INDUSTRIAL CAPACITY UTILIZATION IN ETHIOPIA

by

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ABSTRACT

Manufacturing output and employment losses due to underutilized equipment have been postulated as common in developing nations. This irrational use of existing capital and labour is examined with respect to Ethiopian industry. The basic hypothesis investigated is that capacity utilization is an important policy variable in its own right that can be used to manipulate (increase) output and employment levels.

An, essentially, physical index of capacity utilization is derived and fitted to statistical information on output performance from the "larger" Ethiopian enterprises. The nature of the index requires separate consideration to be given to issues of profitability when a move to increased utilization is contemplated. Variations in input prices prevent the assertion that a fuller use of existing capital will automatically reduce unit costs or increase rates of return.

Also, the nature of the index requires that economic factors contributing to underutilization receive detailed attention in their own right.

The method of information collection, first hand visits to plants, to Industrial Corporations, and the use of a questionnaire, is described both purposefully and prospectively.

Substantial underutilization is revealed. The principal causes relate to input supply deficiencies, particularly higher technical skill levels, and to aspects of demand deficiency. There is more scope for output gains than for employment gains since underutilization is often part and parcel of within production deficiencies that are not felt solely on utilization levels.

More aggregate economic parameters that might be expected to influence utilization levels, such as export sales, imported material input levels and capital intensities of production were statistically tested. The results were poor in terms of explained variation in utilization levels.

The significance of the findings is better realised when viewed against a larger backcloth than normally associated with capacity utilization issues per se. Severe structural deficiencies characterise Ethiopian manufacturing and remedies proposed for underutilization cannot properly be envisaged without this larger backcloth. Generally, this requires acccunt be taken of rationalized production aims and the means to achieval. These are delineated and examined with important linkages across and within industrial groups being made.

When thus considered, the importance of utilization as a policy variable, in its own right, is diminished in an Ethiopian context.

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NOTE ON TERMINOLOGY

"Capacity" or "Capital" Utilization

There is no strict differentiation between the terms "capacity utilization" and "capital utilization" as used in this study. The former is preferred since employment issues are a main consideration herein, and "capacity" appears more embracive for the inclusion of these issues.

On the other hand, employment changes are very contingent on changes in the intensity of capital use and some contributions on the subject have used "capital utilization" while discussing employment changes as one of the relevant issues. Rather than comment on this, the procedure, broadly, has been to follow the usage of individual contributors with the exact nature of the issue under discussion being clear from the context.

Herein, there are references to "capital utilization" where this is seen solely in the context of physical capital capabilities and time-intensities of usage. The references to "capacity utilization" would include this but are wider in scope as indicated.

The lack of a rigid, formal distinction does not detract from understanding in any way since, again, the context clarifies exactly what is meant.

PART A

THEORY

CHAPTER I

OVERVIEW of ISSUES and ORGANIZATION of STUDY

The intensiveness with which installed capital and available manpower are used in the manufacturing sectors of developing nations are important factors in the industrial performance of these nations. During the 1960's and 1970's there have been assertions that underutilization of productive equipment is a common and highly undesirable feature in developing nations. A (persistent) idleness of productive equipment would have adverse effects on the levels and rates of growth of manufacturing output and employment and would generally detract from the formation and building of a sound industrial programme. This sub-optimality in an ongoing industrialization process will, broadly, be the subject of detailed examination in the present study with the empirical content being drawn from the specific conditions found in the major sectors of Ethiopian manufacturing during and prior to 1975/76.

This introductory chapter has a two-fold purpose. First, a brief theoretical perspective on the effects of underutilization on growth and employment is given. This is followed by reports on the prevalence of underutilization and on commonly proposed causes. These issues occupy the first four sections of the chapter and their coverage lays no claim to being a review of all that has been raised in the past on the subject. Rather, these sections are designed to give some of the flavour of the assertions concerning the adverse effects and causes of under-utilization together with the benefits to be derived from a fuller use of existing resources.

Secondly, and drawing on the foregoing review, the aims and organization of the study are stated. The aims are stated in terms of a few principal hypotheses to be tested and the method of doing this is outlined in the organization of the study.

I.1 Utilization and growth.

Capital equipment, in general, has no time preference. The implications of this on growth can be examined by using a Harrod-Domar type framework. The equations to be used below can only bring forth causal directives if specific assumptions are made about the variables; in particular, which of these are to be regarded as independent. For example, in the Harrod model it is stated that the growth rate of income is equal to the proportion of income saved divided by the capital to output ratio. There is no implication that a high savings rate is the cause, as opposed to the result of development. The equations regarding rates of growth are no more than truisms.

This is stressed for two reasons. There exists a widespread dissatisfaction regarding the application of aggregate growth models, reflecting the socio-economic conditions and institutions found in an advanced industrial economy, to developing nations. On causality in particular, much of the argumentation hinges on the constancy or otherwise of the marginal capital to output ratio. This ratio is crucial since it helps determine the magnitude of additions to output. It does not say anything about causality in a Harrod-Domar framework.

The question arises as to why a Neo-Classical growth framework is not used since this would immediately dispense of the problem by virtue of the assumed variability in the capital to output ratio. It is an aspect of variability in this ratio which is to be examined here, not in the sense only of the capital intensity of the production techniques chosen but in the sense of variations in the degree of utilization of capital. This influences both returns to scale and returns to a single factor. Consider a simple statement of the production function in which output is represented as depending on the quantities of labour and capital employed. The former is measured in aggregate man-hours per unit time-period and the latter is measured at cost. In accord with the classical law of diminishing returns, when the ratio of one input to another varies, say the quantity of labour is increased while the quantity of capital is held constant, the relative productivities of the inputs should change in opposite directions. Only when the quantitities of both inputs are changed in the same direction can the effect known as "returns to scale" be discussed.

If changes in utilization are now brought in it is unclear whether this should be taken as affecting returns to scale or the productivity of a single factor. Increased utilization may have an effect similar to that of a change in scale. Simultaneously the ratio of capital to labour is altered. In the working of both of these, the method of production, as indicated by the relative combinations of capital and labour at any moment, is unchanged. Clearly, there is a need to extend the conventional static statement of the production function to incorporate the rate of utilization with the time-dimension element involved being made explicit.

As a heuristic device the Harrod-Domar model provides a more useful approach at this introductory stage to demonstrating the effects of increased utilization on growth since it may be expressed without reference to the production function.

The equilibrium of a Harrod-Domar type model is given in terms of a simple stock condition: the capital stock is used to capacity at all times. This assumption is basic to the production function version of the model which uses a constant output to capital ratio in its formulation.

A different economic exposition can be given by using the constant capital to output ratio approach. Here there is no assumption of a production function. Instead, for any given output, the capital stock desired by firms is a constant multiple of output.

In both versions the capital to output ratio is a constant coefficient of proportionality. In the first version with a constant (capacity) output to capital ratio, capacity output is derived from the earlier capital stock. In the second version the desired capital stock depends on earlier output. Even in modifications to the model, for example, by using the incremental output to capital ratio where the change in output is considered in relation to the change in capital stock, the capital output ratio and its reciprocal are constant.

A Harrod type formulation can be written:

$$g = s/v \qquad \text{(I.1)}$$

where g is the rate of growth of output,

s is the marginal saving rate, and,

v is the marginal capital to output ratio.

The growth rate given here is the "warranted" growth rate in the sense that it is the unique equilibrium which will maintain equality between savings and investment, ex-ante. In Keynesian analysis, the rate of growth of output given by the warranted rate could be less than the full-employment, Harrod's "natural", growth rate. In developed economies the warranted growth rate may not be sufficient to emply all additions to the labour force.

Assuming zero technical change, then the only source of increased capacity is increases in the labour force. This is the only source of productive employment in the economy. Capital stock grows with it. Should the labour force increase at the rate of four per cent per year, and capital and output increase at three per cent per year, it follows that 25 per cent of all additions to the labour force will be unemployed.

In Ethiopia, with its relative capital scarcity such an issue is premature in certain aspects. The Ethiopian capital stock, were it utilized to the maximum, could not absorb the existing unemployed. The issue here precedes the question of the concurrence or divergence of warranted and natural growth rates. The relevant question is whether the capital to output ratio approaches the maximum attainable level of capital utilization. The differences between these becomes clear if a distinction is made between capital as an asset (stock), and capital as a service (flow).

The entity being oonsidered in capital theory is the theoretical input of capital as a factor of production. Capital as an asset refers to the potential availability of inputs to production - capacity to add to output. Capital as a service reflects the actual input of capital to the production process and can be used to indicate the extent of, and changes in, capital utilization.

Investment, in its effect as part of aggregate demand, is a change in capital assets. In its effect as a capacity creating agent, as a factor of production, investment is a change in capital services. Apart from decreased utilization within the familiar Keynesian framework, in which deficient aggregate demand gives rise to excess capacity, modern growth formulations use capital stocks for both effects, and equivalence between capital assets and services is implied. This gives rise to the type of growth formulation exemplified above.

If utilization is now a variable it follows that the capital output ratio cannot be permitted in the form given for "v" in equation I.1, above. This is a stock concept, and investment, as a productive input, implies a change in capital flows. The equivalence of assets and services is broken and an alternative formulation of the growth expression is required. This may be written:

$$g = U.\ s/v \qquad (I.2)$$

where U is variable utilization (O U 1)

Further, let

$$Qp = U.K/v \qquad (I.3)$$

where Qp is the potential output in any period, and K is the existing capital stock.

A sustained increase in utilization, say from U to U^*, will not only raise the level of current output to:

$$Qp^* = U^*.K/v \qquad (I.4)$$

with the given capital stock, but will increase the rate of growth of output to:

$$g^* = U^*\ s/v \qquad (I.5)$$

Even allowing for a decline in the productivity of capital services, the productivity of capital stock will normally rise. Thus Kabaj (1965), reports that of the factors responsible for increases in industrial production in several Eastern European countries in the process of their development, the growth of output, during certain periods, owed more to better capital utilization than to new investment. Similarly, Kim and Kwon (1974), reporting on South Korean data for the period 1962-71,concluded that better capital utilization accounted for almost half of the increase in capital services during the period.

Increased capital utilization implies, inter-alia, an increase in the time-intensity of usage of plant and equipment. This, in turn, implies that more labour is required over time to operate the plant and equipment. The potential gains in growth of output are more appreciated when the employment gains are considered.

I.2 Utilization and employment

The whole importance of an ascribed rate of utilization to a given capital stock depends on the recognition that this rate cannot be raised unless previously unemployed labour is available to operate a more intensive shiftwork pattern. Should full-employment prevail, there exists, by definition, a sufficient capital stock at the ongoing, mean, rate of utilization to employ the full working population. An increase in the rate of utilization *per se* is impossible. In this situation the rate of capital utilization describes a somewhat superfluous relationship between the size of the capital stock and the size of the workforce. This means neither that capital is plentiful, nor that utilization ceases to be important. However, these two issues have more policy relevance in an advanced industrial economy where full-employment obtains. The country from which the empirical data is drawn for this study, Ethiopia, ranks among the poorest in the world on almost every social and economic indicator.

Scarcity of capital relative to labour is often taken as a defining characteristic of underdevelopment. In Ethiopia it may credibly be granted that the existing capital stock is not only insufficient to absorb additions to the labour force but can employ only a limited proportion of the currently unemployed pool of urban labour seeking work. In this environment it would be all the more surprising to learn that substantial scope for increased employment with the existing, meagre, capital stock remains.

An anomalous situation of this nature is exactly what has been hypothesized on the manufacturing sectors of many developing nations. The basis of this hypothesis lies in what is commonly called the utilization of capital.

The rate of employment creation is generally seen to depend on the rate of capital accumulation and technical change. The possibility now is of achieving an increase in the absorption rate of unemployed labour without additional net investment, without increasing (necessarily) the labour to capital ratio, or (necessarily) decreasing the productivity of capital.

Maximum output of a plant is essentially a function of capital productivity and machine hours. The productivity of capital is inherent in the nature of the installed plant in any factory. The amount of labour which can usefully be employed by a given machine, or machine group, is set within limits determined by diminishing marginal productivity. This applies at any point in time when the machine is in operation. If,however, a machine group is used for 40 hours per week, then the scope for increased output and employment within a unit time-period of one year can be substantial if the time-intensity of usage of capital, if the capital utilization rate,is increased. Kabaj (op.cit.) reports that the proportion of the total increase in employment due to better capital utilization was 59 per cent in Hungary,1949-52; 48 per cent in Poland, 1949-53; and 33 per cent in the USSR,1928-32. Similarly, Merhav (1971) reports that employment in Israel rose by 15 per cent in 1968 over 1966/67 levels. The latter years were a recessionary period with extremely low investment and little capacity being added to industry.

Finally, it was stated that capital, generally, has no time preference. Labour certainly has and it would be wrong not to recognise this. However, where consumption levels are already very low, and where the power to tax is already being evoked to the maximum,the possibility of obtaining increased investment through savings is remote. On the other hand,an increase in utilization rates offers the possibility of relatively "painless" increases in employment by means of an increase in the productivity of the capital stock. This necessarily entails the employment of labour outwith what may be regarded as normal,or socially desirable, hours of work. The question of what constitutes normal time work patterns is given attention later. For the moment it is noted that there is no reason a-priori for asserting that people will choose unemployment to working at nights or weekends.

I.3. Prevalence of underutilization

The results of several different studies on the extent of capital underutilization are summarized in Table I.1., below. This statistical data is provided to afford a rough perspective on the significance of capital utilization in several developing nations worldwide.

The table suffers from the obvious setback of non-uniformity in the measures of capacity. Depending on the definition of capacity that is selected,presumably on the basis of the particular set of questions to be answered and on the measurement procedure adopted, the utilization figures given could be altered upwards or downwards. Some of the examples may overstate the extent of utilization if capacity is taken as the maximum attainable output per unit time-period once due regard has been paid to physical and economic factors in the construction of the index. The indexes are often based on local norms. These norms reflect that country's prevailing work patterns. They are often less than developed country norms. Thus, if the rate of utilization is calculated on a one by eight hours shift per day basis then actual utilization may be less than one-half or one-third of the given figure if the potential exists for working two or three shifts per day.

TABLE I.1: CAPACITY UTILIZATION in SELECTED COUNTRIES

REFERENCE	COUNTRY and PERIOD	INDUSTRY COVERAGE	MEAN RATE of UTILIZATION (per cent)
Raghavachari, M.V. (1969)	India, 1967	75 per cent of all industrial production	67
Afroz, G. and Roy, D.K. (1976)	Bangladesh, 1974/75	Engineering and Shipbuilding	59
		Jute-hessian	68
		Jute-sacking	72
		Sugar Milling	58
Kim, Y.C. and Kwon, J.K. (1974)	South Korea, 1962-1971	Manufacturing	25
Institut Nationale pour la statistique et la recherche economique, Tananarive, (1966)	Madagascar, pre-1965	92 Industrial Firms	50
Novic, N. and Farba J. (1964)	Chile,	Modern Industry	60
U.N.I.D.O. (1971)	Central America, (1962) 1/	All Industrial capacity	About 75
I.L.O. (1967)	Sudan, mid 1960's.	Private Sector	15 to 30

Source: Table compiled from information in references cited.

Note: 1/ The countries are: Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

This could apply to the Raghavachari (1969) reference.

Again, capital utilization indexes based on electricity consumption may understate the actual utilization rate since the plants examined may obtain some of their energy requirements from direct sources such as oil fed boilers or generators. This could apply to the Kim and Kwon (1974) reference.

Finally, Table I.1 may conceal significant inter- and intra-industry differences. Any country rankings made on the basis of these reported rates would be meaningless.

I.4: Causes of underutilization

The causes of observed idle capacity form an integral part of the present study. For introductory purposes, and since proposed remedies are very contingent on observed causes, no more than a brief differentiation between major sources of underutilization as found in past literature, is attempted meantime.

Several sources can individually, or in combination, prevent a full - or fuller - use of productive capacity in a plant, sector or industry. On the demand side of the product in question, there might not be a sufficiently large market to absorb the output that a particular sector is capable of producing. Beyond the realization that demand is defective it will be necessary to ascertain why this obtains. Is the situation affecting a particular product akin to the Keynesian situation of deficient aggregate demand? Do the imposition of minimum technological scale economies dictate larger capacities being installed than the market can absorb? Does the existence of imperfect competition make operations at less than full capacity more profitable? Are there cyclical or rhythmical variations in demand patterns for certain output lines which cannot be served adequately from stock? Thus are a few of the issues which might require examination in pinning down exactly which demand factor(s) contribute to idle capacity in a particular sector.

On the input supply side of the production process, underutilization can result from shortages in one or more inputs ranging from raw materials to managerial or technical personnel. Beyond this, and as with demand factors, it will be necessary to specify the cause of the input supply deficiency.

From a straight physical viewpoint there may be an imbalance in the input-output capabilities of a machine or machine group relative to other machine groups in the same process. Even in a balanced set of operations there may be loss of output due to poor efficiency, the reason for which could be related to the capabilities of the machine - it may simply be old and run-down, or the reason may be derived from an input supply bottleneck in the form of technical personnel, for example.

Again, there may be problems in the distribution of output. A lack of transport facilities could prevent a fuller use of existing capacity.

The foregoing provides a sample of some factors which could contribute to underutilization in existing installations. It is important to realize the implication of the removal of these impediments. This, simply, is that a greater level of production, an increase in utilization, could be undertaken. If demand were to increase then, for example, a plant previously built for a certain capacity might now realize higher profits through the scale economies which become available. In this case the plant could be said to have been built ahead of demand on the basis of rational, ex-ante expectations. Similarly, the removal of an input supply bottleneck, or an improvement in transport facilities will result in increased utilization assuming that these adversities were the sole constraints on utilization or that a demand constraint, if it existed, were also removed.

This perspective on causes of underutilization begs questions on the concept and measurement of capacity. Already implicit is the need to reconcile or otherwise account for the physical and economic elements of capacity. Being an introductory chapter, we may be permitted to pause, look ahead and ask, question begging notwithstanding at this juncture, whether a full account of demand, input-supply, output and distribution factors, and machine capabilities, of a nature similar to that indicated in the above sample, would provide a comprehensive statement of all issues affecting levels of capacity use.

The reasons given above for excess capacity can be regarded in two, broad categories. Relating especially to demand factors, there are several situations which would cause productive flexibility to be built into a plant, and these would reflect a competent, rational response on the part of decision-takers. On the other hand, there is what may be termed, loosely at this stage, undesirable idleness. This is caused by rigidities and adversities occuring ex-post in the production process.

Beyond for example, building plant ahead of demand or providing for rhythmical fluctuation in demand, and beyond a raw material or technical personnel deficiency or physical imbalance, might not underutilization persist? Where excess capacity is prevalent in an industry for other reasons, an assessment of ex-ante investment decisions could well prove a revealing exercise. The possibility of obtaining a complete assessment of this nature is somewhat remote, both conceptually with respect to the type of questions which might be asked and empirically with respect to available knowledge in prevailing conditions in Ethiopia. Another approach is necessary.

Assume that entrepreneurs had some idea of market potential which influenced the size of plant they had installed. If not, there is no basis for matching the plant against the projected market for the product. It could transpire that variable cost elements dictated the installation of a plant size which, prima facie, exhibits large reserves of excess capacity. These reserves do not belong to the categories given above for productive flexibility since they are derived from a different subset of cost issues within the total set of costs.

What is being suggested is that where a mean rate of capacity utilization of, say, 30 per cent obtains in an industry then the large potential output that is being foregone by the owners and/or managers can be shown to be economically rational. It is more profitable to operate at this low utilization level, and the decision made in this respect reflects a competent response to factors affecting the plant's operation. A high premium on the return to labour for working at nights and on weekends could induce a low capacity utilization level. But a whole gamut of factors are involved, and these require much more than a narrowly defined costing exercise. Consequently they are deferred meantime.

The point is raised because in the construction of capacity indexes later in the study, the type of excess capacity which can be sensible from the plant operatives' point of view must be separated from that caused by, say, a Keynesian deficient demand situation. The distinction is necessary if proper due is to be paid to policy recommendations. Rational excess capacity can occur without or alongside the undesired idleness caused by a lack of market outlets.

Again, if a high return to labour were inducing a low capacity utilization level then the bottleneck, though arising on the input-supply side of the production process, does not refer to non-availability derived from, for example, physical shortage, lack of working capital or lack of managerial function and thus needs separate treatment from such bottlenecks. The use of labour prices as an example does not preclude the same consideration being given to inputs in general but shift payment differentials were learned to be exceptionally high in Ethiopia and these receive detailed examination later.

In summary, two separate issues are being examined. The starting point is with equipment which has been installed and with the possibility of increasing the intensiveness of its use. Associated with this are employment gains. The first issue relates to unpremeditated idleness caused by demand, supply, and other factors indicated in the first part of this Section. The second issue relates to idleness which is premeditated in the sense of being rational from the point of view of maximizing profits. Both of these will be subject to scrutiny herein.

I.5: Aim and organisation of study

The foregoing sections provided a brief guide to the issues involved in a consideration of utilization, growth and employment. An idea of the widespread nature of underutilization and of some commonly proposed causes were given also. This brought out the need to distinguish between different types of idle capacity so as to help increase the relevance of proposed policies. It remains to specify the aim and organisation of the study.

The basic hypothesis to be tested is that capacity utilization can be an important economic policy variable in its own right and can be used especially to influence the levels of manufacturing output and employment, all with respect to the current situation in Ethiopian industry. This requires that consistent measurements of capacity and its utilization are established and that a full accounting of the factors behind the observed utilization levels is known so that the nature and efficacy of proposed remedies may be stated.

Chapter II, the remainder of Part A, discusses the concept of capacity and measurement of capacity utilization. The first section describes alternative capacity measures with a view to gauging their suitability for the present study. Reasons are given for the rejection of several past proposals on the concept and measurement of capacity, including those of a purely technical nature. However, technical aspects are crucial since the maximum attainable physical capacity, in large part determined by technical factors, represents the universe of which other capacity concepts, when these are translated into physical output terms, are necessarily subsets within a quantitative dimension. Basic characteristics of technical features are, therefore, contained in Section 2 of Chapter II. From this a simple capacity utilization index is constructed and provides the basic unit for examination in the empirical part of the study.

Capacity utilization levels do not give an account of the causes of underutilization. In particular, the above form of construction will contribute nothing useful towards the separation of undesired idle capital from that which is economically rational. Hence the need remains to develop a framework which can be applied to distinguish between these types of idle capacity. This requires a clearly defined terminology and a comparison of profitabilities between the existing level of activity in a unit of enquiry with the profitability level which would obtain if prevailing utilization levels were increased.

This occupies Section 3 of Chapter II and involves an analysis of variable cost factors in which the costs of different wage regimes in the same plant, brought on by the need to work other than "normal" day-shift hours, are very important. No less important, but more difficult to provide for empirically, due to the choice element involved, is the treatment of depreciation and the profitability criterion to be used. These two are very interconnected and the treatment of depreciation has a unique significance for discussions on utilization. The more "correct" profitability criterion is argued to be one which presents net profits as a ratio of the gross value of capital employed rather than a cost of production approach.

The establishment of economic viability in a move to increased utilization leads to a search for problems of implementation. In addition to issues already raised such as the availability of labour, and the problem of arranging adequate supervision and maintenance, difficulties that are more socio-economic in nature than the technical-economic factors predominating in the present study could impede. The willingness of people to work "unsocial" hours, the industrial relations issue, and the effects of shift-work on health all merit attention. A discussion of their more obvious interactions with utilization increases concludes Section 3 but their main importance lies in the direction of policy aligned information where, for example, it could emerge that a strong reluctance on the part of labour to work at night prevents a move to increased shift-work. Since the establishment of such information is a major aim herein and since some socio-economic factors could be highly industry- or even plant-specific no attempt is made to state such influences at a general level. They are brought out and examined in plant- or industry-specific discussions as they arise.

That people might be reluctant to work at night provides one example of the social cost of increased utilization. Where profitability comparisons would recommend that a plant intensifies its present capacity utilization, the implementation of this involves social costs that are no less real than the cost incurred by operating at a low level of utilization. Extension of these and like issues would quickly reveal the necessity to distinguish between private and social costs of production. The importance of the economic appraisal, as distinct from a purely financial analysis, of projects as an aid to decision makers and as a measure of the socio-economic objectives in developing nations cannot be gainsaid. But important as this is, it is subsequent to, not a substitute for the analysis of technical features, investment and cost features, organizational requirements, market prospects, financial results and other similar factors relevant to the decision to increase utilization. These are the concern of the present study and the basic dimensions of a socio-economic appraisal will be taken, largely, for granted. Indeed, where a low level of utilization prevails in a capital scarce nation it is very reasonable to expect this to be far from socially optimal. This expectation is reinforced when it is remembered that employment gains may be in the offing.

The fourth Section of Chapter II discusses employment gains. By virtue of the fairly disaggregated nature of this study, any employment gains deriveable from increased utilization are available in detail from the nature of the factors contributing to underutilization.

Chapter II continues in Section 5 with two numerical examples of all the points raised in the previous three sections. The aim of the numerical examples is to give substance to the concepts discussed by means of applying some of the data gathered in the empirical investigation, and to show how this can be handled quantitatively within the general framework of the previous sections in the Chapter.

The final section of Chapter II discusses the assignation of causes of idle capacity that is undesired on the part of plants sustaining it. This requires that unintended idleness be separated from idleness which is economically justifiable. Both types of idleness have the same physical manifestation but they arise from a different set of economic issues which require different corrective measures. They can be illustrated at an analytic level and the yardstick used to separate them empirically will be the profitability criterion already discussed.

Further, it will be necessary to specify where a detailed profitability analysis is applicable. In general, these are not considered unless there exists a vigorous demand for the product line in question. There will, of course, have to be physical scope for increasing the level of utilization but where this obtains, and where demand for the product is not forthcoming, then the question of increasing output by increasing utilization is of much lesser importance than policy relating to increases in demand. In short, a plant which satisfies its market by operating one shift, or less, per day has more immediate problems than the profit levels potentially available from second or third shift operations.

Where excess capacity has been identified as undesirable the causes are identified first-hand from the empirical investigation. Additionally, multiple regression analysis is used and this requires a very careful statement of causality if meaningless results are to be avoided.

Chapter II, the first in Part B, is concerned with the statistical enquiry from which the empirical information used is drawn. The first section of Chapter III gives a very brief overview of Ethiopian manufacturing industry and this is followed, in Section 2, by a detailed consideration of the factors influencing how the data was collected and why these procedures included the compilation and distribution of a questionnaire. This is reproduced in full as an Appendix to Chapter III.

Chapter IV reports the empirical findings of the study. Section 1 contains a disaggregated account of causes of underutilization-at-plant-level and proposes corrective measures on this basis. Although several diverse causes are identified, ranging from input supply deficiencies through demand for final product deficiencies to machine imbalance, the most striking feature of the results is the need for a radical restructuring of objectives and means to achieval derived from consideration of the very palpable inefficiencies throughout most of Ethiopian manufacturing industry.

Section 2 uses regression analysis to detect sectoral characteristics which might contribute to an explanation of variations in utilization. The results are disappointing, both in terms of the range of explained variation and with respect to the level of statistical significance achieved.

The final Section of Chapter IV summarises the previous two Sections with respect to causes of idle capacity.

By virtue of the levels and causes of under-utilization, and corrective measures being set alongside each other, the major empirical results are revealed in Chapter IV. Thus Chapter V, 'Conclusions and Discussion' comprises an assessment of the validity of the results and comment on their significance. The first Section is very brief and is given over to a general perspective on objectivity and comprehensiveness in which the subjective choice element in the treatment of certain issues in the study is made explicit. The assessment and significance of the results is discussed in Section 2 wherein the links between the postulated importance of utilization as a policy variable, the empirical findings and, as a result of the latter, of the need to go beyond prescriptions for the correction of idle capacity alone, are made. This completes the study.

CHAPTER II

CAPACITY UTILIZATION

In seeking a capacity utilization index, the aim is to relate actual output to potential output. Actual output is an observable entity, particularly when it is measured in physical, rather than value, units. Capacity output is subject to different ideas from the point of view of engineers and economists with considerable variation being found within the ideas of the latter group.

Economic capacity concepts are seen to depend mainly on the intended use of the concept, on the availability of data and on the possibilities and limitations of econometric analysis.

The discussion on capacity in this chapter begins by considering the suitability of several past proposals on the subject. Much of this is rejected as unsuitable for present purposes and what is retained is examined further in the second section which develops a general statement of capacity with emphasis on physical aspects. The third section examines the economic choice criteria which the argument regards as crucial for consideration in aiding the decision to recommend an increase in utilization. Section 4 refers to employment gains from increased utilization and is very brief since any increases in the workforce derived from an increase in utilization are explicitly contained in the statement referring to the construction of the physical utilization indexes. Section 5 provides examples of all points raised in the previous sections in order to give substance to the concepts and methodology adopted. The final section redresses the imbalance caused by the previous emphasis on physical aspects of capacity. It examines the issue of economic causes of underutilization and the policy measures implied. These are treated in their own right and along with the implications of the previous analysis in the chapter.

II.1: Alternative concepts and measures

Economic capacity can be regarded at the level of the firm, the industry, and the economy. At firm level various production and cost theories give rise to different capacity concepts. A. Cournot (1838), in speaking of a monopolist, stated, "the producer will always stop (expanding his output) when the increase in expense exceeds the increase in receipts." (p.59); in short, when marginal cost equates with marginal revenue. For J. M. Clark (1923), full, in the sense of optimal, capacity occurs at the output level where there is "a balance between the increasing cost of operation and the economy due to the increased utilization of the machine itself." These quotations are among the earlier, explicit statements which regard capacity as the output rate at which average costs are at a minimum, and are still part of the core of traditional micro-economic theory. Any point on a cost curve shows the minimum cost at which a certain level of output can be produced, and hence the implied optimality. It is usually associated with the planning, or ex-ante, costs but may be applied to the short run given the installation of the firm in any single period.

In traditional theory the statements on capacity (optimal) output assume that there is only one level of output which the plants can so produce. Such a result is consistent with the U-shaped cost curves which the axioms generate. The most important assumptions for the present study, on which these results are based, are those under the ceteris paribus umbrella, in particular, a given set of factor prices and a given state of technology.

Discussions of excess capacity in monopolistically competitive markets were widespread after publication of E. H. Chamberlin's book on the subject in 1933. N. Kaldor (1934 and 1935) questions the legitimacy of the assertion that the long run cost curve rises after a certain point and, (1935), proceeds to view capacity as the output rate at which long run average costs are at a minimum. Apart from Kaldor, and in differing market situations, many writers have challenged the U-shaped cost curves of traditional theory both on a-priori and on statistical grounds. Instead, the short-run average variable cost curve may have a flat stretch over a range of output and the planning curve may even be L-shaped. The latter result ensues from, for example, the displacement of managerial diseconomies of large scale production by modern management methods. There are also the reasons given in Chapter I.4 for having productive flexibility built in.

The reason for this very brief mention of pure economic capacity concepts lies in a consideration of the aim of the present study. The final aim of cost theory and of the measurement of cost concepts lies in obtaining a fuller knowledge of entrepreneurial behaviour. To the extent that short run entrepreneurial decisions impinge on the present consideration of capacity there are basic postulates within the above ideas which will have applicability in this study. First, it is easier to state what can be safely disregarded.

There are no reasons for dismissing the present study because of the a-priori indeterminate shape of cost curves. These may be U-shaped, L-shaped, or S-shaped. The observed range of output, in some of these curves, may even stop short of optimal utilization. In any of the conepts caricatured above, compensating devices, so that the concepts may be empirically applied, can be built in. Attempts to measure statistical production and cost functions, the latter being derived from the former, have not yet produced anything approaching a general statement. Such indeterminancy regarding cost functions can be disregarded.

The firms chosen, and the period of observation (one year) were such that the rate of output and other measurable cost determinants varied sufficiently to yield observations over a wide range. Also, the plant and equipment remained essentially unchanged, so that short-run adjustments were observable. This precludes technological changes and scale variations of a major nature which might well be implicit in a sizeable investment programme. Such a procedure would be possible, though incomplete and entirely unsatisfactory, in a cost analysis but is justified here given that a major aim is to obtain the measures required for achieving positive output and employment changes with the given resources.

To this end a capacity measure is sought which will contrast with the foregoing theory of the firm concepts. Whereas the latter are related to efficiency of resource allocation in the Paretian sense of economic welfare, which might be theoretically useful in determining whether some reallocation of resources could improve welfare, they do not add directly to questions of the degree of resource unemployment.

Where the above concepts will be useful is well illustrated by the quotation from Clark (op. cit.). The unit of enquiry, the firm, assuming rational response on its part to cost factors, will not operate beyond the point where marginal costs equate with marginal revenue. This, conceivably, could leave much physical capacity idle. Corrective measures applied en-bloc to a loosely specified definition of capacity will not be so effective as those which jointly consider economic and physical capacity.

An early attempt at describing capacity, in American manufacturing, which though of little empirical value since it was directed at the broad industry group and was not operationally developed as it was conceived, contains some essentials of the capacity concept as it is to be developed here is found in E. G. Nourse (1934). Capacity is the output which can be realised "under conditions of sustained simultaneous operations ... " rather than " ... the maximum which each separate industry could turn out if it had no regard to the need of temporary shutdowns for repairs, cleaning, or installations of new machinery". (p.91) At this level such a definition could be given operational validity by allowing questionnaire respondents to "set their own definitions", McGraw - Hill (1961), (p.19).

More operationally useful capacity measures, again all developed in the United States include the Wharton School "trend through peaks" method. This assumes, pervasive auxilliary evidence to the contrary excepted, that a relative peak in an industry's time series of actual output represents the potential output. Linear interpolation between these peaks yields potential output levels for the whole time series and capital utilization rates of actual to potential output are read off.

There are considerable difficulties involved in identifying peak outputs; in the interpolation; in backward and forward extrapolation at the beginning and end of series; in inherent data problems (Federal Reserve Board data on monthly industrial production, in quarterly combination, was used by the Wharton School); and in the combining of industry rates into an aggregate index. Also, each industry exhibits its own problematic characteristics and operating procedures are necessarily very flexible to take account of a-priori information available. Part of the justification for the procedure lies in the aim of the (ongoing) project. Since the errors in measuring potential output were likely to be consistent over - or under - estimates the change in utilization rates from period to period were likely, it was argued, to be reasonably accurately reflected.

Other capacity measures in common use are those employing estimates of capital to output ratios. Very briefly, this consists in the selection of a base period in which it is judged that maximum potential output obtained. Then follows the complex task of estimating the value of the capital stock during this base period. This is ratio related to the base period estimate of the value of maximum potential output and the index, so derived, forms the basic capital to capacity output ratio. Subsequent up-datings are performed by adding net changes to the capital stock and relating these to the new output levels. This method has been used by Fortune Magazine, the National Industrial Conference Board and the Federal Reserve Board.

Attempts have been made to dispense with direct reliance on past, subjective capital to output ratios. R. L. Klein and R. S. Preston (1967) have estimated production functions for a number of industrial sectors, including an adjustment for downward bias, based upon the aggregate production function. The downward bias is reckoned to apply to the "trend through peaks" measure because of the false identification of peaks in the latter. From the estimated production functions, capacity output is calculated as a function of the capital stock in that industry and the industry full-employment supply of labour. Several crucial, debatable assumptions are evoked so as to obtain the utilization rate as the ratio of actual output to the econometrically estimated potential output.

At the macroeconomic level the concept of potential GNP has found favour for certain purposes. It refers to a market valued point on a country's production possibility frontier, takes account of prevailing industry technologies and potential constraints due to insufficient supply of all inputs. The significance of such a measure would be hard to evaluate in an Ethiopian context.

Indeed, beginning from the "trend through peaks", all the methods described above have their own inherent difficulties and deficiencies regarding their application to a developing country. If it is exceptionally difficult to specify a past period for which output indices, or capital to output ratios indicate maximum potential output in an industrially advanced nation, then it must verge on the impossible to do this in a developing country. This emphasizes the need for an independent estimation procedure for potential output before reasonable measures of utilization can be obtained. Further, the utilization indexes so obtained would not provide any indication of the causes of either prolonged or short-period idle capital and thus would not provide the sort of policy aligned information necessary to help remedy the problems found by developing nations.

Developing nations do not have an immediate need for potential output data to estimate output losses arising only out of insufficient effective demand. Cyclical configurations in output series are not of great importance even if it is granted that they reasonably reflect capacity levels. Enumeration of immediate obstacles to output and employment expansion would be no further ahead post-measurement than pre-measurement.

Finally, in this somewhat negative vein of elimination, studies based on engineering production functions have much direct operational appeal. By mathematically displaying all physical and engineering constraints on the process of production with a view to tracing the effects of economies of scale on investment behaviour, H. B. Chenery (1952) regards the capacity "(of a given size of plant)" to be "shown by the points of tangency between the intermediate cost curves and the long run cost curve." (p.4). Engineering cost studies are mainly concerned with production costs. Other costs, like selling, or managerial expenses tend to be neglected. Such studies lend themselves more readily to large-scale process industries like oil-refining, chemical processing and electricity generation than to the less complex activity units in the present study. In these large-scale applications the technical relationships underlying the transformation of inputs to outputs are thoroughly known.

The capacity concept envisaged relates, often, to specific output rates, which, when exceeded, indicate that additional investment in plant and equipment is required. The rationale is similar to that underlying the multiplier-accelerator interaction model of the macro-economy. The analysis can be extended to the aggregate economy, either by use of the accelerator principle, or by the foregoing capacity principle in order to explain induced investment behaviour.

For present purposes it is sufficient to note that even if enough was known about overall industrial activity so as to be able to estimate an engineering production function this will add nothing to the identification and knowledge of factors causing low utilization rates in developing nations. Nonetheless, basic machine capabilities must be specified at some level and at some stage of the construction of a capacity index.

II.2: Physical aspects of capacity

The output of a machine, or machine group, is the number of products/volume of product which leave the machine in a given period of time. The capacity of the machine is the maximum number of products which the machine can produce per unit time-period. The physical capacity of an integrated set of operations is limited by the individual capacities of the machines within the set, by the state of balance between these capacities, by the production route and by the time-intensity of usage of the set of operations.

Specification of machine capabilities are first determined by the manufacturers. These specifications will, for several processes, have to be modified downwards since it is not practical to sustain 100 per cent of theoretical maximum ratings.

It is the lower bound imposed by a machine within a well defined set of operations which determines the extent of imbalance and which is, therefore, taken as the constraint on potential output. Such a lower bound can be verified after examination of each set of operations within that part of the production process containing the lower bound constraint, and the relationship of this with preceding and subsequent parts of the process. This statement of the seemingly obvious is made in order to draw out its implications in the calculation of the denominator, potential output.

Consider a production process consisting of n distinct, successive operations such that n-1 operations are exactly matched in the rate of input absorption, output supply and time-basis of operation. There is one operation in this process, say the i th, which does not match the rest on this input-output basis.

Suppose the i th - 1 operation can supply inputs at twice the rate these can be absorbed by the i th operation, and that the i th operation supplied inputs to the i th + 1 operation at half of the capacity absorption rate of the latter.

As a result, the i th + 2 operation is only receiving and processing inputs at 50 per cent of its capabilities; and similarly for all subsequent stages.

All n operations have the same time-basis.

Faced with this situation several alternatives are conceivable:

a) Depending on the time-basis it may be possible to work the i th process more intensely than the rest. This could remove part, or all, of the bottleneck.

b) That part of the output from the i th - 1 operation which cannot be absorbed by the i th operation may be sold, and the remaining input required to operate all processes from the i th + 1 to the n th, at capacity, could be bought at the i th + 1 stage.

c) The i th machine, or machine group, could be sold or scrapped, and the establishment ceases to perform this part of the process. All of the part processed output from the i th - 1 stage could be sold, and all of the part processed input requirements at the i th + 1 stage bought. The establishment now performs n - 1 operations, all at capacity.

d) A machine, or machine group, which duplicates the i th process could be installed.

e) The i th process could be sold, or scrapped, and a similar type process with larger capacity installed.

f) All machine capabilities except the i th are used at 50 per cent of their potential and the i th operation emerges very distinctly as the bottleneck in the production process.

It may be viable to choose one of these alternatives, or more than one in combination where this is not mutually exclusive. Alternative (f), not perhaps with as large an effect as presented in the above explanation, is commonly observed to occur.

Closely linked to the state of machine balance issue is the choice regarding production route. Consider an assembled product of four component parts. Each part is required in single units and is produced on a separate line of machines with the capacities as given in Table II.1.

TABLE II.1

CAPACITY OUTPUT OF FINISHED PRODUCT per UNIT TIME-PERIOD

	OPERATION NO.				
	A	B	C	D	OUTPUT
PART NO.					
1	11	9	9	10	9
2	10	11	8	8	8
3	7	12	10	9	7
4	18	16	12	12	12

Source: Adapted from Burbidge (1971), Chapter 4.

The first operation on Part No. 3 provides the overall output constraint within this imbalanced production process. Suppose there is scope for increasing the time-intensity of usage of equipment. The production planner knows that the route which maximises output need not minimise cost. If the machines producing parts (3 A) and (4 A) are similar in type but the latter is more productive then it may be more rational to change these machines around rather than simply increase the usage of (3 A). By switching, the output of (3 A) rises, say, from 7 to 9 per unit time-period, and the output of (4 A) decreases from 18 to 10 per unit time-period. This would increase total output to 8 per unit time-period, the operative constraints now being (2 C) and (2 D). Such a change may increase costs owing to the more intensive time work pattern. Whether the switch is made depends on checking the cost reduction gained through the increase in output against any increased costs incurred. These have to be weighed against an opportunity cost situation which would be involved if the operator, in the pre-switch situation, could have been engaged in some other productive activity during the idle period in each cycle of (4 A) caused by the lack of balance. And so the checking goes on between these alternatives and the new situation which arises, if the switch is made, wherein (2 C) and (2 D) become the output constraints.

The choices in the examples of imbalance and routing require account to be taken of the demand for final product, the availability and prices of material inputs, labour and capital goods, together with depreciation for wear and tear and obsolescence, and other considerations of profitability. The calculations involved when the production process is more complex than that schematized above become exceedingly involved. Management often relies on intuition and experience in formulating production plans. The important point is that little can be said _a-priori_ even though the necessary corrective measure need not involve a large capital expenditure nor need it involve a radical, drawn-out alteration in the structure of the plant such as would violate the shortrun framework assumed.

The time-intensity of utilization of plant and equipment over a unit time-period of one year cannot exceed 8,760 hours. This involves working all 365 days of the year, usually over three by eight hour shifts per day. Where machines work less than 24 hours per day it follows that some of this time is lost. There may well be excellent reasons, economic and physical, in many production processes for not operating at this maximum intensity.

On the physical side, periods of non-operation may occur because of necessary repair, maintenance and cleaning. Machine sizes may have to be reset. Breakdowns and other avoidable and unavoidable stoppages are observed. For example, sudden power failure may occur, or labour may strike. These factors, in conjunction with the other physical production aspects already discussed, assist in determining the nominal physical capacity of the major processes to be considered in this study, and, therefore, form part of the upper bound of the denominators of utilization indexes.

One problem lies in categorizing stoppages as avoidable or unavoidable. Since the study is conducted at establishment level it is open to discuss plant specific and industry specific factors in determining the nominal physical capacities of production operations. By initially assuming no unintentionally adverse occurrences on the physical side, and by assuming an ideal economic environment, capacity output levels can be calculated. The individual plant utilization indexes in Part B are formed on the basis of these ideal circumstances, and the effect of physical and economic constraints on capacity output figures may then be examined.

Capacity output is the maximum potential level of output per unit time-period. The two main determinants of capacity output are the time-intensity of productive usage of plant and equipment per unit time-period, and the maximum level of output which the installed plant should be capable of sustaining. These two determinants are interconnected.

The time-intensity of capital usage provides, on its own, an index of capital utilization. Where this is relatively low and examination of the production process concerned shows that the capital use index could be physically increased then capacity output is adjusted upwards accordingly. This, in all likelihood, means that additional labour has to be engaged and the change in employment can be calculated.

However, the time-intensity of usage of capital is not the sole criterion. Two plants could produce similar products on similar machinery of different vintages. The more modern installation may be physically capable of working, say, more than 4,000 hours per year, and the less modern only 2,000 hours per year because of lower initial capabilities, more maintenance time required and more frequent stoppages because of breakdowns. On the basis of physical capabilities the utilization rate in the older plant may exceed that in the modern one because actual output more closely, on proportionality, approaches potential output, In short, even between plants in the same industry with broadly similar productive structures, uniform time-intensities of usage of capital, within identical unit time-periods, cannot be assumed.

The foregoing is now synthesized and a very aggregate, general statement of the capacity utilization index may be stated.

A capacity utilization index links actual capacity use to potential capacity use. The former is the numerator of the index, the latter is the denominator. The actual capacity used is expressed in terms of the physical output quantity or volume of output produced in units appropriate to the product concerned. Potential capacity is likewise expressed. The time-period of observation, usually one year, is identical in numerator and denominator. Although account will be taken of plant and industry production specifics as the utilization indexes are constructed, the following definition of capacity utilization will provide a brief perspective.

Let U denote the extent of capacity utilization (per cent).
Let Qa denote actual output per unit time-period.
Let Qc denote capacity output per unit time-period.
Let Pm denote the minimum production time in hours required to produce a clearly specified quantity or volume of output.
Let Qp denote the quantity or volume of output specified in Pm.
Let Tm denote the maximum attainable production time in hours during the time period of observation once due regard has been paid to periods of non-operation occurring because of

the physical nature of the process. (If the time period of observation is one year, then the theoretical maximum of Tm is 8,760 hours. Such a value is conceivable only in certain continuous, or "continuous batch", processes run at a high degree of efficiency.)

Then,

U = Qa/Qc

= Qa/(Tm/Pm. Qp)

This provides a straightforward arithmetical statement of the utilization level. However, amendments and modifications are imposed from several directions derived, again, from further physical process interactions and from considerations of profitability.

