# Ghana's Textile Sector: Cost Structure and Efficiency.

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## ABSTRACT OF THESIS.


The Ghanaian textile sector, after decades of protection, is today operating in a free trade environment. This means that it is now having to compete with imports in terms of price and quality.

Thus, in this study, it is argued that efficiency of production and cost cutting measures are important in aiding the textile sector in Ghana to become more competitive with imports. The efficiency and cost structure of the Ghanaian textile sector are therefore examined in an attempt to estimate the degree of technical inefficiency and the effect of cost cutting measure on the price of individual textile firms' output. Technical inefficiency is estimated using a stochastic frontier approach.

The main findings are that firms' technical inefficiency declined to relatively low levels as they became more exposed to foreign competition. Also, the competitive position of Ghanaian textile firms, as far as competition with imports is concerned, can be greatly enhanced as a result of the various cost cutting measures looked at. This resulted in some firms achieving an export potential as a result of the potential reduction in their price.

Finally, some policy options are explored. These include: change in tax policies; change in fuel water and power charges; a devaluation of the exchange rate; and incentives for capital investment.

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A. Millet.

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## ABBREVIATIONS.

BOP: Balance of Payments.

CAD: Computer Aided Design.

CBS: Central Bureau of Statistics.

CDB: Cotton Development Board.

CES: Constant Elasticity of Substitution.

CET: Constant Elasticity of Transformation.

COLS: Corrected Ordinary Least Squares.

DEA: Data Envelopment Analysis.

DMU: Decision Making Unit.

DRC: Domestic Resource Cost.

EC: European Community.

EEC: European Economic Community.

EDT: Total Debt Outstanding.

ERP: Economic Recovery Programme.

GATT: General Agreement on Tarrifs and Trade.

GCC: Ghana Cotton Company.

GCCQ: Ghana Cotton Company Questionnaire.

GDP: Gross Domestic Product.

GIC: Ghana Investment Centre.

GLS: Generalized Least Squares.

GNP: Gross National Product.

GPF: Generalised Production Function.

GIC: Ghana Investment Centre.

GIHOC: Ghana Industrial Holding Company.

IDC: Industrial Development Corporation.

IFS: International Financial Statistics.

IMF: International Monetary Fund.

INT: Interest.

LDC: Less Developed Country.

LTA: Long Term Arrangement.

MLE: Maximum Likelihood Estimator.

MFA: Multifibre Arrangement.

ODI: Overseas Development Institute.

OECD: Rganisation for Economic Cooperation and Develpoment.

PEP: Productivity Enhancing Programme.

PPP: Purchasing Power Parity.

SGM: Symmetric Generalised McFadden.

STA: Short Term Arrangement.

TDS: Total Debt Service.

TOT: Terms of Trade.

UNIDO: United Nations Industrial Development Organisation.

WB: World Bank.

WDR: World Development Report.

XGS: Exports.

# 1. INTRODUCTION.

The Ghanaian textile sector, after having been protected for decades in the pre-liberalisation period preceeding 1983, is today operating in a open market environment. This has meant that the sector is now open to competition from imports. Thus, efficency of production and cost cutting measures have become an important component in aiding Ghana's textile sector to compete in this liberalised economic climate.

This study is therefore concerned with the cost structure and efficiency of the Ghanaian textile sector. The Ghanaian textile sector is reviewed, in Chapter (2), in order to put the textiles sector in perspective. Chapter (3) looks at the competitiveness of Ghanaian cotton cultivation relative to world cultivation. The study then goes on to examine the world texiles industry, in Chapter (4), in an attempt to shed some light on the comparative advantage which developing countries might potentially enjoy in view of the fact that their labour costs are relatively lower.

Chapter (5) reviews the history of textiles in Ghana, as well as summarising the state of the Ghanaian textiles sector as seen at the time the fieldwork was conducted.

Chapter (6) reviewed the literature on the measurement of productive efficicency, while Chapter (7) gives a brief account of the questionnaires and the method of data collection. Chapter (8) is involved with estimating technical inefficiency in six textiles firms for the period 1979-89, and Chapter (9) explores cost reducing measures to improve the competitiveness of textiles. Policy options are explored in Chapter (10), and a summary of the study is given in Chapter (11).

