			
none	n.a.	n.a.	n.a.
4. East Africa			
Kenya	Chibuku	-	-
Tanzania	Chibuku	sorghum	(maize)
Uganda	(Chibuku)	millet	-

Notes: - indicates no information obtainable
( )indicates an educated guess

Sources: Botswana - survey interviews; Malawi - correspondence; South Africa & Swaziland - visits; Tanzania - Vogel & Graham, p.22 and correspondence; Zambia - Pan, p.110; Zimbabwe - survey interviews; Ghana - Cronje, p.61; Kenya - Cronje, p.249; Uganda - Vogel & Graham, p.22.

African is still strongly attracted to the taste of sorghum beer. In fact, today sorghum beer holds a predominant share of the liquor market in many African countries. In meeting the considerable demand for sorghum beer, brewers and retailers generate substantial amounts of employment and income.

The amount of income and employment generated depends, of course, on the size of the sorghum beer market. Today, sorghum beer occupies an important position in the overall liquor market of many African countries, particularly in the savanna areas of West Africa and throughout East and Southern Africa. Sorghum beer generally accounts for over half the total volume of alcoholic drinks consumed (that is, sorghum beers + clear beer + wine + spirits); and in terms of value of sales, it normally occupies a substantial market share. For example, in South Africa in 1977, sorghum beer accounted for 74% of the volume of all alcoholic beverages sold and for 15% of total consumer expenditures on such drinks (calculated from Deacon, pp.132,136,247). In Upper Volta in 1970, home-brewed sorghum beer accounted for 43% of the value of all alcoholic beverages purchased (calculated from Planes, pp.33,35,36). Although data on all types of alcoholic beverages are not available, 1972 statistics from Zambia indicate that, on a volume basis, factory-brewed sorghum beer alone outsold clear beer by a ratio of 1.8 to 1 (calculated from FAO, cited in Pann, p.110).

To further underline the important magnitude of sorghum beer

production, consider historical evidence on the percentage of total grain consumption taken in the form of sorghum beer. In the Logone Plains of East Africa in the 1930's, approximately one half of all harvested sorghum was transformed into sorghum beer (Hardy & Ricket, cited in Platt, p.120). In one region of Zambia in the 1930's, approximately 1/6th of the grain was used for the manufacture of home-brewed beer (Richards, cited in Platt, p.120). It has also been estimated that, in several hill villages of Malawi in 1939, 1/8th of all grain was consumed in the form of sorghum beer (Platt, p.120).

Contemporary estimates are equally large. For example, in Rwanda national statistiics indicate that 60% of the country's sorghum production is consumed in the form of banana beer (Third Development Plan, p.216). In Kenya, about three-quarters of the local sorghum production is used in the production of sorghum beer (Vogel & Graham, p.7). Estimates for Upper Volta indicate that 25% of all sorghum is converted into sorghum beer (Planes, p.43). In the capital city of Ouagadougou, that figure rises to 50% (Pallier, p.139).

With the rise of factory-brewed sorghum beer, these proportions remain substantial. In Zambia, the manufacture of factory-brewed beer absorbed 8% of the commercial maize crop in 1972 (FAO, cited in Pann, p.104 who, unfortunately, does not make it clear whether this total includes just sorghum beer or sorghum beer plus clear beer).

Given the magnitude of demand for sorghum beer, it is not surprising that the people who supply this large marrket generate considerable amounts of income and employment.

Employment generation is one of the most important economic contributions of sorghum beers, especially those that are home brewed. A recent ILO report has stated, "Brewing of 'traditional' beers on a domestic scale may well be the greatest single source of employment - particularly for single women - in some African countries." (ILO 1982, p.69). A number of studies - both current and historical - provide quantative evidence of the important employment opportunities available in sorghum beer production and retailing. Historical evidence, for example, is available for both Tanzania and Zambia in the 1950's. A national accounts study in Zambia in the 1950's found between 7% and 75% of all households selling sorghum beer in the five villages studied (Deane, p.168). Although no employment statistics were provided, a national accounts study of Tanzania in the early 1950's indicates similarly that, "By far the most important 'cottage' industry in Tanganyika (now Tanzania) is home brewing (of sorghum beer)..." (Peacock and Dosser, p.33).

More recent evidence is also available, for example in Upper Volta, where a survey of 172 rural households indicated that 55% brewed sorghum beer (Mitchnik, p.31). A comprehensive survey of almost 12,000 non-agricultural enterprises in eastern Upper Volta

recently found that 19% of total non-agricultural employment was generated in home brewing of sorghum beer (Wilcock and Chuta, p.458). In Upper Volta's capital of Ouagadougou, it has been estimated that 14% of the economically active women are brewers or retailers of sorghum beer (Planes, p.5). Likewise in Kenya, a 1977 survey of rural non-farm employment activities found that, "the brewing of a traditional beverage, pombe (sorghum beer), is clearly the most prevalent of all non-farm activities..." Half of all rural households were found to be involved in at least one type of non-farm income earning activity, and of these, 13.4% were involved in the brewing of sorghum beer (Govt. of Kenya 1977, p.3 and Tables 1 & 4). These findings hold true in urban Kenya as well. Although they combined brewing of sorghum beer with distilling of harder home-made liquor, a 1970 study in Nairobi found that brewers and retailers of alcohol accounted for 18% of all employment opportunities for families in one large squatter area of Nairobi (calculated from Hake, p.195). In similar fashion, a recent survey of two suburbs of Kampala, Uganda found that 22% of all women earned income from brewing and distilling. This accounted for 33% of all working women (Obbo, p.126).

Home brewing not only generates large amounts of employment, it is also a profitable business which generates substantial amounts of income for the people involved in producing and selling it. In Upper Volta, it has been found that full-time sorghum beer brewers

in the capital city earned incomes above the per capita national average (Pallier, p.139). Although he provides no statistics, Little comments on the financial attractiveness of beer selling in Kampala, Uganda by noting that, "although the women of Kampala act as assistants in African-owned shops, none of these occupations can rival the attractions of beer-selling." (Little, p.45).

Home brewers and home retailers find sorghum beer related income to be particularly attractive because it is a source of cash income. Cash is often a scarce commodity essential for the payment of school fees, taxes and other necessities of a monetized economy. In one region of Tanzania, Beidelman (p.542) has noted that, "...it is beer which is the most important cash-earning commodity." Summarizing from another anthropolocial study in Tanzania, it has been said, "that beer selling is the best means which poor people have of securing the cash required to buy food in times of want."(Pan, p.108 paraphrasing Harwood). In Zambia as well, "Beer brewing seems to be an important activity ... in the three areas visited, it accounted for a relatively important proprotion of cash income from local sources." (Deane, p.168). In Nigeria, too, it has been observed that, "Brewing is also a major source of ready cash." (Netting, p.377). Similarly for Zimbabwe, May (p.20) has remarked that, "The proceeds from the sale of beer, traditionally brewed by women, are often the only source of income, the only cash procurable for the payment of school fees and equipment." (emphasis added in

all above citations).

Important to individual brewers, the income derived from sorghum beer production and sales can also constitute a not inconsequential proportion of GDP. For example, in Malawi in 1945 income from home brewing of sorghum beer accounted for 6% of net territorial output, and in 1948 the contribution of sorghum beer was estimated at 4% (Deane, p.89). In Tanzania in 1954, "craft industries" were estimated to account for 4% of gross domestic product, and sorghum beer production accounted for the vast bulk of those craft industry earnings. Preparers of those Tanzania national accounts explain that, "Other arts and crafts do not seem very important in magnitude; we have simply rounded up our brewing figures to make allowance for them." (Peacock and Dosser, p.45). Finally, in Rwanda home-brewed banana beer accounted for 9% of GDP in 1970 and for 6.5% of GDP in 1980 (Rwanda National Accounts, 1970 & 1980).

4. Historical Overview of Sorghum Beer Production

Sorghum beer has been a prominent feature of the African diet for many centuries at least - and probably for millenia. In fact, it has been suggested that the desire to brew beer may have provided the original stimulus for the development of domesticated agriculture (Braidwood, p.516). In Africa, it is thought that the Egyptians began making grain beer from malted barley from about

3,400 B.C. onwards (Platt, p.115 & Bryant, p.277). In Southern Africa, sorghum beer production has been prevalent since at least 1505 according to the reports of early Portugese explorers (Bryant, p.279). Likewise, the earliest explorers of West Africa, explorers such as Heinrich Barth and Mungo Park, commented on the existence of sorghum beer in the areas they visited in the mid 1800's (Bryant, p.278).

The motivation for brewing sorghum beer and the mechanisms by which it is allocated have evolved considerably in Sub-Saharan Africa over the past five or so centuries. In its broad outlines, the evolution of sorghum beer production and distribution has commonly involved a progression through the following three phases:

a) the era of socially-allocated home brewing;

b) the evolution from social to cash home brewing; and

c) the rise of factory brewing.

Each of these phases is described briefly below.

a. <u>The Era of Socially-allocated Home Brewing</u>

In the earliest centuries of its use, sorghum beers were allocated through social rather than market mechanisms. Although it is difficult to fix exact dates, the era of socially-allocated brewing endured through about the mid-1800's in Southern Africa, with this date being a likely cutoff for much of East and Central Africa as well. In West Africa, however, the era of the entirely social brewing may have ended sooner, perhaps as early as the

1300's. The issue of dates is explored in more detail in the discussion of the evolution from social to cash home brewing.

During the era of socially-allocated home brewing, sorghum beers were produced for two principal reasons. The first motivation was that of social and household consumption, and the second was to mobilize community labor for work parties (Wolcott, p.69 & Curtis, p.17). Consider first the social role played by sorghum beers. In the grain-producing societies in Sub-Saharan Africa, that social and ceremonial role is of central importance. A multitude of researchers have commented on the importance of sorghum and millet beer in weddings, funerals, birth celebrations, initiation ceremonies, celebrations of the harvest and for festivities of all sorts. As Kringe has said with reference to the Zulu of Southern Africa, "No ceremony is complete unless there is beer; at weddings, at all ceremonies marking the different stages in the life of an individual, there must be beer, and when a man wishes to entertain his friends, he invites them to a beer party..." (in Rosenthal, p.57). Further evidence of the social and ceremonial importance of sorghum beer brewing is provided by Saul (p.1) for Upper Volta, Curtis (p.17) for Botswana, Wolcott (p.71) for Zimbabwe, Netting (p.337) for Nigeria, Sangree (p.10) for Kenya, Gulliver (p.453) for Tanzania, Stefaniszyn (pp.60,62,143) and Richards (p.77) for Zambia, and Middleton (p.576) for Uganda.

As indicated by Kringe, part of the social importance of sorghum

beer involved day-to-day entertainment of friends and visitors. To brew beer for friends and visitors was viewed as a common social responsibility and was a primary method of status accumulation in many societies. As Huntingford has noted with regard to the Nandi of Kenya, "If a Nandi cannot from time to time give a beer party, even a small party, he will lose social standing; he will be considered mean and will not be asked by his neighbors to partake of beer. He will be, unofficially, but nonetheless effectively, pushed out of his rightful place in the social life..."(in Platt, p.117). Further evidence of the social responsibility for brewing sorghum beer is provided by Sutherland (p.13) for Botswana, by Rosenthal (p.59) for the Xhosa of South Africa, by Netting (p.376,377) for the Koyfar of Nigeria, for the Mossi of Upper Volta and by Richards (p.77) for Zambia.

The second motivation for brewing was to mobilize labor in the form of cooperative work parties. In the village economies, it was often important to be able to marshall collective labor for large undertakings such as clearing fields, building houses, plowing and weeding crop fields. A household wishing to obtain assistance for such a task would brew a large batch of beer and invite the rest of the village to work and drink with them. Reference to such practices is provided by O'Laughlin (p.256,267) for Chad, by May (p.20) and Wolcott (p.70) for Zimbabwe, by Curtis (p.17) for Botswana, by Platt (p.118ff for Malawi, by Rosenthal (p.61) for

South Africa, by Richards (p.77) for Zambia, by Saul (p.1) for Upper Volta, by Netting (p.377) for the Koyfar of Nigeria, by Vogel & Graham (p.9) for Uganda, and by Barth (1967, p.153) for Sudan. Sorghum beers, with their central role in mobilizing cooperative labor, provided a key lubricant for orienting village social mechanisms towards economic ends.

Social mechanisms provided the primary means of allocating sorghum beer among consumers in those early years of sorghum beer brewing. It was generally the men, and among them the elders, who drank first in households and at large village gatherings. Drinking was generally from a large common gourd that was passed from one drinker to another. Considerable ceremony was involved in beer drinking, even in a household among friends. Women, in some areas, were not allowed to drink the men's beer, and minors could not drink without the permission of their parents. Evidence on the social allocation of sorghum beer is provided by Solway (p.6) and Sutherland (pp.12,13) for Botswana, Sangree (p.18) for the Tirki of Kenya, Wolcott (p.74) for Zimbabwe, Rosenthal (pp.58,62) for the Zulu of South Africa and Richards (pp.80,81) for the Bemba of Zambia.

The brewing technology in the era of socially-allocated brewing was simple (Novellie 1968, p.17; Bryant, pp. 274-276; Schapera, p.14). Exclusively hand methods were used in turning grain into beer. Malting of the grain was done in clay pots or on dampened

grass mats. Milling of malt and grain was all done by hand, with a mortar and pestal. Cooking and fermentation both took place in locally-made clay pots. Beer was strained through hand-woven strainers. Thus sorghum beer production was, throughout the era of socially-allocated brewing, a simple, socially-focused activity; and it played a very important role in cementing the social relations that held the village together.

b. The Evolution from Social to Cash Home Brewing

Of the broad trends taking place in sorghum beer production, one of the most striking has been the increasing tendency among home brewers to manufacture beer for cash sale. Although this has proceeded at differential rates in different countries and in different regions. The earliest evidence of home brewing for sale comes from West Africa. Both Margin (1912) and Tauxier (1916) indicate that the sale of sorghum beer was common when they visited the West African markets of Upper Volta around 1900 (Skinner, pp.259,260). The monetization of the Sahelian economies during the trans-Saharan trade and the early use of cowries as a currency throughout West Africa is likely the cause of this early development of brewing for sale in West Africa. Upper Volta was linked into this trade as early as 1300 A.D., and it is possible that brewing for sale began as early as that. In Southern Africa, cash brewing initially took the form of women providing sorghum beer to men who had migrated to urban areas to work. This probably began

around 1850, and certainly by the early 1900's cash brewing was well-entrenched in Southern Africa. Rheinalt Jones (p.180) gives an account of cash brewing in Johannesburg in the 1930's; and Richards comments that cash brewing was occurring alongside ceremonial brewing in Zambia in the early 1930's (Richards, p.77). Mackenzie (p.129) indicates that cash brewing was operating in Malawi at least as early as 1925. Evidence from Central Africa is provided by Vansina (p.304) and Stanley (Volume I, p.512) who both indicate that at least as early as 1880 maize beer was being produced for sale in the Tiko area of what is now Congo and Zaire. Evidence for East Africa is limited to that from Gulliver (pp.437,438) which indicates that cash brewing began among the Arusha of Tanzania around 1920. It seems probable that cash brewing would have begun earlier along the coast, likely by 1900 at least.

Limited quantative evidence exists on the relative proportions of cash versus social brewing. A single early report is provided by Platt who cites data from three Malawian villages during 1939. At that time, he found that 26% of the sorghum beer produced was brewed for cash sale, while 53% was used in cooperative work parties and 20% was for household consumption (calculations from Platt, pp.18,19). The smattering of more recent evidence suggests that today cash brewing is by far predominant. In Manga village in Upper Volta, Saul estimates that 97% of all sorghum beer produced in 1979 was for cash sale (calculation from Saul, p.8).

A number of factors have been responsible for the rise of cash brewing. First and foremost is the increasing monetization of the African economies. Internal long-distance trading led to the development of currency systems long ago. The use of cowries in the Trans-Saharan trade in West Africa, for example, has been common since about 1000 A.D. (Hopkins, p.68). The increasing penetration of European trading shops and monies further stimulated the development of a cash economy. The imposition of head taxes in most of colonial Africa in the late 1800's and early 1900's is commonly cited as a landmark in accelerating the monetization of those economies. For further details, the numerous case studies in Bohannan and Dalton's Markets in Africa provide a good overview of the rise of cash economies in Africa.

A second factor promoting cash brewing has been the rapid increase in urban and migrant labor beginning in the late 1800's and early 1900's. This is especially so in Southern Africa, an area in which Cooper (p.26), Sutherland (1976, p.7), Gulbrandson (p.84,85), Platt (p.120) and Koijman (p.92) have all stressed the importance of labor migration in stimulating the rise of cash brewing. Returning mineworkers and urban laborers have injected substantial amounts of cash into rural economies. In addition, the migration of male laborers to urban areas and to the mines was in large part responsible for the rise of the female-headed households that are so common in a wide number of countries (see Obbo, p.90 on the

prevalence of female-headed households in various African countries). Without men to plow and with school fees, clothes and taxes that all require cash payment, many women have been forced to raise cash with one of the few marketable skills they possess - brewing.

Accelerating urban population growth is the third and final important stimulus promoting the rise of cash brewing. Unlike rural areas where the transition from social allocation of goods and services to market mechanisms proceeded more slowly, the newer urban areas in Africa have tended to rapidly replace social mechanisms with the cash allocation system of the market. While sorghum beer is still used for religious and ceremonial purposes in urban areas (Obbo, p.129 & Wolcott, p.78ff), all studies of urban brewing of which this author is aware - for example Hake, Little, Rheinalt Jones, Obbo and the present study - emphasize that urban brewing of sorghum beer is predominantly aimed at earning cash. Thus, as urban poulations rise, a greater and greater proportion of sorghum beer will be consumed there; and it will be sold for cash, increasing the overall proportion of cash brewing in the country. In sum, the three forces of increased monetization, migrant labor and urbanization are working in concert to foster the rise of cash brewing of sorghum beer.

The rise of chash brewing has brought with it several changes in rural life patterns. In Southern Africa at least, the most striking

change is that the young are now important consumers of sorghum beer. When young laborers return from the mines or from work in urban areas, they come with cash earnings which they can use to purchase however much sorghum beer they wish. The allocation of sorghum beer has, therefore, come to be controlled according to purchasing power rather than according to social rank and age. The structures whereby the elders had been able to control the allocation of beer have gradually broken down as has the old social system in general. Sutherland (pp.12,13), Solway, (p.6), Gulbrandson (p.85), Wolcott, (p.74), Kooijman (p.11) and Richards (p.81) have all provided evidence on the decline of social allocation of sorghum beer.

Recipes have also changed along with the increasing predominance of cash brewing. The sizes of brews, for example, have increased (Novellie 1966, p.1). In addition, many women have come to specialize in sorghum beer brewing. The extreme seasonality that formerly characterized home brewing has been dampened with the advent of steady year-round incomes and demand as well as by the increasing size of marketed grain flows which make raw materials available virtually year-round.

Home brewing technology has also become increasingly modernized and refined. Part of the production process has been mechanized with the introduction of hand and diesel hammermills in many villages. A further, and very important, development has been

specialization in the manufacture of brewing inputs. Most important, a malting industry has grown up in many parts of Africa to provide sorghum malt to home brewers. Specialization in input suppy has continued, in Southern Africa at least, to the point where it is now possible to purchase a powdered sorghum beer to which the home brewer merely needs add water.

c. The Rise of Factory-Brewed Sorghum Beer

The culmination of the trend of commercialization, mechanization and brewing on increasingly large scales was achieved when factories began manufacturing sorghum beer itself rather than just inputs used in its production. It is in the Southern African countries of South Africa, Zimbabwe, Zambia and Malawi that factory-brewed sorghum beer developed first; and in those countries, it has grown to the point where factory-brewed sorghum beer controls a predominant amount of the overall sorghum beer market.

Factory brewing of sorghum beer began in Southern Africa as part of an effort to provide adequate amounts of drink to the large concentrations of male workers in urban areas and in the mines (Novellie Nov./Dec. 1966, p.1). Factory brewing was first begun, on a very small scale, by the municipal authorities in Zimbabwe (then Southern Rhodesia) and in South Africa. The township of Salisbury, Rhodesia (now Harare, Zimbabwe) opened the first factory sorghum beer brewing operation in Africa in 1908 and was closely followed by the municipality of Durban, South Africa in 1910 (Wolcott, p.23;

Novellie 1968, p.17). Commercial brewing really took off, though, in the late 1930's when the South African government banned home brewing for sale in urban areas and required that municipal governments assure the supply of sorghum beer in those areas (White, p.1).

In the 1940's and 1950's, private enterprise entered the factory brewing business. They were much stronger in Zambia and Zimbabwe than in South Africa. In South Africa from 1946 to 1953, some private companies did produce factory-brewed sorghum beer; but these efforts were limited, and municipalities now produce all the factory-brewed sorghum beer in that country (Schwartz, p.101). Elsewhere the Heinrich's Chibuku Company, established by a German immigrant named Richard Max Heinrich, was a pioneer in private factory brewing of sorghum beer. This company began brewing sorghum beer in Zambia in the mid 1950's, and by the mid-1960's they were operating numerous sorghum beer breweries in Zambia and Zimbabwe (Heinrich's Chibuku, p.4).

In East Africa, factory brewing of sorghum beer has begun on a limited scale, largely, it appears, due to the expansionary efforts of the Heinrich's Chibuku company. This expansion occurred mainly during the 1960's when the company was owned by the large multinational corporation, Lonrho. Although Lonrho sold the Heinrich's Chibuku company in 1971 (Cronje, p.165), they left a legacy of scattered expansionary initiatives throughout the

continent. Chibuku brand factory-brewed sorghum beer is currently sold in Tanzania, Kenya and probably Uganda. Vogel & Graham provide (misspelled)[1] evidence for Tanzania (Vogel & Graham, p.22) and Cronje does so for Kenya (Cronje, p.249). In Uganda, Vogel & Graham (p.22) indicate that small factory breweries currently manufacture millet beer. It very possibly carries the Chibuku brand name, since Lonrho did have brewing interests in Uganda according to newspaper account (Rand Daily Mail, February 2, 1982).

Unlike East Africa, West and Central Africa have been largely ignored to date by factory brewers of sorghum beer. In all of West and Central Africa, the only factory brewing of sorghum beer of which this author is aware was the brewery set up in Tamale and Obuasi, Ghana by Lonrho in 1969 (Cronje, p.61). It is possible that these breweries have since been shut down ("West Africa", September 20, 1969, p.1126). The legacy of rapid urbanization, heavy concentrations of black wage workers and a strong white settler presence are likely the reasons that factory-brewing of sorghum beer began first in Southern Africa and remains most heavily concentrated there today.

[1]They state that "oibuku" brand sorghum beer is sold in Tanzania, but this is undoubtedly a typographical misrepresentation of "chibuku".

5. The Current Status of the Evolutionary Spectrum

Table 2.3 summarizes the current state of evolution in sorghum beer markets in Sub-Saharan Africa. All African countries have been classified by the present author as being at one of five stages of evolution. Within this five-stage classification system, Stage 0 represents a state of affairs in which a country's entire output of sorghum beer is produced by home brewers and is allocated by social mechanisms. Stage 1 is that in which home brewers still produce 100% of all sorghum beer but in which a substantial proportion of that sorghum beer is produced for sale rather than for distribution through social mechanisms. This stage, thus, represents the beginnings of the evolution from social to cash brewing. At Stage 2, both home- and factory-brewed sorghum beer are sold, although home-brewed sorghum beer holds a dominant market share. Stage 3 is the point at which the factory-brewed sorghum beer attains a predominant share of the market. At this stage, some home brewing is still carried on to supply low income consumers who cannot afford the higher priced factory-brewed sorghum beer; and a very modest amount of home brewing is carried on for allocation through social mechanisms. Stage 4 is the stage at which factory-brewed sorghum beer supplies 100% of the sorghum beer market.

As can be seen from Table 2.3, all countries have evolved past Stage 0; and a large number, particularly those in West and Central Africa, are now at Stage 1, the stage at which the bulk of sorghum

Table 2.3

STATUS OF EVOLUTION IN SORGHUM BEER MARKETS
THROUGHOUT SUB-SAHARAN AFRICA, 1983

Location	Stage 0 Only Socially-allocated Home Brew	Stage 1 All Home Brew: some social, some cash brewing	Stage 2 Home Brew Plus beginning of Factory Brewing	Stage 3 Predominantly Factory Brew With Some Home Brew	Stage 4 Only Factory-Brewed Sorghum Beer
1. Southern Africa	-	-	Botswana Lesotho	Malawi South Africa Swaziland Zambia Zimbabwe	-
2. West Africa	-	Benin Ivory Coast Mali Nigeria Togo Upper Volta	Ghana	-	-
3. Central Africa	-	Burundi Cameroon Central African Rep. Chad Rwanda Sudan	-	-	-
4. East Africa	-	-	Kenya Tanzania Uganda	-	-

Notes: 1) - indicates no countries in that classification
2) countries are omitted if there exists substantial uncertainty as to their classification (for example, Ethopia and Mozambique)

Source: subjective classification based on travels in Botswana, South Africa, Swaziland, Kenya, Rwanda, Ivory Coast, Cameroon, Mali, Niger, Nigeria, Togo and Upper Volta; on readings cited in bibliography; and on discussion with numerous Africans from countries other than those visited.

beers produced are manufactured by cash home brewers. Another large group of countries is currently at Stage 2. Factory-brewed sorghum beers have been introduced in these countries but have not yet gained a predominant market share. These countries lie primarily in East Africa, although Botswana, the country that will form the basis for the present case study, also falls into this category. Stage 3, at which the sales of factory-brewed sorghum beer exceed those of home brew, has been achieved by several countries in Southern Africa. South Africa, Zimbabwe, Zambia, Malawi and probably Swaziland fall into this category. No countries have arrived as far as Stage 4, the point at which no home brewers are in business. The reasons for this will be explored in Chapter 6.

The important point to be derived from this overview is the following: that Botswana, the country to be used as a case study for the present study, can potentially offer some insights of value far beyond its own borders. Botswana's sorghum beer market is currently at Stage 2 and, as we shall see presently, is rapidly moving towards Stage 3. A number of lessons can be learned from Botswana about the economic impact of the expansion of factory brewing and regarding potentially important policy interventions. These lessons have direct applicability in all African countries with large sorghum beer markets, but especially those at Stages 2 and 1. Thus, most of West, East and Central Africa can benefit from the lessons derived in this in-depth study of sorghum beer in Botswana.

B. ON THE ROLE OF HOUSEHOLD AND ARTISAN ENTERPRISES IN INDUSTRIAL DEVELOPMENT

1. Background

The case study of sorghum beer in Botswana provides a current example of a household industry reacting to a changing environment - one in which new, larger scale brewing technologies are becoming available, in which incomes are rising and tastes are changing, in which transportation costs are dropping and urban population concentrations are increasing. By providing a close-up view of the transformations that are taking place, the case study may potentially be able to offer some insights into: 1) the empirical question of how the market share held by household producers changes over time; 2) analytical issues regarding the forces which direct those trends; and 3) policy implications flowing therefrom. The case study, too, will benefit greatly by being framed within this broad context. A number of hypotheses regarding trends and forces at work can be derived from a review of the work done to date on the general process of industrial change. A review of this work should, therefore, highlight key issues to consider in examining the sorghum beer case study in Botswana.

A wide range of academics and practitioners have examined the question of how the importance of household and small manufacturing enterprises changes over time. In developed countries, a number of historians and economic historians - for example, Toynbee (1964) and

Parker (1979) - have paid considerable attention to the decline of household and small industries during the course of the industrial revolution. In addition, a number of industrial organization researchers have compared the size distribution of firms in various countries to determine what factors influence the growth of large and small firms. The works of Banerji (1978), Scherer (1973), Silberston (1972) and Teitel (1975) fall into this category.

In developing countries, the role of small and household manufacturers in industrialization has been widely discussed. Hoselitz (1959), for example, provided an early exposition of the issues involved. In addition, Staley and Morse, after many years of industrial promotion work in Asia, produced a book, Modern Small Industry for Developing Countries, which provides what is still probably the most comprehensive policy analysis of the role of small and household enterprises in the industrial development of Third World countries. Following these two early works, several large bodies of literature have developed on the role of small firms in industrialization. One such body of writing, the "choice of technique" literature, has grown up around the question of whether or not small firms can provide levels of capital and labor efficiency comparable to those achieved in large firms. Morawetz (1974), White (1978) and Chuta and Liedholm (1979) provide a good summary of the choice of technique literature.

More recently, a broad range of institutions - the

International Labour Office (ILO), the World Bank and bilateral donors such as the U.S. Agency for International Development - have increased their focus on very small and household firms, primarily because of their potential for employment generation. The rising interest in the very small and household industries has been most commonly associated with the ILO World Employment Programme, particularly their early country missions to Kenya (1972) and the Philippines (1974). With the ILO interest in small, household and artisinal firms has come the new vocabulary of the "informal" and "formal sector". This terminology was first advanced by Hart (1970) (see Moser, p.1052) but has been heavily promoted by and most closely identified with the ILO (see Bromley, 1978a).

Largely mirroring the ILO interest in the informal sector has been the political economy writers who discuss the same issues and situations but who use Marxist terminology and methods of analysis. They refer to the ILO's informal sector as "petty commodity production" and to the ILO's formal sector as "capitalist production". Despite the different vocabulary and analytical orientation, both schools have done empirical work and have contributed to an understanding of the reasons for the shifting size distribution of industrial firms over time. (See World Development, vol. 6, no.9/10, 1978 for a comparison of the "informal sector" and "petty commodity" analyses.)

Thus, in one form or another, the role of household and small

manufacturing firms in industrial evolution has received a substantial amount of attention. In order to frame the current case study within the broad context of this literature, three principal questions will be addressed: 1) What empirical evidence is available regarding the importance of small and household firms over time? 2) What are the key forces directing the observed trends? and 3) What are the principal policy implications drawn from these empirical and diagnostic analyses? Each of these questions is discussed in turn.

2. Empirical Evidence

Empirical evidence on the changing role of the very small and household industrial enterprises has been best summarized by Anderson (1982). He cites time-series evidence from the United States, Germany, India, Turkey, Japan, Korea, Taiwan the Philippines and Colombia and cross-section data for a large number of countries in Africa, Asia, North and South America (Anderson, pp.8-13). This evidence includes a compilation of information from a number of soruces including Hoselitz (1959), Banarjee (1977), Page (1977), the ILO, various World Bank missions and individual country manufacturing censuses.

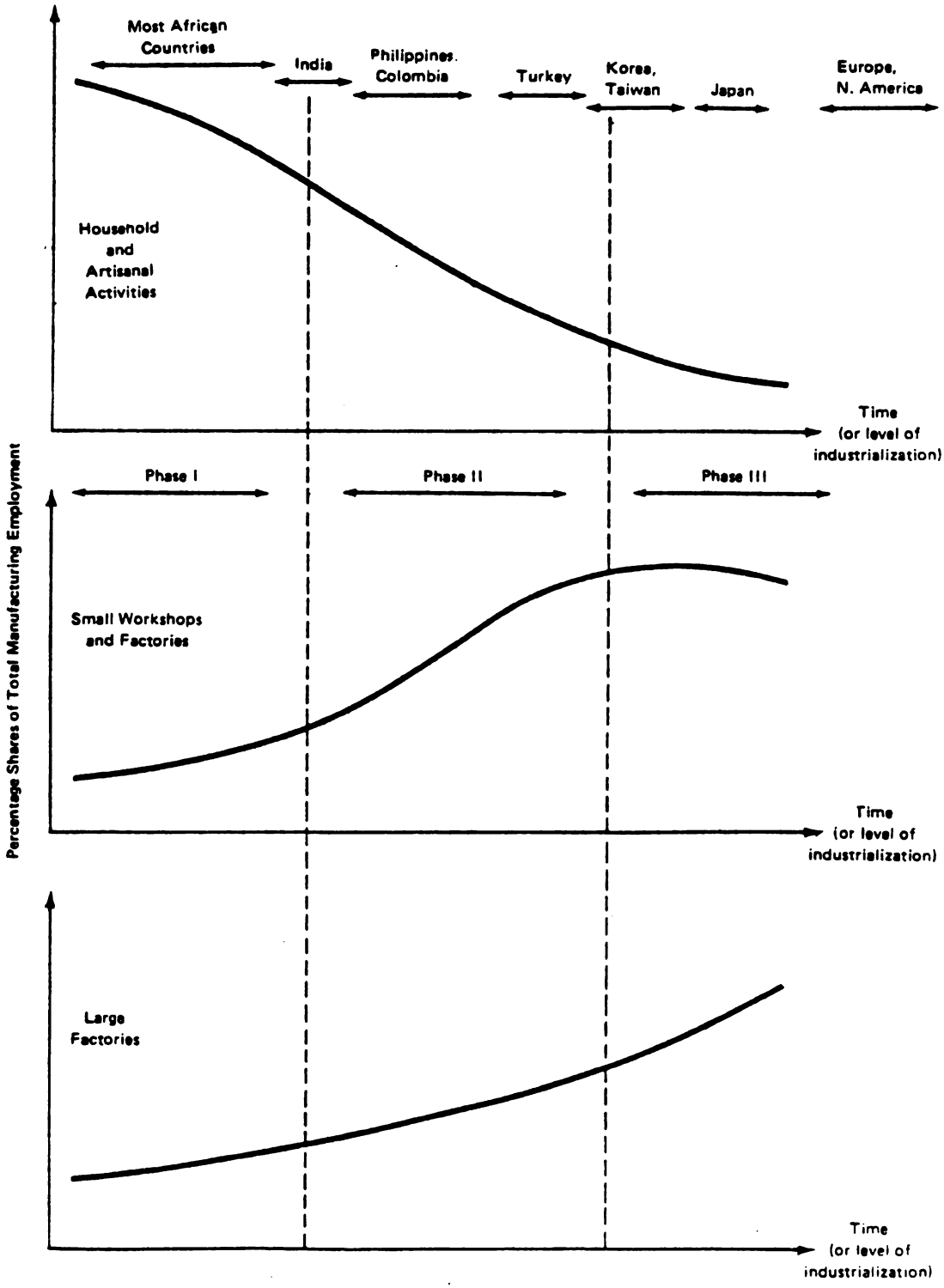
From all this empirical evidence, Anderson has produced a simple, stylized rendering of what appears to be a common pattern of industrial development. His rendering, reproduced as Figure 2.1, indicates that household and artisinal activities decline in

relative importance as industrialization proceeds and that factory producers (both small and large) come to occupy increasingly large industrial market shares.

Five comments are required on this general depiction. First, it must be emphasized that the data on the group of particular interest, the household and artisan producers, are not of exceptional quality. They are largely derived as a residual, by subracting data from manufacturing establishment surveys from that obtained in household labor force surveys. Problems of seasonality, underreporting and variable sampling procedures invariably surface to compromise the comparability of the two types of surveys. As Anderson says, "It is impossible to reconcile the series precisely, but it is believed that the inconsistencies are not such as to obscure the changes taking place." (Anderson, p.14).

Second, it is important to point out that the vertical axis on Anderson's diagram is calibrated in percentage rather than in absolute terms, so a relative decline in household and artisan employment could be consistent with an absolute increase in their numbers if the overall manufacturing growth rate were high enough. Anderson does, in his text, indicate that in the initial stages of development the household and artisinal firms do increase in absolute numbers while at the same time supplying a decreasing proportion of the market share of output. Subsequently comes a point at which household and artisinal firms decline in both

FIGURE 2.a
Changes in the Size Structure of Industry Over Time



(Source: taken directly from Anderson, p.15)

relative and absolute terms (Anderson, p.32).

Third, it should be emphasized that the general trends displayed in Figure 2.1 disguise considerable industry-specific variation. Anderson (p.17), Staley & Morse (Chapters 2 & 3) and virtually all other observers emphasize that, as development proceeds, technology, demand, shifting prices and a multitude of other factors work together to generate growth potential in some small manufacturing industries and lead to the obsolescence of others. According to the composition of output, the location of raw materials, dispersion of consumers and a whole host of country-specific characteristics, therefore, the absolute height of each curve will vary from country to country. While carefully pointing this out, Anderson indicates his belief that the points of inflection and general shape of the three curves do appear to be consistently of the form displayed in Figure 2.1 (Anderson, p.14).

Fourth, it should be empahsized that Anderson's curves represent trends in manufacturring only; they exclude trade, services, agriculture and all other sectors of the economy. Thus, even if accurate for manufacturing, the conclusions may be misleading when considered in light of a more complete view of the economy. This could be so; because, while the growth of large manufacturing firms may put many small producers out of business, it can also promote the development of a broad supporting cast of small service, retailing or agricultural enterprises. For example, the

production of many factory goods - such as automobiles, radios and appliances - generate considerable ancillary activity in small-scale servicing and repair enterprises. Many times, too, centralized large factories require extensive distibution networks; and distributors, particularly at the retail level, are often small firms. Thus, it may be that a broader view of the economy would generate curves of substantially different shape, because large manufacturers may support small-scale activities in non-manufacturing roles.

A final comment has to do with definitions. What Anderson refers to as "household and artisinal activities" are variously referred to by other analysts as dwarf industries, microenterprises, cottage industries, the informal sector and petty commodity producers. Since the ensuing discussion will draw on the contributions of a number of bodies of literature, it is necessry to establish from this diversity some standard terminology and translations.

In the ensuing discussion, size, as measured by employment, will be the key variable used in categorizing firms. The bulk of the empirical work to date has in fact used number of workers as the basis for firm classification. Use of the size breakdown in categorizing industrial firms, has been adopted by Hoselitz (1959), Staley & Morse (p.14), Anderson (pp.8-13) and a host of government statisticians. It is Kilby (1982) who has most clearly articulated

the rationale for using a size breakdown for classifying production enterprise. Kilby provides his defense of size breakdowns as a response to the increasing proliferation of studies adopting the ILO-promoted vocabulary of the "informal sector". He points out that use of the informal sector concept is not particularly useful either for analytical or policy purposes. Size, on the other hand, is a critical variable which, among other things, has a bearing on: scale economies; bargaining power; conditions of entry; and on costs of delivering technical, management and financial assistance (Kilby, pp.42-47). A breakdown of firms by size is, therefore, extremely useful both for analytical and for policy-making purposes.

The following size breakdown and terminology will be adopted in the rest of the present analysis:

1. Household and Artisinal Enterprises

    1.a. household enterprises, those employing less than 10 workers and which take place at home (although not necessarily inside the house);

    1.b. artisan workshops/factories, those employing less than 10 workers and whose production takes place at a specialized location away from the proprietor's home;

2. Small Factories

    2.a. previously existing small workshops/factories, those employing between 10 and 100 workers and which have been practiced in the country for a minimum of about one generation;

    2.b. new small factories, those employing betwween 10 and 100 workers and which have been introduced within the last generation;

3. Large Factories, those employing 100 or more workers.

While Anderson may not explicitly endorse such detailed specifications, he does clearly define small and large factories as is done above. The precise employment cutoff for household and artisinal industries and the subdivision of his first two categories are not attributable to Anderson. The subdivision of the first two groups will prove useful for subsequent analytical and policy purposes. It must be admitted that these definitions are aribtrary as, indeed are any others. It is also true that the size cutoff of 5 workers for small firms and 50 for the large are used by some analysts. In defense of the above definitions, one is forced into the refuge sought by Anderson who says, "The precise choice of the dividing line between these groups is unavoidably arbitrary. It is important, of course, that the conclusions to be drawn from the analysis would not change with another (equally arbitrary) choice, which I believe is the case below." (Anderson, p.7).

Reconciling the present classification system with the numerous other lexicographies currently in use is the final administrative necessity to dispatch before the contributions made by each group can be martialed towards the common end of consolidating understanding of the causes of industrial evolution. Since Hoselitz (1959), Anderson (1982), Banarji (1978), the bulk of the government statitisticians and numerous other analysts use the same, or very similar, size breakdowns, this reconciliation is only necessary for

the "informal sector" and "petty commodity" analysts. Perhaps the easiest place to start is by observing that the informal sector and petty commodity producers are essentially the same. The petty commodity terminology is merely a Marxist label and the informal sector a more neoclassical label for the same thing. In comparing these two bodies of writing, Moser (p.1057) indicates that, "The vast majority of small-scale enterprises, of the type described as being in the informal sector, fit into the category of 'petty commodity production'." In addition to being essentially the same, it is clear from the descriptions involved in the various petty commodity and informal sector studies that both are referring to the smallest size classification in the present system (see Schmitz 1982, p.430). Therefore, the term "household and artisinal" producers or enterprises will be used to encompass what has been referred to as both informal and petty commodity production.

3. Conventional Explanations of the Historical Trends

Having coaxed definitions from the various schools of analysis into the current classification system, it is possible to draw on all bodies of literature in synthesizing current understanding of the principal forces responsible for Anderson's observed, stylized trends in industrial evolution. This task is easier than it might appear; because, despite the divergences in terminology and analytical focus, the various schools of observers have reached

strikingly similar conclusions regarding the causes of industrial evolution.

a. Strengths of the Household and Artisinal Enterprises.

Household industries are the starting point for any discussion of industrial evolution. In the great long ago, virtually all production was undertaken in the home. Shoes were made at home. Yarn was spun, cloth was woven and clothing was produced. Food processing activities such as the production of beer and cheese were also undertaken in each household. Specialization began slowly as some home or artisinal producers began to sell to others in their hamlets. Until the late 1700's, household and artisinal producers were the dominant suppliers of manufactured goods throughout the world. The industrial revolution, which took place in Europe in the late 1700's, is largely a tale of the decline of the household and artisinal industries and the concomititant rise of the factory production system (see Toynbee (1956) or Peters (1968) on the industrial revolution).

In the face of competition from factory producers, household and artisinal enterprises showed a durability that surprised many contemporary observers (Staley & Morse, p.45). Several factors allow the household producers and the artisans to maintain a substantial market share for considerable periods of time as they are shown to do in Figure 2.1. Household producers, in particular, benefit from two specific cost advantages. They benefit, first of

all, from lower overhead costs derived by producing at home instead of renting or building a separate premises. Secondly, as strongly emphasized by Lipton, is the advantage of the fungibility of household assets - the use of a cart to haul water for beer brewing when it would otherwise sit idle; the use of a dining table for sewing; and so on (see Lipton 1983). Artisan firms do not possess these latter two advantages, which is likely why Staley & Morse (Chapter 3) emphasize that the artisan firms must modernize (develop into Group 2.a modern small factories) or cease operating. Both household and artisan producers benefit from low labor costs, as they are normally unregulated and can take advantage of low seasonal labor costs and the generally low opportunity cost of the labor of some household members. Furthermore, by using low-wage labor and with lower overhead costs than large factories, both artisan and household producers many times offer profitable opportunities for the development of subcontracting arrangements, producing inputs or final goods on contract for larger firms. As incomes rise over time, a number of new demands arise, and initially at least, the household and artisan producers are sometimes able to meet that new demand. As long as transport costs remain high, they operate protected from large-scale producers. In sum, wage structures, the dispersion of markets and the nature of scale economies in production process can, in many cases, result in long periods of viability for household and artisan producers.

b. Conventional explanation of the decline of household and artisan producers.

While the these factors can allow household and artisinal firms to compete - and sometimes for protracted periods of time - against factory producers, most observers agree that the ultimate demise of the household industries is only a matter of time. As Hoselitz says so matter of factly, "It is probably not necessary to comment on the rapid decline of handicraft and cottage industries. These industries have been unable to withstand the competition of larger, normally more mechanized establishments..." (Hoselitz, p.604).

The reasons for the ultimate decline of household and artisan enterprises are numerous. While it is difficult to do justice to the rich array of commentary on industrial evolution in a brief space, there are several very strong common themes recurring throughout the writings on this subject.

On the supply side, economies of scale are generally viewed as the driving force in the decline of household and artisan enterprises and the consequent increasing market share held by factory producers. Technical change, accompanied by falling transport costs and rising incomes, results in the development of increasingly large markets, thereby opening up increasing production processes to the gains of scale economies. Analysts from Adam Smith onwards have emphasized the importance of scale economies in industrial evolution. (See, for example, Hoselitz (p.611); Staley & Morse (p.98); Anderson (p.26) and Schmintz (p.160).) As pointed out

by many observers, economies of scale exist not only in production but also in management, marketing and input procurement (for example, Anderson, p.26). As markets grow larger and larger, they bring with them the possibilities for large factory producers to manufacture at costs substantially below those achieved in household and artisinal firms.

In addition to strictly technical factors on the supply side, the existence of market power excercised by large firms is another factor commonly associated with their rise to prominence and with the consequent decline of small producers. While observers from different ends of the political spectrum differ in the tone with which they describe the advantages of market power, analysts of all persuasions agree that large firms have market power which they use to enhance their competitive position. Staley & Morse (p.99), ILO (1974, p.140), Gerry (p.1152) and Tokman (p.1066) are just a few of the writers who have given examples of the importance of size and market power. Often large firms are able to use their market power to bargain for special advantages such as quantity discounts and special credit terms. They are sometimes also able to demand higher prices for their output than are the smaller firms. Industrial organization literature in the United States largely takes it for granted that large firms will attempt to collude and take full advantage of market power in maximizing their profits. In developing countries, it is the political economy writers who

generally highlight such predatory use of market power. They point out that large firms are sometimes able to exercise market power by monopolizing the supply of inputs critical to smaller producers. Gerry (p.1152) gives an example of such a case among shoe makers in Dakar, Senegal. In Tanzania, Bienfeld (p.62) points out how large firms are able to use their considerable financial reserves to temporarily underprice their output in order to drive smaller competitors out of business. These authors, along with many other political economy writers, have adopted what Tokman calls the "subordination approach" (Tokman, p.1066) which emphasizes the efforts of large firms to squeeze smaller competitors, to "extract surplus value" and to either run them out of business or maintain the small firms in a highly tenuous and dependent position.

The role of government is another important supply side factor that is commonly credited with fostering the rising market share of large-scale factory producers. Virtually all analysts agree that large firms have been consistently favored by government policies in a large number of developing countries. Chuta and Liedholm (1979, pp.52-64) provide a good overview of the range of government biases in favor of large producers. Large-scale producers, for example, often receive tariff protection and privileged access to foreign exchange (see, for example, ILO (1972, p.140); ILO (1974, p.504). Finance, too, is often artificially subsidized and application procedures directed at large enterprises. Common policies of

subsidized interest rates result in banks lending only to large, less risky enterprises, thus often depriving small firms of equal access to institutional sources of credit (see ILO (1974, p.158), for example). Licensing and other legal restrictions have often hampered the operation of the smallest enterprises (see ILO (1972, p.228). Government legislation in some countries has also outlawed subcontracting, a major source of employment in many home industries (Staley & Morse, p.23). Expensive, government-financed infrastructure is commonly supplied in urban areas where it is specifically adapted for use by large manufacturers. There is little doubt that government policy in developing countries has generally benefitted the rise of large-scale firms at the expense of the small.

A final important and often mentioned cause of the decline of home and artisinal industries is that of consumer demand. Staley & Morse (p.46) emphasize how the products of many household producers are made obsolete by large factory producers. They give the examples of how demand for well diggers, roof thatchers, farriers (horseshoers) and coopers are made obsolete by the advent of digging machinery, corrugated roofing, automobiles and factory-made drums. In addition to the obsolescence of some products, many authors stress the improved quality of factory-produced articles over those of household and artisinal enterprises. Factory-made cloth (Toynbee, p.372), shoes (Robertson, p.193), carpeting (Cole, p.22) and a whole

array of other products were deemed to be of higher quality than home-made substitutes. Thus, as consumers' incomes rise, they switch from home- to factory-made goods. Many commentators have observed that the products made by home and artisinal businesses are, in many cases, viewed by consumers as inferior goods; and as incomes rise the quantity demanded declines.[1]

Thus, all these forces - especially economies of scale, market power, government preference and consumer demand - work in concert to provoke the decline of home and artisinal industries. Because they cannot benefit from scale economies, household and artisinal firms produce at higher costs than do the factory producers. Because they lack market power, the smaller firms pay higher prices for inputs than do large factory producers. Because of the common network of government preferences for factory producers, the disadvantages faced by household and artisinal enterprises are compounded even further. The resulting decline of the household and

[1]This view is at the center of Hymer and Resnick's theory of the evolution of "Z-goods", which are largely the output of home and artisinal producers. See also ILO (1972, p.229); Weeks (in Moser, p.1055); and Staley & Morse, p.230 for evidence supporting the contention that these goods are inferior. See Byerlee and King (p.51) and Leurquin, (p.313) for two pieces of contrary evidence.

artisinal enterprises takes place largely to the benefit the factory producers, particularly the large-scale manufacturers.