Where market conditions favour a move towards increased production, the choice to be made involves consideration of absolute profitability versus relative profitability. Where financial capital is readily available to an extent which offers the possibility of starting a new plant then the profitability derived from increased utilization has to be considered relative to the profitability from a new plant. Many issues are involved including the availability and quality of managerial and other labour inputs; locational aspects; costs and time necessary for construction of buildings and for plant acquisition and installation; and, in the present context, the trade-off between operating existing plant more intensely and the productivity gains from more technically modern machinery. The frame of reference for the present study denies any serious consideration of erecting a new plant even though a financial analysis might deem this more profitable than increased capacity utilization.

In addition, the crucial technological choice of production method is embodied in the extant plant and equipment. Choice regarding factor proportions and production techniques was made at the stage when the plant was installed. For the present situation, choice is narrowly defined within limits set by physical capabilities; input-output dictates; possible, though likely minimal, adjustments through disembodied technical progress; and, the main subject of this study, the rate of utilization.

These conclusions emerge as a result of direct inspection of physical production processes. Communication with production and technical personnel within this frame of reference was found not to be too difficult. Apart from the assumptive denial of major change in production techniques during the year to which the statistical enquiry refers, most considerations between the short-run and the long-run are somewhat obscure and substitution possibilities are not operationally identifiable with actual production processes when these are visualized in physical terms.

A possible strong modification occurs as a result of interaction between varying vintages of capital equipment. Over the years of a plant's existence certain basic units already installed could make easier the installation of new units of equipment and an addition to equipment, which does not necessitate any restructuring of existing operations, is very possible. A modification of existing equipment may be the most economic alternative over the continued operation of the existing equipment or purchase of new equipment. This results in a plant of mixed vintages and raises the possibility of a change in the pace of operations. Such a change is conceivable in the short-run and, if necessary, can be incorporated in the utilization framework. Indeed, a relatively small capital expenditure, the effect of which is "immediate", may play a large part in the evaluation of capacity output as here described.

Consider a plant operating on a one-by-eight hour shift per day basis for 350 days of the year producing n units of output during this period. Suppose, after collating all information about machine capabilities and requirements it is reckoned that maximum output with the same time intensity of operations is n + x units of output.

If a very good machine balance obtains in this plant and if there is no immediate reason, neglecting input supply, product demand and profitability factors, why the time intensity of operations cannot be, say, doubled - the remaining 33 per cent of maximum available time being required for cleaning, maintenance, overhaul, etc. - then the utilization rate is about one-half of (n/n + x) per cent, according to the general statement of the utilization index.

On the other hand, should a situation obtain where a single, distinct operation or set of operations require working for 24 hours per day to maintain the input-output requirements for the rest of the production operations on a single shift, then a major bottleneck, such as previously discussed, is present. It is now clearly inapplicable to double the time-intensity of operations in the plant. The bottleneck may not be in the actual production operations but may simply result from a lack of lockfast storage facilities - space for final product or input storage, or from some aspect of distribution. When it is realized that correction of a production bottleneck, or that provision of some non-production but necessary ancillary facility need require an expenditure amounting to only a few per cent of the existing value of fixed productive assets, then the justification for weighing existing levels of output against those attainable from admissible rationalization operations is legitimate. Such a procedure accurately reflects <u>actual</u> to <u>potential</u> performance, the essence of capacity utilization indexes.

Such a procedure, given suitable extension may also provide the rationale for profitability comparisons. Whereas attention to the increase in output obtainable from an admissible rationalization will decrease the utilization rate based on actual output, it follows that a projection for actual output should be made in cases where a rationalization is envisaged so that choice can be made from all possible operating situations in order to compare their profitabilities.

These notions can be given operational validity if the general statement of the utilization index is extended to cover the points now raised. Two utilization rates can be identified:

<u>Case I, Existing Operations</u>

Qa = Actual recorded output during the time-period of observations

Qc = Capacity output with the same time-intensity of operations and the same time-period of operations as was actually worked.

This will not relate actual to potential output in the sense described unless actual time-intensity of operations tends towards the "maximum" of such. It may well be required, however, for profitability comparisons with situations containing an admissible rationalization or an increase in the time-intensity of operations, or both.

<u>Case II, Extended Operations</u> -
<u>Rationalized if necessary</u>

Qa = As Case I

Qc = Capacity output on the basis of an increase in the time-intensity of operations to the decided maximum of such, with or without rationalization.

This index corresponds most to that given in Section 2 of this Chapter, and should rationalization not be envisaged then the increase in Qc will be derived solely from the increase in the time-intensity of existing operations and the Qc for Case II will be identical to capacity output as already developed.

It was noted that Case I could be identical to Case II without rationalization if the productive operations in question were already being worked to the "maximum". The construction of the utilization level in the first example of Section 5, which provides illustrations of the analyses in this Chapter, is a case in point. Such situations obviate the need to project actual outputs for profitability comparison purposes.

However, if rationalization is necessary and if there is also scope for an increase in the time-intensity of operations then three profitability comparisons are at once apparent. First, there is the profitability in existing operations. There is the profitability derived from the rationalization without any increase in the time-intensity of operations and, finally, there is the profitability of extended operations. Given that a rationalization is carried out it is to be expected that the rate of output will increase per unit time-period and this requires that projections be made on actual output which, as well as the rationalization, will have to take account of the increase in time-intensity of extended operations where these are envisaged also.

Where no rationalization is necessary, the only scope for a projected actual output, solely for profitability comparisons, lies in an increase in the time-intensity of operations. In this situation, Qa will be projected from actual output in Case I, and Qc will be as in Case II without rationalization.

In addition to its use in profitability comparisons, Case I will be retained in Part B as a descriptive utilization level since it may be taken to reflect a plant operative's subjective estimate of utilization within existing operations. Having allowed for expected periods of non-operation - due to physical factors like maintenance, repair and other necessary downtime - and since the same time-period of operation is used for actual and capacity output then the reasons for a shortfall between these may be more easily discernible if a distinction is made between capacity in existing and extended operations. In the presentation of the utilization indexes in Part B, Case I will be referred to as the Uncorrected Utilization Level and Case II as the Corrected Utilization Level.

The Corrected Level may have been obtained partly on the basis of a rationalization and it may be argued that, no matter how justified or practically necessary the rationalization might be, its incorporation imparts a downward bias on the utilization level since actual output was recorded in a "non-rationalized" situation. It is the contention here that if a proposed rationalization emerges favourably - in the sense previously discussed in the machine imbalance situation - from reasoned examination of cost and time for installation issues, then its inclusion in the construction of capacity output levels is justifiable. In extending this notion with respect to utilization levels it is important to maintain a distinction between such descriptive utilization levels , per se, and the projected actual output levels needed for profitability comparisons. What, then, are the alternatives from which a more desirable figure for the level of utilization may be selected?

As noted, a doubling in the time of existing operations could be a physical impossibility because of machine imbalance. The capacity output in Case II rationalized operations, assuming a move from one to two shifts is envisaged, might tend towards twice the capacity output in Case I's existing operations in which event it would be inappropriate to regard a Case I, uncorrected, utilization level of, say, 80 per cent, as the correct statement of utilization.

It would be possible to consider a projected actual output within the existing time-intensity and with rationalized operations and obtain a utilization level using a capacity output obtained as in Case II with rationalization. This preserves the same time-intensity of operations in actual output as Case I and gives the numerator as well as the denominator the benefit of rationalization. Numerically, this is the most plausible alternative of either the two possibilities just mentioned or the subjective, Case I estimate. Substantially, however, it adds little to the proposed, corrected utilization level.

There is considerable scope for the manipulation of actual and capacity outputs to derive different utilization levels. The proposed procedure, on which the corrected levels in Part B are based, has the important benefit that the actual outputs to be used are recorded observations. Despite any proposed rationalizations it is expected that the major contribution to the increase in output will be derived from the increase in the time-intensity of operations. To take one of the alternatives as preferable in some sense to the Case II corrected level destroys the basis of comparability between the utilization level derived on this basis and the level derived on a Case II basis where no rationalization is envisaged. This could deny comparisons between and within industry groups. The crux of the issue is contained in the reasonableness of the assumptions on the implementation of the ratinnalization. These are specified as they arise and so permit of a critical appraisal.

Permissible rationalization is envisaged for only a few of the units of enquiry and it may reasonably be expected, therefore, that most of the projected actual outputs will rest solely on a non-rationalized, increased time-intensity basis. This is conditional, however, on there being considerable scope within the existing operations of the units of enquiry for such an increase. The resolution of this, of course, is part of the applied findings in Part B.

In the selection of projected outputs for inclusion in a profitability analysis, the discussion on what is a more appropriate utilization level is seen not to have any bearing. As long as the actual output level and the projected actual output level are included in the analysis, and assuming due attention is paid to resultant changes in all constituents of profitability then comparisons may proceed. It remains to examine the constituent parts of profitability and to specify what is meant by this.

II.3: Profitability and utilization

In evaluating the economic viability of increased utilization the aim is to develop a framework which comprehensively accounts for depreciation and changes in variable costs incurred if increased utilization takes place. Once these have been assembled the choice of profitability criterion has to be made.

Several categories of variable costs can be identified. These include: labour costs; raw material costs; other direct production inputs which are not basic raw materials; light and power; fuel and lubricants; interest charges. Additionally, there will be "non-desirable" hours and the effect these have on health and productivity for example. The boundary between what has been labelled as economic and what has been labelled as social is hard to draw, however, and their treatment here does not pretend to belong categorically to either. Thus the problem of arranging adequate supervision and maintenance and the problems which could well arise in the area of industrial relations are both clearly economic and social. All categories mentioned here, and others, are discussed below but the greatest attention is given to the treatment of depreciation and to inputs whose unit costs are likely to increase.

Depreciation arises from physical wear and tear and from obsolescence. The need to and logic of building up a fund to finance capital purchases is no less important in a developing nation than elsewhere. Some of the reasoning behind this assertion is linked directly with capital utilization. The problem in dealing with depreciation in conjunction with utilization lies specifically in separating depreciation due to wear and tear from that due to obsolescence.

It may be argued that a low intensity of capital usage produces less wear and tear, and the length of life of capital is extended. But a lower renewal rate of obsolete equipment hinders the introduction of newer production methods. This, in turn, retards the entire process of technical progress. New equipment is obtained to fit in with older installation. This might necessitate the placing of orders with long time lags to completion because the producer/supplier, presumably from an industrially advanced nation, has moved on to more technically advanced equipment. Costs, as well as time to completion, are increased because of the special requirement of meeting an order for something which is both physically new and technically "old".

Whether the rate of renewal of equipment is held back mainly by lack of physical wear and tear (low utilization), or by obsolescence, does not alter the premiss that a faster rate of renewal is desirable if developing nations are to compete domestically against imports, or have their exports competitive in terms of both price and quality.

Again, how true is it to assert that wear and tear varies directly with intensity of usage? In processes requiring heat treatment it is physically, and thereby economically, disadvantageous to "stop and start" the required heat sources periodically. In such cases it is necessary to maintain a minimum level of heat if serious physical deterioration is not to occur in the equipment. In textiles, periodic stoppages are certainly harmful to the rollers used in preparing fibres for spinning. On the other hand some equipment might benefit from "rest" periods. The point is quite simply that wear and tear cannot generally be assumed to vary directly with utilization. Each production process requires individual examination and should it be established that wear and tear is directly associated with utilization, the nature of the relationship has to be found. For instance, if utilization is doubled, does depreciation due to wear and tear double?

Apart from the physical productive capacity loss due to wear and tear and the separate issue, from an accountancy view point, of larger maintenance costs being incurred, there is obsolescence. Obsolescence is a statement of foregone production opportunities in the sense that it measures the loss in position of a mahcine relative to new machines available to perform the same productive operation. Technical change and obsolescence are inseparably linked and have a unique status in discussions on utilization and associated profitability measures.

An accountant's depreciation allowances reflect an owner/manager's way of spreading expected capital replacement costs, usually based on identical assets and often at unchanged prices, over the anticipated lifetime of the asset. This may incorporate recognition that obsolescence shortens the working life of equipment, yet simultaneously it presumes that obsolescence does not particularly affect the productive value of the asset during its shortened lifespan.

This treatment of depreciation sells obsolescence short. Technical progress is dependent on time and the rate of investment. Investment and productivity, fixed capital formation and the size and vintage of the capital stock are very interdependent. This is well known and much time and effort has been spent in trying to assign the quantitative element in each of these to technical change and vice versa. There is no comment made here on such attempts by others, nor is there any attempt to state and quantify the problem for present purposes.

The issue is raised simply as a means of emphasising that obsolescence should be given its due in depreciation analysis for economic reasons that are, normally, outside many accountancy analyses. Thus W. E. G. Salter (1966) states,

> " ... it is obviously impossible to regard obsolescence (as it so often is) as simply parallel to physical depreciation. Standards of obsolescence reflect basic characteristics of an economy. ... Standards of obsolescence determine how far it is economic to bring the capital stock into harmony with the present. An economy with meagre standards of investment must accept low standards of obsolescence, and a slow adjustment to all changes involving new capital equipment." (p.72)

The quotation is made with respect to industrially advanced nations. Mr. Salter was most careful in stipulating this. The present study is set in Ethiopia where the last sentence of the quotation is certainly relevant and this requires some further elaboration given that the aim is to justify the explicit incorporation of an obsolescence element in the analysis of depreciation herein.

First, there is no contradiction involved even although manufacturing investment outlays in Ethiopia are at a very low level. The difference is one of degree, not of kind. Low standards of obsolescence and slow acquisition of new capital does not mean the dismissal of an obsolescence allowance as part of the overall depreciation allowance on manufacturing plant and equipment in developing nations. Again, a consideration of utilization and appropriate profitability criteria provide further reasons for treating obsolescence separately.

In evaluating a proposal to increase utilization a plant decides to reject if there is any increase in unit production costs. Assume that all variable cost elements maintain the same unit costs and that a blanket figure is assigned to cover depreciation in existing operations and this varies equiproportionately with utilization. Given this there will be no increase or decrease in unit production costs and these do not provide a clear cut decision criteria.

However, let it be assumed that unit production costs increase. A higher average wage may have to be given to labour to persuade them to work the unsocial hours that are entailed. Loss due to wastage might be related to the scale of output on an increasing basis. Such issues are given fuller attention later. For the moment it is sufficient to realise that an increase in one or more variable costs, together with the same treatment of depreciation as in the previous example must raise unit production costs and hence the decision is not to increase utilization.

Where depreciation due to wear and tear does not vary equiproportionately with utilization but still varies directly with utilization, or does not vary with utilization, that is, remains constant, then the issue as far as the unit production costs criterion is concerned centres round the trade off between the increased manufacturing costs, as these are reflected in unit costs, and the difference in depreciation allowances as now conceived.

There is no guarantee that an increase in utilization will lower the cost per unit of output simply because the same capital stock is being used to produce more output even with no decline in the productivity of capital. Any reductions achieved in unit capital costs could be outweighed by a small unit increase in variable cost elements. This is particularly the case if depreciation is assigned a blanket figure which does not contain an element for obsolescence and is reckoned to vary directly with utilization. In such circumstances a profitability calculation based on unit production costs may well be against recommending an increase in utilization.

Even if a reduction in unit costs were achieved on this basis it may not be sufficient to influence an establishment's market share in a competitive environment. This suggests that a narrow costing analysis may be inappropriate in judging the effect of increased utilization on profits - quite apart from the possibility that other economic considerations might be involved. This suggestion becomes more significant when referral is made to the remarks on obsolescence.

Obsolescence is seen to vary with the passage of time through the influence this has on technical progress. Regardless of how this is formulated for analytical purposes, obsolescence remains invariant to changes in the rate of utilization. This means that even a relatively small allowance being made for obsolescence within the overall figure for depreciation will reduce the increase in depreciation caused by a higher rate of utilization even if the balance of the allowance, that is, that part due to wear and tear increased proportionately with utilization. The saving in costs might be very slight or very considerable, depending on the quantitative assignations decided on.

Further, instead of focussing attention on the costs of production, consider profitability expressed in terms of the ratio of net profits, total revenue less total costs, to the value of capital employed. By presenting profits in this manner then an increase in utilization may be recommended where previously it was rejected.

In addition to the lowering of cost per unit of output due to explicit incorporation of an obsolescence factor the recognition of obsolescence in its own right means that broader, though no less important economically, issues are being considered. For example, the rate of renewal will tend to be increased. This cannot be detrimental to productive flexibility, and, structural extension, initially into processes allied to these currently extant, is enhanced also. Competitive power will be increased and potential bottlenecks in new items of capital equipment, caused by their installation alongside equipment of older vintage, are reduced. Probably most important is avoidance of the adverse situation wherein the potential for a faster rate of change and growth is denied because of the self reinforcing technical lag between industrially advanced nations and developing nations. Part of the reason for this lies in the underutilization of existing capital in the latter.

It is emphasized that this is not an advocation for all out measures to install the technologically newest and "best" equipment throughout existing industries in developing nations. Neither is it in any way at variance with studies aimed at identifying appropriate technologies or least-cost technologies, nor does it conflict with any aspect of the currently in vogue practice of emphasizing a rural based agro-industrial development strategy.

By its consideration of underutilization against a backcloth of depreciation issues, the foregoing simply emphasizes the desirability of providing for the more efficient use of existing resources, and for the provision of measures to ensure the future efficient use of capital carried through from the present, and subsequent additions thereto. An examination of an establishment's historical record and current activities could reveal, on the basis of economic criteria, that it should never have been built in the first place. Should this become apparent with any of the units in the present enquiry then the orientation of a discussion on utilization will have to be altered to take account of this ex-ante circumstance.

Apart from these generalizations the ratio of net profits to capital approach has much to recommend it as of right. An evaluation of profitability between an establishment's existing operations and increased utilization reveals, say, an increase in unit production costs and no change in the rate of return to capital. This result would seem to be in favour of rejecting any proposal to increase utilization. This would be acceptable only if the establishment envisaged that the present level of output should never need to be expanded. But if market conditions permit, then expansion of the output volume of the product and the availability of funds for re-investment and for investment in other productive opportunities are factors which merit attention.

Where demand is buoyant, and likely to continue so, then potential investment for expansion is financed from profits or from loans. All aspects of commercial risk are considered when evaluating the application for such a loan and the costs, if it is granted, are likely to be high. Development loans are sometimes available on favourable terms but not, as a rule, for expansion purposes within existing operations. It follows that the more an establishment can finance investment internally, the cheaper this will be. Even a small rationalization of existing operations could markedly increase efficiency and still leave investible funds available for outside uses. The extent of this depends on the difference between the net profits on existing operations and the net profits obtained after increasing utilization.

Again, the establishment might decide that it would rather borrow for purposes of re-investment, because of extremely favourable terms, in which case it still has more investible funds to direct as it wills, and this is a major consideration in any ongoing development process. The attractiveness of this, however, is conditional on the unlikely event of being able, continually, to borrow at a very low rate of interest. It is very doubtful if an establishment could continue to operate in this manner since the debt to equity ratio is being continually increased and this would certainly inhibit creditors, with accompanying results on the cost of borrowing through increased risk factors. It is presumed that managers are doing their job and would act to forestall any cause for concern on the part of creditors arising from borrowing habits.

From the foregoing then, several claims can be made on behalf of a profitability analysis based on the ratio of net profits to value of capital employed. Yet all that is necessary for present purposes is to accept that an increase in unit production costs need not rule out a proposal to increase utilization.

One major problem remaining before the above ideas can be given operational validity lies in the assignation of quantitative values to the constituent parts of depreciation. Each case, of course, will be regarded separately but a very limited perspective on obsolescence can be gained by comparing the advances in capital equipment between industries. It is expected that a higher proportion of overall depreciation would be given to the obsolescence element in, say, textiles, and machine tools compared to tanning. Advances in textiles machinery and in metal cutting tools are very pronounced relative to advances in tanning techniques. Significant gains in productivity due to innovation are much more frequent in the former and hence the obsolescence element should reflect this. Little more can be expected a-priori and other, more general, simplifications which should be dealt with prior to the treatment of depreciation require a hearing.

Where a comparison is made between two or more levels of utilization, it is necessary to value the fixed capital on a comparable basis, particularly if the move to increase utilization required additional capital expenditure. All fixed capital contributing directly to production should be included. This means land, building, machinery and factory equipment. Office space, buildings, and fittings, and motor vehicles - unless they are involved directly in production, are excluded. Herein, all the relevant fixed capital will be valued at original cost, that is, acquisition plus installation costs, together with an allowance for inflation applied from the data of installation to the present. This procedure ensures comparability of all monetary figures. The inflation allowances are taken from the National Bank of Ethiopia import price indexes for industrial machinery and price indexes for land and building costs. They are, obviously, not ideal but they do provide a consistent method of measuring costs and profits across different utilization levels.

Nonetheless, such a procedure does represent a considerable simplification and, in two areas in particular, these are relevant to the present study. One area involves the vintage of capital stocks. If two plants producing the same product are to be compared with respect to say, labour and capital productivity, then the validity of such comparisons, when similar values of gross capital stock representing dissimilar assets in terms of their age-structure are being compared, are reduced. The more modern plant will generally have a lesser time lag in the application of new knowledge which in turn is translated into concrete production gains. These gains cannot be measured directly because changes in the composition of capital over time, changes in the distribution of these vintages within industrial structures, together with rigidities associated with factors of production, raise considerable measurement problems all of which combine to detract from the reliability of capital stock statistics in measuring productivity. To the extent that such measures are brought out in the present study this qualification should be borne in mind. It is not a problem which is specific to discussions on utilization. Indeed it pervades all areas dealing with the concept and measurement of capital.

The second simplification concerns the aggregation of capital values at plant level. Even though a plant may only produce a single, clearly defined type of output there will likely be several stages of production involved. The value added by each machine, or machine group at separately identifiable stages of production will almost certainly vary. This influences both the rate of return to capital and the costs of production. Ideally, it would be desirable to have measures of production costs, value added and rates of return for each separate machine group. The rate of return should be based on the machine group's individual capital costs, floor space occupied, (to account for its share of the fixed capital tied up in land and building costs) and production costs should be based on individual unit input costs, including power, together with the derived value added at each stage. In short, even in a very simple production operation, many techniques of production require identification - these have to be weighted by the factors mentioned above across the whole range of activities that define operations from initial input to final output in order to arrive at completely disaggregated profitability estimates. The problem is not difficult conceptually - rather it is somewhat involved computationally. The basic data would have to be obtained from accountancy records together with consultations with production personnel. At the time of the statistical enquiry for the present study such detail was not available from accountancy practices and records.

Even if these data deficiencies were satisfactorily overcome, there would remain some degree of arbitrariness in the treatment of the constituent parts of depreciation. Justification for continuing in the present case lies in a combination of two factors. The main reason for building the proitability indexes is to provide a guide to the viability of increased utilization. The discussion is not across plants but within plants, and identical techniques of production with the same capital stock and product lines are being considered. This removes much of the sting from ambiguities and pitfalls normally involved in any capital stock measures.

Second, the examination of each individual case can be made very strict in the sense that severe increases can be postulated in the case of those variable cost elements whose cost increases are not known with complete certainty. Most of these are, in fact, known within limits and the severity in such cases is imposed by selecting the upper bounds of these limits. Given this, and the tenor of the argument so far in this section, if the quantitative results still suggest that it would be economically viable to increase utilization then such results may be assumed safe within a liberal margin. A third factor, namely the employment issue, is considered in its own right, (Section 4 below). It remains for the present to consider the main categories of variable costs involved.

The discussion on variable costs is necessarily brief since these are to be assigned quantitative values and such values require specification at individual plant level. Beginning with labour costs it may be noted that labour in industrially advanced countries normally require compensation for working outside normal hours. This is an understandable incentive. Where there is not nearly enough work to go round, however, it might be reasonable to assume that people prefer shiftwork to unemployment. In Ethiopia, where considerable reserves of urban unemployed exist, it might further be assumed that there would be no need to increase average earnings to secure labour for working in the evenings and at night. Many issues and contributions from different disciplines of study would be involved in settling the pros and cons of increased wage levels in a developing nation context. Fortunately, for the purposes of profitability analysis, this can be avoided by referring to the current legislation on the subject. It may be mentioned that labour in Ethiopia is legally entitled to additional wages for working other than a normal day shift and the foregoing preamble was made because, despite what may be conceived as reasonable expectations on wage rates in developing nations, specifically that wage differentials are not paid in most of the labour surplus economies, actual practices may reveal differently. Also it could transpire that increased wage rates may be an important factor in preventing a recommendation to increased utilization. In this case the prevailing wage regimes could become part of the legitimate scope of policy measures.

A final category of costs which might be incurred as a result of a move to increased utilization is interest charges on investment required to rationalize the existing production operations before a move to a more intensive use of capital can be sensibly discussed. These are assessed as required. The other variable cost elements mentioned at the beginning of the discussion on profitability are generally assumed to be directly translatable from existing operations. These are increased as necessary to provide the strictness of results referred to above.

When an examination of economic factors, including the availability and suitability of labour and the arranging of supervision, suggests that it would be viable to increase utilization, several issues that are not entirely economic still remain.

The question as to whether people are willing to work outside a normal dayshift will be seen to be answered in the affirmative in the present study. That is, in Ethiopia at present there is much employment across industry groups in the evenings, at nights and on weekends. The issues derived from this concern labour productivity and the effects of shiftworking on health.

In the construction of the profitability indexes, the treatment of labour productivity has, to a large extent, been accounted for. If a move to a second or third shift lowers productivity then this can be built into the cost calculations since it implies an increase in the cost of output per man-hour. These could be included in the cost of labour to the firm, or, since equipment and materials are being used less efficiently, the cost factor could be taken as part of manufacturing costs excluding labour costs. Herein, and in keeping with the desire for strict results referred to above, an account of any decline in labour productivity will include, for costing purposes, an increase in material input wastage which will be incorporated in the profitability analysis.

However, the effect of shiftworking on health, though an important issue in its own right, cannot be regarded as part of the scope of the present enquiry. Since labour is willing to work shifts then this is accepted for present purposes as it stands. Psychological or physiological rhythms that detract from efficiency can not be measured here.

In addition to evaluating the effect of increased utilization on profitability the other major issue to be settled before a recommendation can be made centres on the employment creation aspect. If analysis suggests that the profitability criterion developed here is going to be fulfilled and if, in addition, employment gains are to be obtained from the increase in utilization then, for purposes of this study, a move to a more intensive use of existing capacity is taken as well founded.

II.4: Employment and utilization

Gains in manufacturing output and employment are generally regarded as functions of investment and technology. In dealing with the short-run period, large increases in capital accumulation are excluded. Investment which took place prior to the period of observation is assumed to have attained its capacity generating potential. Ongoing projects were taking place in a very few of the observed units during the time-period of the enquiry. Their nature is specified in Part B as they occur in individual plants. The methods of production are also given and hence an increase in employment potential derived from intensified labour application is denied also. This implies that the only scope for more employment lies in increasing capacity utilization.

The derivation of a capacity utilization index is conceptually simple, it being the ratio of actual to potential output. The employment index may be similarly conceived bearing in mind that it is additionally dependent on the potential for increased capacity utilization. Where scope for increasing capacity utilization exists, as determined in the previous two Sections, then estimation of potential employment gains can proceed.

Recalling that the theoretical maximum number of hours that plant and equipment can be operated during one year is 8,760 it would be possible to define an analogous concept of maximum employment. Assuming one worker is employed for eight hours per day, every day of the year, then his maximum employment utilization will be 2,920 hours. This assumption is, of course, unrealistic and requires downward adjustment to take account of vacations, public holidays and necessary downtime for routine repair, maintenance and resetting where this is performed other than by the machine operator(s). There may be other causes of unproductive time unrelated to necessary downtime which would probably have to be considered on an ad hoc basis. Practices in all these respects will vary from plant to plant and industry to industry.

Procedure along these lines can be avoided since employment utilization is dependent on capacity utilization and this has already been determined. Instead of using an actual to potential ratio, employment gains can be stated in terms of the ratio of the increase in employment plus existing employment to existing employment. Hence the employment factor will always be greater than, or equal to, unity, the latter occurring where there are no employment gains even if capacity utilization is increased. If the employment factor is expressed in terms of man-hours per unit time period then there is no need to involve considerations of downtime since these are incorporated in the capacity utilization index.

Suppose an examination of capacity outputs yields a utilization index of 33 per cent for a certain plant. The actual output was achieved on a one by eight hour shift per day basis over, say, 290 days of the year. Neglecting efficiency issues and focussing solely on the time basis of calculation, then the toal hours worked were 290 x 8 = 2,320. If an examination of plant operations reveals that it would be economically and physically feasible to increase utilization to, say, 7,000 hours per year then the employment opportunities might be expected to increase by a maximum of (7,000/2,320), and probably less depending on the operator requirements of a machine paced operation during actual production time.

Coefficients of this nature could certainly form the basis of an analysis of employment opportunities but there is no need or desirability in generating a statement of potential increases in employment in ratio form.

It may emerge in some production processes that an exact doubling of productive labour is not required in a move from single to double shifting. This would be the case only if exact balance of machine capabilities and activities existed previously. Some items being forced currently to operate at low rates of utilization may not have to double their intensity of usage in order to accommodate the increased input-output rates of backward and forward stages of production. Other items may require a relative increase in their intensity of usage such as outlined in alternative (a), pages 38 and 39 above. In these cases the employment gains will not be uniform across all the operations in the plant, being less in the first case and greater in the second.

There is also the possibility, albeit remote, of an increase in employment being more than equiproportional to the increase in utilization without any change in the intensity of usage of equipment as in the previous paragraph. This could occur in relatively less capital-intensive operations which require a small investment to rationalize existing production in order to provide a smooth transition to increased utilization - the additional employment being derived from the new investment.

Since the nature of these requirements is already known then any non-proportional increases in employment are implicit in the measures necessary to increase existing utilization.

Sections 2, 3 and 4 have completed the general statements on estimation procedures for utilization, profitability and employment. It is emphasized that they are very general and in order to give them some substance two numerical examples, using information on two plants in the present study, and covering the construction of utilization indexes, profitability analyses and a statement of the derived gains in employment are provided in the following Section.

II.5: Numerical examples of previous analysis

The following examples relate only to the construction of the various indexes. This takes account of the physical factors contributing to utilization levels, profitability analyses and employment gains. The economic implications of the previous section, together with an examination of how causes of underutilization are to be given their relative importance in any explanations occupy the final section of the chapter.

The first example refers to the construction of a capacity utilization index. The plant is a cotton spinning, weaving and finishing mill and the spinning side alone is considered in this example. It is well known that new textile mills with new installations can, in many respects, be superior to mills built only a few years earlier; for example, in production per machine unit, in automatic process quality controls, in labour productivity, and in lower initial capital expenditures on buildings and, perhaps, even machinery.

For this reason statistics on the number of spindles in place is not in itself sufficient to yield an estimate of productive capacity. The operating speeds, spindle revolutions per minute for example, are additionally helpful in obtaining this estimate but given that the aim is to relate actual to capacity output then information was sought on a parameter which could be used as a basis for a capacity output figure. This parameter has to take account of raw material suitability in order to accurately assess the clean fibre yield. This, together with specification of machine capabilities including those of processes prior to spinning were carried out in consultation with technical personnel at plant level and at the Industry Corporation level.

All textile plants under the Ethiopian Textiles Corporation keep a statement of daily machine activities, aggregated on a monthly basis. This includes the production of cotton yarn per spindle per hour. By a combination of raw material assessment, machine capabilities, and processing and operating conditions the hourly yield of cotton yarn per spindle per hour was estimated on a potential basis; that is, after account had been taken of all factors previously mentioned. Thus, for spinning, the capacity output can be written:

$$Qc = S\ (D.H).\ P. \qquad (II.1)$$

where

S denotes the maximum number of spindles installed; and is obtained from an establishment's statement of monthly activities.

D denotes the maximum number of days which can be worked per year.

H denotes the mean, over 12 months, of the maximum number of hours which can be worked per day.

P denotes the average yield of spun cotton yarn per spindle per hour, derived as indicated above.

For the establishment presently being considered the maximum number of spindles was the same in each of the twelve months from July 1975 to June 1976.

$S = 7,568$

The maximum number of days are derived from the actual number of days worked. Both these magnitudes will tend to be the same since the theoretical maximum is closely approached by the actual days worked. A divergence may occur if one or two months have a very obvious shortfall of days worked relative to the other ten or eleven observations. Should definite auxilliary information show this to have been the case for reasons other than those normally expected in connection with the process, then the shortfall will be made up to an amount equal to the mean of the remaining observations.

In this case ten of the twelve monthly observations showed that 289 days were actually worked. The remaining two months recorded an actual days worked total of 31 days. The reasons for this were power failure and labour disputes. The balance of maximum days worked was made up as outlined to yield:

$D = 346$

The actual number of hours worked per day also tends to approach the theoretical maximum. In this case the mean actual hours worked per day was used. Alterations in this case would be made when, as in the number of days worked, there exists strong auxilliary evidence accounting for the shortfall.

$$H = 22.2$$

Factors influencing the parameter P have already been discussed.

$$P = 18.9 \text{ grams}$$

Actual observed production (Qa) over the period was:

965,427 Kgs of spun cotton yarn

$$Qc = 7,568 \ (346 \times 22.2) \ (0.0189)$$

$$= 1,098,682 \text{ Kgs}$$

Therefore,

$$U = 88 \text{ per cent.}$$

It is readily seen from the magnitude of this utilization rate, and from the factors in its construction that there is little in the way of the time-intensity of capital usage that could be brought in to account for the shortfall between actual and potential output. If the, essentially, once-off factors of power failure and labour dispute had not occurred actual output would have tended towards:

$$965,427 + 7,568 \ (346 - 289 - 31) \ (22.2) \ (0.0189)$$

$$= 1,047,987 \text{ Kgs.}$$

This would have yielded a utilization rate of 95 per cent which, on the basis of the capacity concept herein, is very high.

In Part B it will be seen, generally, that high utilization rates prevail on the cotton spinning side of the Ethiopian textiles industry. Further comments on these rates are deferred until then - the purpose of the present example simply being to illustrate the mechanical construction of the utilization rate.

The second example refers to a factory which produces a very popular good quality, shoe with leather uppers. Gents', ladies' and childrens' shoes are all produced and these account for 88, 6 and 6 per cent respectively of production.

The factory has a current attainable capacity of 1,000 pairs of shoes per day on a one by eight hour shift basis. It finds this level difficult to maintain because of a single, crucial bottleneck in prodcuiion. Removal of this bottleneck would not only increase production to 1,200 pairs per shift, it would enable this level to be sustained in an orderly and unstrained manner. Further, it would remove all purely physical constraints, bar one, which might prevent a move to rationalized, two-shift operation.

At present, the capacity of the stitching department fails to meet the material requirements of the lasting department with the result that a set of machinery in the latter is idle. As in many rationalization operations, the costs involved do not end with the removal of the most pronounced bottleneck in production. Additional expenditure may be required in one or more ancillary areas. Two of these were identified in the present case.

The plant produces its own rubber soles. Provision has to be made in this line to prevent it emerging as a bottleneck given that a balance is struck between stitching and lasting, and to allow for changing fashion trends also. To enable smooth production of rubber soles it was estimated that an additional eight moulds would be required. Secondly, extra storage facilities would be required for the increase in material input and finished production.

On this basis, and by considering existing and rationalized operations the two utilization levels and the projected actual outputs may be specified. Capacity outputs, and projected actual outputs are based on 300 days operation per year. Output figures refer to pairs of shoes.

<u>Case I: Existing Operations</u>

Qa = 210,107

Qc = 300,000

Uu = 70 per cent (where Uu refers to the uncorrected utilization level)

<u>Case II: Extended Operations - Rationalized</u>

Qa = 210,107

In projecting the output on the proposed shift, allowance should be made to take account of efficiency loss because of learning time and difficulties required for new labour. For shoe production in the present establishment, learning difficulties did not appear to management to create more than a fairly short-period problem. Most production activities, and over 100 were identified, require very little operational time before material is moved on to the next stage. Workers specializing in one operation, therefore, can be expected to be sufficiently adept fairly quickly. On this basis, the following assumptions were made.

Efficiency during the first six months of second-shift operation: 600 pairs per shift.

Efficiency during the second six months of second-shift operation: 900 pairs per shift.

$$Qc = 360{,}000 \text{, first shift} + 150\ (1{,}500) \text{, second shift} = 585{,}000$$

and $Uc = 36$ per cent (where Uc refers to the corrected utilization level).

Beginning with these results the information required for profitability comparison purposes is built up in Table II.2. Each entry is explained in full in the notes following.

Table II.2: PROFITABILITY ANALYSIS of DIFFERENT UTILIZATION and OUPUT LEVELS WITHIN a SINGLE PLANT

Entry Number and Item	Unit	Existing Operations Case I	Rationalized Operations Single Shift	Rationalized Operations Double Shift A	Rationalized Operations Double Shift B	Rationalized Operations Double Shift C
1. Time Worked per Year	Hrs	2,400	2,400		4,800	
2. Capacity Output	Prs	300,CCO	360,000		585,000	
3. Actual and Projected Actual Outputs	Prs	210,107	360,000		585,000	
4. Utilization Level	%	70	-		36	
5. Output Revenue	$	3,187,300	5,472,000		8,892,000	
6. Manufacturing Costs	"	2,138,150	3,846,710		6,399,734	
7. Direct Labour Costs	"	557,300	845,256		1,406,136	
8. Unattached Costs	"	41,230	48,848		60,627	
9. Selling and Distribution Expenses	"	168,850	289,310		470,128	
10. Fixed Capital	"	1,731,664	1,841,664		1,841,664	
11. Obsolescence Depreciation	"	88,536	93,711		93,711	
				A	B	C
12. Other Depreciation	"	130,851	139,002	139,002	201,476	263,950
13. Interest on Rationalization Loans	"	-	11,000	11,000	11,000	11,000
14. Net Profits	"	62,383	198,163	311,662	249,188	186,714
15. Ratio of Net Profits to Fixed Capital	%	3.6	10.8	16.9	13.5	10.1
16. Unit Costs of Production	$	14.5	14.6	14.7	14.8	14.9
17. Revenue per Unit of Production	"	15.2	15.2	15.2	15.2	15.2
18. Profit Rate based on Unit Costs	%	2.0	4.1	3.4	2.7	2.0
19. Direct Labour Employed	No.	285	368	558	558	558
20. Mean Annual Wage of 19.	$	1,960	2,297	2,520	2,520	2,520
21. Capital Intensity of Production	No.	3.1	2.2	1.3	1.3	1.3

The first four entries in existing operations, Case I, are taken from the notes on the plant utilization levels above.

Entries 5-9 in Case I are the actual operations of the plant for the year July 1 1975, to June 30 1976. The output revenue is based on actual output. There was almost a one to one correspondence between production and sales during the period, the latter being greater by almost 3,000 pairs of shoes, 1.4 per cent, over production.

The items comprising Entry 6, Case I, are:

	$
Raw materials consumption	1,286,300
Other material input consumption	675,000
Fuel and lubricants	3,500
Light and power	51,000
Water and steam	750
Maintenance expense for buildings and machinery	61,500
Insurance expenses	20,100
Workers' transport	40,000
	2,138,150

Entry 7 is, again, the actual figure for the period under review. Labour costs are treated separately from other manufacturing costs for comparison purposes.

Entry 8 comprises general and administrative expenses and are termed unattached since the main item in their composition is staff salaries and office expenses. Although there will not be many economies associated with these when consideration is given to double shift work there is no reason to expect a marked increase in them either since salaried pessonnel will not be working shifts.

On the other hand, selling and distribution expenses can be expected to increase. The actual figure recorded in Entry 9 will be subject to the same strictness as other costs elements in subsequent columns of the Table.

The plant in this example began operations ten years before the period under review. On the basis of price indexes published by the National Bank of Ethiopia the total capital costs were updated to provide the figure for total capital employed in Entry 10. The indexes listed are those for land, buildings/building materials and imported industrial machinery and equipment. Their contribution to the gross value of capital is:

Item	Acquisition Cost $	Price Index
	1966	1966
a) Land	20,000	108.4
b) Buildings	191,000	126.8
c) Machinery	916,444	95.6
d) Machinery	-	-

Item	Acquisition Cost $	Price Index	Price Index	Gross Value
	1974	1974	1975	$
a) Land	-	-	128.7	23,745
b) Buildings	-	-	170.0	256,072
c) Machinery	-	-	133.8	1,282,638
d) Machinery	160,989	127.3	133.8	169,209

Gross Value of Capital Employed in Existing Operations

= $1,731,664

Depreciation is allowed at the rates of five per cent and fourteen per cent for buildings and machinery respectively in this sector of Ethiopian manufacturing. Since standards of obsolescence are low in a nation like Ethiopia the proportion of overall depreciation assigned to obsolescence is correspondingly set. On the other hand, small improvements in the design and performance of stitching, lasting, grinding, insoling and soling equipment, in modern shoe factories are not uncommon.

Further, the fashion aspects of this industry may render some unit of equipment obsolete overnight, or else a costly modification, relative to the initial cost of equipment may be required. That s ch a consideration might be found surprising in a developing nation - that is, one might expect production to be geared towards a basic shoe which protected feet from cuts and disease - does not alter the fact that management were frequently reviewing the fashion aspect in order to maintain their establishment's competitiveness.

In the assignation of constituent parts of depreciation consultation with production and financial staff took into account all aspects of production in the overall operations required to produce a pair of shoes. On this basis, obsolescence was set at six per cent, and wear and tear at eight per cent to account for overall depreciation in machinery. In considering depreciation in buildings no attempt was made to divide the overall level of five per cent.

For Case I, then, depreciation of machinery due to obsolescence is,

$1,475,592 (0.06) = $88,536

and that due to wear and tear is,

$1,475,592 (0.08) = $118,047

Depreciation on buildings is,

$256,072 (0.05) = $ 12,804

The remaining entries in Case I are derived directly from preceding entries. Entry 21 represents a simple reminder that capital is but one input in the production process. It is the capital-labour ratio to the wage-labour ratio, or, simply, the ratio of capital to wages.

Rationalized operations on both single and double shifts are now examined jointly. Entries 1 to 4 are derived as indicated in the construction of the utilization indexes.

The two entries for row 5 in rationalized operations are direct proportional transfers from Case I, Entry 5 and from the projected actual outputs in the one and two shift situations. For profitability comparisons, then, the same revenue per unit of production,Entry 17, is assumed.

Entry 6 in both the rationalized operation situations is, again, a direct proportional transfer from Case I according to the level of output plus an additional allowance on the respective totals to take account of extra wastage arising from the learning difficulties mentioned earlier. A wastage allowance is already incorporated in existing operations in terms of material consumption. Since the projected actual outputs are high relative to plant and equipment capabilities and since, according to production staff, waste allowance would have to be increased during the first year of double shiftwork and rationalized operations,a figure had to be set. From records on wastage in different departments the allowance on rationalized operations, single shift, was set at 5 per cent, and that on double shifts was set at 7.5 per cent. Thus,

Rationalized Operations, Single Shift,
(2,138,150/210,107) (360,000) (1.05) = \$3,846,710

Rationalized Operations, Double Shifts,
(2,138,150/210,107) (585,000) (1.075) = \$6,399,734

Total employment in existing operations is 285 production workers. This includes 75 in the rubber soles department and this department is currently operating on three shifts per day. The increase in the number of moulds in rubber soles will create employment openings for 16 workers per shift. Therefore, total, rationalized employment over three shifts in the rubber soles department will be 123. This will be divided equally for employment and wage assignations purposes between day and late shifts in the double shift operations. For rationalized, single shift operations total wages and labour within the rubber soles department will have to be included as though on a single shift with adjustments being made to take account of the increased hourly wages for labour for late- and night-shift working.

New employment in stitching and lasting due to the removal of the bottleneck in the former is estimated at 35 workers per shift and new employment if a second shift is worked, and excluding the rubber soles, lasting and stitching departments, is estimated at 155.

Hence, employment in the three situations compared is:

	Existing Operations	Rationalized Operations One Shift
Rubber Soles	75	123
Elsewhere (one shift)	210	210
New employment in Stitching and Lasting	-	35
Elsewhere (second shift)	-	-
Total Employment	285	368

	Rationalized Operations Two Shifts	
Existing Operations	1st shift	2nd shift
Rubber Soles	62	61
Elsewhere (one shift)	210	-
New Employment in Stitching and Lasting	-	35
Elsewhere (second shift)	-	155
Total Employment	307	251
	558	

The Ethiopian Government legislated in mid-1975 for minimum wage differentials for all categories of factory employees where they were working in the evening, at night, or on Sundays and public holidays. For Sundays and public holidays a 100 per cent minimum premium on average day-time earnings was legislated. For night shift, the premium is 50 per cent minimum and a suggested 100 per cent maximum. For shift working in the evenings where a complete eight hour shift, or more, was worked, and where any part of this involved working beyond 8 p.m. the premium was one-third minimum and one-half suggested maximum.

These differentials only became operative at the beginning of the period of observation for this study. It was apparent very early on that labour was sufficiently organised at plant level to negotiate successfully for the upper level of the differential ranges set. Further, since the maximum premiums were only "suggested" then scope existed for going beyond this and it was observed in several textile factories that a factor of two and a half times the average weekday, day-shift average had to be paid to labour for a reasonable turn-out rate on Sundays.

Average hourly earnings on day-shift, week days over 1975/76 was $0.82. From this the wage bills in rationalized operations are constructed.