## 2. GHANA: ECONOMY.

### 2.1. Introduction.

After a period of relative prosperity in the 1960's, Ghana experienced a protracted economic decline in the following two decades characterised, in varying intensity, by persistent high inflation, declining production and exports, flourishing illegal activities, and political instability. A gradual decline in per capita income increased the incidence of absolute poverty and was accompanied by a worsening of income distribution, growing unemployment, and the emigration of skilled professionals. Discouraged by this deterioration in the economy, aid donors gradually reduced their support, which further worsened the balance of payments situation.

Although the economic deterioration was partly caused by external factors, such as the two oil price shocks, the sharp rise in world interest rates, and a collapse of primary commodity prices in the early 1980's, the main cause was inadequate economic policies. Beginning in 1983, a major reorientation of economic policies took place with the adoption of the Economic Recovery Programme, (ERP), under the tutelage of the International Monetary Fund, (IMF), and the World Bank, (WB). The key reforms include import liberalisation and the abolition of import licensing; massive devaluation of the Cedi; the removal of price controls; the elimination of the budget deficit; and reduced public sector borrowing from the banking system.

It remains to be seen whether the gains achieved to date will be consolidated. Cries of success would be premature. On the balance of payments front, Ghana will continue to be unhealthily reliant on aid. Prices of the two main exports - cocoa and gold which account for 70 per cent of foreign earnings - are forecast to remain relatively weak. Timber exports will be constrained too by environmental and conservation considerations. Aid dependence is heightened by the reluctance of foreign investors to commit new funds to Ghana, and a particularly worrying aspect of this dependence is the increasing reliance on foreign technical assistance which is taking place.

Finally, industry, while having been weakened by prolonged disinvestment in the early 1980s, is, on the whole, having to face competition from imports while using old and run-down capital stock.

This chapter is divided into seven sections. After the introduction in Section (2.1), Section (2.2) compares the relative size of industry and agriculture. Section (2.3) gives a brief review of the industrialisation push started by Nkrumah in the 1960s. Section (2.4) is interested in what went wrong and the resulting economic downturn of the 1970s and early 1980s. Section (2.5) gives an overview of the ERP of 1983. Section (2.6) looks at the ERP's successes and failures under the following sub-sections: (2.6.1) trade, (2.6.2) investment, (2.6.3) aid, (2.6.4) credit and banking, (2.6.5) industry. The summary is in Section (2.7).

## 2.2. Employment and Output in Industry and Agriculture: 1960-83.

Ghana was known as the Gold Coast until her political independence from the British in 1957. The change of name was implemented primarily to take account of the belief that the Akan ethnic group, which made up about 45 percent of the total population[1], migrated to its present location from the old Ghana Empire when it fell in the 13th century. The change in name was also meant to serve as a mark of national identity and hence as an inspiration to the then emergent liberation movement in Africa[2].

The country is bordered by three former French colonies: on the west by the Ivory Coast, on the northwest by Burkina Faso, and on the east by Togo. The southern part of the country is a 554 km of Atlantic coastline facing the Gulf of Guinea.

Agriculture is by far the largest sector of the economy. As can be seen from Table (2.1), its contribution to GDP at constant prices was 46.5 percent in 1970. By th early 1980s its share was approximately 60 percent. The share of industry in GDP was 18.3 in 1970, rising to 21.0 percent in 1975, and falling sharply to 11.4 percent in 1980 and further to 6.2 percent in 1982. The share of the services sector fell from 40.7 percent of GDP in 1965 to 27.6 percent in 1980 and then rose sharply to 36.4 percent in 1982. Huq (1989)

## Percentage Distribution of GDP by Industrial Origin at Current Prices, selected years.
## Table 2.1.

| | 1965 | 1970 | 1975 | 1980 | 1982 |
|---|---|---|---|---|---|
| **Agriculture** | 40.8 | 46.5 | 47.7 | 61.0 | 57.3 |
| **Industry** | 18.6 | 18.3 | 21.0 | 11.4 | 6.2 |
| **Services** | 40.7 | 35.3 | 31.4 | 27.6 | 36.4 |
| **GDP** | 100 | 100 | 100 | 100 | 100 |

**Source: Huq (1989), p.51.**

indicates that the sharp rise of the service share in 1982 is due to the rise of the share of the wholesale and retail sub-sector during the 1980-82 period as a result of high prices during this period.