The steadily rising market share held by small and large factory producers represents the obverse of the declining importance of home and artisan production. It is the small factories which often develop first and then lead into the development of large factory production units. In the commonly described scenario, markets grow and gradually become large enough to accomodate firms producing on a larger and larger scale. Small factories - either new ones or modernized artisan workshops - rise up to exploit these openings. The small factory producers enjoy scale economy advantages over the home and artisan industries. To a more limited extent, the small factory managers are also able to exercise market power in negotiating contracts; and they sometimes receive special government-conferred advantages, for example in the form of access to subsidized infrastructure, credit or government extension services. More and more small factories develop as larger and larger markets are opened up through the improvements in transportation and rising income levels.

As markets grow still larger, the potential grows for further exploitation of scale economies. Either the small factories grow into larger ones, or they become supplanted by large factories who are ultimately able to take full advantage of scale economies. The rise of the small factories is, thus, viewed as the first stage in a

process which ultimately results in the dominance of the large-scale production units.

4. Common Policy Implications

In recent years, many analysts have been disappointed with the overall economic results brought about by existing trends in industrial development. Many have been particularly disappointed with low levels of employment generated in large-scale manufacturing and with what has commonly become an increasingly skewed distribution of income. In response, advisors and policy makers have increasingly focused attention on small, household and artisinal firms as being potentially better equipped than large firms to meet employment and equity objectives.

When government economic priorities lead to a focus on the smallest of the industrial establishments, two broad sets of policy recommendations are normally invoked in response to the preceeding diagnosis. The first deals with existing government discrimination against small enterprises, the man-made factors promoting the decline of household and artisinal producers. The second set of recommendations focuses on the "natural" causes of industrial evolution such as economies of scale and consumer demand preferences.

Consider first the responses to man-made policy biases against small firms. Where governments do discriminate in favor of large

firms, it is widely agreed they should alter their stance in order to create a more neutral environment, one in which the household and artisan enterprises are not artificially handicapped by government financial, fiscal, tariff and procurement policies. While efficiency-oriented economists are reluctant to recommend discrimination in favor of labor-intensive household and artisinal enterprises, it is widely held that one should at least not discriminate against the small and normally labor-intensive producers. A few government policy makers, for example the Government of India, actively discriminate in favor of household and artisinal producers through licensing and other restrictions on large firms in certain product lines. Most economists, however, favor a neutral stance, one which is not discriminatory in favor of either large or small enterprises. This preference for non-discriminatory policies has been clearly expressed by the ILO mission to the Philippines which indicated, ... "There is no reason to be doctrinaire as to the optimum size of establishment. ... We need policies that encourage the development of the most efficient industries, and the most efficient firms, regardless of size." (ILO 1974, p.146). Most recommendations, therefore, concentrate on unraveling the current network of distortions which discriminate against household, artisinal and sometimes small factory enterprises (ILO (1974, p.148) and ILO (1972, pp.226-231).

The political economy writers, too, agree that current

government stances which place household and artisanal enterprises at a competitive disadvantage should be altered. These writers, however, feel that the relationship between owners of large factories and the structure of government preferences in favor of large firms are not coincidental. Therefore, instead of the marginalist approach outlined above, their general feeling is that only a drastic restructuring of political and economic structures will be effective in lifting the current heavy government discrimination and in mitigating the use of market power by large firms which currently suppress the petty commodity producers. As one writer indicates, "The structure and orientation of the economy has to undergo a rapid and radical transformation..." (Gerry, p.1158). Thus, while disagreeing on the degree of policy change required, both neoclassicists and political economy writers normally recommend shifts in the current policy environment in order to alter the discriminatory nature of the current climate in which household and artisin enterprises operate.

The second broad class of policy responses is aimed at addressing the natural causes of the decline of home and artisin producers. Underlying these responses is a general acceptance of the inevitability that large firms will ultimately dominate the production of a wide range of products. The predominant view is that economies of scale and consumes' desire to buy higher quality products as their incomes rise are natural progressions which cannot

be combatted. Since both shifts in demand and the potential for scale-induced cost reductions vary widely across product lines, the policy focus is oriented around picking winners, helping small producers in viable fields modernize and expand to supply the growing markets. On the other hand, in industries where small producers face declining market shares, government efforts, it is felt, should aim at smoothing their exit and subsequent transfer into more promising activities. Staley & Morse refer to this general approach as "assisted adaptive response" (Staley & Morse, p.52).

In areas that have been identified as particularly promising for the smallest firms, the most common recommendations are to provide financial, technical and management assistance to those firms. Credit reform and the development of agencies capable of delivering funds to very small firms are commonly prescribed as, for example, in the case of the ILO mission to the Philippines (ILO 1974, p.148). Technical assistance is another ubiquituous recommendation for helping to orient and expand small producers. Since small firms do not normally have the contacts or resources necessary to engage in research and development work, governments often shoulder this responsibility. Management assistance and training is also commonly recommended. While not wishing to discriminate in favor of household and artisan firms, many analysts do recommend that government intervention provide institutional

support to make it possible for the very smallest firms to benefit from the natural advantages of economies of scale. This is the motivation, for example, behind the frequent recommendations for marketing assistance and for schemes promoting the bulk purchasing of inputs for small producers. Together these efforts aim to orient small, household and artisinal firms into product areas in which they can viably operate.

In sum, the common view is that large firms will eventually predominate but that governments should not unnecessarily accelerate the growth of the large firms at the expense of small ones. In addition to maintaining a non-discriminatory policy environment, governments are called upon to help smooth the inevitable transition to large-scale production by assisting those small firms and artisans amenable to modernization and growth and by retraining and reorienting those in hopelessly declining fields.

5. The Role of the Case Study

The case study of sorghum beer in Botswana provides an example of a household industry in the process of responding to a changing environment which, like so many others, includes rapid technological change, increasing incomes, changing tastes and declining transport costs. This overview of the empirical, diagnostic and policy analysis from elsewhere helps point to several questions that should be kept in mind when reading through the case study. First is the

empirical question. Is the output of home brewers declining or growing, and in relative terms what is happening to their market share? Are the commonly cited economies of scale, government discrimination and negative income elasticity of demand at the root of the obseved trends? Are the commonly prescribed policy interventions likely to be of any use? In responding to these questions, the material in this section offers some clues as to factors of potential importance. In addition, by providing this background it may be possible to use the case study to help refine these standard views on industrial evolution in developing countries.

C. CONCLUSION

This completes the background description of the prominence of sorghum beer throughout Africa and of the general views on industrial evolution. These are two areas, beyond the borders of Botswana, in which the present thesis is most appropriately framed. It is in both of these subject areas that the case study has a potentially useful contribution to make.

The next major portion of the thesis, Chapters 3 through 7, is devoted to the case study itself. Following the case study, in Chapter 8, the strands of the analysis from Chapter 2 are picked up once again; and it is there that the general implications of the case study are outlined in detail.

CHAPTER 3

BACKGROUND FOR THE CASE STUDY OF SORGHUM BEER IN BOTSWANA

This chapter innaugurates the case study of sorghum beer in Botswana, the case study which will unfold from here through Chapter 7 of this thesis. Some necessary background is provided beginning, in Section A, with a general examination of Botswana's economy and history. Section B focuses specifically on sorghum beer, describing its current importance and its historical evolution in Botswana.

A. OVERVIEW OF THE HISTORY AND ECONOMY OF BOTSWANA

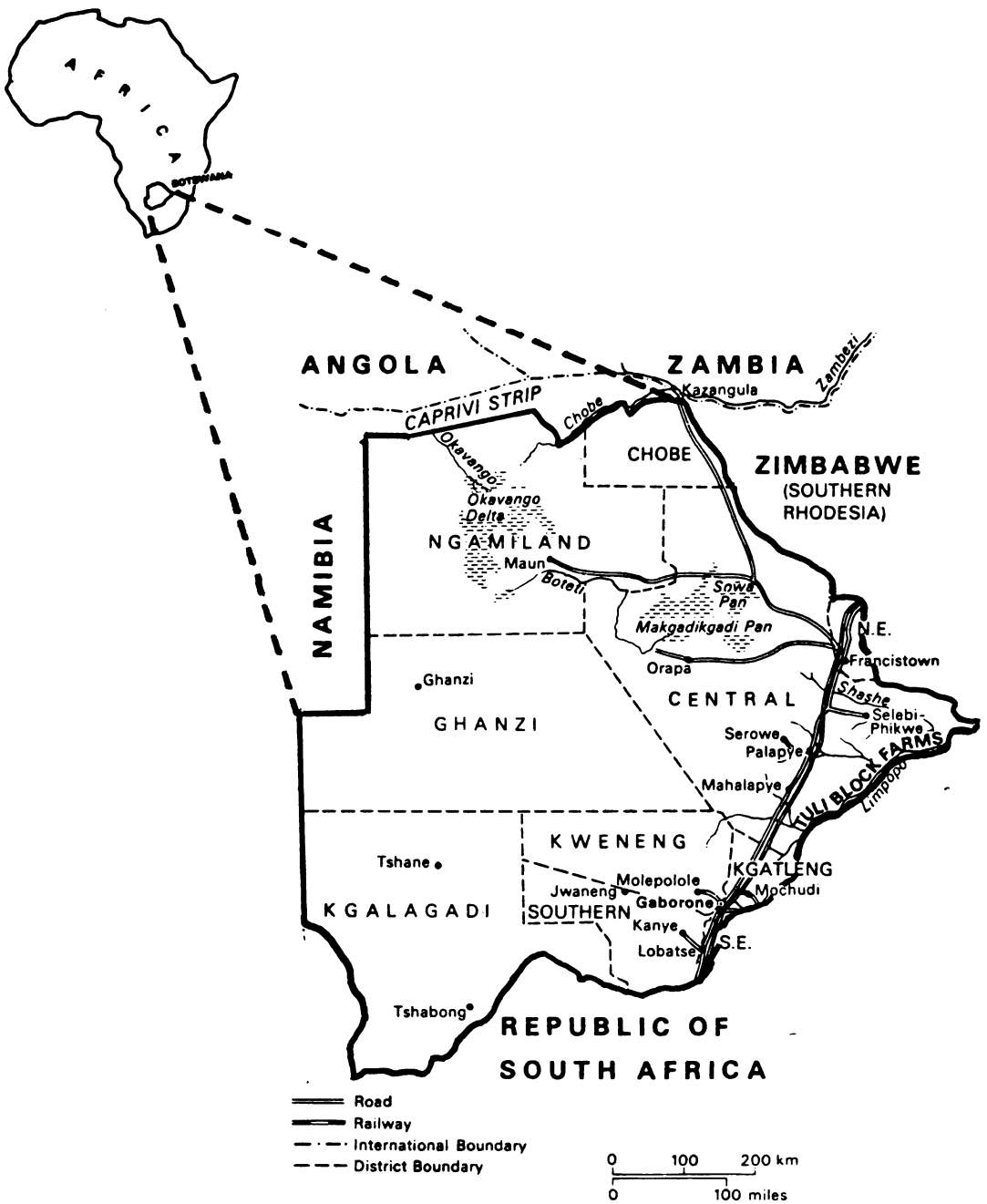
The rapid aggregate growth of Botswana's economy over the past 20 years has given it the fastest-growing national income in Sub-Saharan Africa (Accelerated Development in Sub-Saharan Africa, p.144). GDP per capita has grown at a real rate of over 10% per year since 1965 (calculated from Colclough, p.58 & National Accounts of Botswana 1978/79, p.15). This impressive aggregate growth, however, masks a number of structural weaknesses as will be seen from the following description.

Botswana is a land-locked country located in the center of the southern African plateau. As the following map shows, it is bordered by the countries of Zimbabwe, Zambia, Namibia, and South Africa. Botswana is sparsely populated, being about the size of France (582,000 km^2) and with a population of 916,000. Eighty percent of the population is concentrated along the corridor that runs along the southeastern boundary of the country. Botswana's population is predominantly rural with 85% of the people living in villages and in small rural settlements (Central Statistics Office, Preliminary Results, 1981 Census).

Botswana is an arid country with the Kgalagadi Desert occupying two-thirds of its area. Average rainfall is 16 inches per year, but it is highly variable from year to year (NDPV, p. 3). On average, the southeastern corridor receives more rain than the north and

FIGURE 3.a

MAP, REPUBLIC OF BOTSWANA



western parts of the country. Except for the Okavango Delta in the Northwest, surface water is scarce. The vegetation covering most of the country is scrub and tree savanna.

Only five percent of the land in Botswana is arable (NDPV, p.3). While crop production is marginal except in the Southeast, much of the country is well-suited for raising livestock.

The transportation network in Botswana is reasonably adequate, and it is improving rapidly. There is a good highway running north and south along the eastern border, and it will soon be paved all the way to Zambia. Other main roads, however, are mainly dirt and sand tracks. The railroad that runs along the southeastern border is a key transportation link. It connects Botswana with the rest of the world, on the southern end via South Africa and its ports and on the northern end with Zimbabwe which, via Mozambique, provides a second outlet to the sea. The railroad is a key economic link, and it has played a major role in Botswana's political history as well.

Except for a very sparse sprinkling of nomadic hunter-gatherers, the area that is now Botswana was largely uninhabited until the 18th and 19th centuries. During this period, several waves of the Bantu-speaking Tswana peoples migrated into the area, often having been pushed there by movements of hostile black Africans or by land-hungry Boers (white descendents of the Dutch settlers of South Africa) (Colclough, p.7).

The area now called Botswana was largely a political backwater

until the late 1800's when it acquired a strategic importance in southern Africa. As activity increased in the British colonies of Northern and Southern Rhodesia (now called Zambia and Zimbabwe), the territory occupied by Botswana became a main thoroughfare leading from the British Cape Colony to the British colonies in Rhodesia. In order to protect this key tranport route from potential German incursions from the west and from Boer intrusions from the east, the British established the Bechuanaland Protectorate in 1885. The railroad along Bechuanaland's southeastern border was completed in 1897 providing the important rail link between the Cape Colony and Rhodesia and further cementing Bechuanaland's strategic importance.

The Bechuanaland Protectorate was granted independence in 1966, and thus the country of Botswana was born. Botswana is, and has always been, a black-ruled, democratic state. Its foreign policy has been molded from a blend of two different forces - a political and ideological bond that ties it closely with black Africa, but this tempered by the pragmatic acceptance of intimate economic links with South Africa. Thus, while Botswana condemns apartheid (the strict racial segregation practiced in South Africa) and even refuses to exchange diplomatic representatives with South Africa, Botswana's geographic position and resource endowments dictate a high degree of economic interchange with South Africa.

The economic history of Botswana is one of transition from an impoverished, cattle-dependent economy to a propserous one paced by

rapid, mineral-led growth. Before about 1900, cattle raising, crop production and hunting were the predominant economic activities. In a marginal crop-producing area such as Botswana, cattle rearing has always been the predominant partner in the agricultural economy. During the period of the Bechuanaland Protectorate, the British made very little effort to promote economic development in Bechuanaland. They spent next to nothing on infrastructure, education, or health; although they did spend small amounts on veterinary services (Colclough, p.31). Probably their main economic influence on Bechuanaland resulted from the Hut Tax they imposed on residents from 1899 onwards. This tax was extremely important in stimulating the growth of a pervasive feature of Botswana's modern economy - labor migration to South Africa. By 1950, 30,000 Batswana[1] were employed in South Africa, while only 10,000 found wage employment inside Botswana (Colclough, p.32). Given Bechuanaland's harsh physical environment, its apparent lack of natural resources and its dependence on remittances from migrant labor, it is not surprising that at independence there was widespread pessimism regarding the country's prospects for economic survival.

However, since independence in 1966, Botswana has confounded the pessimists. GDP per capita has grown at a rate of over 10% per year since 1965; in today's prices, GDP per capita has increased

[1]The people of Botswana are called the "Batswana".

from $200 in 1965 to $800 in 1979 (Colclough, p.58 and National Accounts of Botswana 1978/79, p.21). This growth results from expansion in two main sectors, minerals and cattle. As Table 3.1 indicates, growth in the mineral sector has been extremely rapid. Over the past 15 years, Botswana has become one of the world's leading diamond producers as well as an exporter of copper and nickel. It also has some of the world's largest coal deposits, and these are scheduled to be exploited in the very near future.

Outside of minerals, agriculture has grown rapidly; but this is almost totally due to increases in cattle revenue. The importance of cattle in Botswana's overall growth can be demonstrated by two facts. First of all, cattle sales typically account for 80% of value added in agriculture (National Accounts pp. 27,29 and 31); and secondly, one third of manufacturing income is derived from the Botswana Meat Commission, the parastatal responsible for exporting all Botswana's beef (NDPV, p.13). Growth in Botswana's cattle income was initially the result of good weather - the 5-years of drought that ended at independence. Improvements in veterinary services have also helped, but the cattle industry received its major boost as the result of a favorable marketing arrangement made in 1975 with the European Economic Community (Colclough, p.51). This agreement, made under the Lome Convention, results in Botswana's receiving 100% over world prices for their beef exports to Europe.

Table 3.1

BOTSWANA'S GROSS DOMESTIC PRODUCT
(in millions of 1982 dollars)

Sector	1965		1978/79	
Agriculture	$44	34%	$130	18%
Minerals	1	1	176	24
Manufacturing	15	11	64	9
Services	8	6	65	9
Government	18	14	94	13
Construction, hotels & other	45	34	209	28
Total	131	100%	738	100%

Source: Colclough, p.58 and National Accounts 1978/79, p.21

Botswana's current economic position is closely tied to South Africa. Since the 1890's, Bechuanaland, and subsequently Botswana, has been joined in a customs union with South Africa. Today, the Southern African Customs Union Agreement allows for free movement of goods among Botswana, South Africa, Swaziland and Lesotho. Although this makes it difficult to protect domestic industries, the Botswana Government feels that the financial incentives built into the customs union agreement outweigh the disadvantages. This is because the formula for allocating revenue received from the common customs revenue pool provides Botswana with a 140% of its share of the revenues. In 1978/79, the revenue from the customs union amounted to 30% of government revenues (calculated from NDPV, p.34). The customs union reinforces the tight economic links between Botswana and South Africa. For example, in 1980 over 85% of Botswana's imports came from the Common Customs Area, the bulk of these from South Africa (1980 External Trade Statistics, p.27).

Botswana is still heavily dependent on South Africa as an employer of migrant labor, but the scale of migrant labor movements has been declining rapidly over the past 10 years. The total number of Batswana workers in South Africa has declined from a high of 70,000 in the mid-1970's to 25,000 in 1979 (Colclough, p.171 & Field, Table 13.1). That 25,000 acccounted for about 25% of Botswana's wage labor force (Field, Table 13.1). The number of Batswana laborers employed in South Africa will continue to fall, as

South Africa has announced its intention to phase out the hiring of Batswana workers in an effort to provide jobs for its own black population. Having for so long depended on South Africa as an employer, Botswana now faces a major challenge in trying to provide domestic work opportunities for the former migrant workers.

In monetary matters, Botswana has broken free from its links with South Africa's currency, the rand. Although originally part of the rand monetary area, in 1976 Botswana broke away and established its own money, the pula, which currently floats against a basket of currencies. From 1976 through mid-1981, the pula has appreciated steadily against the South African rand and the U.S. dollar. Since mid-1981, the slump in the world diamond and copper prices has led to a substantial decline in foreign exchange earnings that finally forced the Botswana Government to devalue the pula in early 1982. The pula is currently worth 90 U.S. cents.

In spite of its rapid aggregate growth, Botswana has been left with an increasingly skewed distribution of income and wealth. Consider first the disbtribution of wealth. Cattle ownership is commonly used as a proxy for wealth in Botswana, and cattle ownership has become increasingly skewed over time as can be seen from Table 3.2. In 1975, the last year for which reliable figures are available, the wealthiest 2% of rural households owned 35% of the cattle and the top 15% of the households owned 94% of them (Rural Income Distrbution Survey, p.111). The distribution of

Table 3.2

DISTRIBUTION OF CATTLE OWNERSHIP IN BOTSWANA

Number of Cattle Owned	Percentage of Rural Households	
	1943	1975
None	7%	45%
1 - 9	19	20
10 or more	74	15
Total	100%	100%

Source: for 1943, Schapera, Migrant Labor, p.133; for 1975, Rural Income Distribution Survey, p.111.

income is also highly skewed. Again in 1975, the Gini coefficient for rural Botswana was .52; and three-fourths of the rural households had below income below the mean. (Rural Income Distribution Survey, pp. 78,86).

In summary, Botswana's economy has been characterized by rapid aggregate economic growth since independence, although growth has fallen off in the past year due to a drop in the world diamond and copper prices. Its growth has been concentrated mainly in two sectors - minerals and cattle; and it remains a predominantly rural country with wide disparities in the distribution of its income and wealth. The principal challenges facing Botswana today are those of broadening its economic base and addressing the problem of the inequitable distribution of income and wealth that is accompanying its rapid overall growth.

B. THE ROLE OF SORGHUM BEER IN BOTSWANA

1. The Economic Importance of Sorghum Beer

Sorghum beer holds a not insignificant position in Botswana's economy. The local market for sorghum beer is large, and the businesses that supply this market earn sizeable amounts of income in so doing. Even more important than the aggregate income generated from sorghum beer is the fact that much of this income is earned in rural areas and by medium- and low-income groups within the population.

The demand for sorghum beer in Botswana is substantial. Per capita consumption in 1981 was 30 gallons which is 40% higher than U.S. per capita consumption of clear beer (Botswana figures, Table 5.1; U.S. consumption from Elzinga, p.224). Consider, too, the disposition of Botswana's two principal cereal foods, sorghum and maize. In 1980, 15% of all the maize and sorghum consumed in the country was taken in the form of sorghum beer (calculation from survey data plus Ministry of Agriculture statistics). Given the magnitude of the demand for sorghum beer, it is not surprising that the first modern manufacturing industry established in Botswana was set up to supply this huge sorghum beer market.

Millions of pula in income are earned every year by the companies and individuals that supply Botswana's sorghum beer

market. In 1981, these individuals and companies earned a total of P 11 million (Table 7.3). Sixty percent of this was earned directly by brewers and retailers; while the remaining 40% was earned by individuals and companies that supply inputs such as malt, milling and fuel to brewers of sorghum beer. This sorghum beer-related income accounted for 1.2% of Gross Domestic Product in 1981 (Table 7.3 plus depreciation; National Development Plan V, p.54).

Large numbers of people earn income from brewing or selling sorghum beer. In villages, 50 to 90 percent of households normally brew sometime during the year (see Dixey, p.166; Hamilton, p.186; Kjaer-Olson p.5; Opschoor, p.34; Vierich & Shepard, p. 101; & Kooiijman, p.205); and probably 30% do so regularly (see Hamilton, p.186 & Kjaer-Olsen, 1978, p.5). In low-income urban neighborhoods, approximately 15% of the households regularly brew or retail sorghum beer (calculated from Peri-Urban Study, pp.37,48 and from survey data).

More important than the aggregate income it generates and more important than the absolute numbers of people earning sorghum beer related income is the fact that much of the earnings from sorghum beer accrue to important yet difficult-to-reach target groups - the rural dwellers and the low income groups. Rural inhabitants, for example, earned three-fourths of all income generated from the sale of home- and factory-brewed sorghum beer during 1981 (Table 7.5). In aggregate terms, earnings from

home-brewed sorghum beer alone accounted for roughly 3.5% of total rural earnings in 1974/75 (Rural Income Distribution Survey, pp.52,78 combined with survey data on linkages and survey estimate that 80% of home brewing is sorghum beer).

Income distribution effects are equally important. In 1981, poor and medium income groups earned three-fourths of all income generated by sales of home- and factory-brewed sorghum beer (Table 7.6). This income was found to be particularly important for female-headed households. Female-headed households are generally regarded as being economically disadvantaged (Kossoudji and Mueller, 1983), and numerous observers have commented on the importance of sorghum beer income to such households (Schapera, p.225; Egner, p.64; Gulbrandson, p.11; Sutherland, pp.4,5; Curtis, q.20; RIDS, p.49 and Wolcott, p.227; see Appendix C for elaboration). The present survey data indicate that on average male-headed households earn 8% of total household income from sorghum beer, while for female-headed households that figure rises to 23%. It is perhaps appropriate that the migrant labor system that characterized Botswana's economy and which led to the phenemenon of the female-headed household should also contribute to the rise of a cash brewing system that provides partial support for those households.

2. The History of Sorghum Beer in Botswana

Sorghum beer has a long history in Botswana. It has been brewed at least since the eighteenth century with the in-migration of the Tswana peoples (see Rosenthal, p.51 & Colclough, p.7). Since that time, trends have closely followed those in evidence throughout the rest qf Sub-Saharan Africa.

Until about 1870, Botswana's sorghum beer market was at Stage 0, the era of socially-allocated home brewing. Home bewers supplied the entire sorghum beer market; and both motives for brewing as well as allocation methods were socially oriented (Curtis, p.17; Solway, p.6; Wolcott, pp.69,74; and Rosenthal, p.58). It was in the late 1800's that Botswana began the transition to Stage 1, the era of cash home brewing. The increasing penetration of trading shops in Bechuanaland around 1830, the introduction of a Hut Tax in 1899 and the beginning of sizeable labor flows to the South African mines around 1870 (Schapera, p.7) all contributed to the growth of a cash economy and hence to the rise of cash brewing. The labor migration to South Africa was particularly important, it being in large part responsible for the rise of the female-headed household with limited economic options outside of brewing and responsible as well for providing a stream of returning mine laborers with ready cash and a thirst for home brew (Cooper; Sutherland 1976, p.7; Gulbrandson, pp.84,85; and Kooijman, p.92). As elsewhere, the rise of cash brewing has brought with it the allocation of sorghum

beer based on ability to pay rather than on social rank and age; and this has resulted in a dramatic increase in drinking by young adults, particualrly young returning mineworkers (Sutherland 1976, pp.12,133; Solway, p.6; Gulbandson, p.85; Wolcott, p.74 and Kooijmann, p.11).

Within the past 30 years, the mechanization and technical change that has developed in sorghum beer brewing in other parts of Africa has also reached Botswana. Part of the home brewing business has been mechanized with the introduction of hand and diesel hammermills in many villages. A malting industry, initially in South Africa and now also in Botswana, has grown up to provide sorghum malt to home brewers. Today it is even possible to purchase powdered sorghum beer to which the home brewer merely needs to add water.

In the mid-1960's, Botswana entered Stage 2, the period of the rise of factory-brewed sorghum beer. Beginning as early as it did, factory brewing of sorghum beer became the first modern manufcturing industry in the country (interview with Ministry of Commerce & Industry Licensing Officer). The first factory brewing in Botswana was a very small beerhall operation run by the Tati Company in Francistown in about 1964. The Heinrich's Chibuku Company, however, quickly moved in; and it is they who really launched factory brewing of sorghum beer in a big way. Chibuku brand sorghum beer was first produced in Botswana in 1965, athough other brands have also been

produced at various times. In the early 1970's, for example, one company brewed sorghum beer in the village of Mmadinare for a short time; and one did so in Palapye for about an 18-month period starting in 1975 (personal interview with former brewer). Today Botswana Breweries is the company that has the rights to the Chibuku trademark in Botswana, and it is currently the only commercial manufacturer of sorghum beer left in the country. New management took the helm at Botswana Breweries in 1979, and since then they have run an aggressive program of expansion. Today Chibuku and a South African import, Tlokwe, are the only two commercial sorghum beers available on the Botswana market.

Currently, factory brews are continuing to expand sales and home brewers are in the process of adjusting to the new market situation. The remainder of this case study is aimed at describing this evolution, unraveling its internal dynamics and assessing its economic impact.

CHAPTER 4

THE STRUCTURE AND BASIC CONDITIONS OF THE SORGHUM BEER SUBSECTOR

This chapter provides a review of the structure and basic supply conditions in Botswana's sorghum beer subsector. The basic conditions on the demand side of the market are discussed separately, in Chapter 5. Basically descriptive, the information in the present chapter provides a foundation necessary for understanding the dynamics of the sorghum beer business and for informed policy intervention.

Section A of this chapter begins with a description of the basic conditions on the supply side of the sorghum beer market: product characteristics, the technology of production, the mechanics of retailing and the regulations affecting sorghum beer. Section B then provides a definition of the subsector approach, the analytical framework that will be used in the present case study. Section C describes the structure of the soghum beer subector; it enumerates the participants, decribes their relationships to one another, and quantifies the size of the material and product flows within the subsector.

A. BASIC CONDITIONS AFFECTING THE SUPPLY OF SORGHUM BEER

1. Characteristics of the Product

Sorghum beer receives its name because sorghum malt is so important in its brewing process. The sorghum malt is used, first of all, to convert grain starches to sugars; and then in home brewing, it is used as a source of yeast to convert those sugars to alcohol. In addition to sorghum malt (and malted millet in northwestern Botswana), the raw materials used to produce sorghum beer include unmalted sorghum, corn or millet as well as yeast and water.

As was emphasized in Chapter 2, slight variations of the sorghum beer brewed in Botswana is produced throughout Africa under many different names. Sorghum beer is the traditional alcoholic drink in Southern Africa where it has been referred to at various times as kaffir beer, bantu beer, opaque beer, and now is referred to as sorghum beer. While sorghum beer is the English name for this beer, in Setswana, the other official language of Botswana, sorghum beer is called "bojalwa ja setswana".

Several of the physical characteristics of sorghum beer have important implications for the methods used in producing and distributing sorghum beer. Most significant is the fact that sorghum beer has a shelf life of only about three days; if left

unconsumed beyond that point, excessive amounts of acetic acid and unwanted microorganisms are formed altering the taste of the beer unacceptably. Sorghum beer is sold in an actively fermenting state which means it must be shipped in vented containers, making transport both messy and difficult. It also has a very low value for weight. Unpackaged (or bulk) beer retails for 14 thebe a liter which comes to about 60 U.S. cents per gallon or 5 cents per 12 ounce serving. Even packaged sorghum beer retails for only 7.5 cents for 12 ounces. Together, these product characteristics have a profound influence on the strategies used for distributing ad producing sorghum beer.

2. Technology of Production

The production of sorghum beer, both in back yards and in large factories, is based on tribal recipes that are centuries old. These recipes have been passed down and refined, particularly over the past 50-or-so years by cash brewers who began producing beer more often than they had previously and in larger and larger batches. Factory brewers, initially operating on the same scale as home brewers (Oxford, p.315; Wolcott, p.23), have refined these recipes even further. Gradually, the factory operations came to use larger and larger brewing vats, but they retained the same basic brewing process practiced by the home brewers (Novellie Nov. 1966, p.1). In the 1950's, industrial chemists began to carefully study the

biochemistry of sorghum beer production; in fact the South African Government set up a Sorghum Beer Institute in 1954 specifically for this purpose (Novellie 1968, p.27). Private companies, particularly the Heinrich's Chibuku group, have also engaged in such research, and great advances have been made over the past 30 years in understanding and refining brewing procedures. Even so, the fundamental processes used today by home and factory brewers remain remarkably similar as will be seen below.

a. Malting

Production of high-quality malt is the single most important step in successful brewing. For this reason, the first substantial research efforts on the technology of sorghum beer brewing focused on the study of malting (Novellie Nov. 1966, p.1). Malting simply involves the germination of grain followed by its drying and milling. The process of germination causes the production of enzymes, called amalyses, that are not present in the original grain. It is these enzymes in the malt that break down grain starches into simple sugars.

Malt which contains a large amount of sugar-forming enzymes is said to have high diastatic power. Use of high diastatic malt is the key to economy in brewing, because alcohol production is directly dependent on the amount of sugar available for conversion into alcohol. With poor-quality malt, a brewer must use a large amount of grain and/or a large amount of malt to produce a given

amount of sugar. However with high-quality, high-diastatic malt, a brewer can economize by using less grain and less malt to produce the same amount of sugar. Good malt is, therefore, critical to efficient brewing.

Until about 1950, all home brewers made their own malt as the first step in making sorghum beer. Today, 70% of the home brew produced in Botswana is made with home-made malt, while factory-made malt is used in the remaining 30% (calculated from survey data). The factory-made malt is used by virtually all home brewers in urban areas and by some rural brewers as well. It is used by urban brewers because they often do not have enough space for spreading home-made malt out to dry and because hammermills necessary for milling the malt once it is dried are normally not available in urban areas. In rural areas, factory-made malt is used to some extent by regular home brewers who appreciate its higher diastatic power, and it is also used by infrequent brewers just before harvest when grain supplies are low and it is expensive to buy grain for malting.

The 70% of home brewers who make their malt do so as follows (Bryant, pp.274,275). They first soak their sorghum grain for about 12 to 24 hours. After the grain is thoroughly soaked, they place it in a pot or in a damp grass basket which is left in a warm place. The grain is allowed to sprout for about 2 days in the summer and for about 3 days in the winter when it is cooler. After the shoots

and roots are about 3/4 of an inch long, the sprouted grain is spread out on the ground to dry. After drying, the sprouted grain is milled either by stamping with a mortar and pestal or by grinding in a hand- or diesel-powered hammermill.

Factories making sorghum beer also made their own malt in the early days of the factory brewing industry (Novellie Nov. 1966, p.2). In the mid-1940's, however, a specialized malting industry began to develop to support the factory brewers and the growing demand from regular home brewers. The Sorghum Beer Institute in Pretoria did extensive research on malting techniques from 1954 onwards (Novellie 1968, p.27) and was in large part responsible for the increased effeciency of that industry. As the malting industry became more and more efficient at supplying consistently high quality malt, factories brewing sorghum beer stopped doing their own malting and began contracting with specialized producers for malt at precise diastatic specifications. Today, all factory brewers purchase factory-made malt (Novellie Nov. 1966, p.2).

Factory-made malt is produced in two basic ways. Historically, the first method used was floor malting, which is essentially the same process used by the home maltsters. In floor malting, the grain is first soaked then spread out on cement floors and allowed to germinate. The germinating grain is kept damp and turned with shovels periodically to provide adequate aeration. As in home malting, the germination time with this method is dependent on the

weather. When the sprouted grain has reached the desired degree of germination it is spread out on the ground to dry, and when dry it is milled and packed for distribution. Malt made in this way is called "trade malt".

The second method of malting is performed indoors with a substantial amount of specialized equipment. Rather than spreading soaked grain out on the floor to germinate, malting is carried out in a saladin box, a special piece of equipment that allows for strict control of temperature, moisture and aeration at all stages of the malting. Turning of the malt is done by mechanical means, and drying is performed by heaters and fans. This method generally produces the highest quality malt which is called "municipal malt" (Novellie 1968, p.20). Although it was not always the case, factory brewers today normally use only municipal malt in their brewing.

Several factors are important in the production of high quality sorghum malt. The most important factor governing diastatic power in malt is genetics (Daiber 1980, p.1). Certain varieties of sorghum produce good malt and some do not. Much of the research on malting has, therefore, concentrated on the study and breeding of sorghum varieties with good malting characteristics. Two other factors important in determining diastatic power are moisture content and temperature during malting. A temperature of between 25 and 30 degrees centigrade (77 to 86 degrees farenheit) has been found to be optimal (Novellie 1968, p.20); and since the weather in

Southern Africa lies near that level for much of the year, carefully-handled outdoor or floor malting can produce very good malt (Grieff, p.1). While home malting and floor malting can produce high quality malt if the right sorghum varieties are used and if done carefully, the sophisticated commercial malting produces consistently high-quality malt and is preferred by the factory brewers.

b. The Basic Brewing Process

Production of sorghum beer involves the transformation of grain starches into sugar and then converting those sugars to alcohol. While this same basic sequence underlies the production of clear beer, there are several important differences in the way sorghum beer is made. First of all, sorghum beer production involves two fermentations - a lactic acid fermentation and an alcoholic fermentation (Novellie 1968, p.21). The production of clear beer involves only the alcoholic fermentation. Secondly, clear beer has all the solid matter filtered out prior to bottling. Sorghum beer, on the other hand, has only the largest particles of solid matter filtered out and retains a large amount of solids in suspension in the beer. Finally, clear beer is pasteurized while this is not done in sorghum beer production because it would kill off the yeast and alter the flavor of the beer unacceptably (Keddie & Cleghorn, p.90).

The first step in sorghum beer brewing, the lactic acid formation, is extremely important. To a large extent, it performs

the same function hops does in clear beer - it flavors and preserves the beer. Lactic acid flavors the beer by producing the sour taste that characterizes sorghum beer. Consumers have grown to appreciate this sour taste and demand its presence. In addition to flavoring, lactic acid plays an important role in the biochemistry of sorghum beer production. The highly acidic solution created by the lactic acid is a natural preservative; most pathogenic bacteria will not grow at the ph at which sorghum beer is produced. This helps prevent the brew from spoiling by inhibiting the growth of unwanted microorganisms. The lactic acid also softens the proteins which enclose the granules of starch and thereby allows for a faster and more complete breakdown of starches into sugars.

The subsequent stages of the brewing process, as well as the similarities between home and factory brewing, are most easily explained in tabular form. This is done in Table 4.1. It should be emphasized that home brewers do not all follow identical procedures. The general home brewing process laid out in Table 4.1 is, however, commonly used throughout much of Botswana, in rural as well as urban areas.

The similarities between home and factory brewing are readily apparent from Table 4.1. Particularly important is the observation that home brewers, from their long experience over the years, have refined their brewing process so it comes close to achieving the ideal temperature ranges for each set of procedures.

TABLE 4.1

COMPARATIVE BREWING PROCEDURES

	Step 1 Souring Produce lactic acid which: 1. gives sour taste preferred by customers 2. controls brewing process a) acidity controls rate at which enzymes produce sugars b) high ph inhibits growth of unwanted microorganisms 3. softens proteins (which enclose starch granules) & allows more ready release of starches	Step 2 Release Starches Starches from grain (sorghum or corn) released into solution	Step 3 Starch to Sugar Enzymes from malt act on starches, converting them into sugars	Step 4 Sugar to Alcohol Yeast converts sugars to alcohol
Home brewers	boil water & remove from fire; add ground grain (sorghum or corn); let sit for about 6 hours; add malt; leave mixture for 12 hours; depend on lactobacilli present on surface of malt & grain to multiply and create acidic solution; innoculation by bacteria from walls of brewing vessel	boil soured mixture for several hours	cool mixture somewhat; add malt; leave for about 12 hours	add small amount of malt; depend on wild yeast present on malt to perform fermentation; allow to ferment for 12 - 36 hours; strain and serve
Factory production South African Municipalities	mix ground sorghum malt in water; heat mixture to 50° C.; hold temp. for 8 - 16 hours; depend on lactobacilli present on surface of malt to multiply and create acidic solution; innoculation by addition of small portion from previous batch of sour	mix the sour, corn meal and water; boil mixture for 2 hours	cool mixture to 60°; add malt; keep at 60° for 1.5 hours;	strain; cool mixture to 30° C.; add yeast; allow to ferment for short period; while still fermenting, package or load in bulk containers for distribution
Factory production Botswana Chibuku brewery	purchase commercially-made lactic acid	mix lactic acid, corn meal and water; boil mixture for 1.5 hours	cool mixture to 60°; add malt; keep at 60° for 1.5 hours ; heat to 80° for 1/2 hour	strain; cool to 28°; add yeast; allow to ferment for 6 - 8 hours; while still fermenting, package or load in bulk containters for distribution

Sources: Novellie 1968; Bantu Beer Unit 1971; discussions with numerous home brewers, with personnel at Botswana Breweries (manufacturers of Chibuku beer) and with personnel at the Sorghum Beer Unit, Pretoria.

Note: All temperatures given are in degrees centigrade.

The differences between home and factory brewing are minor but worth elaborating. Factory brewing, first of all, uses more standardized inputs than do the home brewers. Most important, factory brewers use only carefully-specified, high diastatic malt. They also use one particular strain of yeast, while the home brewers' yeast varies from one batch of malt to another, according to the yeast varieties present in each particular sample of malt. A second difference between home and factory brewing lies in the strict temperature controls used in factory brewing. Brewing research has determined the optimal temperatures for souring, mashing and fermentation, and the factory brewers monitor temperatures at all stages to ensure that brews remain precisely at those temperatures. Factory brewing takes less time than home brewing because of these careful temperature controls and because steam injectors and cooling towers are used to rapidly raise and lower temperatures to optimal levels when moving between steps. While factory brewing of a 15,000-liter batch of sorghum beer requires only about 18 hours, production of a 200-liter batch of home-brewed beer takes three days.

To conclude discussion of brewing technology it is useful to consider the different types of equipment used by factory and home brewers. As can be seen in the pictoral comparison on the following two pages, home brewers use only very simple methods. Cooking of the brews is performed over an open wood fire, either in the 200-liter

drums or in three-legged iron cooking pots. Cooling is achieved by diluting mixtures with cool water and by pouring brews into numerous shallow vessels from which heat will readily dissipate. Stirring is performed with a long wooden spoon, and straining is done with a woven grass strainer or a home-made strainer fabricated from a small piece of screen wire. All of this equipment is inexpensive and is readily available in villages throughout Botswana. A standard set of brewing equipment - a 200-liter drum, a three-legged pot, a long spoon several shallow cooling vessels and a strainer - costs about 200 pula new which is the equivalent of about $180 (survey data). Equipment is also easily borrowed from neighbors and some can be had second hand, so capital costs are usually closer to P90.

Factories, on the other hand, use larger and much more expensive equipment. The breweries in Botswana use 15,000-liter stainless steel tanks for brewing. Steam injectors rapidly heat the brews and mechanical agitators stir them. Cooling is done in special cooling towers, and brews are strained by mechanized equipment. Special machines are used to package the beer, and trucks are used to deliver it to retail outlets. The two currently-operating factories in Botswana have capital equipment valued at 615,000 pula or about $580,000 per factory (Botswana Breweries certified accounts 1981, p.9).

FIGURE 4.a

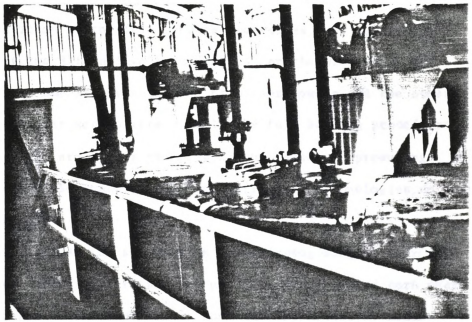
HOME BREWING OF SORGHUM BEER, BOTSWANA 1982

straining the beer

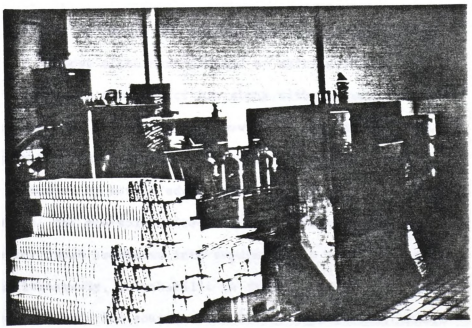
Botswana Gothic

FIGURE 4.b

FACTORY BREWING OF SORGHUM BEER, BOTSWANA 1982



15,000 liter brewing vessels



packaging machinery

c. Alternative Technologies

In addition to the full brewing procedures just described, there exist two alternative technologies for the production of sorghum beer. One involves the use of a beer powder and the other the use of a beer concentrate. While the full brewing procedures described above are by far the predominant method of producing sorghum beer in Botswana, these two alternative technologies do play supporting roles.

Consider first the alternative of producing sorghum beer from beer powder. Beer powder is a dry mixture of pre-cooked corn meal, malt and yeast. The corn meal is normally dry-cooked by steam injection, a procedure which pre-solubilizes the starch and allows for extremely rapid conversion of starches to sugar when water and malt are added. The production of beer powder is a very simple process. It is most often manufactured by maltsters who, with the purchase of only a steam gun for use along with the rest of their equipment, are able to produce beer powder without difficulty.

Sorghum beer can be produced from beer powder in a simple one-step procedure by merely adding warm water. With the addition of warm water, the pre-solubilized starch from the corn meal is available for rapid breakdown into sugars by the enzymes in the malt. Simultaneously, lactobacilli in the malt produce lactic acid which gives the beer its sour taste. As the sugars form, yeasts convert the sugars to alcohol. The production of sorghum beer from

beer powder requires only a 4 to 8 hour fermentation period compared to the 18 hours required for full scale factory brewing.

Compared with fully-brewed beer, that produced from powder is a slightly inferior product; it has a very short shelf life of only one day. This is because the preserving powers of the lactic acid are not at full strength during the early stages of fermentation, as the lactic acid is in the process of being formed at that time. Unwanted microorganisms are not fully controlled by the initially low strength lactic acid, and they grow in the sugary wort leading to early spoilage of the beer.

Powder beer is manufactured by both home and small factory brewers. Beer powder is readily available to home brewers, as it is distributed in small packs through normal retail outlets. It is most commonly used by women as an easy method of brewing for family consumption. In addition, it is sometimes used by home brewers for cash sale, although normally only when grain and malt are either unavailable or very expensive, usually just before harvest time (in May and June). Powder beer comprises less than five percent of the cash home brewing market.

Powder beer is also used on an industrial scale, for example by mining companies who use it to supply sorghum beer as part of their food rations to miners. The powder is also used by very small factory brewers, normally to test markets initially before the setting up a full-fledged brewery. For example, the two small

independent breweries set up in Botswana - at Palapye and at Mmadinare - in the early 1970's were powder mix operations. In addition, the new brewery currently being built by Botswana Breweries in Maun will initially be a powder mix operation. The attraction of powder mix brewing is that initial costs are very low. Equipment costs are low because only fermentation tanks and not souring and mashing tanks are required; little sophisticated temperature control equipment is required; and a far-less-skilled technician is required to run the brewing operation. Thus, the powder mix operation provides an inexpensive, low-risk method of testing out a new market.

A second alterntive technology for producing sorghum beer involves the use of a beer concentrate. This concentrate was developed by the Sorghum Beer Unit in Pretoria - and only very recently. Its first non-laboratory production trials took place in the summer of 1982. The concentrate is a syrupy brown substance produced by a full-fledged sorghum beer brewery. After Stage 3 in the brewing process, the conversion of starches to sugar, the brew is almost fully dehydrated producing a thick syrupy mixture of concentrated sugars and solids. This concentrate can be inexpensively transported to remote locations where warm water can be added along with yeast to induce fermentation. After fermentation, the beer is ready for distribution; and it is a high quality sorghum beer indistinguishable from fully factory brewed

sorghum beer.

The potential gains to factory use of sorghum beer concentrate lies in the servicing of remote or sparsely populated regions. These outlying areas are generally too small to support a full-sized brewery and are difficult to service from existing large breweries because of the low value for weight of sorghum beer, the high transport costs and the short shelf life of the beer. In these remote locations, the concentrate can be mixed in warm water with yeast added to it. After fermentation, the concentrate produces a high-quality brew. The production of this concentrate has the potential to open up large pockets of consumers to factory brewed sorghum beer.

Sorghum beer concentrate could also have a potentially large impact on home brewing. With such a concentrate, home brewers could produce beer of a guaranteed consistent quality and indistinguishable from factory brewed sorghum beer. While this concentrate has the potential to substantially influence future evolution in the sorghum beer subsector, it is still too early to tell how price competitive production of the concentrate will be.

3. The Mechanics of Retailing

Retailing has played a crucial role in the evolution and performance of the sorghum beer subsector. Because of its central importance, it is useful to have a basic understanding of the

mechanics of retailing.

Two types of establishments are key: a) the unlicensed home retailers, or shebeens; and b) licensed sorghum beer bars or beer gardens. Consider first the shebeens. The facilities in shebeens are most often very simple. The drum of beer is generally placed in the shade, under a tree or in a rondaval, and customers most often drink outside on benches or chairs, often under a shade tree.