Wage Bill in Rationalized Operations - One Shift

		$
2,400 hours x $0.82 x 286 workers	=	562,848
2,400 hours x $0.82 (1.5) x 41 workers (soles department, 2nd.shift)	=	121,032
2,400 hours x $0.82 (2) x 41 workers (soles department, night shift)	=	161,376
Total	=	845,256

Wage Bill in Rationalized Operations, Two Shifts:

1st shift		
2,400 hours x $0.82 x 286 workers	=	562,848
2nd shift		
2,400 hours x $0.82 (1.5) x 231 workers	=	681,912
2,400 hours x $0.82 (2) x 41 workers (soles department, night shift)	=	161,376
Total	=	1,406,136

Almost 75 per cent of the unattached costs, or $30,000, were accounted for in Case I by staff remunerations. There is no reason to expect an increase in these if a move to double shifting were to take place. Other main aspects of general and administrative expenses are contained in items like audit fees, telephone bills, stationery costs and postage. To maintain the strictness of results referred to, these items will be increased proportionately with output in the rationalized situations. A similar derivation is made in the case of selling and distributive expenses since these may reasonably be taken to increase proportionately with output.

The remaining cost items relate to fixed capital and the treatment of depreciation. The gross value of fixed productive capital in existing operations has been determined as $1,731,664. The breakdown of the capital expenditures necessary to remove the production bottleneck and otherwise to rationalize existing operations is:

			$
Stores, Building 250m^2	-	@ $100/m^2	25,000
Stitching Machines	-	10 @ $3,000 each	30,000
Upper Cutting Machines	-	3 @ $10,000 each	30,000
Rubber Grinding Machines	-	1 @ $5,000	5,000
Shoe Uppers, Insole Machine	-	2 @ $4,000 each	8,000
New Moulds for Rubber Soles	-	8 @ $1,500 each	12,000
		Total	110,000

This raises the gross value of capital employed to $1,841,664 and the values in existing and in rationalized operations are on comparable, updated bases. In the rationalized situation interest on the new investment loan is taken at 10 per cent. This is probably a lower price for capital than the firm has a right to expect. In economic terms the implication is that less emphasis is being placed on techniques of production that will save capital and as such will not affect the comparisons here since, essentially, identical techniques prevail in each of the three situations. To the extent it may be too low an interest rate it will affect subsequent profitability comparisons only very marginally.

Turning now to depreciation, the same rates are applied in rationalized single shift operations as in Case I. In the double shift 'A' situation there is no allowance for increased wear and tear depreciation. In the 'B' situation it is assumed that wear and tear will increase by around 50 per cent, that is, rises to 12 per cent, if utilization were to double; and the 'C' situation assumes depreciation due to wear and tear doubles, to 16 per cent, if utilization doubles. Obsolescence varies with time and hence the depreciation rate assigned to this is independent of the rate of utilization. It remains at six per cent throughout.

Depending on the assumptions made regarding the treatment of depreciation, and assuming that the strictness incorporated in the calculation of variable costs reasonably reflects the transition to increased utilization it is seen that the rate of return on capital is greater in all rationalized situations than it is existing operations and is greater in double shifting situations 'A' and 'B' than it is in single shifting. From the construction of the profitability analysis it may be argued that this could hardly have been otherwise. This, however, is debatable since an increase of about 2½ per cent in wastage allowances, or an increase of about 17 per cent in the return to labour in situation 'A' would be sufficient to lower the ratio of net profits to capital beyond the level for this in existing operations. The increase in these parameters would not have to be so large to increase unit production costs beyond those in the existing operations situation and it follows that a much lesser increase in wages or wastage would be required to produce the same effect in situation 'B', and in situation 'C' with respect to the rate of return.

Despite plausibly intuitive notions of the effect on profitability when the same capital stock is used to produce an 80 per cent increase in output in a plant per unit time-period it is not obvious that a reduction in unit capital costs increases the rate of net profit to capital and where the profit rate on capital is increased this may be accompanied by an increase in the production costs per unit of output. The bargaining power of labour in factory employment in developing nations should not be underestimated. Apart from the situation in Ethiopia, the United States Department of Commerce (1968), reports on legislated wage differentials in numerous developing nations. G.C.Winston, (1971), explicitly regards wage differentials in West Pakistan as a factor compounding the scarcity of capital (pages 54 and 56).

On the other hand, even where wage differentials exist, these might not be fully implemented. Even where they are quantitatively significant they might not be the most important factor. In some operations there may be a very marked increase in the expense incurred in repair and maintenance. In the present example a large increase in wastage allowance was envisaged in order to incorporate the strictness in results referred to. Wage differentials in Ethiopia, however, must be judged in the light of the previous remarks on legislated differentials and the ability of labour to exploit this legislation.

The gain in employment in double shift over single shift rationalized operations is fairly large, 52 per cent,in the present example and arises only because of the nature of operations in the plant. The factory is a fairly modern one yet the type of operations and the amount of these is such that this employment increase was deemed necsssary. Each stage of the production process is moved to the next by a racking system and these racks of part completed shoes are moved manually. In common with many shoe factories this is preferred to belt or other automatic conveyor systems.

Hourly earnings per man in two shift operations, assuming the shift employment is evenly rotated are now in the region of $1.05. Where profitability alone is going to be the criterion in recommending an increase in utilization the decision basis is clear cut. Where profitability in conjunction with the increase in employment and the higher average wage earnings is considered and where the profitability rate is reduced beyond the pre-increase in utilization level by the new earnings level, or by some other variable cost increase factor, then the decision basis is ambiguous. However, if employment gains are significant then, particularly in a developing nation, closer examination is required to establish if a reduction in wage differentials, or other variable costs, could increase profitability to an extent that would make, on profitability grounds, any decision basis for increased utilization more distinct. This does not imply that the average earnings of labour need be less than those prevailing in existing operations.

It would not have been possible to construct profitability comparisons over one and two shifts in the pre-rationalization situation. This was rejected outright because of the considerable production problems, for example, in scheduling and storing, that were bound to arise and which were brought out in the discussion on rationalization.

It is believed that the approach adopted here, both with respect to rationalization and with respect to profitability analysis, display the correct foundations for a comparison of utilization levels and projected output levels. The argument for preferring a rate of return approach over a costs of production approach contained the reasoning that the former will be associated with a faster rate of growth for the firm. The suggestion is made, in line with Chapter I.1, that if an economy as a whole adopts increased levels of utilization then this will be associated with a faster rate of development.

This presumes that the availability of industrial capital is a major constraint on growth and this might imply that the economy as a whole is not insignificantly dependent on the contribution made to income by manufacturing, But industry in Ethiopia is at alittle more than an embryonic stage and this detracts from impressions gained by macro growth models. At the same time, and in keeping with government emphasis in most African nations, development of the industrial sector is a major stated intention of the Ethiopian Government. Whether this is correct, or whether the emphasis is misplaced to the detriment of, say, the rural sector does not change the desire of these nations for industry now. Given this, the validity of the present study is not diminished because of the minor scale of manufacturing. The opposite can be argued since any recommendations of a policy nature made in the present study emerge from the desirability to make better use of existing resources.

The foregoing examples of calculations associated with utilization levels and profitability comparisons conclude this section. It remains to discuss the significance of observed utilization levels in terms of their assigned causes since policy recommendations are very conditional on these.

II.6: Causes of underutilization and links with previous analysis

This chapter has discussed the concept of utilization, as it is to be used here, mainly from a physical viewpoint. From this, and given scope for an increase in physical utilization, a statement on employment gains can be given.

Also, the economic choice criteria necessary for consideration in recommending an increase in utilization were examined and examples were provided on all these points.

An important question now arises and relates to the contribution to underutilization by each specified cause that has been identified in the course of, and consequent to, the statistical enquiry. As a first step, but the most crucial, direct qualitative observations of the information gained will yield immediate answers to questions relating to adequate or inadequate demand, or whether inability to obtain an essential input in sufficient quantity significantly affects the observed level of utilization.

The contribution of these economic constraints operating in the factor and product markets depend on whether they are the sole causes of underutilization or whether they co-exist with physical constraints. The relative importance of each set of causes, where they do co-exist, is described and built up from plant to industry level on the basis of the information obtained from the empirical enquiry.

A summary review of the more common of these causes is now undertaken. The discussion begins with the applicability of profitability analysis in differing demand situation.

One immediate, practical orientation to be gained from a profitability analysis is the separation of capital idleness that can be shown to be economically rational from that which is not. Where prevailing wage regimes and other input costs are such as to provide a greater rate of return on capital than that provided by an increased utilization situation then plant operators can be regarded as justifiably holding the view that expectations on capital stock and the utilization level are being satisfactorily met.

Since states of capital idleness have the same physical manifestation regardless of their underlying causes it is useful to distinguish between these states of idleness, their causes and comment on the different directions for policy that are implied.

Consider the operations of two plants, A and B, in the same unit time-period, one year. Assuming time for repair, maintenance and resetting has been made available in each plant there will be a maximum potential time left for productive operations. Let this be the same in A and B, say, 8,000 hours. Of this time available to both plants let A use 7,200 hours so that the utilization rate on a time-intensity of operations basis is 90 per cent. Let B use 3,600 hours so that the utilization rate here is 45 per cent. These are the physical indexes of utilization, neglecting output rate considerations, as discussed in Chapter II.2. If it is further assumed that the two utilization rates yield returns to capital in both plants such that an increase or decrease in the time of operations lowers these rates of return, then the 45 per cent utilization rate in B implies some sort of optimality, in terms of the firm's operations, of utilization. If it is desired to increase the output of B, then the factors requiring examination are those which cause the rate of return to be at a maximum when less than 50 per cent of the capacity is being used.

The purpose of the present study is not to determine whether 5,000 hours per year utilization is, in the above sense, optimal compared to 4,999 hours or 5,001 hours per year. Herein, much more discrete jumps are being considered since the profitability analyses relate, mainly, to eight hours per day shift systems and the consequent rates of return are based on these. However, certain points are made in this statement which, albeit extreme, are relevant and can be given a general perspective.

The different policy orientations that can arise due to different demand profitability situations are outlined in the following four cases. In all four there is clear scope for increasing the time utilization of capital.

If adequate effective demand exists for a product and if an increase in utilization raises the rate of return on capital, it follows that what is required is an examination of factors at plant and industry level to ensure a quick and efficient increase in utilization. If demand is clearly defective, and within the context of a paper exercise on profitability herein, if an increase in utilization raises the return on capital then what is required are measures to increase effective demand in conjunction with the measures to ensure a smooth transition. to a higher level of utilization as in the previous situation.

Situations three and four relate to the two demand structures where an increase in utilization lowers the rate of return. If demand is adequate then an examination of plant and industry variable cost factors, in order to single out those which contribute significantly to costs, and which could thereby become the legitimate scope for policy measures, is required. Finally, where demand is inadequate then corrective measures here, together with the cost examination and corrections as in the previous situation are required.

One policy reason for spelling out these distinctions is the predominance of demand stimulating measures that are prescribed for observed idle capital in developing nations. The efficacy of sch policies is not being questioned here, particularly since it is reasonable to expect that the investigators' analyses and judgements led them to conclude that deficient demand was, in some sense, a binding cause of underutilization. However, recommendations to increase effective demand by measures such as income redistribution, aimed at raising consumption levels in favour of lower income groups, linked to a judicious control of competing imports, or export subsidies, are sometimes made without evidence, beyond the contention, implicit or explicit, that unit capital costs will decrease, of further considerations of profitability.

In line with the demand/profitability distinctions made above the suggestion is now being made that policies which advicate the stimulation of demand could be more harmful than good if it transpired that the observed idleness was economically rational. Where lack of effective demand is not a binding cause of underutilization then measures designed to increase demand could induce unwarranted investment levels in some industrial sectors.

However, in the second and fourth demand/profitability situations there may be very large reserves of idle capital that are caused by the dominance of an inadequate demand level for the product, or product group concerned. In this circumstance, the question of increased utilization in terms of an additional shift, or more, being worked is premature since the situation envisaged has low utilization levels within the existing, presumably one shift, time-intensity of operations. The application of a profitability analysis is largely meaningless from a practical viewpoint. The major aim in such cases is, given a detailed examination of the demand structure, to implement the measures required to effect an increase in demand. In terms of the procedure in Part B, this means that the application of profitability analyses require the existence of physical scope for increased utilization and an adequate demand level. The former, alone, is insufficient.

The level and structure of demand will always be an important factor in discussions of capital utilization.

and an adequate demand level. The former, alone, is insufficient.

The level and structure of demand will always be an important factor in discussions of capital utilization. But a bland statement to the effect that there is insufficient aggregate demand is not particularly useful. Consider excess capacity akin to the Keynesian situation of deficient aggregate demand. This is forced on the industry, is undesirable and unpremeditated. Plants wish to produce more, are capable of doing so, but are prevented by the lack of market outlets, domestic and foreign. A situation of this sort is not difficult to envisage in an industrialized society wherein, for whatever reason, a slump or depression can result in decreased production and employment. The implication, which is important for present purposes, is that the idle capital and labour were previously employed in a more prosperous period.

This does not mean that Ethiopian manufacturing could not be subject to a falling off in industrial activity due to internal or international forces. Rather, the contention is that where excess capacity prevails, and where the plant operators would produce more, given the market, there can be reasons unconnected with a decline in demand for low, even very low, utilization levels. Further, these reasons still relate to demand circumstances.

Where excess capacity is prevalent in an industry for other demand reasons, the assessment of ex-ante investment decision at individual plant level would be a revealing exercise. The possibility of obtaining a complete assessment of this nature is very remote since it would entail first-hand knowledge of all factors relating to the decision-making process for every plant from the time of the first notion on its inception to the present day. On the other hand, several well-known reasons which justify ex-ante the existence of excess capacity are to be found in intermediate level microeconomic texts. These include:

(1) Building Ahead of Demand

Idle capacity in the short-run period is justifiable because the (expected) future increase in demand will result in fuller utilization of plant and in higher profits through the scale economies which become available. (The advantages of scale are expected to be greater than the advantages of full utilization on the basis that unit output costs in small plants can be higher than those for larger plant working at less than full capacity). This enables a firm to maintain its share in a growing market. Excess capacity of this nature should, therefore, be a transient situation, but, if the market projections were overestimates, or if the product mix projections were wrong then excess capacity may well be a prolonged eventuality due to the non-realization of ex-ante expectations.

(2) Monopolistic/Oligopolistic Structure

The presence of non-perfect competition would justify excess capacity *ex-ante* by virtue of the firm facing a downward sloping demand curve which makes it more profitable not to operate at full capacity.

(3) Fluctuations in Demand

Where demand fluctuates seasonally, or on some other temporal rhythm, there may be peak periods of activity which results in the maintenance of underused equipment at other times.

(4) Equipment Breakdown Provision

Excess capacity can provide for the continuation of a smooth product flow in the event of a serious breakdown in some item of equipment.

(5) Perishable Inputs

Excess capacity can be necessitated by the perishable nature of certain input supplies.

(6) Inability to Enter, or to Penetrate Export Markets Sufficiently

Penetration into export markets can be difficult due to quality/price non-competitiveness or lack of promotion services. Often, plants are not seen to pursue the question of exports because the returns from these are less than from the domestic market. This could be because producers buy inputs at inflated prices whereas output enters international markets at more competitive rates.

Among the more common factors contributing to idle capacity on the input supply side, there are: raw materials shortage; equipment shortages; skilled personnel shortages; and utilities shortage.

(1) Raw Material Shortage: Various aspects under this heading can be specified:

(a) Physical Shortage; The use of this term refers mainly to inputs for agricultural processing sectors where a plant cannot obtain its basic input because of deficiency in needed supplies - there is not enough grain or flour, for example, available. This is a different situation from:

(b) Lack of organizational facility relative to raw material acquisitions; This refers to a lack of foresight by plant or corporation management in obtaining basic material inputs. The implication is that proper organization would have prevented a shortfall in input requirements.

(c) Poor or varying quality; Again, utilization could be forced down because of poor input quality. For example, inferior or changing standards in the hides and skins for leather tanning can force utilization down either by decreasing the intensity of operation or by reducing finished output per unit time period.

(d) Transport and storage facilities; This refers mainly to bulky raw material inputs or to those plants whose inputs cannot be stored, and where collection has to be frequently carried out.

(e) Shortage of foreign exchange/import restrictions; This can be one aspect of a balance of payments problem. The strength and vigour of representation at import licensing authorities/credit institutions often decides whether permission and capital for the acquisition of inputs from abroad are obtained. At a domestic level, a shortage of working capital can be mentioned since constraints in this direction may aggravate shortages in inputs which, otherwise, could be stockpiled.

(2) Equipment Shortages: The reference here is primarily to spares and maintenance equipment. The various impacts of this can follow a pattern similar to that for raw material shortages.

(a) Non-availability; Required parts might not be available unless specially ordered and manufactured. Delays and hence, underutilization, results.

(b) Organizational facility; Efficient organization and anticipation of requirements can alleviate the delays referred to in (a).

(c) Transportation; Difficulties are common with deliveries from seaports to the interior. Generally, plants have no control over this.

(d) Foreign exchange/import restrictions; As before, except here the adverse effect is in terms of the acquisition of needed spares and equipment.

A foreign exchange problem preventing importation of essential inputs probably reflects one facet of a larger balance of payments problem. Policy measures at national level could provide part of the solution to this. Import duties on required inputs could be reduced or eliminated. A licensing policy which allows for the importation of materials and spares necessary for maaintaining high utilization rates should be adopted. The imports of many materials and spares are permitted in quantities that are observed to be barely sufficient to cover a "normal" one shift operation. On the other hand, import permits may be more easily available for basic installations. This stimulates the purchase of these, can contribute to excess capacity, and intensifies the problem of upkeep and efficient operation of existing plants. Data on Pakistani manufacturing suggests that duty free entry of essential inputs can markedly increase utilization rates. The U.N.I.D.O. (1971) reports that utilized productive capacity rose by 29 per cent to 82 per cent between 1963 and 1965. This 55 per cent increase in utilization was derived from such a measure.

Alongside this there are export promotion policies. The granting of direct export subsidies, together with privileges in the use of foreign exchange acquired through exporting could be mutually reinforcing towards higher utilization rates. The difficulty in such measures lies in achieving a satisfactory trade-off, both internally and internationally. The answer to possible retaliatory action might lie in the establishment of trade agreements with foreign nations, or in the international sharing, on a reciprocal basis, of manufacturing facilities. Again, many difficulties are inherent but for small industrial nations such policies offer an opportunity to establish industries of modern scale for which local facilities for organizing input supplies, and demand levels, are insufficient.

Much assistance from aid donors is based on an assessment of total resource requirements as well as on what is presently available in recipient countries. The apparent predilection for new projects could have an adverse effect on utilization in a manner somewhat analogous to a tight importation policy on needed spares. These latter are often more critically required for the smooth and fuller utilization of existing programmes than is the requirement of a new project.

Fiscal incentives of a domestic nature need not be particularly sophisticated to be effective. A straight tax rebate on sales derived from production in excess of a base period's production, given the same level of installed plant, could be used to increase utilization. A more generous depreciation allowance on plant being worked for two or three shifts per day could be introduced.

Finally, adequate working capital might not be forthcoming once a plant is built. Access to credit is often difficult. This confounds expectations on providing for an adequate stock of raw materials and spare parts. They prevent the hiring of necessary technical and professional skills which detracts from efficiency in many areas including planned and actual production and distribution, and in financial operation.

(3) <u>Skilled Personnel</u>:

(a) <u>Managerial</u>;

(b) <u>Technical</u>;

Shortages in these functions are difficult to categorize. An indication of the presence of managerial deficiency should be regarded as a defect in, for example, administrative, financial or distributional function whereas technical deficiency refers to shortcomings in repair, maintenance and efficient running of machinery generally. This may require further comment to be supplied. For example, it will be necessary to bear in mind the level and sophistication of mechanization. Within a large textile plant there may be more than one skilled technician who work hard and efficiently but because of the amount and complexity of equipment more of their number would be an asset. Therefore, a shortage of technical personnel would be indicated. But this is a quite different situation from, say, a small grain mill where there is no-one clearly fulfilling the role of technician and where, again, a shortage of skilled personnel would be indicated.

(4) <u>Utilities</u>;

(a) <u>Electricity supply</u>;

(b) <u>Water supply</u>;

Failure in electric power supply and water shortages were not particularly important contributions to underutilization. They did occur in isolated instances and are mentioned for completeness.

Following the individual plant and industry discussions in Part B, the result of the enquiry can be summarized on the basis of the presence or non-presence of these factors, their frequency of occurrence and relative importance, across all observations. There is no implication of mutual exclusivity between many of the above causes of underutilization. Deficient demand can co-exist with input supply bottlenecks. However, even though there is no exact dichotomy between demand and supply factors, which influence utilization levels, there can be the rough expectation that, where demand is strong and utilization very low, the reasons for this are mainly related to input supply conditions.

Again, the inter-relationships between causes under the same general heading can be involved. A lack of transport and storage facilities, or varying input quality could be a result of deficient organizational facility but varying input quality may be related to physical shortage alone. Clearly, an examination of plant specific features will aid the tracing out of such cause-effect relationships.

Finally, it will be necessary to consider the inter-relationships between utilization and important economic parameters, of a more aggregative nature, that have not yet been admitted explicitly. Examples of such parameters would include the average size of plants in an industry, their capital intensity, their capital-income ratio, labour productivity and the influence of the external sector in terms of exports, competing imports and imported inputs in the structure of total material inputs. (These parameters are defined in full after the table displaying their values in Part B of the study).

The purpose in developing this quantitative description of the structure of utilization is straightforward enough. Such measures are the first step in ascertaining the inter-relationships between utilization levels and the economic categories described. From this, hypotheses can be identified and tested. For example, it might be expected that the relationship between capital utilization and imported inputs as a proportion of total intermediate inputs is positive, or that the level of utilization will vary inversely with the level of competing imports - particularly in a sector which was subject to an import-substitution policy. This would mean not only that demand for domestic production would be reduced because of imports, but also that previous investment has been biased towards industries which markedly compete with imports. Conversely, however, it is to be expected that current exports add to demand and therefore have a direct effect on utilization. Again, it could be argued that past exports will detract from utilization if investment was subject to import-substitution policies with its concomitent export despondency.

Are utilization rates positively associated with capital to output ratios? The intuitive response would probably be 'yes' since this would reflect profit and/or sales maximizing behaviour adjustments to the cost and productive structures obtaining among industries. Maybe the size of a plant is related to its rate of utilization - issues involving economies of scale arise and consideration has to be given to indivisibilities in production relative to demand, to managerial economies, and to the scale of achievable product flows within the plant as opposed to binding indivisibilities on output.

Other questions not easily ascribed to a particular hypothesis could be asked. Would relatively high (low) labour productivity be associated with relatively low (high) utilization rates, or is the relationship between these direct?

Several other hypotheses could be mentioned but these belong in Part B of the study. From the examples given it is clear that multiple regression analysis is ideally suited to their testing - provided note is taken of the basic statistical assumptions that require to be fulfilled.

Regression analysis is not applied at the stage where the existence and extent of underutilization is determined. The intervening qualitative observations on the structure of underutilization are a necessary element in the correct setting out of the regression equations. Except for the application here, where the dependent variable is utilization, several econometrics texts, in showing how statistical theory attempts to cope with the intricacies imposed by economic actuality, contain generalizations of the points to be made.

A major problem in the application of regression techniques is often the specification of the individual relationships to be tested, herein the structure of causality of underutilization. A single-equation framework is immediately excluded since this assumes that the various causes are independent variables and are substitutable in the sense that an increase in the weight of one is compensated by a decrease in the weight of another. This balancing simply doesn't exist since each cause could well be sufficiently independent in its own right. Multiple equation systems may be inadequate also. These require that all postulated causes are simultaneously incumbent. In the outline of capacity and its utilization, as presented here, it is to be expected that some causes are binding while others are not - this, in fact, becomes very apparent once the indexes in Part B are examined. The general application of a simultaneous system will, therefore, yield wrong estimates of the causal extent of every independent variable listed.

Again, recalling from Chapter I.4, the premise that producers had some idea of the expected market, which influences their choice of plant size, then the possibility exists of a production process operating on one shift per day with very high utilization rates on this basis, but obviously low utilization rates obtaining if three shifts working is possible. This means that the left hand side of the equation is not variable utilization, $0 \leq U \leq 1$. The dependent variable is now the desired shift system, assuming values of 1,2 or 3. This raises the possibility of using a logistic transform for probabilities lying outside the zero to one range but the multinomial logit required raised consderable computational barriers, apart from the lack of a standard concept. Other variations such as the use of binary variables or discriminant function techniques also raise conceptual and computational difficulties.

The existence of these impediments would prevent the use of a very powerful tool of analysis unless it is possible to divide the range of observations into subsets containing the same binding explanatory variable. Thus the qualitative observations on the structure of under-utilization are an essential prerequisite of the legitimate use of regression techniques. An obvious example of a two set classification of all the data would be industries where lack of effective demand is likely to be a binding cause of idle capital and industries where this is not the case. This criterion, and others are applied to the observations herein so that multiple regression techniques can legitimately be used.

This concludes the main theoretical aspects of the study of utilization. The methods used to compile the statistical information and the application of the techniques developed in this Chapter occupy Part B.

PART B

DATA, TESTS and RESULTS

CHAPTER III

THE STATISTICAL ENQUIRY

This chapter mainly describes the statistical investigation which supplied the information used in the study. It begins, however, with a very brief perspective on the Ethiopian manufacturing sector.

III.1: Background perspective

The remarks in this section are of a descriptive nature only. An analysis over time is possible only on the basis of certain broad aggregates. Most economic statistics on Ethiopia are subject to a considerable range of error since the collection of information at source is still at an early stage. Comparisons are made only with those aggregates for which the nature of the change is reasonably distinct. On this basis some salient features of the Ethiopian National Income are provided in Table III.1. Subsequent remarks in this section are confined to entry B.2., manufacturing, in the Table. All dollar references are to Ethiopian dollars. During the year 1975/76 the Ethiopian Dollar was tied to the United States Dollar at the rate of U.S. $1 : E $2.07.

Industrial production in Ethiopia is mainly geared towards the limited domestic market and consumer goods

TABLE III.1: SUMMARY ETHIOPIAN NATIONAL ACCOUNTS DATA, 1960/61-1972/3

	1960/61 $m	1964/65 $m	AVERAGE ANNUAL GROWTH RATE 1960/61 to 1964/65 (per cent)	1968/69 $m	AVERAGE ANNUAL GROWTH RATE 1964/65 to 1968/69 (per cent)	1972/73 $	1960/61 to 1972/73 (per cent)	1964/65 to 1972/73 (per cent)	1968/69 1972/73 (per cent)
GROSS DOMESTIC PRODUCT AT CONSTANT FACTOR COST OF 1960/61	2331.7	2837.3	5.1	3327.1	4.0	3879.2	4.1	8.0	4.0
of which									
(A) AGRICULTURE SECTOR	1504.5	1670.3	2.7	1791.4	2.1	1947.4	2.1	3.9	2.1
(1) Agriculture a/	1434.4	1588.0	2.1	1694.5	1.7	1873.2	2.2	4.1	2.6
(B) OTHER COMMODITY SECTORS	286.2	390.3	8.1	534.7	8.2	640.6	7.0	6.4	4.6
(1) Mining and Quarrying	3.3	7.6	23.0	6.6	-3.6	9.5	9.2	2.9	9.6
(2) Manufacturing	43.9	79.8	12.7	126.2	12.0	175.2	11.9	10.3	8.6
(3) Handicraft and Small-Scale Ind.	98.4	116.1	4.3	156.4	7.7	193.2	5.9	6.6	5.4
(4) Building and Construction	130.8	165.8	6.2	214.3	6.6	220.8	4.4	3.6	0.9
(5) Electricity and Water	9.8	21.0	21.0	31.2	10.4	41.9	12.8	9.0	7.7
(C) DISTRIBUTION SERVICES b/	217.7	340.3	11.9	443.2	9.3	585.1	8.7	7.0	7.2
(D) OTHER SERVICES c/	323.3	436.4	7.8	557.8	8.4	706.1	6.8	6.2	6.0
Population ('ooo)	20,219.0	21886.0	2.1	23690.1	2.1	25771.2	2.1	2.0	2.1
GDP Per Capita	115.3	129.6	3.1	140.4	2.0	150.5	2.1	2.0	1.8

Source:- Compiled from data supplied by the Central Statistical Office, Addis Ababa

Notes:- a/ Other components of AGRICULTURE SECTOR are: Forestry; Hunting; Fishing.

b/ DISTRIBUTION SERVICES comprise: Wholesale and Retail Trade; Transport and Communication.

c/ OTHER SERVICES comprise: Banking, Insurance and Real Estate; Public Administration and Defence; Ownership of Dwellings; Educational Services; Medical and Health Services; Domestic Services; Other Services.

account for more than 85 per cent of total manufacturing. Prior to the nationalization of large productive enterprises in early 1975 the owner/manager structure was largely expatriate. Even more during the period of enquiry than just prior to it there was a dearth of trained manpower and skills at all levels. There is a significant amount of imported input dependence and a liberal guess-estimate of profitability is about 10-12 per cent. This compares favourably with commercial agriculture but would hardly be sufficient to attract potential investment, domestic or foreign, even in a stable environment far less one which is exhibiting considerable government and domestic upheaval.

As well as a low value-added share in the cost of production, Ethiopian manufacturing exhibits a non-competitive price structure. This probably owes much to the prevailing tariff system. Effective rates, though irregular, tend to be high. Examples have been observed where the import price value of a product is less than the value of intermediate inputs - also at import prices. Enough empirical work in various nations is now available to strongly suggest that there is no association between high effective protection and increased value-added, employment or foreign exchange gains. This appears to be the case in Ethiopia according to the paper by S.J. Guisinger (1972).

The last survey on manufacturing industry for which results are fully complete was for 1972/73. Only 421 establishments employing ten or more people, and having powered machinery of five or more horsepower were eligible for inclusion. The employment and installed power criteria separate manufacturing from the handicraft and small-scale industry sector as far as entries in the Ethiopian National Accounts are concerned.

Bearing in mind the caution on data, Table III.2, page 121, offers some information on manufacturing for the six years up to 1972/73.

Within manufacturing, textiles is the leading industry on many indicators. It employs about 24,000 (44 per cent of the manufacturing total), and has 31 per cent of the gross value of output. Total value-added in manufacturing, at factor cost, was $214.4 million in 1972/73, of which textiles had 32 per cent, ($69 million).

Other industries which figure prominently in the categories of employment, value of gross output and value-added are: Food - 18, 12 and 19 per cent, of the respective totals: Beverages - 5, 10 and 9 per cent; Chemicals - 5, 11 and 12 per cent; and, Leather and Shoes - 5, 6 and 4 per cent. These five industries, therefore, account for 77 per cent of employment, 81 per cent of the value of gross output and 76 per cent of value added in overall manufacturing.

TABLE III.2: PRODUCTION and EMPLOYMENT STATISTICS, Ethiopian Manufacturing, 1966/67-1972/73

Year	Gross Value of Production $ Millions	Employment	Gross Value of Production per Employee
1966/67	365.00	44,349	8,232
1967/68	467.5	47,332	9,877
1968/69	542.6	48,903	11,096
1970/71	625.9	51,312	12,198
1971/72	689.7	53,398	12,916
1972/73	772.5	55,028	14,039

Source: Central Statistical Office, Addis Ababa.

By far the majority of observations in the present study come from these categories and it is the nature of the enquiry on the individual units which is now discussed.

III.2: The statistical enquiry

This section describes the empirical framework within which the study is conducted. The units of enquiry are nationalized Ethiopian firms under the control of the Ethiopian Ministry of National Resources Development, (M.N.R.D.) In addition, some share companies comprising foreign and Ethiopian Government capital were investigated. As will become apparent, a virtually complete enumeration of the larger Ethiopian establishments in the food, beverages, textiles, leather, and leather products, printing and iron and steel industries was obtained.

Certain chemical industries including soaps,paints and varnishes, and plastic products were also covered. An unfortunate omission was the larger cement plants. The main Ethiopian cement firms were not, at the time of the investigation, under the control of the M.N.R.D. The Ministry which did have control of these was not so amenable in allowing an outsider to investigate its activities in the cement line. Enough information was obtained to permit of a blanket statement on capacity, and auxilliary information will enable accurate comment to be made on this. However, the extent of detail is not nearly so complete as for other units of enquiry.

The state control of Ethiopian industry took place mainly during the first few months of 1975. Corporations, designed to serve broad industry groups, roughly corresponding to the I.S.I.C. three digit level, were formed and this process was ongoing during the period of investigation. Each corporation is responsible to the M.N.R.D. and each has its own production planning, financial, manpower, marketing and other departments dealing with diverse technical and economic matters. Department heads liase with their corporation head who, in turn, takes up relevant matters at Ministry level, usually to the Industry or Planning Sections within the M.N.R.D. It should be emphasized that Corporation personnel were often highly trained, both formally and experientially, people and although they were another cog, virtually by definition, in an already extended bureaucracy they functioned more as a business partner to their plants on a commercial basis in the areas already mentioned rather than as an additional bureaucratic channel.

In January 1976, contact was established with the then head of the Industry Department at the M.N.R.D. During the first few visits the nature of the present study was discussed and written authority to seek information at plant and corporation level was obtained from the Permanent Secretary to the Ministry. During these initial meetings the scope of the enquiry and the method of obtaining the desired information was discussed. At the same time it was mutually understood that a complete listing of all desired information could not be immediately supplied. This is preponderantly the case, of course, in statistical investigations that are not grounded in an axiomatically consistent and rigid theory. Indeed, a formal theoretical structure to be tested by approved techniques was never a characteristic of any subsequent stage of the statistical data gathering. As the investigation proceeded several competing alternative hypotheses were observed. A good investigatory design must encompass a variety of alternative, testable constructs or theoretical structures and attempt to provide the crucial data required to choose among them. The task is made complex either by the apparent lack of connection on the one hand, or, on the other, by the diversity of this between the constructs and the variables that can actually be measured.

But the variables which can actually be measured in practice are many and it would be foolish to write down all possible data just as it would be foolish to single out a particular hypothesis a priori and proceed to test this alone. To simply collect data would quickly lead to an unmanageable morass and to select one hypothesis is being unduly rigid and must be regarded as obsolete in the area of experimental design. It becomes imperative to select a balanced course between these. This requires that the process of data collection possesses some structural connection.

Such a connection and hence justification for continuing the investigation is to be ascertained from two directions neither of which, unfortunately, is precise until the study is complete. First, it is important to maintain contact with the situation or behaviour, or set of these that is to be explained. Capacity utilization was firmly in mind during all aspects of the statistical enquiry. The second direction consists in satisfying a critical audience that the explanations given are superior to likely alternative explanations. The method of gathering the statistical data and how the link with capacity utilization was maintained is now given.

The first visits conducted at plant level did not seek exact answers to questions unless such answers were immediately apparent. The reason for this was essentially pragmatic in that it was obviously desirable to be familiar with a plant's operation at first hand before sensible questions could be posed anyhow and, also, it was equally desirable to try and establish as reasonable a relationship as possible with plant operators. This was not going to be aided if questions which might require time and effort on their part to answer were asked outside an informed and organised approach.

The reasons given for undertaking the investigation and the broad questions posed at the initial stage with M.N.R.D. were covered in Chapter 1's overview of capacity. Discussion on these and similar issues quickly revealed that no generalizations between or within industry groups on causes of underutilization would be possible on the basis of initial observations. Low utilization rates appeared in groups or in plants within groups where demand for final product was strong and where also the raw material was not deficient. Industry groups with relatively high capital intensive structures displayed low rates of utilization - a result which flies in the fact of much accepted doctrine on the subject. However, such allegations are question begging at this stage. They are made for two reasons. The need to obtain non-plant specific information, competing imports for example, was always recognised. This also raises the question of what is meant by capacity.

If a plant has two operable production lines producing identical products with only one operating, and further, if the operatives declare that they are working at full-capacity then they have their own views on this which need not correspond with those of operatives in other plants. The suggestion in this particular case could be that a producer is working well below the physical capacity of his plant but is easily meeting the market demand for his product. Part of this particular product market may be shared with imports and the producer is operating at capacity, as he sees it, in market terms.

The approach to capacity adopted here has already been discussed and the preceding is just an example of an alternative viewpoint, but it does involve the more general issue of knowledge gained inductively through enumeration of instances. Thus statistics on several aspects of a plant's operations could be combined with externally gathered statistics. Other information to do with the history of the plant and its operations could be obtained and the combination of quantitative and descriptive observation yields a testable construct, but one which might not appear to have any general validity. The construction of a theory and the testing of this against revealed facts did not emerge in a distinct manner. Rather, certain empirical insights, inductive bases, were generated and the programme of theoretical and observational information proceeded together. It was believed that movement towards more comprehensive information would thus be assured even though an exact analytic statement of the problem was not immediately to hand.

Should the results of an investigation designed to test, for example, whether competing imports contributed to excess capacity prove negative then this hypothesis requires reformulation if it is not to be dismissed. If the results of such an investigation prove positive then the hypothesis is supported and the remainder of the investigation seeks to fill out detail. This process continues until no reasonable doubt remains. Other hypotheses, not mutually exclusive to the supported one, are not ruled out. But where results of an investigation are mixed - that is, if a hypothesis is fully borne out empirically with information applied to some observed units while identical categories of information applied to the same hypothesis on other observed units yielded negative results then finer discrimination is called for. This dismisses any claims of generality of an "x affects y in such and such a way" type statement but the hypothesis cannot be dismissed, nor can the validity of statistical results be challenged simply because they provide no evidential substance to previously supported hypotheses.

This investigative procedure-effect relationship is two edged. It can be summarized by noting that the constancy of a generalization should not be allowed to detract from insights deriveable only from close individual examination while this latter should not be allowed to deflect attention from the comprehensiveness deriveable from generalization on a broad plane. The gathering of data, then, was personified by an apparent cleavage between causation and the, again apparent, performance of existing theories. At no stage, however, was it envisaged that "contradiction" of previously held conclusions would result in their replacement by a "newly-found" substitute. If this were done it would be in direct contradiction to the foregoing. More specifically, since the commonly proposed causes of underutilization were already available and were not part of the results of the investigation, then there is no basis for judging between these and insights generated by the enquiry until all evidence has been examined. To do so would presume superiority and involve, implicitly, value-free behavioural assumptions - a state of affairs which is non-existent.

These considerations led to the concept of capacity already discussed. This has the appeal of being uniform across industries and markets and is to be preferred operationally since it is in principal observable without reference to exogenous influences on actual performance. Apart from providing the capacity output level, the inherent nature of the construct reveals physical and technical factors contributing to underutilization. It was then envisaged that economic, social and other non-physical contributors to underutilization could be worked in as the overall operations of each unit were exhibited in detail. The problem now lay in the collection of the required information.

A two way approach to the problem of gathering data was adopted. Several personal follow-up visits were made to the plants investigated. This was during the last half of 1976; it made possible first-hand familiarisation, in a lay sense, with the production methods of the units of enquiry and enabled direct verification/negation of issues which were raised during previous visits. In addition, a questionnaire was designed and distributed to all units of enquiry. Auxiliary information such as the proportion of imports in the total supply of a product, product markets and methods of distribution were obtained from the bodies most able to provide these. Thus a breakdown of imports was obtained from records held by the Customs Head Office in Addis Ababa. Imported input price movements were obtained from the National Bank to supplement and confirm information obtained on this at plant level. In short, a comprehensive store of auxiliary information, for which a precisely specified end use could not be immediately ascribed, was built up.

At plant level it was not sufficient to specify the general object of the enquiry. The uses to which the answers were going to be put had to be kept in mind so that the questions were in the right form. The starting point of the questionnaire and the plant visits was to set out in detail that information which it would be ideal to obtain, - this being subject to modification because of what is learned as the investigation proceeds. In this study a decided advantage was possessed in that decisions on the required date, the compilation of the questionnaire, its distribution, the first-hand observation of relevant physical operations and the analysis of the data were carried out directly in all cases. This compensated completely for any amendments necessitated because of non-inclusion of a plant specific feature. In addition, after the initial distribution of questionnaires, no contact was made with plants for a period of five to seven weeks in order that these could be completed without any investigatory bias being imparted orally. The questionnaire is reproduced in full in an appendix to this chapter.

In framing the questions the over-riding consideration was to obtain concrete information on why a scarce resource, capital, was underused. Care was certainly taken in specifying the capacity concept but this was done so that it would shed light on the causes of underutilization rather than as an exercise in precise estimation. The justification for this was simply that continually refined estimates of capacity, such as those obtainable from exceptionally detailed specifications of productive activity, are not as warranted in Ethiopia with its embryonic industrial structure as is the need to obtain causes of underutilization.

Consideration of the precise form of the questionnaire had to take account of qualitative and numerical attributes of such methods of data collection. The questions were formed so that unique answers were, in principle, possible. Question 18, page 12 in the questionnaire, could have contained some ambiguity but checks on this were incorporated in the preceding and subsequent questions. Again, ample opportunity for checking was provided during the follow-up visits. Indeed the follow-up visits were very useful in obviating the lack of statistical theory generally which exists in the field of questionnaires. In particular, since this branch of statistics has not completed even the qualitative description and enumeration of its characteristics then possible ambiguities were capable of being resolved first-hand. Inaccuracies due to capricious responses were easily checked and those due to the respondent not being in possession of the relevant information at the time of the enquiry were resolved during subsequent visits. Since nationalization, all the categories of information requested, apart from those designed specifically to elicit information on capacity utilization, were the subject of ongoing enquiry at the M.N.R.D. if they were not immediately to hand at plant level. This knowledge was held in reserve until all responses were complete on a first time around basis. They then served as an additional check on several of the responses. For example, Questions 8 to 12 in the quesionnaire often involved the collection of information available from plants but not in a form immediately amenable to insertion in the questionnaire. In these cases translations were made and later compared to comparable exercises performed by the relevant Corporation or M.N.R.D. official.

All the questions on capacity and its utilization were completed at plant level before further direct investigation was entered into. Responses varied in detail as far as the capacity questions were concerned. One plant, producing structural iron and steel products provided a handbook of their complete technical operations together with a summary of this attached to the questionnaire. On the other hand, one soft drinks plant merely listed six single word headings, which covered its entire operations, stated under which one a bottleneck occurred and declared capacity depended solely on this. Subsequent investigations filled this out descriptively and quantitatively but the constraint stated by the firm remained binding and the further detail obtained added little to the causes of underutilization outside those arising from within the physical dimension. This emphasizes the point raised earlier about ascertaining causes rather than having a utilization index speciously accurate to the order of one tenth of one per cent.

The General Instructions on page (i) of the questionnaire were, in addition to their obvious function, an attempt to ensure the attainment of the minimum objective of semi-quantitative information whenever fully quantified data might not be obtained. The questions were directed at the gathering of all quantitative information that might be available. However, despite the provision made for offering extensive aid to all establishments in answering the questionnaire through personal visits, the final form of the questionnaire was less detailed than originally envisaged. The need to back-pedal on the extent of detail was apparent from consultation with M.N.R.D. officials and this was reinforced after a few initial visits to selected establishments in different industries. Any categories of questions outside those with which the respondents were completely familiar in their daily work reduced considerably the chances of an effective response. The issue then became one of a trade-off between a relatively high incidence of unanswered sections at establishment level and the amount of follow-up that could be done to rectify this. This consideration culminated in the revised questionnaire given in the Appendix to this Chapter.

Table III.3, provides the possible and actual coverage of the statistical enquiry at the I.S.I.C. Four digit level. By possible is meant those industries under the control of the M.N.R.D. or under joint M.N.R.D.-foreign ownership together with a few other units of enquiry that are under the control of other Ethiopian Government Ministries or bodies. These are designated in the table. By actual is meant the usable response in terms of completed questionnaires, personally gathered information at plant level, and information from the M.N.R.D. or relevant corporation.

TABLE III.3: RESPONSE to QUESTIONNAIRE on CAPITAL - CAPACITY USE

I.S.I.C.	Description	Response Possible	Response Actual
3111	Meat Processing	2	1
3112	Dairy Products	3	2
3115	Oils and Fats 1/	8	6
3116	Grain Mill Products	13	10
3117	Bakery Products	6	4
3118	Sugar Refining	3	3
3132	Wineries	3	3
3133	Malt Liquors	3	3
3134	Soft Drinks	8	7
3140	Tobacco 2/	1	1
3211	Spinning, Weaving, Finishing	11	11
3212	Made-Up Textiles	7	6
3213	Knitting Mills	4	4
3214	Carpets and Rugs	2	1
3215	Cordage and Rope	3	3
3220	Wearing Apparel, not Footwear	2	1
3231	Tanneries	7	6
3240	Leather Footwear	5	5
3412	Paperboard Boxes	1	1
3420	Printing and Publishing	6	6
3511	Compressed Gas	1	1
3521	Paints, Varnishes, Lacquers	3	3
3523	Soaps and Cosmetics	4	4
3530	Patroleum Refining 2/	1	1
3559	Rubber Footwear	3	3
3560	Plastic Footwear, Plastic Sheets, Pipes	3	3
3620	Glass Bottles	3	3
3691	Structural Clay, Bricks	1	1
3692	Portland Cement 2/	2	2
3710	Steel Bars, Slabs, Corrugated Iron Sheets	5	5
3811	Hand and Edge Tools	1	1
3813	Structural Metal Products	1	1
	TOTAL	125	112

Notes 1/ Includes animal feed cakes

2/ Not under M.N.R.D. control

III.3: Appendix, The Capital-Capacity Use Questionnaire

This Appendix displays in full the questionnaire used to obtain information on capital-capacity use in the present study.

It is reproduced exactly as distributed except that the space for answering has been reduced to enable the same pagination as the original.

The Ethiopian calendar consists of 12 months of 30 days each, plus a period, "month", of five or six days, (leap year). The first day of the Ethiopian year 1968 was the 11th of September, 1976, Gregorian Calendar. The Ethiopian fiscal year is July to June.

ADDIS ABABA UNIVERSITY
DEPARTMENT OF ECONOMICS

CENSUS on CAPITAL-CAPACITY USE 1976

CONFIDENTIAL

For Statistical Use Only.

GENERAL INSTRUCTIONS

(1) It is realised that there is no uniform system of sales analysis, accountancy practices and other items of information sought in this questionnaire. Records of completeness vary considerably from company to company. If actual records are not available then your best approximations will be acceptable. Further, the information requested here is for the Ethiopian fiscal years of 1967 and 1968. If your records are completed on another basis, and if it proves difficult to adjust this to a fiscal year basis, then enter your answers according to the other basis. Be sure to specify the period you are answering for if it is different from the period requested.

(2) For questions regarding productive workers. This would include workers who are engaged in fabricating, processing, assembling, inspecting, receiving, packing, warehousing, shipping, maintenance, repairs, power plant operating, and other closely related services. This would not include non-production personnel such as salesmen, clerks, other routine function personnel, financial, legal, or other professional categories of workers.

(3) Use additional sheets of paper, if necessary, to complete any section, or to give further information or explanation. Identify each additional sheet with the section number appearing in the question heading.

CERTIFICATION	Name of person to contact regarding this report	Telephone No.

This report is substantially accurate and covers the period from ______ to ______

Signature of Authorized Person	Position	Date

(1) NAME, LOCATION and ACTIVITY

A. Business Name of Establishment	B. Address of Physical Location of Establishment
C. Address of Head Office if different from B.	D. Describe the Establishment's Activities during 1975/76

(2) YEAR-ROUND or SEASONAL ACTIVITY

A. Indicate whether the Activity of the Establishment is Perennial or Seasonal	B. If Activity is Seasonal give details.

(3) PAYROLL and EMPLOYMENT: Report all remunerations paid to persons employed in this establishment. Include salaries, wages, commissions, bonuses and payment in kind, e.g., food, clothing, lodging.

	1974-75 ($)	1975-76 ($)
Cash salaries and wages paid before deductions.		
Bonuses and Commission		
Payment in Kind		
Total		

(30) PAYROLL and EMPLOYMENT by FUNCTION: Distribute the number of employees in 1974/5 and 1975/6 according to their principal functions. Total wage bill here should equal the total in (3)

	1974/75					1975/76				
	Enter No. of Persons	How many of these are not Ethiopian	WAGE BILL $			Enter No. of Persons	How many of these are not Ethiopian	WAGE BILL $		
			CASH	OTHER	TOTAL			CASH	OTHER	TOTAL
Managerial Staff										
Clerical Staff Employees										
Sales Staff Employees										
Skilled Workers										
Semi-skilled Workers										
Others										
TOTAL										

(4) KIND OF BUSINESS GROUP: Mark only one box for the group in which your kind of business fits best. If none of listed groups fits your activity, mark box 5 and specify.

1. Mining, minerals extraction quarrying	2. Manufacturing, fabricating, assembling materials into new products other than beverages or foodstuffs.
3. Construction; general building and contracting, land sub-division and development.	4. Processing of foodstuffs or beverages
5. Other specify:	

(5) FINANCIAL VOLUME of BUSINESS

List all sales of merchandise and other receipts from customers after deducting returns, allowances and discounts to customers outside your company. Include all sales, payments received or not, and services-including repair and maintenance, delivery and installation charges. Include all paid taxes relevant to sales. Exclude investments and land rentals.

	1974/5 $	1975/6 $
Sales of merchandise, services and other receipts		
Indicate the percentage of your sales figures accounted for by taxation		

(6) SOURCE OF RECEIPTS List the main types of merchandise sold, or type of construction activity, or products manufactured, mined or processed or services rendered. Indicate the percentage each was of receipts listed in Section 5 (according to) the classes of customer specified

Description of Merchandise Activity or Services Sold	Average price per Unit 1974/5	Average price per Unit 1975/6	General Public	Government	Construction	Textiles	Chemicals	Iron & Steel	Other.
1.									
2.									
3.									
4.									

(7) MANUFACTURING ACTIVITY AND PRODUCTION METHOD: List and describe briefly the main products and/or services which the establishment is equipped to provide even if these are not mentioned in Section 6. Describe the method of production used. Use additional paper where necessary. Any available literature may be included.

PRODUCT or SERVICE	DESCRIPTION	PRODUCTION METHOD

REMARKS RELATING to PRODUCTION METHOD: Write down or elaborate on any information relating to the above described production methods.

(8) CAPITAL EXPENDITURES DURING 1974-5 and 1975-6 (EXCLUDE LAND)	TYPE OF CAPITAL EXPENDITURES	$ 1974-5	1975-6
Report all capital expenditures during the relevant time period. These refer to all costs that are chargeable to fixed-assets accounts for which depreciation or amortization accounts are normally kept. Include major alterations, capitalized repairs and improvements. Include expenditures made in the appropriate year for establishments under construction, but not those in operation. Exclude cost of land. Exclude maintenance and repair charged as operating and current expenses.	(A) New structure and additions to plant		
	(B) New machinery and equipment		
	(C) Used plant, machinery and equipment acquired from others.		
	(D) Capitalized development and tests on agricultural land.		
	TOTAL CAPITAL EXPENDITURE (E) = (A) + (B) + (C) + (D).		
(9) CHANGES in FIXED ASSETS 1974-5 and 1975-6 Give the value of fixed assets of your establishment for which depreciation and amortization accounts are normally kept. Gross Book Value represents the acquisition cost (original cost) to your establishment of such fixed assets. Net Value represents the gross value of such fixed assets after deduction of their accumulated depreciation and amortization.	(A) Gross Book Value of fixed assets owned by your establishment at the beginning of the relevant year.		
	(B) Net Value of fixed assets at beginning of relevant year.		
	(C) Total Capital expenditure during the year. Copy figure from Section 8 (E).		
	(D) Other acquisition of fixed assets not included in 8 (C).		
Include fixed assets for all facilities. Include all depreciable assets - buildings, structure, plant, equipment etc. Exclude depletable assets (land) and non-fixed assets (inventories, cash accounts receivable etc.) These are given below.	(E) Other deductions from fixed assets during relevant year. i.e., net value of assets sold, retired, destroyed or scrapped.		
	(F) Depreciation and amortization charges against fixed assets during relevant year.		
Include all improvements and construction started, but not completed by end 1974-5 or end 1975-6.	(G) Net value of fixed assets as of end 1974-5 and 1975-6. This should equal (B) + (C) + (D) - (E) - (F). If not, please comment in remarks section at foot of page 5.		

	TYPE OF CAPITAL EXPENDITURE	$ 1974-5	1975-6
(10) RENT PAYMENTS MADE in 1974-5 and 1975-6 Report all rental payments made or accrued in 1974-5 and 1975-6 to other firms or agencies owning plant and equipment rented by your establishment. In reporting rent for buildings do not include land use fees such as ground rents. Under machinery and equipment include rent paid for use of production machinery, office equipment, rented cars and trucks, materials handling equipment, etc..	RENTAL PAYMENTS made for:		
	(A) Use of buildings and structures excluding land.		
	(B) Use of machinery and equipment.		
	(C) Total Rent Payments (A) + (B).		
(11) INVENTORIES at BEGINNING and END of 1974-5 and INVENTORIES at END of 1975-6. Report inventories at beginning and end of each year on a comparable basis. Inventories include: finished products in stock; work in progress; materials, supplies and fuels. Report values on a current cost basis if possible - otherwise at book value.	(A) All inventories as of beginning 1974-5.		
	(B) All inventories as of end 1974-5.		
	(C) All inventories as of end 1975-6.		
(12) TOTAL COMPANY ASSETS as of END 1974-5 and END 1975-6 Report total company assets of your establishment on a consolidated basis as indicated.	TYPE of asset. (A) Net value of fixed assets. (Copy figure from section 9, line (G).		
	(B) All other assets (i.e., cash accounts receivable land, inventories, etc.)		
	(C) Total [= (A) + (B)]		

Remarks:-

(13) REAL CAPITAL ASSETS. Report details of total real capital assets available in the establishment according to the following table

Description of Asset	Owned	Hired	Purchase or Con-struction		Rental per Month Where Applicable	Value of Purchases						Construct-ion or Improve-ments During 1974-5 and 1975-6	Value of Sales since Beginning of 1974-5	Broken or Discarded Since Beginning of 1974-5
						1974-5			1975-6					
			Year	Value		NEW	USED	TOTAL	NEW	USED	TOTAL			
				$	$	$			$			$	$	$
(A) Land: Specify area														
1)														
2)														
3)														
B) Buildings: List type of buildings, their dimensions and functions														
1)														
2)														
3)														
(C) Plant Machinery: List available power machinery and equipment														
1)														
2)														
3)														
(D) Tools and Implements:- List all important, non-power equipment														
1)														
2)														
3)														

(13) Contd. Real Capital Assets

Description of Asset	Owned	Hired	Purchase or Construction: Year	Purchase or Construction: Value	Rental per Month Where Applicable	Value of Purchases 1974-5: NEW	USED	TOTAL	Value of Purchases 1975-6: NEW	USED	TOTAL	Construction or Improvements During 1974-5 and 1975-6	Value of Sales since Beginning of 1974-5	Broken or Discarded Since Beginning of 1974-5
				$	$	$			$			$	$	$
(E) Transport: List and report functions														
1)														
2)														
3)														
(F) Others: Specify														
1)														
2)														
3)														

(130) Real Capital Assets Unused: Of the assets listed in Section 13, what items HAVE NOT been in use for a continuous period of one month, or more, during or prior to the two years 1974-5 and 1975-6. Give periods of non-use and reasons for this.

(14) PURCHASE and CONSUMPTION of MATERIALS and SERVICES. Give breakdown of actual purchase of materials and services according to the following table
Be sure to state appropriate units - e.g., electricity in Kilowatt hours (Kwh), petroleum in litres, etc.

	Is Item Produced in Ethiopia or Imported				Purchased During the Year				Other Sources of Supply		Consumed by the Establish-ment	
	Produced in Ethiopia	Imported	Unit	Price Per Unit	1974-75		1975-76					
				$	QUANTITY	VALUE $	QUANTITY	VALUE $	QUANTITY	VALUE $	QUANTITY	VALUE $
(A) Basic Raw Materials												
1)												
2)												
3)												
(B) Energy												
1)												
2)												
3)												
(C) Auxilliary Materials and Spare Parts												
1)												
2)												
3)												
(D) Fuel and Lubricants												
1)												
2)												
3)												
(E) Services Received												
1)												
2)												
3)												
(F) Others Specify												

(15) Technical Capacity: With respect to the power machinery listed in Section 13 (c), give capacity specifications where this is available. Include such information as size limits, operating speeds, output per specified time period and anything else you consider relevant.

POWER-MACHINERY Quote No. From Section 13 (c)	FUNCTION	TECHNICAL CAPACITY SPECIFICATION

Remarks Relating to Technical Capacity: Use the space to write down or elaborate on any information relating to the capacity of the particular machine installations in your plant, only with respect to technical specifications. Sections dealing with other aspects of capacity are included later.

(16) Productive Labour Use: With respect to those workers who are:

(a) engaged in machine-paced operations,*

(b) engaged in the general physical handling of materials and products;*

(c) engaged in general maintenance work;*

report as indicated.

		1974-5	1975-6
(A) Total Number of Workers in Productive Labour Use Category			
(B) Total Wages of Workers in Productive Labour Use Category $			
(C) Report breakdown of total number of workers in productive labour use category according to Function Performed	FUNCTION-Specify		
	1)		
	2)		
	3)		
	4)		
	5)		
(D) Enter total number of man-days worked by productive workers for each calendar quarter of 1974-5 and 1975-6. Man-days is equal to the number of productive workers multiplied by the amount of days they have worked. Do not include vacations, holidays, or sick leave in the calculation.	CALENDAR QUARTER		
	1) July-September		
	2) October-December		
	3) January-March		
	4) April-June		
(E) Enter total number of man-hours worked per calendar quarter by productive workers. Man hours is equal to man-days multiplied by the average hours worked per day.	CALENDAR QUARTER		
	1) July-September		
	2) October-December		
	3) January-March		
	4) April-June		

(F) Did your establishment operate any form of shift system. Answer Yes or No.

(F) (1) If yes, then report clock-times of main shifts operated.	SHIFT NO.	FROM	TO
	1)		
	2)		
	3)		

(F) (2) If answer to (F) was yes, then state approximate number of workers on each shift on a calendar quarter basis.

	1974-5	1975-6
Shift number 1, July to September		
" " 1, October to December		
" " 1, December to March		
" " 1, April to June		
" " 2, July to September		
" " 2, October to December		
" " 2, December to March		
" " 2, April to June		
" " 3, July to September		
" " 3, October to December		
" " 3, December to March		
" " 3, April to June		

* See note on the categories of workers to be included in the General Instructions.

(17) <u>Nominal Maximum Capacity According to Major Process or Processes</u>:

Give the time-basis of calculation (operating time, setting time, other downtime) and indicate specific groups of machines, equipment and skilled personnel in your establishment that determine the nominal maximum capacity of the major process or processes. Answer only with respect to technical and physical specifications of existing plant.

(170) <u>Additional Capital Requirements</u>:

What additional capital equipment is required to balance the facilities of the existing plant. What effect would this have on capacity. What would be the estimated cost of other expenditure necessary. Answer only with respect to physical and technical specifications.

(18) <u>Capacity Output Rates of the Plant</u>

This is a very open type question which means that you have the opportunity to call on your acquired knowledge of the plant's operation. It is also a hypothetical question in that certain conditions are given to you as being fulfilled. Remember these conditions when you are replying. There will be an opportunity provided later for you to explain the main reasons why your plant might not reach as high a level of production as it is capable of.

Estimate the maximum possible output rates of your plant with the total capital equipment which is presently installed under "ideal" conditions. By "ideal" conditions is meant:

(A) Demand for your major product or products is sufficient to bring forth capacity production.

(B) There are no labour, material input, or other supply bottlenecks.

(C) There are no information delays, nor delays in obtaining maintenance and transportation of material and service facilities required in controlling input-output rates and composition.

Given these idealized conditions what would be the plant capacity output rate if all installed capital was used. Take into account normal stoppage time, derived shift-work patterns, seasonal variations and technical requirements of plant and equipment.
Report the time-basis of calculations.
Answer within the ideal conditions specified.

(18) <u>Capacity Output Rates of Plant</u> (continued)

Continue your answer to (18) on this page.

(19) Factors Contributions to Unused Capacity

This section is also very open but is not hypothetical. We are concerned to find why your output does not reach capacity in terms of your answer to Section (18) and also Section (17). Some factors which may contribute to your plant producing less than it might are listed. You should consider these and comment on them as requested.

(A) Supply Factors

(i) Does your plant production levels suffer from a shortage of basic raw materials. Are these inputs supplied domestically, or imported or both. If available locally, is quality relevant. Do traditional marketing patterns affect supply of raw materials.

(ii) Does your plant have difficulty in obtaining supplies of energy, fuel, water or spare parts. Include transportation problems if any. Specify main difficulties and comment.

(19) (A) Supply Factors (Continued)

(iii) Does your plant suffer from a shortage of skilled labour, supervisory or managerial personnel. Specify and comment.

(iv) Does lack of working capital contribute to underuse of capacity. For instance, adequate working capital could correct raw material shortage through stockpiling. Comment.

(19) Factors Contributing to Unused Capacity (Continued)

(B) Demand Factors

(i) Does the lack of a sufficiently large market cause you to curtail production. Comment.

(ii) Is there any wastage of product because of limited market (mainly applicable to agricultural processing). Comment.

(19) (B) Demand Factors (Continued)

(iii) Has the advent of other firms into your field, or the existence of similar plants, contributed to excess capacity or decreased production. Provide details.

(iv) Have imports of similar products to yours, or imports of near types of products which can be substituted for your products contributed to excess capacity or decreased production.
Specify and comment.

(20) Major Capacity Constraints: In terms of your answers to the previous four sections what is (are) the major constraint(s) on capacity output. What other factors do you consider important in this respect that have not, so far, been mentioned.

CHAPTER IV

THE STRUCTURE OF IDLE CAPACITY AND POLICY IMPLICATIONS

This chapter presents and analyses the main empirical findings of the enquiry into capacity utilization in Ethiopian manufacturing.

A disaggregated statement on the extent of utilization is given on an uncorrected and on a corrected basis for each industry group at plant level. This is in Table IV.1 immediately after this introduction. Table IV.2 provides information of a more aggregative nature which, although used extensively in the second section of the chapter, is often referred to in Section 1 and is located after Table IV.1.

A disaggregated statement assists in the discussion on industry and plant technical and economic factors contributing to idle capacity. It reveals where scope exists for the application of profitability analysis and, thirdly, it provides a detailed statement of potential employment gains from increased utilization.

Another main benefit of a discussion carried out at a disaggregated level should be the avoidance of making too much claim on generality with respect to causes. Additionally, disaggregation provides a basis for the combination of industry groups according to key qualitative constraints on their levels of capacity utilization. The analysis of the structure of underutilization may then be extended to a more aggregative basis by the identification and testing of explanations at this combined level. This reveals important characteristics, of an industry or industries, that are significantly related to the observed levels of utilization. Section 2 provides the industry combinations, establishes the hypotheses to be tested, and uses regression analysis to assist in their acceptance or rejection.

Throughout the first two sections, the implications of the discussion for policy are brought out as these are revealed. Additionally, the third section of the chapter summarises and unites the analysis of the first two sections so that all implications are checked, and perhaps added to on the basis of having available both sets of empirical results on causes and structure.

Finally, a few of the plants examined are located in Eritrea Province in Northern Ethiopia. The civil strife here was such as to cause physical disruption to a few of the plants in this region. The effects of this, and the plants concerned are raised as the discussion proceeds. The plants concerned are not treated separately from the rest of their industry groups but the plants are excluded from any aggregative analysis by omitting them from such.

TABLE IV.1: UTILIZATION DATA on ETHIOPIAN MANUFACTURING PLANTS 1975/76

Entry No.	ISIC	Commodity	Unit	Actual Output	Capacity Production 1/ Existing Operations	Extended Operations	Utilization Level 2/ Per Cent Uu	Uc
1	3111	Salted Meat	kgs.	48,200	108,000	190,000	45	30
2	3112	Butter, Cheese	kgs.	26,000	84,000	140,000	31	19
3	3112	Pasteurized Milk	litres	993,672	1,168,000		85	
4	3115	Edible Oils and Fats	kgs.	519,865	648,000		80	
5	3115	Edible Oils and Fats	kgs.	427,757	760,000		56	
6	3115	Edible Oils and Fats	kgs.	1,038,800	1,900,000		55	
7	3115	Edible Oils and Fats	kgs.	229,900	490,000		47	
8	3115	Edible Oils and Fats	kgs.	378,860	1,557,000		24	
9	3115	Edible Oils and Fats	kgs.	---	---		About 20-25	
10	3116	Milled Flour	qtls.	71,356	134,000		53	
11	3116	Milled Flour	qtls.	80,020	150,000		53	
12	3116	Milled Flour	qtls.	94,823	150,000		63	
13	3116	Milled Flour	qtls.	63,355	88,000		72	
14	3116	Milled Flour	qtls.	96,196	135,000		71	
15	3116	Milled Flour	qtls.	52,124	136,000		38	
16	3116	Milled Flour	qtls.	7,454	18,600		40	
17	3116	Milled Flour	qtls.	45,036	70,000		64	
18	3116	Milled Flour	qtls.	15,429	36,000		43	
19	3116	Milled Flour	qtls.	65,084	110,000		59	
20	3117	Bakery (Pasta) Products	qtls.	71,356	125,000		57	
21	3117	Bakery (Pasta) Products	qtls.	28,842	120,000		52	
22	3117	Bakery (Pasta) Products	qtls.	10,698	17,000		63	
23	3117	Bakery (Pasta) Products	qtls.	6,499	9,400		69	
24	3117	Sugar Production	qtls.	303,736	332,388	337,932	91	90
25	3118	Sugar Production	qtls.	402,626	431,626	443,275	93	91
26	3118	Sugar Production	qtls.	526,507	574,960	659,770	92	80

Table IV.1: Contd.

Entry No.	ISIC	Commodity	Unit	Actual Output	Capacity Production 1/ Existing Operations	Extended Operations	Utilization Level 2/ Per Cent Uu	Uc
27	3132	Artificial Wine	litres	3,445,229	3,600,000	4,300,000	96	80
28	3132	Artificial Wine	litres	927,722	1,512,000	1,800,000	61	52
29	3132	Artificial Wine	litres	960,021	1,350,000	2,000,000	71	48
30	3133	Lager Beer	hls.	123,947	145,000		85	
31	3133	Lager Beer	hls.	125,657	125,000		101	
32	3133	Lager Beer	hls.	119,791	338,000		36	
33	3134	Soft Drinks	cases	2,119,546	1,490,000	3,718,000	85	57
34	3134	Soft Drinks	cases	1,113,339	2,715,000	3,976,000	41	28
35	3134	Soft Drinks	cases	366,384	1,120,000	1,456,000	33	25
36	3134	Soft Drinks	cases	364,697	561,000	868,300	65	42
37	3134	Soft Drinks	cases	---	---	---	About 30	
38	3134	Soft Drinks	cases	298,723	630,000	896,000	47	33
39	3134	Mineral Water	cases	1,370,966	2,100,000	2,796,000	65	49
40	3140	Cigarettes	'000pcs	1,251,168	1,494,000		86	
41	3211	Cotton Cloth	kgs.	6,647,916	7,723,900		86	
42	3211	Cotton Cloth	kgs.	4,281,249	5,096,700		84	
43	3211	Cotton Cloth	kgs.	3,456,156	3,859,600		89	
44	3211	Cotton Cloth	kgs.	2,812,200	3,235,300		87	
45	3211	Cotton Cloth	kgs.	965,427	1,098,700		88	
46	3211	Cotton Cloth	kgs.	2,136,084	2,345,600		91	
47	3211	Cotton Cloth	kgs.	1,319,352	1,449,300		91	
48	3211	Cotton Cloth	kgs.	780,000	1,096,600		71	
49	3211	Cotton Cloth	kgs.	1,343,076	1,598,900		84	
50	3211	Cotton Cloth	kgs.	859,260	940,500		91	
51	3211	Cotton Cloth	kgs.	1,319,750	1,475,000		89	
52	3211	Wool Yarn	kgs.	774,400	1,238,200		63	

Table IV.1, Contd.

Entry No.	ISIC	Commodity	Unit	Actual Output	Capacity Production 1/ Existing Operations Extended Operations	Utilization Level 2/ Per Cent $\frac{U_c}{U_c}$
53	3211	Sewing Thread	kgs.	252,312	296,000	85
54	3212	Blankets	pcs.	12,115	30,000	40
55	3212	Blankets	pcs.	197,856	231,300	86
56	3212	Blankets	pcs.	95,616	115,000	83
57	3212	Blankets	pcs.	333,576	416,000	80
58	3213	Knitwear	pcs.	404,952	460,800	88
59	3213	Knitwear	pcs.	3,358,236	4,805,500	70
60	3213	Knitwear	pcs.	217,524	405,600	54
61	3213	Knitwear	pcs.	2,517,900	3,924,000	64
62	3214	Carpets	M^2	10,200	52,800	19
63	3215	Sacks and Cordage	kgs.	2,150,000	4,280,000	50
64	3215	Sacks and Cordage	kgs.	3,875,180	15,900,000	24
65	3215	Sacks and Cordage	kgs.	3,221,000	15,000,000	21
66	3220	Denim Clothes	pcs.	225,998	265,840	85
67(A)	3231	Finished/part Finished Leather	Hides	70,000	90,000	78
67(B)	3231	" " "	Skins	1,062,850	1,500,000	71
68	3231	" " "	Hides	90,500	140,000	65
69(A)	3231	" " "	Hides	28,950	35,000	83
69(B)	3231	" " "	Skins	147,236	780,000	19
70	3231	" " "	Skins	638,098	1,200,000	53
71	3231	" " "	Skins	125,000	400,000	31
72	3231	" " "	Skins	250,000	900,000	28

Table IV.1, Contd.

Entry No.	ISIC	Commodity	Unit	Actual Output	Capacity Production 1/ Existing Operations	Extended Operations	Utilization Level 2/ Per cent Uu	Uc
73	3240	Mainly Leather Shoes	pairs	385,609	400,000	600,000	96	64
74	3240	Mainly Leather Shoes	pairs	251,086	332,000	450,000	78	56
75	3240	Mainly Leather Shoes	pairs	210,107	300,000	585,000	70	36
76	3240	Mainly Leather Shoes	pairs	130,824	450,000		29	
77	3240	Mainly Leather Shoes	pairs	66,612	90,000		74	
78	3412	Paperboard Boxes	tons	4,546	5,775		79	
79	3420	Printing and Publishing	hours	6,150	6,600		93	
80	3420	Printing and Publishing	hours	3,896	6,200		63	
81	3420	Printing and Publishing	hours	4,119	6,400		64	
82	3420	Printing and Publishing	hours	4,855	7,000		69	
83	3420	Printing and Publishing	hours	3,991	6,800		59	
84	3420	Pringing and Publishing	hours	4,350	7,000		62	
85	3511	Industrial Gases	M^3	79,760	110,000		73	
86	3521	Paints and Varnishes	tons	290	1,200	2,000	24	15
87	3521	Paints and Varnishes	tons	588	1,800	3,200	29	16
88	3521	Paints and Varnishes	tons	425	1,350	2,250	31	19
89	3523	Powder and Cake Soap	tons	548	2,160	3,450	25	16
90	3523	Powder Soap	tons	937	1,800	3,200	52	29
91	3523	Cake Soap	tons	1,440	2,180	2,820	66	51
92	3523	Cake Soap	tons	---	---	---	About 20	
93	3530	Refined Petroleum	tons	497,933	590,000		84	
93	3559	Rubber Footwear	pairs	271,378	1,200,000		23	
95	3559	Rubber Footwear	pairs	63,800	270,000		24	
96	3559	Rubber Footwear	pairs	1,628,190	1,800,000		90	

Table IV.1. Contd.

Entry No.	ISIC	Commodity	Unit	Actual Output	Capacity Production 1/ Existing Operations	Capacity Production 1/ Extended Operations	Utilization Level 2/ Per Cent Uu	Utilization Level 2/ Per Cent Uc
97	3560	Plastic Pipes and Sheets		---	---	---	About 25	
98	3560	Plastic Footwear	pairs	1,215,871	3,000,000		41	
99	3560	Plastic Footwaar	pairs	390,800	1,530,000		26	
100	3620	Glass Bottles	'000pcs	32,000	72,000		44	
101	3620	Glass Bottles	'000pcs	29,000	45,000		64	
102	3620	Glasses	'000pcs	4,700	8,000		59	
103	3691	Clay Bricks	pcs	3,500,000	9,600,000		36	
104	3692	Cement	tons	37,500	70,000		54	
105	3692	Cement	tons	22,300	52,000		43	
106	3710	Corrugated Iron Sheeting	tonnes	9,524	13,800	27,600	69	35
107	3710	Steel Tubes and Pipes	tonnes	zero	360	700	zero	
108	3710	Steel Tubes and Pipes	tonnes	850	3,150		27	
109	3710	Iron Slabs, Bars and small Ware	tonnes	8,605	13,140		65	
110	3710	Ferrous Wire and small Ware	tonnes	625	3,640		48	
111	3811	Hand and Edge Tools	tonnes	---	---	---	About 35-40	
112	3813	Structural Metal Products	tonnes	1,692	2,152	9,000	54	19

Source: Plant Information and respective Corporations.

Notes: See following page.

Table IV.1, Notes

1/ Capacity production in existing operations refers to the output potential from the time-intensity actually worked by the plants during the year 1975/76. Capacity production in extended operations refers mainly to an increase in time-intensity where this is physically viable. Alternatively, this may refer to the output deriveable from a set of facilities not in use, the reason for which is not related to physical adversities. Where there is no scope for an increase in intensity of operations, then the (single) capacity production figure indicates this by being situated between the Existing and Extended Operations columns.

2/ Following from Note 1/, the corrected and uncorrected utilization levels, Uu and Uc, are stated. A single utilization level embracing both the Uu and Uc columns is derived from these cases where there is no scope for an increase in operations.

The symbol, ---, denotes 'not available'. Reasons for this are discussed in the text.

Unit Abbreviations

Kgs.	-	kilograms
qtls.	-	quintals
hls.	-	hectolitres
case	-	24 x 350 centilitre bottles
pcs.	-	pieces
M^2	-	square metres (M^3 - cubic metres)
hides) skins)	-	In leather finishing this refers to the number of finished/part finished cattle hides or sheep/goat skins.

TABLE IV.2. SUMMARY UTILIZATION and PLANT INFORMATION, ETHIOPIAN MANUFACTURING, 1975/76

	NUMBER of ISIC CATEGORIES	Uc – SUMMARY DATA MEAN	RANGE	STANDARD DEVIATION	$'000	COMPETING IMPORTS	IMPORTED INPUTS	EXPORTS	CAPITAL-ICCOME RATIO	LABOUR PRODUCT-IVITY	CAPITAL INTENSITY
FOOD:											
Preserved Meat	1	30			708.6	8.7	8.2	17.9	1.4	1.3	4.6
Dairy Produce	2	44	66	33.9	1,543.5	1.8	—	14.2	5.4	1.0	12.1
Edible Oils/Fats	6	48	60	19.3	2,240.6	15.4	3.3	49.9	2.5	1.5	9.9
Grain Mill Products	10	58	34	11.9	1,082.4	2.5	0.0	3.2	2.0	2.3	9.9
Bakery Products	4	56	17	7.7	799.5	4.3	0.6	0.5	1.8	0.9	5.8
Sugar	3	86	11	4.4	15,437.2	—	24.0	5.3	3.1	3.7	7.5
BEVERAGES											
Wine	3	66	32	15.4	438.5	8.0	31.4	0.1	1.4	2.1	5.2
Beer	3	62	64	30.1	7,233.0	0.2	47.8	—	1.6	6.7	8.4
Soft Drinks	7	52	32	19.5	1,424.9	3.5	49.2	—	3.1	1.6	7.8
TOBACCO	1	84			4,221.5	6.6	8.3	—	0.9	7.6	7.2
TEXTILES											
Spinning	13	86	28	8.1	4,896.2	5.7	22.8	0.5	1.2	1.6	4.1
Made Up Textiles	5	77	67	31.5	1,367.6	9.4	67.4	1.5	1.8	0.8	4.3
Knitwear	4	68	34	12.4	570.6	29.4	35.2	0.5	1.3	1.0	5.3
Weaving Apparel	1	85			902.1	39.2	55.2	1.00	0.9	1.3	2.7
COARSE FIBRES	3	26	29	14.2	—	6.4	11.9	—	—	9.1	—
LEATHER	6	36	58	28.2	1,314.1	2.6	10.9	22.0	0.8	1.9	6.0
FOOTWEAR	10	45	57	22.3	2,618.5	3.7	33.7	0.8	1.5	1.2	3.7
PAPERBOARD	1	79			3,698.8	7.8	36.2		4.5	3.0	21.3
PRINTING	6	69	34	12.9	585.2	29.5	36.3	—	1.5	1.5	2.3
COMPRESSED GASES	1	53			756.0	98.9	97.4	0.2	2.2	4.3	12.2
PLANTS AND VARNISHES	3	17	4	1.7	372.3	28.3	61.5	0.0	1.2	4.6	5.7
SOAP	4	31	35	13.7	2,042.0	33.1	63.1	0.0	0.7	4.6	7.4
PETROLEUM	1	84			25,773.0	46.8	100.0	—	1.9	9.2	4.2
MOULDED PLASTICS	1	About 25			1,313.8	14.8	50.1	0.7	3.7	1.2	11.9
GLASS CONTAINERS	3	53	20	8.9	2,275.0	30.6	57.5	4.5	7.1	1.7	13.6
BRICKS	1	36			1,488.2	3.5	18.0	—	4.1	0.7	10.0
CEMENT	2	49	11	5.5	2,694.8	0.7	33.2	14.2	9.7	2.4	4.0
METALWORKS	7	29	31	19.00	3,379.6	54.6	85.0	1.7	1.5	3.7	7.7

Source: Compiled from information obtained at: Plants and respective corporations; Customs Head Office, Addis Ababa; National Bank of Ethiopia Addis Ababa; and Central Statistical Office, Addis Ababa.

Notes: See following page.

Table IV.2: Explanations and Definitions

The symbol, ---, denotes 'not available'.

The symbol, ____, denotes very small (less than 1/10 th of one per cent).

ISIC's 3240, 3559 and part of 3560 - leather, rubber and plastic footwear are considered together to form a ten plant footwear industry.

Average Size of Plants: The total value of fixed assets for a sector or industry is divided by the number of plants in that sector of industry.

Competing Imports: Imports by ISIC categories as a per cent of domestic production in these caegories - measured in quantity/volume terms.

Imported Inputs: Imported raw and auxilliary material inputs as a per cent of total intermediate inputs - measured in dollar values, c.i.f.

Exports: Exports by quantity/volume as a per cent of total domestic output.

Capital to Income Ratios: The ratio of the total volume of fixed assets to value added, net of indirect taxes.

Labour Productivity: The ratio of value added, net of indirect taxes, to the product of productive employment and time worked, (labour hours).

Capital Intensity: The ratio of the total value of fixed assets to the wage bill.

4.1 Utilization levels, their determinants and policy (1)

A: Food Industry

The state controlled part of the Ethiopian food industry contains twenty one fully controlled establishments and the three sugar mills are part Ethiopian, part foreign controlled and managed. Information was collected on nineteen of the twenty one fully controlled establishments and on the three sugar mills. This gave rise to the twenty six Four Digit ISIC Entres on which utilization data is presented in Tables IV.1 and IV.2

The Food Corporation is the most recently formed group of all the nationalized industries and the plants under its control are the most unsatisfactory to investigate since they are often characterized by large gaps in important information categories and, indeed, by a general lack of comprehension, on the part of Corporation personnel, to come to terms with the present and future functions and importance of the industry. As a result the extent of informed coverage in this industry is the least detailed of all the major industry groups and the time period of observation, the base of the utilization indexes, ranged from only seven to nine months in many of the plants.

Despite this a reasonably clear and very dismal pattern of the constraints on activities emerged.

With the exception of sugar it is apparent that capacities in most plants are far from being realized. One feature of the utilization rate distribution between Uu and Uc is the lack of scope for an increase in the time-intensity of operations. For the Ethiopian Food Industry this reflects that it is a normal practice, resulting either from the nature of operations or otherwise established work patterns, to operate three by eight hour shifts per day in the main sectors of edible oil production, grain-milling, bakery products and sugar. It does not reflect that part or all of any of the processes involved require time for, for example, product maturation, fermentation or mixing which is equipment controlled and which requires but a minimum level of human monitoring.

If 24 hours per day, year-round operation is regarded as standard practice then a main question is why so many of the plants have output levels well below their potential. This does not apply to the sugar sector which is seen to display high utilization rates. Since the shortfall between actual and potential output is fairly easily accounted for then sugar may quickly be cleared from the discussion.

The three sugar mills are part of an integrated cane growing and processing operation with the growing being plantation organized. In all three, capacity utilization in relation to factory equipment production capacity is almost at its rated maximum. Sugar is produced for a certain period of the year - the milling season. The rest of the year - the rainy season - is used for overhaul of the plants' machinery and equipment. The information in the tables is capacity utilization in relation to the milling season and the discrepancies between actual and potential output refer to factory operations.

Based on the crushing capacities of the mills, the average expected yield of sugar from cane, the average number of hours worked per day and the actual number of milling days worked, the product of these gives capacity production in existing operations. To the actual milling days worked is added the downtime due to factors apart from necessary repair and maintenance and apart from other expected stoppages. From this revised milling time the capacity output figures for extended operations is derived.

The differences between Uu and Uc in Entries 24 and 25 of Table IV.1 is seen to be only one and two per cent respectively. The principal determinants of these differences were learned to be labour disputes and cane shortages. In Entry 26 the difference between Uu and Uc is 12 per cent of which cane shortage due to lack of rain, lack of cane organization and labour trouble accounted for 42, 10 and 43 per cent respectively of the difference.

Productive operations in the three plants display Uu levels that verge on the maximum. Shortfalls between actual and capacity outputs in existing operations are accounted for by the same factors that explain the difference between Uu and Uc with the additional comment being necessary that the effect of these factors in the denominator of Uu were spread over several, small and isolated time intervals that were not 'captured' in the index as constructed here. The more noticeable of such effects were recorded in the plants' daily reports on operations and from this the differences in capacity outputs are derived.

In conclusion it is noted that discrepancies between Uu and Uc do not relate to inefficiencies or rigidities in the capital equipment structure. The domestic market for refined sugar was strong enough for occasional shortages to have been observed. The small amount of exports - Table IV.2 - is confined to neighbouring African states, except Kenya and to a few Arab states. Direct domestic consumption and input to other processes, particularly elsewhere in the food industry and in the beverages industry accounts for 95 per cent of total output.

The other major sectors in the food industry - edible oils and fats, grain-milling and bakery products - do not share the same levels of efficiency as sugar in their productive operations. General conditions affecting these sectors are not outlined and can be given more depth by referring to specific examples.

In these sectors it was noted that capacity was stated in terms of 24 hours per day and 340-360 days operation per year. Oil and flour mill capacities are based on the rated gross theoretical maximum which is made net by allowing for a percentage, usually around eight, which corresponds to the normal downtime for repair and maintenance. These plants, therefore, were supposedly engaged on productive operations for upwards of 7,500 hours per year and, on a time-intensity basis, have no scope for increased utilization. With mean utilization levels of 48, 58 and 56 per cent in edible oils, grain-milling and bakery products respectively it is clear that capacity output levels are adversely affected from other directions.

Deficient effective demand for the products in question is not a constraint on utilization even though imported edible oils and bakery products (pastas) are found. Plants in these sectors have an almost one-to-one correspondence between production and sales at any moment and deficiencies in the supply of bakery products, this being derived from milled grain shortages, were not infrequent during the period of observation. Many small bakeries were shut at irregular hours due to the inability to obtain flour. Since their products are perishable this could not be made up in a subsequent period - people do not buy twice as much bread or pasta after they have had a period of forced denial. As far as could be ascertained there were no distributional irregularities between grain mills and their outlets. Edible oils enjoy flourishing export sales and it is the opinion of Corporation personnel that potential for these is considerably in excess of current levels. At the same time, oil bearing seeds are exported raw and much capacity in the sector is idle. Comment on this at a disaggregated level is considered before the broader implications are brought out. Meantime it is reasonable to accept that the food industry is fortunate in the sense that it does not have any serious or complex output market capacity problems. Present requirements cannot be met and these are growing quickly on both the domestic and export fronts.

At plant level, the main problem areas discovered were: lack of managerial and technical personnel; old and partly damaged equipment, particularly in oil mills and the related spare parts and maintenance problems; bottle shortages for oil; and frequent deficiencies in the supply of grain.

In most plants the management is newly appointed as a result of nationalization. It is generally young, inexperienced and lacks a formal education background in the technology and engineering of the sectors in which it serves. Everyday running of plants, and this in all aspects from acquisition of inputs to distribution of products, is frequently the responsibility of a single employee who is often a foreigner.

Again, in most plants, regular repair and maintenance is unheard of. Only two flour mills are known to be able to sharpen their milling rolls. There are no facilities for the replacement of the extension mouth of the oil presses, or for the stator knives or rotation snail. With one observed exception these parts are ordered from abroad on a piecemeal basis with what this implies in terms of costs and foregone production. A similar picture is seen in macaroni plants where driers are idle because of inability to fix their rotating vacuum drives or thermo-couple instrumentation. Such operations are fundamental to the smooth running of the processes indicated and are not difficult aspects of maintenance or replacement given a minimum level of replacement provision and technical know-how.

The supply of grain to the flour mills is an intolerable constraint for a nationalized industry. The mills have no control over their basic input and depend either on private, individual road carriers or on the railway to bring wheat to their doorstep. It can credibly be assumed that hoarding of wheat is perpetrated by some farmers or carriers or both. Government campaigns carried out by the army were operating during the period of enquiry to prosecute offenders. The extent of hoarding practices is not known. Its effect on a situation in which a genuine grain scarcity obtained in certain areas also cannot be gauged. An aggravating factor in this situation was the lack of storage facilities in some mills which resulted in the ludicrous situation of mills having, sometimes, to refuse grain on their doorstep while not knowing when the next delivery would be.

The same problem did not exist with respect to oil seed inputs. About 60 per cent of these refer to cotton seed and the distribution is first handled by the Textile Corporation so that the supplies to oil mills were organized and overseen from the plantations via the ginneries. Additionally, the Government supervision of oil yielding materials is easier to conduct than the much more scattered and individually controlled grain harvesting and storage operations would be.

The effects of these factors and others which are plant specific can be brought out and evidenced at plant level.

The principal oil yielding seeds used are cotton, castor, niger, rape and lin. General aspects of production are deficient in many areas, there being an almost total lack of production planning programmes, sanitation and quality control. The oil fraction of compressed oil cake is decidedly too high and there is no valorization of the protein content.

One Addis Ababa located plant has eleven presses varying in age from five to about twenty five years. Four different manufacturers are represented and four only of the presses are operable. No person at the plant or at the Food Corporation could provide data on daily input-output levels, capacity, waste, or on the oil content in the pressed cake. No person even had an idea of the expected yield of the seeds. A parallel state of data deficiency exists at the refining stage where there is neither quality nor quantity control. Oil is bleached and deodorized under vacuum without any analysis of effects. Bottles are washed and filled manually.

Another plant in Addis Ababa has six presses - 1 x 120 quintals per day, 1 x 100 quintals per day and 4 x 50 quintals per day pressing capacities. Only the 10 tonne press is operable. The other five presses all require to have damaged cog-wheels replaced. As in the previous plant, sanitation and laboratory facilities and quality and quantity control are lacking.

One oil mill provided an exception to the general picture. This plant is also located in the capital and has an expatriate manager who deals efficiently with all aspects of production. Thus cleanliness and well-maintained equipment were everywhere evidenced. The pressing, refining, and washing and bottling line equipment are maintained and serviced on a regular basis and a minimum level of replacement parts is kept. The technical manager has initiated quantity control checks at various stages of production from initial seed input through semi-finished products to final output. The oil fraction of the cake is controlled and this is evidenced at each batch by analysis carried out by a technician trained by the technical manager. Data on all these parameters are used for costing and production programme purposes. The most pronounced unfavourable comment on this plant would undoubtedly refer to its almost total dependence on one man.

It is not that this last plant provides a superior exception to the management and operations one might reasonably expect to find in an edible oil mill that causes concern in this sector of the Ethiopian food industry. It is simply that the standards found in this mill should represent a generally prevailing norm instead of being the only efficient plant out of six observations.

The overall conclusion emerging from this description of edible oil plants is that a very significant gain in output is achievable from a fuller utilization of existing capacity. An average level of 48 per cent utilization is a very dismal situation in a country where domestic demand is not lacking and which exports both refined oil and unprocessed seed.

A somewhat similar picture is found in flour mills with the additional factor that some of these were periodically idle because of their inability to obtain wheat. One old plant with a milling capacity of up to 30 tonnes per 24 hours lacks transportation facilities from the storage of wheat up to the start of production. The chief miller, in charge of the plant, is a skilled worker on a self-trained level. The rest of the operatives are unskilled. As a result, all the undesirable features regarding regular repair and maintenance, production programmes and quality and quantity control are found.

Even modern buildings and installations suffer because there is no skilled personnel. A recently completed mill was denied over 30 per cent of its capacity use because the purifying department in the smaller of the two milling lines requires total rebuilding. Apart from the costs involved here there is the possibility that the building will have to be strengthened to ensure that it can withstand both lines operating. Again, this plant depends solely on an elderly expatriate miller who was the only person found able to change the milling diaphragm.

Macaroni plants range from the obsolete to the very modern. Given that much of their input is obtained from the grain mills then input shortages occur in this sector also. Even without this, however, the constraints on activities at plant level are as much in evidence here as in the rest of the food industry.

One modern, fully automated plant with four lines installed for the production of long and short macaroni and noodles only had two lines operative during various periods in 1975/76. One line was out after trouble with vacuum pumps and the other because the water and flour chain transporter was not working. Thermocouples on all lines were out of action at different times so that the drying capacity of the chambers was impaired. In another plant one third of the installed capacity was completely denied because of lines out of action.

These examples could be repeated but aspects of productive or administrative efficiency that could be commended were not in evidence apart from the exception found in a single edible oil factory. Given this situation it is a relatively simple matter to prescribe corrective practices at plant level; for example, the need to have trained engineers/technologists and management staff, and perhaps a centralized workshop for repair and replacement provision. Such measures might be valid in their own right but the discussion now focusses on corrective measures in the food industry overall. That is, with respect to its role in the national economy.

The primacy of the food industry in Ethiopia should be considered alongside the country's agricultural character and the joint potential that the growing and processing sides of agro-industrial development have for Ethiopian growth and improvement. The food processing industry should not be treated in isolation from its agricultural raw materials. Food processing should begin in the field with the aim being the efficient integration of field and factory operations so as to formulate and realise medium and long-term production and marketing efficiency programmes. Within this larger framework several, more immediate, policy conclusions on present utilization performance can be drawn.

Since the discussion is essentially concerned with a nationalized industry, and since responsibility for the running of this falls on the Food Corporation it seems reasonable to begin at this level. The present staff of the Food Corporation, probably because of its inexperience, gave the impression that it was waiting for somebody from elsewhere in Government to turn up, organize and arrange its affairs. This, of course, is a highly subjective observation yet the way to the removal of the more pressing of present difficulties is reasonably straightforward given competent executive functionaries.

A major present difficulty is the supply of grain to the largest single sector in the industry. This could be dealt with in isolation or, better, alongside consideration of the further planning of raw materials in an integrated agro-industrial structure. In Ethiopia this could take the form of agricultural combinations with the authority to exclude all the various kinds of middlemen that are presently found. The next stage is to go direct to the markets for intermediate inputs and processed foods by means of commencing its (the Food Corporation's) own distribution network. This production and marketing structure is successfully displayed in the sugar industry and the reason for allocating the role to a Government body in the other sectors derives jointly from the declared intent of the Ethiopian Government to have 'Socialist' development and from the fact that it is dubious in the extreme to expect private capital, Ethiopian or foreign, to appear in support of the proposed measures.