Although sorghum beer dominates the home retailing market, other types of drinks are often sold from shebeens as well. For example, khadi, a home-brewed drink of fermenetd honey or wild fruit, is sometimes produced and sold. In addition, high-class shebeens retail clear beer and whisky along with sorghum beer, although a few specialize and sell only the harder liquors. In the exclusive shebeens, the facilities often include, in addition to the outdoor seating, a well-furnished living room in which consumers of the higher-priced drinks are served. While a great variety of drink combinations are retailed in shebeens, sorghum beer accounts for 83% of the volume and 80% of the value of liquor sold by home retailers (survey data). Home retailing is dispersed throughout villages and in low- and medium-income urban neighborhoods; although some neighborhoods, particularly those near commercial centers, have a higher concentration of shebeens than average.

The licensed sorghum beer bars and beer gardens are the second important type of retail establishment. Most of these outlets are

privately owned, although a few are owned by the local councils. These outlets are licensed for the selling of sorghum beer only; clear beer and hard liquor are sold from different premises and are licensed under a different law. Owners of sorghum beer bars can obtain licenses to sell for consumption on their premises, for off-sale or they can do both. Off-sale depots consist of little more than a small cement block room, often behind a general trading shop, from which the factory-brewed sorghum beer is sold out of a small window. On-sale retail outlets are normally bordered by a chain link fence. Inside is a small building for storing beer and which has one or two counters from which the beer is sold. Drinking is generally done outside on tables and benches, sometimes with umbrellas, corrugated roofs or small covered patios for shade. Villages of up to 5,000 people generally support only one sorghum beer bar, while large villages of 30,000 people can have up to five spread throughout the village.

The council-owned sorghum beer bars are sometimes referred to as beer gardens or beerhalls. The facilities are very similar to those in the larger privately-owned sorghum beer bars. The council outlets, however, are usually a little larger than the private bars and they are generally the only retail outlets selling bulk beer in addition to sorghum beer packaged in cartons.

The distribution of sorghum beer to retail outlets is not complicated. In the case of home brewers, beer is sold in the same

compound in which it is brewed so there is no transport of beer to the retailing site is required. This is in distinct contrast with countries such as Upper Volta where the sorghum beer is all taken to a central market for sale (Saul, p.1).

Factory-brewed sorghum beer is distributed by truck to retail outlets. Botswana Breweries, the brewers of Chibuku brand sorghum beer in Botswana, have their own fleet of trucks and distribute directly to all licensed outlets as well as to some home brewers. In Francistown and Gaborone, where the two sorghum beer breweries are located, some retailers - both licensed and unlicensed - come to the brewery to collect the Chibuku. They come by truck, taxi or bicycle. They collect the sorghum beer themselves to assure themselves a supply, since there is currently not enough factory-brewed sorghum beer available to meet to demand. For Tlokwe, the factory brewed sorghum beer imported from South Africa, transport is handled by several licensed retailers in the southern part of Botswana who drive to South Africa to collect the beer. Some sell the Tlokwe only in their premises, while many also distribute it to other licensed and unlicensed retailers in their area.

In order to understand later discussions of trends and performance in the sorghum beer subsector, it is important to underline the fact that shebeen queens who retail factory brewed sorghum beer obtain their beer in one of three ways. About 45% of the factory brew they sell is delivered directly to their compounds

by the distributors' trucks. Another 45% must collect their factory brewed beer at retail outlets (and at retail prices) and take it back to their compounds in wheelbarrows, on their heads or by bicycle. Home retailers in Gaborone and Francistown have a further option of going directly to the breweries to obtain their beer. The remaining 10% of factory brewed sorghum beer retailed in the shebeens is procured in this way. The reasons for these different procurement methods will be discussed in future chapters on the dymanics and conduct within the subsector and in the following section on the laws affecting sorghum beer production and distribution.

4. Government Regulations Affecting Sorghum Beer

In Botswana, four sets of regulations affect sorghum beer. The first governs production, the second deals with retailing, the third concerns taxation and the final one derives from a restriction on malt imports within the South African Customs Union. Each of these regulations and its impact is described below.

Production is regulated by the central government's Ministry of Commerce and Industry (MCI). Under its industrial licensing regulations, factory brewing of sorghum beer requires an industrial license, while home brewing does not. The law stipulates that all manufacturing enterprises with more than 10 employees or those employing machinery of 25 horse power or more require an industrial

license from the MCI. The two (and soon to be three) commercial breweries in Botswana all meet these criteria and therefore require manufacturing licenses. According to the law, a license is required for each brewery location. Home brewers, on the other hand, all have fewer than 10 workers and no power equipment and are, therefore, not required to have a manufacturing license.

The retailing of sorghum beer is regulated by local governments, the town and district councils. Two basic principles are embodied in the retailing bylaws. The first is that the retailing of home-brewed sorghum beer should not be (and is not) regulated. The second principle is that the retailers of factory-brewed sorghum beer - except for the home retailers - do require retailing licenses. The licensing law provides special dispensatiion for the shebeen queens by stating that, "within the boundaries of a lolwapa (compound) traditional beer (factory-brewed sorghum beer) may be sold by and bought from persons engaging, for the purposes of subsistence or the maintenance and education of children, in the sale of traditional beer." (Traditional Beer Model Retail Bye-Laws, para. 3.1). Since virtually all households have children to educate and have to eat, the effect of the law is to exempt home retailers of factory-brewed sorghum beer from the requirement of having a license. On the other hand, retailers setting up special business premises uniquely for purposes of retailing sorghum beer do require a retail license. Details on the

rationale for this assymetric treatment are provided in Chapter 6, Section B.

Tax laws affect sorghum beer in two areas. Corporate and personal income taxes are theoretically due on all income earned by all brewers, factory as well as home brewers. In practice, home brewers do not report their brewing income to the tax authorities and pay no income tax on these earnings. Botswana Breweries, however, does pay corporate income tax on their earnings, and their wage employees have their income tax (and local government tax) withheld from their paychecks. Thus, income from factory brewing is taxed while income accruing to home brewers is not.

The second tax law affecting sorghum beer is the Traditional Beer Levy. This is an excise tax imposed by the councils on each liter of factory-brewed sorghum beer retailed within their jurisdiction. The beer levy is paid monthly by Botswana Breweries, and it is paid directly to each council. Here again, factory brewers of sorghum beer pay taxes while home brewers do not.

A final regulation currently affecting sorghum beer is the Control of Goods Act under which certain malt imports are prohibited from entering Botswana. Under the Control of Goods Act, the Ministry of Agriculture is allowed, in spite of the South African Customs Union, to restrict the import of agricultural products it feels will damage local producers. In March of 1982, low-diastatic sorghum malt was placed on the restricted list because the ministry

felt the two existing maltsters in Botswana could supply the local market if the South African and Zimbabwean imports could be kept out. Since these two local maltsters practiced open floor malting, only the import of low-diastatic or trade malt was prevented. Botswana Breweries continues to import high-diastatic malt from South Africa, while home brewers who purchase malt must now buy malt made in Botswana. This ruling undoubtedly increases the incomes and employment provided by Botswana maltsters, but it also raises the cost of home brewing. This is particularly true because South Africa maintains lower sorghum prices than does Botswana, so Botswana Breweries pays for malt made with low-priced South African sorghum, while home brewers buy malt made by less efficient maltsters and made with the more expensive Botswana sorghum.

These regulations all affect the sorghum beer business in different ways. It will be useful to keep these regulations in mind, as they have implications for the dynamics of the subsector as well as for the measurement of income and employment tradeoffs. Having seen this basic background, it is now possible to move on to an overview of the structure of the sorghum beer business. But first it is necessary to explain what is meant by a "subsector" since it is the analytical construct within which the structure will be examined.

B. THE ANALYTICAL FRAME: THE SUBSECTOR

1. The Basic Subsector Concept

The sorghum beer "subsector" rather than the sorghum beer "industry" will be the basic unit of analysis for this case study. This departure from standard Industrial Organization (IO) terminology is made in an effort to highlight the importance of vertical flows and of different vertical levels in the sorghum beer supply chain. The production of certain intermediate inputs and the vertical channels through which raw materials are ultimately directed to consumers are of extreme importance in both the dynamics and the performance of the sorghum beer subsector in Botswana.

Some would argue that the difference between a subsector and an industry is only semantic. It will be argued below, however, that there is, in fact, a substantive difference between the two, with the subsector framework placing particular focus on vertical flows and economic coordination problems within an economic subsystem.

At the risk of caricature, the strict distinction between a subsector and an industry is drawn as follows. Joe Bain, a prime mover in the development of standard Industrial Organization (IO) analysis, carefully defines an industry as a horizontal collection of firms selling products that are close substitutes in a common market (Bain 1968, p.6). On grounds of manageability, he

specifically excludes from his analysis vertical relationships of firms in input markets (Bain 1968, p.2). A subsector, on the other hand, is defined as a meaningful grouping of firms related horizontally and vertically to supply a closely-related set of commodities (Shaffer 1968, p.1146 & March 1968, p.2). The subsector specifically includes the vertical as well as horizontal relationships in a supply chain; while an industry, strictly defined, includes only a horizontal grouping of firms.

To illustrate the difference between a subsector and an industry, consider the present case study. The sorghum beer industry, as strictly defined in the IO literature, includes only the firms and individuals actually brewing the sorghum beer. The sorghum beer subsector, on the other hand, includes not only the brewers but also the malting industry, parts of the milling industry and the sorghum beer distribution system. In general, as in this case, several industries or parts of industries are subsumed within a subsector.

Subsector analysis and standard Industrial Organization are closely related. The objective of both is to evaluate and to ultimately improve the performance of a portion of the economy in matching supply and demand. Many of the methods of analysis - descriptive studies, the structure-conduct-performance (SCP) paradigm, and econometric tools - are common to both approaches. Subsector analysis has evolved, over the past 15 years, out of

mainline industrial organization analysis and is firmly rooted in it.

2. The Evolution from Industry Studies to Subsector Studies

The analytical focus of Industrial Organization (IO) has changed over time from the industry studies of the 1930's, 40's and 50's to the quantitative, cross-industry studies of the 1960's and 1970's (Helmberger, p.519; Weiss, p.362). The most recent iteration in the progression of IO analysis is the recent emergence of subsector studies. The analytical progression - from industry to cross-industry to subsector studies - is reviewed here very briefly, as it is helpful for comparing and contrasting industry and subsector studies and for determining which is more appropriate for this case study.

The industry study was the principal form of analysis used in the early days of the industrial organization field (Helmberger, p.518; Phillips & Stevenson, p.331). The influence of Mason (1939) and E.A.G. Robinson (1931) was particularly important in promoting its use. The industry studies were promoted because it was hoped that through examination of a number of specific cases general hypotheses would emerge regarding the nature of market structure and how that affected firm conduct and performance (Helmberger, p.518).

The book-length industry study as a genre has declined dramatically since the late 1950's. Paralleling the decline of the

industry study was the rise of a second phase in the development of the Industrial Organization (IO) field, the cross-industry structure-conduct-performance (SCP) paradigm (Weiss, p.362). It was in 1959, with the publication of his classic book Industrial Organization, that Joe Bain launched this second phase of IO analysis. In his book, Bain coalesced the results of the range of industry case studies undertaken up to that point and provided an intial set of general hypotheses that could be tested across industries. For purposes of theorizing and generalizing, certain simplifying assumptions had to be made. Among these simplifying assumptions, Bain and others decided that internal firm behavior could be assumed to be profit maximizing and vertical relationships among firms could be taken as a given part of the industry structure. Thus simplified, the cross-industry structure-conduct-performance (SCP) paradigm enjoys preeminence as the standard conceptual framework in todays industrial organization establishment (Weiss, pp.362,398; Helmberger, p.519).

Subsector analysis has grown up within the last 15 years, largely within the agricultural economics literature (see, for example, Shaffer 1968; Shaffer 1973 and French 1974). Subsector analysis is being developed because it is felt that the standard IO SCP framework has failed to focus adequate analytical attention on phenemona of increasing importance within agriculture and in agro-industries. Two central features are of principal concern: a)

the increasing importance of vertical relationships in agricultural supply chains, and b) the rich variety of internal firm behavior induced in dealing with the uncertainty caused by widely-fluctuating production levels and agricultural prices (Shaffer 1968, pp.1438 cf; NC117 Project Revision Paper, p.1). Subsector analysis has been advanced largely in an attempt to integrate these two areas of concern into an expanded Industrial Organization mold in which the unit of analysis is enlarged to include a network of vertically as well as horizontally related firms.

The initial analytical work done within the subsector framework has concentrated, as did early Industrial Organization analysis, on descriptive case studies. Many of these have been done under the auspices of the regional project, NC 117 (see, for example, Ricks, Hamm & Chase-Lansdale; and Ward & Kilmer). In terms of disciplinary development, the rise of subsector studies can be viewed as a return to the specifics of the case study industry approach, but this time with a revised focus of attention.

3. The Distinction between Subsector Studies and Industry Studies

The distinction between subsector analysis and conventional Industrial Organization (IO) analysis must be briefly discussed before the case can be made for using the subsector framework in this case study. In contrasting subsector studies with conventional IO analysis, the first comment must be made on the distinction

between subsector analysis and the second phase of IO analysis, the quantitative cross-industry studies. The quantative cross-industry studies obviously operate at a higher level of abstraction than do either industry case studies or subsector case studies. Since the development of generalized cross-sectional hypotheses regarding SCP relationships within subsectors is not yet well-developed (Ricks, Hamm & Chase-Lansdale, p.ix), a contrast between cross-sectional subsector analysis and cross-sectional industry studies would be premature. It is more fruitful, for purposes of this study, to move directly to a comparison between subsector case studies and industry case studies.

As a first step in contrasting subsector studies and industry studies, it is important to discuss the common ground they share. An initial similarity is that the motivation for undertaking industry studies as well as subsector studies is normally problem-solving and prescriptive. In subsector studies, vertical relationships are always analyzed. In industry studies - following from the work of E.A.G. Robinson (1931) and Coase (1927) - vertical relationships are often explicitly studied as well. This is done primarily in cases where there are different degrees of vertical integration among firms, and it becomes necessary to include vertical as well as horizontal relationships in order to define a meaningful analytical unit. A final stretch of common ground is that both industry studies and subsector studies rely heavily on the

structure-conduct-performance (SCP) paradigm.

Despite these similarities, there are a number of key differences. Central is the fact that the two methods of analysis view the world from substantially different perspectives. In a subsector orientation, vertical relationships within an economy are viewed as potentially housing a predominant share of economic inefficiencies, and therefore the study of vertical relationships and vertical performance is deemed to be of paramount importance. In industry studies, on the other hand, economic performance is examined primarily in terms of horizontal measures of efficiency such as technical and allocative efficiency.

Because their implicit assumptions regarding the primary sources of inefficiency in the economy diverge, the two analytical frameworks define their units of analysis differently. Subsector studies generally define as their unit of analysis a piece of the economy that is "taller" and "more slender" than that commonly chosen in industry studies. It is taller in the sense that it normally includes a number of industry levels in a supply chain, and it is more slender in that the product lines studied often exhibit very little horizontal branching. A classic example would be any agricultural commodity subsector which includes farmer to processor to wholesaler to retailer supply chain, a vertical chain with little branching.

Another difference is that subsector studies focus on firm

conduct in vertical dimensions and on the array of potential vertical relationships - markets, contracts and regulation - into which a firm can enter. Industry studies, on the other hand, most often examine vertical relationships as a characteristic of industry structure; and they generally limit discussion of vertical relationships to consideration of the level of vertical integration. Finally, subsector studies place more emphasis on internal firm behavior than do industry studies. The subsector focus on internal behavior of firms is closely tied to a concern with vertical coordination and determining when and why firms will enter into certain types of vertical arrangements. Thus, although subsector studies and industry studies share a broad swath of common ground, there are significant differences in the two approaches.

4. Rationale for Using the Subsector Framework for this Case Study

The subsector approach has two main advantages over the industry study for purposes of this paper. The first advantage is that a subsector approach highlights the vertical relationships, and these are critical for understanding the dynamics of the sorghum beer business. In particular, the link between the brewing industry and the distribution system is fraught with various legal barriers to entry, and an understanding of these vertical links is, therefore, critically important in explaining trends in the sorghum beer business. The industries supplying the grain and malt inputs

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to the sorghum beer brewers also play an important role in affecting the competitiveness of the brewers. A narrow, horizontal focus on the sorghum beer brewing industry would, therefore, lead to an inability to understand the forces directing the dynamics of the subsector.

The second advantage of the subsector framework is that it leads directly to an accurate assessment of the performance of the sorghum beer business. Key performance criteria in this case study are the income and income distribution tradeoffs associated with home brewing as opposed to factory brewing technologies. An industry focus on brewing alone could potentially be very misleading, as the value-added in beer production amounts to only about 30% of the total value-added supported by sorghum beer sales (Table 7.3). As much as 70% of the total value-added supported by sorghum beer sales accrues to input suppliers and distributors. Therefore total income generation, and an assessment of income distribution, cannot be accurately made without looking at the sum of the income streams within both the vertical and the horizontal channels of the subsector.

For these two major reasons, the sorghum beer subsector rather than the sorghum beer industry will be the basic unit of analysis in this paper. The structural relationships among the subsector participants are outlined in the following section.

C. STRUCTURE OF THE SUBSECTOR

1. Schematic Overview

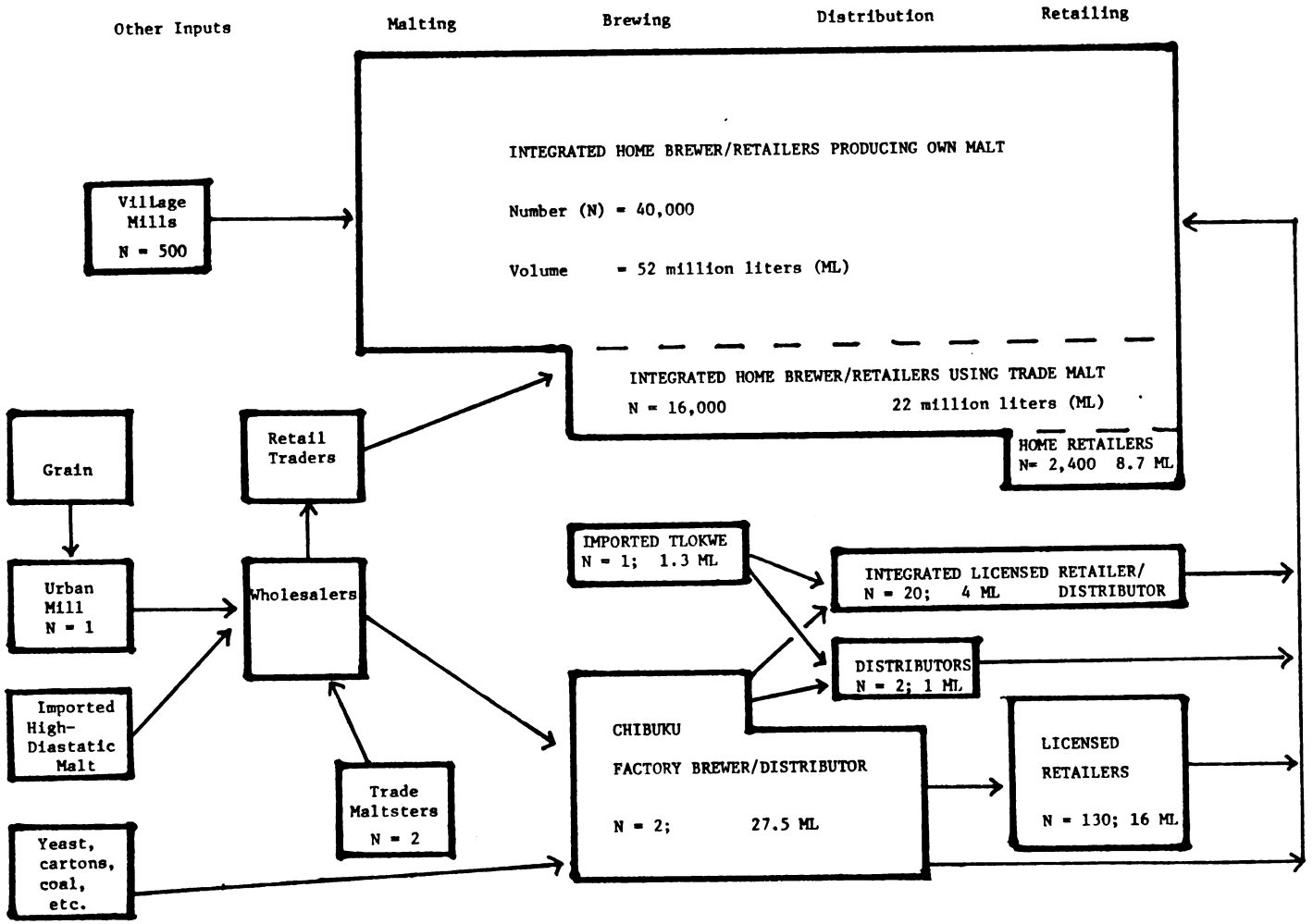
The structure of the sorghum beer subsector in Botswana is displayed in schematic form in Figure 4.c. Included in the figure is the number of participants at each level within the subsector as well as a quantification of the flows of beer within the system. Sources of raw material supply are included in the diagram even though they are not considered part of the subsector. They are not considered part of the subsector because the majority of the output of the raw material producers goes to industries other than those associated with sorghum beer in Botswana. With Figure 4.c as a guide, each of the industries or stages within the subsector will be discussed in more detail below.

2. The Malting Industry

Three types of enterprises are found in the malting industry - home maltsters, trade maltsters and producers of municipal malt. The home maltsters are examined first. Seventy percent of the home brewers, or about 41,000 women, malt their own sorghum as the first step in beer production. These home maltsters are mostly located in rural areas, as trade malt is not always available there and because milling services, grain and working space are readily

Figure 4.c

SCHEMATIC OF BOTSWANA'S SORGHUM BEER SUBSECTOR, 1982



available. Home malting, however, is rarely carried out in urban areas because of space constraints, the unavailability of milling services and of unmilled sorghum grain. The home maltsters are all brewers themselves; they do not sell malt to others, nor do they specialize in malt production.

Firms producing low diastatic or trade malt comprise the next segment of the sorghum malting industry. Two such firms, practicing open floor malting, are currently operating in Botswana. As indicated in Section B, the Botswana government has stopped giving import permits for trade malt as of Februry 1982; and as the old permits expire over the course of the ensuing year, the import of trade malt from South Africa and Zimbabwe will trickle off to nothing. Entry into this business is unimpeded; and with the recent ban on imports, the next year or two will undoubtedly bring the entry of several more maltsters into the field.

Firms producing high diastatic or municipal malt form the third component of the malting industry. These capital-intensive malting operations are all located in South Africa. Botswana Breweries is the only purchaser of this high-grade malt in Botswana; in fact, municipal malt is only sold through one large wholesaler and is not sold at the retail level at all. Entry into the production of high diastatic malt is open. In fact, one of the current trade maltsters is actively working to upgrade his operation so he can produce consistent, high diastatic malt to Botswana Breweries'

specifications.

3. The Milling Industry

Two types of milling establishments service Botswana's sorghum beer subsector. First to be considered is the village milling industry. Roughly 500 hand- and diesel-operated mills operate in rural Botswana. They exist primarly because of the demand provided by local brewers. These village mills grind all the home-made malt as well as all the sorghum used in home brewing. Thus, the village mills grind 77% of the sorghum malt and 60% of the grain used in the sorghum beer subsector. Entry into village milling is free, but the limits of village markets are such that few new village mills will come into operation except to replace old ones or to introduce dehullers and begin servicing the largely untapped home porridge market.

One large urban mill, located in Lobatse, represents the other component of the milling industry that provides inputs to the subsector. That urban mill grinds all the corn used in Chibuku production and much of the corn used by home brewers. Entry into milling on this scale is free, and it is likely that more large mills will come into operation over the next few years.

4. Brewing

The brewing establishments supplying Botswana's sorghum beer market include about 56,000 home brewers, two (and soon to be three) domestic factories and one foreign factory. Home brewers currently supply 72% of the volume of sorghum beer sold, domestic factories 26% and the one foreign brewery supplies the remaining 2% of the market. All of the imported Tlokwe beer and 80% of the locally-produced Chibuku is sold in cartons while the remainder of the factory brewed sorghum beer is sold in bulk.

Entry for home brewers and imports is unimpeded. Manufacturing licenses, however, are required before any new domestic factory sorghum beer breweries can be built. Thus, entry into domestic factory brewing can potentially be limited by government licensing control. This will be discussed further in Chapter 8.

5. Distribution

Although potentially important, wholesale distributors currently play a minor role in Botswana's sorghum beer subsector. Only two businessmen have specialized as distributors; one sells Chibuku and one sells Tlokwe. The Chibuku distributor operates in Gaborone and sells only to shebeen queens, providing a valuable procurement mechanism for them. The Tlokwe distributor, on the other hand, sells to both shebeens and licensed retail outlets. While these two distributors currently play a useful role in stimulating competition

and in providing beer to unlicensed retailers, it is unclear whether political and market forces will result in an expansion or a contraction of their role in the future.

6. Retailing

There are two types of sorghum beer retailers in Botswana - licensed and unlicensed. Home retailing and unlicensed retailing are synonymous. Approximately 58,600 unlicensed home retailers sell 80% of Bowswana's sorghum beer to its final consumers. They sell all of the home brewed sorghum beer and 30% of the factory brewed sorghum beer.

Theoretically, entry into home retailing is free - for both home- and factory-brewed sorghum beer. With the retailing of home brew, entry is, in actuality free; and many women do brew irregularly, entering the market only when they have an urgent cash need. In the case of factoy-brewed sorghum beer, however, shebeen queens are not always able to obtain beer to retail. Exclusionary practices by licensed retailers and unwitting assistance by local councils prevent free access by shebeens to Chibuku and Tlokwe. These exclusionary practices will be discussed in some detal in Chapter 6 as part of a geneal discussion of conduct in the subsector.

Botswana's 150 licensed retail outlets sell 70% of the country's factory-brewed sorghum beer which amounts to 20% of all

sorghum beer sold. Entry into licensed retailing is governed by licenses issued by local town and district councils. Several of the councils own beerhalls themselves, but they are run by Botswana Breweries on a management contract with the profits going to the council. About 60% of the remaining licenses are held by traders who have expanded from retailing in general trading goods or other liquors into sorghum beer. Most of the rest of the licenses are held by the councillors themselves or by the wives of civil servants. The allocation of licenses is often opposed by existing license holders, and in many areas no new licenses are being granted on grounds that over-trading already exists. Influence with the councils is certainly helpful in obtaining these retail licenses.

7. Vertical Integration

Vertical integration in the sorghum beer subsector is mostly limited to the home brewers. Initially, of course, all home brewers were compeletly vertically integrated. They grew their own grain, made their own malt, stamped their own grain and malt, brewed and retailed their own beer. The history of the evolution of home brewing has largely been one of increased specialization and a decreasing amount of vertical integration. The growing of one's own grain was the first function to be commonly separated out of brewers' production processes. Devolution of the milling function to mechanical mills owned by others within the village followed.

Most recently, many brewers, especially in urban areas, have taken to purchasing factory-made malt. Currently, 70% of the home brewers remain integrated as home maltster, brewers and retailers of their beer. The remaining 30% of home brewers purchase their inputs and integrate only their brewing and retailing operations.

In the industries supporting factory brewing, vertical integration is minimal. Maltsters, to be sure, do integrate malting and milling of the germinated malt. Botswana Breweries is also vertically integrated in a very limited way in that they enter the retailing arena through the management contracts they have to operate several council beer halls. With these two exceptions, factory producers are specialized; there is very little vertical integration among factory milling, malting and sorghum beer brewing operations.

8. Coordination Mechanisms Within the Subsector

Coordination within the subsector is handled almost exclusively by spot markets. Grain is marketed freely throughout the country and market prices are well known. Trade malt is likewise widely available through normal retail trading outlets, but temporarily it is in short supply as the existing producers are attempting to expand production to fill the gap left by the now-excluded foreign maltsters.

The principal coordination problem lies in the allocation of factory brew for retailing. The market for factory brew is not yet

saturated, and current production is largely rationed by the licensing system along with the moral suasion exercised by retail licensee holders.

This completes discussion of the basic conditions and structure of the supply side of the sorghum beer subsector. In the followiing chapter, the basic conditions on the demand side are discussed.

CHAPTER 5

THE NATURE OF CONSUMER DEMAND

This chapter investigates the nature of consumer demand for sorghum beer. The demand issues addressed in this chapter are extremely important for analysis of the dynamics of the sorghum beer business. In addition, discussion of the demand side of the sorghum beer market provides the final set of background information required before delving into the analysis of economic performance in the sorghum beer subsector.

In providing the necessary core of information on consumer demand, Chapter 5 begins, in Section A, with a general overview of Botswana's liquor market. Subsequently, in Section B, attention is focused more narrowly on the characteristics of demand for sorghum beer. Because time and resource contstraints did not allow in-depth consumer surveys to be undertaken as part of the field research in Botswana, this chapter draws heavily on work done in the surrounding countries of South Africa, Zimbabwe and Zambia on consumer demand for sorghum beer.

A. OVERVIEW OF BOTSWANA'S LIQUOR MARKET

1. Current Level of Liquor Consumption

Sorghum beer occupies a preponderant position in Botswana's overall liquor market. This is well demonstrated in Table 5.1 which provides an overview of current levels of annual consumption and expenditure on liquor in Botswana. From Table 5.1 it can be seen that in 1981 sorghum beer accounted for 77% of the volume of liquor consumed in Botswana and for 34% of consumer expenditure on alcohol.

Homemade liquors other than sorghum beer account for another 12% of the volume of alcoholic beverages consumed, although they only comprise 5% of expenditures. The most important of these other homemade drinks is khadi, a drink made with crushed berries or with honey. Khadi, and particularly a variant called sethulphoko, has probably the highest alcohol content of all the home brews. The other homemade liquors that are produced include primarily beers made from wild fruit as it comes in season, for example marula and watermelon beer.

Clear beer accounts for a very large proportion of consumers' total expenditure on alcohol; today fully 45% of consumer expenditure on alcohol is spent on clear beer. In addition to its current importance in consumer expenditures, clear beer is playing a significant role in long-term liquor consumption trends as will be

Table 5.1

OVERVIEW OF THE BOTSWANA LIQUOR MARKET, 1981

Beverage	Annual Sales ('000 liters)		Value of Annual Sales (millions of pula)	
Sorghum beer	102,725	77%	P 13.9	34%
- home-brewed	(74,000)			
- factory-brewed	(28,725)			
Khadi, fruit beers & other home liquors	16,300	12%	2.1	5%
Clear beer	13,441	10%	18.1	45%
Wine	760	.6%	2.1	5%
Spirits	552	.4%	4.3	11%
Total	133,778	100%	40.5	100%

Sources: (1) Customs Statistics Unit, (2) Botswana External Trade statistics 1981, and interviews with (3) maltsters, (4) factory brewers and distributors of sorghum beer, (5) home brewers, and with (6) Kgalagadi Brweries, the sole manufacturer of clear beer in Botswana. Home-brewed sorghum beer calculated from 1,2,3, & 5; factory-brewed sorghum beer from 4; khadi, fruit beers & other home liquors from 5; clear beer from 1,2 & 6; and wine and spirits from 1 & 2.

seen presently.

2. Trends in Liquor Consumption

Until as recently as 20 years ago, virtually no clear beer, wine or spirits were consumed in Botswana. Their current level of consumption reflects a trend of steadily increasing sales since 1960. This increase was initially brought about by a change in legal restrictions. Before 1960, it was illegal for any black in Bechuanaland to consume clear beer, wine or spirits. Sorghum beer was the only alcoholic drink allowed to the black population. With the formation of the Legislative Council for Bechuanaland in 1960, the restriction on consumption of clear beer, wine and spirits, as well as other racially discriminatory statutes, was lifted (date inferred from Agunda, p.61; Deacon, p.28; and Laws of Botswana, Cap 45:01, Liquor). The lifting of this restriction, together with steadily increasing incomes since independence, has caused consumption of clear beer, wine and spirits to rise from practically nothing in the late 1950's to the 1981 levels depicted on Table 5.1.

Over the past 50 years total consumption of sorghum beer has also very likely increased. For the initial 35 years of this period, from about 1930 to 1965, home-brewed sorghum beer was the only sorghum beer available in Botswana. Although no hard statistics are available showing changes in the level of home brewing, several observers have commented on increases over time in the absolute

quantity of home-brewed sorghum beer consumed Kooijman, p.11; Gulbrandson, pp.84,85). The increase in home brewing activity likely started in the 1930's and was caused by the large increase in incomes from migrant labor coupled with the rise of drinking by young returning migrants who had been hitheroto excluded from drinking sorghum beer. National consumption of home-brewed sorghum beer also jumped noticeably higher in the 1960's. Before then, tribal chiefs had controlled the production and sale of sorghum beer in many parts of Botswana (Schapera 1959, p.14; Gulbrandson, p.84). The lifting of this control in the early 1960's certainly resulted - at least initially - in a significant increase in home brewing activity in Botswana. Some of the increase in home brewing activity has undoubtedly been displaced due to the availability of factory-brewed sorghum beer starting in the mid-1960s; so the net change in home brewing activity from 1930 to 1980 is uncertain. What is generally agreed, however - by factory brewers, home brewers and knowledgeable observers - is that since about 1965, the market share held by home brewers of sorghum beer has declined; and since about 1970, the absolute level of home brewing of sorghum beer has declined more or less steadily in the face of increasing supplies of factory-brewed sorghum beer.

Factory-brewed sorghum beer became available in Botswana starting in about 1965; and the quantity sold increased rapidly, from nothing in the early 1960's to 28 million liters per year in

1981. Table 5.2 charts the rise of Chibuku sales in Botswana. Although other factory brews - produced in Botswana, Zimbabwe and South Africa - have been sold in Botswana at different times over the past 15 years, statistics are unavailable regarding their total sales in Botswana. Since Chibuku has always accounted for the major share of Botswana's factory-made sorghum beer, the figures in Table 5.2 give a good estimate of trends in the overall sales of factory-brewed sorghum beer. The rapid increase in Chibuku sales, evident since 1979, is due to the arrival, at that time, of an aggressive new management team at Botswana Breweries.

3. Substitution Between Sorghum Beer and Other Liquors

Trends in liquor consumption are strongly influenced by the substitutability among various types of alcoholic drinks. The potential for substitution between sorghum beer and other liquors can be summarized in the following two propositions. In the short run, sorghum beer is a very weak substitute for other liquors. Over a 20- to 40-year time horizon, however, there appears to be a shift from consumption of sorghum beer to stronger manufactured liquors, particularly to clear beer. The evidence for these two assertions is presented below.

a. The Short Run

That sorghum beer and other liquors are very weak substitutes over the short run has been commented on by several knowledgeable

Table 5.2

ANNUAL CHIBUKU SALES IN BOTSWANA
('000 liters)

Year	Total Sales
1966/67	338
1967/68	4,500
1968/69	5,534
1969/70	8,295
1970/71	10,084
1971/72	7,960
1972/73	10,024
1973/74	15,308
1974/75	18,875
1975/76	16,344
1976/77	15,021
1977/78	12,635
1978/79	11,214
1979/80	17,559
1980/81	25,600
1981/82	29,440

Source: Haggblade 1981, p.4 and interviews with Botswana Breweries personnel.

participants in the sorghum beer subsector. Two participants in particular were impressed by the fact that, after legalization of all alcohol for blacks in the early 1960s, consumption of clear beer, wine and spirits did not rise appreciably. R. Novellie, head of the Sorghum Beer Unit in Pretoria, noted that it was in the years following the legalization of clear beer, wine and spirits for consumption by South African blacks that sorghum beer sales grew at an unprecedented rate. He concluded that, "Although the consumption of other liquors is rising, these do not seem likely to be serious rivals to Bantu (sorghum) beer in the near future." (Novellie, Nov. 1966, p.5). A similar situation prevailed in Zambia where, in 1962, all alcoholic drinks were made available to blacks and were introduced for sale in the beerhalls alongside sorghum beer. After a few years, the municipalities discontinued the sale of clear beer, wine and spirits in their beerhalls, because the demand for drinks other than sorghum beer turned out to be so weak. The Heinrich's Chibuku company concluded from this that, "The vast majority of the Bantu people will only turn to spirits, clear beer and wines when they are not entirely satisfied with the Bantu (sorghum) beer available." (Heinrich's Chibuku, p.3). Thus, two of the most important participants in the sorghum beer business determined that there was little substitutability between sorghum beer and other liquors over a short period of time.

There is another, and very powerful, reason for believing that

in the short run there exists very limited consumer substitution between sorghum beer and other manufactured liquors - in Botswana, sorghum beer and other liquors are most often sold only in physically separate establishments. This physical separation is due to a legal restriction in Botswana's liquor laws which specifically prohibit the sale of clear beer, wine and spirits in the same premises in which sorghum beer is sold (Laws of Botswana, Chapter 40:01, para. 6.4 and Chapter 45:01, para. 42). Thus, customers drinking in licensed establishments choose one type of liquor; and once they have entered the appropriate establishment, they are physically unable to substitute sorghum beer for other forms of alcohol.

It is only in the shebeens - and there illegally[1] - that sorghum beer is sometimes sold alongside clear beer, wine and spirits. Such side-by-side selling of sorghm beer with clear beer, wine or spirits is not very widespread; it occurs in less than 5% of the shebeens. The physical separation of sorghum beer from wine, clear beer and spirits, in the shebeens as well as in licensed retail outlets, constitutes a strong barrier to the short-term substitution of sorghum beer for other alcoholic beverages.

[1]Since a liquor license requires the building of special premises on a plot zoned for commercial use, any shebeen queen who sells clear beer, wine or spirits in her shebeen is, by definition, doing so illegally. Selling these liquors in a shebeen - with or without sorghum beer - is, therefore, illegal.

b. The Long Run

Over the long run, however, consumers do appear to substitute other liquors - particularly clear beer - for sorghum beer. Changing tastes over time is a primary reason for substitutability between sorghum beer and other liquors over the long term. As Van Niekerk has noted, "Wherever the native has come into contact with Western civilization in Africa he has proceeded to discard his traditional way of life and imitate the European. Thus with liquor he gradually deserts tribal brews and goes to great lengths to obtain the same drinks the European consumes." (Van Niekerk, p.34). As urbanization and modernization take place, the packaged liquors of the industrialized world become sought-after status symbols. Reader & May clearly point out in their study of liquor consumption in Zimbabwe that, "European beer is becoming increasingly desirable as a status symbol." (Reader & May, p.37). Status was the most common reason given for drinking clear beer among consumers they interviewed (Reader & May, p.26). Also, as would be expected in a world of changing tastes, the young are in the vanguard of change and are more apt to prefer and drink clear beer than are the old (May, pp.11,12). It seems clear that changing tastes are playing a large role in the gradual shift toward a preference for modern liquors and for clear beer in particular.

Rising incomes is the other principal reason for a gradual shift toward clear beer, wine and spirits. The demand for these

manufactured liquors is income elastic, especially in certain income ranges. Of these manufactured liquors, empirical evidence from southern Africa is available only for clear beer. For example, Reader and May conclude that, "With rise in income (among African drinkers) in the sample, beverage consumption increases in favor of European beer." (Reader & May, p.viii). From the data they provide on average clear beer expenditures for various income groups, a rough estimate of the income elasticity of demand can be calculated. The midpoints of the income ranges were used to compute the change in income, and the elasticity was then crudely calculated as (change in beer expenditure/initial expenditure)/(change in income/initial income). Thus, in the income range of .01 to 16 Zimbabwe dollars (8-16 U.S. dollars) per week, the income elasticity of demand for clear beer can be estimated to be about .33 (calculated from Reader & May, p.25). This is close to the recent .4 estimate of the income elasticity of demand for clear beer in the United States (Hogarty & Elzinga, p.197). While not large in absolute terms, the income elasticity of demand for clear beer is substantially higher than it is for sorghum beer as will be seen in Section B.3 of this chapter. Thus as incomes rise over time, clear beer comes to occupy a position of increasing relative importance in consumer liquor purchases.

As a final point regarding the long run substitutability between sorghum beer and other manufactured liquors, it should be

emphasized that the most important long-run substitution of this nature is the gradual move from sorghum beer to clear beer rather than to wine or spirits. In South Africa, representatives of both the wine and the clear beer industries agree that as incomes rise sorghum beer consumers generally move to clear beer rather than to wine. They indicate that, "The black man has traditionally and for centuries been a sorghum beer drinker. In an urbanized setting it is natural for him to move to malt beer. It is not so natural for him to move to wine." (Time Magazine, Liquor Supplement, December 7, 1981, pp.7,12). Similarly, in Zimbabwe, officials have resigned themselves to what they see as, "the gradual but apparently inevitable increase in the percentage of the total market given over to European-type beers." (Wolcott, p.33).

4. Trends in Liquor Consumption in Southern Africa

Time series data are available on liquor consumption in the Southern Afican Customs Union[1], and they provide the best insights available into likely future trends in Botswana. Botswana has followed in the steps of other countries in the Southern African Customs Union (SACU) in many respects, and it is likely that they will do so in liquor consumption as well. Table 5.3 shows the changing composition of liquor consumption in the SACU over about

[1]Membership in the Southern African Customs Union includes Botswana, Lesotho, Swaziland and South Africa.

Table 5.3

LIQUOR CONSUMPTION
IN THE SOUTHERN AFRICAN CUSTOMS UNION AREA*

	1960		1970		1977	
Volume of liquor (millions of liters)						
sorghum beer**	1,771	(89%)	2,002	(79%)	2,310	(74%)
clear beer	75	(4%)	259	(10%)	520	(17%)
wine	108	(6%)	216	(9%)	240	(8%)
spirits	28	(2%)	54	(2%)	59	(2%)
Total	1,922	(100%)	2,531	(100%)	3,131	(100%)
Expenditure of liquor (millions of rands***)						
sorghum beer			100	(17%)	231	(15%)
clear beer			130	(22%)	420	(28%)
wine			108	(18%)	281	(19%)
spirits			256	(43%)	574	(38%)
Total			594	(100%)	1,506	(100%)

* Membership in the Southern African Customs Union Area includes the countries of Botswana, South Africa, Lesotho and Swaziland.

** Includes factory-made sorghum beer plus home-brewed beer produced from powder beer; excludes home-brewed beer made from scratch.

*** In current prices. One rand is the equivalent of one U.S. dollar.

Source: Deacon, pp. 132,136,138,140,247.

the past 20 years. Of course, trends in the Republic of South Africa, because of its huge size relative to the other members, dominate these figures. During the nearly 20-year period covered in Table 5.3, many changes have taken place in the customs union countries: per capita incomes have risen rapidly, legal changes have been instituted making it legal for blacks to consume liquor other than sorghum beer, and tastes have changed as the population has become increasingly urbanized. As a result of all these changes, both the volume of liquor consumed and total expenditure on alcoholic beverages have increased, and they have increased in all categories of drink.

The biggest change taking place in the Southern African liquor market has been in the relative market shares held by sorghum beer and clear beer. In terms of volume, sorghum beer has dropped from 89% of the total quantity of liquor sold in 1960 to 74% in 1977, while the relative position of clear beer has increased from 4% to 17%. The share of sorghum beer in total liquor expenditures has also declined, from 17% in 1970 to 15% in 1977. Over that same seven-year period, expenditures on clear beer rose from 22% to 28% of total liquor purchases. Thus, there does seem to be a relative shift from sorghum beer to clear beer over about a 20-year time span.

In spite of the long-run shift to clear beer, one should not conclude that sorghum beer is in danger of becoming obsolete any

time soon. In absolute terms, sorghum beer sales are still increasing in the customs union area, and they still account for three-fourths of the volume of all liquor sold in the customs union countries. If the broad trends prevailing in the customs union also hold in Botswana - and they very likely will - sorghum beer sales will continue to hold an important position in Botswana's liquor market for several generations at least.

B. GENERAL CHARACTERISTICS OF THE DEMAND FOR SORGHUM BEER

1. Who Drinks Sorghum Beer and Why?

A detailed discussion of technical issues such as income elasticity and price elasticity of demand will be important parts of the ensuing analysis of the demand for sorghum beer. However, those readers not familiar with Southern Africa and with sorghum beer will be unacquainted with the general characteristics of demand on which the technical analyses will elaborate. For such readers, this introductory section contains a short descriptive profile of sorghum beer consumers and their motivations.

Anyone strolling through the villages of Botswana or through its low- and medium-income urban neighborhoods will pass numerous groups of people sitting, conversing and sharing gourds, cups or cartons of sorghum beer. The pictures on the following page give a feel for the ambiance in the drinking establishments. Although all citizens of Botswana probably drink sorghum beer at one time or another, the regular consumers of sorghum beer are members of the lower income groups. In urban areas, clerks, drivers, messengers, industrial wage laborers, policemen, town council and tribal administration employees are income groups at the upper limit of those which still drink sorghum beer. Both men and women over the age of about 18 drink sorghum beer, although men generally outnumber

FIGURE 5.a

A SHEBEEN AND A LICENSED RETAIL ESTABLISHMENT

a Botswana shebeen

beer gardens in Bulawayo, Zimbabwe (from Wolcott, p.111); similar to fanciest licensed outlets in Botswana

women in both the shebeens and in the licensed beer outlets. Particularly in the villages, it is the older men and women who are most likely to be consumers of sorghum beer, even when their income or wealth would allow them to consume more expensive drinks.

People who drink sorghum beer do so for two main reasons - for sustenance and for social reasons. The primary types of sustenance sought by consumers of sorghum beer are food value and a desire to quench thirst. The sour taste of sorghum beer makes it a particularly effective quencher of thirst, even drunk warm as it always is. When asked why they like sorghum beer, consumers encountered in the course of the field work for this study frequently indicated that it filled their stomach and satisfied their hunger. Thus, the sour taste to quench thirst and the solids in the beer to fill the stomach are the primary characteristics sought in sorghum beer. In fact, experiments have shown that sorghum beer with alcohol content below 1% will be accepted as normal by consumers of sorghum beer so long as the sour taste and beer body are acceptable (Novellie 1963, p.2).

The social motivations for drinking sorghum beer are no less important. As discussed in Chapter 3, social events were historically the occasions for which sorghum beer was brewed. Still today, the social interactions available in shebeens and in licensed beer gardens are prime attractions for consumers. Gulbrandson (1981) has even suggested that in rural areas of

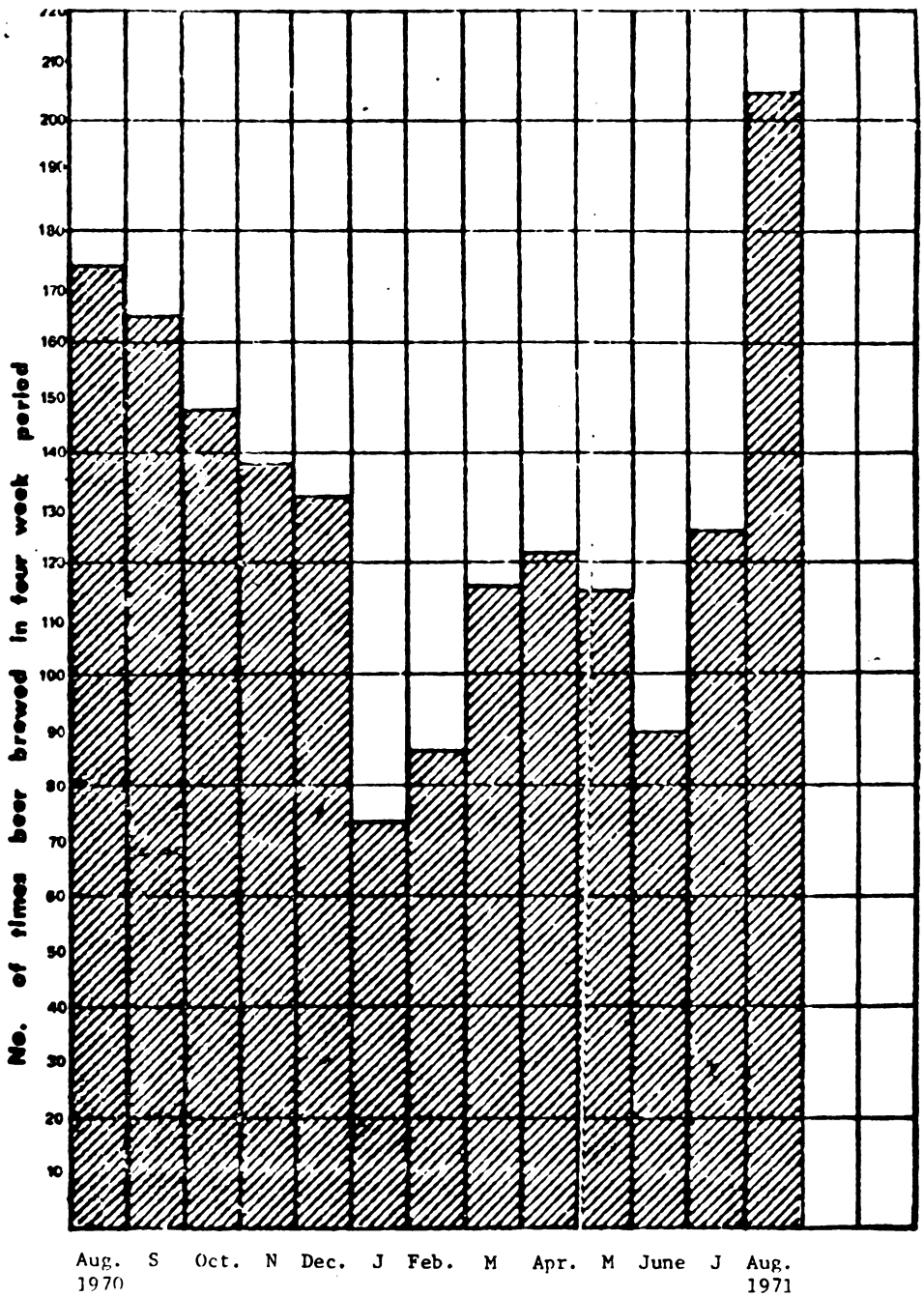
Botswana the declining importance of the kgotla (the traditional tribal council) as a forum for social interchange has been offset by the rising importance of sorghum beer retailing establishments. In urban areas, social motivations are also important. Shebeens and beer gardens provide convenient stopping places for policemen or council workers to honor tea time and to catch up on local news during the week. On evenings, and particularly on weekends, music and dancing often accompany the drinking taking place in the shebeens.

2. Seasonality

Fluctuations in consumption levels follow different patterns in rural than in urban areas. In rural localities, the predominant fluctuations are yearly in nature and are tied to the agricultural cycle. Figure 5.b displays the pattern of seasonality in a typical medium-sized village named Shoshong. This figure includes only data on home brewing. Since very little factory-brewed sorghum beer was available in Shoshong in 1971 when these data were gathered, the focus on home-brewed sorghum beer should not affect the seasonality pattern displayed. From Figure 5.b, it can be seen that the highest level of brewing activity takes place in August, right after the harvest. This peak occurs due to the abundant supplies of grain, its low price, and the fact that demand is high in this period, as all villagers return from the farmlands to the village at that time

FIGURE 5.b

SEASONAL BREWING PATTERNS IN RURAL BOTSWANA, SHOSHONG VILLAGE



(Source: Syson 1971)

of year. Demand and home brewing activity drop off in January and February when many villagers go to their fields for planting. The second decline in brewing activity, in July, is due to a drop in demand caused by people leaving the village to harvest their crops. The harvest-related decline is also due to the increasing scarcity and costliness of grain, the price of which reaches its peak immediately before harvest. From the foregoing, it is clear that seasonality of sorghum beer consumption in rural areas revolves around the agricultural cycle.

In urban areas, on the other hand, the agricultural calendar has little influence on seasonal consumption patterns. Incomes and population levels are constant throughout the year, and this tends to attenuate fluctuations in the level of demand for sorghum beer. The only annual patterns of seasonality in urban areas are induced by weather and holidays. In Botswana, the peak in urban demand occurs in the summer months, December through March, because the heat makes people thirstier than they are at other times of the year. December is the peak month for sorghum beer sales because of the Christmas holidays coupled with the high summer temperatures.

More important than the broad seasonal cycle in urban areas are the marked fluctuations in demand that occur throughout the course of each month and throughout each week. Demand each month is highest at the end of the month, right after payday. Retailers of both home- and factory-brewed sorghum beer indicate that sales in

the week following payday are about double the level of the other three weeks in the month. Spliced onto this monthly trend is a weekly cycle of low consumption levels early in the week mounting to a peak on the weekends, particularly on Friday and Saturday evenings. The weekly fluctuation is, of course, due to the influence of the standard five-day work week. These weekly, monthly and annual fluctuations in consumption are common in urban areas of South Africa as well as in Botswana (Novellie Nov. 1966, p.3).

These seasonality patterns have implictions for competitiveness and conduct in the sorghum beer subsector. First of all, the monthly and weekly fluctuations in demand, combined with the short shelf life of sorghum beer, put factory brewers at a cost disadvantage with respect to home brewers and brewers of clear beer. Factory brewers of sorghum beer operate with excess capacity in the early weeks of the month and in the early parts of each week, raising unit overhead costs and therefore raising total unit costs of production. As urban population levels grow and as wage labor becomes increasingly common in rural areas, these weekly and monthly fluctuations in demand levels will be reinforced. From this, one can conclude that factory brewers of sorghum beer will face increasingly strong pressure to spend research and development monies investigating ways of prolonging the shelf-life of sorghum beer.

3. Income Elasticity

Having completed our descriptive overview of consumer demand, it is possible to begin a more quantitative and technical analysis of the topic. Income elasticity of demand is the first of the technical demand issues to be discussed, and in so doing two main points must be made. First of all, at low income levels sorghum beer appears to be a normal good. Second, past an annual income level of about P 5,000 (or about $ 4,500) sorghum beer seems to become an inferior good; its income elasticity of demand becomes negative.

Numerous pieces of evidence support the contention that, at low income levels, the income elasticity of demand for sorghum beer is positive. Based on their consumer interviews in Zimbabwe, Reader & May conclude that, "With rise in income, beverage consumption does appear to increase, and in favour of European rather than African beer, although consumption of both increases." (Reader & May p.26, emphasis added). As with clear beer, Reader & May provide data on average weekly expenditures for sorghum beer in several income-level groupings. By using the midpoints of these income groupings, the income elasticity of demand can be crudely calculated at +.064 for incomes in the range of $Z.01 to $Z16 (or up to about U.S. $16) per week. While not large, it is clearly positive.

The behavior of returning mine workers provides further evidence for a positive income elasticity of demand for sorghum

beer. Numerous observers have commented on the important source of demand provided by mineworkers (Gulbrandson p.11; Modimakwane p.41; Sutherland p.13; Curtis, p.25). Mine wages almost invariably represent an increase in income for the laborers who take up such work. That the returning mineworkers increase their sorghum beer purchases as a result indicates a positive income elasticity of demand.

Past a moderate level of income, however - about P 5,000 per year in Botswana - sorghum beer appears to become an inferior good. Increases in income past this point result in a decrease in sorghum beer purchases and a move to more prestigious liquors, particularly to clear beer. This is the unanimous view of the brewers of clear beer as well as brewers of factory- and home-made sorghum beer who were interviewed in this study. It was evident in the survey work; in fact, it strongly affected the research design. Before sampling in urban areas and in large villages, a careful walk-through was made in each locality and individual neighborhoods were classified as having high, medium or zero sorghum beer selling activity. These classifications, it quickly became apparent, were inversely correlated with income and wealth. In the high-income neighborhoods, no sorghum beer selling or buying was taking place. This suggests strongly that in higher income groups sorghum beer is an inferior good. Discussions with retailers of sorghum beer combined with a knowledge of industrial and government pay scales

and consumption patterns by neighborhood lead to an estimate of about P 5,000 per year as the critical turning point in income level. Past this point, increases in income will normally result in decreased consumption of sorghum beer and increased consumption of clear beer.

The aggregate data in Table 5.3 are consistent with the view that, past certain income levels, sorghum beer is an inferior good. The trend of a declining proportion of sorghum beer in total liquor sales can be interpreted as an indication that people at the high end of the income distribution are abandoning sorghum beer in order to drink clear beer. In addition, further calculations based on Table 5.3 indicate that on a per capita basis both volume consumed and real expenditure on sorghum beer have declined between 1970 and 1977. Per capita consumption has dropped from 80 liters per year to 77; and real per capita expenditure on sorghum beer has declined from 4 rands to 3.85 rands (in constant 1970 rands; calculated from Deacon, pp.132,136,138,140,247). This declining real expenditure on sorghum beer in the face of rising real per capita incomes provides further evidence that sorghum beer is an inferior good past a certain income level.

A final point to be made about income elasticity is that home-brewed sorghum beer becomes inferior at a lower income level than does factory-brewed sorghum beer. This contention is explored in more detail below in an important discussion of the

substitutability between home- and factory-brewed sorghum beer.

4. Substitution between Home- and Factory-brewed Sorghum Beer

Home-brewed sorghum beer and factory-brewed sorghum beer are extremely close substitutes. In fact, factory brewing - initially set up by municipal governments in South Africa and Zimbabwe - was begun for the express purpose of displacing home-brewed sorghum beer. In Zimbabwe, home brewing for sale was specifically declared illegal when the municipalities went into the business of manufacturing sorghum beer (Wolcott, p.39). In South Africa, the townships were initially given the option of supplying sorghum beer themselves or licensing private brewers; but in 1937, they were forced to choose one method or the other (Nelson, p.41). Most townships opted to supply factory-brewed sorghum beer themselves and to make the home brewing and brewing by private companies illegal. In 1962, a blanket law was passed making it absolutely illegal to home brew sorghum beer for sale in any urban area in South Africa (Sorghum Beer Act, No.63 of 1962). Thus, in both Zimbabwe and South Africa, factory brewing has been set up to take the place of home brewers. Factory-brewed sorghum beer in those countries is, by design, being directly substituted for home-brewed sorghum beer.

The direct tradeoff between home- and factory-brewed sorghum beer has been commented on by numerous home brewers throughout Botswana during the author's two and a half years of close

observation of the home brewing business. Similarly in Zimbabwe, May has noted, "The beerhalls in the rural areas are often a source of resentment as they have reduced or removed a source of cash. ... Sixteen men volunteered complaints that the women's income from brewing had been curtailed or done away with, and that in many cases it was an old woman's only source of money. The majority of women interviewed resented the financial loss involved..."(May, p.21). Wolcott has noted in Bulawayo, Zimbabwe that during periods when the supply of factory-made beer was unable to keep pace with the growing urban population and demand for sorghum beer, the level of home brewing would increase to fill the gap (Wolcott p.39). Home- and factory-brewed sorghum beer must be close substitutes if the level of home brewing rises and declines depending on the adequacy of the supply of factory-brewed sorghum beer. All of these observations suggest direct substitutability between home- and factory-brewed sorghum beer.

In order to diminish the substitutability between their sorghum beer and home-brewed sorghum beer, factory brewers in Botswana take considerable effort to differentiate their product. They do this primarily through packaging. Eighty percent of the Chibuku produced in Botswana is sold in one-liter wax paper cartons, while 20% is sold in draught. The cartons are attractive red, white and blue containers which make the factory brewed beer seem modern and therefore desirable. Thus, while home- and factory-brewed sorghum

beer are close substitutes, packaged factory-made beer is a slightly differentiated prestige consumption item.

5. Price Responsiveness of Demand

The responsiveness of sorghum beer expenditures to changes in price is another important characteristic of consumer demand. Two main points can be made on this subject: a) that the price elasticity of demand for sorghum beer is probably inelastic, and b) that among sorghum beer product lines, unpackaged beer (both home-brewed and bulk factory-made beer) is likely more sensitive to price changes than is packaged sorghum beer. Evidence supporting these general conclusions is provided below.

For sorghum beer as a whole, several factors affect the price responsiveness of demand and many of them lead one to expect the price responsiveness to be low in absolute value. The fact that sorghum beer has few close substitutes in the short run leads one to expect a low price elasticity. In addition, the modest proportion of consumer income spent on sorghum beer tends to insulate consumer demand from price changes in sorghum beer by diminishing the importance of the income effect. A final factor promoting a small price responsiveness of demand is its value as a food and energy source, the demand for foods normally exhibiting low sensitivity to price changes. For all these reasons, one would expect the price elasticity of demand for sorghum beer to be low, that is below 1 in

absolute value.

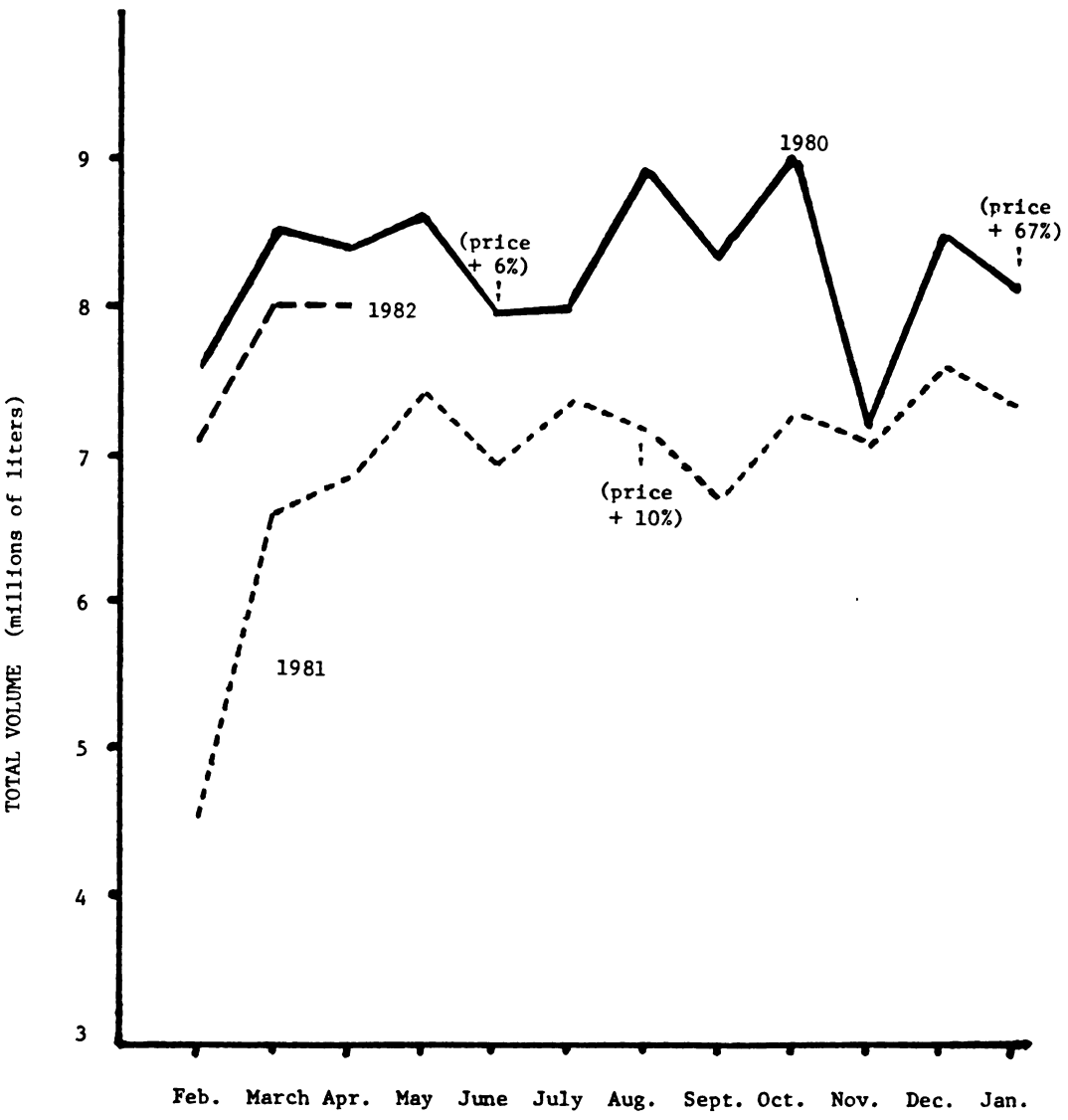
Within the array of sorghum beer products available in Botswana, one would expect packaged sorghum beer to be less price sensitive than unpackaged (or bulk) beer. This expectation arises because of the product differentiation, the premium image associated with packaged factory-made sorghum beer. The purpose of product differentiation is, after all, to insulate a product from price competition with substitutes.

Statistical evidence to support the two hypotheses - of low overall price elasticity and of even lower price elasticity for packaged beer - is very difficult to obtain. Prices of sorghum beer normally increase gradually over time, and it is very difficult to find any price variation substantial enough to support statistical tests of hypotheses regarding consumer response to price changes. The only potential for such a test occurred in Zimbabwe in 1981 when the new government removed a subsidy on brewers grits (brewers corn meal) and at the same time increased the excise tax on sorghum beer, the net result being a series of price increases of 6%, 67% and 10%. While numerous town councils in Zimbabwe were asked for information regarding sorghum beer sales before and after the price hikes, only the Bulawayo City Council was kind enough to respond. The data they provided are displayed in Figure 5.c which shows the level of sorghum beer sales in Bulawayo for a one-year period before and after the 67% price increase.

FIGURE 5.c

SALES OF FACTORY-BREWED

MUNICIPAL SORGHUM BEER IN BULAWAYO, ZIMBABWE



These Bulawayo data should be interpreted with considerable care. One problem with the data is that they exclude information on both quantities and prices of home brew sold over the two-year period. Although it is likely that the price of home brew remained more or less constant and that the quantity sold increased noticeably, no data are available to corroborate this. A second difficulty is related to the potential impact of clear beer prices on sorghum beer sales. Prices of clear beer rose in parallel with the prices of factory brewed sorghum beer over the period from February 1980 to February 1982, and there is no way to separate out the influence of each. Because of this nearly perfect multicollinearity, and despite the fact that it will bias the price elasticity estimates downwards, it was necessary to eliminate the price of clear beer from the regression from which the price elasticity was computed. A final difficulty with the Bulawayo data is that an important factor other than price affected the sales of packaged sorghum beer during the two-year period from February 1980 to February 1982; namely, there were deficiencies in packaging machinery and restricted allocation of cartons, which has artificially depressed packaged beer sales, were resolved during this period. Thus, the more or less constant sales of packaged beer over the two-year period are due not only to a hypothesized insensitivity of packaged beer to price rises but also in large part to the breaking of supply bottlenecks that had resulted in

previously artificially depressed sales of packaged beer. These data, then, are far from ideal. They are presented because they are the only data available and present a unique opportunity to gain insights, however limited, into the issue of price responsiveness of demand for sorghum beer.

Calculations of price elasticity of demand were made from the Bulawayo data. Since home brewing is illegal in urban areas of Zimbabwe, the data provided cover only the factory brewing segment of the Bulawayo sorghum beer market. Data for 24 months were provided by the city council, 12 for the months before the 67% price increase and 12 representing the months immediately following it.

Definite seasonal fluctuations in consumption are apparent from Figure 5.c. As in Botswana, these annual fluctuations are undoubtedly due to holidays and to changes in temperature throughout the year. In order to isolate the influence of price alone on quantities consumed, it was necessary to separate out these cyclical, seasonally-induced fluctuations in sales. Before estimating price elasticity, therefore, the 24 monthly observations were seasonally adjusted by assuming the variations in quantity consumed during the 12 months prior to the 67% price increase were due only to normal seasonal fluctuations. Each of these 12 observations was indexed at 100, and corresponding months in the year following the price rise were computed as percentages of the base year. The 24 data points, thus, consisted of 12 base year

indices and 12 deviations from the normal, base year consumption pattern.

Several functional forms were considered for use in estimating the price elasticity of demand. Logarithmic demand equations are often used because of their simplicity and close correspondence with the expected functional form of demand relationships. In this case, however, a linear model was estimated. This is because essentially only two price observations were available, and it is impossible to estimate any curvature in a function without a range of observations of both the dependent and independent variables. The estimating equation adopted was, therefore, of the form: $Q = a + bP$, where Q is the quantity of sorghum beer sold per month and P is the price of the sorghum beer. Prices of substitutes were not used as explanatory variables. For home brewed sorghum beer, prices were not available; and for clear beer, prices were almost perfectly collinear with sorghum beer prices and so had to be omitted as well. Although income also influences demand, no data were available on aggregate incomes over the two year period under investigation. This is not a serious problem, as income levels between February of 1980 and February of 1982 are not likely to have risen appreciably.

Identification is not a problem in estimating this demand relationship. The variables other than price that influence demand

- income and the prices of substitutes - are likely to have remained stable over the period under consideration.[1] While the demand curve was likely stable over the two-year estimating period, the supply curve was not. The large exogenous increase in excise tax levels resulted in a large jump in the price at which each quantity of sorghum beer could be supplied. Newspaper accounts during this period indicate the supply of beer was elastic during this period as output was cut back to match the lower level of demand following the large price rise (see, for example, the Bulawayo Chronicle February 7, 1981 and the Salisbury Herald February 9, 1981). Thus, the exogenous tax increase shifted up the supply curve, tracing out the demand curve in classic fashion.

In estimating the linear sorghum beer demand equation, regressions were run on total sorghum beer sales; and separate equations were also run for packaged and unpackaged sorghum beer individually. The results of these estimating equations are as follows:

[1]The one exception of clear beer prices has been mentioned above. Because clear beer and sorghum beer are not close substitutes in the short run, the omission of clear beer prices should not result in any significant bias.

1. Total of all factory made sorghum beer

   b = -.26 (.05) standard error

   R^2 = .70

   F statistic significant at .001 level

   price elasticity of demand computed at midpoint = -.40

2. Unpackaged factory made sorghum beer

   b = -.26 (.06) standard error

   R^2 = .70

   F statistic significant at .001 level

   price elasticity of demand computed at midpoint = -.41

3. Packaged factory made sorghum beer

   b = -.03 (.13) standard error

   R^2 = .005

   F statistic not significant

   price elasticity of demand computed at midpoint = -.04

Several observations can be made from these data. First of all, the overall price elasticity of demand for factory-brewed sorghum beer appears to be low, that is below 1 in absolute value. This is to be expected for sorghum beer over all, that is for factory-brewed plus home-brewed beer. However, this is not to be expected if home-brewed and factory-brewed beer are perfect

substitutes. If they were perfect substitutes, and if both were readily available to consumers, an infinitesimal rise in the price of factory-made beer would cause all consumers to switch to home brewed beeer causing the price elasticity of demand for factory beer to be infinite rather than low as computed from the Bulawayo data. The low elasticity of demand for factory- made sorghum beer is likely due to legal restrictions outlawing home-brewed beer and to the physical separation of the sale of home- and factory-made beer, making it difficult to address the critical issues of cross-price elasticities and the degree of substitutability between home- and factory- brewed sorghum beer. The most that can be said is that in situations of legal restriction of home brewing and physical separation of home- and factory- brewed beer which impede substitution, the price elasticity of demand for factory-brewed sorghum beer is likely below 1. While this conclusion is of little use in Botswana, it may be of interest in other African countries such as South Africa.

A second observation concerns the likelihood of lower price responsiveness of packaged as opposed to unpackaged sorghum beer. The Bulawayo data provide support for the proposition that the demand for packaged factory beer is less price sensitive than is the demand for bulk beer. One cannot reject the hypothesis that unpackaged beer is more price sensitive than packaged sorghum beer. While our initial two hypotheses - of low overall price elasticity

and of lower responsiveness of packaged factory made beer - are supported by the Bulawayo data, the evidence is by no means compelling.

The issue of price responsiveness, particularly cross-price elasticities, is an area of obvious importance for any future research on sorghum beer. While studies of sorghum beer consumption have been undertaken by the Sorghum Beer Institute in Pretoria, these studies were performed under contract with various municipal brewers, and the reports are confidential. To this author's knowledge, studies from other countries on the demand for sorghum beer are unavailable save for those cited in this section. For clear beer in the United States, studies are available indicating that the price elasticity of demand for clear beer is about .9 (Hogarty and Elzinga, p.197); however caution must be exercised in extending this result to sorghum beer in Africa. Further work on price elasticities and on cross-price elasticities of demand for sorghum beer will be very important both as an input to government taxation policies, which are currently undertaken without the benefit of solid economic data, as well as for use in making more precise projections of future trends in the sorghum beer business.

5. Future Trends

Future trends in demand are best predicted by reference to the evolution that has taken place in surrounding countries of South

Africa and Zimbabwe. These two countries have an ethnic composition similar to that of Botswana, but both have achieved a much higher level of urbanization and per capita income. Future trends in the sorghum beer business have to a large degree been discussed in Section A of this chapter. To recap, the probable trends in Botswana are an increasing share of factory brewed sorghum beer, and over the long run, a rising share of clear beer in overall liquor purchases. These trends, however, are strongly influenced by public policy on taxation and licensing of both production and distribution. As will be emphasized in future chapters, public policy can play a large role in affecting future trends in the sorghum beer subsector.

CHAPTER 6

FIRM-LEVEL FINANCES AND THE CONDUCT OF SUBSECTOR MEMBERS

This chapter analyzes, from the perspective of the individual firm, the financial returns earned in brewing and retailing of sorghum beer. Financial returns provide valuable insights into current motivations of subsector members, and they also provide important indications of the likely future evolution of the subsector. Discussion of finances, conduct and subsector evolution are, therefore, entertwined in this chapter.

Section A begins by reviewing financial budgets for the production of both home- and factory-brewed sorghum beer, while Section B is devoted to retailing. Since the most important, most influential interventions made by subsector members take place at the retail level, it is in Section B that the conduct of subsector members is most heavily stressed.

A. PRODUCTION

Financial budgets are built from the technical input coefficients for each type of production. The necessary coefficients are presented in Table 6.1 for all three types of sorghum beer production - home brewing with home-made malt, home brewing with trade malt and factory brewing.

In addition to providing the raw material from which budgets will be constructed, Table 6.1 highlights in quantative terms what has been stressed verbally before, that the quality of malt is critical in the production of sorghum beer. The magnitude of the quality differences in the three types of malt is dramatically evident from the average input coefficients displayed in Table 6.1. These coefficients indicate that users of home-made malt typically use twice as much malt as do home brewers using trade malt; and compared with factory brewers, users of home-made malt use six times as much malt and two-thirds again as much total starch (grain plus malt). Factory brewers and home brewers using trade malt use about the same amount of total starch (grain plus malt), but the ratio of malt to grain is much lower in factory brewing. The very high diastatic power of municipal malt allows factory brewers use only about one-third as much malt as is used by home brewers with trade malt. Malt quality is, thus, the key to economy of input use in

Table 6.1

TECHNICAL COEFFICIENTS* FOR SORGHUM BEER PRODUCTION, BOTSWANA 1982
(average quantity of inputs per 100 liters of beer)

Input	Home Brewing With Home-made Malt	Home Brewing With Trade Malt	Factory Brewing
Malt	18 kg.	8.8 kg.	3 kg.
(s.d.)**	(4.3)	(3.3)	(0)
Grain	7 kg.	6.9 kg.	12 kg.
(s.d.)	(1.4)	(2.4)	(0)
Labor	7.5 hours prodn. 4 hours retail.	5.5 hours prodn. 4 hours retail.	.9 hours
Depreciation	.15 pula	.15 pula	.74 pula

* These coefficients are averages of individual brewer recipes weighted by annual volume of beer sold.

** s.d. is the standard deviation from the mean.

Source: Survey interviews with 107 home brewers, with Botswana Breweries' personnel and consultation of Botswana Breweries' published accounts.

brewing.

1. Home Brewing Finances

The financial budgets for home brewing are obtained by weighting the technical coefficients in Table 6.1 with market prices. A detailed, item-by-item breakdown of cost and revenue is provided in Appendix B, Table B.1. Table 6.2 summarizes the main components of the budgets, and Table 6.3 displays standard financial indicators of profitability such as returns to labor and returns to capital.

The prices used in constructing these financial budgets are the average market prices prevailing in Mahalapye during the 1981/82 cropping year. Mahalapye is a major village, centrally located along the eastern corridor that houses 80% of Botswana's population. Prices prevailing there represent a good composite of grain prices prevailing throughout Botswana. Since the budgets constructed here are annual budgets constructed from single interviews, use of the average price prevailing throughout the year is taken as a best approximation of the result that would have been obtained by using nominal prices with flow information over the course of the year.

It should be pointed out that the market price of home brewing labor is zero. For that reason, the following financial budgets do not include home brewing labor as a cost. Financial "profit", therefore, includes returns to both capital and labor. The economic budgets in Chapter 7 will, of course, include a shadow wage

rate in computing economic returns.

The standard budgets for each of the home brewing methods are provided in Table 6.2. Not surprisingly, they show that home brewing with trade malt is more profitable per unit of ouput than brewing with home-made malt. Even though the price of trade malt is higher than that of home-made malt, the large economies of input use achieved with trade malt more than compensate for its higher price. The profit per 100 liters is 5% higher for brewers who use trade malt than it for those using home-made malt.

The financial ratios displayed in Table 6.3 provide further evidence on the profitability of home brewing. From these ratios it can be seen that home brewing is financially a viable proposition. Profit per labor hour exceeds the minimum wage rate of P .36 per hour. It is also true that, by any measure, home brewing with trade malt is more profitable than brewing with home-made malt. The largest difference lies in the profits per labor hour which are about 25% higher among home brewers who use trade malt than they are among those brewing with home-made malt.

The implication of these financial returns is that more and more home brewers will be switching to the use of trade malt. In fact, in urban areas, brewers really have no choice. Urban brewers must use trade malt if they wish to brew, because sorghum gain (from which the malt is made) is not normally available in urban shop. Even if it were, there are no urban hammermills available to grind

Table 6.2

STANDARD FINANCIAL BUDGETS FOR THE PRODUCTION AND RETAILING OF HOME-BREWED SORGHUM BEER IN BOTSWANA, 1982
(in pula per hundred liters)

	Home Brewing With Home-made malt	Home Brewing With Trade Malt
1. REVENUE		
a. sorghum beer	9.75	9.75
b. byproducts	1.01	.87
Total	10.76	10.55
2. EXPENSES		
a. raw materials	5.79	5.32
b. production labor*	0	0
c. retailing labor*	0	0
d. depreciation	.15	.15
Total	5.94	5.47
3. TOTAL "PROFIT"* PER 100 LITERS	4.82	5.08

* Note that production and retailing labor receive no wage. Thus, the "profit" includes returns to labor as well as capital. In the course of Chapter 7, a shadow wage will be imputed in computing economic budgets.

Source: Appendix B, Table B.1.

Table 6.3

FINANCIAL RETURNS IN HOME BREWING OF SORGHUM BEER, BOTSWANA 1982

	Users of Home-made Malt	Users of Trade Malt	Aggregate*
1. Average volume per yer, in liters	4,350	4,350	4,350
2. Value of annual sales	P 424	P 424	P 424
3. Net annual profit	P 210	P 221	P 213
4. Capital requirements (fixed plus working)	P 96	P 96	P 96
5. Profit as a percent of capital**	219%	230%	222%
6. Income as a percent of sales	50%	53%	50%
7. Profit per labor** hour	P .42	P .54	P .45

* Aggregate returns are computed by weighting the home- and trade malt brews by their relative market shares. In 1981, 70% of all home-made sorghum beer in Botswana was made with home-made malt, while 30% was made with trade malt.

** Because the market wage is zero, "profit" includes a return to both capital and labor.

Source: Budgets from Tables 6.1 and 6.2; annual volumes from survey data.

the sorghum once it is malted. Thus, virtually all urban brewers already use trade malt. It is the rural dwellers who will be increasingly shifting from home-made malt to trade malt.

Availability is the major factor currently limiting more widespread use of trade malt. There has been a shortage of trade malt in Botswana since February 1982 when the Ministry of Agriculture banned the importation of trade malt in order to promote local malt production. Although they are expanding rapidly, local maltsters have not been able to fully satisfy the local market, and it is likely that other malting businesses will be set up in the near future. Currently, about 30% of all home-brewed sorghum beer is made with trade malt, and that percentage will likely increase substantially over the next five years as the supply of trade malt increases.

2. Financial Returns in Factory Brewing

Standard financial budgets for factory brewing are provided in Table 6.4. A more detailed, item-by-item breakdown is available in Appendix B, Table B.2. Two observations can be made from Table 6.4. The first is that factory brewing is much more costly than home brewing. It is true that, because factory brewers use high-diastatic malt and buy inputs at wholesale prices, material costs are lower in factory brewing than they are in home brewing. This cost advantage, however, is more than offset by high overheads,

Table 6.4

STANDARD FINANCIAL BUDGETS FOR FACTORY-BREWED SORGHUM BEER, BOTSWANA 1982
(in pula per 100 liters)

	Bulk Beer	Packaged Beer	Aggregate*
1. REVENUE	P 12	P 17	P 16
2. EXPENSES			
a. raw materials	4.33	4.33	4.33
b. production labor	.09	.09	.09
c. depreciation & overheads	1.49	1.49	1.49
d. packaging costs	0	4.26	3.41
e. distribution costs	1.35	1.35	1.35
Total	7.28	11.52	10.67
3. BEFORE-TAX PROFIT PER 100 LITERS	P 4.72	P 5.48	P 5.33
4. TAXES			
a. beer levy	1.00	1.00	1.00
b. corporate tax (at annual output of 27,000,000 liters)			1.52
			2.52
5. AFTER-TAX PROFIT PER 100 LITERS			P 2.81
(share due to foreign corporate owners)			(1.12)

* The aggregate factory brewing budget is computed for production of 80% packaged beer and 20% bulk beer.

Source: Appendix B, Table B.2 and Botswana Breweries' published accounts.

distribution and packaging costs. For packaged sorghum beer, the cost of packaging alone exceeds the cost of all the other raw materials combined. Under the current factory brewing product mix (80% packaged beer and 20% bulk), factory-brewed sorghum beer costs 84% more to produce than does home-brewed sorghum beer.

The second point illustrated by Table 6.4 is that the profit margin on packaged beer is higher than that earned on bulk beer. In other words, even though packaged beer costs substantially more to produce than does bulk beer, no attempt is made to minimize the cost differential between bulk and packaged beer. The reason for this has to do with marketing strategy and a desire to promote the premium image of the modern-looking, attractively packaged cartons of sorghum beer.

Rates of return in factory brewing are displayed in Table 6.5. The overwhelming conclusion from the financial statistics is that factory brewing is an extremely profitable business. The rate of return on assets is over 50%. Botswana Breweries, thus, has a tremendous financial incentive to expand production, and this they are trying to do. In recent years, they have greatly enlarged the capacity of their two existing breweries, and they are currently planning to build breweries at new locations.

A final important observation to be made from Table 6.5 is that a substantial proportion, in fact 40%, of Botswana Breweries' profits accrue to foreign corporate shareholders. Up until late

Table 6.5

FINANCIAL RETURNS IN THE PRODUCTION OF FACTORY-BREWED SORGHUM BEER, BOTSWANA 1981

	Aggregate Factory Brewing (80% packaged, 20% bulk)
1. Average volume per year	27,500,000 liters
2. Value of sales	P 4.4 million
3. Gross profit (minus beer levy & corporate tax)	P 1.47 million - .69
4. Net profit (portion due to foreign owners)	P .77 million (.31)
5. Capital requirements (fixed plus working)	1.43 million
6. Return on assets	54%
7. Profit as a percent of sales	11%

Source: Table 6.2, Appendix B, Table B.2 and Botswana Breweries published accounts.

1979, Botswana Breweries was 100% owned by foreign interests. This partial foreign ownership is highlighted here, since it has a bearing on the domestic income generation that will be discussed in more detail in Chapter 7, Section A.

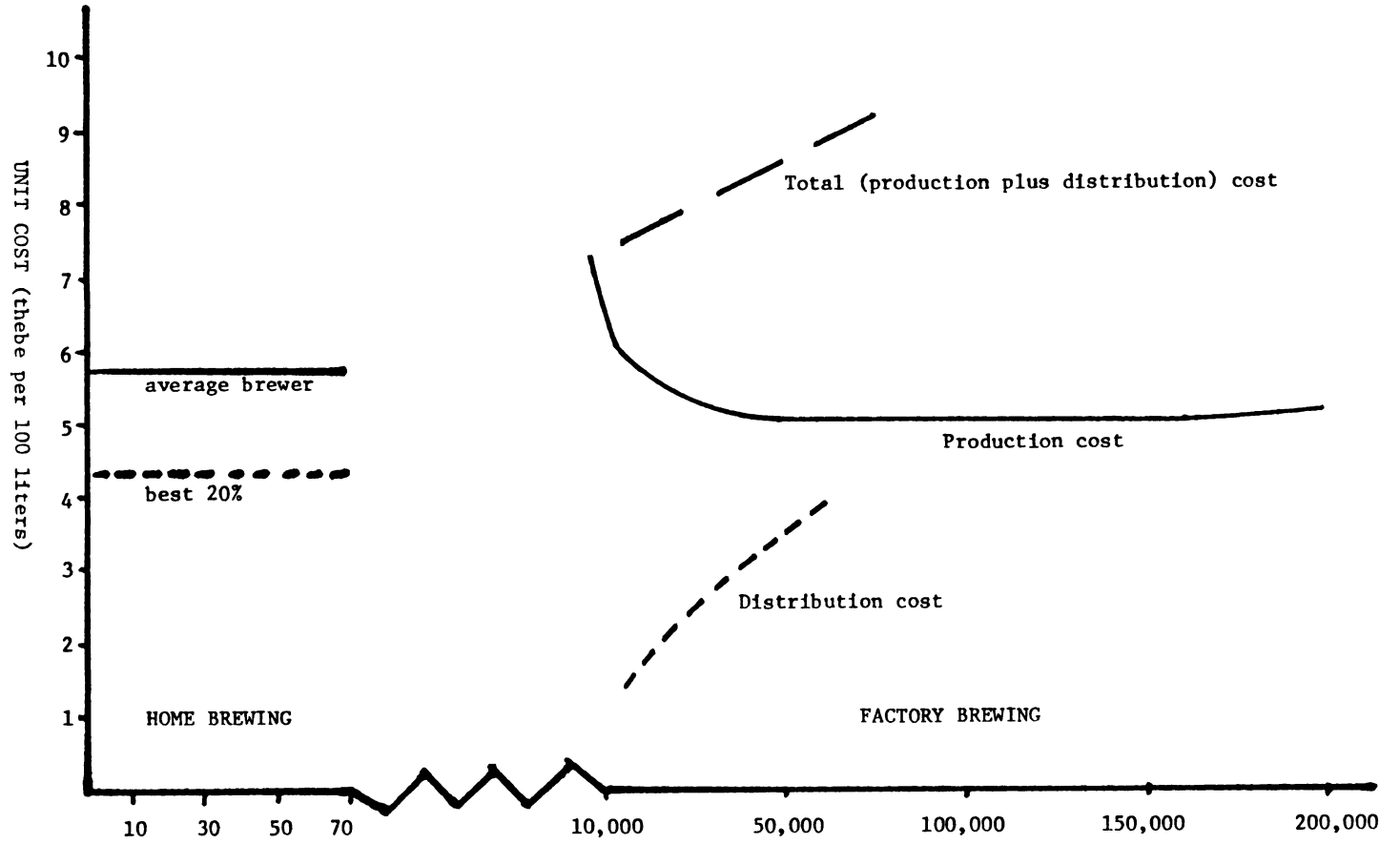
3. Economies of Scale

Economies of scale is a final aspect of the finances of production and one that can have a strong bearing on brewers' choices of plant location and scale of operation. The nature of scale economies in sorghum beer production is displayed in Figure 6.a. The cost curves in this figure were constructed from minimum average cost data for home and factory brewers. For home brewers, the field survey data from this study were used. The average cost for home brewers is 5.8 thebe per liter as is shown in Figure 6.a. (calculated as a weighted average of the cost figures in Table 6.2). Many regular brewers, however, achieve a far lower cost - around 4.4 thebe per liter.

The cost curves for factory brewing were obtained from two sources. The costs in Botswana Breweries' two 15-million-liter-per-year breweries were computed from Appendix B, Table B.2. The remainder of the factory brewing cost curve was built from a study of scale economies undertaken by the Sorghum Beer Unit in Pretoria (Van Wyk, deVilliers and Jordaan, 1974). The authors of this study directly measured the average costs of production for varying sizes

FIGURE 6.a

ECONOMIES OF SCALE IN THE PRODUCTION OF UNPACKAGED SORGHUM BEER, BOTSWANA 1982



(Source: Van Wyk, deVilliers & Jordaan; survey interviews)

of South African sorghum beer breweries.

In order to display the costs of home brewing and factory brewing on the same diagram, it has been necessary to make the horizontal scale discontinuous between the maximum home brewing output of 70,000 liters per year and the smallest factory output of about 10 million liters per year. It appeared from the survey work that 70,000 liters per year is, in fact, the maximum a home-brewing enterprise can produce. During the field interviewing, the largest annual volume of home brew being sold by a single household was produced by a woman in Gaborone, the capital city. This woman brewed 200 liters of sorghum beer every day. This is the equivalent of about 70,000 liters per year. Because brewing is normally a three-day processs, in order to produce at such a rate three separate brews had to be under production at any one time, each at a different stage of preparation. This is likely the physical maximum output that one home brewer is able to produce.

Home brewing, it can be seen from Figure 6.a, is characterized by constant returns to scale. Returns to scale are constant because increasing output up to the physical maximum of 70,000 liters per year merely involves more frequent replication of identical procedures with the same equipment, labor and inputs. Under such conditions, unit costs remain constant. Economies of scale, therefore, do not influence brewing technology or plant size for Botswana's home brewers.

The transition from home brewing to factory brewing represents a tremendous jump in scale, well over a 100-fold increase in annual production levels. This jump in plant size from home to factory brewing is characterized by decreasing returns to scale as represented by the jump in costs between the maximum home brewing output and the smallest factory brewery. The higher costs involved in the transition to factory production are due to indivisibilities of factory-required inputs and due also to the fact that factories incur overhead costs not required by home brewers. Some of the lumpy inputs required for factory production are fermentation tanks, cooling towers and boliers which come only in certain minimum sizes. In addition, a technically qualified (and indivisible) brewer is required to run a factory brewing operation. Over and above the costs resulting from indivisible inputs, factories incur overhead expenses for items such as land and buildings, financial expenses that are not incurred by home brewers. As shown in Table 6.4, these overhead costs raise the production costs by 1.5 thebe per liter at an output level of 15 million liters per year. For all these reasons, the smallest factory breweries have production costs substantially above those of the home brewers.

Factory brewing, when considered separately from home brewing, is initially characterized by rapidly increasing returns to scale. The higher costs in the small plant sizes are due to indivisibilities in fixed costs, particularly in process control

equipment, buildings and technical personnel. It should be noted that the input indivisibilities increase costs quickly at output levels of less than 15 million liters per year, which is likely the reason that surviving plants are seldom found at scales below that level.

In factory brewing, once a minimum production level of 50 million liters per year is reached, returns to scale are very close to constant. The reason for essentially constant returns over a wide range of plant sizes (from 50 million to 170 million liters per year) is that factory brewing is standardized on certain batch sizes, 15,000 liter batches in Botswana and 10,000 liter batches in South Africa. Increases in production simply involve a duplication of identical processes (Van Wyk, deVilliers & Jordaan, p.20). The slight rise in costs beyond the 180 million liter per year output level is due to internal inefficiencies in management, raw material handling and the tendency of management to purchase fancy equipment that is not fully justified on economic grounds (Van Wyk, deVilliers & Jordaan, p.27).

The nature of scale economies in sorghum beer brewing is generally similar to what has been found regarding economies of scale in the production of clear beer in the United States. Elzinga (1977, p.234) indicates that U.S. production of clear beer exhibits initial rapidly declining costs as brewery size increases followed by a lengthy range of relatively constant costs. Although the shape

of clear beer and sorghum beer cost curves is essentially the same, their scales are quite different. While sorghum beer production achieves its minimum optimal plant scale at 30 million liters per year, clear beer breweries in the U.S. do not achieve minimum optimal scale until an output level of 175 million liters (Elzinga, p.234), an output level six times as large as in sorghum beer production. Although he does not provide exact cost curves, Deacon (1980, p.261) indicates that clear beer breweries in South Africa also produce at individual plant output levels substantially higher than the local sorghum beer breweries. All this indicates that the minimum optimal scale is lower for sorghum beer production than it is for the brewing of clear beer.

For practical purposes, the most important conclusion about scale economies in sorghum beer production is that distribution costs - and not economies of scale in production - greatly dominate consideration of what size factory breweries to erect and in what locations. The predominance of distribution costs in determining optimal plant sizes and locations is clearly demonstrated in Figure 6.a. The distribution costs in that figure are those that would be incurred by increasing output at Botswana's existing breweries, and they have been estimated on the basis of known population densities and transport costs per kilometer. As Figure 6.a makes clear, increases in plant size, above the existing capacity of 15 million liters per year per factory, lead to increased total (production

plus distribution) costs. This is because, in order to expand output and sell it, it is necessary to distribute the additional output to increasingly remote areas. Due to the very dispersed nature of Botswana's population, these distribution costs increase very rapidly, and the additional distribution costs quickly swamp any gains derived from economies of scale in production. It is, therefore, not economies of scale but rather distribution costs that are dominant in determining optimal plant sizes and locations of factory breweries.

B. THE ECONOMICS OF RETAILING

1. The Political Economy of Retailing

Familiarity with the political economy of retailing is essential for understanding the financial flows within the retail segment of the sorghum beer subsector. The conduct of specal interest groups has profoundly influenced the economics of retailing sorghum beer in Botswana.

Of particular importance is the retailing income from factory-brewed sorghum beer. The flow of factory-brewed sorghum beer through the various types of retailing channels has been severely skewed by the application of political power, economic influence and the misinterpretation of legal statutes. Over the past 15 years, the share of factory-brewed beer in the total sorghum beer market has been increasing rapidly. The steadily increasing retail income from factory-brewed sorghum beer has been garnered, however, not by home brewers, but instead by the traders who generally control the licensed retailing of factory-brewed sorghum beer. Today, licensed retailers sell 70% of the factory-brewed sorghum beer consumed in Botswana, while shebeen queens retail the remaining 30%. This situation is a direct result of the exclusionary practices of the licensed retailers. It is also caused, in part, by a misunderstanding of the retailing legislation, particularly the

licensing exemption granted to home retailers of factory-brewed sorghum beer.

The exemption of shebeen queens from retail license requirements is likely the result of the common view that home retailing of factory-brewed sorghum beer is a natural progression from home brewing. There is a tradition of non-regulation of home brewing by the central government, and this laissez-faire stance carried over to views on home retailing of factory-brewed sorghum beer.

The link between home brewing and the home retailing of factory-brewed sorghum beer is strong in the minds of many people. It was (and still is) widely felt in Botswana that the introduction of factory-brewed sorghum beer would decrease the demand for home brew; and unless home brewers could retail factory-brewed sorghum beer, their incomes would decline. This fear was expressed, for example, by a prominent Francistown politician in the late 1960's, during the early years of the introduction of Chibuku in Botswana. He stated in a public speech that, "The failure of parents to pay school fees for children was created by the sale of Chibuku which has now made traditional (sorghum) beer a thing of the past from which parents used to get money to educate their children." (Botswana Daily News, January 14, 1969).

Home brewers themselves also feared the repercussions of a declining market from home brew in the face of competition from

factory-brewed sorghum beer. When Chibuku was first introduced, home brewers resisted its introduction in a number of districts. For example, reports from the villages of Mapoka and Moroka in North East District indicate that home brewers destroyed crates of Chibuku as the first distributors attempted to unload factory-brewed Chibuku in those villages. Subsequent deliveries were reportedly accompanied by strong-armed employees who physically assured the off loading of Chibuku and upended drums of home-brewed sorghum beer as well (personnel communication, Brian Egner, former District Officer, North East District).

These confrontations occurred in late 1968 and in 1969, and the sorghum beer retailing law, the Traditional Beer Model Retailing Bye-Laws, was promulgated in early 1970. Very likely these early confrontations motivated the framers of the new licensing law to extend to home brewers the privilege of retailing factory-brewed sorghum beer without a retailing license, the objective being that any income lost through decreased home brewing income could be recouped by retailing of factory-brewed sorghum beer.