Another identified cause of underutilization relates to personnel. Part of the Corporation's executive function should be the recruitment and training of the managerial and technical manpower in which the plants are most deficient. The importance of this cannot be gainsaid since it affects such major operations as production planning, expansion and diversification. Such personnel are also required to bring reasonable efficiency to existing operations. Important short-run issues are the ordering and provision of spare parts, related maintenance and repair services, product quality and quantity control, raw material yields and hygiene.

On production planning it can be seen from Table IV.2 that a sizeable quantity of food products are still imported, despite the ability of Ethiopian agriculture to provide suitable raw inputs, particularly edible oils and fats. This occurs alongside the processing of relatively high value inputs into products of lesser importance. Thus soap is manufactured from crude edible oil instead of being made from imported and less expensive whale oil or tallow as might reasonably be expected. Again, flour mill production seems irrationally geared to white flour rather than to a perfectly adequate 80-85 per cent standard yield. By following the latter programme a saving of wheat upwards of a hundred thousand tonnes per year is feasible.
Only one oil mill had a solvent extraction plant. With the Ethiopian oil industry processing upwards of 300,000 tonnes of seed per year, yielding 240,000 tonnes of oil with about eight per cent oil then solvent extraction would provide an additional 16,000 tonnes of oil.

With few exceptions the issue of repair and maintenance was a non-starter in the plants examined. There is, therefore, an urgent need for the ability and drive to organize centralized repair and maintenance workshop facilities for all plants in the food industry. The ability required should extend beyond regular servicing and maintenance to the repair of larger, more complex machinery through the training of personnel and the preparation of documented specifications of equipment requirements in this important area.

A similarly organized facility is necessary in the provision of quality control and sanitation.

From this discussion on the food industry it is evident that proposed corrective measures lie outwith what might be considered the bounds of capacity utilization. Apart from the intent to do this in all industries, as indicated in the introduction to the chapter, the food industry can lay special claim on such a necessity since it displays a greater amount of glaring deficiencies in its productive structure than any other industry examined. The measures proposed obviously have a wider applicability than capacity utilization but this does not obviate their relevance to utilization issues.

In effect, what is envisaged is an almost total restructuring of the food industry but there has been little comment on future potential or proposed lines for this development. It is emphasized, however, that within any medium or longer term programmes of diversification/specialization or expansion, the proposed corrections are very necessary and should be carried out now in order to avoid rigidities and imperfections which would impede future development.

Finally, it would be unrealistic to expect present day Ethiopia to provide the necessary personnel from its own manpower. Specialized assistance from foreign or international aid agencies will be required in clearly identified areas. There exists considerable scope in this industry for detailed economic appraisals in established and potential agro-industrial sectors. At the present level of discussion, widely experienced personnel in the capacities of food technology, grain and oil mill engineering and repair and maintenance are clearly required. Consultancy services will equally be required to prescribe for the restoration of idle facilities as well as production programmes.

B: Beverages Industry

The Ethiopian beverages industry is considered in three sections - wines, beer, and soft drinks and mineral waters. Some background is provided on each of these before a detailed discussion on utilization.

The nationalized wine industry comprises three small plants in which only the largest could reasonably be taken as exemplifying wine production technology as this term is normally understood from texts on the subject - see, for example, M.A. Amerine et.al., 1960, Chapter 6. At present, wine is manufactured from imported raisins together with additional sugar. These are fermented with a kind of wine yeast imported from Italy. At the same time it is increasingly recognized that Ethiopia has excellent potential for the growing of grapes and the increasing consumption of both artificial and natural wine in Ethiopia and in the rest of the world gives this sector a significant role in overall economic development. This view is emphasized when it is remembered that efficient wine grape plantations, the growing and harvesting operations, are usually integrated with the production of wine, and programmes to develop this potential is the major aim of this sector of the Beverage Corporation and of the manager in charge of wineries, a man thoroughly educated and experienced in this type of development. A major share of the

Table IV.3: RECORDED WINE PRODUCTION in ETHIOPIA 1971/72-1975/76 in MILLION LITRES

	1971/72	1972/73	1973/74	1974/75	1975/76
Total	5.301	5.132	4.602	4.644	---
Beverage Corporation	4.294	4.208	3.820	3.762	5.333
Beverage Corporation (per cent)	81	82	83	81	---

Source: Ethiopian Beverages Corporation, Addis Ababa, 1976.

financing of such programmes is to be derived from the continued production of the present, artificial wines in the plants examined.

Recent levels of wine production in Ethiopia and of the Beverage Corporation's share in this market are given above (Table IV.3).

The decline in the Beverage Corporation's output in the two years 1973-1975 was due to over half of the capacity in one plant being denied because of non-repair to a cement fermentation tank. The capacities in major operations in the three plants are illustrated in Table IV.4.

Table IV.4. MAJOR OPERATIONAL CAPACITIES in ETHIOPIAN WINERIES 1975/76 - MILLION LITRES

Table IV.1 Entry No.	Fermentation Overall	Washing per Year per shift	Filling per Year per shift
27	4,21-4.50	3.60	5.625
28	1.44-2.40	1.72	1.512
29	1.80-2.20	0.7875 (manual) 3.60 (machine)	1.350

(Source: Plants Information and Ethiopian Beverages Corporation, Addis Ababa 1976).

In the utilization indexes one shift operation is taken as the time-basis in existing operations. The operative constraint in Entry 27 is therefore washing, and in the other two entries is filling. The operative constraint in the corrected utilization levels is fermentation. This will vary within the bounds given according to the precise product mix. Between the three plants over thirty different wine labels are marketed and a figure at or towards the lower end of the overall fermentation capacity is taken as the potential output.

It was noted that only in the largest plant did the bottling operations fall below the lower bound of the fermentation capacity. In none of the plants was there any need to go beyond one shift operation in washing or filling to cater for the year's actual production and wineries provided an example of a sector which Corporation personnel and plant operatives regarded as being at "full-capacity".

Within the capacity concept developed herein a few comments may be made. Despite the subjective notions of plant operatives the denominator of Uc was a sustainable level of output. The sales and marketing of domestic wines are vigorous and increasing. Imported wines do not represent a threat to this position because of the high effective rates of protection afforded the Ethiopian product. A cursory examination of the capacity levels of the main operations reveals that washing and filling could be brought up to the assigned fermentation capacity levels with increases in activity in the bottling hall of 19 per cent in washing, Entry 27, and increases of 19 per cent and 32 per cent in filling in Entries 28 and 29 respectively. That is, it would not be necessary in any of the plants to engage in full scale double or three shift work in the bottling hall to meet fermentation requirements. The question of overtime arises and two main areas of difficulty, one legislative and one physical conspire against this with the physical constraint being found within existing operations also.

As part of a drive to increase industrial employment the Government legislated against overtime being worked by existing industrial labour and in favour of new employment. Adherence to this is often checked in the form of unannounced visits to industrial establishments. It is being strongly opposed by the M.N.R.D. in general and by some Corporations, notably Textiles, in particular. It is more easily enforced in smaller industrial units where the workforce was commonly on overtime in order to meet repair or order delivery deadlines. The legislation was only introduced in April/May 1975 and a strict assessment of effects is not possible but they appear to be very bad in those activities where labour, though classified as unskilled, requires a minimum of basic know-how. In garment production, for example, several managers attribute a marked deterioration in quality to this enforced recruitment alone.

There is little in the nature of specific evidence that can be used to substantiate this impression with respect to the wine industry. However, it was learned in one of the wineries that output is traditionally bottled in the Italian type Chianti flasks, round bottomed and with a straw base and straw outside lining. These are washed manually so as not to wet the straw, that is, the insides and the neck outside are washed. The situation was observed where twenty six women were clustered round an open tank each with a wire brush and each getting in her neighbour's way in an attempt to satisfactorily "sterilise" the flasks which were stacked around them in wire crates. Given that this type of container has to be used, and at the moment it does, then a small amount of organisation in the form of overtime would probably increase the marginal productivity of the bottling hall.

That round bottomed flasks have to be used brings out the physical constraint in existing operations which, simply, is a shortage of bottles. This factor is relevant in beer and in soft drink production also but not to the same extent. In common with many of the nationalized plants in this study, the two bottle making factories were formerly owned by expatriates. Also in common with many of the plants there was a disproportionate amount of supervision, maintenance and production planning controlled by non-Ethiopians who, often, removed all documentary records of operations, instruction and other machinery manuals and blueprints when they quitted their spheres of ownership and control. No moral condemnation or approval of this practice is contemplated here. The result was simply that the Ethiopians taking over did so at a disadvantaged level apart from lack of knowledge and ability specific to their tasks.

The bottle problem is compounded since one of the bottle making plants is located in Asmara from which transportation in 1975/76 was particularly difficult. Breakages and non-return of bottles will continue to be felt until these plants are brought under the central wing of the Beverages or Food Corporation.

Importation of bottles is, because of the unit costs involved, regarded as totally impractical. It should therefore be realized that the operations of the wineries at any moment could be at a diminished level because of the bottle shortage and that the twenty-six women might at another time, have been seen with their arms folded waiting on bottles coming. This does not deny the logic of overtime during another period but, together with the other issues raised, is important in any reading of tabular utilization results.

These issues raised on the capacities of wineries should be seen in the light of the Beverage Corporation's aims in this sector. The demand for wine is growing continually. Even though the production levels for 1975/76 show a distinct improvement over several previous years the three plants cannot satisfy the domestic market. It is likely that the larger of the wine producers outside the Beverage Corporation will show lesser production levels both absolutely and relative to the nationalised sector's share in 1975/76 since many of these were Italian, Greek or Armenian concerns and their previous owners have left Ethiopia due to the change in Government. The stated intent of the Beverage Corporation in the short-run is to maintain maximum possible output of artificial wine without consideration of increased capacities in existing plants and, simultaneously, an investigation is proceeding into the establishment of a planned natural grape wine industry. This includes a study of the fresh grape requirements of existing wineries based on existing and proposed capacities and will be carried out on the assumptions of total substitution of natural for artificial wine and of higher quality wines generally.

Corrective measures, therefore, are very much confined to the short-run, existing situation until the benefit-cost studies are completed and the main measures for immediate implementation would relate to the bottles shortage and to some planned flexibility in overtime regulations. Unlike the food industry the wine sector in Ethiopia is fortunate that it possesses a responsible and knowledgeable management at plant and at Corporation level. This feature is shared by the brewing sector of beverages which now receives attention.

Whereas it was legitimate to assert that wine production and sales do not meet existing market requirements the situation in beer consumption is subject to its own peculiarities and the first part of this discussion relates to beer demand and supply.

The output of beer between 1968/69 and 1974/75 exhibits an annual average growth of 12 per cent with growth rates of 25.4 per cent and 25.6 per cent in 1970/71 and 1974/75 over the preceding years. The 25.6 per cent jump occurred mainly as a result of the revived marked for the beer produced by Entry 30. On

TABLE IV.5: PRODUCTION of BEER and MARKET SHARE, 1968/69-1974/76 in HECTOLITRES

Year	TABLE IV.1 Entry 30	Share (per cent)	TABLE IV.1 Entry 31	Share (per cent)	TABLE IV.1 Entry 32	Share (per cent)	Total	Growth Index
1968/69	94,623	42	21,000	9	113,212	49	228,844	100
1969/70	80,671	35	38,000	16	113,912	49	232,588	102
1970/71	81,619	28	61,941	21	148,169	51	291,729	127
1971/72	74,774	25	75,789	25	151,451	50	302,014	132
1972/73	43,990	15	91,752	32	154,576	53	290,318	129
1973/74	32,784	9	101,493	39	217,008	62	351,285	155
1974/75	52,762	11	109,010	25	279,422	63	441,194	193

Source: Ethiopian Beverages Corporation, Addis Ababa (1976).

Note: Output levels for the first two years are sales. The variation is practically zero since a one-to-one correspondence exists at any moment. That is, the level of ending and beginning stocks of beer has not been considered since the brewery stores, both at plant and at distribution points, do not accommodate more than 25 per cent of their daily output.

the other hand the growth between other years during the period was almost stagnant or negative. The actual recorded outputs and growth index are illustrated in Table IV.5.

The breweries referred to in Entries 30 and 31 are located in Addis Ababa and Entry 32 is located in Asmara with lager being the principal product line in all three. The share among Ethiopian breweries was always in favour of the Asmara plant, the output of which increased by 147 per cent during the seven year period reviewed.

The output figures further show that Entry 31's share grew while that of 30 declined. This, in large part, was due to a keen consumer preference for the beer prodced in 31, and the sharp downturn of output in Entry 30 in 1972/73 coincided with the expansion of capacities in the other two breweries at the same time.

An examination of Table IV.6 reveals the insignificance of both the volume of imported beer and of beer exports over the period 1968/69-1974/75.

TABLE IV.6: BEER CONSUMPTION in ETHIOPIA, 1968/69-1975/76 (Hectolitres)

Year	Domestic Production	Imports	Exports	Domestic Consumption	Index
1968/69	228,844	2,159	276	230,727	100
1969/70	232,583	2,814	209	235,188	102
1970/71	291,729	3,193	2	294,920	128
1971/72	302,014	4,035	6	306,043	133
1972/73	290,318	1,956	50	232,224	127
1973/74	351,285	1,878	5	353,158	153
1974/75	441,194	1,256	4	442,446	192

Source: Ethiopian Customs Head Office, Addis Ababa and Table IV.5.

Since beer consumption is so dominated by the domestic product then the indexes in Tables IV.5 and IV.6 are almost identical. These tables stop short of the period of enquiry for the study as a whole and the market situation in 1975/76 is now examined.

Production and sales in 1975/76 show a marked deviation from the trend in the previous years examined. The Asmara location of the largest brewery is the major contributor to this distortion which extends beyond beer into the soft drinks field. From Table IV.1, the total supply of domestic beer for this period was 369,395 hectolitres and this is shared as indicated in Table IV.7.

TABLE IV.7: SUPPLY of DOMESTICALLY PRODUCED BEER

1975/76 (Hectolitres)

Entry Number From Table IV.1	Production	(Per Cent)	Per Cent Change Over 1974/75 Production	Share
30	123,947	34	140	209
31	125,657	34	15	36
32	119,791	32	-133	-97
Total	369,395	100	-22	---

Sources: Tables IV.5 and IV.6.

Overall production in 1975/76 was only 84 per cent of the previous year. Considering the average growth of domestic production then the 1975/76 output is less than 75 per cent of demand, or about 140,000 hectolitres shortfall. The decline in the supply of beer from Asmara has created a supply deficiency which permitted the output of Entry 30 to be significantly increased.

Thus are some of the effects of a disruptive civil strife situation in Northern Ethiopia. The analysis is subject to the qualification that, apart from a once-off mention of the relative non-popularity of Entry 30's output, it assumed homogenerous products and hence perfect substitutability among the three lager varieties. Production figures pre-1975/76 could be regarded as an indication of market preferences and the growth in output of Entries 31 and 32 along with the decline in Entry 30 evidences market preferences for the former. A Beverage Corporation consumer survey indicated that a shift between Entries 31 and 32 could be made without much effect on tastes and preferences. Given this, the tendency is towards a conclusion that the shortfall indicated is more acute than the figures suggest.

The derivation of the physical utilization indexes can now be examined against this backgroud. The capacities of major operations in the three breweries are displayed in Table IV.8.

TABLE IV.8: SUSTAINABLE CAPACITIES of MAJOR OPERATIONS in BEER PRODUCTION

Department	Unit	Entry 30	Entry 31	Entry 32	Shiftworking Arrangement Entry 30	31	32
Brewhouse	HL/yr	150,000	120,000	300,000	"continuous batch process"		
Fermentation I		145,000 1/	120,000	---		"	
Fermentation II		200,000	120,000	---		"	
Filtration	Litres/hr	5,000	8,000	---	2	2	2
Washing	Bottles/hr	14,000	23,000	23,000	2 with		
Filling	"	14,000	18,000	33,000	over-time or	2	2
Pasteurization	"	14,000	18,000	29,000	3	3	2

Source: Ethiopian Beverages Corporation and Plant Level Information.

1/ During the year 1975/76 large scale ongoing projects were in operation in Entry 30. By the end of the year a maltery with a capacity of 2,500 tons of hops per year was installed. The brewhouse capacity was increased to 220,000 hl. and overall fermentation to 215,000 hl. At the beginning of the period the Fermentation I capacity was 140,000 hl. and the figure listed in the Table acknowledges the realizable output for the year in terms of the increases in capacity. For the year 1976/77 realizable capacity in this plant should be about 215,000 hl.

2/ Bottle size is 350cl.

The bottling end of operations, though presented in sustainable terms in Table IV.8 is a problém area in Entry 30. The filling, washing and pasteurizing operations have theoretical capacities of 27,000, 18,000 and 19,000 bottles per hour respectively. Production in bottling is sometimes down to 8,000 bottles per hour because of excess foam generation at the filling section and because of the lack of full repair and adjustments to very worn out machinery.

Despite this, the capacities in the brewhouse and in the fermentors are very closely matched in the bottling hall. It is evident that Entry 31 displays a very efficient set of operations and both plants have an efficient management which pays close attention to quality control and sanitation tests and procedures, these being carried out on all inputs and at all stages of production.

Most of the underutilized capacity in this sector then, is contained in Entry 32, and is caused, not by lack of demand, but by the transportation problem in bringing the Asmara plant's beer to the interior region. From projections based on Table IV.5, the growth in consumption for the five years following the period of enquiry can be built up assuming, again, that the 12 per cent growth displayed continues to be representative and invoking <u>ceteris paribus</u> with respect to consumption factors. Against this extended background the present capacity situation can be more fully prescribed for.

TABLE IV.9: DEMAND PROJECTION for BEER 1976/77-1980/81

(Hectolitres)

Year	Demand	Actual Brew [1/]
1976/77	553,500	595,000
1977/78	620,000	666,000
1978/79	694,000	746,000
1979/80	777,500	836,000
1980/81	871,000	936,000

Source: Table IV.6.

Note 1/ Actual brew is about 7.5 per cent more than beer output so as to allow for wastage and breakage at all stages of production.

Table IV.9 gives the demand projection for beer.

Given the shortfall of supply over demand the Beverage Corporation is increasing the capacity of Entry 31 by 150 per cent to 300,000 hectolitres per year. This plant, unlike Entry 30 has ample room to expand and a more than adequate source of natural spring water. It is expected that this level of production will be operable by mid 1978. If it is assumed that all of the Asmara plant's capacity is used then this will provide a realizable capacity of 815,000 hectolitres per year overall. From Table IV.9 it is evident that this will suffice only until 1979.

The previous owner of the Asmara plant had embarked on an expansion programme designed to raise capacity by 200,000 hectolitres per year. All of the investment outlays except filtration and bottling have already been committed but, understandably, the Beverage Corporation would not complete the expansion during 1975/76. Should the Northern Ethiopian situation normalize this programme will be carried out. Assuming it does, realizable capacity would reach 1,015 million hectolitres per year which would suffice until 1980. If the civil strife does not abate then realizable capacity will be in the region of only 635,000 hectolitres per year. When this is viewed against the growth in demand then the resultant supply shortfall makes considerations of a fourth brewery a serious matter.

This concludes the discussion on brewing which may be summarized by noting that one brewery is operating at its absolute capacity, one has enjoyed a very large boost in demand for its product at the expense of the Asmara plant. The latter is forced down to around one-third of its potential due to distribution problems caused by civil strife. The demand situation is strong enough to warrant significant expansion and even, perhaps, an additional brewery.

The third sector of the beverages industry is soft drinks and mineral waters. As before remarks are begun at a general level prior to plant specific discussion on utilization. Capacity utilization is first considered against the supply and demand situation in which the relationship between production and sales is significant.

In the beverages industry production is geared to sales except for a small volume of relatively expensive and better quality wine. The difference between production and sales is mainly attributable to breakages and the main areas where these occur are in stores, loading and off-loading, in warehouses and on display. Net production exceeds sales by about 1.5 per cent due to these factors. The reason for this correspondence between production and sales lies in the uneconomic nature of storage requirements relative to the value and volume of the products. Because of this the finished product is distributed to the various outlets as quickly as possible.

The biggest soft drinks plant in Addis Ababa producing Coca Cola, has a finished goods store of 1,200 cubic metres capacity. This can hold a maximum of 10,000 by 24 bottle cases which have a sales value of $35,000 and is somewhat less than one day's production. Sales of soft drinks are seasonable, being less during the rains which last around four months. Even with this seasonality, however, it would be impractical to suggest stockpiling during the slacker period. The building and space requirements for, say, one month's production would be vast. Should this be overcome other practicalities impede. Packing materials are fragile, soft-wood cases, so that the proportion of breakage would increase due to the additional handling involved. Products close to the roof would be exposed to more heat which would cause additional breakage and colour loss. The installation of cooling units to combat this would be an expensive process.

Again, most soft drinks plants operate their daily activities on an overdraft basis so that the financing of inventories would be even higher with the result that unit costs would escalate immensely, and this from directions other than those mentioned.

As well as being fragile, wooden cases are more expensive than their soft drink content. It is difficult to gauge the extent to which increased circulation would offset this. Similarly with bottles. The value of a case and its complement of regular size (24 X 150 centilitre) empty bottles is around $9.50. This would more than double if imported green glass bottles were used. On the other hand the value of the soft drinks alone is $3.50, or 27 per cent only of the total packaging, container and content value. In short, to finance the stocking of one day's production would require $95,000 for cases and bottles plus interest on the overdraft or other loan. (The ratio of cases and bottles value to content value will not nearly be as high in beer or wines as the almost 2:1 ratio found here in soft drinks. This is simply because beer and wine have a higher value. But consideration of such factors are still very much in evidence in the beer and wine sector. They have been mentioned by example in this discussion on soft drinks where their impact is greatest).

The conclusion of this part of the discussion is that immediate distribution of the products, particularly to outlying areas, is a prerequisite for the fullest use of attainable productive capacities. The situation during 1975/76 regarding outlying areas was that these would have to be reached more frequently since this demand was outstripping the distribution capacity.

The main channels of distribution, however, are very short. The plants are in close contact with customers with about 4,500 soft drink outlets in Addis Ababa alone where four of the five major soft drink producers are located. The large urban market areas have been divided into zones and routes by each plant with each driver-salesman having assigned numbers of outlets. Competition between plants is therefore very keen since the arrival of one lorry at an outlet one minute after the arrival of another from a different plant can result in the former having to move further afield to make his sales before returning for the next load. On the other hand, since outlets do not deal solely with one plant the turnover can often be low.

Outside the larger centres the costs of distribution increase and, in order to direct delivery, adequate transport fleets are esential. The major part of capital expenditure in all the plants is transport facilities. New vehicles are bought every year to replace old ones and to serve new markets. Hired trucks are common because plants are not so financially strong as to be able to operate entirely through owned trucks. Hiring has its own problems usually associated with expense, non-availability and unwillingness on the part of operators to travel where roads are poor or where security is lacking. This confounds production and sales co-ordination.

Five of the seven plants in this sector produce mainly cola variety soft drinks under the franchise of Coca Cola, Pepsi Cola or Canada Dry. Of the remaining two, one produces soft drinks of a unique variety and mineral water, and the seventh bottles mineral water only. In the discussion of plant specific features four of the five cola producers are considered together in terms of sales and production. The fifth cola producer is considered on its own as are the remaining two plants since these three have characteristics, either in terms of their productive operations or their products which set them apart from the first group.

The sales growth and locations of the four major cola variety producers are shown in Table IV.10.

TABLE IV.10: SALES and MARKET SHARES of the FOUR MAJOR SOFT DRINK PRODUCERS 1971–1975

(SALES in CASES of 24 BOTTLES and SHARES per cent)

Calendar Year		Entry Number from Table IV.1, and Location, 33. Addis Ababa	34. Addis Ababa	35. Harar	37. Asmara	Total	Index
1971	Quantity	1,689,703	803,202	225,969	403,300	3,122,174	100
	Share	54.1	25.7	7.2	12.9		
1972	Quantity	1,345,013	614,951	179,474	324,214	2,463,652	80
	Share	54.5	24.9	7.2	13.1		
1973	Quantity	1,611,503	779,813	197,978	370,228	2,959,522	95
	Share	54.4	26.3	6.6	12.5		
1974	Quantity	1,803,576	779,813	229,445	446,338	3,279,172	105
	Share	55.0	24.3	6.9	13.6		
1975	Quantity	2,127,369	976,095	332,904	277,536	3,713,904	119
	Share	57.2	26.2	8.9	7.4		

Source: Beverage Corporation, Addis Ababa 1976.

The growth of total sales during this five years is unimpressive. Total average annual growth was 6.3 per cent but only 3.6 per cent if 1975 is left out. The sharp decline exhibited in 1972 is due to the imposition of an excise tax of $0.03-$0.05 per bottle to which the plants responded by adding between $0.90-$1.20 per case of 24 bottles. Retailers passed this on to consumers with an $0.05 increase in the price per bottle. The latter became $0.35 which is expensive to the "average" Ethiopian consumer and is one of the highest prices for this product on the African continent.

From these figures, and Table IV.10, the price elasticity of demand at this time was about 1.75. According to the Ethiopian Central Statistical Office Survey for 1975, preliminary results, the value of production in the manufacturing sector grew by 10 per cent so that the explanation for the decline in soft drinks sales seems very much down to price increases. The sales value in 1972 was down by an average of three per cent across plants from the previous year.

The decline in sales for the Asmara plant at the end of the period is, again, attributable solely to its location with the associated distribution problem. These sales figures cannot be taken as synonymous with demand. For 1975/76 demand was clearly greater than supply but the extent to which this is due to a shortage of beer as opposed to an increase in demand for soft drinks is not known. The most pronounced complaints of soft drink shortages came from locations where the same complaint was made with respect to beer and "enforced" substitution is an important factor in the demand situation for soft drinks during the period of enquiry. Despite the increased level of output in soft drinks in 1975/76 compared with the five previous years there was still a volume shortfall in the combined supply of beer and soft drinks. A subsequent scan of the situation in Northern Ethiopia suggests that the production operations in the Asmara brewery will not have normalized so that the following discussion on productive capacity in soft drinks is made against a background of vigorous demand for the product subject to specified qualifications in certain market areas.

Due to physical, productive capacity constraints the growth of output in 1975/76 was considerably short of desired output levels.

The major constraints on physical productive capacities in this sector are found in the bottling hall and since plants do not have bottlenecks on the washing side the capacity outputs are determined from the filling process. The number of effective working days taken for the calculation of Uc is 280 and the number of effective hours per day is 16, unless more than these days or hours were actually recorded in which case this would be the basis for Uu and Uc.

Capacity output in terms of three shifts operation is not considered because continual running of machines is not advisable from an efficiency point of view. The non-running time per day is assigned to preventative maintenance and cleaning which should result in an improved and constant efficiency. Sundays, too, are deemed necessary for maintenance and are not included in the calculation of the Uc denominator, Theoretical filling speeds are taken at 75 per cent of the manufacturers' rated maximums since a level of 75-80 per cent was never surpassed when the machines were new - this according to technical information from the Beverages Corporation.

The capacity utilization for the largest plant is very low because the filling efficiency has been deteriorating each year since the installation of the washing/filling equipment in August 1972. In 1975/76 output was about 500 cases per hour instead of the attainable 800. Further deterioration in this situation is very likely unless the existing filler is dismantled for a major overhaul or unless a new filler is provided. Both of these alternatives can be regarded as beyond the scope of a rapidly achievable short-run measure to improve existing resources. As such, they could not be regarded as a rationalization of existing stmcture in the same light as the equipment addition in the shoe factory example of Chapter II.5. Thus the overhaul alternative will involve the loss of about one month's production and the replacement will involve expenditure of about $400,000. Nonetheless, consideration of these two alternatives and the implementation of one of them is the only way out of the plant's current production rigidities. These alternatives are now considered.

The total cost of a major overhaul would be about $286,000. About $130,000 of this consists of installation and parts and the remainder consists of the fixed costs that would have to be absorbed over the period of repair.

If this course were chosen, maximum output would be 2,700,000 cases per year over 16-hours per day operations or 4,000,000 cases per year over three shifts per day. It is very doubtful if the latter could ever be sustained. Unless there is proper maintenance and a close follow up of the filler by a competent technician it would not be advisable to operate more than two shifts because the efficiency will decline to an uneconomical level. Additionally, spare parts for the existing filler are hard to come by because the filler manufacturer/ supplier could not provide all necessary parts in a short time period. This is due to a combination of modifications found in the current range of new fillers produced and the necessity to order required parts on a special basis on the grounds of the allegation by the manufacturer that these are not stocked. Since part of the financing is to be expected from the franchise operator then the machine manufacturer is specified and would be in any case if efficient integration of all bottling hall operations is envisaged since the bottle conveying and washing equipment comes from the same manufacturer.

A new filler having a theoretical capacity of 1,000 cases per hour would cost about $400,000 including installations. At 80 per cent efficiency this would produce 3.6 million cases in two shifts which is about 33 per cent more efficient and 43 per cent more expensive than overhauling filler.

The overhaul would not allow the plant to go beyond its present level of production and the capacities in washing and carbon-cooling operations would still be underutilized. The plant's boiler would still have to be run at full speed so that fuel and other expenses involved here would be spread over a lower level of output. This would apply to most overhead costs. The product in question has a buoyant demand and the purchase and installation of a new filling unit appears to be the better alternative. The existing filler could be used in another plant when the need arises - this is probable in the near future.

The Asmara plant is subject to the same productive constraints as the brewery in the same location. In 1975/76 it was not going beyond one shift operation since it could not reach interior markets due to transportation disruptions. The remaining Addis plant has relatively new equipment and should seek new markets but is constrained by the general factors already mentioned, particularly financial limitations which prevent the enlargement of its truck fleet, the storage problem and the availability of bottles - these are not always obtainable in the necessary quantities at the required time.

The fifth cola plant, Entry 35 in Table IV.10 is characterised by old, inefficient machinery and the major constraints on the further use of technical capacity are those imposed by the washing and filling operations. The machinery for these is thirteen years old and apart from a major and not wholly successful overhaul in May 1974 these items did not have regular maintenance until recently. The actual bottles washed is about 250 cases worth per hour and this level requires "continual" maintenance to be performed by the only skilled technician. Prior to this man's appointment at the beginning of 1976 actual output had been as low as 150 cases per hour. The stated capacity of this washing machine is 750 cases per hour.

In the filling end the maximum attainable output was 240 cases per hour and bottling hall operations were undoubtedly the main physical capacity constraints.

This plant, until end 1974, was composed of three different production lines. One was artificial wine;

one was a traditional Ethiopian honey mead based on the fermentation of dilated honey with selected yeast; the third activity was soft drinks. The sole line of production is now soft drinks, mainly cola, orange and raspberry flavours and these are bottled under the internationally known Canada Dry franchise. Because of inherited difficulties this plant cannot be prescribed for on the simple basis of a comparison of alternatives to improve production as was possible in the case of the largest plant.

An examination of this plant's records reveals that the previous product lines could not establish secure markets. The Canada Dry product had to shoulder the liabilities and problems of its predecessors. This made it difficult to get the essential financial and managerial backing to overcome these inherited problems. Despite this, sales exhibited an average monthly growth of 17 per cent during the first seven months of operation - the production period prior to the year 1975/76.

The main constraints on capacity apart from machine operations relate to the distribution problem caused by a shortage of delivery vehicles and to the supply of bottles. Not only are additional vehicles required but modification of the existing fleet is required to fit new product line requirements. Despite the readily available market, sales levels were very curtailed since the expected arrival of new Canada Dry bottles did not materialize and the plant does not have bottles for circulation and return beyond the average sales level for 1975/76.

A detailed appraisal of the operations of this plant is necessary in the two main areas of production and distribution before any pronouncements are made on capacity. The extent to which these interacted during 1975/76 would render any improvements in machine performance redundant unless concomitant improvements were made in distribution and vice versa. It would not be difficult to prescribe for corrective measures on both fronts and, indeed, most of the factors to be considered have already been raised in previous discussions. For this reason it is not gone into for the present plant although this is predicated also on the fact that there are too many unknowns in other areas, like overall plant organization and the various aspects of financial structure, to be able to make proposals with reasonable assurance.

In the plant producing both soft drinks and mineral water the capacities of the main operations are:

Washing	- 250 cases per hour
Filling and Corking	- 200 cases per hour, soft drinks
	- 170 cases per hour, mineral water.

Although new machines were installed in 1971 there has been no proper maintenance or supervised production and some items of equipment were out of operation shortly after installation. The plant chemist also supervises production and these two posts require different skills so that both cannot be properly handled by the present man.

Despite this, the washing and filling operations are in satisfactory working order apart from some minor repairs required for temperature and pressure gauges. Unlike other plants in this sector the most serious detrimental effect to overall production is caused by the lack of a carbon cooler unit, or rather the non-repair of the existing unit which was damaged due to the absence of a competent technician/production foreman. Since water is not being cooled, temperature and pressure variations are found. Carbon dioxide is not absorbed and resultant bottle breakages are more than twice the 1.5 per cent average found elsewhere in the sector. Additionally, excess foaming results so that the bottle content average is reduced. Re-running at the filling stage is carried out and this, of course, impairs efficiency in mineral water production and in soft drinks. In the latter there is the additional effect of overdilution on the concentrate content so that customer complaints on too little quantity and impaired quality are frequent. At present, concentrate mixing is done by hand and the corrections to production operations in this plant will centre around the replacement of the carbon cooling unit and the purchase of a syrup mixer at a combined cost of about $25,000.

To realise the benefits of this, a competant production and maintenance supervisor Mill have to be employed. The aggregate efficiency loss due to the absence of a carbon cooler is estimated at 20-25 per cent.

The market for the mineral water part of production suffers from the competition of the remaining plant, Entry 39 in Table IV.1., and moves were afoot during the period of enquiry to assign these plants separate market areas. The products are homogenous and the Beverage Corporation views an overlapping sales network as an unnecessary distribution cost.

A remaining adversity in this plant would relate to its lack of working capital. The projected market is very favourable and, in order to realize this, an overdraft facility beyond the current limit would likely be very advantageous.

The mineral water part of production in this plant and the remaining plant has been examined from the exporting viewpoint and the available evidence suggests that this could be lucrative but would require an aggresive sales campaign. The main requirement now is an investigation into the desired type and content of containers, price levels, demand and other marketing information. Both plants require sufficient laboratory facilities to meet quality standards in terms of sanitation and uniformity of product. If export sales are seriously attempted then, undoubtedly, the remark previously made about working capital in the previous plant becomes more pertinent.

The potential export market for this product is Africa and the Middle East and Ethiopia has hardly exploited its rich mineral water wells and springs that are found in several areas with a history of volcanic activity. Production should not be a problem since the actual operation, apart from bottling, consists solely of "cleaning" the water. In addition to the problem of storage general to the sector, the difficulty for export will be the efficient promotion of the product's advantages.

This completes the detailed examination of plants in the Beverages industry. Unlike the Food industry the administrative, financial and commercial management appears adequate to the tasks in hand. Unlike the food industry again, beverages have a well established, dynamic corporation staff. Like the food sector in kind but to a much lesser degree there are some technical staff shortfalls as indicated above. The prevailing view of Corporation personnel is that the wines and brewing sectors of beverages should be treated as part of an integrated agro-industrial complex. If movements do proceed in this direction, for example - natural grape and increased domestic barley production, then the requirements for specialized personnel will increase sharply.

C: Textiles

The Ethiopian Textiles Corporation comprises 14 fully controlled factories, one partly controlled factory and a cotton farm. These are made up of both integrated textile mills in the various processes of spinning, weaving and finishing and non-integrated spinning plants. The nationalized sector is the exclusive producer of such staple fabrics as sheetings, ('Abujedid' - a loom-state grey fabric), poplins and drills; fancy woven fabrics like dobby and sateen, requiring dobby and Jacquard looms; simple or elaborate prints on a variety of fabrics; industrial fabrics like sacks and hessian cloth, (coarse fibre products are treated separately); carpets, blankets and drapery requiring special weaving and finishing; knitwear of various kinds; and marginal products like towelling and bandages.

The importance of the modern textile industry in the Ethiopian economy requires little emphasis. Its contribution in investment, employment, gross value of production, value added, and earnings is the highest among manufacturing industries. In addition, the traditional textiles hand-loom sector is a substantial producer in its own right and the bulk of its yarn input is produced by the modern sector.

In the textiles industry, the largest sub-sector is the spinning and weaving of cotton fabrics and, as in the rest of the industries considered, the supply and demand situation for the product is taken as a main element in the discussion on capacity utilization. Unfortunately, the range of products coming under the rubric of woven cotton fabrics is considerable and these require examination in depth. In the food and beverage industries an observed shortage of grain mill produce or soft drinks was more easily identified but product variation in textiles does not permit of generalization in this regard and the first several pages of the discussion on textiles has to be given over to a description of the supply and demand situation in individual product lines, followed by an analysis of this before sensible comment on capacity utilization is possible.

The total supply of woven cotton fabrics and yarn for the period 1971-1975 has been taken as the sum of total domestic production and imports less exports and re-exports, if any. Overall demand has been arrived at by adding total sales and imports, net of exports and any re-exports. These magnitudes are presented in Table IV.11.

(Although the convention of using an area and weight measure to express fabrics and yarn magnitudes respectively does reflect Ethiopian practice, it

TABLE IV.11: THE SUPPLY AND DEMAND for WOVEN COTTON FABRICS and YARN 1971-1975 (Fabrics in '000m^2, Yarn in tonnes)

Year	Supply		Demand	
	Fabrics	Yarn	Fabrics	Yarn
1971	83,619	8,145	64,960	7,502
1972	76,840	7,646	72,957	7,419
1973	77,817	7,528	78,960	7,909
1974	70,448	7,614	79,804	7,660
1975 1/	35,084	3,867	33,821	2,828

1/ January-June

Source: Ethiopian Textiles Corporation and Customs Head Office, Addis Ababa.

prevents comparison of these figures with the output levels of Table IV.1. The latter are taken immediately after the spinning stage, that is, the yarn, and are expressed in weight terms. For a statement of the problem of reconciliating those weight/area measures, and for a justification for the procedure adopted herein, refer to pages 247 and 248 below and, in general, to the rationale and construction of the utilization indexes).

The supply of woven cotton fabrics between the years 1971 and 1974 has been declining at an annual average of four per cent.

As imports account for less than one per cent of total supply, this trend is almost entirely determined by domestic production movements. Domestic production has, save for an increase of two per cent between 1972 and 1973, been declining at an annual average rate of 3.8 per cent up to 1975 (first half).

The supply situation of yarn in the period prior to 1975/76 has been similar. Total supply reflects an average annual drop of 1.75 per cent, while the decline in domestic production is about 0.75 per cent. Domestic production for the same period shows a decline of about 2 per cent. The impact of the loss in domestic production is more felt here since imports, which accounted for a relatively higher portion of total supply in 1971 and 1972, have been almost entirely abandoned.

While the supply of both woven cotton fabrics and yarn up to June 1975 reflected a steady downward trend, the case with the demand for these goods has been the reverse. Overall demand for fabrics between the years 1971 and 1974 has been increasing at an annual rate of 5.3 per cent. The demand for yarn over the same period does not reflect any strong trend.

A comparison of the supply/demand situation for fabrics reveals that demand surpassed supply in 1973. Excess supply in 1971 amounted to about 14.3 million square meters or 22 per cent over a demand figure of some 65 million square meters of woven cotton fabrics. The disparity between supply and demand in 1972 exhibited a substantial reduction, being only five per cent.

Domestic production in 1971 dropped by three per cent while demand increased by 12 per cent. The increase in imports for the same year was 29 per cent, a record for the period under consideration. In 1973, demand overtook supply by about 1.14 million square meters or just about one per cent. A 10 per cent drop in supply during the year 1975, coupled with the increase in demand for the same period, albeit small, has led to a worsening supply/demand situation. Excess demand in 1974 reached 9.4 million squre meters or 13 per cent from 1.1 million square meters or one per cent in 1973.

The supply/demand situation for yarn between the years 1971/1974 seems to behave in a similar manner. Supply deficits began to occur in 1973,when demand surpassed supply by 5 per cent.

The foregoing figures deal with the overall supply/demand situation in aggregate terms. An item by item examination would reveal that not all articles are in deficit and/or in surplus. Based on the stock movements of the various woven cotton textile articles, the fabrics in question have been divided into surplus and deficit articles. Surplus articles are defined as those having a cumulative surplus over the period. Table IV.12 lists articles showing a cumulative surplus and a comparison of this surplus/deficit situation with the latter part of the period.

TABLE IV.12: CUMULATIVE NET SURPLUS for WOVEN COTTON FABRICS and YARN, 1971 - 1975 (first half)

(Negative Quantities in Parentheses)

Article	Unit	Apparent Cumulative Surplus	Situation in 1974	Situation 1975 (Jan-June)
Bandages	Yds.	81,064	(14,438)	6,101
Grey Drill	Yds.	2,469,790	(654,555)	447,686
Chick-gray	Yds.	1,192,940	(485,920)	(118,000)
Dyed Sheet	Yds.	8,324,776	978,888	357,755
Grey Sheet	Yds.	539,535	(495,726)	42,030
Printed Flannel	Yds.	129,278	(6,527)	56,567
Dyed Poplin	Yds.	6,390,199	3,845,921	(802,859)
Printed Poplin	Yds.	6,699,894	1,091,050	(82,652)
Dyed Twill	Yds.	5,601,914	(59,699)	(293,169)
Denim Drill	Yds.	350,860	316,265	29,446
Yarn	Tons	482	(46)	39

Source: Ethiopian Textiles Corporation.

Annual surplus/deficit levels for the different articles under consideration have been calculated as total production for a given year less total sales for that year. The surpluses/deficits so derived have then been netted over the past four years to arrive at the apparent cumulative surplus/deficit levels. The surplus fi ures are entered as "apparent", because information gathered from the textile mills indicate that stocks held are either very small or they report no stocks at all. These reports, however, are a clear contradiction of the production and sales information received.

This information, moreover, exhibits no clearly discernible trend. Of course, the surpluses shown should somehow be accounted for and the possibility exists that stock levels of the magnitude indicated were lying somewhere.

Based on the foregoing brief discussion on the nature of the apparent surplus levels in the past four years, a total cumulative surplus of some 21.9 million square meters is yet to be accounted for. In what follows, the major surplus articles are dealt with separately.

(a) Bandages

This is an item exclusively sold to hospitals and clinics. The only producer in the past four years has been one Asmara plant. The production of bandages follows no definite trend,perhaps because of its limited end-use, but seems to have adequately contained the demand from its specialized consumers.

A small amount of surplus, about 6,000 square meters, has been recorded during the first-half of 1975. However, the surplus/deficit situation for this particular article is regarded as unimportant since it falls outside conventional woven cotton textiles which are mainly used for clothing purposes.

(b) Grey Drill

As its name suggests, this is a grey fabric and is mainly consumed in rural areas. It belongs to a category of fabrics that may be designated as coarse.

The main market locations are the highland areas of the country, where heavy attires are wanted. Although a coarse, and hence relatively cheap fabric, its popularity is very limited. This is due to the price differential, between this article and the better quality dyed drill, being very small. When seen in the light of the total production of woven cotton fabrics, grey drill accounts only for an average of about three per cent. As such, the impact of this fabric on total supply would be very minimal.

(c) Chick-Grey

Chick-grey is used as a retention material for the traditional, native built, house ('chicka') walls. It is more of a 'building material' than an apparel fabric. The demand for this article is tied to changes in the technology of 'chicka' wall finishing, which currently has reached a level of sophistication where chick-grey could be abandoned to a greater degree and indications are that it would not be long before this article loses its main end-use entirely.

(d) Dyed Sheet

Throughout the four and half years under consideration, dyed sheets have been in surplus. One reason is that this article happens to be directed at urban consumers, whose buying habits seems to vary substantially when viewed against the desires of producers. The range in the quality of dyed bed sheets produced has diversified from an almost entirely coarse quality to relatively finer qualities. The movement into finer qualities means more cotton per unit sheet and less output in terms of area for a given weight of cotton.

(e) Printed Flannel

Dyed and printed flannels are mainly used for night wear and warm clothing for infants. Most of the textile factories are capable of producing this article and in fact did produce in the past, having the raising machines needed for the purpose. Another Asmara plant is the only producer currently. The market is very limited and the quality produced by this factory is regarded as the best. The fact that the other factories have stopped producing this fabric may also be seen as indicating that the article lies outside what may be termed conventional apparel fabrics.

(f) Dyed and Printed Poplins

Dyed and printed poplins are among the most important woven cotton textiles. Together, these articles account for an average of 23 per cent of total woven cotton fabrics. The average percentage share of dyed and printed poplin during the period 1971-1975 (first-half) have been 14 per cent and 9 per cent,

The cumulative surplus of dyed and printed poplin is 11 million square meters. The analysis of the surplus/

deficit situation for these articles, however, needs to be based on the range of qualities produced. These range between the cheap and coarse qualities, for example, those used for pusposes of mattress cover, and high quality linen-type sanforized/ mercerized products used for clothing purposes. The tendency in most of the textile mills in the past few years has been a shift into the finer fabrics of dyed and printed poplins. The wisdom of this diversification is debatable since it has occurred at the cost of coarser materials whose popularity is wide among the rural population and the urban poor. With the movement to finer qualities, and hence increased unit price, the market for these articles tends towards consumers with more sophisticated tastes. The demand for these goods among the target consumers does not seem to fall in line with the wishes of the textile mills, perhaps because these consumers have an ample latitude of choice. It would not be at all suprising, therefore, if the stocks that were held happen to be finer fabrics which not only require more cotton per meter of output, but which are also less popular among the vast majority of consumers currently. That is, there could be shortages in the coarser quality fabrics, and stock accumulation in fine or supposedly better quality fabrics.

(g) Dyed Twill

This article belongs to the most popular top five woven cotton fabrics and may be categorized under finer quality textiles. Its popularity, however, is greater in the urban that in the rural areas, although the magnitude in the latter is still substantial particularly when consideration is given to the ready-made clothes going to the rural markets. Also, dyed twill is one of the first textile items in which a shift in demand towards finer quality fabrics reflects itself. The decline in the production of twills, which will be dealt with in greater detail later, is one reason for the increase in deficit during the years indicated. This deficit situation began to appear only since 1974.

(h) Denim Drill

Although a drill in construction, this article may be categorized under finer quality fabrics, since it is mainly consumed by urban youth and is expensive relative to normal khaki drill. Denim drill, in fact, is a relatively recent introduction to the product mix of Ethiopian textile mills.

(i) Grey Sheet

This is a multi-purpose fabric popular among the rural populace. It is used both as a bed sheet and as a substitute for 'gabi' or 'netala' - (night clothes). Gray sheet is also used in some regions for purposes of girdles below the waist. The total cumulative surplus for the period up to June 1975 amounted to four per cent of total production.

(j) Yarn

Sales yarn is primarily produced for the consumption of the cottage industry, especially for hand-loom weavers. Only a small portion of this article is believed to go for purposes other than 'shamma' (cloak) weaving. It is further belived that most of the requirements, greater than ninety per cent, of 'shamma' weavers is met by modern sector spun yarn. The rest is accounted for by imports and mainly home spun yarn from back yard cotton.

Reports received from the mills indicate a total cumulative surplus of some 482 tons of sales yarn between the years 1971 and the first-half of 1975. This is just about one per cent of total output of sales yarn for the period. Insignificant as it may look, the level of surplus indicated holds an important implication on the seriousness and/or the truth of the current opinion on the supply situation of sales yarn, again a subject to be dealt with in greater detail later.

By using a similar procedure to that in the definition for surplus articles the remaining product lines, deficit articles, are now considered. The relevant figures are given in Table IV.13.

TABLE IV.13 CUMULATIVE NET DEFICIT for WOVEN COTTON FABRICS and YARN, 1971-1975 (first half)

Article	Unit	Apparent Cumulative Deficit	Situation in 1974	Situation in 1975 (Jan-June)
Abujedid	Yds.	(149,633)	(4,237,147)	481,164
Dyed drill	Yds.	(1,070,338)	24,760	(162,119)
Mahmudi	Yds.	(670,786)	(3,339,546)	420,764
Malmal	Yds.	(7,831,454)	(2,722,234)	(392,031)
Sateen	Yds.	(15,711)	4,273	(22,684)
Dobby	Yds.	(25,054)	(66,960)	(5,121)
French twill	Yds.	(19,045)	(50,829)	43,456
Dyed flannel	Yds.	(54,189)	1,813	18,733

Source: Ethiopian Textiles Corporation, Addis Ababa 1976.

(a) Abujedid

Abujedid is a loom-state grey fabric which, up to 1975, accounted for an average of 35 per cent of the total woven cotton textiles produced. Popular among the rural population, especially those in the lower income bracket, the share of this article in total output has been the highest since before the period of review. As the demand for abujedid is not associated with increases in income and urbanization, its consumption and in effect its share in total output- tends to decline.

An apparent cumulative deficit of 130,000 square meters of abujedid has been reported for the period 1971-1975 (first-half). Against the aggregate output of 110 million meters, the level of recroded deficit becomes negligible. Any surplus recorded during the period under consideration, save 1971 when it was about 18 per cent of production for the year, has similarly been insignificant with the highest recorded being about five per cent of total output for the year. The years 1973 and 1974 were the two in which heavier deficits occurred with figures of 2.3 million and 3.5 million square meters or 10 per cent and 18 per cent of output respectively. The first half of 1975 showed an improvement in that a surplus of about four per cent was recorded.

(b) Dyed Drill

This is another coarse fabric that had wide popularity in the rural areas. When seen against the shift in consumption to higher quality fabrics, dyed drill is next only to dyed twill. The share of dyed drill in total output in the four and a half years has averaged nine per cent.

The apparent cumulative deficit reported between 1971 and the first-half of 1975 has been three per cent of total production for the period. The heaviest annual deficit, about 40 per cent of production for the year, occurred in 1973. Otherwise, annual production/sales balances reflect surpluses of varying magnitude - about 18 per cent in 1971, 2 per cent in 1972, and insignificant in 1974. Annual deficit again occurred during the first half of 1975, being about 6 per cent of total output for the period.

(c) Mahmudi

Mahmudi is a coarse fabric, although at a higher standard in quality, used for a diversity of purposes ranging from shirtings to embroidery material. This article is popular both in rural and urban areas.

The apparent cumulative deficit reported between 1971 and the first half of 1975 has been about three per cent of aggregate output for the period. Annual deficit was greatest in 1974, when the deficit surpassed actual production for the year by about 14 per cent. The yearly production/sales movements have, otherwise, always reflected varying magnitudes of surplus - 26 per cent in 1971, 10 per cent in 1972, 8 per cent in 1973, and 17 per cent during the first-half of 1975.

(d) Malmal

This fabric is mainly used as lining material and head-wrap for clergy and women in some regions.

Throughout the period, the production/sales balances for malmal have bbeen in deficit. The average annual deficit during this period has been 1.4 million square meters. The aggregate deficit for the period has been 6.5 million square meters, about 44 per cent of aggregate output for the period.

(e) Sateen

Sateen is a fine fabric mainly consumed by people with high cash income. The total apparent cumulative deficit reported for the period 1971-1975 (first-half) amounts only to one per cent of the aggregate output during the period. Save for 1973 and the first-half of 1975, when deficit levels of 20 per cent were reported in both cases, annual production/sales balances were in surplus, averaging five per cent.

(f) Dobby and French Twill

Dobby is also a fine fabric mainly produced here for purposes of table cloth and other decorative or part-decorative end-uses. The apparent cumulative surplus recorded for the period amounts to about two per cent of aggregate output. Deficits began to occur only in the last one and half years and these amounted to 25 per cent for 1974 and seven per cent for the first-half of 1975.

French twill, a dobby of a coarser quality, is an apparel fabric used almost exclusively for women's wear. It is popular both in urban and rural areas, and is mainly consumed by average to lower income groups. When seen in light of the aggregate output for the period under consideration, the cumulative deficit is negligible. Annual production/sales balances between 1972 and 1974 reflect continuously declining deficit levels of five per cent, 3.1 per cent, and three per cent, respectively. The situation improved to exhibit a surplus of 20 per cent is the first-half of 1975.

(g) Dyed Flannel

The general features of this article have been discussed earlier along with printed flannel.

In the past four and a half years, dyed flannel accounted for ten per cent of total flannel production. Total cumulative defiit between the years 1971 and the first-half of 1975 was 46 per cent of total output. Annual production/sales deficit occurred only in 1971. Between 1972 and the first-half of 1975, however, annual surplus levels ran at 68 per cent, 34 per cent, 6 per cent, and 67 per cent, respectively. The deficit bias on the cumulative results from the large shortfall reported in 1971.

In summary, total cumulative surplus between the years 1971 and the first-half of 1975 amounted to some 22 million square meters for woven cotton fabrics and

480 tons for sales yarn. Total cumulative deficit for the period has been about 8.3 million square meters. The overall cumulative net surplus, therefore, becomes 13.7 million square meters. This is about four per cent of total output for the period in the case of woven cotton fabrics and just about one per cent for sales yarn.

Among surplus articles the total in 1974 was 4.9 million square meters while in the deficit category a total of some 10 million square meters was recorded, making a net overall deficit of 5.2 million square meters. The net deficit, then, was about seven per cent of production for the year. During the first-half of 1975, however, the net situation reflected a very small surplus, amounting to 21,000 square meters.

Finally, an overall surplus situation, however small, has been perceived in these four and a half years. It has further been observed that net deficit of the amount indicated has been recorded in 1974 while an insignificant amount of surplus has been reported during the first half of 1975. To acquire a deeper understanding of the significance of these general features, a closer scrutiny of important articles among what have earlier been termed 'surplus' and/or 'deficit' articles is required.

As the figures given in Table IV.12 above are aggregates, the precise nature of the surplus levels are difficult to establish. Under poplin alone, for instance, a diversity of qualities ranging between the very coarse and the very fine fabrics may be included. During this period's production, the owners of the mills operated at will and emphasised the production of articles that yielded relatively high unit profit. The tendency has always been to produce finer qualities, for these have greater return per unit measure. As such certain cheap and coarse qualities were if at all, given only peripheral attention, although they may be the most wanted articles. Cases in point are lower quality categories of finished fabrics like poplins, drills, and even twills. The current composition of poplins, although not isolated in the figures provided, seems to concentrate on finer varieties. A substantial portion of the total poplin production, around half, of the single largest producer for example, is accounted for by finer qualities. The tendency in the other producers, except for a single Asmara mill which has always produced fine qualities, has also been towards the production of finer qualities and this, of course, at the cost of the coarser ones. This tendency has been prevalent not only in the case of poplins, but also in items like dyed bed sheets and drills. Finer qualities have been introduced in the case of the former by way of diversity in size, density, and finish while quality improvement in the case of the latter came about through a supposedly new product - denim drill.

Among what have been termed 'surplus' articles, printed and dyed poplin, dyed twill, dyed sheet, and grey drill have exhibited a sizeable amount of cumulated stock although these magnitudes, when viewed against total output, may be considered small. But about 13 million square meters, the net cumulative surplus reported, of relatively finer fabrics when translated into coarser articles would amount to a much greater quantity. The heavier the picks the lesser the yield in terms of area. Note is made that this does not mean that whatever is held by way of cumulative stock necessarily belongs to the category of fine fabrics. It is, however, safe to conclude that the greater portion of this surplus is accounted for by special varieties of known qualities and other finer fabrics. As alluded to above, any scheme of 'diversification' by the domestic textile producers tends to be biased in favour of finer fabrics. As a result of the tendency towards finer fabrics, five qualities of poplins and greater than one variety of other popular articles are found in the local product mix. While there is no harm in improving the general quality of fabrics produced, care should be shown in order to avoid the bias of catering to the tastes of a relatively privileged few on the grounds of cost distribution and better unit profits. Producers now, that is, the managers of the nationalized concerns need to reorient themselves in the direction of satisfying the requirements of the lower income groups rather than producing at will. At any rate, this might reasonably be expected from the declared aims of the 'socialist' government.

The emphasis should be to satisfy the demand for such consumption articles like abujedid and lower categories of dyed and printed poplins as well as dyed drills. Important among 'deficit' artides stated in Table IV.13 above are abujedid, dyed drill, mahmudi, malmal, and french twill, in that order. Sateen and dobby are relatively unimportant.

The situation with sales yarn is more clear-cut. As noted earlier, a cumulative net surplus of about 480 tons of sales yarn has been reported between the years 1971 and the first-half of 1975. Production/sales balances for each producer indicate that only two plants were in deficit, 280 tons in total, during the period. Except for two mills, which are exlcusive producers of sales yarn, the rest are vertically integrated enterprises which in most cases go into sales yarn only after satisfying their loom shed requirements. There is a generally declining tendency in the production of sales yarn, especially in the vertically integrated mills. This puts the exclusive producers of sales yarn, who have reached almost full capacity, in a special position since they will have to meet the demand pressure resulting from any decreases in production from the vertically integrated plants.

The qualification of the demand pressure that must be sustained by sales yarn producers is a very difficult exercise. As over ninety per cent of the total sales yarn produced goes for purposes of shamma-making, the demand situation has a direct correlation with the developments in the hand-loom sub-sector. As estimation of the possible shamma production along with the corresponding yarn consumption is presented in Table IV.14.

In this exercise, abot five per cent of total sales yarn supply is assumed to go for purposes other than shamma weaving. This refers to yarn used by a single sewing thread factory, which on the average consumes about 300 tons per year, and other small cotton knitters, whose consumption is roughly between 50 and 100 tons per year. It is further assumed that the shamma weaving sub-sector almost exclusively depends on factory spun yarn.

Based on these assumptions, shamma production in 1974 exhibits a decline of seven per cent or about 3.2 million square meters when compared with that of 1971. Two factors seem to be very important determinants of the fluctuation in the production of shamma. One is the supply of sales yarn while the other is the increase or decrease in the number of hand-loom weavers. While the supply direction is clearly indicated, albeit roughly quantified, the number of

TABLE IV.14: POSSIBLE SHAMMA PRODUCTION and SALES YARN CONSUMPTION, 1971-1975 (first half)

Year	Total Yarn Supply for Shamma Weaving (Tons)	Possible Shamma Production ('000m^2)
1971	7,738	48,750
1972	7,264	45,760
1973	7,152	45,060
1974	7,233	45,570
1975 (Jan/June)	3,674	24,144

weavers is not so clear. In effect, it has been assumed that new entrants are equal to leavers. Earlier findings by the Textile Corporation indicate that an average hand-loom weaver takes about two weeks to produce an average size shamma of about seven square meters.

It follows, therefore, that there were about 270,000 hand-loom weavers in 1971, with a total shamma production of about 48.8 million square meters. Based on the assumption that new entrants equal leavers, the yarn supply in 1974 could satisfy adequately the demand of only 250,000 hand loom weavers. Translated into shamma, the 20,000 drop between 1971 and 1974 in the number of hand-loom weavers computes to about 520,000 shammas per annum. This comes to about 580 tons of sales yarn, which, if the stated assumptions hold, represents the magnitude of unsatisfied demand in the hand-loom sub-sector of the textile industry. The area/weight conversion ratio used in these figures is based upon Textile Corporation findings that a kilogram of yarn is equal to 6.3 square meters of shamma.

Although there are various indications that the industry's current output may not be satisfying the domestic demand for some important textile articles, the industry as a whole appeared to be operating close to full capacity during most of the year 1975/76. Fabric production was almost 9 per cent higher this year than the average for the preceding four and a half years. Yarn supplied to the hand loom industry this year was also better than the average level for the period January 1971 to June 1975, (being 2.3 per cent up). The industry fared even better with 1974 as the basis of comparison. Fabric production was up by about 18 per cent and the supply of sales yarn by about 4 per cent. These results were achieved by an industry with relatively old equipment and with very little in the way of renovation, modernization or other additions to production capacity.

However, it is fairly clear that the capacity utilization index used here, that is, one which relates actual to potential output requires careful attention before saying that the textile industry operations approach capacity. In particular, the supply and demand analysis of the various products has to be related to the tabular figures on utilization.

The installed capacity of the spinning, weaving and finishing sector reached about 176,600 spindles and 2,800 looms. These figures do not include expansion and renovation programmes already under way. While it is normal to express capacity in this way for textiles, it is also desirable to obtain an expression for the cloth equivalent, given the intensity of machine activities. This is done in terms of weight and the procedure for derivation is gone through in Chapter II.5. The conversion of this into an area equivalent is very difficult unless actual performances are so measured. Since about ten per cent of all cotton yarn is further processed outside the modern textile sector a full statement of measured results is not available. Whereas an area measurement can be obtained for fabrics it will have been noticed that sales yarn is in weight terms. Conversion rates from weight to area can only be approximated. The area equivalents in square meters per kilogram of fabric have ranged from 2.7 for a fine poplin (United Nations 1967) through 4.8, (the average level in Ethiopian textiles for 1976/75, to 6.3, (Textiles Corporation figures on shamma production, pages 245 and 246 above). Because of this variation, output for present purposes is identified after the spinning stage before being consigned for further processing within the modern sector and before outside sales.

The main reason for the above conversion variations, given an average expected yield of spun cotton per unit fibre input, is variation in the types of fabric and count of yarn produced. The more the product mix is of heavy pick fabrics and high yarn counts, the less is production in terms of area. Taking month to month or year to year outputs could reveal disparities having little, if anything, to do with capacity utilization, being derived solely from changes in product mix. This drives the investigator back to the output at the end of the spinning stage, and the choice is between a physical statement of machine activities and the procedure adopted here. Since the latter is simply an extension of the former with the additional feature of a quantity dimension it fits better with the concept of capacity utilization herein.

This index, however, has the inherent disadvantage of non-consideration of the subsequent product mix and the previous discussion on supply and demand is now linked with an examination of utilization across the "staple" fabrics - sheetings, poplins and drills, and the "fancy" fabrics reqiring dobby and possible Jacquard looms. When this is complete the more obvious constraints on utilization in 1975/76 can be discussed at plant level prior to policy recommendations.

Of the attainable capacity available prior to the production of woven cotton fabrics and yarn about 86 per cent has been utilized in 1975/76. Since the product mix has been characterized by a drive towards the production of better quality, heavier pick fabrics - including synthetic blends, and since there have been no significant changes in capacity during this year then it is possible that there has been production of fine fabrics to the detriment of the markets for "staples".

In other words, by linking the supply and demand sections above, and assuming, as seemed to be the case, that these production trends and lines were continual in 1975/76 than the level of production is almost on a par with demand. Demand, however, is not being satisfied because the product mix has changed, as indicated, from that found in 1971.

What appears to be a shortage in capacity may simply be the lack of proper production programmes. The basis of the assumption of no change in production trends in 1975/76 from that previously is the response of plant managers and Corporation personnel when this was put to them. There is clear scope for a shift in emphasis towards the production of staple fabrics which have wide popularity among the bulk of the population - the lower income groups. An increase of ten per cent in the output of these is not difficult to envisage from the foregoing figures.

The situation in sales yarn is different. Increased utilization of capacity for woven articles necessarily reduces the scope for the production of sales yarn and shortages in the supply of this to the traditional sector appear to be on the increase. The two spinning mills producing yarn solely for sale are operating close to capacity in terms of their machine activities and they have the oldest equipment among all the plants. Additionally, the integrated mills would have less yarn for sale were they to step up production of "staple" fabrics and, therefore, the installation of additional spinning facilities for up to 100,000 kilograms yarn per year production may be necessary. On the other hand a concerted increase in the production of factory woven fabrics could result in a decrease in demand for sales yarn in the traditional sector. However, additional capacity would not be idle since it could be integrated to meet the increase in demand for factory woven fabrics.

Product-mix imbalance accounts for much of the demand pressure found in the textile industry. This is not the sole factor and account must be taken of the adverse conditions under which the Asmara plants are operating. These plants averaged twenty per cent of total yarn output between 1971 and 1974. Their share in the production of sales yarn for the same period was thirteen per cent. They still operate upwards of 21 hours per day but this is now over two shifts, usually of twelve and ten hours on alternate days. The effects of this on labour efficiency are adverse but the variation between plants is significant. Thus one plant reports a decline of 12-15 per cent in efficiency while another reports this at two per cent. Lost production due to efficiency is hard to net out from production losses due to suspended or reduced operations arising from other factors. There are detailed in the plant specific discussion.

Distribution, apart from the transport difficulties in Northern Ethiopia, has become disorganised since nationalization. After the nationalization of urban and rural land, and the redistributional reforms in the latter (early 1975), former landlords who depended on property incomes had to find alternative income sources. Market sources indicate that the number of wholesale dealers in the textile business increased by around 50 per cent during the first half of 1975. This has created congestion at the wholesaling end. The main cause, however, of this situation developing is derived from the easy procurement of wholesaling licences and it was a common occurrence for "whole-salers" to be caught transacting "purchase slips" when they had neither the premises nor the capital to warehouse or purchase the merchandise themselves. This situation is worsening and requires increased Corporation and plant monitoring.

Although the demand pressure currently observed might be more misapprehension than an increase in effective demand, the medium to long term requirement for meeting increased demand may be summarized. These requirements are necessarily tied to the rate of growth of demand for woven cotton fabrics. Although it is expected that the urban land redistributions will have positive impacts on the consumption of woven cotton fabrics, the magnitude of the effect is very difficult to foresee at this particular point in time. A trend extrapolation of past behaviour in this case is not a particularly strong basis on which to forecast future demand.

If it is conservatively assumed that the impact of the current redistribution programme would begin to be felt after 1980, and if it is further conservatively assumed that demand would grow at a rate equal to population growth until 1980, then two demand projections may be considered. In the case of the former assumption a linear trend of about four per cent has been made, based on past behaviour. The latter assumption is based on the rates of population growth estimated by the Ethiopian Central Statistical Office, (CSO, Addis Ababa 1972). A first rate of seven per cent has been assumed to hold beginning 1981 and up to 1985. The results of the projections are listed in Table IV.15.

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TABLE IV.15 PROJECTION of the DEMAND for WOVEN COTTON TEXTILES
(in '000 Square Meters)

Year	Projection I Based on Population Growth 1/	Projection II Based on Past Behaviour 1/
1976	84,000	86,300
1977	86,200	89,800
1978	88,500	93,400
1979	90,900	97,100
1980	93,400	101,000
1981	99,900	108,000
1982	106,900	115,600
1983	114,400	123,700
1984	122,400	132,400
1985	130,900	141,627

Projection II is probably a more likely future trend if for no reason other than the fact that the CSO population surveys appear, increasingly, to be under estimates. Based on this projection available capacity will be exhausted by 1977. This situation would then warrant the installation of an integrated plant of at least 20,000 spindles or about 200,000 kilograms. The additional capacity would satisfy domestic demand up to 1980, when additional capacities of 20,000 spindles would continue to be added at intervals of two years up to 1985.

The future behaviour of the demand for sales yarn is more difficult to assess. This, among other things, very much depends on government policy as regards small-scale and cottage industries.

The factors adversely affecting capacity utilization, and operating more on the physical aspects of production were very similar across all plants in 1975/76 and were often characterized by an erratic, perhaps once-off, nature. Thus, an electric power failure, for example, results in lost production which, according to the duration of the failure, can be acurately quantified. In causes of this nature there is little that plant managers or Corporation personnel can do in the way of insurance since the situation is totally adverse and lies beyond the control of plant operatives. Such factors would decrease the level of production regardless of the level of capacity utilization, but where machines are operating around 7,600, or more, hours per year it follows that there is small chance of recouping lost production in a subsequent period. Hence, production stoppages due to erratic occurrences will have a pronounced effect on utilizeable capacity in this industry.

On a quarterly basis the best production levels were found in the period October-December 1975, the second quarter of 1975/76. Average monthly production of yarn by the whole industry was almost 2,000 tonnes for the year. The largest output was obtained in

December, 2,185 tonnes, and the two lowest outputs were in September, 1,799 tonnes and June, 1,764 tonnes. The primary cause of the lesser production in the first quarter was a strike throughout the industry for 12 days in the second half of September. Additionally, there was widespread worker unrest throughout the industry prior to the actual strike. With the establishment of more normal working conditions in early October the level of production increases and peaks in December.

The decline of production in 1976 is again attributed to labour problems by plant operatives, low wages, combined with the then high and increasing cost of living put labour in a combative mood. Superior - worker relations were very strained, discipline was lax, absenteeism at many plants was much higher than normal so that slowdowns were frequent and deliberately damaged equipment was reported in some instances.

One aspect of a new labour law was discussed in beverages. This referred to overtime. Other contents of this law had an effect which was particularly felt in textiles. These included the requirement that workers have an uninterrupted 24 hour rest period once per week and that workers take their annual vacation within one year. There was an increase in the number of workers seeking and obtaining lighter duties and there were many older and experienced workers pensioned off. All these, combined, have an immediately adverse effect on production.

In addition to the, by now expected, adverse transportation situation in the north, factories in Asmara are on 12 hour night shifts with the associated negative effects on productivity. Power failures of 7 and 12 days duration occurred in April and June and one Asmara plant had a shortage of lint cotton in May. Least rectifiable is that all northern plants have lost key personnel to varying degrees. The Bahr Dar plant was on slowed operations due to spare parts, bobbins and lint cotton shortages for the first quarter of 1976. An additional factor in Dire Dawa plants, affecting especially fabrics production, was a dry season shortage of water. This creates a bottleneck in the finishing department.

Blanket production did not exhibit any marked deviations from the mean total monthly production in any of the plants except one where there were temporary stoppages because a significant number of waste wool sorters were laid off in February 1976 due to health hazards in the working conditions. Output in this line met the targetted level which, according to plant operatives, is demand determined.

Production in knitwear was affected by the general adversities in the industry as a whole, occasional acrylic yarn shortages and the granting of vacations to workers in numbers somewhat higher than previously recorded. The largest single producer here is located in Asmara where output was maintained at a level approaching the maximum in normal work condition periods.

The single carpet producing plant uses only a small fraction of its capacity to produce carpets. This is demand determined and the factory's production target for the year was met. Total demand is domestic and no enquiries have been made regarding possible exports.

The following remarks summarize the discussions thus far and concludes with policy recommendations.

There is technically enough capacity to accommodate the existing demand for woven cotton textiles. Based on the projection made earlier, existing capacity could meet domestic demand until 1977. On the other hand, sales yarn production has reached capacity.

The demand pressure currently observed in the textile market is more of a misapprehension than an actual increase in the demand for woven cotton fabrics or a shortage in capacity. The distribution and wholesale licensing aspects of the issue further complicate the matter.

The production programmes currently in force exhibit no noticeable change from what existed before nationalization. An unnecessary drive to higher quality fabrics still overshadows the need to clothe a population whose per capita consumption of factory woven cotton textiles in 1974 was a meagre three square meters.

Physical deterrents to fuller utilization in 1975/76 were characterized by a series of factors over which management often had little control. These included power failure, labour strikes and unrest, locational adversities and a general period of unsettled activity caused by the change in government and subsequent developments.

On the basis of the identified causes the following policy recommendations emerge.

Although there is adequate capacity to meet current demand, it would not be too long before this capacity is exhausted. The envisaged increase in the demand for woven cotton fabrics, about 10 million square meters by 1978 warrants the installation of a 20,000 spindle plant by 1977. To avoid unnecessary delays, it is advisable to start working towards the implementation of the project. What is due for immediate implementation is the installation, as discussed earlier, of a 10,000 spindles spinning plant.

The location of new installations is a matter that needs to be carefully analysed. One of the issues to be considered in this connection would be the possible expansion of the existing mills. However, according to a UNIDO study, "the greatest influence of economies of scale on investment costs as well as production costs are noted in small plants of between 2,000 and 10,000 spindles. In larger units of 10,000 to 20,000 spindles the influence becomes less significant, and in mills that have 20,000 to 100,000 spindles even less so." (UNIDO 1967). Scale economies, therefore, appear to be an argument against the expansion of existing mills, for all but one of these lies beyond the minimum stated capacity for significant gains in economies of scale. The foregoing statement brings to the fore a sound argument for regional development, for it provides a basis for the devolution of the textile industry to other regions without any loss in gains from scale economies. Locations worthwhile considering would therefore be areas like Arba Minch, Shashamane, and Dessie, which areas need to be studied in depth.

Production programmes are the basic instruments for meeting consumer demand. The Textile Corporation has a very important role to play in preparing production programmes according to anticipated domestic consumption of the various articles to be produced. The brief of the Corporation could go as far as enforcing specialization schemes in which a certain firm produces only coarser quality fabrics while another concentrate on finer blends.

A crucial move in the implementation of this would be the initiation of a complete technical economic appraisal of the industry, one aim of which would be to eliminate bottlenecks by utilizing the most appropriate equipment in sub-programmes of production. The ramifications go far beyond this and since the industry is nationalized a major aim would be the prevention of individual plant investment which does not contribute optimally to the further development of the industry.

In terms of capacity utilization several aspects can be emphasized. Although there was no general shortfall of cotton supply during the period 1975/76 there were problems. The quality of the cotton is very relevant and the shorter are the basic staple lengths of yarn the harder are these to work with. They break more easily and are used more for coarser fabrics and blending. At the beginning of 1975, and despite warnings from the Textile Corporation, the relevant government pricing agency set the price range between the shorter and longer ends at too narrow a level. All plants went for the longer ends and stock piling occurred at the shorter. Again, ginneries are located in the main urban centres, well away from the cotton fields.

To rectify this, the Corporation should be allowed to start its own policy in the supply and distribution of cotton. Ginneries should be located at cotton sources. This would have distributional benefits and cotton grading could start here also. Cotton grading standards should be set with guidance being obtained from export standards, and also with a view to optimizing blends for different domestic products. Exports are considered even though imported inputs in ISIC 3211 account for more than one fifth of total inputs. Much of this is cotton which is generally regarded as nonsensical in Ethiopia where growing potential is not nearly realized and in which available resources are not well utilized. Apart from possible international trade, and almost certain domestic production benefits, such policy should contribute to increased farm income and to the structural development of the land.

Centralized direction should also contribute to efficient production and storage of spare parts, utensils and other inputs. Many of the requirements for a unified textile industry can be considered in terms of rationalized lot-sizes of production whereas the feasibility of this for single factories is a non-starter.

Although the Ethiopian textiles industry performed well in terms of the intensity of its operations in 1975/76, it is nonetheless characterized by a shortage of technical personnel and aid in this direction will be required if the industry is to become efficient. In textile technology, advances are very common and are quickly worked through the industry at an international level - for example, open end spinning and shuttle-less looms, in less than five years have taken most new investments in this area in industrialized nations. Trained personnel, able to select new equipment on a soundly appraised basis are required. Similarly, quality control in a competitive textile industry requires skilled people, and technical managers are noticeable by their absence in Ethiopian plants or the post is filled in name only. This, of course, does not reflect badly on the many inexperienced, sometimes without any background in textiles, people who have been "flung in at the deep end". It is simple a reflection of the hopefully, very transitory position this industry was in during 1975/76.

Finally, problems of distribution require an extended role from the Corporation. Its mandate should be extended so that it can perform as an instrument of market feed-back to the plants and as an agent for the distribution and supervision of goods to whole-salers.

D: Coarse Fibres

This industry is treated separately from the rest of the textiles industry because of the different nature of the raw material input and because it is administratively separate from textiles in terms of corporate division.

The main raw materials are jute, musa (a kind of manilla hemp), flex and lin-fibre and sisal. The main products of two of the plants are bags, sacks and woven materials for use in agriculture. The third plant produces the same range of products and also rope and twine.

Capacity outputs are stated in terms of overall processing and assume an average product mix according to recorded production and sales during the year of inquiry. The main contributors to the low levels of utilization are found within the productive structure and this is related in turn to input deficiency. Additionally, one plant is located in Asmara with its associated problems.

Information on the demand situation is very sparse, since past levels of production and sales were not obtained. Response to questionnaires indicated that the plants wanted to produce more but that the physical constraints prevented this. Normal operations of the plants were stated in terms of three shifts and this over 300 to 340 days so that scope for increase in the time intensity of operations did not exist. None of the plants regarded either imported sacks or synthetic substitutes (polyethylene or polypropylene bags) as affecting their production. Increased oil prices have severely curtailed the production of previously low priced products and world trade statistics indicate that the present strong market for coarse fibres and their products will be a lasting one.

The raw materials problems relate to shortages and inadequacies. Spinning operations in one plant are largely carried on with only a blend of short fibres which produces at 20-25 per cent of the installed capacity. Because of this the carding department is constrained to the same level, and similarly in weaving. However, the material "shortage and inadequacy" in the plant is more related to technical inadequacy than to fibre non-availability since no one at the plant has experience in sisal blending and it is admitted that the poor processing performances is very much determined by this.

Another plant reflects the serious effects that a lack of repair and maintenance facility can have. More than half of the weaving capacity is denied because looms are completely out of production and these have been stripped of some components to maintain the looms that are working. This plant reports that it has to wait two years for spares.

The Asmara plant attributes much of its poor performance to the loss of labour efficiency as a result of longer working hours than before. The number of shifts has been reduced from three to two and each shift works ten hours and fourteen hours alternately each day. Output quality has also deteriorated.

The overall low productivity in this industry and the small size of the industry should not deter from an examination of factors necessary to secure a quick and efficient rationalization. These factors would relate to the supply of raw materials, their blending prior to processing and equipment maintenance and repair. To achieve this requires the type of appraisal effort, as was recommended in textiles, to be made.

E: Leather Tanning and Finishing

The discussion on this industry is in three parts. First, the demand and supply situation is considered. Next, the capacity utilization indexes are explained and causes of underutilization, derived from productive facility deficiencies, are examined. The discussion concludes with policy recommendations.

Production levels for the six tanneries are given in Table IV.16. There is little in the way of trends apparent in any of these figures and year to year variations in both directions are frequent. Reasons for the variations are principally derived from three areas - the supply and quality of raw hides and skin, the related quality standards within processing operations and the, again related, generally adverse and deteriorating condition of productive equipment, much of which is very old.

In this industry, as in the grain milling sector of the food industry, it is apparent that the structure of underutilization is mainly characterized by input supply deficiencies and by deficiencies in the productive structure overall an opposed to adversities which occur to prevent an increase in utilization within an already relatively efficient set of operations. Corrective measures are urgently required but these relate to input supply and improving existing efficiency rather than attempting to

Table IV.16 PRODUCTION (AND SALES) LEVELS FOR SEMI-PROCESSED AND FINISHED LEATHER 1970/71-1975/76

Entry Number From Table IV.1	Product	Unit	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
67	Pickled Sheep & Goat Skin	Pieces	571640	871748	964170	514860	708072	885750
	Finished Leather-upper	sq.ft.	2473366	2294345	2468111	2218265	2331585	1674150
	Finished Leather-sole	kgs.	162053	85505	94888	90233	91751	101830
	Finished Leather-lining	sq.ft.	-	-	-	-	-	791650
68	Finished Leather-upper	sq.ft.	1300000	1350000	1409000	1553000	1652000	1515000
	Finished Leather-sole	kgs.	125000	110000	138000	131000	141000	143000
	Finished Leather-lining	sq.ft.	-	-	-	-	-	600000
69	Wet Blue Goat Skin	pieces	244572	363684	587580	165073	25320	84144
	Finished Leather-upper	sq.ft.	96800	55779	488613	525648	74081	890000
	Finished Leather-sole	kgs.	-	-	-	-	-	23530
	Finished Leather-lining	sq.ft.	107300	77939	126300	151939	27495	182620
70	Pickled Sheep Skin	pieces	585856	968328	146936	1557259	1270389	580044
71	Pickled Sheep Skin	pieces	-	-	67672	87000	60668	-
	Wet Blue Sheep Skin	pieces	-	-	60604	85997	59636	-
	Crust Leather (Sheep)	pieces	-	-	56641	83962	60021	117504
72	Pickled Sheep Skin	pieces	-	287720	485123	36470	133000	217450

wring more production from an increased time-intensity of operation. The latter, in any event, is not a feasible proposition given the nature of time requirements at different stages of processing.

Probably the most important single factor in determining the level of production of part-processed and finished leather is that the supply of raw hides and skins is totally outwith the influence of the tanneries. With this exogenously determined raw material supply, marketing policy concentrates particularly on the value of the output as opposed to the volume. The output quality is crucial in the fields of export sales, which market is well established, and in the further domestic processing of leather into finished goods, mainly footwear. This situation in the market for leather is not unique to the Ethiopian product since the lack of control over raw input availability prevails throughout the developing world (UNIDO 1976). Additionally, the adverse environment in Northern Ethiopia compounds supply difficulties.

Exports comprise about one-fifth of total sales revenue. This level has been reached by slow but steady growth over the last several years. The outputs of three plants in 1975/76, consisting of pickled skins and crust leather are geared solely to exports; two more plants produce pickled and wet blue leather for exports, together with finished leather for the domestic shoe industry; and the sixth plant produces finished leather solely for the domestic market. All export sales were handled directly between plants and foreign consumers in the world market.

Although international markets in leather received some impetus from increased oil prices, technical advances in synthetic substitutes can still pose a threat to the market for low grade leather and Ethiopian consumers are known to be discerning in their footwear purchases in this respect. The Ethiopian Leather and Shoe Corporation regards the continuance, at least in the short-run, of the market for low grade leather to be essential for the continuance of its leather industry and even though the product is categorized as low grade this does not mean that quality is unimportant, although the range of quality controls will be less than that expected in fine quality shoe upper leather. Performance standards require to be clearly set and met if exports are to increase and if the domestic leather shoe industry is to become competitive. Thus the demand situation is strong, subject to quality levels being maintained.. Both internationally and domestically, the market potential is greater than is being realized. These factors are now considered at plant level.

The response to questions on what determined the prevailing levels of utilization, once equipment specifications and adversities had been accounted for, centred on comments on the availability and quality of raw materials. Only one plant moved beyond this constraint to make repeated comments on a lack of working capital.

Raw hides and skins are predominantly butchery supplied and these are acquired through individual dealers with some tanneries employing agents to seek and purchase. To ascertain the nature of quality defects plants were asked to rate their raw material input as very good, good, fair or poor according to the qualities of texture and thickness, preservation, flaying, disease and mechanical damage. In hides, the response was poor to all of these except in two plants which rated mechanical damage as fair. In sheep and goat skins, all replies were good or fair with the added comment that better skins go to production for exports. Other comments on quality concerned skinning damage, improper salting and framing of the hides and skins by collectors. Bad skinning causes mechanically defective hides and, because of the framing practices, edges are decayed which results in lower yields.

The extent of testing procedures and facilities for carrying these out vary across plants. Beginning with the graded selections of hides skins at purchase, checks are initiated at the pickling and chrome tannage stages, including neutralization and pH checks. Dyes are tested for penetration, and lacquer adhesion is tested at finishing. All plants would state that these tests, and others, were carried out but whereas in one plant experienced personnel would judge without resort to special equipment, another plant will exhibit records and facilities beginning with experimental testing drums and chemicals up to an adequately equipped laboratory. The frequency of quality control sampling varies from 'often' to 'once at each stage of production at least'. Thus testing standards vary and there is considerable scope for policy action in this area. These measures are examined once the physical aspects of capacity are completed.

In the derivation of the capacity utilization indexes, difficulty was experienced in relating actual to potential output. Raw material input was obtainable on the basis of the number of hides and skins consumed. Part-finished or finished output was given in terms of weight or area. In the case of plants producing both part-processed and finished leather there was no breakdown of skin vis-a-vis hide input going to the finished stage and hence the input-output of raw skins to part-processed skins was unknown unless assumptions were made about expected yield ratios. For example, a raw skin or hide of a certain weight and/or area can be expected to yield a certain weight or area of part-processed or finished leather. These conversion ratios, however, exhibited wide variations both within and across plants. Thus one plant stated that a raw hide of 5.3 kilograms yielded 24 square feet of useable hide while another plant stated that a raw hide of 7.0 kilograms yielded 40 square feet of which 27 square feet was useable. Sources of these differences are diverse. Similar variations were seen in sheep and goat skins. Much depends on the type of animal the area from which it came, the inherent qualities already mentioned and efficiency levels in production. With a mix of types used, with only a total figure on numbers consumed and with only an average band of yields obtained it was decided not to attempt conversions.

On the other hand, it was common practice to state capacity in terms of the number of hides and skins that could be processed over a year and, after allowing for wastage, the capacity utilization index in the leather industry relates actual hide and skin consumption to processing capacities based on information from plants and from the Ethiopian Leather and Shoe Corporation. The distinction between hides and skins represents a further division within a Four Digit ISIC and this gives rise to the eight entries from six plants. The distinction is maintained in Table IV.2.

The age of plants vary from over forty years, two plants, though ten to fifteen years, three plants, to the most recent which began operations in 1973 with new processing machinery. Throughout all plants, although to varying degrees, complaints on productive structure bemoaned the lack of maintenance, because there were few mechanics. Also the lack of spares locally and even the non-availability of spares from equipment manufacturers were common complaints. With the exception of one Asmara tannery all plants have very weak workshops which can not accommodate more than a small fraction of minor repairs and spare part production.

Three of the tanneries, those producing finished leather, each have sister shoe factories and the much higher utilization rates seen in hide processing, from which most of the finished leather is obtained, reflects this integrated arrangement. This does not mean that the market for semi-processed skins, the export market, is deficient relative to available capacity. The remarks on raw material supply are particularly relevant with respect to sheep and goat skin availability. Additionally, plant specific circumstances contribute significantly to variations in utilization.

Two of the finished leather producers are located in Addis Ababa and one in Asmara. The output of leather shoes from the associated Asmara plant has an uncontested popularity in both price and quality on the domestic market. Whereas, about eighty per cent of the hides consumed by this tannery are obtained from the Asmara area about half of the skin input is obtained from the Gonder region in Ethiopia. The transport situation from here to Asmara results in both shortages and quality defects arising from delivery delays. The general supply deficiency is further aggravated by an increase in prices occasioned by a more than normal shortfall in input supplies from the Asmara area itself. In the case of this plant it may safely be concluded that the level of utilization is very determined by the deficiency in raw materials particularly since it has a very strong workshop able to satisfy about eighty per cent of its spares requirements.

The two Addis Ababa located tanneries are the oldest. In one of these, most of the existing plant and machinery is old and fully depreciated. Additions to plant and machinery over the years were made on a piecemeal basis and this has further increased congestion in the production hall. Although clearly defined bottlenecks exist, it would be somewhat meaningless to consider their rectification outside a framework which did not improve the efficiency of almost all operations at the same time.

There are pronounced production bottlenecks at the stages of:

(i) <u>liming</u> - the name given to the process of removing excess alkali which is accomplished by treating with mild acids or acid salts. Only one liming drum is operational and actual operations are about 1200 kilograms of dry hides per day instead of 2000.

(ii) <u>sammying</u> - the removal of excess water from hides and skins. The existing machine for this purpose is 40 years old and is so worn out that it is impossible to samm sufficiently for the shaving operation. Hides, therefore, are hung all over the production hall to be, as it were, 'suspension - sammed'. This situation is very difficult to tolerate, particularly during the rains when two days hanging are required, and congestion increases.

(iii) <u>shaving</u> - after sammying, hides or skins require to be made a uniform thickness. This is done on a shaving machine. The larger of the two in operation has serious mechanical defects, again because of old age, on both the shaving cylinder and feed rollers. The output suffers serious quality defects because shaving is uneven or knives are lodged deep into the sides of hides. The capacity is inadequate to absorb the daily production and an old machine is further strained by having to be used more intensely.

Additional defects were observed at the <u>buffing</u> stage - the grinding of the leather surface with an abrasive to remove surface blemishes on the grain prior to pigmentation and other finishing. The only operational hydraulic press, and, paradoxically, the oldest, out of three installed has serious mechanical problems because of the excessive work load it is carrying and breakdowns, which are frequent, lead to a virtual stoppage in production. The capacities of tanning drums have no scope for increase.

Despite the wide ranging deficiencies, the factory is well run in the sense that the quality of the leather is satisfactory for the relatively poor quality, mainly military, footwear that its sister company produces. Day to day production is firmly overseen by the technical manager.

However, it is clear that the plant is living on borrowed time if expenditure is not quickly implemented for replacement and additional facility investment. If this were sufficient to enable the plant to process skins, as it did in the recent past, then foreign exchange earnings are virtually assured. Increased finished leather production would ease the tight supply position of leather uppers and linings in the domestic market.

The remaining Addis Ababa located tannery evidences relatively high utilization rates in the processing of both hides and skins. This tannery was established in 1927 and, until nationalization, was run by the same family. The shoe produced by its sister company has enjoyed a high quality reputation, although this has changed recently and is becoming a subject of concern as will be evidenced in the discussion on the shoe industry.

Machinery and equipment has been replaced on a planned, balanced basis. Until nationalization, relations with equipment suppliers were good and spare parts acquisition was an efficient aspect of operations. All pickled skins are exported with the United States and West Germany taking over 90 per cent of these. The plant is fortunate in the respect that the previous owners had undertaken the thorough training of Ethiopian staff and technical personnel so that the transition to new management was smooth.

Of the remaining three tanneries one is located in Asmara, Entry 70 in Table IV.16 and this plant is particularly affected by the disrupted transport situation since 95 per cent of its sheep skin supply was normally obtained from the Addis Ababa and Gonder areas. Its capacity utilization has dropped very significantly in 1975/76 as indicated by previous production levels in Table IV.16.

Entry 71 is located in Addis Ababa and was, at mid, 1976, beginning to extricate itself from an adverse marketing situation. Indications during the last quarter of calendar 1976 were that this plant was operating at more than 85 per cent of capacity instead of the 26 per cent recorded for the period of enquiry.

This plant was established in 1964 and processed crocodile and sheep skins. It was a wholly owned subsidiary of a European parent company, and was intended solely to process crocodile skins. Increasing severity in the law relating to allowed kill amounts of crocodiles, culminating with permission to kill being denied after 1973, led to diversification into sheep skins. During 1974 the tanning capacity for sheep skins had reached about 40,000 per month and a capacity utilization of more than 60 per cent was recorded with the parent company being the sole buyer. After nationalization, January 1975, the parent company severed relations completely and, since the product was not known elsewhere, the plant had to begin to establish the quality of its product and find customers in a competitive world market.

There followed a period, occupying most of 1975/76, during which the plant barely maintained operations with utilization rates of 10-15 per cent per month being recorded. However, the establishment of the product and the search for export outlets culminated in mid 1976 with guaranteed orders, mainly from West Germany and Eastern Europe, for 600,000 skins over the Ethiopian fiscal year 1976/77. Thus operations in 1976/77 should not only have been maximised in terms of capacity utilization but some additional capacity investment was approved at the end of 1975/76. These characteristics, unique to this plant, explain much of the variation found in its utilization levels before, during and after 1975/76.

The final tannery to be considered is located in Addis Ababa and the pronounced fluctuations in output over the last four years, Entry 72, Table IV.16, were caused by changing fortunes in the world market and, in particular, the non-fulfilment of expectations regarding its main customer in Eastern Europe. In 1975/76 the already very low utilization level would have been further reduced by about 25 per cent had another Addis Ababa tannery, Entry 67, not absorbed some output in a bid to alleviate the high unit costs caused by the heavy overheads on the low output level.

1975/76 was only the fourth year of full operations in this plant and, apparently, failing quality standards led to cancelled orders and, therefore, interrupted production programmes. Poland imports about 80 per cent of this plant's output and technical assistance in the form of a resident Polish leather technologist and fellowships in Poland for two Ethiopians were started in 1976.

Nationalization should provide this industry with certain advantages relating to input supply and processing quality which would be more difficult to achieve on a private basis. The organisation of a collective network for hides and skins and the transportation and flow of these to the tanneries should be undertaken. Improvements in the quality of hides and skins could begin at this stage, immediately after an animal is slaughtered. Through the simple expedient of offering a premium on salted hides and skins, then more of these than dried would be obtainable. This may require that the Corporation and tanneries provide the salt.