In addition to reviewing the current legal situation and its origins, it is important to highlight Botswana Breweries' position on retailing - Botswana Breweries has consciously refrained from the retailing of sorghum beer. Company officials indicate this is because they wish the retailing to be in the hands of local citizenry. This is a standard practice factory brewers have adopted

in other countries (with the exception of South Africa) as part of a general effort to distribute the profits from factory brewing to individuals and institutions of influence. As part of these efforts to distribute the profits from factory-brewed sorghum beer throughout the corridors of power, Botswana Breweries has repeatedly tried, and finally succeeded, in inducing the Botswana Developent Corporation, a government parastatal, to become their partner and thereby share in the profits derived from producing Chibuku. In addition, the traditional (sorghum) beer levy - paid by Botswana Breweies to the district councils - has the effect of aligning the financial interest of the councils with the commercial success of factory-brewed sorghum beer. Similarly, by insisting that factory-brewed sorghum beer be retailed by citizens rather than by themselves, the factory brewers have promoted the growth, throughout the country, of an influential lobby of distributors who have a financial interest in promoting increased sales of Chibuku. Since Botswana Breweries has purposely stayed out of the retailing business, the dynamics of retailing revolves around the interactions of the following cast of characters: the licensed retailers, the unlicensed home retailers and the district councils who are empowered to issue sorghum beer retail licenses.

The conduct of retail license holders has been the central force in shaping the current retail patterns. Numerous license holders, for example, have acted vigorously to prevent home

retailers from obtaining factory-brewed sorghum beer directly from the brewery delivery trucks at wholesale pricess. The licensed retailers have done so by impressing upon the brewery's delivery men the necessity of their delivering the factory brew to the licensed depots and not stopping to deliver it to unlicensed shebeens along the way. The retailers - some of them councillors - have also lobbied with district councils urging them to force shebeens to procure factory brew only from licensed outlets and at retail prices. The license holders feel that, since they paid the licensing fee and built a retail facility to Health Department specifications, they are entitled to the monopoly on distributing factory-brewed sorghum beer in their area. Many holders of retail licenses frankly admit they have successfully used their inflence to prevent the delivery of sorghum beer to home brewers.

Holders of sorghum beer retail licenses are, in general, happy to have home retailers sell as much factory-brewed beer as they want - provided the shebeen queens purchase it from licensed bars at retail prices. Legally, of course, this is an untenable position. Shebeen queens are allowed to buy factory brewed sorghum beer at wholesale prices and then retail it without paying a license fee. Sorghum beer license holders, though, often choose to ignore this provision in the law, and it is in their financial interest to do so.

The successs of license holders in controlling the retailing of

factory-brewed sorghum beer has varied throughout the country. South East District presents the most extreme example of the success of license holders in excluding shebeens from the retailing of factory-brewed sorghum beer. In South East District in 1982, four out of a total of eight sorghum beer retail license were held by councillors. It is not likely a coincidence that the South East District Council also flagrantly misinterprets the retailing law; they instruct their licensing officers to absolutely forbid the retailing of factory-brewed sorghum beer by home retailers (information from interview with South East District Council staff). In June of 1980, a complete enumeration of Tlokweng, the largest village in South East District, confirmed that no households were retailing factory-brewed sorghum beer (South East District Rural Industrial Officer survey).

While the case of South East District represents an extreme, in other locations as well strong attempts have been made to prevent home retailers from obtaining factory-brewed sorghum beer except at retail prices. In Central District, for example, during 1981 the Council Bye-Law Enforcement Officer threatened to take action against shebeen queens who were retailing factory-brewed sorghum beer except in cases where the beer had been procured from a licensed outlet. This author, then a staff member of the Ministry of Commerce and Industry, initiated intervention to apprise the Council of its misinterpretation of the law and to prevent them from

further misenforcement of the law. As a result, the threats against home retailers were stopped, although periodic reminders were subsequently necessary.

The varying success with which the licensed outlets control the retailing of factory-brewed sorghum beer is illustrated in Table 6.6. This table quantifies the flow of factory-brewed sorghum beer through licensed and unlicensed retailing channels in the five localities surveyed. From these data, and from discussions with other retailers throughout Botswana, estimates have been made of the country-wide volume of factory-brewed sorghum beer retailed through each of the retailing channels. From this projection, which is displayed in Table 6.6, it can be seen that licensed retail outlets sold 70% of all factory-brewed sorghum beer in 1981, while the remaining 30% was retailed in shebeens. It is because of the intervention of licensed retailers, often influential local businesspersons, that the bulk of factory-brewed sorghum beer is currently retailed through licensed outlets and not through shebeens.

2. Retailing Budgets

The distribution of retailing flows through different categories of retail outlets must be combined with basic retailing budgets in order to provide a basis for complete estimation of overall retailing income and its distribution. Table 6.7 provides the

Table 6.6

DISTRIBUTION OF
RETAILING OF FACTORY-BREWED SORGHUM BEER IN BOTSWANA, 1981

(thousands of liters)

Retailer	Gaborone		Molepolole		Ranaka		Serule		Estimate for All of Botswana	
Licensed outlets	1,602	(38%)	347	(95%)	10	(100%)	68	(81%)	19,980	(70%)
Shebeens, beer obtained directly from factory	1,736	(41%)	18	(5%)	0		0		4,800	(17%)
Shebeens, beer obtained from licensed retailers	41	(1%)	0		0		16	(19%)	2,595	(9%)
Shebeens, beer obtained from distributors & other shebeens	844	(20%)	0		0		0		1,350	(4%)
Total	4,224	(100%)	365	(100%)	10	(100%)	84	(100%)	28,725	(100%)

Source: survey interviews with 57 home retailers and 15 licensed retailers.

necessary retailing budgets for the sale of home-brewed sorghum beer, the home retailing of factory-brewed sorghum beer and the retailing of factory-brewed sorghum beer through licensed outlets.

Two main conclusions arise from Table 6.7. The first conclusion is that licensed retailing of factory-brewed sorghum beer is immensely profitable. Average annual income is about P5,000 which is substantial in a country where average per capita income is $800. In addition to being extremely lucrative, retailing of sorghum beer is one of the easiest imaginable businesses to operate. Only one item needs to be stocked, and turnover is extremely rapid, less than three days. Cash flow and inventory control problems, therefore, normally never arise. Further, unsophisticated laborers can easily operate a sorghum beer retail outlet with only limited managerial supervision.

Easy to manage and tremendously profitable, licensed sorghum beer retail outlets are increasingly popular as investments by relatively wealthy investors. In the village of Serowe, for example, there were no licensed sorghum beer outlets in 1980; but by May of 1982, there were five. Similarly in Kweneng District, 13 sorghum beer retailing licenses were held in 1980; but by May of 1982, 25 had been issued (information from interviews with the Kweneng and Central District Licensing Officers). The lucrative nature of licensed retailing explains much of the traders' eagerness to enter into this business. It also explains their interest in

Table 6.7

COMPARATIVE SORGHUM BEER RETAILING BUDGETS, BOTSWANA 1982
(financial profits computed at market prices)

	Home Retailing		Licensed Retailing of
	Home-brewed Sorgh. beer	Factory-brewed Sorgh. beer	Factory-brewed Sorghum Beer
1. Average volume sold per year	4,350 ltrs.	3,650 ltrs.	133,000 ltrs.
2. Average annual sales	P 424	P 967	P 30,324
3. Profit per liter	4.7 thebe	6 thebe	3.7 thebe
4. Annual profit	P 210	P 219	P 4,975
5. Capital requirements			
- fixed	P 90	0	P 2,600
- working	6	19	470**
Total	96	19	3,070
6. Profit as a percent of:			
-total capital	19%	1,153%	162%
-working capital	3,400%	1,153%	n.a.
7. Profit per labor hour			
-unskilled***	P .45/hour	P1.50/hour	P1.51/hour
-management	infinite	infinite	P 24/hour
8. Profit as a percent of sales	50%	23%	16%

* These financial budgets are representative averages for each category. Column 1 is a composite budget reflecting the fact that, on average, 70% of home brew is made with home-made malt, while 30% is made with trade malt. Column 3 reflects the fact that 80% of all factory brew sold is in cartons, while 20% is sold in bulk.

** This represents one weeks working capital.

*** For home brewers, this includes total production labor plus retailing time.

Sources: Column 1 - Table 6.3; Column 2 - interviews with 57 home retailers; Column 3 - Appendix B, Table B.3.

preserving that income by trying to maintain as much of the sorghum beer retailing market as they can for themselves.

The second main conclusion from Table 6.7 revolves around the following question: Which is financially more attractive to a shebeen queen, the retailing of factory-brewed or the retailing of home-brewed sorghum beer? The answer is not straightforward. It depends, in part, on the configuration of the local market for sorghum beer and also on certain household-specific characteristics. It depends on whether capital or labor is the binding constraint to increasing household income, and it depends further on whether a particular household already has accesss to the equipment necessary for home brewing.

The configuration of the local market is probably the most important factor in determining which is more attractive to retail. Since the income elasticity of demand for factory-brewed sorghum beer is positive up to income levels of about P5,000 per year, the relative proportion of factory brew in total local sorghum beer sales will depend, in large part, on the local income distribution. The demand for factory-brewed sorghum beer is highest in high-income localities and where wage employment is readily available. This is generally the case in urban areas. In less affluent areas, the demand for factory-brewed sorghum beer may be so small that the retailing of home brew is more attractive regardless of the rates of return on capital or labor, since these average rates will generate

only small absolute amounts of income when applied to small sales volumes.

Nevertheless, in a number of localities, there exists a substantial demand for both types of sorghum beer; and in these areas, some shebeen queens sell home-brewed sorghum beer, some sell factory brew and some sell both. Barring considerations of differential access, the household retailing decisions will be made as follows.

Consider first the conditions under which the retailing of factory-brewed sorghum beer is more attractive to a given household than is the retailing of home-brewed beer. A quick glance at Table 6.7 indicates that the retailing of factory-brewed sorghum beer generates substantially higher profits per labor hour than does the retailing of home-brewed sorghum beer. This is because the shebeen queen spends no time in the production of factory-brewed beer, while home brew requires substantial production labor. Thus, for a household in which maximum profit per labor hour represents the route to maximizing income, the retailing of factory-brewed sorghum beer is the more attractive home retailing option. In addition to higher profits per labor hour, the retailing of factory-brewed sorghum beer generates higher rate of profit per unit of capital than does the retailing of home brew. This is because the retailing of factory brew requires no fixed capital, only working capital. Thus, in cases in which capital is a household's

constraining resource, the retailing of factory brew will result in maximum household income - but only for households which do not already have access to the equipment necessary for home brewing.

Retailing of home-brewed sorghm beer is the more attractive option for households which already possess the equipment necessary for home brewing and which need to maximize the rate of profit on working capital to achieve maximum income. Home brewing is more attractive than the retailing of factory brew for these households because the rate of profit on working capital is double in home brewing what it is in the retailing of factory-brewed sorghum beer. There are a great many households in Botswana which fall into this category. They are particularly predominant in rural areas.

A generalization that can be made from all this is that the retailing of factory-brewed sorghum beer is generally more attractive to households in urban areas, and the retailing of home-brewed sorghum beer is likely to be attractive to a larger proportion of households in rural areas. This is true, for one reason, because the demand for factory brew is most concentrated in urban areas where incomes are higher on average than they are in rural areas. It is also in urban areas that many households do not have the equipment necessary for home brewing and where the opportunity cost of labor is relatively high. Conversely, the retailing of home-brewed beer is likely to be more attractive to households in areas where the aggregate demand for home brew is

great, where many women have a low opportunity cost of labor and where many households already have the equipment necessary for home brewing. This is a set of conditions that is more likely to prevail in rural than in urban areas; and a rule of thumb is, therefore, that home brewing is attractive to a larger proportion of households in rural than in urban areas.

3. The Conduct of Home Brewers in the Face of Increasing Availability of Factory-Brewed Sorghum Beer

Financial incentives have governed the reaction of home brewers to the introduction of factory-brewed sorghum beer. Initially, fearing they would be displaced, many home brewers voiced strong opposition to the introduction of factory-brewed sorghum beer in their villages. Individual brewers, however, soon discovered there was a demand for factory-brewed sorghum beer and that they could make money by retailing it.

Accomodation, therefore, rather than opposition, has been the predominant response of home brewers and retailers to the introduction of factory-brewed sorghum beer. This has been largely due to the fact that factory-brewed sorghum beer has been introduced very gradually in most areas of Botswana, and individual brewers have not felt the immediate impact of a competitive squeeze. It is also the case that factory-brewed sorghum beer is attractive because it is less work than is home brewing. Finally, in urban areas home brewing is rendered difficult due to an absence of mills and an

increasing scarcity of firewood, so retailing of factory-brewed sorghum beer is particularly attractive to urban households. All of these factors have combined to make home brewers and retailers generally accomodating to the introduction of factory-brewed sorghum beer.

The gradual accomodation of factory-brewed beer by home brewers and retailers is best illustrated by the sequence depicted in Table 6.8. This table gives an indication of the changes that take place in home brewing and retailing as factory-brewed sorghum beer becomes increasingly prevalent in a given town or village. Column (b) provides information on villages where virtually no factory-brewed sorghum beer is currently being sold by home retailers. Moving to the right, column (c) provides information for a village in which substantial amounts of factory-brewed sorghum beer have only become available in the last several years. The supply of factory-brewed sorghum beer is not yet sufficient to saturate demand in this village. Column (d) depicts the final stage in the evolution; it represents a fully mature market for factory-brewed sorghum beer. In this market, factory-brewed sorghum beer has been available for the past 15 years, almost as long as the town has been in existence. Chibuku is produced in this town, and the supply of factory brewed sorghum beer there fully saturates demand.

The initial reaction of home retailers to the availability of factory-brewed sorghum beer is found by comparing columns (b) and

Table 6.8

EVOLUTION OF PRODUCT MIX
SOLD BY BOTSWANA'S HOME RETAILERS OF SORGHUM BEER, 1982
(percent by volume of total home-retailed sorghum beer)

(a)* Product Mix of Households	(b)** Market With No Home Retailing of Factory Brew	(c) Market With Recent Intro. of factory brew	(d) Mature Factory Brew Market
HSB	99%	25%	33%
FSB	0	4	23
HSB+FSB	0	63	0
HSB+Mftr	1	0	0
FSB+Mftr	0	0	29
HSB+FSB+Mftr	0	8	15
Total home-retailed sorghum beer	100%	100%	100%

*HSB = Home-brewed sorghum beer
FSB = Factory-brewed sorghum beer
Mftr = Manufactured drinks, i.e. clear beer & spirits

**Column (b) = villages of Maun, Molepolole & Ranaka
Column (c) = village of Serule
Column (d) = town of Gaborone

Source: survey interviews.

(c) in Table 6.8. As can be seen, the first reaction of many home brewers upon the arrival of factory-brewed sorghum beer is to begin retailing it alongside their home-brewed beer. Sixty-three percent of the home beer brewers in the village depicted in column (c) have shifted to integrated retailing of home- and factory-brewed sorghum beer since the recent introduction of factory-brewed sorghum beer. A few home retailers have begun retailing exclusively factory-brewed sorghum beer, but they do so only in very small volumes. While these households account for only 4% of the volume of home-retailed sorghum beer, they account for 18% of the retailing households in that village. As one would suspect, these small, specialized retailers of factory-made sorghum beer are the newest entrants into the home retailing business. Thus, as new retailers enter the home liquor market, some now begin retailing factory-made beer right from the start.

The effect of moving from a transitional to a fully mature sorghum beer market can be seen by a comparison of columns (c) and (d) in Tables 6.8. One principal difference is the increasing importance of retailers specializing in factory-brewed sorghum beer only. This is undoubtedly due to the fact that consumption of factory-brewed sorghum beer is greater in the fully-saturated market than in the transitional one.

The second significant difference between columns (c) and (d) is the move, in the fully mature market, to an integration of

sorghum beer sales with more expensive, income-elastic drinks such as clear beer and spirits. It should be pointed out quickly that this difference, while very real, is not primarily due to the extra volume of factory-brewed sorghum beer available in Gaborone. The average income level in Gaborone is substantially higher than in Serule, and wage employment is much more prevalent. It is undoubtedly these higher incomes that increase the demand for more expensive drinks; and it is not surprising, therefore, to see the retailers catering to their customers and assisting them to "graduate" up to more prestigious alcoholic drinks such as clear beer. As cash incomes rise in other localities and as factory-brewed sorghum beer becomes increasingly available, the configuration of home retailers' product mix will very likely become more and more similar to that displayed in the fully mature sorghum beer market represented in column (d).

C. CONCLUSION

To summarize, the relationship among finances, conduct, subsector evolution and performance can be characterized as follows. All the key actors in the sorghum beer subsector - the factory brewers, the licensed retailers and the shebeen queens - have strong financial incentives to control as much of the sorghum beer market as they can for themselves. These efforts to control market shares lead to severe zero-sum conflicts, particularly between licensed retailers and shebeen queens. The shebeen queens respond to the increasing availability of factory-brewed sorghum beer by altering their product mix and attempting to retail as much of the factory-brewed sorghum beer as they can. However, the exclusionary practices of the licensed retailers have very effectively corralled the bulk of the factory brewing retail income for the trading community. It is difficult to see how the home retailers will attain a larger retailing share of factory-brewed sorghum beer without political intervention.

The sorghum beer market is currently in substantial disequilibrium, and the jockying for position that will take place over the next few years will be critically important in establishing the ultimate distribution of sorghum beer-related income. Overall income generation and the distribution of that income represent two key measures of performance that will be examined in greater detail in the following chapter.

CHAPTER 7

PERFORMANCE IN THE SORGHUM BEER SUBSECTOR

While the previous chapter viewed subsector performance from the vantage point of the individual firm, this one evaluates performance from an economy-wide perspective. In addition to using standard measures of economic performance, an effort has been made to evaluate performance along dimensions of particular concern to policy makers in Botswana.

Three facets of performance are treated in this chapter. Section A focuses on physical and financial measures of performance that are of particular concern to the Government of Botswana. A "choice of technique" comparison is made between home and factory brewing using as measures of performance the key government priorities of employment creation, income generation and income distribution. Section B continues the "choice of technique" comparison using standard economic measures of performance. These measures include returns to capital, returns to labor, economic cost of production and total economic profit.

Sections A and B concentrate on the relative performance of home versus factory brewing given current industry standards of efficiency. However, there currently exists a significant degree of inefficiency - particularly technical inefficiency - among home brewers. Section C, therefore, examines the potential for improving subsector performance by increasing economic efficiency within home brewing.

A. HOME VS. FACTORY BREWING: FINANCIAL AND PHYSICAL MEASURES OF PERFORMANCE

Botswana's current development plan emphasizes rapid increases in employment and incomes as two of its major objectives. A third important objective is the promotion of a more equitable income distribution (National Development Plan V, 1979-85, pp.61,62,64). The current income-related goals contrast with the objectives of the previous plan, which emphasized the building up of basic infrastructure. Given the government's new focus on employment, income creation and income distribution, it is of paramount importance that performance in the sorghum beer subsector be measured against these three closely-related objectives.

1. A Framework for Measuring Tradeoffs

The dominant dynamic feature of the sorghum beer subsector is the increasing market share held by factory-brewed sorghum beer. A key measure of subsector performance will, therefore, be a determination of the impact this is having on subsector employment and incomes. In order to make this assessment, one must first project the probable magnitude of shifts in market shares. Such a projection is provided in Table 7.1.

Table 7.1 - attempting to abstract from temporal changes in tastes and incomes - indicates what the market shares of home- and

Table 7.1

PROJECTED EVOLUTION
OF MARKET SHARES IN BOTSWANA'S SORGHUM BEER SUBSECTOR
(volume in millions of liters per year;
sales value in millions of pula per year)

	Stage 1 Home Brewing Only	Stage 2 Status Quo, 1981	Stage 3 Predominantly Factory brew	Stage 4 All Factory Brew
1. Volume				
a. home brew	120	74	40	0
b. factory brew	0	29	50	65
Total	120	103	90	65
2. Sales Value				
a. home brew	P11.7	7.2	3.9	0
b. factory brew	0	6.7	11.6	15.1
Total	P11.7	13.9	15.5	15.1

Source: Column 2 from Table 1.1. Projections to Stages 1, 3 & 4 made based on discussions with Botswana Breweries personnel and with sorghum beer retailers. Three assumptions are made in making these projections: 1) that home brewing remains, at all stages, 70% made with home-made malt and 30% made with trade malt; 2) that factory-made beer retains, at all stages, its composition of 80% cartons and 20% bulk; and 3) that current retailing of factory brew remains controlled 70% by licensed retailers and 30% in shebeens.

factory-brewed sorghum beer would have been in 1981 under four sets of circumstances. These four situations correspond to Stages 1 through 4 in the development of sorghum beer markets and have been described in some detail in Chapter 2, Section A. It will be recalled that in the progression from Stage 1 to Stage 4, each successsive column represents a situation in which factory-brewed sorghum beer holds an increasingly important market share.

Notice that in the projected evolution between stages, a one-liter increase in the sale of factory-brewed sorghum beer does not result in a one liter decrease in the sales of home-brewed beer. Because factory-brewed sorghum beer retails at roughly double the price of home-brewed beer, an increase in factory-brewed sorghum beer results in a more than proportional decrease in the volume of home-brewed beer sold. Total expenditure on home- plus factory-brewed sorghum beer, however, increases as increasing amounts of factory-brewed sorghum beer are made available.

The easiest place to start in evaluating Table 6.1 is at Stage 2, which represents the current situation. Presently, home-brewed sorghum beer accounts for roughly three-fourths of total volume and slightly over one half of all consumer expenditures on sorghum beer. Stage 1 projects back to what the market situation would be if only home-brewed sorghum beer were available. This was the case in Botswana until 1967 and is still the case in most of West and East Africa today.

Although currently at Stage 2, Botswana's sorghum beer subsector is moving rapidly to Stage 3, the point in its development at which the current excess demand for factory-brewed sorghum beer will be met, giving factory brew a majority share of the sorghum beer market. It is the current excess demand that has led to the recent increases in the imports of Tlokwe, a factory-brewed sorghum beer from South Africa. The supply shortage has also motivated Botswana Breweries to expand the capacity of their two existing breweries and to embark on a program to build new breweries. As indicated in column 3, if all consumer demand for factory-brewed sorghum beer were to be satisfied tomorrow, the sales of factory-brewed sorghum beer would be approximately 70% above their current levels. Left unconstrained, Botswana Breweries could achieve the Stage 3, full market saturation level, within the next three to five years.

To complete the market share projections, the far right-hand column of Table 7.1 provides estimates of the situation that would prevail if no home-brewed sorghum beer were available in Botswana. This situation is not likely to occur. It would only come about by government prohibition of home brewing, as has been done in urban areas of South Africa and Zimbabwe. However, experience in these countries indicates that, even where illegal, home brewing is never totally suppressed (Wolcott, p.36 and discussions with staff of the Sorghum Beer Unit, Pretoria). Column 4 is provided for illustrative

purposes, to show governments which contemplate a ban on home brewing what it is they are trying to achieve.

In order to evaluate the employment and income tradeoffs occurring as a result of the current subsector evolution, the trends projected in Table 7.1 must be combined with three assumptions. The first assumption is that, as relative shares of home- and factory-brewed sorghum beer change, the current composition within home brewing remains constant. In other words, we assume that, at each stage, 70% of all home-brewed beer is made with home-made malt and 30% is brewed with trade malt. While this assumption is not valid over time, it is valid for the current analysis which attempts to abstract from temporal changes. The second assumption made for purposes of this analysis is that the output of factory-brewed beer remains as currently distributed, with 80% sold in cartons and 20% sold in bulk. The third assumption is that the retailing share currently held by various categories of retailers remains constant, that is that licensed outlets continue to retail 70% of factory-brewed sorghum beer, while home retailers continue to retail their current 30% share of the factory-brewed sorghum beer. Given these assumptions, the budgets from Chapter 6 can be used along with Table 7.1 to project the varying employment and income implications of shifting market shares within the sorghum beer subsector.

2. Employment Tradeoffs

The currently increasing market share of factory-brewed sorghum beer is leading to large decreases in employment in Botswana, both in terms of the absolute number of people earning income as well as in terms of full-time labor equivalents. Table 7.2 quantifies the employment tradeoffs that are brought about by a shifting composition of the sorghum beer market.

The first conclusion to be reached from Table 7.2 is that the declining market share held by home-brewed sorghum beer is leading to a substantial decline in overall employment levels. The tradeoff is a loss of 13 people earning income in home brewing for every job gained in factory brewing or retailing (calculated, for example between Stages 2 and 3 as (56,240-30,400)/(4,720-2,738)). In terms of full-time labor equivalents, the tradeoff is 5 full-time equivalent home brewing jobs lost for every unit of employment generated in the production and sale of factory-brewed sorghum beer (calculated, between Stages 2 and 3, as (4,033-2,180)/(875-508)).

A second, very important conclusion from Table 7.2 has to do with the home retailing of factory-brewed sorghum beer. The promotion of home retailing of factory-brewed sorghum beer is of critical importance in attenuating the employment losses associated with increasing sales of factory-brewed sorghum beer. As can be seen from Table 7.2, home retailers of factory-brewed sorghum beer account for 90% of the total income-earners supported by the

Table 7.2

EMPLOYMENT TRADEOFFS ASSOCIATED WITH EVOLUTION IN BOTSWANA'S SORGHUM BEER SUBSECTOR

	Stage 1 All Home Brew 120:0*	Stage 2 1981, Status Quo 74:29	Stage 3 Predominantly Factory Brew 40:50	Stage 4 All Factory Brew 0:65
1. Total number of people earning income				
a. Home brewing, production & retailing	91,200	56,240	30,400	0
b. Factory brewing				
- production	0	128	220	286
- licensed retailing	0	203	350	455
- home retailing	0	2,407	4,150	5,395
	0	2,738	4,720	6,136
c. Total in home & factory brewing	91,200	58,978	35,120	6,136
2. Total full-time job equivalents**				
a. home brewing	6,540	4,033	2,180	0
b. factory brewing, prodn. + retail.	0	508	875	1,138
c. total	6,540	4,541	3,055	1,138

* As a reminder, the market shares are listed for each stage of the subsector evolution. The first number in each pair is the volume of home-brewed beer, and the second number is the volume of factory-brewed beer. The volumes are given in millions of liters.

** A full-time job equivalent is computed at 8 hours of work, days a week and 50 weeks a year. It equals 2,000 total labor hours.

Source: Calculations based on Table 7.1 and Appendix C, Table C.1.

production and sale of factory-brewed beer. Without home retailers, the shrinking employment resulting from increased sales of factory-brewed sorghum beer would be even more pronounced than it is currently. Where factory-produced sorghum beer is sold in competition with home brew, any employment-oriented policy must focus on opening up the retailing of factory-brewed sorghum beer to home retailers. With a rising market share being held by factory-brewed sorghum beer, its increased retailing in shebeens represents the only strategy for avoiding a major decline in subsector employment levels.

3. Income Tradeoffs

As with employment, total sorghum-beer-related income declines as the market share of factory-brewed sorghum beer increases. The magnitude of the income decline, as well as its breakdown, is displayed in Table 7.3. The standard coefficients used to construct Table 7.3 are provided in Appendix C, Table C.2. These figures are derived from the income analysis in Chapter 6 but with two modifications: 1) the entire domestic value added in the sorghum beer subsector (including wages, profits and taxes) is included in Table 7.3, while only the profit to brewers and retailers is included in Chapter 6; and 2) foreign earnings (the portion of Botswana Breweries' profits accruing to foreigners) are excluded here, since they do not represent earnings to Botswana.

Beyond the central observation that total value added falls as the market share of factory-brewed sorghum beer increases, two additional points should be made based on Table 7.3. The first is that the retailing of factory-made sorghum beer provides a substantial portion of the total income generated in factory brewing. Retail margins are high with factory-brewed sorghum beer, and total retail income is, therefore, very significant.

Further, the reader should be warned that the aggregate figures in Table 7.3 mask a large shift that is taking place in income distribution. In the progression from a market wholly supplied by home brewers to one wholly supplied by factory brewing, the absolute level of the decline in local value added is on the order of 25%; but this figure camouflages the tremendous upheaval taking place in the distribution of that income.

4. Income Distribution

Increases in the sale of factory-brewed sorghum beer are resulting in a massive transfer of income from rural regions to urban areas and from poor and medium members of Botswana's population to the rich. These trends run directly counter to the government's two principal income distribution goals which are to encourage increased income flows to rural areas of the country and to poor members of the citizenry (Botswana National Development Plan V, pp.62,64).

Table 7.3

PROJECTED EVOLUTION OF FINANCIAL VALUE ADDED
IN BOTSWANA'S SORGHUM BEER SUBSECTOR
(total value added at market prices;
figures in millions of pula)

	Stage 1 All Home Brew 120:0*	Stage 2 1981, Status Quo 74:29	Stage 3 Predominantly Factory Brew 40:50	Stage 4 All Factory Brew 0:65
1. Home brewing				
a. production & retailing	5.9	3.6	2.0	0
b. suppliers of prodn. inputs	5.8	3.6	1.9	0
Subtotal	11.7	7.2	3.9	0
2. Factory brewing				
a. production**	0	1.5	2.6	3.3
b. retailing	0	1.7	2.9	3.8
c. suppliers of prodn. inputs	0	.6	1.1	1.4
Subtotal	0	3.8	6.6	8.5
3. Total Value Added	11.7	11.0	10.5	8.5

* As a reminder, the market shares are listed for each stage of the subsector evolution. The first number in each pair is the volume of home-brewed beer, and the second number is factory-brewed beer. The volumes are given in millions of liters per year.

** Production income includes profits, wages and taxes. It excludes, however, the portion of profits earned by South African Breweries, since these do not represent income for Botswana. In 1981, at Stage 2, these South African Breweries profits amounted to P .3 million.

Source: Calculations based on Table 7.1 and Appendix C, Table C.2.

Table 7.4 provides a good indication of why increased sales of factory-brewed sorghum beer have income distribution consequences so contrary to Goverment of Botswana (GOB) objectives. This table breaks down the total 1981 value added from sorghum beer sales, indicating the amounts accruing to each group of economic agents. From this breakdown, it is clear that the people making money from home brewing are the shebeen queens, the growers of sorghum, firewood collectors and rural mill operators. The bulk of these people are rural dwellers and are found on the middle and low ends of the income distribution.

On the other hand, the people earning income from factory-brewed sorghum beer are predominantly wealthy, urban and male. For example, the owners of Botswana Breweries - the Botswana Development Corporation and a foreign company, South African Breweries - are profitable large corporations, certainly not the poorest of the poor. Together these two corportions earn about 20% of the total income generated by the sales of factory-brewed sorghum beer. The traders who control most of the retailing of factory-brewed sorghum beer earn roughly another 20% of the total income derived from factory-brewed sorghum beer, and they are normally among the wealthiest members of their communities. Public authorities, the central government and the district councils, earn about 25% of factory brewing income. The suppliers of inputs used in production are the next largest earners of income from factory brewing. These

Table 7.4

DISTRIBUTION OF VALUE ADDED FROM SORGHUM BEER, BOTSWANA 1981
(value added at market prices, in thousands of pula)

Recipient	Home Brewing	Factory Brewing	Total
Shebeen queens	3,626	525	4,117
Suppliers of grain, malt, etc. to shebeens	3,570	0	3,570
Profit to Bots. Brew. owners			
- Bots. Dev. Corp.			
- local earnings	0	375	375
- foreign earnings	0	(90)	(90)
- South African Breweries	0	(310)	(310)
Licensed retail outlets	0	750	750
Government			
- central government tax	0	819	819
- district council	0	275	275
Botswana Breweries' input suppliers	0	600	600
Botswana Breweries' direct employees	0	336	336
Total Value Added	7,196	4,080	11,276
Total Local Value Added	7,196	3,770	10,966

Source: Budgets constructed based on interviews with 107 home brewers, with Botswana Breweries personnel and from Botswana Breweries published accounts.

input suppliers include a large, urban milling company which mills the imported corn meal used in Chibuku. It includes the wholesalers who earn a commission for importing the brewery's inputs and also encompasses the companies that supply Botswana Breweries with services such as accounting and insurance. These input suppliers are virtually all urban based, and they garner roughly 15% of the income generated from the sale of factory-brewed sorghum beer.

The remaining 20% of factory brewing income is earned by less-affluent members of Botswana's population, the shebeen queens and wage employees. Even this figure is slightly overstated, though, since one-third of the wages paid out by Botswana Breweries goes to a handful of highly-paid managers.

This initial overview shows the types of income-earning opportunities supported by both home and factory brewing of sorghum beer. Useful in providing a qualitative feel for the distribution of income flows, these figures can also be reworked to provide a more precise indication of the income distribution consequences engendered by a rising market share of factory-brewed sorghum beer. In elaborating on income distribution issues, two areas are of particular concern to the Government of Botswana: a) the rural versus urban distribution of income; and b) its distribution among income groups in the population.

a. Rural vs. Urban Income Distribution. The Government of Botswana (GOB), like many governments in the developing world, is very concerned by accelerating rural to urban migration. Although it has not yet reached a critical stage in Botswana, evidence from elsewhere has shown what severe problems - urban overcrowding, deplorable health and sanitation standards, rising urban unemployment, political instability and a draining of rural talents - can result from excessive rural to urban migration. The government is anxious to stem the tide of rural to urban migration before the common problems it generates become intractable. Government efforts to stem the tide of migration center around the active promotion of income-earning opportunities in rural areas.

Currrent trends in the sorghum beer subsector, however, are running directly counter to the government wishes. With the rise of factory brewing, income from the production of sorghum beer is being transferred from rural to urban areas; and income accruing to input suppliers is being transferred from rural to urban areas and even abroad. It is only at the retail level that factory brewing has an essentially neutral influence on the rural versus urban distribution of income.

With production income, it is clear why a rising share of factory-brewed sorghum beer brings with it a transfer of income from rural to urban areas. When home brewers serve a rural market, they do their brewing on site, in the rural locality. With factory

brewing, however, all brewing is done in one of two urban breweries. This situation will change, of course, when their small brewery begins operation in the major village of Maun; but in terms of total output, well over 95% of the factory production of sorghum beer will take place in urban breweries, even when the Maun brewery comes on stream.

Income earned by input suppliers is also largely transferred out of rural areas and into urban areas as the market share held by factory-brewed sorghum beer increases. In fact, income earned by input suppliers is commonly transferred from rural areas to foreign countries. This is because home brewers buy rurally-produced inputs. They buy firewood, milling services, and sorghum locally. Even the trade malt used in 30% of the home-brewed sorghum beer is all produced in rural areas of Botswana. The inputs used in factory brewing, however, come mostly from abroad. The equipment, cartons, high-diastatic malt, lactic acid, brewers yeast and coal are all imported. While the corn meal used in factory brewing is milled locally, the mill is in an urban area (the town of Lobatse), and the bulk of the corn they mill is imported from South Africa.

Botswana Breweries management does indicate a desire to procure inputs locally. For that reason, the Botswana Development Corporation, one of the owners of Botswana Breweries, is growing malting varieties of sorghum on a trial basis on one of their corporate farms. They hope, in the future, to be able to produce

high-diastatic malt locally. These efforts are important and laudable; but the factory brewing process is such that many of its inputs will not be produced viably in Botswana in the forseeable future. Retailing of the rurally-consumed factory-brewed sorghum beer represents the only significant source of rural income supported by factory brewing of sorghum beer.

The current distribution of rural versus urban value added in the sorghum beer subsector is quantified in Appendix C, Table C.2. The figures from that appendix indicate that 95% of all value added supported by home brewing is earned in rural areas. On the other hand, only 37% of factory brewing income is earned in rural areas. Retailing income and the channeling of government tax revenue back to rural areas account for virtually all the rural earnings from factory-brewed sorghum beer.

Based on these observations, it is not surprising that the growing market share held by factory-brewed sorghum beer is resulting in a substantial transfer of income out of rural areas and into the cities. Table 7.5 documents the magnitude of the income transfer that occurs as factory-brewed sorghum beer occupies an increasingly large market share in Botswana. The movement from the currrent situation (Stage 2) to one in which the demand for factory-brewed sorghum beer is fully saturated (Stage 3) will result in an annual loss of P2.0 million in rural income in exchange for an annual increase of P1.5 million in urban income. The net result of

Table 7.5

TRENDS IN THE GEOGRAPHIC DISTRIBUTION OF SORGHUM BEER-RELATED INCOME IN BOTSWANA
(total subsector value added at market prices; figures in millions of pula)

	Stage 1 All Home Brew 120:0	Stage 2 1981, Status Quo 74:29	Stage 3 Predominantly Factory Brew 40:50	Stage 4 All Factory Brew 0:65
1. Rural value* added	11.1	8.4	6.5	3.5
2. Urban value* added	.6	2.6	4.0	5.0
Total	11.7	11.0	10.5	8.5

* Attribution of source of income based on survey interviews with home brewers as well as on interviews with retailers, factory brewers, millers and input suppliers.

Source: Calculations based on Table 7.1 and Appendix C, Table C.2.

the increasing market share held by factory-brewed sorghum beer is, thus, a large transfer of income from rural to urban areas. This movement runs in direct opposition to the first of the government's income distribution goals.

b. The Distribution of Earnings Among Rich and Poor Income Groups. The government's second main income distribution objective is that of increasing the share of income currently earned by poor and medium income groups. This aim is motivated by a desire to correct a very unequal distribution of earnings. In 1974, the Gini coefficient for Botswana was estimated to be .57 (National Development Plan V, p.45), indicating a high degree of inequality. The Botswana figure is comparable to that which is found in developing countries generally. In 1978, the average Gini coefficient for 96 developing countries was .58. For middle income countries, inequality is much lower, the average Gini coefficient for 20 such countries being .16 during the same period (Little, p.271).

The general conclusion on sorghum beer and income distribution is that the increasing market share held by factory-brewed sorghum beer is leading to a large transfer of income from poor and medium income groups to the rich. The magnitude of that transfer is summarized in Table 7.6. Once again, the general trend - rising earnings among the wealthy at the expense of lower income groups - runs directly counter to the GOB's economic goals.

Table 7.6

INCOME DISTRIBUTION TRENDS IN BOTSWANA'S SORGHUM BEER SUBSECTOR
(total subsector value added at market prices;
figures in millions of pula)

	Stage 1 All Home Brew 120:0	Stage 2 1981, Status Quo 74:29	Stage 3 Predominantly Factory Brew 40:50	Stage 4 All Factory Brew 0:65
1. Income Percentiles*				
a. Poor (bottom 60%)	5.6	4.6	3.8	2.5
b. Medium (61% - 94%)	4.7	3.8	3.2	2.0
c. Rich (95 +)	1.4	2.6	3.5	4.0
Total	11.7	11.0	10.5	8.5
2. Sexual Distribution				
a. Women	7.8	6.4	5.3	3.5
b. Men	3.9	4.6	5.2	5.0
Total	11.7	11.0	10.5	8.5

* Attribution of income distribution based on RIDS classification of activities. For some, it was necessary to use RIDS classification based on cattle. The "poor" classsification corresponds to 9 cattle or less. "Medium" indicates ownership of 10-80 cattle, and "rich" indicates more that 80 cattle.

Source: Calculations based on Table 7.1 and Appendix C, Table C.2.

Before commenting in detail on the broad trends, it is necessary to briefly review the evidence on which the income distribution projections have been made. Two studies - the present work and the Rural Income Distribution Survey (RIDS) - provide the bulk of the evidence on which the following income distribution analysis rests. The present study is particularly important, since it is the only one to date that has systematically examined not only home brewing of sorghum beer but also the production and retailing of factory-brewed sorghum beer. Most other studies have concentrated virtually exclusively on home brewing and on small rural settlements. The RIDS is important because it is by far the most extensive, carefully done, authoritative income distribution work undertaken in Botswana. It is based on interviews with 1,800 households and was designed to provide results that would be representative of all rural areas of Botwana, where 84% of the country's population lives. RIDS includes both major villages and smaller rural settlements, although it does not include urban areas within its scope of analysis.

In addition to these two basic works are a spate of studies in which comments have been made on beer brewing and income distribution. The Batswana are likely one of the most throroughly surveyed people on earth. An extraordinary number of anthropological, economic and social surveys have been undertaken, most of them with a focus on small rural settlements. Because of

the importance of home brewing in the rural economy, many of these researchers have included comments on beer brewing in their reports. Anthropological studies, nutritional research and studies of water points are among those from which comments have been made on beer brewing and income distribution. Given the differences in definitions, locations studied and major foci of these various works, it is perhaps not surprising that not all authors are in agreement about the economic status of home brewers.

While reconciliation of all the various pronouncements on beer brewing and income distribution can quickly become tedious, three principal conclusions contain the gist of the findings. First of all, it is the view of RIDS, the present study, and many of the social researchers that home brewing and home retailing of sorghum beer are more important to poor and medium households than they are to the rich. The second main conclusion, based principally on the present study, is that, while the earnings from factory-brewed sorghum beer accrue to all income groups, a disproportionate share is collected by people at the very high end of the income distribution. Third, the results of the present study corroborate what many observers have suggested, that female headed households are generally more dependent on sorghum beer earnings than are male-headed households. Readers who are particularly interested in income distribution or in research in rural Botswana are referred to Appendix C which provides a detailed analysis based on which the

general income distribution projections in this section are made.

Table 7.6 provides a synthesis of the findings on income distribution consequences of the increasing availability of factory-brewed sorghum beer. It is clear from this table that the current evolution towards increasing sales of factory-brewed sorghum beer is resulting in a huge transfer of income from the poor and medium population groups to the rich. It is likewise resulting in the transfer of income from women to men. All this should come as no surprise given the background discussion involving Table 7.4. It is very clear that the current evolution in the sorghum beer subsector runs strongly counter to all of the Government of Botswana's major economic goals - increasing employment, incomes and promoting a more favorable income distribution.

B. ECONOMIC PERFORMANCE

Until now, the evaluation of subsector performance has focused on observable, physical measures such as numbers employed, amount of cash income actually earned and the distribution of those financial earnings. We turn now to an economic analysis of performance in which all commodity and income flows are valued at their opportunity cost. While the flow of economic profits does not correspond exactly to the physical movement of financial income, the Government of Botswana is interested in economic profits, since they indicate the true costs to society, in terms of opportunities forgone, of moving through the various stages of evolution in the sorghum beer subsector.

There is one major difference between the economic analysis performed in this section and the financial analysis performed in Section A. In the economic analysis that follows, all inputs and outputs will be valued at their opportunity cost (shadow price) rather than at market prices. In general in Botswana, market and shadow prices do not diverge greatly from one another. For six inputs, however, there is a divergence between market and shadow prices. These six inputs are: i) home brewers' labor; ii) minimum wage labor; iii) retail management labor; iv) sorghum; v) trade malt; and vi) capital. The details of calculating these shadow

prices are provided in Appendix D.

Although the details of calculating these shadow prices are relegated to Appendix D, it should be mentioned here that a positive shadow price has been attributed to home brewers' labor. A figure of 72 thebe per day is used. This estimate is very likely an overestimate of the true opportunity cost of home brewers labor given the very few opportunities open to untrained women in a country with severe unemployment problems. Because the economic value attributed to home brewers' labor is on the high side, the following economic analysis represents a conservative estimate of the economic gains achieved in home brewing of sorghum beer.

1. Standard Economic Measures of Performance

Several economic criteria are often used in comparing the performance of alternative production technologies. Of these, four important measures of economic performance will be used in the following analysis: 1) returns to capital; 2) returns to management labor; 3) economic cost of production; and 4) economic profit. Returns to capital indicate the economic profits being earned by owners of capital, over and above the 20% nominal opportunity cost. The return on capital measure is important where capital is the scarce resource in a society, and returns to that scarce resource must be maximized to achieve maximum income growth. Since management labor is also sometimes alleged to be the constraining

factor in Botswana's income growth, economic returns to management labor are also reported in the following analysis of the economic profitability. Economic cost of production quantifies, for each technology, the opportunity cost of resources used producing a given quantity of output. Finally, economic profit indicates, for each production technique, the annual excess of revenue over input cost when all inputs - including wages, management and capital - and output are valued at their opportunity cost.

Table 7.7 displays these four measures of economic performance for both home and factory brewing of sorghum beer. From this table, it is evident that both returns to capital and returns to management time are much higher for home brewing than for factory brewing. This is not surprising given that home brewing uses extremely small amounts of capital and requires no scarce executive management in producing sorghum beer. It should be noted that the real returns in factory brewing are nonetheless quite high, 130% returns to capital and returns to labor of P46 per hour. These figures, though, still represent only a fraction of the returns achieved in home brewing.

An important methodological implication should be highlighted here: In "choice of technique" comparisons, it is of critical importance that firms being compared operate at equivalent levels of vertical integration. In his review of the literature on choice of technique and factor substitution in developing countries, for example, White (1978) indicates that, "truly valid comprisons

Table 7.7

ECONOMIC PERFORMANCE OF HOME- VERSUS FACTORY-BREWING OF SORGHUM BEER, BOTSWANA 1981
(values in Pula; 1 Pula = 90 cents)

	Home Brewing	Factory Brewing
1. Resource cost of producing 100 liters of beer	6.59	11.53
2. Economic profit per 100 liters		
a. production	4.16	3.45
b. retailing		5.43
c. input supply	4.95	2.90
Total subsector value added per 100 liters	9.11	11.78
3. Total subsector value added per P100 sales	93.47	50.65
4. Returns to capital		
- in production	-	66%
- in production + retailing	189%	130%
5. Returns to management labor		
- in production	-	P 118/hour
- in production + retailing	infininte	P 46/hour
6. Retail price per 100 liters**	9.75	23.25

* These home brewing budgets are weighted averages of the 103 home brewing budgets obtained in the survey interviews. The weight used is annual volume of production. These figures, therefore, represent overall average costs incurred, not those of the best- or worst-practice firms.

** Average price of factory beer calculated as follows: 20% sold in bulk by licensed retailers @ 14 thebe/liter; 50% sold in cartons by licensed retailers @ 25 thebe/liter; 30% sold in cartons in shebeens @ average of 26.5 thebe/liter. Average price = (.2)x14 + (.5)x25 + (.3)x26.5 = 23.25 thebe/liter.

Source: Budgets constructed from interviews with 107 home brewers, from Botswana Breweries' published accounts, and from discussions with Botswana Breweries' staff.

between large and small firms are very difficult to construct. Not only must the same final product be produced by both firms, but they must be vertically integrated to the same extent." (White, p.40, emphasis added). Stewart (1977, pp.193,194) concurs. The reason is, of course, that different phases in a production or distribution process normally utilize different factor proportions. Thus, even if technologies are identical at all levels, a comparison of two firms producing the same final output but with different levels of vertical integration would result in different capital/output and capital/labor ratios. As White says, one might then, "mistakenly conclude that these indicated differences in efficiency (between the two processes)." (White, p.40). Most of the work on choice of technique is potentially very misleading; because, as White notes, "None of the studies cited above has tried to correct for this problem (of different levels of vertical integration)." (White, p.40).

Table 7.7, unlike the studies cited by White, does provide empirical evidence in which the problem of differing levels of vertical integration is taken into account. In the study, the correction is of substantial importance. Consider Row 4 in Table 7.7 in which home and factory brewing are compared using the standard project evluation measure of efficiency, economic returns

to capital.[1] The figures in this row highlight the danger of ignoring differing degrees of vertical integration when comparing technologies. Returns earned by home brewers, who are all integrated producer/retailers, should not be compared with returns achieved in only the production of factory-brewed sorghum beer. To do so would considerably understate the profitability of factory brewing by omitting the very necessary retailing segment associated with factory production of sorghum beer. Since retailing of factory-brewed sorghum beer houses a large portion of subsector income and requires only modest amounts of capital, its inclusion strongly influences the overall returns to capital in the factory-brewing channels of the subsector. To exclude the retailing of factory-brewed sorghum beer from the analysis in this case would understate the returns to capital in the factory brewing portion of the subsector by a factor of two! While the final efficiency ranking of the two techniques is not affected in this case, in that

[1]This represents a slight departure from the choice of technique literature. Normally, value added/capital and value added/labor ratios are compared to see if any techniques absolutely dominate others in the sense of having both higher rates of value added for both inputs. Price lines are then used to compare economic efficiency among technically efficient (undominated) production alternatives. This procedure could be followed here to show how failure to account for varying levels of vertical integration will bias the value added/capital and the value added/labor ratios. Use of the economic returns to capital is preferred, however, since the message it carries regarding potential distortions is the same and since it fits better with the main line of analysis in this section.

home brewing still generates superior economic returns to capital, this may not always be so. One can conclude that much of the choice of technique literature may have to be reevaluated in light of the common existence of differing levels of vertical integration and in view of the fact that most studies have ignored this problem.

While small integrated producer/retailers have often been compared with specialized factory producers, it does not appear that a reevaluation of these studies would reveal consistent biases in favor of small or large scales of production. In the present case, failure to include the retailing segment of factory production would have strongly biased the outcome against large factory producers. Boomgard, although using what appearto be low value added estimates, reaches the opposite conclusion in his study of the furniture subsector in Thailand (Boomgard, pp.174ff). Resolution of this issue will turn on empirical estimates of value added per unit of inputs in various levels of a production/distribution system. Unfortunately, no general predictions can be made, and determinations will have to be made, therefore, on a case-by-case basis.

In should be noted, in conclusion, that use of the subsector framework makes it much less likely that techniques of production which exhibit different levels of vertical integration will be mistakenly compared. It is not likely a coincidence that Boomgard (1982, pp.175,245) and the present study are two analyses that make

allowance for differing levels of vertical integration in comparing techniques of production - and both are subsector studies.

With that brief methodological aside, we may now return to the evaluation of factory versus home brewing of sorghum beer. In terms of cost of production, Table 7.7 indicates that, for equivalent volumes of sorghum beer, factory brewing requires almost twice as much in the way of resource inputs as does home brewing. This is due to the heavier capital requirements in factory brewing, to the high overhead costs incurred by factory brewers, and to the fact that factory brewers use certain material inputs that are quite expensive. In particular, factory brewers package 80% of the beer they produce; and for cartoned sorghum beer, the cost of a carton equals the cost of all the other raw materials combined. For all these reasons, a given volume of factory-brewed sorghum beer costs Botswana about twice as much to produce as does the same quantity of home-brewed beer.

In spite of the higher costs of producing factory beer, Table 7.7 indicates that the economic profit per liter is higher for factory brew than it is for home-brewed sorghum beer. How can this result occur? How can factory-brewed beer both cost more and generate higher economic profit per unit of output? The answer, of course, is that consumers are willing to pay more for factory-brewed sorghum than they will pay for home-brewed beer. In fact, the average selling price for factory-brewed sorghum beer is about

double the price of home-brewed beer. Home-brewed beer sells for about 10 thebe per liter, factory-brewed beer sold in bulk sells for 14 thebe, and packaged factory-brewed sorghum beer sells for 25 thebe a liter. The extra revenue received for factory-brewed sorghum beer more than offsets the higher cost of producing the beer in factories. Consumers are willing to pay a premium for factory-produced sorghum beer and this raises the issue of consumer preferences and the related one of of consumer welfare. These are both important issues, but before addressing them, let us quickly use the economic coefficients from Table 7.7 to project what the aggregate economic effects would be from a shifting composition of sorghum beer production.

Table 7.8 provides a breakdown of the changes in economic performance that are taking place as Botswana's sorghum beer market evolves towards one in which a larger and larger share of the total market is held by factory-brewed sorghum beer. The results of an increasing concentration of factory-brewed sorghum beer are four: 1) the economic cost of production increases; 2) total economic profit decreases; 3) returns to capital fall; and 4) returns to management also decline. By all four measures of economic performance, Botswana is becoming worse off as the share of factory brewing increases in the sorghum beer market.

Table 7.8

ECONOMIC TRADEOFFS WITH INCREASING CONCENTRATION OF FACTORY-BREWED SORGHUM BEER IN BOTSWANA
(millions of Pula)

	Stage 1 All Home Brew 120:0	Stage 2 1981, Status Quo 74:29	Stage 3 Predominantly Factory Brew 40:50	Stage 4 All Factory Brew 0:65
1. Economic Cost of Production				
a. Home brewing	7.9	4.9	2.6	0
b. Factory prodn.	0	3.3	5.8	7.5
Total	7.9	8.2	8.4	7.5
2. Economic Value Added				
a. Home brewing	10.9	6.7	3.6	0
b. Factory prodn.	0	3.4	5.9	7.7
Total	10.9	10.1	9.5	7.7
3. Returns to capital (prodn. + retail)	189%	156%	142%	130%
4. Returns to management labor (prodn. + retail)	infinite	P 102/hr.	P 64/hr.	P 46/hr.

Source: Calculated from Tables 7.7 and 7.1.

2. Consumer Welfare

If all the economic performance indicators are moving in an undesirable direction, why do sales of factory-brewed sorghum beer continue to increase? They continue to increase because consumers are interested in buying more factory-brewed sorghum beer. While Botswana as a whole is economically worse off as the share of factory-brewed sorghum beer increases, consumers, apparently, feel they are better off.

Why are consumers willing to pay a premium for factory-brewed sorghum beer? The key, this author believes, is that factory-brewed sorghum beer - in its fancy, bright, red-white-and-blue package - is viewed as being modern, attractive and, therefore, desirable. Buying factory-made sorghum beer is a form of conspicuous consumption that allows consumers an inexpensive way of making a statement about how modern and progressive they are.

Packaging is central to the attraction of factory-brewed sorghum beer. It is the red-white-and-blue carton, more than anything else, that differentiates factory-brewed sorghum beer from that which is home brewed. Consumers, after all, are not willing to pay a large premium to purchase unpackaged factory-made sorghum beer. The profit margin on bulk beer - both at the production and the retailing level - is substantially lower than it is for cartoned factory-made sorghum beer; the total (production plus retailing) margin is 5.7 thebe per liter for bulk beer and 12.5 thebe per liter

for cartoned beer. This large difference is likely due to consumers not being willing to spend a large premium to drink factory-brewed sorghum beer that is not conspicuously labeled as "modern". The carton provides that modern label.

The premium paid for cartons of factory-brewed sorghum beer is not explained by convenience. Customers do not normally carry their beer home to drink. Since much of the attraction in liquor consumption is the social interaction that accompanies it, consumers go to bars and shebeens to do their drinking. Once there, it is not clear how it could be more convenient for a customer to drink beer from a cup than to drink it from a carton.

And the large premium paid for factory-brewed sorghum beer is hard to justify on grounds of superior product quality. While it is probably true that factory-brewed sorghum beer is a more consistent product that home-brewed beer, it is not necessarily more refreshing or of higher quality. On sanitary grounds, it is not likely to have much of an advantage over home-brewed sorghum beer. Factory brewers do brew indoors and in closed containers, while home brewers carry out their production outdoors and in open containers. However, the first step in the brewing process, that of producing lactic acid, greatly reduces the potential disadvantages of brewing in the open. Lactic acid is a natural preservative. At the ph at which brewing takes place, most pathenogenic bacteria cannot survive (Novellie 1968, p.24 and discussions with staff at the Sorghum Beer Unit,

Pretoria). The potential disadvantages of brewing in the open are, therefore, substantially reduced.

On nutritional grounds as well, home-brewed sorghum beer is not likely an inferior product. In fact, home-brewed sorghum beer is probably of superior nutritional value than factory-brewed sorghum beer. First of all, home-brewed sorghum beer contains more B vitamins than factory-brewed sorghum beer manufactured in Botswana. This is because home-brewed beer is most often made with sorghum grain as the starch source, while factory brewers use corn, and the result is lower B vitamins in the factory brew (by analogy with Novellie December 1966). The second reason that home-brewed sorghum beer in Botswana is probably more nutritious than factory-brewed sorghum beer is that home-made beer normally has more free available nitrogen (protein) in solution. Lactic acid used by home brewers is cultured from sorghum malt (as is done in South African factory breweries) and this process solubolizes nitrogens, making them available for human consumption. On the other hand, the commercially produced lactic acid used in the manufacture of Chibuku provides very little free available nitrogen (FAN), thus reducing the protein availabile from factory-brewed sorghum beer (from

discussion with brewing technology staff at the Sorghum Beer Unit, Pretoria).[1]

Thus, consumers are willing to pay a premium for factory-produced sorghum beer even though, in some ways, it is of lower quality than home brew. Doubly disconcerting is the fact that the production of factory-made beer results in absolute economic losses to Botswana. Thus, consumer preferences are inducing a choice of technologies, the effects of which are in direct opposition to fundamental government priorities.

The important question that policy makers must then face is how to value consumer preferences in comparing the economic benefits of alternative production technologies. This issue falls squarely within the domain of welfare economics. A review of the welfare literature (see, for example, Mishan (1969) and Mueller (1976)) leads to the following conclusion: that economic theory currently offers no clearly acceptable objective rule for choosing between two resource allocations when the choice involves making some people better off at the expense of others. What is generally agreed, however, is that in such cases value judgements must be made which weigh the interpersonal gains and losses. This is certainly the view of Bergsen (1938), Little (1949), Baumol (1972) and Mueller

[1]Currently, the most up-to-date review of the nutritional status of sorghum beer is provided in Zammit (1980) and in Van Herdeen (nee Zammit) (August 1981).

(1976). According to welfare economics, therefore, all that can be said is that ultimately the Government of Botswana, in making any decision on the sorghum beer subsector, will have to make value judgements in which they compare the welfare losses of unemployed shebeen queens with the welfare gains of consumers, licensed retailers and brewers of factory brewed sorghum beer. Since value judgements are necessary, it would seem preferable - as Bergson (1939) and Little (1972) suggest - to make these value judgements explicit. The issue of molding explicit value judgements into concrete policy recommendations will be addresed in Chapter 8. First, however, there is one final aspect of performance that must be addressed.

C. THE POTENTIAL FOR IMPROVING PERFORMANCE BY INCREASING THE EFFICIENCY OF HOME BREWERS

In the performance comparisons thus far, home and factory brewing have been compared based on current actual industry efficiency levels. Under current industry practices, it has been seen that home brewing performance is superior to that of factory brewing according to all evaluation criteria (with the exception of maximizing consumer surplus). This conclusion, though, likely represent a conservative picture of the potential gains from home brewing, because standard home brewing practices may house substantial amounts of technical and allocative inefficiency. Thus within home brewing, it may be possible to raise economic and financial benefits to levels substantially above those depicted in Section B.

The principal goal of this section is to measure the potential for improving subsector performance by increasing the economic efficiency of home brewers. Both components of economic efficiency - allocative and technical efficiency - are examined. A second, and related, objective is to provide an empirical contribution to the debate about the relative importance of allocative versus tecchnical inefficiency.

This analysis is limited to a comparison of the two home brewing processes; factory brewing is excluded from the following

discussion. The major reason for omitting factory brewing is that it is not possible to measure technical inefficiency in Botswana's factory breweries. Only one firm is in operation, and it operates two plants with identical equipment, inputs, procedures and management. Meaningful inferences on technical efficiency cannot be made based on a sample of two identical firms. Similarly, questions of allocative efficiency cannot be made by considering only two firms using identical technologies.

Although plant-level indices of inefficiency cannot be computed for Botswana's sorghum beer factories, the few available indicators lead one to believe that the factory breweries exhibit a high degree of technical efficiency. Glimmers of evidence are available only regarding their use of raw materials and capital. Rough comparisons with factory breweries in South Africa indicate that Botswana Breweries uses the technically required minimum amount of material inputs such as malt and grain. Capital costs also appear to be kept to a minimum. The brewery management shops carefully for second-hand equipment. Their parent company is a multinational that was a pioneer in the sorghum beer business and currently operates sorghum beer breweries in Zimbabwe, Zambia and Swaziland. Botswana Breweries, therefore, has access to a network of information on second-hand equipment as well as access to the results of technical research and development carried out by central corporate staff. These bits and pieces lead one to expect high levels of

efficiency in factory sorghum beer production in Botswana. Therefore, the following focus on inefficiency in home brewing, in all probability, captures the bulk of the inefficiency under sorghum beer manufacturers' control.

1. Definitions and Measurement of Technical, Allocative and Total Inefficiency

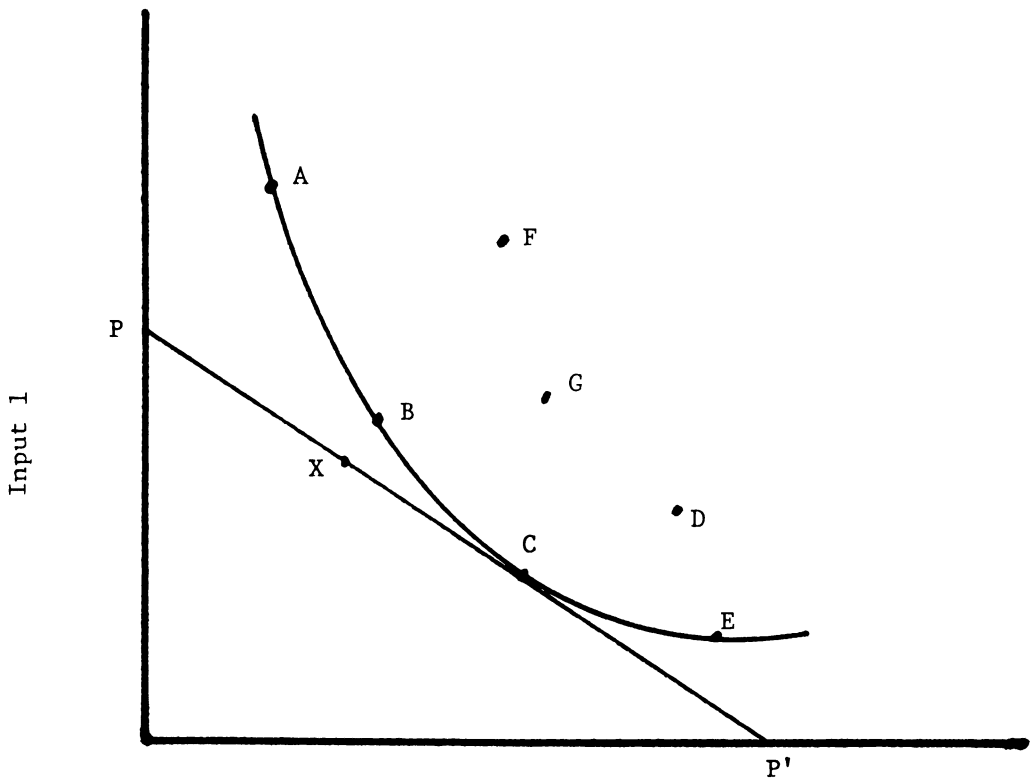
In a production process, total inefficiency, or economic inefficiency as it is sometimes called, can be attributed to two different sources - allocative and technical inefficiency. The breakdown of total inefficiency into these two constituent elements was first suggested by Farrel (1957). The decomposition is best illustrated with the aid of Figure 7.a which depicts a unit isoquant, AE, for a simple 2-input production process. The relative factor prices are displayed by the slope of the budget line PP'. The well-known tangency condition at point C locates the profit maximizing factor proportions.

Allocative inefficiency is the most commonly studied component of total inefficiency. It has to do with the ratio in which inputs are combined in the production process. Only firms using the profit maximizing factor proprotions are said to be allocatively efficient. Thus, in Figure 7.a firms C and D are allocatively efficient, since they produce with the optimal input proportions.

Technical inefficiency is different from allocative inefficiency and exists when a firm produces below its production

FIGURE 7.a

UNIT ISOQUANT FOR MEASURING ECONOMIC INEFFICIENCY



frontier. A technically inefficient firm is one that fails to produce as much output as possible with a given bundle of inputs. For example, in Figure 7.a firms A, B, C and E are technically efficient, while firms D, F and G are technically inefficient. Only firm C is both technically and allocatively efficient.

Total inefficiency can be quantitatively decomposed into its two constituent elements. Take firm F as an example. Total inefficiency is represented by the distance XF. Out of that total, XB represents the portion due to allocative inefficiency, while the distance BF is due to the technical inefficiency of the firm.

The specific measures inefficiency to be used in this analysis of home brewing are ones which describe the basic Farrel decomposition in cost terms. The exact definitions that will be adopted are as follows:

$$\text{total inefficiency} = \frac{(\text{actual cost of production} - \text{minimum cost})}{\text{minimum cost}};$$

$$\text{allocative inefficiency} = \frac{(\text{frontier cost} - \text{minimum cost})}{\text{minimum cost}}; \text{ and}$$

$$\text{technical inefficiency} - \frac{(\text{actual cost} - \text{frontier cost})}{\text{minimum cost}}.$$

This series of definitions - the one implicitly adopted by Schmidt, Lovell and Knox (1980) - has several virtues. The first is that total inefficiency equals the sum of allocative and technical inefficiency. The second advantage of these definitions is that they directly measure the costs due to each component of total

inefficiency.

Two separate methods - the Farrel method and a version of the Corrected Ordinary Least Squares (COLS) method - will be used in computing the components of total inefficiency among home brewers in Botswana. The rationale for selecting these two methods can best be explained with a brief overview of the various methods available for measuring the components of total inefficiency.

Farrel was the first to suggest an analytical decomposition of total inefficiency into two parts. He was also the first to suggest a method of measuring the two types of inefficiency - allocative and technical inefficiency. A very important characteristic of Farrel's approach to measuring inefficiency is that, in measuring technical inefficiency, he compares firms to existing best-practice firms rather than to engineering estimates of ideal production processes. Most subsequent analysis has adopted this standard as well.
A second major feature of Farrel's method is that it is valid only for processes that exhibit constant returns to scale. Under the assumption of constant returns to scale, Farrel is able to represent firms of all sizes on a unit isoquant such as the ones depicted in Figures 7.b and 7.c. Farrel further assumes perfect divisibility of production activities. With these assumptions, Farrel's production frontier is simply defined by drawing line segments to connect the firms along the south-west frontier. This segmented frontier forms the isoquant. The Farrel frontier is normally computed by linear

programming techniques.

The basic Farrel method of computing a production frontier is suitable for the present study of home brewing. The assumption of constant returns to scale is limiting in some applications, but since home brewing of sorghum beer exhibits constant returns to scale, the assumption presents no difficulties in the present case. Farrel's method has also been criticized as being sensitive to outliers. It was to address this problem that Timmer (1971) proposed his "probabilistic" frontiers. His proposal was simply to discard a small percentage of extreme observations until the frontier stabilized. In the present case, the frontier is reasonably stable without discarding observations, as can be readily seen in Figures 7.b and 7.c. The problem of sensitivity to outliers, thus, did not arise in the home brewing application. In general, therefore, the Farrel method is suitable for the present application.

Two basic families of frontier production functions have grown up from the original Farrel conception. In their excellent review article, Forsund, Lovell and Schmidt (1980) have provided a detailed classification of the numerous approaches to estimating frontier production functions. To summarize and simplify slightly, the two general approaches can be labelled as: 1) the deterministic frontier production functions; and 2) the stochastic frontier production functions. Of the deterministic frontier production functions, some

FIGURE 7.b

ISOQUANT FOR 100 LITERS OF SORGHUM BEER MADE WITH HOME-MADE MALT

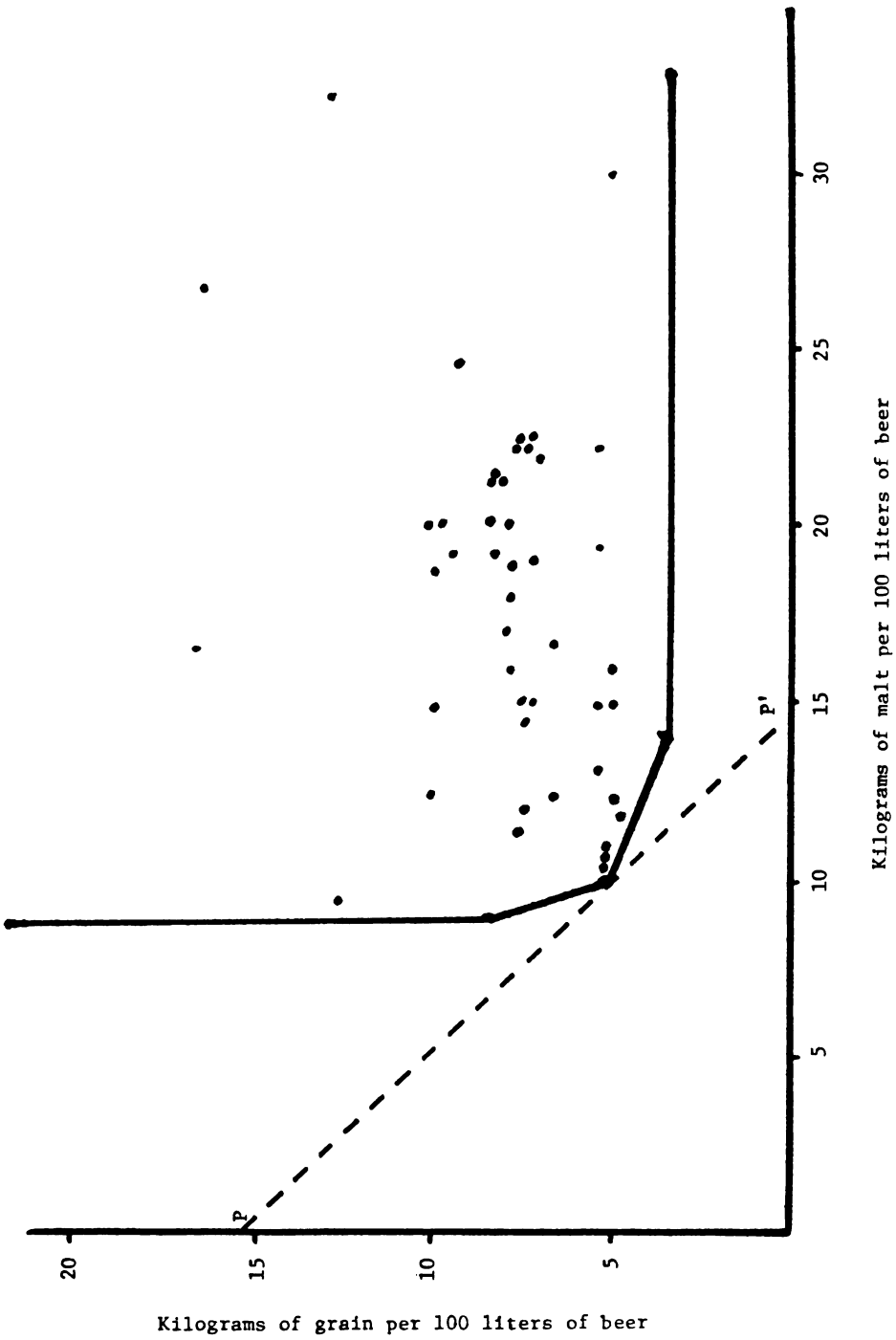
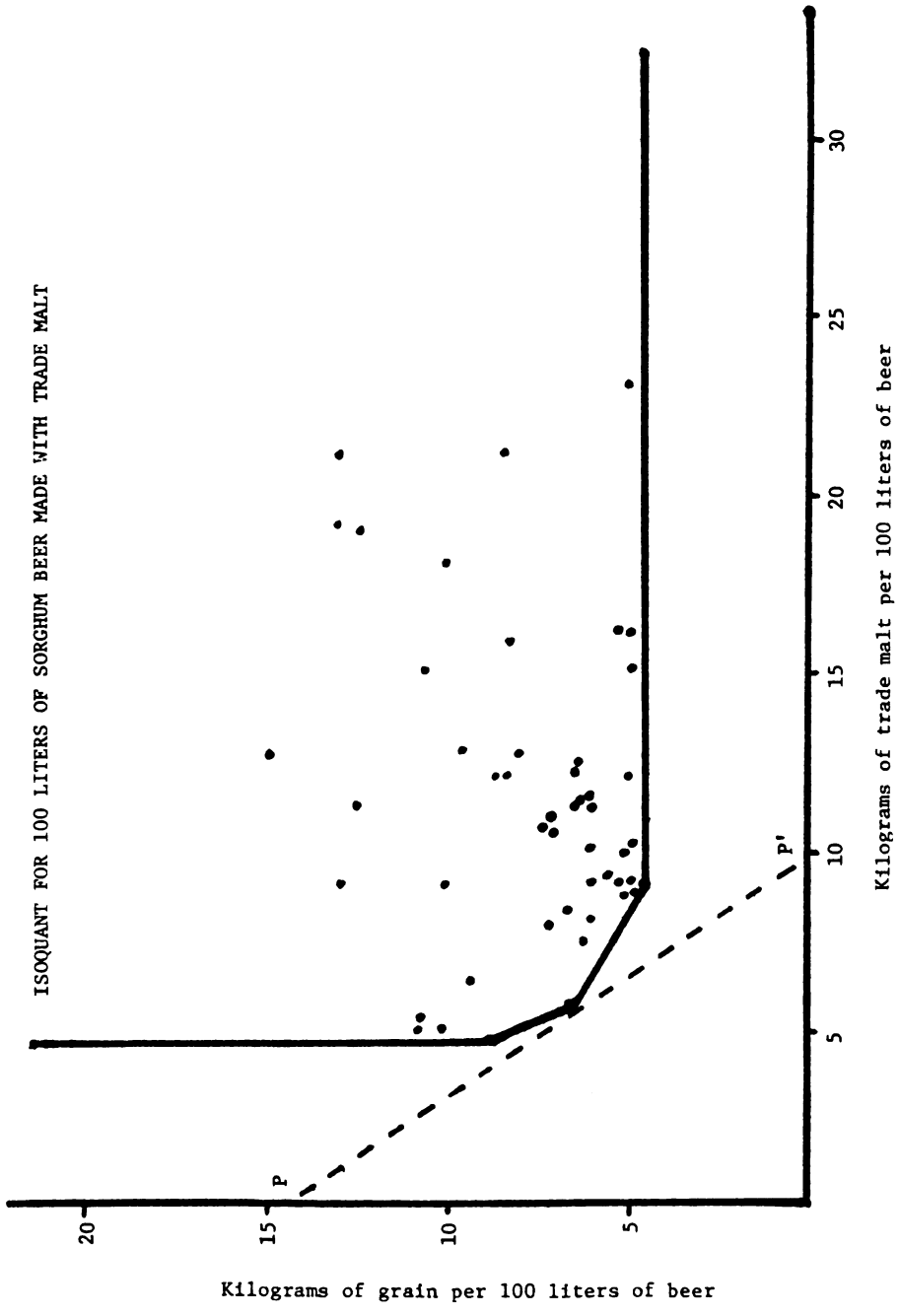


FIGURE 7.c

ISOQUANT FOR 100 LITERS OF SORGHUM BEER MADE WITH TRADE MALT



are parametric and some are not. The original Farrel method and several subsequent applications were non-parametric; that is they did not impose any functional form on the data.

The Corrected Ordinary Least Squares (COLS) method is a member of the family of parametric determinitic production frontiers. The basic aproach of these parametric frontiers is to assume a functional form, one sided error terms and to then estimate the production frontier. While Farrel himself first suggested this could be done, Aigner and Chu (1968) first implemented the suggestion using a Cobb-Douglas formulation. Timmer (1971) also implemented and refined this basic functional approach. The advantage of this extension of the Farrel approach is that it can be applied in situations of increasing or decreasing returns to scale. Second-generation parametric frontiers, such as the COLS frontiers, have a further advantage in that they avoid the problems of extreme observations unduly influencing the shape of the estimated production surface. In studying developing countries, Tyler (1979), Page (1979), Fisseha (1982) and Shapiro and Mueller (1977) have used frontier production functions to measure technical inefficiency; while Boomgard (1982), Page (1980) and the present study have used them to estimate technical and allocative inefficiency.

There are a number of varieties of the COLS technique. The version used in this analysis has been chosen because it has a number of very attractive properties. In particular, it produces

consistent estimates of production function paramaters; it provides estimates of technical inefficiency that are independent of the assumed distribution of the error term; and it assures that the frontier is actually a frontier, that is that no observations lie above it. COLS, as its name would suggest, can be applied to any function that can be estimated by ordinary least squares. The version used in the sorghum beer analysis simply involves estimating a production function by OLS and then shifting the constant term by the amount of the largest negative residual. The analyst is, thus, left with a production surface in which one firm is technically efficient and the rest lie below the production surface. This method was apparently first applied by Richmond (1974). Gabrielson (1975) and Green (1980) have shown that it produces consistent estimates of production parameters. The duality between cost and production is used to determine the frontier cost function. While only the production function is necessary for estimating technical inefficiency, both cost and production frontiers are required when both technical and allocative inefficiency are to be studied.

COLS has most often been used with a Cobb-Douglas functional form. The Cobb-Douglas is also used in the sorghum beer study because its algebraic properties easily allow the necessary manipulation between cost and production functions.

The final class of efficiency frontiers is the stochastic production and cost frontiers. Proponents of this approach estimate

frontier functions with a two-part error term, a two-sided error representing totally random influences on output and a one-sided error representing economic inefficiency. These stochastic functions have the virtue of accomodating the realistic situation in which random shocks (such as weather, earthquakes and illness) influence output levels. The key benefit derived from estimating stochastic frontiers is that they separate out the random influences on output from the variations due to inefficiency of the firm managers. The basic notions of the stochastic production frontiers were first developed by Aigner, Lovell and Schmidt (1977) and by Meeusen and van den Broek (1977).

One drawback of using the stochastic production frontiers is that they do not allow the estimation of firm-level indices of technical inefficiency (Schmidt and Lovell, p.364), although firm-level indices of allocative inefficiency can be obtained. Since one objective of the present analysis is to attribute sources of both technical and allocative inefficiency, it is necessary to obtain firm-level measures of both types of inefficiency. This is not possible with stochastic production frontiers, making them inadequate for the present purposes.

2. Computation of Inefficiency Levels in Home Brewing

Six major inputs are required in producing home-brewed sorghum beer. These inputs are: malt, grain, milling services, firewood,

equipment, labor and water. Inefficiency (that is, producing at a cost above minimum achievable cost) can result from the over-use of any single input. To the extent that inputs are substitutable one for another, inefficiency can also result from an improper input proportions.

In the ideal situation, analysis of inefficiency would be based on firm-specific measures for each input. For reasons that will be made clear presently, this has unfortunately not been possible for all the home brewing inputs. Firm-specific measures of malt and grain have been used. However, uniform input costs were ascribed to all brewers for their firewood, milling, malting labor and equipment inputs. Reluctantly, water and production labor have been totally omitted from the inefficiency analysis. This modification of the ideal procedure has implications for the interpretation of the results. These implications will be reviewed after first outlining the practical difficulties that necessitates limiting the input data used in the inefficiency analysis.

Malt and grain are relatively easy to measure accurately, since brewers normally use standard receptacles for measuring them. Firm-specific measures of malt and grains were, therefore, easily obtainable during the survey interviewing. The firm-specific measures of these two inputs are used in the following analysis of inefficiency. Their inclusion is important, since together they account for 70% of total production costs measured in economic

terms.

For several reasons, it was necessary to impute standard input costs for milling services, capital, firewood and malting labor. Milling services were, in fact, uniform for all brewers in a given location. The standard cost was, therefore, attributed to all firms. Equipment costs, as well, were essentially identical across firms. Much borrowing and trading of of equipment takes place among home brewers; thus, in many cases, the exact same physical capital is used by different brewers. In addition, much of the equipment - such as buckets, pails and large water drums - are owned by virtually all households whether they brew or not. Detailed equipment lists were solicited during the survey interviews. The cost of this equipment was similar across brewing households, and it was felt that any differences were more likely due to measurement error than to levels of inefficiency. Small measurement errors could easily result, for example, from forgetting to list a bucket that is used for general water hauling as well as for brewing. It seems most accurate, therefore, to ascribe a uniform capital cost to all home brewers.

An average figure is also used for firewood cost. Use of an average cost was necessary simply because it was impossible to determine precisely how much wood was used for each particular brew. Brewing firewood is collected along with that used for general cooking, and it is stacked all together in the compounds. Because

of the irregular shapes and density of the wood, the only sure way to obtain a measure of wood useage is to weigh a pile of wood before brewing and then weigh it afterwards to determine the difference. While this was done a number of times to compute an average figure, it was not possible to do so for every brewer interviewed. Because of the extreme measurement difficulty, use of a standard figure across brewers represented the only feasible course of action.

Water and production labor have been excluded form the inefficiency analysis, while an average figure has been included for malting labor. Water is excluded for several reasons. It has a market price of zero, and a shadow price would be difficult to impute. In addition, it was not possible to obtain from brewers exact estimates of how much water they used in a particular batch of beer. Observation suggests the quantity per 100 liters does not vary much across brewers.

Production labor was also very difficult, in fact impossible, to measure with any degree of confidence. This is mainly because home brewing is an activity that is interwoven among other household duties. A brewer will stir her brew for a while and then, for example, will feed the chickens or sweep the compound. She returns periodically to check the brew, interspersing other household duties in the slack moments in brewing. Even the most conscientious brewer attempting to estimate the time spent on her last brew would have difficulty coming up with an accurate estimate. While the question

of labor input was originally included in the interview questionnaire, it was soon dropped. It became clear that a large amount of the variation in use was coming from measurement error rather from differences in actual input use. It would be misleading to use such highly variable and highly inaccurate labor data in computing technical inefficiency. Much apparent inefficiency would really be nothing more than errors in recall. Omission of the very inaccurate labor data was considered a lesser evil than including it and peppering the technical inefficiency measures with a large dose of arbitrary variation.

An average cost figure for malting labor, however, was included for all brewers using home-made malt. This procedure was necessary in order to be able to make a fair cost comparison between brewers using trade malt and those using home-made malt.

When a variable is omitted from analysis of inefficiency, it is, in general, unclear how the computed results are affected. The index of total inefficiency may be unbiased or it may be off in either direction. The magnitude of the difference will depend on how much of total costs are made up by the omitted variable. When large variables are omitted, the results will vary much more than when small variables are left out. The direction of the difference in total inefficiency measured will depend on whether or not inefficiency in the use of the omitted variable is positively or negatively correlated with inefficiency in the use of the remaining

inputs. In the present case, it is unclear whether brewers who are careful in their use of grain and malt are also careful not to waste labor or whether, on the other hand, waste of malt and grain is caused by allocating too little labor time to the brewing process. It is likely that the former condition prevails: brewers who are careful with malt and grain inputs are also efficient in their use of labor time. If this is true, the estimated value of total inefficiency is an underestimate of the true value. What can be said with more certainty is that, because production labor accounts for only 7% of total production costs (calculated from Appendix D, Table D.1), its omission will have a relatively small impact on the measurement of indices of total inefficiency.

On the composition of total inefficiency, slightly more can be said about the impact of an omitted variable. To the extent that the omitted variable can be substituted for included variables, its omission will tend to overstate the ratio of technical to allocative inefficiency. This is because variations in the included inputs may be inversely related to utilization rates of the omitted variable. If the omitted variable could be included, some of the variation in the included variables would be seen to be a manifestation of allocative inefficiency. Thus, by omitting a variable, the results will overstate the share of technical as compared to allocative inefficiency. While the COLS measurement technique houses no clear biases, it should be noted that with the Farrel method of

measurement the omission of a variable also tends to overstate the importance of technical inefficiency. Because of the geometry of the Farrel method, the use of additional inputs can only decrease the measurement of technical inefficiency (Farrel, pp.269,270). For both these reasons, the magnitude of technical inefficiency will probably be overstated in the following analysis because of the omission of the labor input.

On a practical level, it should be noted that the basic analysis is still of substantial interest of policy makers. The overall indices of technical and allocative inefficiency may or may not be biased, but the estimate of the absolute amount of total inefficiency in the use of non-labor inputs still accurately represents potential gains that can be achieved by improving efficiency among home brewers. Measurement of inefficiency is, therefore, still of major importance to policy makers.

The details of the computations as well as a complete listing of the firm-level measures of inefficiency are found in Appendix E. The most important summary statistics are provided in Table 7.9. The principal result from this analysis is that there exists a large degree of total inefficiency in home brewing. Non-labor costs are, on average, about 50% above minimum achievable costs.

The second conclusion from these results is that the majority of inefficiency is technical rather than allocative. While the Farrel indices of technical inefficiency are biased slightly

Table 7.9

COMPOSITION OF TOTAL INEFFICIENCY AMONG BOTSWANA'S HOME BREWERS OF SORGHUM BEER, 1982

	Total Inefficiency		Technical Ineff.		Allocative Ineff.	
	Farrel	COLS	Farrel	COLS	Farrel	COLS
Beer Made With Trade Malt	.47	.48	.26	.33	.21	.15
Beer Made With Home-Made Malt	.48	.50	.42	.46	.06	.04
Weighted Average**	.48	.49	.37	.42	.11	.07
Correlation Coefficient Between Farrel & COLS Indices	.99		.97		.88	

* Indices are averages of individual brewers weighted by annual output.

** The indices are weighted according to the relative volumes, 70% for beer made with home-made malt and 30% of beer made with trade malt.

Source: Appendix E.

upwards, this is not the case with the COLS estimates. According to the COLS indices, technical inefficiency accounts for 85% of total inefficiency in the production of home-brewed sorghum beer.

A final conclusion is that the Farrel and COLS indices are exceedingly close. This can be seen from the complete listing in Appendix E. It can also be seen in Table 7.9 that the correlation coefficients between the Farrel and COLS indices are all above .88.

3. Causes of Inefficiency

Knowledge that there exists large amounts of inefficiency among home brewers is of little use to policy makers if they do not also have some idea of how the potential gains can be captured. A number of previous studies - Boomgard (1982), Fisseha (1982), Page (1979) and (1989), Shapiro and Mueller (1977), Timmer (1971) and Tyler (1979) - have also attempted to identify causes of inefficiency among producers of various products. These studies have all focused on the causes of techniqal inefficiency rather than allocative or total inefficiency. The statistical methods used have been very simple. The most comon approach - used by Page (1980), Fisseha (1982) and Timmer (1971) - has been to run an ordinary least squares regression of the efficiency index on a number of potentially useful explanatory variables. Tyler (1979) also used an OLS regrsssion, but on one right hand side variable at a time to produce analysis of variance estimates of the direction and significance of

correlations. Another propular approach - used, for example, by Page (1979) and (1980) and Fisseha (1982) - has been to compute simple correlation coefficients between efficiency indices and each explanatory variable, one at a time.

All these various attempts to explain technical inefficiency have resulted in modest success, although inconsistencies are not unknown. One common theme running through these analyses is that management seems to be an important cause of technical inefficiency. Fisseha (1982, p.240) and Page (1980, pp.332,333) have found training and previous experience of the manager to be positively correlated with technical efficiency. Shapiro and Mueller (1977, pp.303,308) have found found technical efficiency to be positively correlated with the entrepreneur's stock of information and degree of modernization. Both Fisseha (1982, p.244) and Page (1980, pp.332,333) have found that the intensity of supervision of production workers tends to lead to higher technical efficiency. Fisseha (p.238) also found record keeping to be positively correlated with technical efficiency. Page (1980, pp.332,333) found that the use of expatriate managers led to higher technical efficiency in Ghana's wood industry. On the other hand, both he and Tyler (1979, pp.490,491) found that nationality of ownership was not significantly related to technical efficiency. Contrary to conventional wisdom regarding parastatals, Tyler (1979, pp.490,491) also found no correlation between government ownership of firms and

levels of technical inefficiency. Finally, size - in terms of output and value added (Fisseha, (1982,p.240) and Page (1979, p.38a)) and market share and sales (Tyler (1979, pp.490,491) - was determined to be positively correlated with technical efficiency.

By following procedures similar to those of the above authors, it will be possible to investigate the sources of total, technical and allocative efficiency among Botswana's home brewers of sorghum beer. The statistical analysis to be used is multiple regression analysis in which the three measures of inefficiency are regressed on the following potentially useful explanatory variables: VOL, the volume of beer brewed for sale in the previous year; YEARS, the number of years the brewer has been selling sorghum beer for sale; MALT, a dummy variable equal to 1 if the brewer uses trade malt and equal to zero if she maker her own; and SBY, the percentage of total household income derived from the sale of home-brewed sorghum beer. There are a number of reasons for including these particular variables. VOL and YEARS are expected to be useful since one expects that experience and regularity of brewing will allow brewers to refine their recipes and procedures over time. MALT quality is very important, since trade malt is of both higher and more consistent quality than home-made malt. One would expect, therefore, less technical inefficiency among brewers using trade malt than among those using home-made malt. SBY may also be important if those households who depend on home brewing for a

greater percentage of their livelihood are particularly careful to avoid waste and thus produce at a lower cost than other households for whom brewing is less crucial. Education is a variable commonly seen in the right hand side of equations such as these; but it is, unfortunately, not available for use here. Using the four explanatory variables available, a simple linear equation was estimated.

The results of the regression equations are as follows:

1. Total = 69 -.001 VOL -.73 YEARS - 6.6 MALT - .074 SBY R^2=.07
   Inefficiency (.002) (.81) (9.6) (.17)

2. Tech. = 64 -.001 VOL -.8 YEARS - 16.8 MALT - .06 SBY R^2=.12
   Inefficiency (.001) (.76) (8.9)* (.16)

3. Alloc. = 4 +.0001 VOL +.046 YEARS + 10.1 MALT -.019 SBY R^2=.35
   Inefficiency(.0001) (.18) (2.1)** (.036)

The figures in parentheses are standard errors; and ** indicates significance at the 1% level, while * indicates significance at the 5% level. Inefficiency, it should be noted, has been measured in percentage points rather than as decimal fractions.

This statistical analysis, coupled with knowledge of the brewing business, points to two methods of increasing efficiency among home brewers. Both center around the use of trade malt. The first derives from the conclusion that brewers using trade malt achieve much higher levels of technical efficiency than do brewers who make their own malt. This is as expected, because trade malt is of higher and of more consistent quality than is home-made malted

sorghum. Because of the variable quality of home-made malt, home brewers making their own malt are likely required to use consistently excessive amounts of malt and grain in order to reduce the chances of a totally failed brew. Among home brewers with equal experience, those using trade malt achieve cost savings (due to higher technical efficiency) of 17% over brewers who use home-made malt. The first method of increasing efficiency is, therefore to encourage the use of trade malt among home brewers.

The second method is to attack the problem of allocative inefficiency among brewers using trade malt. The statistical analysis of inefficiency shows users of trade malt to be more allocatively inefficient than brewers using home-made malt; and this mitigates, to some extent, the gains resulting from the superior technical performance achieved with trade malt. Although the allocative losses of 10% do not totally offset the 17% gains from reduced technical inefficiency, they do present cause for concern.

There is a way to overcome the problem of allocative inefficiency among home brewers using trade malt. To see how allocative inefficiency can be reduced, one must realize that the source of allocative inefficiency among brewers using trade malt is the high ratio they use of malt to grain. This is clearly demonstrated in Figure 7.b. It seems that, in moving from brewing with home-made malt to brewing with trade malt, brewers retain the approximate 2:1 malt to grain proportions they previously used in

brewing with home-made malt. A few brewers, however, have learned to lower cost by reducing the ratio to 1:1. That more brewers have not discovered the possibility of brewing with 1:1 malt to grain proportions is probably due to that fact that it represents such a large departure from the recipes handed down for generations which called for at least a 2:1 malt to grain ratio. This is compounded by the fact that many brewers have been using trade malt for only a short period of time.

In sum, action promoting the use of trade malt is likely to substantially reduce inefficiency among home brewers. Such promotion will have to be accompanied by instruction of some sort so the converted brewers use the optimal malt to grain ratio right from the start. Details of how such promotion could take place are provided in Chapter 8.

The potential gain from such actions is substantial. Even if only half the brewers currently using home-made malt were to switch to trade malt and also use the proper malt to grain proportions, the economic profit in home brewing and retailing would increase by 14% overall. In 1981, this would have represented a gain to home brewers of P400,000. Thus, the gains that can realistically be expected are significant.

D. SUMMARY

This chapter's discussion of performance in the sorghum beer subsector is of central importance, since it sets the stage for the policy analysis that follows. Because of its length, however, it is useful to recap the chapter's major findings before proceeding to the denouement.

The principal conclusion from this chapter is that the current shift within the subsector, the increasing share of factory-brewed sorghum beer at the expense of home brew, is producing economic results that are diametrically opposed to the Government of Botswana's major economic objectives. Employment, incomes and overall economic profit are all decreasing as a result of the rising importance of factory brewing. Just as important is the fact that the current shift in market shares is leading to a large redistribution of income from poor and medium income groups to the rich. Already more effective than factory brewing at employment and income generation, home brewing could be made even more so. By increasing technical efficiency among home brewers, there exists substantial scope for raising the income generated in home brewing to still higher levels.

This chapter concludes the case study of sorghum beer in Botswana. It has followed up descriptions of the subsector

dynamics with an analysis of the economic impact of an increasing predominance of factory brews, thereby completing thesis objective number one.

The conclusions reached in this chapter have strong implications for policy makers, both in Botswana and elsewhere. Those implications are explored in some detail in Chapter 8.

CHAPTER 8

IMPLICATIONS OF THE CASE STUDY

This chapter ties together the threads of the previous analysis. It puts the capstone on the case study by providing policy recommendations related to sorghum beer in Botswana; but it does so within the context of several broad issues for which the case study has particular relevance. A number of important themes - those related to patterns of industrial development, to sorghum beer elsewhere in Africa and to certain methodlogoical issues - have been woven throughout the preceeding chapters and have surfaced at various points in the discussion. A major purpose of this chapter is to return to these main themes and to draw together the most important implications derived from the case study.

Section A addresses the issue of general trends in industrial evolution. Based on the case study, it draws a number of implications - empirical, diagnostic and prescriptive - relating to analysis of long-term trends in industrial development. This initial discussion directly meets thesis objective number two. The very general industral policy prescriptions in this first section lead into a more specific discussion, in Section B, of policy issues bearing directly on sorghum beer. These sorghum beer policy issues are first discussed specifically for Botswana, and then implications are drawn for other countries in Sub-Saharan Africa. Section B thereby completes thesis objective number three. The chapter concludes with a brief recapitulation of the methodological implications of the case study and with a short summary statement at the end.

A. IMPLICATIONS OF THE CASE STUDY FOR GENERAL VIEWS ON INDUSTRIAL EVOLUTION

1. Empirical Implications

The case study of sorghum beer in Botswana provides yet another example of the tendency of household industries to decline as industrialization proceeds. Over the past 15 years, the volume of market sales held by home brewers has dropped from 100% to 52%, and their share is still declining (calculated from Table 7.1). While reliable time-series data are not available on the absolute level of home brewing, it is likely that, since about 1968, there has been a steady and significant decline in the total volume and value of home-brewed sorghum beer sold in Botswana. The evidence from this case study, thus, supports the view that household industries decline, first in percentage terms and then in absolute terms, as industrialization proceeds.

2. Explaining the Trends

The decline of home brewing in Botswana, however, does not square well with the commonly accepted explanations of the decline of household industries. On the supply side, it is true that technical change has occurred, both in malting and in brewing procedures, so it is now possible to brew sorghum beer on a substantially larger scale than before. It is also true that the advent of improved transportation and communications systems has

opened up markets of greater and greater size. However, the economies of scale that are commonly alleged to take advantage of these two factors to provide unbeatable cost competitition to household industries are not manifested at all in Botswana. Economies of scale cannot explain the rise of factory brewing of sorghum beer there. In financial terms, the cost of producing bulk beer in Botswana's most efficient-sized factory brewery is approximately equal to the cost of production achieved by the average (not the most efficient) home brewer. When distribution costs are included, the factories are found to produce at 30% over the unit costs incurred by average home brewers. Economies of scale in no way contribute to the rise of factory brewing in Botswana; quite the contrary, they would seem to preclude the development of factory breweries.

Another common supply-side explanation for the decline of household industries is that large factory producers use their market power to enhance their competitive position vis-a-vis the smaller producers. In Botswana, the factory brewers have definitely tried to wield their power, but most often this has not been to the detriment of home brewers. The factory brewers' efforts have mainly revolved around the sharing of production profits with government parastatals and in contracting with the local councils in such a way that the financial interests of the council and the brewery are coincident. These actions, however, have been mainly aimed at

preventing competition from other factory brewers of sorghum beer; they have not been aimed at affecting home brewers. In the future, when their new brewery in Maun becomes operational, Botswana Breweries management does intend to cross-subsidize their operatiion there and sell Chibuku initially at no profit. After establishing a market share, they will undoubtedly raise up the price. While this is a clear example of the use of market power that will contribute to increased factory beer sales, this tactic has not yet been applied and cannnot, therefore, be cited as a reason for the rapid rise of factory brewing up to this point. One can argue that licensed retailers of factory-brewed sorghum beer have exercised market power to prevent shebeen queens from retailing factory-brewed sorghum beer. Neither the factory brewers nor the licensed retailers, however, have made efforts to hamper the home brewing of sorghum beer. This common explanation for the decline of small producers does not seem to contribute much to understanding why home brewing is on the decline in Botswana.