The implementation of recognised national quality standards would be invaluable in obtaining increased export outlets. This should be more easily implemented in a nationalized industry. With the currently favourable world market situation in semi-processed and finished leathers, now is the time to overcome technical difficulties and marketing problems. The feasibility of going beyond current processing levels should be part of this since returns increase considerably the more nearly finished the leather is. These and other aspects of a marketing study should necessarily encompass and establish programmed production in the existing leather industry on the basis of current productive potential and on the basis of feasible expansion. In both of these, co-operation with recognised distribution networks in different parts of the world should be sought.

In absolute terms, Ethiopia has one of the largest, commercial leather yielding animal populations in the world and a programmed structuring of the leather industry, including as it does the organisation of supply, would have to examine methods of combating and eradicating animal disease and practices like branding which detract from hide and skin quality.

One indication of the strength of export potential is reflected in the recently completed construction of a new tannery in Mojo, near Addis Ababa. This was built with Czechoslovak aid and has a hide processing capacity of 390,000 per year, and a skin processing capacity of 1.3 million per year, of which one million is the target for the first full year of production (1977). All of this is guaranteed exports.

At the same time, the world market is highly competitive with respect to quality and the implementation of these recommendations will require technical aid in various forms including technology and financial consultancy. This should begin forthwith since the reason for elucidating so much on potential lies in the fact that the leather industry for Ethiopia represents a rare, genuine possibility for quick, national economic expansion.

F: Footwear Industry

Three major categories of footwear after the ISIC Four Digit level are identified. These are mainly leather footwear, Entries 73-77 in Table IV.1; rubber footwear, Entries 94-96; and plastic footwear, Entries 98 and 99.

Reported production levels for these plants are given in Table IV.17.

The demand situation in footwear is very uneven across plant brands and although it might be reasonable to assert that demand for leather footwear is strong, this requires qualification since it is not reflected in utilization levels. Entry 76, for example, is located in Asmara and the extent of market decline due to conditions there, together with the fact the product has yet to fully establish itself, that is, become competitive with respect to price and quality, accounts for much of the abysmally low utilization level. However, Entry 75 is also located in Asmara and displays a 70 per cent utilization rate, almost three times that of Entry 76, in existing operations. Entry 75 refers to the plant used for the profitability analysis example in Chapter II.5 and from this it is known to be suffering from pronounced production bottlenecks. The popularity of its product is well established and it has the decided advantage over Entry 76 in having its own arrangements with one of the Asmara tanneries regarding

TABLE IV.17 PRODUCTION LEVELS in the ETHIOPIAN FOOTWEAR INDUSTRY 1970/71-1975/76 (Pairs)

Entry Number From Table IV.1.	Product	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
73	Mainly leather footwear	207,178	218,704	251,465	251,612	351,636	385,600
74	"	263,823	251,956	257,150	260,321	254,066	250,100
75	"	61,169 (6 months)	120,586	160,921	227,697	186,319 (10 months)	210,107
76	"	90,719 (6 months)	101,053	149,299	136,714	165,433	130,824
77	"	8,851 (6 months)	20,416	15,151	23,956	49,597	66,600
94	Rubber footwear	---	4,343	77,544	430,187	310,520	271,378
95	"	...	...	...	...	28,116 (6 months)	63,800
96	"	...	...	...	...	...	1,628,190
98	Plastic footwear	893,326	559,251	893,860	1,153,904	1,136,466	1,215,871
99	"	10,909 (6 months)	55,794	167,968	313,925	242,137	390,800

finished leather input supplies. Again, a more than threefold difference is apparent in utilization levels in two Addis Ababa plants producing mainly rubber shoes, that is, rubber soled and rubber - canvas composition uppers. An, explanation of this would have to consider price/quality variations that are reflected in differing demand patterns. In short, the market for footwear may be reasonably strong in absolute tems, but between plant variations is very common and there can be no generalizations of the nature that were made with respect to demand in, say, grain mill produce. Each plant is now treated individually.

The plant in Entry 73 was established in 1958 and much of the existing plant and machinery is old and fully depreciated. Some replacements are required and several, relatively new, items of equipment require complementation if existing bottlenecks are to be cleared. This plant, together with two other mainly leather shoe producers provide the first opportunities to apply the profitability anlaysis of Chapter 2, in deciding whether or not to recommend a move to increased utilization. The profitability exercises on two of the plants are carried out together, (pp. below), and this contains details of the investment costs required for a rationalization of existing production or investments required to allow of a smooth transition to increased utilization.

For the moment, the nature of the bottlenecks and the demand situation is discussed.

(It is noted that 65 per cent of the observations have been examined, mainly on an individual plant basis, before the opportunity has arisen here in the shoe industry for increased utilization to be considered jointly from the viewpoints of physical and economic rationality. Beverages was the only previous industry in which equivalence between uncorrected and corrected utilization levels did not mainly obtain. In beverages, however, the difference arose from poor machine performances relative to their specified performances and no scope existed for an increase in the time-intensity of operations as it does in the shoe industry.)

The bottleneck situation in Entry 73 curtails production, reduces quality and wastes manpower. Correction consists of additional machine installations. A heel seat machine and toe moistening machine are required. These moistening operations precede and are necessary for the efficient ironing and creasing of the base of the upper prior to the final soling. This operation is currently done on dry uppers and by hand so that time and manpower are wasted. The additional labour might be regarded as a beneficial situation in a developing nation were it not that the resulting quality of lasting operations were impaired. This is full of folding and creasing defects apart from the interruption and slowing down in the operations flow.

Another bottleneck is found in upper perforating and lacing. The operations involve the perforation of holes for eyelets, and the preliminary lacing of the upper before it is passed for lasting. These are done by hand and backlogs accumulate. The manual operations further result in irregular holing. The installation of automatic perforation and lacing will solve both these problems and reduce wastage. The eight workers on these operations can certainly be engaged in other departments.

The reference to new machinery relates mainly to the civilian footwear department in this plant. In prior years, and during 1975/76 more than 75 per cent of production has been military footwear. Civilian wear has been given only peripheral attention. This was caused by the virtual monopoly the plant had in supplying the military but an ever increasing demand for civilian shoes renders it wasteful not to use this department to its fullest extent when only some additional machinery will have to be acquired.

The new acquisitions required consist of a cylinder-bed sewing machine and a feed-up-the-arm sewing machine. These are particularly required for boot production in order to insert side zips and/or to side stitch.

All investments and costings are listed below (pages 286 - 289). The implementation of these investments would place the plant in a position to fulfil an output level of 422,000 pairs on one shift which is, after all, only the attainable capacity on rationalized existing operations. Daily production levels in 1975/76 sometimes reached 1,400 pairs but this was exceptional, and to be sustained requires the bottleneck removals indicated. With civilian shoes now having a vastly higher share of production and with the sharing of facilities in existing production there is no reason, within physical operations, not to contemplate an additional shift being worked and an output of about 200,000 to 210,000 pairs of civilian shoes and boots. A level of sales of 380,000 to 390,000 is currently guaranteed to the military - this market might, of course, be removed tomorrow, but such an exigency cannot be foreseen. It is unlikely since the fulfilment of military footwear orders could not be carried out by other domestic producers without considerable restructuring of their production operations. The projected two-shift outpt, therefore, is taken at 600,000 pairs. This is both physically feasible and demand justified. The benefits in terms of profits and employment remain to be determined.

Entry 74 is also located in Addis Ababa and the plant has a programme of good quality leather shoe production. Since nationalization several factors have conspired to reduce efficiency and quality. If introduction to second shift working is seriously considered - as it should be on the grounds of physical feasibility - several immediate problems will have to be overcome.

Working discipline is lax, there is much late-coming and absenteeism, and the authority of foremen is very low. Only one shoe modellist remains since nationalization and this man also oversees daily dispositions - production planning.

The situation in the production hall is contrary to all accepted norms in rational shoe production. In a single day-shift of eight hours there can be ten-twelve different shoe models produced. This causes changes in programmes and in the disposition of operations. Work variations at each production stage are occurring up to ten or twelve times more than necessary, efficiency is reduced, time and even materials are wasted, and quality supervision deteriorates markedly. The root of this situation lies in the relationship between retail outlet requirements and the non-existence of stock in the factory. Shops want to have their shelves filled on a virtually daily basis and the plant has no end-product storage.

Apart from space and building requirements for the latter, enquiries as to why larger daily production lots were not undertaken received the reply that this would require a greater number of lasts. On the positive side it was noted that the plant has sufficient raw material storage for about one year's production on existing operations. Spare-part, maintenance and workshop facilities are also well organised.

The demand for the product of this plant is growing. Marketing is a problem only in so far as retail outlet allocation is concerned. Additionally, the product has been exported on a small scale during 1972/73 and 1973/74. The comments on this appear favourable in that the reason given, at both the plant and at the Leather and Shoe Corporation, for the non-continuance of exports referred to the limited capacity and, in terms of 1975/76 operations, the high costs of production.

Subject to the results of an in-depth examination of the physical requirements and economic viability of second shift production, and assuming that capably supervised production programmes can be entered into, there is no reason not increase utilization by increasing the time-intensity of operations.

As before, the required capital expenditure has to be regarded in two, connected contexts. One is the investment required to keep the existing operation going smoothly and the investment required to increase production through a better utilization of existing resources.

To remove bottlenecks in existing operations two upper leather skiving machines complete with grinding wheels for knives need to be acquired since the existing four machines cannot satisfy the requirements of the daily production plan. For the implementation of a second shift the equipment required will be upper stitching, sandal lasting, inseam trimming and sole rouhening machines. In addition, storage facilities for the increased volume of finished goods and raw materials will have to be included in the cost estimation.

Following the procedure established in Chapter II.5, the profitability comparisons between different utilization levels are given for the plants in Entries 73 and 74 of Tables IV.1, and IV.17. These occupy Tables IV.18 and IV.19 (pages 290 and 291 respectively). Since the procedure adopted has been detailed the information presented on the construction of the profitability indexes refers mainly to the new investment required and to employment gains.

For the plant in Entry 73, the new investment requirements are:

(a) Replacements

	$
Bandknife Splitting Machine	12,250
Upper Skiving Machine	2,550

	$
Leather Splitting Machine	3,700
Rubber Edge Cutting Machine	2,000
Zig-zag Sewing Machines (two)	8,000
Two Needle Sewing Machines	4,000
Three Needle Sewing Machines	7,000
Lasting Machine	30,000
Heel Seat Lasting Machine	20,000
Tack Lasting Machine	17,000
Upper Ironing Machine	1,250
Roughening Machine for Rubber Soles	2,500
'Macchina Refilatrice'	4,000
Upper Roughening Machine	2,000
(a) Total =	116,250

(b) Bottleneck Removal

Heel Seat Moistening Machine	1,500
Toes Moistening Machine	1,400
Cylinder Bed Sewing Machine	3,000
Feed-up-the Arm Sewing Machine	3,000
Automatic Upper Lacing Machine	13,000
Perforating Machine	3,000
(b) Total =	24,900

(c) Building

Store (c) Total =	135,000

Total Required Investment =	276,150

Employment in existing operations in this plant is 389. The investment detailed above would create openings for a further 83 people in rationalized, single shift operation and employment on a second shift is estimated at 222 so that total employment on two shifts would be 694. These investment and employment figures are displayed in Table IV.18 and form part of the basis of the profitability calculations. All other assumptions and procedures follow the same pattern as in Chapter II.5.

For the plant in Entry 74, the total new investment evisaged amounts to $133,500.

This is made up as follows:

		$
(a)	Replacement and Bottleneck Removal	
	Upper Stitching Machines (Fifteen)	37,500
	Sandal Lasting Machine	20,000
	Automatic Stiffner Skiving Machine	7,000
	Inseam Trimmer	12,000
	Sole Roughening Machine	7,000
	(a) Total =	83,500
(b)	Building	
	Store and Office Extension (b) Total =	50,000
	Total RequiredInvestment =	133,500

The rationalization operations would create about 24 jobs raising the single shift employment to 364.

Introduction of second shift working would employ about 230 people with total employment over both shifts being 670. In both plants the additional work force would be mainly unskilled, although about 20 and 15 skilled workers would quickly be necessary in Entries 73 and 74 respectively. In both plants, therefore, the employment gains are substantial and, as would be expected, the bulk of this gain refers to the second shift as opposed to the rationalized, single shift operation. As with the plant discussed in Chapter II.5., however, there is little point in contemplating an increased time-intensity of operations without the proposed investments going through.

From the profitability comparisons it is seen that there is no unequivocal recommendation to increase utilization in either plant. The net losses incurred in three of the six double-shift operations considered over both plants require examination of the constituent table entries contributing to them. These may be considered under four broad headings. There is the 'strictness' of cost increases built into the variable cost factors. Secondly, there is the wage-bill element due to shift premiums. Thirdly, there is the treatment of depreciation. Finally, some comment may be made about the physical output figure used to derive the total revenue.

The strictness of cost increases is derived from the more than proportional extrapolation from costs in

TABLE IV.18 PROFITABILITY ANALYSIS of DIFFERENT UTILIZATION and OUPUT LEVELS for the SHOE PLANT of Entry 73, Table IV.1

Entry Number and Item	Unit	Existing Operations Case I	Shift	Rationalized Operations Double		Shift
L. Time Worked per Year	Hrs.	4,360	2,400		4,800	
2. Capacity Output	Prs.	400,000	422,000		600,000	
3. Actual, and Projected actual Outputs	Prs.	385,609	422,000		600,000	
4. Utilization Level	%	96	- 96		64	
5. Output Revenue	$	7239,200	7922,383		11,264,052	
6. Manufacturing Costs	"	5015,540	5763,314		8,389,387	
7. Direct Labour Costs	"	635,500	781,632		1,341,072	
8. Unattached Costs	"	108,520	111,050		123,561	
9. Selling & Distribution Expenses	"	405,330	443,582		630,685	
10. Fixed Capital	"	4526,481	4802,631		4,802,631	
11. Obsolescence Depreciation	"	235,330	243,799		243,799	
				A	B	C
12. Other Depreciation	"	333,989	352,031	352,031	514,563	677,095
13. Interest on Rationalization Loan	"	-	27,615	27,615	27,615	27,615
14. Net Profits	"	504,991	199,360	156,002	-6,530	-169,062
15. Ratio of Net Profits to Fixed Capital	%	11.2	4.2	3.2	-0.1	-3.5
16. Unit Costs of Production	$	17.5	18.3	18.5	18.8	19.1
17. Revenue per Unit of Production	"	18.8	18.8	18.8	18.8	18.8
18. Profit Rate based on Unit Costs	%	7.4	2.7	1.6	-0.05	-1.6
19. Direct Labour Employed	NO.	389	472	694	694	694
20. Mean Annual Wage of 19	$	1,634	1,656	1,932	1,932	1,932
21. Capital Intensity of Production	NO.	7.1	6.1	3.6	3.6	3.6

TABLE IV.19 PROFITABILITY ANALYSIS of DIFFERENT UTILIZATION and OUTPUT LEVELS for THE SHOE PLANT of ENTRY 74, TABLE IV.1

Entry Number and Item	Unit	Existing Operations Case I	Rationalized Operations Shift	Double Shift		
				A	B	C
1. Time Worked per Year	Hrs.	2,580			4,800	
2. Capacity Output	Prs.	322,500	360,000		450,000	
3. Actual, and Projected Actual Outputs	"	251,086	360,000		450,000	
4. Utilization Level	%	78	--		56	
5. Output Revenue	$	4,479,060	6,421,949		8,027,437	
6. Manufacturing Costs	"	2,704,020	4,070,794		5,209,648	
7. Direct Labour Costs	"	603,100	602,784		1,373,904	
8. Unattached Costs	"	107,710	119,404		129,059	
9. Selling & Distribution Expenses	"	346,950	497,447		621,809	
10. Fixed Capital	"	4,188,291	4,321,791		4,321,791	
11. Obsolescence Depreciation	"	184,547	189,557		189,557	
12. Other Depreciation	"	301,687	310,842	310,842	437,214	563,585
13. Interest on Rationalization	"	--	13,350	13,350	13,350	13,350
14. Net Profits	"	231,046	617,771	179,268	52,896	-73,475
15. Ratio Net Profits to Fixed Capital	%	5.5	14.3	4.1	1.2	-1.8
16. Unit Costs of Production	$	16.9	16.1	17.4	17.7	18.0
17. Revenue per Unit of Production	"	17.8	17.8	17.8	17.8	17.8
18. Profit Rate based on Unit Costs	%	5.1	10.6	2.3	0.6	-1.1
19. Direct Labour Employed	NO.	340	364	670	670	670
20. Mean Annual Wage of 19	$	1,774	1,656	2,051	1,051	2,051
21. Capital Intensity of Production	No.	6.9	7.2	3.1	3.1	3.1

existing operations. The adopted procedure is hypothetical since there are no extant situations of a comparable nature. This means, in short, that the magnitude of the cost increases are approximations - although these are based on experienced judgement by plant operators and, given the lack of supplementary information, should be regarded as they stand. As stated in Chapter II, however, these variable cost increases are at the maximum bound within which they might reasonably be conceived so that adjustments, if they were being made, would be in a downward direction and would therefore increase net profits.

The shift-premium element of the wage bill is a straightforward example of scope for costs reduction on paper. In practice, it would be very much a political process on which comment, for costing purposes, would consist simply of postulating reductions in the premiums and calculating accordingly. The impression gained during the investigation was that it would be too difficult for the government to back-pedal on the extent of premium now legislated far less rescind this without considerable loss of support from an important elite of employed people as those Ethiopians in factory employment are when compared to most urban groups or virtually all rural sections of the population. For costing purposes in the present exercise, therefore, the wage calculations are exact according to prevailing legislation.

Little can be added to the previous, lengthy discussion on depreciation in Part I. Unlike the increases in variable costs, or the wage-premium issues, the treatment of depreciation is intrinsically complex and these (economic) complexities prevent a smooth translation into monetary amounts for costing purposes. Given the range of allowances within current Ethiopian corporate practice, the 'C' situation in double-shift operations can be regarded as an extreme maximum. If explicit account were to be taken of increased depreciation allowances on wear and tear arising from the more intense use of equipment then an allowance bringing this part of depreciation to somewhere between the levels suggested by the 'A' and 'B' situations appears more likely.

In projecting the output on the proposed second shifts in both plants account was taken of the lower efficiency levels of new labour and this in a manner similar to the method of calculation in Chapter II.5. The projections are over the first year of rationalized and extended production, and there is every reason to expect a substantial increase in efficiency after the transitional period. Similarly, it is to be expected that the cost increases arising from wastage would be steadily reduced during this period as new labour becomes more proficient.

When all the foregoing points are jointly considered, it is seen that the strictness of results incorporated in the cost calculation bases are truly so, and that, despite the recommendation being against an increase in utilization for the two plants on commercial grounds, the expected temporary nature of these results should be emphasised. After the initial period of increased utilization, during which the increase in costs proceeds at a greater rate than the increase in revenue, a marked improvement in commercial profitabilities should ensue. When projected output levels are increased, as they safely could be after the transition period is over, and when the wastage losses are decreased, then the recorded, low rates of return should be substantially improved. Finally, the extent of employment gain is large, and although so systematic attempt is made herein to account for social issues arising from increased utilization, it is clear that the new jobs would figure largely in any such attempt.

The remaining plants producing leather footwear, Entries 76 and 77 in Table IV.1 also produce rubber and plastic footwear. Thus Entries 76, 94 and 98 refer to one plant and Entries 77, 95 and 99 to another. With the exception of leather footwear production in Entry 77, all these show a considerable scope for increased utilization within the existing, one shift, time-intensity of operations.

The main reasons for this are the demand pattern, input supply and locational adversities.

Thus both plants complain bitterly of the extent of their markets relative to the other footwear producers. The Asmara plant, Entry 76, began operations in 1964 producing solely leather footwear and between then and 1971 never operated at more than 20 per cent of its built in capacity on one shift operations. The production of rubber and plastic footwear began in 1968/69. This can be regarded as a response to the situation in the leather footwear side of production in that a cheaper product which might be substituted for leather footwear was being offered. Unfortunately, details on the decision making process in the establishment of this plant, and in Entry 77, were not uncovered due to the changes in ownership structure. In both of these plants it would appear to be the case that plant installations of the capacities indicated were built in the belief that fuller levels of utilization would be realized.

Subsequent demand, structure and level, has prevented this.

In addition, both plants complain of the upward price trend in imported inputs and of delays in delivery, apart from the locational aspect of the Asmara plant. These are contributory factors to a low rate of utilization, but the main cause still relates to demand as indicated in the production levels of Table IV.17, and as borne out by the level of activity in the final plant to be considered.

Entry 76 is located in Addis Ababa and the plant produces a range of shoes with moulded rubber soles and canvas/rubber uppers. The input supply, the repair, adjustment and maintenance of equipment and the preparation of monthly programmes down to detailed daily dispositions are all efficiently carried out and resolved by the plant management. A good worker management atmosphere prevails. There is only a minimum level of production for stock and the market is strong and increasing. The reason for the shortfall between actual and potential output lies in the age of some items of equipment, 12-13 years, which has resulted in a marginal decrease between specified and actual performance. The plant operates three shifts per day, and there are detailed programmes of expansion, for an additional 600,000 pairs of shoes per year, which merit approval on the basis of past and existing operations.

It is seen from the foregoing that utilization levels in footwear production exhibit wide variation, and that the causes of this are diverse also. The following policy recommendations are made with particular reference to the relatively poor performers.

Quality control is required at the various input purchase levels. This includes chemicals, packing materials and general merchandise as well as finished leather, rubber and plastic. Quality control should also be increased at semi-processed and finished production stages. A source of information on new technologies in shoe production should be organised at Corporation level. Probably most important is that Corporation should organise its own marketing facilities which, in conjunction with quality improvements among the poorer performers, will be necessary in order to realize rational production of shoes in larger lot sizes. If this is not carried out then the lopsided demand pattern will be aggravated in that popular shoes will increase productive strains in Entries 73-75 while excess capacity will prevail in Entry 76 and in the non-leather shoe production of Entry 77. Neither of these should be allowed to prevail in a nationalized industry.

G: Paints and Plastics Industries

This section embraces four plants. Three produce paints, varnishes and lacquers and one produces plastics products by extrusion and rolling. All four were characterized by a defective demand for their products during 1975/76. This was mainly because activity in the construction sector was severely curtailed which, in turn, was a result of uncertainties regarding changing ownership patterns as the process of nationalization began to encroach on smaller business units and, in particular, on private house building since these properties were also subject to government take over.

Capacity in all four plants is used only partly and, despite recommended improvements which could be made at plant level, this situation is very much down to the level of demand. The paint factories have similar programmes and structures of production. They have a high dependence on imported raw material inputs and each plant operates independently in this regard. Overseas dependence is a feature in spare and maintenance parts supplies also.

The paint plants are located close to each other in Addis Ababa and a variety of products, which could easily be produced domestically with existing facilities, continue to be imported. These include polishes, glues, different sprays, insecticides, printers' ink and Turkish red oil. Given the proximity of location of the plants, their functions should be rearranged by subdividing an extended programme of production between them. This recommendation is based on the existing market and management problems.

None of the plants have organized marketing or sales departments. Their output largely depends on spontaneous orders from the market, usually by way of previous retail outlets and a rationalized programme of integrated production and aggressive sales is called for in this industry. Part of this would include an extensive market study to reduce imports of different chemical products which could be produced in one of the plants. Production of the articles previously mentioned - that is "small" chemical products, which could serve house and office needs, and which could find industrial application at least in the food, textiles and leather industries - could be put in one plant with very little new investment. The demand for paints and varnishes could, without difficulty, be accommodated in the remaining two factories.

To restructure production as indicated would require: new lines of products and cheaper inputs to be organised; quality control to be implemented; the introduction of modern technical management on an integrated arrangement; and the training of Ethiopian personnel. At present, the programme of paint production in carried on by semi-skilled workers in all plants and a proper restructuring will require technical assistance in the areas of paint and lacquer technology and marketing.

The main product lines of the plastics plant are:

(A) from PVC

(1) insulated wires, various sizes

(2) pipes, hard and soft

(3) pipe joints

(4) garden hoses

(5) boots

(6) tubes for electrical installations.

(B) from polyethylene

(7) sheets, various areas and thicknesses

(8) bags, various

In addition to inadequate demand this plant suffers from deficiency in raw materials supplies. PVC pipes and tubes are used mainly for building and water supply purposes and activity here has been interrupted as indicated. Production (input-supply) difficulties are associated with the transport disruptions between Addis Ababa and Assab and Asmara. Within production difficulties are encountered because of the lack of dies and shortage of specialist tools which cannot easily be imported.

Production and sales management feel strongly that a normalization of building programmes will increase demand sufficiently to take up all existing capacity stock. During the period of enquiry, the product market constraint resulted in overstocks of finished output and this contributed, largely, to the problem of finding adequate working capital. There are, however, production problems independent of the demand situation.

Repair and maintenance bottlenecks are pronounced. There is little knowledge or physical facility to deal with what can fairly be regarded as sophisticated extension and printing equipment. One bag-printing machine is out of use because three photo-electric cells, which regulate the location of the stamping bags to be printed, are not working and attempts to replace these have been unsuccessful. This item could account for 25 per cent of printed polyethylene bag production at full capacity.

The recommendations for this plant, given the assumed normalization of demand, would include a marketing study to ascertain demand for a range of products, closely allied to those currently produced, which the plant is capable of producing. The range and application of extruded and printed goods, polyethylene bags, PVC pipes, etc., is considerable. The impressions on expansion possibilities might be considered premature at this stage but the alternative of maintaining existing operations is very negative. On the production side, attempts should be made to diversify the sources of raw materials and technical co-operation would be necessary as regards the production of new and replacement tools and dies, and the possible training of Ethiopian personnel.

H: Metalworks and Metal Tools Industry

A total of six plants comprise the Ethiopian Metalworks Industry. Five of these produce the range of products indicated in Entries 106-112 of Table IV.1. Entries 106 and 107 refer to a single plant as do Entries 108 and 112. In the former plant the tube and pipe section has been non-productive since 1973 due to 'lack of demand'. The sixth plant has been included in the Metalworks Corporation by the MND on grounds of convenience. Its main product is industrial gases, oxygen and acetylene, and it also produces bleaching agents, various types of small cement products and shoe polishes. This is the plant referred to in Entry 85 of Table IV.1.

The generally recognized importance of a beginning metalworks sector in developing nation industrialization was not particularly evidenced by the dismal performance of Ethiopian metalworks during 1975/76. The explanation for this performance will take account of the inadequate demand for the volume of output the plants are capable of sustaining, of the programme of production - technical problems, and of problems relating to the supply of raw materials.

As far as obtained plant records indicated there was no period during the two or more years prior to 1975/76 when any plant's capacity approached full utilization although 1975/76 evidences particularly poor output levels. This suggests that recommendations aimed at securing an increase in demand are contingent upon obtaining additional new outlets as opposed to re-establishing previously held markets or increasing the share of existing markets which are satisfied by competing domestic products as, for example, was found in certain shoe factories or in beer production for the plant referred to in Entry 30 prior to the disruptive situation in Northern Ethiopia.

Examination of the demand situation begins with the plants referred to in Entries 106/7 and 108/12. These are considered jointly because of location, joint management, the raw material supply situation, the comparability of the tube and pipe products produced by 108/12, which 106/7 is capable of producing, and because resultant policy recommendations are made with respect to both plants.

Both plants are located on the outskirts of Addis Ababa and are within one kilometre of each other. They have the same general manager and other managerial staff. None of these have had much experience in their present line of work and with the exception of the leading technician in the galvanizing line of plant 106/7 the level of technical ability is insufficient.

The raw material input comprises more than eighty per cent of production costs in both plants. Rolled iron and steel sheets, zinc, hydrochloric acid, chromic acid and machine oils and lubricants are imported, all from Japan. Both plants were started by a subsidiary of a large Japanese manufacturing and trading concern and this company remained the major shareholder until nationalization. The present management has neither the knowledge nor experience to seek comparative bids and offers for the required raw material input. Together with this apparently very heavy dependence on imported inputs, a glance at Table IV.2. might suggest that competing imports were a singificant factor in explaining the poor performance of these plants. This assumes that the (almost 55 per cent) level of these for the overall metalworks sector was completely reflected, or reflected in greater proportion in the two plants being discussed. In fact, the latter obtains and these issues will, as previously indicated, be examined further in Section 2 of the chapter.

Total production, sales and sales revenue for the plants in Entries 106/7 and 108/12 are listed in Tables IV.20 and IV.21. respectively. The production process in 106/7 consists mainly of finished operations on coils of black iron sheets. To galvanize these they are passed through hydrochloric acid tanks into zinc cots and then into water and chromic acid tanks. The sheets are levelled prior to corrugation which is carried out by repeated roller operations in various settlings of calendar presses. The finished product is inspected and delivered.

TABLE IV.20 PRODUCTION, SALES and SALES REVENUE of CORRUGATED IRON SHEETS, 1970/71-1975/76

Entry 106/7	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Production (tonnes)	11,139.5	7,134.8	11,185.3	10,533.8	12,038.4	9,524.5
Sales (tonnes)	12,148.0	9,193.0	13,868.0	11,502.0	12,085.0	9,703.0
Sales Revenue ($'000)	10,300.5	8,136.4	14,680.1	16,285.6	18,080.6	14,351.7

Source: Plant Records and Ethiopian Metalworks Corporation, Addis Ababa.

TABLE IV.21 PRODUCTION, SALES and SALES REVENUE of STRUCTURAL METAL PRODUCTS (SMP) and STEEL TUBES and PIPES 1973/74-1975/76

Entry 108/12	1973/74	1974/75	1975/76
Production, SMP (tonnes)	1,726.8	1,704.5	820
Production, Tubes and Pipes (tonnes)	NIL	NIL	872.3
Sales, SMP and Tubes and Pipes (tonnes)	1,770.2	1,608.7	1,271.9
Total Sales Revenue ($'000)	3,199.2	2,800.4	2,198.7

Source: Plant Records and Ethiopian Metalworks Corporation, Addis Ababa.

Assuming the current product mix, relating to the different thicknesses of corrugated sheets that can be produced by Entry 106/7, the plant has a sustainable actual production of 4,600 tonnes on a single shift of operation. The plant has two separate and identical galvanizing and corrugating lines. Only one of these was in use during 1975/76 and this over three shifts per day. On this basis, the output level, 13,800 tonnes, from which Uu is stated, is derived. Consideration of the unused line leads to the corrected capacity output level and, hence, Uc.

It is emphasized that these output levels are sustainable and have been derived after due allowance has been made for routine and other maintenance, and for resetting. Actual production days per year for both output levels are 260. On a purely physical basis it would be possible to conceive a bottleneck in existence in the galvanizing department since, on identical time intensities, the corrugation department can absorb the former's output about one third faster than this could be supplied. Unfortunately, considerations of this nature are far from uppermost in improving the plant's performance.

This plant has additional facilities for the production of a range of steel and iron tubes and pipes for housing, general building and industrial purposes and community water lines. The production method is, briefly, steel coil is slit and formed into tubular shape by a series of rolls. It is then passed into an induction coil and squeeze rolled, where alternating current is applied to weld the abutting edges. Pressure is applied immediately after welding to ensure a perfect unicn of the seam.

The pipe section began operations in late 1970 and only produced intermittently until 1973 because of "lack of demand". On a one shift per day basis, 230 days per year, it can prodce about 360 tonnes of water pipes from ½ to 3 inches diameters. About 80 production workers could be employed on a single shift basis. Before examining further the demand, and other economic and technical factors associated with this plant, the plant in Entries 108/12 is considered.

In common with Entries 106/7, Entries 108/12 display abysmally low utilization levels and a set of production operations relating vey much to the finishing of the products concerned. This plant, however, does produce piping for housing and community purposes. The rest of the output mix consists of galvanized door and window frames, metal furniture, metal fittings and "small" metal products for structural and mechanical usage.

The pipe making operations are similar to those in the previous plant. The main inputs for (SMP), all from Japan, are black steel coils, pickled and unpickled, galvanized steel coil, uncoated and precoated, and alumunium sheet coil. Open and closed profiles are produced from galvanized steel and from aluminium on slitting and pressing machines and are used for window and door frames. Round pipe and square or rectangular hollow sections used for furniture, mechanical and structural purposes are also produced. The market for these products is almost entirely dependent on orders being received. On a three shifts per day basis, 315 days per year, the pipe section has a capacity of 3,150 tonnes, and the profile and press forming sections have capacities of 1,575 and 4,725 tonnes respectively. This plant also has the facility of a complete oxygen manufacturing and bottling unit. It is not used, the output from the plant in Entry 85 satisfying all the metalworks industry requirements in this respect.

It is clear that the capacities in both factories are used only partly. This applies equally to the buildings as well as plant and equipment. The buildings are modern and even at full production of the existing product mix there would exist scope for new lines. That is, the range of products related to general building and community purposes could be extended and consideration of this, together with the market situation of both plants, is integral to proposed policy recommendations.

Beginning with problems related to production and technology, initial corrective measures must establish integrated and rationalized operations for the two plants. This, in turn, requires examination of the demand potential. (Part of the rationalization will extend to the metalworks industry as a whole - in particular, policy measures for the 'heavier' operations of the plant in Entry 108, below, will be related to the two plants presently being discussed).

The first move towards rationalized operations should be the integration of both plants. One plant should control all equipment necessary to produce: galvanized and corrugated sheets; tubes and pipes; and different profiles and construction goods. The other plant would then be geared towards new lines of production into goods already in demand and in accord with future requirements. There is a possibility of producing conveyors, grain silos, storage bins, lift boxes, and even more sophisticated equipment like heat exchangers, central heating systems, ventilators, liquid storage tanks, and stainless steel structures for the food industry including kettles and globular and pneumatic transporters. This, of course, may be regarded as somewhat ambitious but the alternative, given the structure and level of demand and even given an upturn in demand levels, is to continue with both plants operating partly.

The relevant issue for policy is the implementation of such a programme of production, paying attention to economic as well as technical factors. On technology, it is noted that a programme of extended production will require assistance from foreign sources in order to obtain ready made designs, perhaps adapted to suit Ethiopian requirements, for different products and technologies. An obvious form of implementation would be technical assistance from an international aid organization with foreign personnel paying attention to the training of Ethiopians in this type of work as well as adopting production programmes geared to Ethiopian markets and requirements.

An expanded production would as indicated, relate particularly to linkages with the agricultural and building sectors. The increased organization of agricultural co-operatives, the development of crop processing industries and food industries in general, together with a quicker improvement in lamentably deficient housing conditions can not but benefit from rationalized, extended production in the metalworks industry. Where the physical facility or, in its more general usage, where the capacity already exists for such production, then its non-utilization is quite wrong.

The sales organization in both plants is only at the beginning stage. A much more commercially minded attitude is required on the part of present management which does not regard selling as an important part of its job. The current attitude to sales is essentially passive with management waiting on orders from the Corporation, from municipal authorities or from the Ministry of Agriculture for example. This may suffice if the above programme of production were implemented. At the moment it is totally inadequate as evidenced by production levels and growing stocks. The direction of a marketing study is examined after consideration of Entry 109, following, but the organization of sales should be carried out by the plants themselves and in co-operation with already established sales outlets with respect tothe present programme of production .

A more urgent requirement for the integrated plants would be a capable and experienced technical manager who should organize foreign co-operation, re-arrange the production capacities, increase productivity and begin the new programme of expanded production by establishing the necessary designs and blue prints. Co-operation with, and training of Ethiopian personnel would be a necessary part of this expert's brief.

Repair and maintenance in both plants was very restricted during 1975/76. The repair shop hardly operates and equipment for the production of jigs and dies, including a copy-mill fraising machine was not utilized because of inadequate personnel. All production depended on existing tools and dies and improvement of this situation, is, again, examined with respect to proposals on Entry 109.

Part of this includes the setting up of a central die and tool shop, under the management of the Metal-works Corporation, and, apart from everyday maintenance, both integrated plants should co-operate closely with this centralized facility.

Finally, the provision of raw materials should be sought on a wide competitive basis. This aspect may better be carried out centrally at the Corporation but should be investigated quickly since the possibility exists for considerable savings in the cost of production.

The plant in Entry 109 produces steel ingots from scrap iron. The process consists of melting the scrap with calcium carbonate, ferro - manganese,ferro - silicate etc., in order to obtain steel with the required strength, hardness and composition with respect to defined standards of carbon and sulphur content. The plant was seen to produce over-whelmingly for stock with the storage of ready made bars being large.

Ingots are rolled into rods and wires from 6 to 36 millimetres. From the rolled material, various small wares are produced, including; nails; fine wire, barbed wire; and wire nets ad springs. Ingots drawn off from the melting department either go directly to sales (stocks) or to the rolling mill. The steel bars from rolling go to sales or to the wire rod department. From there the draw bench operations are performed and nails are produced, or the rest of the input at this stage is carried into the galvanized unit from which the nets, springs and various wires are turned out.

The nominal capacities of the main operations in the plant are listed in Table IV.22.

On a physical basis, the furnace is the distinct bottleneck in primary operations. Prior to nationalization a 'load' in the furnace used to be ready 2.25 hours, or 9.7 loads per 24 hours. Production during the period of enquiry averaged about 6 loads per day, which, together with general problems of production and technology to be disucssed, gives rise to the utilization level of 49 per cent.

None of the subsequent processing, given the level of demand and the product mix, were strained in their physical operations although the draw bench machine which reduces the diameter of 6 millimetre wire rod in order to produce the small ware products is very old and has a spares problem. Were demand to pick up and furnace operations improve this draw bench would appear as a bottleneck.

The metalwork sector is, like paints and varnishes, characterized by a lack of demand which can be regarded as a binding constraint on utilization

TABLE IV.22 NOMINAL CAPACITIES of MAJOR OPERATIONS for the PLANT of ENTRY 109, TABLE IV.1

	Shifts per day	Annual Sustainable Capacity (Tonnes)
1) Furnace	3	13,140
2) Rolling Mill	3	35,000
3) Nails	1	2,300
4) Draw Bench	3	2,595
5) Fine Wire	3	1,095
6) Nets and Springs	1	500

Source: Plant Records.

in the sense that, despite technical problems, an increase in output could be immediately achievable if demand increased. Much of the demand deficiency has been a long standing problem in this industry and although demand levels have further fallen off due to the reduction in construction activity which followed on the change in government in 1974, all the plants considered were characterized by low utilization levels. As already noted, competing imports and imported inputs appear large in this industry. At the same time, the capital-income ratio of 1.51, (see Table IV.2), compares very well with other Ethiopian industrial sectors and this, it will be argued in the next section, is largely due to levels of protection and other import arrangements. For the moment, consideration is given to the types of problem relating to personnel, production programming, technology, and marketing.

The owner and technical personnel in this plant, prior to nationalization, were Europeans. They have left and present operators do not have the technical managers necessary to run the plant efficiently. There are no metallurgical skills. Spare parts lists, refractory specifications and drawings of the furnace and rolling mill were all taken by the previous owners and, although unable to be confirmed, it appeared that the supplier company of spare parts in Europe is under the control of former owners. The amount of equipment unused because there are no specifications on dies, tools, special steels and necessary repair and maintenance is considerable. The machine shop for repair and maintenance is ill-equipped and used to depend strongly on the import of necessary parts from Europe. Adequate personnel are lacking except for an elderly European who can supervise the adjustment of the rolling mill.

This lack of personnel should be rectified as quickly as possible. It does not appear likely that co-operation with former owners will be possible so that training for selected Ethiopian personnel, particularly in iron metallurgy, and toolmaking, either abroad or by aid personnel will be necessary. Aspects for immediate attention will include all necessary data on designs of the furnace and rolling mill, specification of required repair and maintenance, acquisition and qality of aditional refractories for future use, instrumentation of the metallurgical laboratory requirements and a schedule of required quality control procedures. A tool maker technician who can begin the repair and maintenance work for the electric steel furnace and the rolling mill and who can specify the required dies and tools for present-production is urgently required. This person will have the additional task of educating several Ethiopians in his area.

As in the previous two plants, corrective measures envisage the improvement of output quality and quantity. In present day Ethiopia this plant should have a crucial role in the production of diffeent items in industrial and housing construction and in general infrastructural consumption. This role would reduce dependence on impots and otherwise be beneficial to national product. Clearly, this role will not be realized by present managerial and skill levels and technical assistance is essential.

A suggestion with respect to the previous two plants, and further added to in the present plant, was the organization for the whole metalworks industry, of a central machine shop for tools and dies, This shop could be under the supervision of the Metalworks Corporation and its output should be aimed at satisfying many of the requirements of other Corporations and will include a central storage facility for commonly used parts so as to improve and make cheaper the supply of these by curtailing investment of foreign currency in them.

Entry 110 is a small plant located in Asmara and little information could be obtained on it beyond basic financial, employment and production data for 1975/76. It produces a range of small were products very similar to that of Entry 109, and, pre-nationalization, had the same owners as this plant. It acted as a sales outlet for the Northern market. It also supervised imported inputs.

The final plant in this industry, Entry 111, is located in Addis Ababa and again, production levels suffer from deficient demand and physical bottlenecks. It does not, however, suffer from personnel deficiencies nearly to the same extent as the previous plants.

The plant produces more than 100 types of simple and basic hand tools for agricultural and construction uses, fittings, and provides repair services for customers. The last activity is presently minor in its contribution to total revenue, but can grow into an independent workshop to produce essential spare parts and cater to the maintenance needs of the manufacturing sector at large. The principal products, all in various sizes, are: hammers, sledgehammers, picks, shovels, ploughs, axes, crowbars and hinges and bolts.

Because of this range there was no attempt made to state actual to potential output levels. Basically, there are six departments in the plant with four to sixteen functions being performed in each. These may be stated briefly as follows:

(a) Forging: 16 operations and 20 items of equipment. The sheets or bars of steel are cut into specified shapes.

(b) Grinding: 5 operations and 11 items of equipment. Blades are edged and sharpened and metal surfaces are smoothed.

(c) Heat treatment: 5 operations and 9 items of equipment. The semi-finished product is kiln heated for hardening purposes.

(d) Machine department: 15 operations and 22 machines. This is the workshop to provide outside services as well as plant requirements. The drilling and milling operations for the various products are performed here.

(e) Woodwork.

(f) Paint Shop.

It is difficult to state the capacity in terms of output due to the range of products, the variations in operations that each item of equipment performs and the several processes that each product undergoes in the different departments. Machine hours can indicate total capacity and the time required from the different operations to produce a unit of product to arrive at the total outpt which the firm will be able to produce. Based on a year of 250 days and single, eight hour shift operations, the machine hours used were:

(a) Forging	40,000 machine hours
(b) Grinding	22,000 machine hours
(c) Heat Treatment	18,000 machine hours
(d) Machine Department	44,000 machine hours
(e) Woodwork	8,000 machine hours
(f) Paint shop	10,000 machine hours

On this type of specification the following was capacity utilization in the different departments in 1975/76:

(a) 89 per cent	(d) 48 per cent
(b) 100 per cent	(e) 60 per cent
(c) 53 per cent	(f) 63 per cent

From these figures, and bearing in mind particularly the time intensity considered, the stated utilization level of about 40 per cent in Table IV.1 is seen to be a liberal assessment.

All the main products manufactured in the plant undergo some sort of operation in a crank press machine. Its function is to pierce and trim holes through which wooden handles or struts are passed. A temporary breakage, which is often the case, leads to an almost total stoppage of production. Normal maintenance, even given that parts are available, also requires considerable time. Replacement of this machine and keeping it as a standby would ensure a smoother and more continuous flow of production. Again, it is being assumed that sales levels will rise - that is, activity rates in construction and agriculture will normalize and further increase in the near future. If this materializes there would be little difficulty in operating a second shift. In agriculture in particular, it is clear that present needs for different hand tools are many times greater than either demand or production levels suggest.

The plant was initiated and built up by last European technical and financial co-operation and two European specialists are still employed. One is a mechanical engineer with long experience in foundry processing and tempering technology. The other is a tool and die maker who supervises adjustment and repair and maintenance of the whole set of operations. Ethiopian equivalents in these areas are highly desirable.

Apart from the crank-press, the capacity constraints of the factory are in departments (a) and (b), forging and grinding. The machine shop is well equipped and knowledgably operated. It merits consideration as the node for the (proposed) central tool, die and repair and maintenance facility of the Corporation.

Unlike the previous plants, the technology levels here are adequate, but the market is poor. Marketing studies in this industry will require a major effort from government level down. This conclusion emerges from consideration of all plants and their potential contribution, that is, the importance of a beginning, domestic metalworks industry in any ongoing process of development. General comments of this nature should be read along with specific measures of improvement derived from a plant's circumstances.

The approach to marketing in this plant is very unsatisfactory. There is a passive reliance on orders from a few sources, particularly the Ministry of Agriculture and farmers co-operatives. The passivity implies a centralized planning and distribution system which is patently premature. No commercial feeling could be detected among managers and a completely changed approach to bring about the creation of an aggressively minded sales organization, in co-operation with the Corporation, is required. Apart from the suggested key role of this plant in a centralized tool and maintenance shop, it merits special attention when the role of agriculture, and the mechanization of it in the further development of Ethiopia is considered.

In concluding these comments on metalworks, it is noted that the lack of a sufficient market is a frequently cited cause of underutilization. With the exception of Entries 109 and 110, that is, the 'heavier' type of output plants and the Asmara plant, the rest of the plants are less than 10 years old and were built with foreign participation. The hand tools plant was the only one built on a technical aid basis with the others being joint Ethiopian - foreign ventures on a purely commercial basis. In all these plants it appears unanimously that they were designed and constructed for output levels much higher than domestic demand could absorb and the products are not of a type or quality which can find export outlets. In addition, the size of these plants will be related to their low utilization levels through the lumpiness of certain units of equipment relative to the market size, and the discrepancy between capacity output and the lesser output required to satisfy the market probably reflects the indiscriminate adoption of non-appropriate means of production.