Government intervention, commonly found to discriminate against small producers, does not do so in the case of Botswana's sorghum beer subsector. Home brewers, in fact, hold the advantage over factory producers in that the home brewers are not licensed, taxed or subject to minimum wage legislation. The large factory breweries have been set up with unsubsidized financing obtained at commercial rates, and they receive no protection or tariff advantages. The

only government favor they receive is the advantage of importing their high-diastatic malt from low-cost foreign producers as opposed to home brewers using trade malt who must buy locally-produced malt made with higher cost sorghum and by higher cost local producers. On balance, however, it would seem that government policy, if anything, favors home brewers over factory producers.

It is only on the demand side of the market that standard arguments concerning the decline of household industries seem to have any relevance in the case of Botswana's home brewers. The conventional view from the demand side is that household products are of low quality and are, therefore, inferior goods. As incomes rise the demand for household-produced goods decline. This view comes closest to the mark in explaining the decline of Botswana's home brewers; because home brewed sorghum beer is clearly an inferior good. Product quality, however, is not the reason home-brewed sorghum beer has a negative income elasticity of demand. While factory-brewed sorghum beer is a more consistent product than home brews, there is no evidence to suggest it has a better taste or is a more refreshing drink than home-brewed sorghum beer. In fact, on nutritional grounds, factory brewed sorghum beer is, in all likelihood, the inferior product.

The real reason for the decline of home brewing is not product quality but the consumer perception that factory-brewed sorghum beer is modern, status-conferring and therefore preferable. The

packaging of factory-brewed sorghum beer in attractive red-white-and-blue cartons is aimed at promoting the premium image of factory-brewed sorghum beer. The key to the rise of factory-brewed sorghum beer lies in the marketing and in the promotion of the image of factory-brewed sorghum beer as a moders, desirable product. A few writers, such as the ILO (1978, p.13) and Bienfeld (p.62) have mentioned "smartly packaged products", "surface finishing" and the "more modern is better mentality" as factors influencing the increasing demand for factory-produced goods. It seems, however, that the mainstream of analysis has not focussed much attention on the use of packaging, marketing and prestige in promoting the demand for products of large factories.

It is likely that the common shift of consumer demand to products of allegedly higher quality has, in other cases as well, been not so much a search for higher quality as a pursuit of prestige. In some lines of production - for example precision machinery - large factories can clearly produce goods of quality superior to those produced in household firms. In other areas - such as sewing and food preparation - it is not at all clear that consumer shifts to factory produced goods have been motivated by superior quality of the factory products. In many cases such as these, the consumers' motive is often likely to be one of status, not a search for quality. For example, observers from numerous countries have noted how manufacturers of highly refined maize flour

can sell a nutritionally inferior producct in a fancy package at a premium over what small maize mills can supply (see, for example, Stewart, p.236; Hoyt, pp.16,17). Another example comes from Kenya where modern breakfast cereal manufacturers have recently set up and sell colorful packs of nutritionally inferior cereals at a premium to people who would otherwise eat less expensive local cereals (Kaplinsky 1981, p.90). The well publicized case of Nestle's infant formula is still another example of a lower quality product which consumers are willing to purchase in order to appear more modern. The duping of consumers, it should be made clear, is not limited to developing countries. Stores in the United States sell pre-faded jeans and jean skirts at a substantial premium over those made of new material. People around the world are status conscious and time and again have proven willing to spend extra money on goods which, on utilitarian grounds, are substantially inferior to less expensive substitutes. Marketing and image promotion has, at least for a number of goods, been an important and largely ignored force in the rise of factory production in developing countries.

3. Policy Implications

The contribution of this case study is to point out that, in many cases, the problem at the root of the decline in household industries may be the packaging and image promotion of factory-produced goods. If this is so and if the economic consequences run

counter to key government objectives, policy interventions should be considered.

One strategy would be to constrain the advertising of factory producers. The World Health Organization (WHO), for example, adopted this approach in attempting to diminish the market share held by Nestle's infant formula. The WHO succeeded in obtaining an agreement from Nestle's to ban advertizing of that product (The Christian Century, Nov. 10,1982), and more recently they have reached an agreement whereby Nestle will not give out free samples. Action along similar lines, either through review of the advertising of large firms or some sort of truth in advertising regulation, represent a first intervention governments could consider in combatting this problem.

Another avenue to be explored would be that of engaging in active advertising on behalf of household industries, something akin to a "home brew is good for you" campaign. These campaigns, unfortunately, are notoriously unsuccessful. Another, perhaps more successful, tack might be that of creative marketing assistance for small-scale producers, for example experimenting with packaging or product promotion.

A final course of action to consider is that of raising the price or limiting the availability of a certain technology or product. This could be done by taxation or by licensing controls. To directly limit the quantity of factory-produced goods, of course,

requires making the value judgement that the loss incurred in consumer welfare is outweighed by the damage forgone by restricting the sale of that product. Such value judgements lie at the root of all consumer protection legislation. If consumers are being misled by slick marketing or advertizing and if the costs incurred by the sale of such products are deemed to be particularly deleterious, governments should legitimately take action to limit distribution of those goods. Any decisions to limit the sale of particular goods should, of course, be made on the basis of a careful analysis of the impact of the product under consideration.

B. POLICY ISSUES RELATED TO SORGHUM BEER

1. A General Policy Orientation for Botswana

Before plunging into the specifics of proposed government interventions, it is useful to outline the broad elements of a desirable policy orientation related to sorghum beer in Botswana. It is particularly helpful to ground this discussion in a general macro view of industrial evolution. With respect to sorghum beer, the current situation in Botswana is a common one in which a household industry is declining at the expense of factory production. In terms of general industrial policy and planning, it is relevant to ask the following three questions: 1) What role should home brewers play in Botswana's industrial profile over the next 10 to 20 years? 2) What will their role be in the long run? and 3) Is there cause for intervention now? The ensuing general policy orientation for Botswana will be devoted to briefly answering each of these three questions.

Given the current economic conditions in Botswana, it seems that home brewers could play an important economic role there over the next 10 to 20 years. Botswana is currently experiencing a serious unemployment problem. There is a shortage of skilled manpower. A large number of women are skilled in brewing; but they have little formal training, and domestic obligations often limit their capacity to respond to economic opportunities far outside the

home. The opportunity cost of their time is, therefore, very low. In large part because of that low opportunity cost, home brewing of sorghum beer is currently an economically more efficient technology than is factory brewing; economic returns to capital are higher in home than in factory brewing. It addition, the backward linkages supported by home brewing are much greater than those in factory brewing, and this contributes to higher domestic value added per value of sales in home brewing. For all these reasons, the shift from home to factory brewing of sorghum beer is currently leading to declining economic returns to capital, lower employment, lower aggregate income levels and an increasingly skewed distribution of income. Thus, there are considerable gains to be derived from the maintenance of the home brewing business.

The economic attractiveness of home brewing is likely to remain intact for many years to come. Since training is a slow process and since alternative employment opportunities are likely to grow only very gradually, the opportunity cost of home brewing labor is likely to remain low for some time. Since a broadening of Botswana's productive base is also likely to proceed only very slowly, the opportunity for improved backward linkages from factory brewing are unlikely to develop rapidly. For at least the next decade, and probably for the next two, home brewing could play an important employment and income generating role in Botswana.

Over the longer run, say in the next 30 to 40 years, this will

probably not be so. As employment opportunities rise and as the workforce becomes more skilled, the opportunity cost of labor will rise and the viability of home brewing will decline. As Botswana's productive base broadens, the opportunity for improved backward linkages with factory brewing may well develop. Over the next 30 to 40 years, therefore, the economic viability of home brewing will most likely decline.

At the present time, however, it would appear there is ample cause for government intervention in the sorghum beer subsector. The current decline of home brewing at the expense of factory-brewed sorghum beer is resulting in a decline in employment, incomes and income distribution, all key government economic priorities. It would, therefore, seem appropriate to intervene somehow in favor of the home brewers. It should be clearly stated that this call for intervention rests squarely on the following value judgement: that in the course of the current transition from home to factory brewing, the income losses to home brewers and their suppliers exceed in social value the welfare gains to brewers, retailers and consumers of factory-brewed sorghum beer. Such a value judgement appears to be consistent with stated government economic objectives. It is based on this explicit value judgement that the general policy orientation recommended for Botswana is one of intervention in favor of home brewers of sorghum beer over the next one or two decades.

Given this general orientation, it is possible to proceed with the specifics of the current and recommended interventions.

2. Botswana's Current Policy on Sorghum Beer

Botswana's current policy on sorghum beer has been expressed in five different ways: a) through policy on manufacturing licenses; b) in the regulation of sorghum beer retailing; c) through taxation; d) through restriction on malt imports; and e) in responding to questions about potential import protection for factory-brewed sorghum beer. The policy stances exhibited in areas b), c) and d) have been outlined in Chapter 4. Areas a) and e) require some elaboration here.

Government of Botswana (GOB) policy on potential import protection for factory-brewed sorghum beer, item e), will be discussed first. This issue was raised recently when Member of Parliament asked the Government why Tlokwe, a factory-brewed sorghum beer from South Africa, was allowed into Botswana given that it competes with locally-manufactured Chibuku. He further pointed out that Chibuku's owners were assessed a tax in the form of the beer levy while Tlokwe was not charged under this levy since it is not manufactured in Botswana. Consistent with the government's general free trade principles, the Minister of Commerce and Industry responded that Tlokwe, and any other South African products, were freely importable into Botswana by virtue of a common customs union

agreement (Botswana Daily News, Dec. 4, 1981).

Recent GOB policy commitments under the industrial licensing laws are also worthy of comment. As explained in Chapter 4, home brewers are exempt from manufacturing license requirements, while factory brewers, since they employ more than ten people, are not. Normally this industrial licensing requirement would not be an interesting topic for discussion, because GOB policy is to routinely grant manufacturing licenses.

In early 1981, however, the Ministry of Commerce and Industry (MCI) took steps to consider limiting the expansion of factory-brewed sorghum beer by refusing manufacturing licenses. During early 1981, an application was made to MCI for the construction of a sorghum beer brewery in Lobatse. At the same time, active discussions were under way regarding the construction of a brewery in Maun. Faced with a potential doubling of the number of factory sorghum beer breweries, and concerned about accelerating negative impact on home brewers, the present author, then a staff member at the MCI, prepared a report drawing together the limited information then available on the employment and income consequences of expanded production of factory-brewed sorghum beer. In the discussions that ensued, two decisions were taken. First, the license for the sorghum beer brewery in Lobatse was denied. Second, the decision was taken to let the plans for the Maun brewery proceed. However, the position was taken that the impact of the brewery in Maun would

be monitored, and any future license application would be made based on the Maun evaluation. A baseline (pre-brewery) study of home brewing was undertaken as part of the field work for this thesis. It took place in May of 1982. After the brewery was operational for some time, it was intended that the Rural Industrial Officer in Maun would supervise a post-brewery survey to see what the impact had been on home brewers. The brewery was expected to be operational by October 1982, and the follow-up evaluation was to take place between May and December 1983. As of August 1983, the follow-up evaluation had not taken place. Neither had any further license applications been submitted for factory breweries of sorghum beer.

3. Policy Recommendations for Botswana

A number of government interventions might prove very fruitful at the current time. Seven recommendations are made below. They are not costly to implement, and if implemented they could lead to a substantial annual increase in incomes.

i. The use of trade malt should be encouraged among home brewers.

This recommendation will have the advantage of increasing efficiency among home brewers and will increase their profits as well as increasing the incomes earned by local trade maltsters. In addition, since brewing with trade malt requires only half as much malt as brewing with home-made malt, such a switch could result in a savings of large amounts of sorghum every year. If half the current

brewers using home-made malt switched to trade malt, the annual savings would be 2,600 tons of sorghum. This represents 5% of domestic consumption in 1980 and could be an important complement to food security efforts in a country, such as Botswana, that is not regularly food self-sufficient.

The promotion of trade malt should take place on several levels. First, it will be necessary to increase the local supply capacity of trade maltsters. New firms should be encouraged to get into trade malting. This should not be difficult, since there is (as of June 1982) a large excess demand created by the Ministry of Agriculture ban on the import of trade malt. The Botswana Development Corporation, for example, has indicated an interest in malting. Related to the promotion of malting, it is very important that the Ministry of Agriculture cooperate with local maltsters in assuring that good malting varieties of sorghum are grown in sufficient quantity in Botswana. This author took several samples of grain sorghum from the Seed Multiplication Unit to a maltsters in Serowe in June of 1982 for germination tests. The results were sent to the Seed Multiplication Unit, and the staff there at the time indicated an interest in further collaboration with the maltsters. It will be important that this interaction not be allowed to atrophy and that malting properties be incorporated into decisions on the sorghum variety recommendations issued by the Ministry of Agriculture and on seed varieties produced by the Seed

Multiplication Unit.

Finally, some limited extension work may be required in promoting the use of trade malt among home brewers. Since it is financially more profitable than use of home-made malt, little regular extension work would be required. Word would spread very quickly after one or two demonstrations in a given locality. It would be best to encourage the malting companies to undertake demonstrations as part of their promotional work. The malting companies have salesmen working for them, and it would be in their interest to promote their individual brands.

Government extension staff may, at some point, have to become involved in promotional demonstrations. This is because, while brewers can increase their brewing incomes by 5% by switching to trade malt, they can increase them a further 4% if they alter the malt to grain ratio after they make the switch. Since the malting companies may be reluctant to recommend lower malt to grain ratios, government extension workers may have to do so. Rural Industrial Officers or the Council Home Economists would seem likely organizers of brewing demonstrations on the merits of using trade malt and on optimal malt to grain ratios. Before getting into such extension work, however, it will be necessary to have some technical support. The Post Harvest Technology Specialist recently hired by Rural Industries Promotion would seem to be the most likely person to perform this technical role. Without such technical back-up,

brewing demonstrations could pose considerable difficulties for extension workers with lack of brewing experience. It should be emphasized, though, that even without demonstrations on optimal malt to grain ratios, a switch to trade malt is still desirable.

The potential gains to be derived from this recommendation are large. If half the brewers currently using home-made malt make the switch to trade malt, their incomes will increase by P68,000 per year. If those brewers who switch can be shown how to reduce their malt to grain ratio to optimal proportions, they will save a further P52,000 annually. Income to owners and employees of trade maltsters will rise by another P400,000 per year.

ii. <u>The further expansion of factory-brewed sorghum beer should be limited</u>.

The fundamental problems posed by factory-brewed sorghum beer are that it has a relatively low value added as a percent of sales, it is capital intensive and therefore generates less employment than home brewing, and it transfers money from poor and medium income groups to the rich. To avoid aggravating these adverse trends, it is necessary to limit the expansion of factory-brewed sorghum beer.

This recommendation, it will be noticed, falls short of proposing a complete ban on factory-brewed sorghum beer. It should be clearly stated, though, that the optimal position in terms of income and employment creation would be one in which no factory-brewed sorghum beer would be produced. The only way this could be brought about in Botswana would be for the Government of Botswana

(GOB) to buy out Botswana Breweries and then close down their production facilities. In addition, they would have to reimburse the 150 or so licensed retailers of factory-brewed sorghum beer for their capital investments.

Although the banning of factory-brewed sorghum beer would be the position most closely aligned with major GOB objectives, there are a number of reasons why it is not recommended. The overriding reason is that a complete ban on factory brewing would not stop the sale of factory-brewed sorghum beer in Botswana. Because of the customs union agreement with South Africa, Tlokwe brand factory brew could not be prevented from coming in and taking the entire market share currently held by Chibuku. Although the Customs Union has a number of benefits, in a case such as this it hampers independent policy action by the GOB. As long as the customs union exists, factory-brewed sorghum beer will be sold in Botswana - regardless of the government position on domestic manufacture.

While the shutting down existing production facilities would be to no avail, the Ministry of Commerce & Industry (MCI) can make an important contribution to economic welfare by limiting the expansion of factory brewing of sorghum beer. They can do so by carefully controlling the issuance of new manufacturing licenses. From the factory brewers' viewpoint, their ideal expansionary scenario would involve building two additional breweries, one in the south-eastern portion of the country, in Lobatse, and one in the north central

region, in either Serowe or Palapye. All three of these locations have, at one time or another, been discussed as potential sites.

The MCI should refuse a manufacturing license for any sorghum beer brewery in Serowe, Palapye or any other location in the north central part of the country. These are predominantly rural areas that can be well supplied by home brewers. The small segment of wage earners can be supplied, as they currently are, with factory-brewed sorghum beer from the existing breweries in Francistown and Gaborone.

A new sorghum beer brewery in the south eastern part of the country should, however, be allowed. The South East will be saturated with sales of imported Tolkwe brand sorghum beer in any case. If there is to be factory-brewed sorghum beer there, it should at least be domestically produced. The most reasonable locations to consider are Lobatse or Kanye, locations which would be ideal for defending the Botswana market against imports of Tlokwe. Growth of the large urban market in the new mining town of Jwaneng would be conveniently serviced from either of these location. If water is available, MCI might consider requiring that the new sorghum beer brewery be located in the village of Kanye rather than in the town of Lobatse. If factory brewing is to expand, it should be done in such a way as to promote government efforts at increasing rural incomes.

iii. Keep as much retailing as possible in the hands of the shebeen queens.

If factory-brewed sorghum beer is to continue being sold, it is important that as much retailing income as possible be kept in the hands of the shebeen queens. Forty-five percent of income supported by factory brewing is earned at the retail level, and currently 70% of this is earned by the traders who control the retail licenses.

The best way to ensure a more equitable repartition of retailing revenues is to assign someone at MCI, most logically the Senior Rural Industrial Officer, to maintain vigilence over the sorghum beer subsector. As was done in the past, he or she should lobby with councils or private retailers should any of them misinterpret the retailing laws and attempt to divert the flow of sorghum beer from the shebeens. The potential payoffs, in terms of more equitable income distribution, are extremely large, and this is a simple recommendation to implement. Botswana Breweries is aware of these MCI interventions (which they support), but they could be reminded of the position and of the fact that that none of their drivers are to be browbeaten into delivering only to licensed outlets. In the end, the ideal situation will be one in which both home and licensed retailers have access to factory-brewed sorghum beer at wholesale prices, and consumers will then be free to decide where it is they prefer to drink their sorghum beer.

iv. Experiment with creative marketing of home-brewed sorghum beer.

This represents another means of limiting the decline of home brewing of sorghum beer. One could imagine any number of tactics to follow in an effort to raise the market image of home-brewed sorghum beer. The use of inexpensive bulk plastic beer dispensers with individual brewer logos would be one such strategy. These dispensers could be supplied by trade maltsters as part of their promotional work. Beer in these dispensers could be sold along side factory-brewed sorghum beer in the licensed retail outlets. This possible course of action directly addresses the principal problem of home brewers, the image of their beer. While this tactic has promise in other countries, it is probably the case that any image-setting to be done in Botswana has been accomplished, and at this stage, it would be extremely difficult to alter consumer perceptions of home-brewed sorghum beer. The following recommendations probably hold more promise for improving economic welfare.

v. GOB should encourage the sale of factory-brewed sorghum beer in bulk.

The sale of factory-brewed sorghum beer in bulk has numerous advantages over that sold in cartons. Bulk beer lowers the cost to consumers by 45% over the price of packaged sorghum beer, it reduces the inroads made into sales of home-brewed sorghum beer by removing the symbol of modernity, the carton and it considerably

reduces the import content of the factory-brewed beer. Consumers would save P2.5 million per year if all the factory-brewed sorghum beer sold were as bulk beer.

Two actions should be considered in promoting the sale of bulk beer. One is to use the position of the Permanent Secretary, Ministry of Commerce and Industry on the Board of Directors of the Botswana Development Corporation to lobby for such a move. The second action that should receive serious consideration is taxation. The beer levy could be raised, perhpas to 5 thebe per liter, and made to apply only to packaged factory-brewed sorghum beer. In view of the commonly discussed litter problem posed by cartons of factory-brewed sorghum beer, the name of the levy could be changed to that of the "litter levy".

vi. GOB policy on the imports of Tlokwe should remain unaltered.

The import of Tlokwe or any other foreign-produced sorghum beer into Botswana is currently unrestricted. This situation should be maintained. Despite the fact that imports are not liable for taxation under the beer levy, imports should not, and indeed cannot under the customs union agreement, be restricted; although a number of attempts have been made at restricting their import. If one more factory brewing license is granted in Kanye or Lobatse, it will allow local manufacturers the opportunity to counter these imports on the most favorable terms. Some importation, or even just the threat of it, does provide a very useful function, that of providing

price competition for the single domesitic manufacturer of factory-brewed sorghum beer. This price competition is very healthy and should not be restricted.

vii. Council retailing of factory-brewed sorghum beer should be outlawed.

Currently, at least two councils, the Lobatse and Gaborone Town Councils, own licensed sorghum beer retailing outlets. In both Gaborone and Lobatse, the outlets are run by Botswana Breweries under management contract for the councils. In Gaborone, this situation arose because the outlet, when run under council management, was losing money, a considerable achievement given the large retail margins earned with factory-brewed sorghum beer.

The community of financial interest between the councils and Botswana Brewers creates a clear conflict of interest. The councils, must pass judgement on license applications filed by people wishing to sell other brands, their competitors. Their legal association with Botswana Breweries can serve no purpose but to severly prejudice the council in considering license applications for competing brands of factory brewed sorghum beer. Such a conflict of interest did arise in early 1982 whan an importer of Tlokwe applied for a license to set up a wholesale depot in Gaborone. The license was ultimately granted, but the council should not have been placed in the position of having a strong financial incentive to disallow the request.

This completes the overview of existing government position as

well as further policy recommendations for Botswana. These findings, as will be seen presently, have important implications for other countries in Sub-Saharan Africa.

4. Policies in Other African Countries

Historically, one common element among early African policies on sorghum beer has been to separate sorghum beer legislation from that dealing with stronger forms of alcohol, for example clear beer, wine and spirits. This initial separation has roots in a joint decision made by the African colonial powers at conventions in Brussels in 1899 and again in 1919. The International Convention of St. Germain-en-Lay issued a protocol in 1919, "in which it was agreed that the supply of Bantu (sorghum) beer should not be limited and that the subject of Bantu (sorghum) beer should be dealt with under legislation separate from that relating to distilled liquors." (Heinrich's Chibuku, p.1; Van Niekerk, p.34). This position reflected the common view that sorghum beer was an important component of the local diet in many countries and that it was much more nutritious and lower in alcohol content than European manufactured alcoholic beverages. Under separate statutes, therefore, the sale to blacks of clear beer, wine and spirits was virtually forbidden in Sub-Saharan Africa until the late 1940's (Van Niekerk, pp.195ff). In August 1962, South Africa became the last country to legalize the sale of all alcoholic beverages to blacks

(Deacon, p.28).

Sorghum beer, on the other hand, has always been legally available to blacks. It has been supplied, in most countries, by home brewers who retain their historic position as the principal provisioners of the local sorghum beer markets. But in countries such as South Africa and Zimbabwe, urban home brewing was outlawed; and factory-brewed sorghum beer was provided in place of home brew. In one form or the other, though, sorghum beer has been legal for blacks to drink throughout Sub-Saharan Africa since the early 1900's.[1]

The sorghum beer legislation in effect today exhibits strong similarities across countries. Factory brewing of sorghum beer does not appear to be illegal anywhere. Similarly, home brewing for personal consumption or for ceremonies is legal everywhere to my knowledge.

However, positions do diverge on the treatment of home brewing for sale. Two basic positions have been taken. One group of countries, by far the larger of the two, permits home brewing of sorghum beer for sale everywhere in the country, in both rural and

[1]In some areas, tribal authorities have, for certain periods of time, forbidden the sale of home-brewed sorghum beer. This was the case, for example, among several tribes in Botswana before 1960 (see Schapera 1953, p.25 and Gulbrandson, p.84).

urban areas. The second group, however, forbids home brewing for sale in urban areas.

The great bulk of African countries fall into the first category; they allow home brewing for sale in both urban and rural areas. In fact, it appears that all countries except South Africa, Zimbabwe, Zambia and possibly Swaziland and Kenya fall into this category.[1]

Botswana appears to be among the most liberal of the first group of countries in that Botswana requires no licensing for either production or retailing of home-brewed sorghum beer. Information available for the remaining countries in the first group indicates that, while home brewing of sorghum beer for sale is legal and not restricted, it is subject to a licensing procedure. Saul (p.8) indicates that in Upper Volta all selling of home-brewed sorghum beer takes place in market places and that a license is required. Licenses for retailing home brew are also required in Tanzania (Beidelman, p.542; Gulliver, p.453) and Uganda (Obbo, p.126). These

[1]The classifications of South Africa, Zimbabwe and Zambia are clear cut according to Deacon (p.29); Wolcott, (p.39) and Miracle 1962, pp.723,724, respectively. Deacon (p.30) describes the liquor laws in Swaziland as being, "almost similar to South Africa," which indicates that urban home brewing for sale is likely prohibited in Swaziland. For Kenya, Hake (1977) consistently refers to, "illegal home brewing" in Nairobi. He, unfortunately, lumps together both home brewing ofsorghum beer and home distilling of much stronger alcohol. Although he does not say so explicitly, the strong inference is that even the home brewing of sorghum beer is illegal in urban Kenya.

licenses are normally issued by local authorities rather than by the central government.

The second group of countries - South Africa, Zimbabwe, Zambia, Swaziland and Kenya - allow home brewing for sale in rural areas but outlaw it in urban areas. Why would they take this position? It is only in the case of South Africa that it has been possible to piece together the rationale according to which urban home brewing has been made illegal. The rationale derives from the fact that, for many years, sorghum beer was the only alcoholic beverage generally available to the black population in South Africa. In the early 1900's, municipal authorities reported that, because sorghum beer was legal and other beverages were not, substantial problems were being encountered with people selling spiked sorghum beer, or even hard liquor thinly disguised as sorghum beer. As White describes the situation, "Illicit beers are often produced by unscrupulous persons in European towns for sale to the Bantu in the slums. These 'beers' are, in many cases, vile concoctions, adulterated with menthylated spirits or with carbide added to give extra kick." (White, p.2). Novellie elaborates by saying that, "To avoid exploitation of the situation, brewing was placed in the hands of local authorities such as municipalities and town boards."(Novellie 1966, p.1). The prevailing view, apparently, was that the legal sorghum beer would continue to be adulterated with illegal

substances unless the production of sorghum beer was carefully controlled by government authorities.

In their quest to prevent the sale of adulterated sorghum beer, South African authorities ended up giving municipal governments the monopoly on the brewing of sorghum beer in urban areas. They ultimately banned home brewing for sale as well as privately-owned factory brewing of sorghum beer. It is worth noting that government authorities did not necessarily wish to render the home brewers unemployed nor did they originally aim to control sorghum beer production themselves. Initially, both municipal governments and licensed private companies were allowed to produce sorghum beer in urban areas of South Africa. Apparently because of lack of private interest, the Traditional Beer Law of 1962 required that all municipalities provide factory-brewed sorghum beer and made it illegal for any else to do so. It was thus that home brewing became illegal in urban South Africa.

In concluding this review of existing policies on sorghum beer, it is important to mention one policy response that has been repeatedly implemented and then abandoned. On at least five occasions, governments in Sub-Saharan Africa have attempted to supply urban areas with sorghum beer by grouping home brewers together in central production facilities. This approach was tried in: Durban, South Africa around 1909 (Oxford, p.315); in Salisbury, Rhodesia (now Harare, Zimbabwe) in 1908 (Wolcott, p.23); in

Bulawayo, Zimbabwe in 1915 (Wolcott, p.23); in Dar es Salaam, Tanzania in 1936 (Pan, p.107); and in Dodoma, Tanzania in 1952 (Chalmers Wright, p.73). In all five cases, local authorities provided a central location, a lock-up store for equipment and supervision to ensure quality of the brews. Some provided the brewing equipment as well, while others merely rented out the stalls to women who were to bring their own pots and manterial inputs. The common objective of these five efforts was to supply sorghum beer in a way in which the production could be supervised by township authorities. All five of these efforts were apparently abandoned.

The reasons for discontinuing these efforts have not, unfortunately, been recorded in detail. Wolcott provides the most extensive explanation when he states with respect to the Bulawyo and Salisbury (Harare) efforts that, "the combination of rapid growth of the populations in the African townships and the initial success of the beer making enterprise encouraged the development of more efficient brewing techniques and facilities..." He continues later by saying that, "problems of both quality and quantity led inevitably to the modernization of the industry." (Wolcott, pp.23,74).

An attempt to flesh out this rather vague diagnosis leads one to believe that these attempts were abandoned for a number of reasons. First of all, many of the cost advantages enjoyed by home brewers were lost in the centralized city brewery locations. The

brewers were not able to fit brewing in around other household chores. They incurred transport costs to and fro. The advantage of fungibility of inputs such as water drums and containers, normally around the household and freely available for brewing, was lost (Lipton 1980 particularly points out this advantage of brewing at home); and full-time equipment had to be supplied at the central brewing location. Second, the local authorities likely found it unwieldy to try to supervise a dozen women with different schedules and procedures and who, perhaps, brought small children to tend while working. This attempt at centralization of home brewing was inconvenient for both the brewers and the local authorities, and it is difficult to see how such an approach could be made to work. This is certinly an important conclusion for other countries. Any attempt to legislate and centralize large-scale, government supervised home brewing efforts is probably doomed to failure.

5. Recommendations for Other Countries

One important recommendation has been derived from the previous policy discussion: attempts to centralize large numbers of home brewers under government supervision are not likely to work. Beyond this conclusion, a number of important policy recommendations can be derived from the Botswana case study for application in other Sub-Saharan African countries.

i. Governments should promote the use of trade malt by home brewers.

The use of trade malt will increase the incomes of brewers; it will help to standardize brew quality and can lower aggregate grain use in home brewing by up to 35%. In a country such as Upper Volta, where 25% of all local sorghum goes into beer production, this amounts to a decrease in grain consumption of 9% nationally, not an insignificant figure for a government which, like so many others, is striving for food security.

For most countries, adopting this recommendation will require the establishment of a trade malting industry. In doing so, governments will be able to draw on a generation of technical research on sorghum malting. This research has been concentrated in South Africa, a country with whom most of Black Africa will refuse to do business. Zimbabwe, therefore, seems the most likely useable source of technical assistance. The most straightforward approach would be to invite bids from several Zimbabwean companies to set up a joint venture trade malting business. An important part of promoting trade malting would be the establishment of a small laboratory which would randomly check batches of trade malt and rate them in diastatic units. The establishment of technical standards would go a long way towards helping brewers improve the technical sophistication and consistency of their brewing.

In countries such as Upper Volta, where a home malting industry

has arisen, an appealing notion is that of upgrading the home maltsters into trade maltsters. This approach, unfortunately is not likely to work. The production of trade malt often requires specialized equipment which is very inexpensive by international standards but is several orders of magnitude in excess of the investment capital available to home maltsters. Beyond the capital constraint is the fact that an important step in trade malting involves the use of formaldehyde, and it is probably best to keep this chemical in specialized malting yards and out of hundreds of home maltsters' kitchens.

ii. Experiment with creative marketing of home brewed sorghum beer.

The objective of this effort is to combat the status image of factory-produced clear and sorghum beers. There should be ways in which marketing techniques can be used to promote the sale of home-brewed sorghum beers. For example, companies in Southern Africa have devised simple, colorful draught containers for sorghum beer. They are easily washed and reusable. It might well be possible to initiate retailing of home-brewed sorghum beer in draught in local licensed bars in order to compete directly with clear beers or, where it is produced, with factory-brewed sorghum beer. Attractive draught containers could perhaps be supplied by the malting company with a blank space for individual brewer logos. Very small regional breweries in the U.S. have survived on high quality and limited geographic distribution. With standardized

inputs, it is possible that a certain number of home brewers could do the same thing with sorghum beer in Africa. This would be easy to do, and the dividends could be substantial.

iii. <u>If no factory-brewed sorghum beer is currently produced, it should not be allowed in</u>.

The principal conclusion of the Botswana case study is that factory brewing is more costly, more capital intensive and creates far less employment than does home brewing. Countries which have thus far been spared the economic dislocation created by factory-brewed sorghum beer should be advised to forbid its manufacture from the start. Of course such a decision should only be taken based on economic calculations similar to the ones performed for Botswana. This, however, should be easily done. Since the technical coefficients can be taken from this thesis, only local prices need be substituted in. Under most conceivable price structures, however, home brewing will prove to be economically far superior to factory brewing. It is only in countries in which the opportunity cost of home brewing labor is very high that factory brewing might be found to be the more attractive method of producing sorghum beer. Given the large employment problems in much of Africa, it is hard to imagine a situation in Sub-Saharan Africa in which home brewing would not be by far the more attractive economic option for producing sorghum beer. As suggested in an ILO report, "The brewing of corn (sorghum) beer on an industrial scale ... should not be contemplated without investigating the possible

displacement of labor in the informal brewing sector." (ILO 1978, pp.69,71).

iv. <u>If factory-brewed sorghum beer is already sold, it is critical to keep its retailing in the hands of home retailers</u>.

The Botswana case study has shown that 45% of all value added by factory-brewed sorghum beer is earned at the retail level (caculation from Table 7.3). Thus, the magnitude of the retailing revenues are such that displaced home brewers could, if permitted, recoup a substantial portion of their lost income by retailing factory-brewed sorghum beer. In order to ensure home brewers access to factory brew to retail, legal statutes should clearly state that home brewers are free to retail factory-brewed sorghum beer. Some registration system may be deemed desirable, but in no case should a government allow a small group of wealthy traders to dominate the retailing income derived from the sale of factory-brewed sorghum beer.

These four conclusions are straightforward, and they have the potential to generate tremendous economic gains to most countries in Sub-Saharan Africa. Certainly all the 18-or-so countries at Stages 1 and 2 in the sorghum beer evolution stand to make substantial gains by implementing these recommendations, recommendations derived from a detailed analysis of the situation in Botswana.

C. METHODOLOGICAL IMPLICATIONS

In the practical work of industrial planning and policy formulation, industrial organization literature has most often turned to industry studies using the now-standard structure-conduct-performance paradigm. The present case study has adopted an approach slightly different from that of the standard industry study. Instead of an "industry study" this case study has been constructed as a "subsector study".

The distinction embodied in the subsector label is that it highlights the nature of vertical linkages in a sub-component of the economy. The underlying logic of this approach is a belief that, in many cases, vertical relationships critically influence the efficiency, dynamics and general functioning of economic agents involved in the chain of activities which supplies a given final output. The use of the subsector terminology is important in carrying out analytical and prescriptive work in industrial organization for two principal reasons.

First of all, the subsector terminology brings to the fore the vertical relationships in an economic subsystem. The use of the term "industry study" focuses the attention of the analyst on the tip of the iceberg, the market for the final goods in that industry. On the other hand, use of the subsector framework requires that, in

designing a research program, the analyst trace out and have a good feel for the nature of both the horizontal and the vertical flows within the subsystem under review. The analyst is, thus, forced to consider the vertical flows and to include them in the research program if they differ markedly among producers of final goods, if they appear to be changing or otherwise influencing the performance with which the final output is supplied. It must be said that many good industry studies (see for example Bain (1961) and White (1969)) have delved beyond the final output market and explored backward vertical linkages in some detail. This has not always been done, however; and vertical relationships often do play an important role in affecting overall performance. At least in the initial stages of outlining a research program, an analyst should always be forced to trace out the vertical flows in a system and determine which, if any, will be important to include for study. Ultimately, a purely horizontal industry study may be appropriate for answering the question of particular concern. However, such a delineation should be explicitly made after having examined the complete network of product and service flows first. A great strength of the subsector approach is that it forces the analyst to explicity consider vertical links in designing the research program.

A second factor in favor of the subsector approach is that the strict definition of an "industry" has led numerous scholars to provide misleading analyses of economic efficiency in comparing

different techniques of production. This has been a particular problem in the case of developing countries where many small producers are integrated producer/retailers. The common comparisons of integrated small-scale producer/retailers with large-scale producers who retail through other firms can lead to sizeable biases. In the present case study, the magnitude of the bias has been measured and is presented in Table 7.7, Row 4. From this table it can be seen that economic returns to capital, when estimated for factory production alone, represents an underestimate of nearly 50% compared with the aggregate subsector returns generated in production plus retailing. An analyst focusing exclusively on production would have arrived at a conclusion that dramatically underestimated the economic viability of factory brewing. Use of the subsector framework is a good guarantee against the all too common misleading and inapproapriate comparisons that have been made.

D. SUMMARY

This thesis revolves around the case study of sorghum beer in Botswana. Home brewing of sorghum beer has been an important part of the social life and diet in Botswana for many centuries. Within the last 50 years, this age-old craft has become commercialized; and today cash brewing is the most important female-dominated business activity in the country. In the last 15 years, factory-brewed sorghum beer has become available in large quantities in Botswana; and it has been making steady inroads in the market share formerly held by the home brewers. Home brewing of sorghum beer has declined in both absolute and relative terms since the introduction of factory-brewed sorghum beeer. In value terms, factory-brewed sorghum beer has increased its market share from zero in 1964 to 48% in 1981, and it is still gaining ground at a rapid rate.

The subsector approach was the analytical framework used in analyzing these trends in Botswana's sorghum beer market. By emphasizing vertical levels in the subsector - levels such as malting and retailing in addition to brewing - the subsector approach highlighted a number of areas of key importance to the dynamics of the subsector. It also enabled an accurate estimation of the aggregate economic performance within the subsector.

The economic impact of the decline in home brewing has, in

fact, been substantial. Economic returns to capital, aggregate employment and national income have all declined substantially, and the country's income distribution has become increasingly skewed. These trends run contrary to every major economic objective of the Government of Botswana.

Given the current wage structure, the economic base in Botswana and the rate at which they are evolving, home brewing of sorghum beer will remain economically more viable than factory brewing for some time to come. Home brewing will have an important economic role to play in Botswana's industrial profile for about the next 10 to 20 years.

A number of policy recommendations are offered which aim at increasing the economic benefits derived from the existing sorghum beer market. First, income to home brewers of sorghum beer can and should be increased by the provision of high quality malt which will increase their technical efficiency and raises profit margins. Second, home brewer access to retailing of factory-brewed sorghum beer must be assured, as it is critical to efforts aimed at preventing further deterioriation in income distribution in the sorghum beer subsector. In addition, the further expansion of factory brewing should be limited through the selective allocation of manufacturing licenses. Finally, substantial cost reduction to consumers can be achieved through increased use of bulk containers in the retailing of factory-brewed sorghum beer.

Many other African countries also house large sorghum beer markets. In most of West, Central and East Africa, factory brewing of sorghum beer has not developed to nearly the extent that it has in Botswana. By learning from Botswana, those countries can avoid much of the economic cost and social dislocation that has accompanied the rise of factory-brewed sorghum beer in Botswana. Various recommendations are made for these other African countries. They revolve around the development of a high quality malting industry to increase the technical efficiency and profits of home brewers and to decrease the aggregate grain requirements in national sorghum beer production. Another recommendation is that, subject to cost calculations using country-specific prices, it would normally be wise to forbid the introduction of factory-brewed sorghum beer.

The reason for the decline of home brewing in Botswana does not square well with commonly advanced explanations for the diminishing importance of household manfuacturing in the general process of industrial evolution. Economies of scale do not favor factory brewers of sorghum beer in Botswana; home brewers, in fact, can produce at lower cost than can the factories. The use of market power by the large breweries has not been a major problem for Botswana's home brewers, contrary to what has been found elsewhere. Also unlike the situation in many places, government policy in Botswana has not favored the development of the large-scale factory sorghum beer breweries. On the contrary, the net impact of

government policy has probably been favorable to the home brewers.

The key to the decline of home brewing in Botswana lies in patterns of consumer demand. Home-brewed sorghum beer, although of higher nutritional value and of taste and thirst-quenching power equal to that of factory brew, appears to have a negative income elasticity of demand past the modest income level of P5,000 per year. On the other hand, the income elasticity of demand for factory brew appears strongly positive. The factory-brewed sorghum beer is attractively packaged and offers consumers a low cost method of conspicuous consumption.

This diagnosis likely holds true for a range of household products such as soap, cereal and other prepared foods. In these markets, attractively packaged factory goods commonly displace the products made in households despite higher quality in the home-made goods. The policy implications are that interventions may have to be focused directly at the image problem through truth in advertising laws or creative marketing assistance for home and small producers. In extreme cases, it may be necessary, through taxation or licensing restrictions, to limit distribution of a factory-produced good to prevent its fashionable image from driving the small producers out of business.

Finally, and probably most importantly, the case study provides evidence confirming the potential for economically viable household industries. Thus even today, given the wage and price structure in many developing countries, some of the household and artisan industries have the potential to play an important employment and income generating role without sacrificing economic efficiency.

APPENDIX A

SURVEY METHODS AND SAMPLING

APPENDIX A

The field work for this study took place between March and July of 1982 and included interviews with the complete range of actors in the sorghum beer subsector, from input suppliers to retailers and from the smallest home brewers to the large factory breweries. The attached schematic, Figure A.i, displays the numbers of participants interviewed at each level within the sorghum beer subsector. As can be seen from this diagram, small numbers made it possible to completely enumerate domestic factory brewers of sorghum beer, trade maltsters, urban millers and importers of factory-brewed sorghum beer. Actors of relatively minor importance - such as traders, village millers and wholesalers - were not completely enumerated. The one wholesaler supplying Botswana Breweries was interviewed; and in each locality surveyed, several traders and millers were selected at random for interviewing.

Home brewers and retailers are far too numerous for all to be interviewed. A two-stage sampling procedure was, therefore, adopted for selecting those to be visited. In the first stage, a number of localities were chosen for intensive study; and then, within each locality a number of brewers and retailers were selected for interviewing.

Five localities were selected for intensive study. They were chosen from the stratified sample frame described in Table A.1 in which localities were stratified according to two important characteristics: 1) type and size of locality; and 2) whether or not the location had access to factory-brewed sorghum beer. One

FIGURE A.i

SURVEY SAMPLING FRACTIONS
(x/y = sample size/population size)

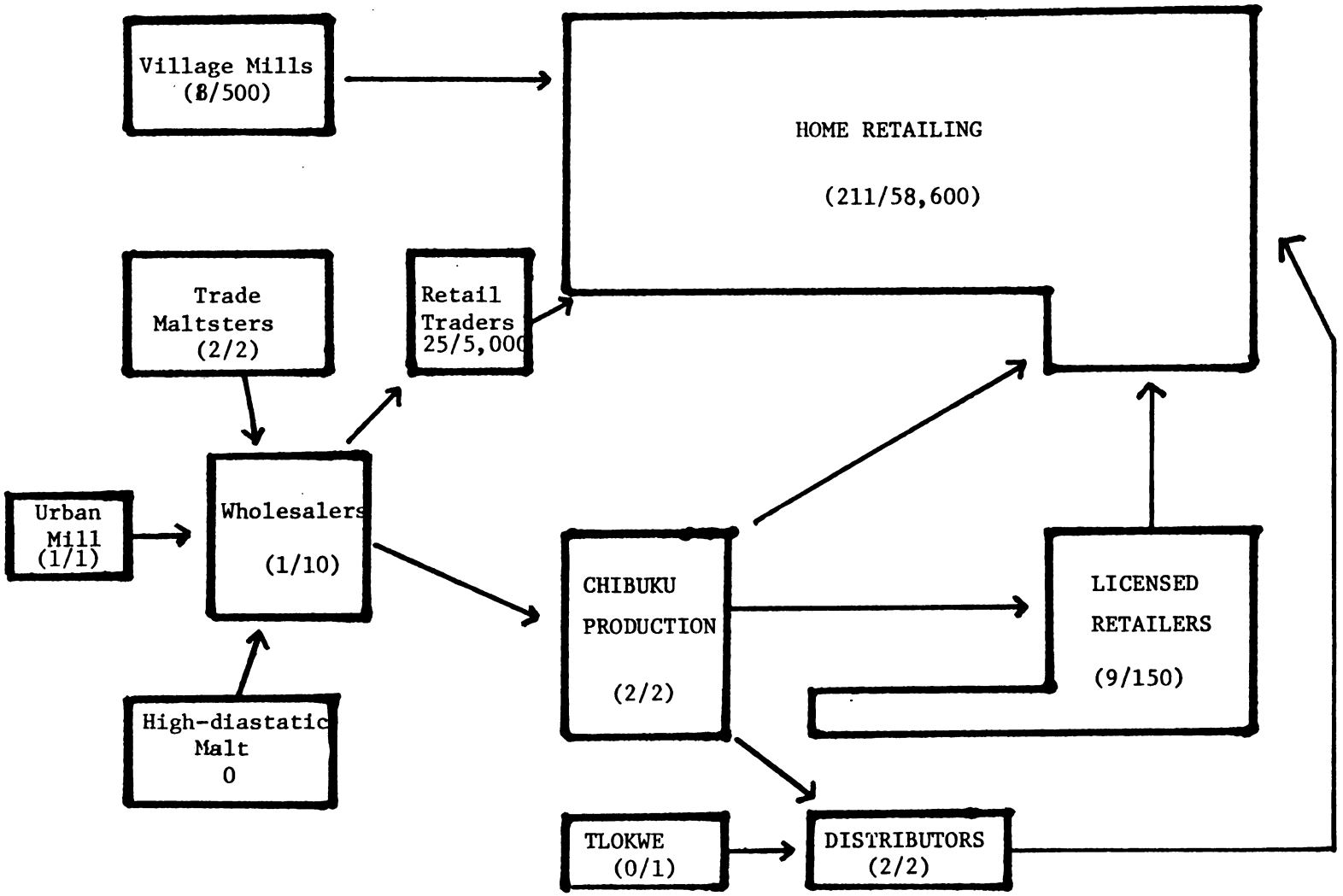


Table A.1

SAMPLE SELECTION

Population Characteristics			Sample Characteristics			
Type of locality	Number	Population	Locality Selected	Population	# HH Interviewed	# Lic. Retailers
Urban area, with a. factory-brewed sorghum beer	6	150,000	Gaborone	59,700	75	3
Major village						
b. with factory-brewed sorghum beer	7	127,300	Molepolole	20,700	65	5
c. without	1	15,000	Maun	15,000	86	0
Small Village						
d. with factory-brewed sorghum beer	59	64,300	Serule	1,102	51	1
e. without	1,127	578,700	Ranaka	1,926	27	0
Total	1,200	930,000	5	98,428	304	9

locality was chosen from within each of the five cells so delineated. The localities were selected randomly and with probability proportional to population. Within each of the five cells, therefore, each retailer and household had an equal probability of selection. The localities chosen through this procedure were Gaborone (urban area with factory-brewed sorghum beer), Molepolole (major village with factory-brewed sorghum beer), Maun (major village without factory-brewed sorghum beer), Serule (small village with factory-brewed sorghum beer) and Ranaka (small village without factory-made sorghum beer).

Having selected the localities, it was necessary to identify the specific brewers and retailers to be interviewed. In small villages the process adopted was as follows. One and a half weeks were spent interviewing in each village, and during that period all establishments retailing sorghum beer - both licensed or unlicensed - were interviewed. Since retailers of home-brewed sorghum beer produce their own beer to sell, this means all women brewing sorghum beer during that one and a half week period were interviewed. In addition to the brewers and retailers, a random sample of non-retailing households was interviewed as a control.

In the major villages and urban areas, a slightly different procedure was followed. All the major villages and towns were so large that a complete enumeration of home brewers and retailers was not possible within the two weeks available for the study of each

locality. Each locality was carefully explored before any interviewing took place. The locality was then zoned into areas of high, medium and zero brewing and retailing activity. Using population census maps, the high and medium zones were further divided into a number of homogenous areas, each of which could be reasonably studied during the time available. One unit from among the high-activity areas and one unit from the medium-activity areas were selected. Both were chosen at ramdon and with probability proportional to popultion. Within each selected area, all establishments brewing or retailing sorghum beer during the weeks of the survey were interviewed. In addition to those brewing and selling that week, a random sample of non-retailing households was selected and interviewed as a control. Since the licensed retail outlets are not numerous in any one locality, all of them were interviewed in the localities chosen for interviewing.

Ultimately, this sampling procedure resulted in the interviewing of 9 licensed retailers of factory-brewed sorghum beer as well as 304 individual households. Of the 304 households, 119 were home brewers of sorghum beer, 47 were home retailers of factory-brewed sorghum beer, 89 produced and retailed home-made liquor other than sorghum beer (this was primarily khadi), 21 retailed clear (european) beer and spirits, and 93 were non-brewing, non-retailing households. The total of these figures exceeds 304, because some households retailed more than one type of liquor.

While this procedure involved a several-tiered system of stratification, it was necessary in order to produce a sample with representation from among all the interesting classification groupings in the subsector. Because all households and retailers were selected randomly, it is possible to apply statistical tests of significance based on the data obtained. Further, unbiased estimates of critical population values can be obtained from the sample.

APPENDIX B

DETAILS OF FINANCIAL BUDGETS

Table B.1

DETAILED FINANCIAL BUDGETS FOR THE PRODUCTION AND RETAILING OF HOME-BREWED SORGHUM BEER, BOTSWANA 1982

	Home Brewing with Home-Made Malt			Home Brewing with Trade Malt			Aggregate Home Brewing Budget (70% home-made malt, 30% trade malt)
	Quantity	Price/Unit	Value	Quantity	Price/Unit	Value	Value
1. REVENUE							
a. Sorghum beer	100 liters	.0975*	P 9.75	100 liters	.0975	P 9.75	
b. Byproducts							
- husk (moroko)	2 buckets	.30	.60	1 bucket	.30	.30	
- grain residue (dintshe)	2 kg.	.205	.41	2 kg.	.25	.50	
Total			10.76			10.55	10.70
2. EXPENSES							
a. Raw materials			5.79			5.32	
- malt	18 kg.	.205	(3.69)	8.8 kg.	.39	(3.43)	
- grain	7 kg.	.205	(1.44)	6.9 kg.	.25	(1.73)	
- milling	25 kg.	.02	(.50)	0	n.a.	(0)	
- firewood	20 kg.	.008	(.16)	20 kg.	.16	(.16)	
b. Production labor & retailing	7.5 hours	0	0	5.5 hours	0	0	
"	4 "	0	0	4 "	0	0	
c. Depreciation	P 96	n.a.	.15	P 96	n.a.	.15	
Total			5.94			5.47	5.80
3. PROFIT PER 100 LITERS			P 4.82			P 5.08	P 4.90

* The standard Price of P .13 per liter is multiplied by .75 to reflect the fact that roughly one-fourth of each brew is given away for free tasting. P .13 x .75 = .0975.

Sources: Survey interviews with 53 home brewers using home-made malt and 54 home brewers using trade malt.

Table B.2

DETAILED FINANCIAL BUDGETS FOR THE PRODUCTION OF FACTORY-BREWED SORGHUM BEER, BOTSWANA, 1982

	Bulk Beer			Packaged Beer	Aggregate*
	Quantity	Price/Unit	Value	Value	Value
1. REVENUE	100 liters	.12	P 12	P 17	P 16
2. EXPENSES					
a. Raw Materials			4.33	4.33	4.33
- malt	3.2 kg.	.36	(1.15)	(1.15)	(1.15)
- grain	12 kg.	.21	(2.52)	(2.52)	(2.52)
- coal	n.a.	n.a.	(.13)	(.13)	(.13)
- lactic acid, yeast, misc.	n.a.	n.a.	(.53)	(.53)	(.53)
b. Production Labor	.9 hrs.	-	.09	.09	.09
c. Depreciation & Overheads	-	-	1.49	1.49	1.49
d. Packaging Costs	-	-	0	4.26	3.41
e. Distribution Costs	-	-	1.35	1.35	1.35
Total			7.28	11.52	10.67
3. BEFORE-TAX PROFIT PER 100 LITERS			P 4.72	P 5.48	P 5.33

* Aggregate production refers to the current composition of output which 80% cartoned and 20% bulk beer.

Source: Interview with Botswana Breweries staff and consultation of Botswana Breweries' published accounts.

Table B.3

BUDGET FOR LICENSED RETAILERS OF FACTORY-BREWED SORGHUM BEER, BOTSWANA 1982

1. Revenue

19,980 liters/year = 133,000 liters/year on average
150 licensed retailers

80% = packaged beer = 106,440 liters @ P .25 =		26,600
20% = bulk beer = 26,600 liters @ P .14 =		+ 3,724
Total annual revenue		P 30,324

2. Costs

a. sorghum beer at wholesale price 106,400 @ .17 26,600 @ .12	21,280
b. wages	
1.33 workers @ 2.88/day x 310 days/year	1,190
proprietor 1 hr./day = 310 hours/year	0
c. retail license	70
d. depreciation 1 building, 20 m2 @ P130/m2 = P2,600 over 20 years	130
Total annual costs	P 22,670

3. Gross Annual Income 7,654

4. Net Annual Income
tax @ 35%, therefore net income = 7,654 x .65 P 4,975

5. Return on Capital
4,975/3,070 = 162%

6. Net Income as a Percent of Sales
4,975/30,324 = 16%

7. Net Profit per Liter
4,975/133,000 - 3.74 thebe per liter

Source: survey data.

APPENDIX C

DETAILED EMPLOYMENT AND INCOME CALCULATIONS

APPENDIX C

DETAILED EMPLOYMENT AND INCOME CALCUALTIONS

I. Overview

This appendix provides details on the calculations made in Chapter 7, Section A. In addition to a detailed verbal exposition on income distribution and sorghum beer, this appendix includes the following tables:

Table C.1. Standard Employment and Income Coefficients

Table C.2. Breakdown of Financial Value-added

Table C.3. Detailed Income Distribution Calculations

Table C.4. RIDS Evidence on Home Brewing and Income Distribution

Table C.5. Regression Analysis of Income Distribution

II. The Evidence

The most important quantitative evidence that will be brought to bear on subjects of employment, income and income distribution is displayed in Tables C.1 through C.5. Tables C.1, C.2, C.3 and C.5 summarize much of the evidence from the present study, while that in Table C.4 is derived from the Rural Income Distribution Survey (RIDS). Most of these tables are self-explanatory, although C.4 and C.5 do require some explanation.

The RIDS information in Table C.4 requires two comments. The first is that, in Table C.4, cattle ownership is used a a proxy for income levels. Cattle ownership is a standard measure of wealth in

Botswana. In rural areas at least, it is also a good proxy for income, since levels of cattle ownership correspond closely to income levels. This is evident from the RIDS data which indicate that in households that make up the bottom 10% of the income distribution, livestock accounts for 5% of total household income; for middle income groups in the 60th to 95th percentiles, livestock accounts for 32% of total household income; and for the top 3% of households, livestock contributes 64% of total income (RIDS, pp.97-100). The second comment on Table C.4 is a warning. The RIDS data on home brewing lump together all forms of home brewing - including sorghum beer, khadi and other home-brewed liquors. Since we are interested only in sorghum beer, these RIDS data must, therefore, be interpreted with some caution.

Much of the income distribution evidence from the present study is displayed in Table C.5. This evidence takes the form of three sets of regression equations in which three different dependent variables - LIQY, HBY, and CHY - were regressed on a number of explanatory variables. LIQY is defined as the proportion liquor-related income in total household income. This includes the retailing of home- and factory-brewed sorghum beer as well as other home-made liquors and other factory produced alcohol. HBY is the proportion of income from home-brewed sorghum beer as a percent of total household income. CHY is the proportion of income from retailing factory-brewed sorghum beer as a percent of total

household income. The explanatory variables used fall into four broad groups. The first group, indicating household income level, includes INC, total household income; FHH, a dummy variable equal to 1 if the household is female-headed and equal to 0 otherwise. The second group of right-hand-side variables represents wealth and includes the variables: CATTLE, the number of cattle owned by the household; CAR, a dummy variable equal to 1 if the household owned a motor vehicle and equal to 0 otherwise; and GLASS, a dummy variable equal to 1 if the house had glass windows and equal to 0 otherwise. The third category includes only the variable SCH, the number of school-aged children in the household. The final group of explanatory variables measures the household's access to grain and includes GRAIN, the number of kilograms of grain harvested by the household in the previous season and PLOW, a dummy variable equal to 1 if the household planted grain last year and equal to 0 if they did not. A simple linear function was estimated. One might expect the relationship between liquor-related income and total household income to have some curvature representing a rapidly declining importance of brewing income past a certain income level. Both semilog and hyperbolic functions are potentially useful here. Both were estimated, but linear version displayed in Table C.5 provided the best fit.

Before proceeding with an analysis of these equations, the low R^2 requires some comment. Cross-section data do not normally

generate high a R^2. These particular regressions are no exception, and this is due to two factors. The first is the omission of one important variable - education. Information on the education of the brewer as well as the educational level of the head of household would likely go a long way toward improving the explanatory power of these equations. Unfortunately, data on education were not collected during the survey work, so we are left with only a partial explanation of the differences in the economic importance of liquor selling to households in Botswana. The second reason for a low R^2 is that the income profile included in these regressions does not include households from the very richest segments of the population in major villages and in urban areas. This is because the first step in each locality surveyed was to walk through and carefully classify each neighborhood as an area of high, medium, low or zero home retailing activity. Because of a confined time schedule, areas with zero home retailing of liquor were excluded from the interviewing schedule. The areas of zero home retailing activity were clearly the very richest neighborhoods in the localities. Therefore, the survey data provide a profile of only poor and medium income households. If a number of the very rich households were to be included with, as they all have, zero income from the home retailing of alcohol, the R^2 in the income distribution equations would increase substantially as would the significance of the negative sign on the right hand side income variable. The data in

Table C.5 should, therefore, be seen as testing income distribution relationships between poor and medium income households only.

III. The Findings On Sorghum Beer and Income Distribution

In an effort to sort out carefully the current state of understanding, the relationship between sorghum beer and income distribution is summarized in the following seven propositions:

i. Earnings from factory-brewed sorghum beer accrue to people at all income levels but primarily to people at the very high end of the income distribution. This is clearly demonstrated in Table C.3. Profits from the production of factory-brewed sorghum beer are earned by a large foreign corporation, South African Breweries, and the Botswana Development Corporation (BDC). South African Breweries is a very profitable large corporation. Since 77% of the BDC stock is owned by the Government of Botswana, Table C.3 assumes that percentage of its earnings to be alocated among income groups as are general central government revenues. The remaining 23% of BDC stock, however, is owned by wealthy private organizations.

Retailing income is divided among all income groups, although the rich earn about half. They do so because licensed retailers are generally very wealthy traders, and they control the bulk of the retailing of factory-brewed sorghum beer.

The suppliers of inputs to factory brewers are also wealthy. Since the bulk of Botswana Breweries inputs are imported through local merchants, the commission charged by the importers represents

local value added, but it accrues almost exclusively to well to do traders. The situation is similar for services such as accounting and insurance which accrue to professionals who are very wealthy by local standards.

Finally, the government's impact on income distrubtion is more complex. While many expenditures, such as cattle subsidies and international airports, benefit mainly the rich, the Government of Botswana (GOB) is committed to a considerable volume of spending for health, education and infrastructure that aim to benefit the poor. The exact attribution of government expenditures is detailed in Table C.3.

ii) Home brewing and home retailing of sorghum beer constitute a larger percentage of household income for poor and medium households than they do for the wealthy. Syson (1972, pp.29,30) specifically indicates that sorghum beer income constitutes a higher percentage of total household income for the poor than it does for the rich. Curtis (p.20), Gulbrandson (p.11) and Modimakwane (p.41) strongly infer this is the case. In addition, both RIDS and the present study provide evidence of this. The RIDS data in the first row of Table C.4 show clearly that the poor and medium income households depend more on home brewing than do the rich. Home brewing accounts for 5% of household income for the very poor and only .1% of household income for the rich. It must be remembered, however, that in defining home brewing RIDS data lumps together both

sorghum beer and other types of home-brewed liquor, primarily a kind of local wine called "khadi". Evidence on the income distribution of khadi earnings is mixed, some studies indicating that khadi brewers are the very poor others indicating they are the middle income groups (Roe, pp.8,9). The present study indicates that the volume of khadi brewing is only about one-fourth that of sorghum beer. Therefore, a reasonable attempt to separate out sorghum beer from the RIDS "home brewing" data would merely invovle reducing the percentages in Table C.4 by 20 percent. Thus adjusted, the RIDS data would still present strong trend of greater importance of sorghum beer income for poor and medium households than for the rich.

Evidence from the present study also supports the conclusion that home brewing and home retailing of sorghum beer is more important to poor and medium income groups than it is to the rich. This is evident from the equations displayed in Table C.5. For all home retailing, and particularly for home-brewed sorghum beer, the coefficient on the income variable is significantly negative indicating that higher income households earn a lower proportion of their total income from sorghum beer than do the poor. This result holds even after taking account of the special situtation of female-headed households which are generally less well off than are male-headed households.

iii) Female-headed households are normally poor and more dependent on home retailing of sorghum beer than are male-headed households. Kossoudji and Mueller (1983) provide the most solid evidence on the first part of the proposition, that female-headed households have lower average incomes than do male headed households. The current study provides the strongest statistical evidence for the second part of the propostion, that the retailing of sorghum beer is of particular importance to those female-headed households. It is clear from Table C.5 that female headedness is statistically the most important household characteristic associated with home retailing of sorghum beer. On average, female-headed households earn 22% more of their income from home retailing than do male-headed households.

In addition to these two principal pieces of evidence are the observations of numerous other researchers. Among them, Curtis (p.20), Kjaer-Olson (1976, p.6), Schapera (1959, p.225), Egner (p.64) and RIDS (p.49) all indicate that female-headed households are particularly dependent on earnings from home brewing of sorghum beer. In addition, Kooijman (p.205), Kerven (p.6) and Sutherland (1977, p.13) indicate that female-headed households depend heavily on home brewing income, although they do not specify whether it is sorghum beer or khadi on which they depend. On the other hand, Kjaer-Olson (1980, p.45 and 1978, p.6), Syson (1973, p.46) and Vierich (1978, p.6) indicate that female-headed households are not

more likely to brew beer than are male-headed households. Our conclusion is that the weight of the evidence supports the contention that home retailing of sorghum beer is more important to female- than to male-headed households.

iv) Most home brewing of sorghum beer is done by poor and medium households. From the RIDS data in row two of Table C.4, it is clear that this is so. This is not surprising given that the great bulk of Botswana's population lies in the poor and medium income groups. The importance of making this observation explicit is that it can then be contrasted with a fallacious extension that is sometimes made, that poor and medium households are "more likely" to brew than are the rich. While this is true in urban areas, it is not so in rural localities areas, it is not correct.

v) In rural areas, all types of households - rich, medium and poor - are equally likely to brew or retail sorghum beer for sale. This conclusion is not unanimous as a review of the evidence indicates. Curtis (p.20), Modimakwane (p.41) and Lipton (Vol.II, p.178) indicate that the poor are more likely to brew sorghum beer for sale than are the medium or rich households. Gulbrandson (p.11) and Kjaer Olsen (1976, p.6) also indicate that the poor are more likely to sell "beer". They do not carefully define what beer they are referring to, but it is probably both sorghum beer and khadi. On the other hand, Roe (p.5) indicates, based on data from the Water Points Survey, that middle income households are most likely to brew

sorghum beer; while Kjaer Olsen (1980, p.45ff), Vierich (1979, p.95), Opschoor (cited in Roe, p.5), Vierich and Sheppard (1980, p.112) and Turner (p.9) all indicate that the wealthy households are more likely to brew sorghum beer than are poor and medium households.

A middle ground is held by both Syson (1972, p.29,30) and the Rural Income Distribution Survey (see Table C.4), both of whom indicate that all rural households are equally likely to brew sorghum beer for sale. Although the RIDS data lump together khadi and sorghum beer income, their data, displayed in rows 2 and 3 of Table C.4, show clearly that the percent of total brewing income for each income group is equal to their percentage of the overall rural population. Both Syson and RIDS were careful, year-long studies, and it seems safest to side with them in concluding that all categories of rural households are equally likely to brew sorghum beer for sale.

vi) In urban areas, however, it is definitely the poor and medium households that are most likely to retail sorghum beer. As indicated earlier, the sampling procedure for the present study eliminated the wealthiest income neighborhoods from survey interviewing precisely for this reason. The very wealthy urban inhabitants do not retail liquor to earn income. Women in these households are generally well educated and have very good jobs. They can earn more in wage employment than they can by running a

shebeen. There is little doubt that sorghum beer retailing is run only by the medium and poor households in urban areas.

vii) In major villages, home brewing of sorghum beer may be an important avenue through which women earn the money necessary to pay school fees for their children. Numerous researchers have associated beer brewing with the payment of school fees. Gulbrandson (p.11), Kooijman (1978, pp.92,205), Modimakwane (p.41) and Sutherland (1977, pp.4,5) have all made this connection. Sutherland, in particular, has suggested that young women from small villages often move to major villages for prolonged periods of time to brew sorghum beer and thereby earn the money they require to pay school fees for their children (Sutherland 1977, p.13). The data in Table C.5 provide statistical support for his hypothesis. It is only in the major village equation that number of school-age children is significantly correlated with high levels of home-brewed sorghum beer sales. This suggests that importance, over and above employment and income considerations, should be attached to home brewing income in major villages.

Table C.1

STANDARD EMPLOYMENT AND INCOME COEFFICIENTS
IN BOTSWANA'S SORGHUM BEER SUBSECTOR, 1982
(all figures per million pula of sales)

	Input supply	Production*	Retailing	Total
1. Total number of income earners				
- Home brewing	-	760		760
- Factory brewing	-	4.4	83 (home) 7 (lic.)	94.4
2. Full-time labor equivalents				
- Home brewing		34.5	20	54.5
- Factory brewing		4.4	6.1 (home) 7 (lic.)	17.5
3. Total value-added				
- Home brewing	P48,250	P49,000		P97,250
- Factory brewing	P21,859	P51,060	P58,235	P131,154

* Production Income includes profits, taxes and wages paid to production employees.

Source: Budgets constructed from interviews with 107 home brewers, with Botswana Breweries personnel and from Botswana Breweries published accounts.

Table C.2

BREAKDOWN OF FINANCIAL VALUE ADDED IN BOTSWANA'S SORGHUM BEER SUBSECTOR, 1982
(value-added in pula per million liters of beer)

	Home Brewing	Factory Brewing		
		Prodn.& Inputs	Retail	Total
1. Income Percentiles				
a. poor (1-60%)	47,024	22,937	14,729	37,666
b. medium (61-94%)	38,880	16,629	14,729	31,358
c. rich (95% +)	11,346	33,353	28,772	62,130
Total	97,250	72,919	58,235	131,154
2. Rural/Urban				
a. rural	92,258	19,559	34,752	54,311
b. urban	4,992	33,360	23,483	76,843
Total	97,250	72,919	58,235	131,154
3. Sexual Breakdown				
a. women	64,886	20,789	33,055	53,844
b. men	32,364	52,130	25,180	77,310
Total	97,275	72,919	58,235	131,154

Source: Budgets constructed based on interviews with 107 home brewers, with Botswana Breweries personnel and from Botswana Breweries published accounts. Income distribution categories taken from the Rural Income Distribution Survey, pp.97-100,111 and from Dahl, various tables. For details on the income distribution calculations, see Table C.3 and the ensuing discussion.

Table C.3

DETAILED INCOME DISTRIBUTION CALCULATIONS
FOR BOTSWANA'S SORGHUM BEER SUBSECTOR, 1982

	Income per Million Liters	Poor (0 - 65%)	Medium (65 - 95%)	Rich (96 +)	Source
1. HOME BREWING					
a. Production & retailing	P 49,000	61%	37%	2%	Dahl, Tables 1.5.17 - 1.5.20; use RIDS, p.111 to classify income percenti from cattle ownership
b. Inputs					
- sorghum	33,180	38%	51%	11%	RIDS, pp.97-101
- milling	3,150	0%	50%	50%	estimate based on interviews with mille
- gathering wood	1,600	66%	30%	4%	RIDS, pp.97-101
- trade malt	7,710	45%	23%	32%	estimate based on interviews with malts and on the following assumptions: a) th sorghum accounts for 47% of value added b) that 27% of value added is profit tc corporate owners; and c) 26% of v.a. ac to wage laborers
- maize meal	2,610	0%	0%	100%	estimate based on discussion with mill
Total	48,250				
2. FACTORY BREWING					
a. Retailing					
- home retailers	18,266	50%	50%	0%	estimate based on interviews with sheb
- licensed retailers	25,979	0%	0%	100%	estimate based on interviews with lic.
- tax paid by licensed retailers	13,990	40%	40%	20%	estimate based on 2 years service in tl Botswana civil service
Total	58,235				

Table C.3 (continued)

	Income per Million Liters	Poor (0 - 65%)	Medium (65 - 95%)	Rich (96% +)	Source
2. FACTORY BREWING (cont.)					
b. Production					
- management wages	P 4,189	0%	0%	100%	estimate based on interviews with brewery staff and consultation with Botswana Breweries published accounts
- minimum wage workers	6,668	100%	0%	0%	"
- skilled workers	1,361	0%	100%	0%	"
- BDC domestic profit	13,004	40%	40%	20%	estimate as per distribution of GOB tax money
- private investors' corp. profit	676	0%	0%	100%	estimate based on interviews
- central government tax revenue	15,162	40%	40%	20%	estimate based on service with GOB
- beer levy	10,000	50%	40%	10%	"
Total	51,060				
c. Inputs					
- raw material suppliers	14,695	0%	0%	100%	estimate based on interviews with brewery staff
- services	7,164	0%	0%	100%	"
Total	21,859				

Table C.4

BOTSWANA'S RURAL INCOME DISTRIBUTION SURVEY,
EVIDENCE ON HOME BREWING AND INCOME DISTRIBUTION, 1974

	Number of Cattle Owned Per Household			
	0 - 9	10 - 80	80 +	Total
1. Percent of total household income	5.2%	1.6%	.1%	2.2%
2. Percent of total home brewing income	61%	37%	2%	100%
3. Percent of total rural households	64%	32%	4%	100%
4. Percent of total rural income	27%	46%	27%	100%

Source: calculations from Dahl's (1980) breakdown of the Rural Income Distribution Survey (RIDS) data, various tables.

Table C.5

REGRESSION ANALYSIS OF INCOME DISTRIBUTION

(Coefficients a - g from estimating equation)*

	a Income	b FHH	c Cattle	d Car	e Glass	f School Children	g Grain	h Plow	R^2
1. LIQY									
All areas	-.028 **	22***	-.003	-7.5	.43	-.12	-.11	-2.2	.13
Urban	-.019	19***	-2.4	-15	1.2*	-.70	.16	-11	.22
All Rural	-.013	19***	-.13	-12	2.5	-.07	-.02	-4.9	.11
- Major villages	-.046*	17***	-.65	-12	-1.4	2.2	-.02	-6.5	.13
- Small villages	.045	14***	-.72	.64	4.8	-.56	-.008	-3.9	.07
2. HBY									
All areas	-.05***	6.3**	.33	-3.6	6.2**	1.3	-.01	4.4	.10
Urban	-.01	6.7	-.56	-3.5	5.4	.81	.01	.46	.10
All Rural	-.064***	4.7	.43	-5.2	10*	1.5	-.014	2.4	.11
- Major villages	-.091***	4.6	.84	-1.1	14**	3.7**	.04	.04	.20
- Small villages	.02	.81	-.33	3.4	-3.5	-6.7	-.01	1.7	.02
3. CHY									
All areas	-.003	1.6	-.09	-2.4	38***	.18	.002	-2.9	.06
Urban	-.016	15**	-.12	-7.9	5.1	-.87	.15	-6.1	.17
All Rural	-.004	.17	.03	.02	-.83	.32**	-.001	-.48	.04
- Major villages	-	-	-	-	-	-	-	-	-
- Small villages	-.005	1.8	.05	.07	-1.8	.41	-.001	-1.3	.08

*Estimating equation is:

LIQY or HBY or CHY = constant + aIncome + bFHH + cCattle + dCAR + eGlass + fSchool Children + gGrain + hPlow

APPENDIX D

DETAILED CALCULATION OF ECONOMIC BUDGETS

This appendix provides a detailed breakdown of the calculations used in computing the economic returns displayed in Tables 6.7 and 6.8. The bulk of the background information required for the economic calculations is provided in the following tables:

Table D.1. Economic Budgets for the Production and Retailing of Home-brewed Sorghum Beer

Table D.2. Economic Budget for the Production of Factory-brewed Sorghum Beer

Table D.3. Economic Budget for Licensed Retailing of Factory-brewed Sorghum Beer

Table D.4. Economic Budgets for Home Retailing of Factory-brewed Sorghum Beer

Table D.5. Economic Value Added from Input Suppliers.

These tables are built up from the financial budgets in Chapter 6 into which shadow prices have been substituted for market prices. The following discussion explains in detail how the shadow prices have been obtained.

The prices of the following six inputs diverge from their market prices: i) home brewers' labor; ii) minimum wage labor; iii) retail management labor; iv) sorghum; v) trade malt; and vi) capital. The shadow price of each is computed in the following few pages.

i) Home brewing labor, the unpaid labor of the brewer or her family members, has a market price of zero. The opportunity cost of that labor, however, is estimated to be 72 thebe per day. This estimate is likely on the high side, since the vast majority of home brewers - in fact, 90% of those interviewed - indicated that, other than brewing, they have no means of earning income. This is not surprising given the tremendous unemployment problem that currently exists in Botswana (see Lipton, 1978) and given the fact that most brewers live in rural areas and are generally poorly educated (see Tsimako, 1983) making them probably the least employable members of the population. In addition, most women have substantial family obligations, and it is difficult to find other income-earning opportunities that can be woven in and around their household duties as beer brewing can. Ten percent of the brewers, nonetheless, did indicate they had other income-earning opportunities. Three percent of all home brewers interviewed indicated they could find wage employment, while the remaining 7% felt they could, if not brewing, find alternative self-employment in areas such as sewing and baking.

Given this background, the 72 thebe per day shadow price of home brewing labor was calculated as follows. The 3% of home brewers who could find wage employment would earn the minimum wage of P2.88 per day. The self-employed could earn about P4.08 per day (average earnings in female-dominated activities whose budgets are provided in Section 3.B of the Rural Industrial Officer's Handbook). While the 90% without opportunities probably have an opportunity cost very close to zero, a figure of 40 thebe per day has been used to indicate that, if not brewing, the women would likely be caring for children or in some other way increasing the welfare of their community. Using a weighted average of these three figures, we arrive at an opportunity cost of home labor of (.03) x 2.88 + (.07) x 4.88 + (.9) x .40 = P .72 per day.

ii) The labor of unskilled urban factory workers, who constitute a large proprotion of the work force in the factory breweries, also has a very low opportunity cost. Minimum wage regulations, however, raise the cost of that labor above its opportunity cost. The Ministry of Finance estimates that the opportunity cost of unskilled urban wage labor is 50% of the current minimum wage (Government of Botswana, March 1982, p.14). The shadow wage rate for minimum wage workers is, therefore, P1.44 per day compared to the P2.88 per day minimum wage.

iii) Management labor used in licensed retailing is another input whose opportunity cost must be estimated. While most of the

labor employed in the licensed sorghum beer outlets is unskilled minimum-wage labor, the proprietors are required to spend some time looking after their business, most importantly in regulating the flow of cash and stocks. As can be seen in Appendix B, Table B.3, it is estimated that proprietors must spend an average of one hour per day attending to their licensed sorghum beer outlets. They receive no salary for this; instead all the profits from the business accrue to them as income. Their labor, however, carries an opportunity cost that must be accounted for in assessing the economic returns in retailing. The opportunity cost of the proprietor's labor is estimated to be P5 per hour. This may well be conservative, since management labor is considered to be very scarce in Botswana. Botswana Breweries management personnel receive pay on the order of P10 per hour. A mid-level government functionary received P5 per hour, so this likely represents a conservative valution of the opportunity cost of that management input.

iv) The market price of sorghum grain is also slightly higher than its true opportunity cost. This situation has prevailed since 1981; because at that time, in order to encourage sorghum production, the Botswana Agricultural Marketing Borad (BAMB) raised their guaranteed minimum buying prices to levels above the price of imported sorghum from South Africa. The price differential in the 1981/82 cropping year was roughly 1 thebe per kilogram. For example, the Mahalapye shadow price of sorghum (computed as the

border price plus transport) was 19.5 thebe per kilo compared with the BAMB-set minimum market price of 20.5 thebe per kilo.

v) Trade malt also has a market price that is slightly above its shadow price. The gap between shadow and market prices is due primarily to the differential between the market and shadow price of sorghum, sorghum being the principal raw material from which trade malt is produced. The use of minimum-wage labor in trade malt production also contributes to the distortion of trade malt prices. In addition, it is important to know that the Ministry of Agriculture no longer allows the importation of trade malt (made with lower-priced South African sorghum), so home brewers buying trade malt in Botswana have no choice but to purchase locally-produced trade malt at a market price above that for which imports would sell. The shadow price of trade malt is estimated by assuming that the cost of sorghum accounts for 35% of the final cost of trade malt and that minimum wage labor accounts for 10% of final cost. After making adjustments for these two input prices, one arrives at a shadow price for trade malt of P.38 per kilogram.

vi) Capital is the final input whose shadow price requires discussion. In the economic analysis that follows, a 20% opportunity cost has been used for capital. This figure is obtained by taking the 6% real opportunity cost of capital recommended by the Ministry of Finance and Development Planning (Government of Botswana, March 1982, p.14) and adds to it the 14% annual rate of

inflation.

Adjustments for the opportunity cost of capital need to be made to both the initial stock of capital held by firms as well as to the flow of receipts and expenditures occurring over the course of the year. In explaining why two adjustments are necessary, it is important to remember that the following analysis uses nominal prices along with flow data over a one-year period as a basis for comparing returns in various techniques of production. We are making observations at the end of year 1 and trying to project into the future the net economic benefits to be derived from using each technique for ever more. In project evaluation, the standard formula for evaluating the economic worth of a stream of costs and revenues is as follows:

$$NPV = \text{sum } (Bt - Ct)/(1 + r + i)^t$$

where NPV is net present value, Bt is the revenue in period t, Ct is the cost incurred in period t, r is the real rate of interest and i is the rate of inflation. Normally, the initial stock of capital, Co, is not discounted; and all flows of revenue and expenses during each year are fully discounted at the rate (i + r). That is, the flows are taken as if they occurred on December 31st of each year. The flows are fully discounted even though they should technically only be discounted at a portion of the total annual discount rate. Flows in June, for example, should only be discounted at half the annual rate. For simplicity, however, many analysts take all the flows to the end

of the year (see Gittinger, p.351). While this may be a reasonable simplification in cases where one has flow information over the life of a project, it is less defensible in cases, such as the current one, where one year of flow information must be used to provide an accurate ranking of alternative projects - or in this case, alternative technologies. To use the standard simplification in the current case would bias the outcome against those technologies with the highest ratios of capital to net annual income. In an effort to avoid such a bias in comparing techniques of production, the following analysis discounts the flow of net annual revenue at 10%, half the annual opportunity cost of capital. Since must of the brewing and retailing activity is more or less even throughout the year, this effectively takes account of the fact that each businessperson has had the use of much of his or her revenue during the course of the year.

To summarize, two adjustments will be made in valuing economic revenues and costs in order to take account of the opportunity cost of capital. First, 20% of the initial cost of capital and start-up working capital required at the beginning of the year is deducted as the opporutnity cost of those funds. Secondly, 10% of the net annual income flows (revenue - cost) is added as a benefit to reflect the value of early investment or early consumption of those flows. The effect of these two adjustments is clearly laid out in Tables 1 and 2.

The effect of these six shadow prices on the economic budgets of sorghum beer producers is shown in the following tables. The economic

budgets, in turn, will be used to compute the figures appearing in Chapter 7, Tables 7.8 and 7.9, the tables which evaluate the economic performance in the sorghum beer subsector.

Table D.1

DETAILED ECONOMIC BUDGETS FOR THE PRODUCTION AND RETAILING OF HOME-BREWED SORGHUM BEER, BOTSWANA 1982

	Home Brewing with Home-Made Malt			Home Brewing with Trade Malt			Aggregate Home Brewing Budget (70% home-made malt, 30% trade m.
	Quantity	Price/Unit	Value	Quantity	Price/Unit	Value	Value
1. REVENUE							
a. Sorghum beer	100 liters	.0975	P 9.75	100 liters	.0975	P 9.75	
b. Byproducts			1.01			.80	
c. Compounded value of revenue flows			.40			.44	
Total			11.16			10.99	11.10
2. EXPENSES							
a. Raw materials			5.72			5.32	
- malt (incl. 2 hrs. malting labor)	18 kg.	.205	(3.69)	8.8 kg.	.39	(3.43)	
- grain	7 kg.	.195	(1.37)	6.9 kg.	.25	(1.73)	
- milling	25 kg.	.02	(.50)	0	n.a.	(0)	
- firewood	20 kg.	.008	(.16)	20 kg.	.16	(.16)	
b. Production labor	5.5 hours	.09	.50	5.5 hours	.09	.50	
c. Retailing labor	4 hours	.09	.36	4 hours	.09	.36	
d. Depreciation			.15			.15	
e. Opportunity cost of capital			.41			.41	
Total			7.14			6.52	6.94
3. ECONOMIC PROFIT PER 100 LITERS			4.02			4.47	4.16

Table D.2

DETAILED ECONOMIC BUDGETS FOR THE PRODUCTION OF FACTORY-BREWED SORGHUM BEER, BOTSWANA 1982

	Bulk Beer			Packaged Beer	Aggregate*
	Quantity	Price/Unit	Value	Value	Value
1. REVENUE	100 liters	.12	P 12	P 17	P 16
b. compounding of annual revenue flows					.43
					P 16.43
2. EXPENSES					
a. Raw Materials			4.33	4.33	4.33
- malt	3.2 kg.	.36	(1.15)	(1.15)	(1.15)
- grain	12 kg.	.21	(2.52)	(2.52)	(2.52)
- coal	n.a.	n.a.	(.13)	(.13)	(.13)
- lactic acid, yeast, misc.	n.a.	n.a.	(.53)	(.53)	(.53)
b. Production Labor	.9 hrs.	-	.05	.05	.05
c. Depreciation & Overheads	-	-	1.45	1.45	1.45
d. Packaging Costs	-	-	0	4.13	3.31
e. Distribution Costs	-	-	1.35	1.35	1.35
f. Opportunity cost of capital					1.04
Total					11.53
3. FOREIGN-EARNED PROFITS					1.45
4. DOMESTIC ECONOMIC PROFIT PER 100 LITERS					3.45

* Aggregate production refers to the current composition of output which 80% cartoned and 20% bulk beer.

Source: Interview with Botswana Breweries staff and consultation of Botswana Breweries' published accounts.

Table D.3

ECONOMIC BUDGET FOR LICENSED RETAILERS OF FACTORY-BREWED SORGHUM BEER, BOTSWANA 1982

1. **Revenue**		
19,980,000 liters/year / 150 licensed retailers = 133,000 liters/year on average		
a. 80% = packaged beer = 106,440 liters @ P .25	=	26,600
20% = bulk beer = 26,600 liters @ P .14	=	+ 3,724
b. compounded value of net income flows		670
Total annual revenue		P 30,994
2. **Costs**		
a. sorghum beer at wholesale price		21,280
106,400 @ .17		
26,600 @ .12		
b. wages		
1.33 workers @ 1.44/day x 310 days/year		595
proprietor 1 hr./day = 310 hours/year @ P5		1,550
c. retail license		70
d. depreciation		
1 building, 20 m2 @ P130/m2 = P2,600 over 20 years		130
e. opportunity cost of capital		
3.070 @ .20		614
Total annual costs		P 24,239
3. **Economic Profit**		6,755
4. **Return on Capital**		
6,755/3,070 =	220%	
5. **Net Profit per Liter**		
6,775/133,000 -	.05 thebe per liter	

Source: Interviews with 15 licensed retailers.

Table D.4

ECONOMIC BUDGETS FOR HOME RETALING OF FACTORY-BREWED SORGHUM BEER, BOTSWANA 1981

From Table 5.5, we know that the average home retailer of factory-brewed sorghum beer earns financial returns of P219 per year on a volume of 3,650 liters of beer. Three adjustments must be made to obtain economic returns from the financial figures:

1. opportunity cost of labor
   subtract 36.5 x 100 liters x 4 hrs/100 liters x .09/hr = P13.14

2. opportunity cost of capital
   k = 0

3. net income flows must be compounded
   add P219 x .10 = P22

The net economic profits from home retailing of factory-brewed sorghum beer are, therefore, P219 - 13.14 + 22 = P228/year or 228/36.5 = P6.25 per 100 liters. Because fixed capital and management labor are not required, returns to both these factors are infinite.

Table D.5

ECONOMIC VALUE ADDED FROM INPUT SUPPLIERS IN BOTSWANA'S SORGHUM BEER SUBSECTOR, 1981

(in pula per 100 liters)

	Fincial Value Added	Economic Value Added
1. Factory brewing		
a. raw materials	1.47	1.27
b. local services	.72	.60
c. wages	1.22	1.03
Total	3.41	2.90
2. Home brewing		4.95

Source: survey interviews.

APPENDIX E

DERIVATION OF FARREL AND COLS INDICES OF INEFFICIENCY

Derivation of Farrel and COLS Indices of Inefficiency

I. Farrel Indices

The Farrel indices of inefficiency were computed from the following cost equations:

1) Cost of beer made with home malt = .215 x Grain + .215 x Malt + .93

2) Cost of beer made with trade malt = .25 x Grain + .38 x Malt + .75.

Quantities of grain and malt are measured in kilograms, and the coefficients are prices given in pula. The equations are valid for production of a standard batch of 100 liters of beer. The .93 constant term at the end of the first equation includes the average costs of firewood, milling services, malting labor, depreciation and the opportunity cost of capital for a 100 liter batch of beer. The .75 in the second equation includes the cost of firewood and the depreciation and opportunity cost of capital for 100 liters of beer. For each brewer, total inefficiency was computed as the percentage difference in actual costs over minimum achievable costs. The decomposition of total inefficiency into its technical and allocative components was achieved by use of the isoquants displayed in Figures 7.b and 7.c. The frontier input levels were computed algebraically for each firm.

One caveat is must be mentioned concerning the Farrel indices of inefficiency: urban brewers using trade malt were only compared to the best-practice brewer using trade malt. All other brewers

were compared to the absolute lowest-cost firm which turned out to be a home brewer using home-made malt. Urban brewers do not have the option of using home-made malt, because sorghum grain (from which malt is made) is not normally sold in urban shops and because no service mills are available in urban areas for milling the malt once it is germinated and dried. Since urban brewers can only brew with trade malt, their level of inefficiency can only be computed with reference to the lowest-cost brewer using trade malt. Fifteen out of the total of 107 brewers fell into this category of urban brewers using trade malt.

II. COLS Indices

A. The Basic Equations

The Corrected Ordinary Least Squares (COLS) indices of inefficiency were computed from the following frontier cost functions:

3) Cost of beer made with home malt $= .052 \times Q^{.909} + .0093 \times Q$

4) Cost of beer made with trade malt $= .0433 \times Q$

where Q is quantity of beer brewed in a particular batch. These are Cobb-Douglas cost functions that were derived algebraically from the following Cobb-Douglas production functions:

5) Beer made with home-made malt

$$\ln Q = \underset{(.25)}{1.79} + \underset{(.10)}{.47} \ln GRAIN + \underset{(.10)}{.63} \ln MALT \qquad R^2 = .78$$

where the figures in parentheses are standard errors. To make the

largest residual zero, this average function was shifted up by .53. With the new intercept of 1.79 + .53 = 2.32, this function becomes the COLS frontier production function. Taking antilogs yields $Q = 10.11\ GRAIN^{.47}\ MALT^{.63}$. For a standard Cobb-Douglas production function, $Q = A\ G^a\ M^b$, the relevant cost function can be computed as $Cost = ((a+b)\ PG^{a/r}\ PM^{b/r})/(a^{1/r}\ (a^a\ b^b)^{1/r})$ where PG and PM refer to the prices of grain and malt, respectively and r = a+b or returns to scale. By substituting the estimated production function parameters from equation 5) along with prices into the above cost equation and then adding a term to incorporate the average costs of the non-material inputs yields the frontier cost function listed in equation 3).

6) Beer made with trade malt

a. unconstrained

$$\ln Q = \underset{(.16)}{3.2} + \underset{(.07)}{.40}\ \ln GRAIN + \underset{(.07)}{.27}\ \ln MALT \qquad R^2 = .66$$

The initial estimation resulted in the above equation which displays decreasing returns to scale. The sum of the coefficients is significantly less than one. Since technicians indicate that home brewing does, without a doubt, exhibit constant returns to scale, a revised estimation was performed constraining the sum of the input coefficients to equal 1.

b. constrained to constant returns to scale

$$\ln Q/M = \underset{(.04)}{2.46} + \underset{(.07)}{.55}\ \ln G/M \qquad R^2 = .54$$

The coefficients from the constrained Cobb-Douglas function were used in

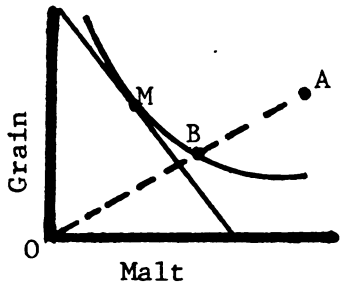
estimating the COLS indices of technical inefficency for home brewers using trade malt. In making this average production function into a frontier production surface, it was necessary to shift the constant term by 3.83. This made the largest residual equal to zero. The new intercept, thus, became 2.46 + 3.83 = 6.92. The frontier production function was translated into a frontier cost function by the formula described above, yielding the cost function described in equation 4).

B. Computing Indices of Inefficiency

In computing firm-level indices of total, technical and allocative inefficiency, three calculations are required for each firm. The first involves merely computing the actual cost of production, CA, incurred in producing that firms level of output. The second computation involves computing the absolute minimum cost, CM, achievable at that output level. This corresponds to the tangency of the isoquant and price line and is found from equations 3) and 4). The frontier cost function, after all, traces out the expansion path of such tangencies and indicates the cost achieved at those points for each level of output. The actual and minimum costs are represented by the costs at points A and M on the following diagram. The difference between CA and CM represents total inefficiency.

Figure E.i

Decomposition of Inefficiency



To break down total inefficiency into its constituent parts, it is necessary to compute the cost of production for a technically efficient firm using the same input proportions as the firm being examined. That is, one must compute the cost at point B in the following diagram. The cost at point B is computed by first determining the value of input coordinates at B. This is accomplished by computing the intersection of ray OA and the frontier isoquant derived from the production function. After the coordinates have been computed, they are merely weighted by input prices to determine the cost of production at point B. Call it CB.

The decomposition of inefficiency can then be calculated as follows:

Total Inefficiency = (CA - CM)/CM,

Technical Inefficiency = (CA - CB)/CM, and

Allocative Inefficiency = (CB - CM)/CM.

The results of these calculations are dispalyed on Table E.1.

Table E.1

INDIVIDUAL INDICES OF INEFFICIENCY
AMONG HOME BREWERS OF SORGHUM BEER, BOTSWANA 1982

Case No.	Total Inefficiency				Technical Inefficiency				Allocative Inefficiency			
	Home-made Malt		Trade Malt		Home-made Malt		Trade Malt		Home-made Malt		Trade Malt	
	Farrel	COLS	Farrel	COLS	Farrel	COLS	Farrel	COLS	Farrel	COLS	Farrel	COLS
1	0	.03	0	.06	0	.02	0	0	0	.01	0	.06
2	.03	.02	.06	.13	.02	0	.06	.06	.01	.02	0	.05
3	.04	.07	.13	.11	.03	.05	0	.09	.01	.02	.13	.02
4	.08	.12	.17	.19	.04	.08	.06	.19	.04	.04	.11	0
5	.11	.11	.20	.22	0	.11	.10	.13	.11	0	.10	.09
6	.13	.22	.23	.25	.09	.19	.05	.09	.04	.03	.18	.16
7	.13	.15	.23	.29	0	.03	.13	.26	.13	.12	.11	.03
8	.18	.19	.25	.29	.13	.19	.10	.12	.05	0	.14	.07
9	.19	.17	.28	.23	.15	.13	0	.04	.04	.04	.28	.19
10	.21	.21	.29	.25	.20	.20	.07	.24	.01	.01	.22	.01
11	.21	.21	.29	.36	.16	.21	.21	.24	.04	0	.08	.12
12	.26	.26	.30	.25	.19	.20	.05	.09	.07	.06	.25	.16
13	.28	.29	.30	.25	.23	.24	.05	.09	.05	.05	.25	.16
14	.31	.32	.30	.25	.23	.25	.05	.09	.08	.07	.25	.16
15	.36	.37	.30	.25	.36	.36	.05	.09	0	.01	.25	.16
16	.36	.37	.30	.25	.07	.34	.05	.09	.29	.03	.25	.16
17	.39	.50	.32	.30	.31	.50	.08	.12	.08	0	.22	.13
18	.39	.39	.32	.30	.39	.38	.22	.27	0	.01	.10	.03
19	.39	.39	.33	.32	.39	.38	.21	.23	0	.01	.12	.09
20	.44	.44	.33	.34	.43	.42	.12	.15	.01	.02	.21	.19
21	.44	.41	.38	.37	.40	.37	.14	.18	.04	.04	.23	.19
22	.44	.43	.40	.34	.43	.41	.12	.15	.01	.02	.28	.19
23	.47	.40	.40	.34	.36	.30	.12	.15	.11	.11	.28	.19
24	.52	.45	.46	.40	.51	.43	.23	.26	.01	.02	.23	.14
25	.52	.46	.47	.41	.47	.45	.25	.28	.05	.01	.22	.13
26	.57	.51	.51	.52	.55	.48	.34	.36	.02	.03	.17	.16
27	.59	.60	.54	.54	.55	.56	.53	.51	.04	.04	0	.03
28	.60	.60	.58	.51	.55	.56	.14	.26	.04	.04	.44	.25
29	.60	.60	.58	.51	.55	.56	.38	.40	.04	.04	.20	.11
30	.65	.59	.58	.52	.62	.57	.34	.36	.03	.02	.24	.16
31	.66	.65	.58	.52	.55	.55	.34	.36	.12	.11	.24	.16
32	.67	.60	.58	.57	.63	.51	.38	.42	.04	.09	.20	.15
33	.71	.68	.63	.62	.70	.67	.42	.46	.01	.01	.21	.16
34	.71	.69	.67	.67	.71	.67	.41	.45	0	.02	.26	.22
35	.74	.74	.67	.70	.70	.70	.33	.66	.04	.04	.33	.04
36	.75	.74	.70	.79	.70	.70	.42	.48	.04	.04	.28	.31
37	.75	.74	.71	.71	.70	.70	.68	.71	.04	.04	.03	0
38	.78	.74	.80	.77	.78	.73	.62	.65	0	.14	.18	.12
39	.78	.75	.80	.77	.78	.73	.62	.65	0	.01	.18	.12
40	.78	.78	.85	.78	.71	.72	.17	.44	.07	.06	.68	.34
41	.78	.78	.87	.87	.71	.72	.17	.50	.07	.06	.70	.37
42	.78	.78	.89	.88	.71	.72	.88	.85	.07	.06	0	.03
43	.78	.78	.94	.89	.71	.72	.77	.79	.07	.06	.17	.10
44	.78	.78	.95	.89	.71	.72	.27	.54	.07	.06	.68	.35
45	.78	.78	1.05	1.06	.63	.77	.86	.88	.14	.01	.19	.18
46	.78	.78	1.12	1.04	.71	.72	.84	.85	.07	.06	.28	.19
47	.93	.94	1.20	1.13	.79	.93	1.02	1.03	.14	.01	.18	.10
48	.97	.89	1.23	1.14	.92	.81	1.15	1.12	.05	.08	.08	.02
49	1.03	1.04	1.43	1.33	.62	.84	1.18	1.17	.42	.20	.25	.16
50	1.29	1.20	1.58	1.48	1.14	1.06	.24	.92	.15	.14	1.34	.56
51	1.47	1.37	1.61	1.62	1.43	1.32	1.14	1.30	.04	.05	.47	.30
52	1.55	1.45	1.65	1.64	1.52	1.41	1.45	1.43	.03	.04	.20	.11
53	1.81	1.70	1.70	1.59	1.69	1.50	1.50	1.48	.12	.20	.20	.11
54			1.88	1.77			1.66	1.64			.22	.13

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