I: OTHER SECTORS/INDUSTRIES

The discussion so far in this Section has taken in 89 of the 112 observations. The remaining observations range over eleven sectors or industries and these are now discussed.

a) Food

In the food industry, the three remaining plants are located in Asmara in Northern Ethiopia and concern preserved meat and dairy produce. The preserved meat plant averaged about 60,000 kilograms production in each of the four years prior to 1975/76. Even before the present disruption arising from civil strife, considerable excess capacity caused by building ahead of demand prevailed in the plant. In addition it has a monopoly of the vacuum packed, mainly pork meat market in Ethiopia and also enjoys substantial export sales. Because of the disruptive situation around Asmara, the plant experienced difficulty in obtaining its pork input and transportation to the interior was prevented during certain periods of the year of enquiry. On a physical basis, the smokehouse is the operative constraint on capacity. Neither the cutting/boning nor the vacuum packing side of operations present problems according to Food Corporation personnel. The machine controlled packing process is only in operation for a few hours each day. The previous owners of this plant are still running operations and deficient managerial or technical personnel inputs did not figure as a cause of under-utilization.

The butter and cheese, and pasteurized milk plants also contain elements of excess capacity from building ahead of demand. Both experienced difficulty in obtaining raw material inputs and the butter and cheese products which have a large part of their market in the interior suffered the same transportation of output disruptions as the preserved meat plant.

b) Cigarettes

Cigarette production is controlled by the Ethiopian Tobacco Monopoly. The plant works around the clock and the sales, if not popularity, of the domestic product are virtually guaranteed by the around four times higher price that must be paid for imported brands.

c) Paperboard

The wrapping paper and paperboard boxes produced by this single factory satisfies over 90 per cent of domestic demand. The capacity output figure is based on 24 hours per day operations which is normal for the plant. Like cigarettes and footwear the presence of the plant owes much to the inflated price of the domestic product relative to the free market price of competing imports. Like cigarettes again but unlike footwear, the major production costs are found in the imported input content.

d) Printing and Publishing

Capacities for the six plants in this industry are stated in terms of working time over the year for the major items of equipment. Two of the plants, however, are located in Asmara and the Printing Corporation was not formed until October 1976. Only two print-shops were actually visited. The actual hours worked figures listed in Table IV.1 were compiled from questionnaire returns or from verbal reports by operators to Croporation personnel so that, despite their apparent accuracy down to single unit digits, they should be regarded, at best, as provisional estimates. The general impression gained was that equipment maintenance and parts provision were not particularly severe problems and that personnel were up to the task in hand.

More certain, is that this industry experienced a sizeable upswing in activity during 1975/76. This was due to the, government ordained, printing of the more popular papers and segments by authors such as Karl Marx, Mao Tse Tung, Kim Il Sung, Julius Nyrere and others, in Amharic, Tigrinian and other Ethiopian tongues. The two shops in Addis Ababa which were visited were thus engaged 24 hours per day.

e) Compressed Gas, Bricks and Cement

The four plants concerned here have experienced a marked downturn in activity levels in 1975/76 compared to previous periods. This was due to the virtual suspension of fresh, modern sector building activity which, in turn, reflected negative actions or inaction on the part of the ruling military junta. Thus, for part completed public works there was a discontinuation of funding; extant proposals were shelved; and private construction activity ceased with nationalization in January 1975. This feature, of course, is shared by paints and varnishes, and metalworks. Unlike these however, the present plants had previous levels of activity which were relating closer to their respective capacity output.

In addition to those demand factors, the largest Addis Ababa cement plant had lost its top management and technical personnel. The general manager taking over during the period of enquiry was a civil servant and knew nothing of his plant's operations. He was faced by a set of problems relating to general administration, technical factors and input acquisition on top of the work demand.

Both the compressed gas plant, and the normal equivalent clay-bricks plant were operating 'comfortably' within the constrained demand situation and no outstanding problems relating to input supplies of materials or skilled personnel were detected.

f) Soap

Two soap plants are located in Asmara and these produce different brands of cake and powder soaps under well known international franchises. A third plant is located near Addis Ababa and produces only soap powder in a relatively very capital intensive, modern installation. The fourth plant is located in the capital, produces only cake soap and is a subsidiary operation within an edible oil processing plant.

To the franchise operators, and the modern, Addis Ababa located plant, the imperfect market structure and building ahead of demand are the major elements contributing to excess capacity. As in other mentioned sectors, the level of protection offered the Ethiopian produced variety helped secure the existing market.

In the fourth soap plant, soap is produced in three modern production lines. Technical personnel deficiency is manifest in the quality of the product. Although the production lines are modern, the process of soap cooking has a traditional sector flavour.

Edible vegetable oils and fatty wastes are decomposed, using a very strong caustic lye, to soap, and the water component is simply dumped outside the plant. The soap is pumped to the production lines without washing or properly completed separation from the lye. There is not any recovery of glycerine. Apart from these it may be suggested that the more general issue of processing a relatively high value raw material, edible oil, into a product like soap would not stand close examination. Instead, (relatively cheap) imports of whale oil or tallow could be used. However, the main problems relating specifically to underutilization concern defective demand and personnel as in the first three plants.

g) Petroleum

The single Ethiopian petroleum refinery is located in the Red Sea port of Assab. It was built in the mid-1960's and the throughput from the first year of full operations until 1975/76 was never less than 90 per cent. The slight downturn during the year of enquiry resulted from a change in terms for the supply of unrefined oil. The main supplier was Saudi Arabia and, as a result of the change in government in Ethiopia; the Saudis demanded hard currency payment in advance. A few minor delays were experienced in the off-loading of unrefined oil while payment for these particular consignments were being confirmed. Petrol rationing began during the period of enquiry. This was rigidly enforced bureaucratically - in the form of ration cards and specified outlets - but was never severely felt in practice, and the rationale was the saving of foreign exchange as opposed to being derived from an acute physical shortage per se. Shortages did occur in outlying areas but the causes of this related to transport difficulties post refinery.

h) Glass Products

Two of the factories producing glass containers are located in Asmara and, prior to nationalization, operated with shared management structures. These personnel left after nationalization and the plants were being run at a greatly reduced level of general efficiency during the period of enquiry. The Addis Ababa plant had in exceptionally high wastage rate. In this plant the bottles coming hot from the moulds were moved on a conveyor belt to the cooling chaber. This belt suffered frequent, often prolonged breakdowns shich stopped the whole set of operations. Although "tongs" were available for manual handling the breakage rate with these increased several fold over the conveyor operations and the same volume just could not be handled manually. Incandescent bottles were spoiled.

Although only two bottle producing plants are here concerned, the implication for beverage and food are important and have been brought out in these sections. Rectification, of course, refers to most of the whole set of reasonable measures contained under the headings of maintenance and spare parts provision.

IV.2 Utilization levels, their determinants and policy(2)

This section uses regressisn analysis to test for statistically significant relationship between levels of capacity utilization and primary structural characteristics in Ethiopian manufacturing. The regression results, on their own proved disappointing although not quite fruitless. That is, the statistically best determination of the structure of utilization left about 70 per cent of the total variation in capacity use unexplained.

Two reasons could account for this. The full causes of underutilization, other independent variables, were omitted from the specification. Secondly, there may be error, apart from non-inclusion, in the specification and further treatment of the regression. On the former, a reference is being made explicitly to the account of causes of underutilization given in the previous section. This has two aspects. Previously, the discussion on causes centered round qualitative, perhaps once-off issues that accounted for idle capacity during the year of enquiry. This discussion was conducted at a disaggregated, mainly individual plant, level and on the basis of the previous section it is asserted that a reasonably full account of the particular circumstances affecting utilization preformance has been given.

In contrast, the regression analysis will deal with more aggregated parameters wherein many individual plant adversities and advantages will not be specified. For example, two plants in the same industry with the same product mix would hardly be expected to have similar utilization levels if one had well maintained equipment and competent administration relative to the other. Both plants, however, may well face a very similar set of aggregate parameters relating, say, to imported raw material dependence and the level of exports in total production. Thus the regression analysis is kept simple and careful, so that the data are not pushed too far.

The sample set of cases is now defined. This is followed by a statement of the principal regression results and discussion on these.

Recalling the remarks on Chapter II.5 on the classification of plants and industries that may legitimately be included in regression analysis, the total set of observations was initially divided into two subsets according as the level of demand, as determined in the previous section, was a key constraint or not on the observed utilizations levels. The subset is which deficient demand was not a key constraint was divided into a further two groups on the basis of their being 'competitive' or non-competitive' in structure. The criterion for this was simple but not arbitrary given the nature of the observations. It consisted of deleting industries in which up to three plants accounted for 75 per cent, or more, of total domestic production as non-competitive.

The remaining observations totalled 70 and, from Table IV.1 comprised:

ENTRIES from TABLE IV.1	ISIC	ENTRIES from TABLE IV.1	ISIC
4 to 24	3115/6/7		
33 to 39	3134	73 to 77, 94 to 96,	3240, 3559,
41 to 61	3211/2/3	98 and 99	3560
67 to 72	3231	79 to 84	3420

From these observations, eleven plants located in Northern Ethiopia were removed on the grounds that the political situation would have rendered some of the variables to be tested as unrepresentative. The distribution of these removals by industry is: Food, 2; Beverages, 1; Textiles, 4; Tanning, 1; Footwear 2; and Printing and Publishing, 1.

The remaining 59 observations coprise over half the original set. They encompass most of the four major manufacturing industries of food, textiles, leather tanning and footwear. In addition, the soft drinks sector of the beverages industry is included together with printing and publishing.

In terms of the total set of observations the omissions are certainly considerable. On the one hand these omissions were dictated by the aim of achieving some robustness in the statistical results and were derived from the demand/competitive structure criteria described above. On the other hand, mention should be made of the general level of industrialization in Ethiopia. Even by sub-Saharan Africa standards, Ethiopia is a poor nation and one aspect of this is its very meagre level of manufacturing activity. The non-inclusion of many of the industry groups represented in Table IV.1. by a single plant, or by two or three plant entries, reflects this embryonic industrial set-up as much as it reflects agreement with the competitive structure criterion used in arriving at the final 59 observations.

The main hypothesis relating to the structure of capacity utilization tested in this section concerned six of the industrial characteristics listed in average form in Table IV.2. The omitted characteristic was competing imports. These could not be given an actual figure at individual plant level whereas actual values for the other characteristics for each of the 59 observations were used in the regression.

A stepwise programme, permitting the selection of the best explanatory variables was run. This technique provided a hierarchical empirical search for relationships among the listed variables and it is on this basis that the results below are presented. Such a procedure does not imply a tendency to throw variables indiscriminately into the regression. Many variables that could be associated with a particular hypothesis were omitted by inspection. They either did not appear to contribute to any explanation or they could be expected to be highly correlated with included variables.

The simple model which was tested with the above inter-industry, cross-section data at the ISIC Four Digit Level, and which included all 59 observations, postulated that the observed levels of utilization were determined as follows:

$$\text{Log Uc} = a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + U$$

Where Uc = Corrected Level of Utilization

X_1 = Plant Size

X_2 = Imported Inputs

X_3 = Exports

X_4 = Capital to Output Ratio

X_5 = Labour Productivity

X_6 = Capital to Wages Ratio

U denotes dummy variables that were introduced to allow each of the industry characteristics to have different weights in the different industries (None of the dummies added more than 0.73 per cent to the co-efficient of determination and none had a significant co-efficient. They are, therefore, omitted from the results).

A logarithmic specification was demand superior to a linear one because of the non-linearity apparent in the variables.

The stepped regression results were:

a) $\log Uc = 4.06 - 0.10\log X_3$
$$(0.024)$$

$$R^2 = 0.2073$$

$$F = 16.737$$

The figure in parenthesis is the standard error of the regression co-efficient. Exports are significant at 99.5 per cent and this statistically 'best' characteristic provides only 21 per cent of the variation in utilization among industries.

With the incorporation of plant size and imported inputs, the results were:

b) $\log Uc = 3.58 - \underset{(0.026)}{0.114X_3} + \underset{(0.054)}{0.082X_1} - \underset{(0.026)}{0.036X_2}$

$$R^2 = 0.2454$$

$$F = 6.721$$

Again, exports are significant at over 99.5 per cent while size and imported inputs are significant at over 90 per cent only.

The inclusion of further variables in the regression was even less well tolerated and the final result excludes the capital to output ratio whose regression co-efficient was insigificant and which explained less than one per cent of variations.

c) $\log Uc = 3.94 + \underset{(0.026)}{0.095X_3} + \underset{(0.053)}{0.083X_1} - \underset{(0.031)}{0.062X_2}$

$- \underset{(0.108)}{0.227X_6} + \underset{(0.107)}{0.106X_6}$

$R^2 = 0.3012$

$F = 5.172$

Exports remain significant at 99.5 per cent with imported inputs and the capital to wages ratio significant at 97.5 per cent and labour productivity significant at only 80 per cent.

These regression results are unsatisfactory both in terms of the range of variations in utilization explained and in terms of the significance levels of some of the variables. Each variable is now reviewed.

The relationship between exports and utilization should be regarded in two parts. Current exports add to current demand and this should, <u>ceteris paribus</u>, contribute to relatively higher levels of utilization. On the other hand, Ethiopia has followed a strategy of import substitution in attempting to build up its manufacturing base so that it would be possible that past planned investment was detrimental to exporting industries. Table IV.2. suggests that, in either case, only edible oils and leather tanning have particularly noticeable levels of export sales and this skew in the distribution of the export sales characteristic will impart a bias in the regression results. Thus, not only is the nature of the relationship between exports and capacity use undecided but statistical impediments intrude also. Since the co-efficient of exports was negative than it may be very tentatively, suggested that demand conditions are less important than investment conditions. But the evidence is both narrow and weak and further pronouncement, on the basis of the regressions, would be quite inadmissible.

Plant size raises various issues relating to economies of scale. This, in conjunction with the capacity output led to the use of the fixed asset measure of size. Machine imbalance can result in certain machines lying idle while other parts of the process 'catch-up'. Yet the plants used in the regression do not, apart from some soft-drinks plants, suffer from equipment lumpiness to the same extent as, say, metalworks, or course fibres. In the case of metalworks, the occurrence of imbalance in production alongside deficient demand provides an example of excess capacity resulting in stockpiling. But deficient demand is not a feature of the observations discussed in the regression and, equally important, the capacity output figure is based on the lower bound imposed, where applicable, by imbalance in all the plants reported on in the study. In short, scale considerations resulting from equipment imbalance, or from demand considerations, or from both of these have been eliminated from the regressions.

Less easily dismissed than technological scale economies are managerial economies. The influence of these on the present sample are bound to vary. Thus several textile plants have clearly defined managerial functions in, for example, production, sales, finance, distribution and in supervisory and other roles. Such clearly defined functions are lacking in other textile plants and may be missing altogether, in the sense that one man performs all collectively, in grain-milling, edible oil-processing or printing. One way round this in the managerial sense would be to categorize 'blue-collar' employees but, given the aid, and differing effects of this, provided by Corporation and Ministry personnel the efficacy of a quantitative analysis would be debatable. The value of production in reporting units would probably capture more of the flavour of managerial as opposed to technological economies but since this was more usefully employed in measuring labour productivity and since there was a strong association between division of management function and size of plant as measured by the value of fixed assets then the assets measure was used to indicate plant size. In addition, there is likely to be some degree of management performance reflected in the measure of labour productivity defined.

On this basis, and taking imported inputs along with size, about 4.5 per cent is added to the variation explained by current exports, but at a much reduced level of singificance. The co-efficient attached to the size variable is positive as is expected if for no other reason than higher utilization levels imply greater efficiency and plants displaying greater efficiency would be expected to have grown faster and therefore be larger in terms of fixed assets at any given moment.

A shortage of input requirements from abroad will adversely effect utilization levels. Shortages are generally seen as arising from one or both of two directions. Import regulations might prevent the required inputs being obtained in sufficient quantity or, as capacity in a particular sector increases or tends to be more fully used, the requisite foreign exchange for input purchase might not be readily available. In several of the industries considered in this section, imported input dependence is seen (Table IV.2.) to be considerable but neither shortage of capital nor licensing regulations were regarded as constraints as far as imported raw material acquisition was concerned. (Chapter IV.1).

Nonetheless, a regression was run including imported inputs as an explanatory variable in order to see, simply, if and to what extent there was any association between this and utilization levels. As revealed, a very weak and not highly significant correlation was apparent.

However, a balance of payments problem is an often present and severe constraint in the Ethiopian economy and foreign exchange eanings are highly dependent on trade in a few primary commodities, coffee being dominant among these. In general, foreign trade restrictions and controls do result in a general discouragement of imports. One important manifestation of this is in the area of imports of machinery and equipment required for repair and maintenance purposes. Improved provision of these, through specific relaxation of import controls and foreign exchange grants/loans should be regarded as a prime priority if fuller utilization of installed plant and equipment is desired.

A direct relationship was expected between the ratio of capital to wages and utilization on the basis that the higher was this ratio then the more likely it would be that increased output would be sought through a more intensive use of existing plant and equipment as opposed to the purchase of additional equipment. In fact, the indication was of an opposing nature was revealed by the regression. Two factors could account for this. Statistically, the procedure used to estimate capital values is second hand in the sense that it was not always available directly from plants or from Corporations and it may be that, despite every effort to be accurate, the information was not suitable for testing intra-industry differences relating, for example, to the vintage of the capital stock. This factor results in differences in the production technique and the exact nature of the product.

Secondly, it is noticeable from Table IV.2. that the industries with the higher capital intensities of production - the edible oils, grain mill and bakery product sectors in food, the soft drinks sector and leather tanning - are all characterized by adversities in production relating to input supply or equipment to a much greater degree than these adversities are found in textiles or printing. The latter, generally, have much higher levels of utilization and this may have been sufficient to result in an inverse relationship between capacity use and capital intensity.

In the definition of the capital to output ratio used here, it is reasonable to expect a direct relationship between this ratio and levels of utilization. Part of the reasoning in recommending an increase in utilization for a particular plant centres round the question of the profitability of this move. If the internal rate of return to capital is increased and if the unit costs of productions are decreased through more intensive utilization then, on economic grounds, the move is to be recommended. This assumes that revenue maximization adjustments to prevailing costs and production techniques are being made by plant operators. Of course, where rates of return increase and unit production costs also increase the decision basis is not clear cut and considerable space has been given to an examination of this issue in previous parts of the study. In the regression analysis, where aggregates are being considered, no pronouncement can be made. This requires examination of input cost, particularly wage differentials in the pre- and post-increase in utilization situation. The capital to outpt ratio used here has value-added in the denominator and it is on this basis that, ceteris paribus, a positive relationship with utilization is postulated. In the event, this variable added practically zero to the explained variations in utilization.

As with imported inputs competing claims on the effect of labour productivity on utilization can be made. Skilled labour is in short supply in Ethiopia and the expected effect of this would be to detract from capacity use. Again, in industries with relatively lower productivities there may be correspondingly lower wage rates and the implication of this could be a more intensive use of equipment consistent with the notion that an increase in output per unit time period implies not only an increase in capital productivity but in efficiency of operations, including output per man per unit time period, generally. To answer this, however, it would be necessary to conduct a detailed enquiry into methods of production, wage rates and labour time and motion studies between and within industries. Different industries obviously face different sets of technologies but variations in productivity can prevail within industry groups where the technology is broadly similar. The regression results do not proide any enlightenment in this respect. A much clearer picture of the effect of skill deficiencies on the level of utilization was gained in the previous section vis-a-vis individual plants and industries.

In concluding this section some comment is made on why essentially unsatisfactory results were reported. At a basic level it follows that where a hypothesis can be generated regarding the relationship between capacity use and an aggregate economic parameter, the hypothesis should be stated and tested, or at least commented on. For present purposes regression analysis appeared suited to the task.

Many studies on underutilization in developing nations have made varying claims on the importance of one or more of the above tested and other characteristics in explaining observed levels of utilization. At a quantitative level, the paper by G.C. Winston (1971 op. cit. Chapter 1) 'explains' over 90 per cent of the variation in intersectoral utilization costs in West Pakistan manufacturing (1965/66) by a regression combining the effects of copeting imports, exports, capital to income ratio, size of firms, number of firms in an industry and labour-productivity. Apart from size of firms, which Winston measures in terms of annual production, there is broad similarity between his definitions of the other characteristics and the corresponding ones used here. Winston used aggregate data averaged across 26 industrial sectors.

Also in Pakistan, A.R. Kemal and T. Alauddin (1974) found by regression that average firm size, using the fixed assets measure, and imported inputs were important in explaining utilization levels. Again, average data were used.

Chapter III.2 mentioned the necessity of maintaining a distinction between apparently general results and insights deriveable only from close individual examination of the units concerned. This does not mean that generality should not be sought. On the contrary, if results found obtaining in one part of the world could be corroborated by information from the Ethiopian experience then a step, albeit a very small one, towards increased generality would have been made. For this reason statistical tests were derived.

However, both the above references use aggregate data and this must influence the effect of characteristics at individual plant level. In addition, Winston does not aggregate his data according to key constraints on utilization criteria and this raises additional questions over the statistically satisfactory nature of his results. Where average data, as reported in Table IV.2, for the present study were used then between 70 and 80 per cent of the variation in utilization levels in Ethiopian manufacturing can be seen to be "explained" by regressions using these aggregate characteristics.

If this were a true reflection of the structure of underutilization, then the role of the qualitatively detailed considerations in the previous section have been overstated. The opposite, that is, that the effects of broad aggregate characteristics have been overestimated in the regressions, is asserted here. An input supply bottleneck, for example, whether due to physical non-availability or lack of planning adequately for production requirements, can cause severe disruptions in even a previously low utilization situation. A similarly disruptive effect can be caused by the lack of a required spare part or by the absence of a technician required to effect an immediate replacement or repair. And whether or not managers respond to an upswing in demand by a more intensive use of existing equipment and by increasing employment, or by increasing the capital stock does not alter the fact that the previous utilization level was very likely to be considerably influenced by the market for the product.

Again, particular industry groups may display less variation in inter-plant characteristics like capital intensity and export sales than the variation observed in these between industries. The industries displaying more similarity in these characteristics - this does not imply a high uniformity of values across plants in the same industry - may also face a generally similar set of constraints relating, for example, to skill levels and size. To the extent that the latter type factors influence utilization levels then there will be an association between capacity use and the aggregate, quantified characteristics used in regression analysis. Thus the question of the nature and direction of the cause-effect sequence is obscured and has little chance of being unravelled by a statistical analysis, not because of defects in statistical theory but because of the 'messiness' involved in partitioning, isolating and identifying the variation in utilization due to different independent variables. Analyses of utilization conducted at an aggregate level and using averaged data must inevitably neglect the effect of plant factors which can have pronounced effects on levels of production. This assertion is made on the basis of the present results in Ethiopian manufacturing but may safely be assumed to have some general validity since, by definition, practical and accurate diagnoses, are more likely to result from deepened data bases.

IV.3 Summary of empirical findings

The empirical findings of the first two sections are now summarized with respect to causes of underutilization. The summary falls into two parts. First, the presence of generally prevailing economic and machine factors contributing to underutilization, and ranked by importance, are presented in Table IV.23, (p.352). This is constructed from the disaggregated examination of plant, and also follows fairly closely the listing of factors given in Chapter II.4. However, certain causes of underutilization brought out in II.4 will not figure in the tabular summary either because of their isolated - or non-occurrence. Since these causes appear plausible, as indicated by past literature on underutilization in developing nations, some comment on their relative unimportance in an Ethiopian context is offered for the sake of completeness and forms the second part of the summary.

Table IV.23 represents a very skeletal summary and a word of explanation, prior to consulting it, is required.

By 'generally prevailing' is meant factors in common to the majority of, or to all, plants in a sector or industry. Plant specific qualifications should be recalled when reading the Table. For example, a technical personnel input deficiency will be indicated explicitly in edible oils and fats production. But one of the six plants in this sector of the food industry exhibited competent technical efficiency. Again, '<u>deficient demand</u>' would not generally be considered a factor in the footwear industry although two or three of the ten plants provide qualified exceptions to this.

Comparisons across sectors or industries cannot be made on the basis of these rankings. Where a factor has the same ranking in any two sectors,the effect of this factor on utilization in one of these sectors can be much greater than its effect in the other. The effect of any particular factor can, indeed, be very varied across plants in the same sector as indicated by individual utilization levels and their intra-sectoral range. However, the constraints on activity levels still remains sufficiently uniform in importance to permit of their ranking. The exact nature and impact of each effect, and its interrelationships with others can only be ascertained by recourse to the previous discussions in the chapter.

Four major sets of factors relating to demand, input supply, output distribution and miscellaneous issues are identified. Under each set, one or more contributory causes or aspects are listed and the presence and importance of each cause, relative to other causes in the same sector or industry, is indicated by 1, 2, 3, ..., orders of magnitude. Where a demand factor is ranked first, then this should be read as indicating that demand is a binding constraint on utilization such that, given an increase in the market for the product, an increase in output could be immediately achievable even though significant problems coexist within the other factor sets.

To read the table, the following recap of causes and their column identification are provided.

DEMAND FACTORS

Column 1) Demand was observed to be deficient in 1975/76 but was higher in a recent previous period.

Column 2) Building ahead of demand/Economies of scale.

Column 3) Monopolistic/Oligipolistic structure.

SUPPLY FACTORS

Raw Materials; Supply is deficient because:

Column 4) Physical shortage.

Column 5) Poor/Varying quality.

Column 6) Transport/Storage problems.

Column 7) Shortage of working capital.

Column 8) Lack of organizational facility.

Spares and Maintenance Equipment; Supply is deficient because:

Column 9) Non-availability.

Column 10) Transport difficulties.

Column 11) Shortage of working capital

Column 12) Lack of organizational facility.

Where a lack of organizational facility is indicated in either raw materials or in spares and maintenance equipment, the reference is to plant or Corporation management.

Personnel Deficiency; Two main aspects are identified;

Column 13) Managerial input and;

Column 14) Technical input.

In addition to managerial deficiency where this is indicated by a lack of organization in the acquisition of raw material and spares, a few sectors were characterized by a gneral lack of administrative capability in every day operations (Column 13).

A deficiency in technical personnel (Column 14), is indicated in these cases where poor output arises because machinery is not well maintained or is broken down and not repaired. The implication is that the defect is of a type which a reasonably efficient plant could repair and is to be distinguished from non-maintenance because of inability to obtain spare parts and equipment as previously indicated.

Other machinery factors like imbalance or old, run-down but reasonably well maintained equipment do not appear in the table since such factors have been allowed for in the construction of utilization indexes. They have outstanding importance in some instances but were examined in the plant-specific discussion.

<u>OUTPUT DISTRIBUTION FACTORS</u>; Difficulty is experienced in getting the finished product to the market because:

Column 15) Product 'packaging' problems.

Column 16) Transportation problems.

<u>MISCELLANEOUS FACTORS</u>; The following columns refer to factors which were present infrequently, or which occurred in a once-off basis across a minority of plants, or, if present in several plants, where their effect on utilization was not great. Such factors are not ranked, and are indicated by 'X':

Column 17) Defective demand due to price/quality non-competitiveness relative to the majority of plants in the sector or industry.

Column 18) Electricity supply failure.

Column 19) Shortage in water supply requirements.

Column 20) Transportation of output difficulties.

Column 21) Labour disputes.

TABLE IV.23 SUMMARY RANKING of FACTORS CONTRIBUTING to UNDERUTILIZATION in ETHIOPIAN MANUFACTURING, 1975/76

	DEMAND FACTOR				INPUT MATERIALS				SUPPLY MAINTENANCE				FACTORS AD.	MP.	OUTPUT PG.	TP.	MISCELLANEOUS				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MEAT	4	1	2	3																	
DAIRY PRODUCE	1			2																X	
MILL FLOUR				4				5				3	2	1							
EDIBLE OILS, FATS												3	2	1		4					
PASTAS				4								3	2	1							
SUGAR				1														X			X
WINE														2	1						
BEER																				X	
SOFT DRINKS											6	3	1	2	4	5				X	
CIGARETTES																					
SPUN COTTON					3								1	2				X	X	X	X
MADE UP TEXTILES		3											1	2							
KNITWEAR		2											1								
WEARING APPAREL	2	1			3																
COARSE FIBRES					3				4		5	2		1							
LEATHER				2	1							4		3			X				
FOOTWEAR												2		1			X				
PAPERBOARD	1																				
PRINTING														1							
COMPRESSES GAS	1																				
PAINTS, VARNISHES	2		1											2							
SOAP		2	1										4	3							
PETROLEUM						2										1					
MOULDED PLASTICS		2	1					7	3	6			4	5							
GLASS CONTAINERS								3				2	1								
BRICKS	1																				
CEMENT	1												2	3		4					
IRON and STEEL	3	1					2			5										X	
HAND TOOLS	1						2														
STRUCTURAL METAL PRODUCT	2	1					4			6			3								

Compiled from Chapter IV.1.

The second part of this summary refers to causes of underutilization that were raised in Chapter II.5 but which have not yet appeared prominently apart from this.

On the demand side no evidence could be detected to suggest that rhythmic changes in demand contributed to underutilization. The falling off in activity levels as indicated in Demand Factor 1 of Table IV.23. was the only temporal change of any significance and certainly does not refer to cyclical or other rhythmic configurations in demand. Again, neither equipment breakdown provision, nor the perishable nature of certain input categories was ever stated or reasoned to contribute to excess capacity.

The final factor with respect to demand refers to inability to enter or to significantly penetrate potential export markets. This is a major area of study in its own right and property validated conclusions on the effects on industrial efficiency and utilization levels of tariffs and trade policies would necessitate historical examinations of the strategy of import substitution policies, of the pattern of industrial development, and of policy alternatives in Ethiopia. A first hand undertaking of this magnitude was considered beyond the scope of the study. Recourse has been made to generally prevailing observations and to the paper by Guisinger (op. cit. Chapter III).

The following remarks, therefore, are probably more general than might be desired for present purposes, and in no way suggest quantitative assignations. They are directed primarily, though not exclusively, to those sectors where some aspect of excess capacity prevails.

Where industrial efficiency is considered in terms of the domestic resources required to save/earn foreign exchange then it appears reasonable to assert that the Ethiopian tariff system and other protective devices have aided the establishment and continued functioning of highly inefficient plants. Generally, resource costs and protection levels vary directly across the range of Ethiopian manufacturing industries. Despite this inefficiency, it is very probably socially profitable to maintain production in these industries since the resource costs are now, mainly, sunk costs and since the capital equipment has a less opportunity cost and probably little in the way of salvage value.

In common with many developing nations, the levels of protection have encouraged capital intensive enterprises and, within these individually, the use of more capital intensive methods of production. Tariff remissions operate on capital equipment and this together with an overvalued domestic currency conspire against relatively more labour using methods of production.

Apart from the adverse effects of these inefficiencies on the current and ongoing industrialization in Ethiopia, the contention in II.5 that some plants are unwilling to contemplate exports appears to be borne out on a general plane at least. Their quality/price non-competitiveness precludes a serious consideration of exports so that, as a remedy for excess capacity foreign markets do not constitute a serious proposition for certain Ethiopians products like wearing apparel, paints and varnishes or metal products. It is noted that this method of treatment of import substituting categories which have demand deficiencies should not properly regard the inability to export as a cause of underutilization. Such markets never existed and it is their potential as a remedy for excess capacity which has been considered. This has, unfortunately, proved negative.

Turning to input supplies, raw materials or spares and maintenance equipment, and remaining with trade policies, a comment is made on the import licensing and foreign exchange situation. Sectors and industries exhibiting a high imported material input dependence did not have any marked problems in securing these either with respect to import permits or the acquisition of foreign exchange. (Petroleum refining is an important sector which provided a temporary and little felt exception to this). This does not mean that a serious bottleneck could not arise from foreign exchange curtailment or changes in import licensing policies, simply that they did not appear as such during 1975/76. A downturn in coffee prices, or a poor harvest in this or oil seeds, for example, could produce a reversed situation in another period. In this case it is quite conceivable that foreign exchange earnings will be reallocated elsewhere. Balance of payments fluctuations will almost certainly be mirrored in input supply capabilities.

Apart from this there were other deficiencies and vulnerabilities. Thus soft drinks manufacturers and the metal-working sectors are tied to individual sources of supply. The international soft drinks franchisers enjoy monopolies with respect to the concentrated syrup input for their branded products and this occupies a high proportion of input costs. The metal-working sectors have not removed themselves from the original, participating foreign input suppliers. That is, Ethiopian plants have not sought more competitively priced inputs from elsewhere.

With respect to spares and maintenance equipment, the same general picture remains. Where a particular set of equipment was required then, providing plant and Corporation personnel could present a reasoned case for their request with the import licensing and control bank authorities the various permissions were forthcoming. Certainly a reasoned case had to be presented and this was investigated, particularly by the National Bank of Ethiopia but, since nationalization at least, and according to the various Corporations, responses have been favourable to the granting of foreign exchange. Delays were inevitable for unplanned replacements whether or not these replacements should have been foreseen, therefore implying lack of foresight, or were necessitated by unforseeable adversities. Additionally, some delays were occassioned by the particular type of order being placed and arising from the need to meet a specialized, uncommon and unstocked requirement. Examples were seen in the cases of soft drinks and coarse fibres production. An important element in ongoing work at Corporation level is the rationalization of spares and maintenance materials provision and this explicitly recognises the advantage in timely orders from foreign suppliers.

This provision of spares and maintenance was, however, only in the beginning stages of organization during 1975/76 and its success will largely depend on accurate feedback from plant level. The commonly observed existence of equipment which was idle for want of a relatively minor repair or adjustment, or equipment which was cannibalized to keep similar items operative was brought out in the first section of this chapter - refer, for example, to the discussion on the food industry. Such a situation does not augur well for an informed feedback and emphasises the dearth of personnel as a factor in underutilization. The situation does not, however, reflect a chronic lack of foreign exchange or denied import applications. It does, to repeat, reflect much more a lack of organizational facility, a lack of mechanics and technical personnel at shop floor level. Further discussion on this important aspect is deferred until the validity and significance of the results are assessed in the final chapter.

CHAPTER V:

CONCLUSIONS and DISCUSSION

This study attempted to establish if capacity utilization in Ethiopian manufacturing industry could be an important policy variable used to influence the levels of manufacturing output and employment. The results are mixed. These have to be shaped into clear conclusions for assessment of their validity and comment on their significance.

V.1 Objectivity

Chapter I provided a summary of the study in prospect and a summary in retrospect is not needed now. Several issues were subsequently discussed in more or less detail. Some of these would automatically be regarded as significant per se and others often receive only secondary consideration or form footnotes in literature on industrial development in poor nations. Manufacturing capacity utilization probably belongs more to the latter group, and the studies dealing with methods of production and choice between these, which has had and continues to occupy a prominent place in development literature, and which impinged on the present discussion a few times in Chapter II, is a significant, mainstream topic.

Despite the relative lack of documentation on the present topic, part of the motiviation was derived from the objective of comparing past, seemingly 'glowing' results on the potential of increased utilization as an important variable in the creation of employment and expanded output levels with a given capital stock. Note, of course, that although this view is fairly common, it does not reduce to a homogeneous or uniform doctrine. This notwithstanding, there was no attempt made to list individual differences across contributions on the subject. Therefore, and to a large extent, the major issue being dealt with has been regarded generally and subjected to specific findings.

On the analytical aspects chosen, and on the hypotheses examined there was considerable exercise of personal judgement. Inevitably, this implies differing degrees of objectivity. Even a passing glance at the development of economic thought would indicate the ineffectiveness of trying to persuade other people to agree in such subjective judgements through refined rationalizations of them. The alternative, well-known, is simply to be candid about one's preconceived notions and, though some of these unavoidably remain implicit, they permit readers to form their own viewpoint.

More obviously, subjectivity arises from the non-inclusion of issues known to have been covered in the literature on underutilization. Theories of utilization based on management control were not given any systematic attention. The problem of the effects of psychological and physiological rhythms on productivity were likewise treated. The subjective element arises not so much in the omission of issues per se but in the judgement that they have little to offer. This is not an illegitimate procedure once the scope of the study has been stated but does mean that no certification of the inutility of untreated issues is possible.

Therefore the study does not meet precisely defined standards of objectivity/comprehensiveness. It is selective but not arbitrarity so. It has retained and modified what was regarded as worthwile and discarded that which was not so regarded.

With this brief preface on objectivity, the validity and significance of the reults are discussed.

V.2. Validity and significance of results

The discussion in Chapter IV was concerned with an enumeration of cases. Some coherence in the treatment of observations was provided by the organization of a few key concepts in Chapter II. These were, 'the concept of capacity' in II.1, 'physical aspects of capacity' in II.2, 'profitability and utilization' in II.3, 'employment and utilization' in II.4, and 'causes of underutilization' in II.6. In different parts of Chapter IV all of these found applicability and proved useful in structuring the discussion.

The discussion in Chapter II.1 on alternative concepts and measures of capacity was essentially a ground clearing exercise for the concept of capacity that was adopted herein. To a large extent it glossed over several sophisticated micro- and macro-theoretical statements and empirical works on capacity utilization. This was predicated on the requirement of achieving a measure suitable for present purposes and most work on capacity utilization, including that referred to in II.1, has been within an industrialized nation context. The emphasis in such studies has been on output losses arising from deficient aggregate demand and other cyclical variations in output. On the other hand, several past studies concentrated on what might be called the "micro engineering aspects of production" in which precise engineering production functions, and hence observations on capacity, are estimated.

Although such studies have some relevance herein - thus deficient demand played an important role as a factor in underutilization, and machine capabilities were integral to the utilization index - they also fall short of what is required. It was recognised that a prime need in the present study would be to go beyond a numerical statement of capacity output and utilization levels in order to search out the obstacles to output and employment expansion. Therefore, and contingent also on considerations of convenience and the provision of comparisons across sectors and industries, it was desired to have a uniform and straightforward capacity concept/measurement procedure.

This was achieved in Chapter II.2 by the construction of a capacity utilization index based largely on a capacity output denominator determined by physical production capabilities of machinery and equipment. The nature of this index provides the starting point for the discussions on empirical results.

The denominator of the utilization indexes represent sustainable capacity output figures. They are not derived from once-off peaks that might be achieved for minimal durations. As such, and in physical output terms they also reasonably represent conservative estimates of foregone output during the period of enquiry. Referring to the Uc column of Table IV.1, and to the summary utilization data of Table IV.2 it may be concluded that much potential output has been foregone.

Chapter II.3 provided a significant departure from the tenor of the rest of the study. Here the concern was with the profitability elements to be considered in those cases where a move to increased utilization was physically possible. The main point to be established was that an increase in utilization could result in lower profits due to variability in input prices and, the role of wage differentials stuck out as a possible, important cost factor which could cause the dichotomy. These aspects were examined herein and their importance was derived from the varied implications for policy that are occassioned by different causes of idle capacity.

There is little new in the observation that optimum output levels could differ between the physical and economic. J.M. Cassels (1937) stated that optimum output levels varied directly with the valuation of fixed factors and inversely with the prices of variable factors. Alfred Marshall (1930) saw that the economies from higher utilization increased with the value of capital. This part of his analysis went on to pay careful attention to obsolescence elements which further aggravated the waste of idle capital. The differences, then, between economic and physical capacity are long recognised and give rise to the general observation that, ceteris paribus, the more capital intensive is a process, the more sense it will make to economise through increased utilization levels.

But varying variable input costs make other things far from equal and non-recognition of this, together with other simplyfying assumptions have led to many studies on factor prices and factor proportions, aimed at shedding light on methods of production and choice between these, which pay little attention to the possible influence of varying utilization levels. Indeed the whole question of optimal economic utilization is pre-empted in production studies using input stocks as opposed to flows. If flows were to be examined, one useful area for study might be the examination of substitution rates between these flows - that is, substitution possibilities should include explicit recognition of the time element which distinguishes factor stocks from factor flows.

Based on these general remarks the logical necessity of considering the effects on profitability levels of varying utilization levels is believed not to have been diminished because of the limited applications such analysis found herein. The limited application arose because of the set of circumstances prevailing in Ethiopia. But of the conditions necessary for profitability analysis, the lack of scope for increased utilization is not missing. The lack of demand is certainly important but this still leaves many observations with low utilization levels.

Of the sectors having adequate demand and low utilization levels, notably most of food, beverages, leather and footwear, all but footwear display little scope for an increase in the time intensity of operation. Their low utilization levels are derived from input supply deficiencies but only in leather production is this related primarily to raw materials. In two major industries, food and footwear, and in over half of the plants in the beverages industry the deficiencies relate to personnel. The upshot of this is that the dearth of various skill levels and varying input quality has resulted in substantial losses in manufacturing output. Requirements and proposals for policy have been made in this regard.

Since, however, these low utilization levels are not due to low time-intensities of operation, being derived mainly from within plant efficiency defects, or raw material defects, there is almost no prospect of employment gains in the rectification of these defects. Beyond the managerial and technical personnel requirements, existing labour forces will be more, rather than less than adequate to cope. These industries provide the mixed nature of the results. Output gains are potentially substantial; employment gains are almost negligible.

This result is contrary to the experience of certain socialist countries in the early stages of their industrialization as reported by Kabaj, (op. cit. Chapter I.2.) Of course, these countries even though they could be described as less developed in the period for which the results were reported were considerably more advanced than Ethiopia today, and the point is raised to emphasize the underlying elements of a utilization index.

Productive capacity is commonly regarded as a function of input time, equipment and labour losses, and equipment productivity. The latter is often assumed as given, that is, an previously determined by the nature of the installation. This is certainly true at any point in time but to proceed to view utilization as depending solely on the time inteksity of operation is incomplete since it tends to neglect efficiency aspects of production. The effects of these can, in turn, have major effects on utilization so that bald statements on utilization levels alone cannot when these levels are low, be taken to imply that employment gains automatically result from utilization increases. As a starting point, and one employed herein, the product of time worked and machine capabilities expressed in output terms, provides a good first approximation to capacity output. Provision should be made, however, for major modifications arising from detailed examination of efficiency issues. In the Ethiopian case, these can have pronounced effects in even the very short-run period.

Turning now to sectors and industries where demand factors played a major role in determining the utilization levels, there is clear scope for both increases in output and employment through increased utilization. This arises from both an increased time-intensity of operations and from the employment of unused sections of equipment. Even here a cautionary note is an order and refers, again, to efficiency aspects of production. Should prevailing demand rigidities ease off then many of the sectors in this category will not be any less plagued by poorly functioning, poorly maintained equipment. A call for increased output will clearly aggravate existing personnel deficiencies.

Apart from three or four single plant entries in Table IV.1 it is seen that only sugar refining and textiles display high utilization levels. The former still maintains financial and technical links with its European turnkey promoter and, within its existing set of operations, exhibits organised and efficient production. Textiles, in particular the basic sector spinning cotton, displays high utilization levels both in terms of the time-intensity of operations and expected output levels.

Even in textiles, however, high levels of utilization are not necessarily synonymous with generally efficient operations. James Pickett, Director of the David Livingstone Institute of Overseas Development Studies at the University of Strathclyde, and Robert Robson of the same Institute, have found that output levels per man-hour in the cotton spinning sector in Ethiopia are as low as one-sixth of the corresponding levels in some, Far Eastern and European countries (Personal communication 1977).

This pervasiveness of productivity defects across a considerable range of Ethiopian manufacturing has been outlined to aid the present examination of capacity utilization. Even in textiles, where the often used parameters - time-intensity of operations and equipment output capabilities - yielded high utilization rates, the notably low labour productivity levels are an important finding in their own right. In the present study such a result is important because it implicitly makes apparent that discussions on capacity utilization, per se, are but one facet of several industrialization and productivity issues. More specifically, comparable exercises to the one undertaken in textiles by Pickett and Robson are not available for other sectors and industries so that the generality of conclusions and the applicability of results that were attempted on capacity utilization are subject to the very obvious provision that they are based on a defined set of testable propositions and empirical observations. This is one aspect of the issues raised on objectivity/comprehensiveness in Section 1 of this chapter.

On a practical level the significance of results turns very much on the possibility of corrective measures being realised. One outstanding feature has been the common requirement for many sectors and industries of completely reorganised and restructured production programmes. The need for this was occassioned by low efficiency which, in turn, was largely due to higher skill level deficiencies. Although not quantified, it is believed that a considerable lacunae in skill levels was occassioned by the changeover in Ethiopia to a military government in 1974. Since then, both Ethiopian and expatriate personnel have left. In Chapter IV.1 the exact nature of skill deficiencies in various sectors was pinpointed. Many of these deficiencies were politically occassioned. In addition, there is a civil strife situation in Northern Ethiopia, the effects of which on plants concerned was also eplicated in IV.1. These remarks, however, should not be taken to imply that all required organizational and technical personnel and facilities were present prior to the changeover in Government. But shortfalls in this direction were aggravated as a result.

The upshot of this is fairly clear. Ethiopian industry is seriously disarrayed and the indigenous Ethiopian input cannot but benefit considerably from circumspect assistance from abroad. The chances of this being realised depend considerably on the present ruling junta accepting the urgency of required corrective measures, and to exhibit willingness in their implementation in the form of financial assistance and other vigorous co-operation. Without this, the functioning of plants will further deteriorate and, although the magnitude of some of the corrective proposals is very large, which itself emphasises the requirement of fully pledged government committment, the prospect of Ethiopian industry as an agent of growth and employment will be dismal.

It seems reasonable to assert that the study on capacity utilization has, in its attempt to pinpoint the causes of idle capacity, raised questions on the whole structure and productivity of Ethiopian manufacturing. This has prevented easily categorised "cause of under-utilization" to "remedy for underutilization" prescriptions. The emphasis has been on the possibilities revealed for output growth and employment creation. The potential for these is considerable but because of the general inefficiency found, the remedial measures must extend well beyond the issues generally regarded as within the capacity utilization domain. Strictly put, this means that the hoped for importance of capacity utilization as a policy variable was over-optimistic and, more importantly, potential output and employment gains will become more remote if measures for overall rationalized production are not put in motion.

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