Table (2.2) shows the occupational distribution of the labour force. It can be seen from this that in 1960, agriculture engaged 61.5 percent of the total labour force, declining to 57.0 percent by 1970. While agriculture's proportionate share of the labour force fell in this period, both manufacturing and services recorded substantial employment growth rates. Huq (1989) points out that this trend is in line with the universal performance of these three sectors in the course of economic development.

## 2.3. The Industrialisation Strategy.

Industrialisation was an official policy of the government as far back as 1947 when a statutory body - the Industrial Development Corporation (IDC) - was established to 'foster industrial growth' (Grayson 1971, p.73). Among its objectives was 'securing the investigation, formulation and carrying out of projects for developing industries in the Gold Coast'[3].

The emphasis on industrialisation was also apparent in Nkrumah's development plans, issued shortly after he became Prime Minister of the Gold Coast Colony in 1951 and after independence in 1957:

## Distribution of Employment by Industries.

Table 2.2

| | 1960 | | 1970 | |
|---|---|---|---|---|
| | '000 | % | '000 | % |
| **Agriculture** | 1581 | 61.5 | 1787 | 57.0 |
| **Mining** | 48 | 1.9 | 31 | 1.0 |
| **Manufacturing** | 250 | 9.7 | 380 | 12.1 |
| **Utilities** | 14 | 0.5 | 12 | 0.4 |
| **Construction** | 89 | 3.5 | 74 | 2.4 |
| **Commerce** | 369 | 14.3 | 427 | 13.6 |
| **Transport & Communic** | 68 | 2.6 | 84 | 2.7 |
| **Services** | 154 | 6.0 | 342 | 10.9 |
| **Total** | 2573 | 100.0 | 3137 | 100.0 |

**Source: CBS, Poulation Census, 1960 and 1970.**

"Our first Development Plan [1952-7] concentrated on communications, public works, education and general services. It prepared the way for our industrialisation drive."

"This was the keynote of our Second Development Plan [1959-64] which will provide for the establishment of many factories, of varying size, to produce a range of hundreds of different products."[4]

Nkrumah emphasised the role of import-substituting domestic manufacturing industries in order to reduce foreign dependence for those goods. Thus, industrialisation was originally conceived:

"Primarily as a means of achieving economic independence and growth, rather than as a response to foreign exchange needs."[5]

According to the Economic Survey (1962) it was not until 1962 that the country had its first serious balance of payments deficit, and reference was made to "helping the balance of payments situation" as a primary reason for encouraging domestic production.

To speed up the industrialisation process, Nkrumah introduced a package of incentives for the manufacturing sector in the 1960s. For example, the Capital Investment Act was passed in 1963. this act, as is pointed out in the Ghana Economic Review (1973-75), offered a wide range of fiscal and other concessions to potential investors including: tax holidays of up to five years; accelerated depreciation rates for building plant and machinery;

exemption from customs duties on machinery, raw materials, spare parts and fuel; deferment of company registration fees and stamp duty for up to five years on capital invested in approved projects; guaranteed remittance of capital and profits and employment tax credit for a period of up to ten years.

Apart from these incentives, industry was given protection. This involved the imposition of tariffs, quotas and complete restrictions on the importation of certain manufactured products. Steel (1972), for example, points out that the import licensing system, which was established in 1961, became an important determinant of investment and production in manufacturing.

Thus, the main build-up of the industrial sector took place in the 1960's, under Nkrumah. But, as Killick (1978) points out, efficiency was low and industrial output growth was poor. In fact, Steel (1972) used the Effective Rate of Protection (ERP), and Leith (1974) used the Domestic Resource Cost (DRC) to examine the efficiency of industries in Ghana.

Steel's work indicates that if tariffs and licensing had been removed in the period being studied (i.e. 1967-68), only 15.4 percent of the firms surveyed would have been competitive with imports at the official exchange rate, and devaluation by 50 percent would have raised that figure only up to 25.6 percent. Leith's study shows that the ERP varied widely for the firms surveyed in the period 1968-70, and gives negative value added at world prices in a number of instances.

The results of Steel and Leith cast doubts on the efficiency of import-substituting industrialisation in Ghana as pursued up to 1970. Steel concludes:

> "These firms represent a waste of investment funds and a failure of import substitution, if they are continually operated at the level and cost structure observed in 1967-8. As of that year, Ghana's industrialisation and import substitution policies were extremely unsuccessful in establishing a structure and level of manufacturing output which could efficiently reduce foreign exchange requirements and stimulate growth of GNP."

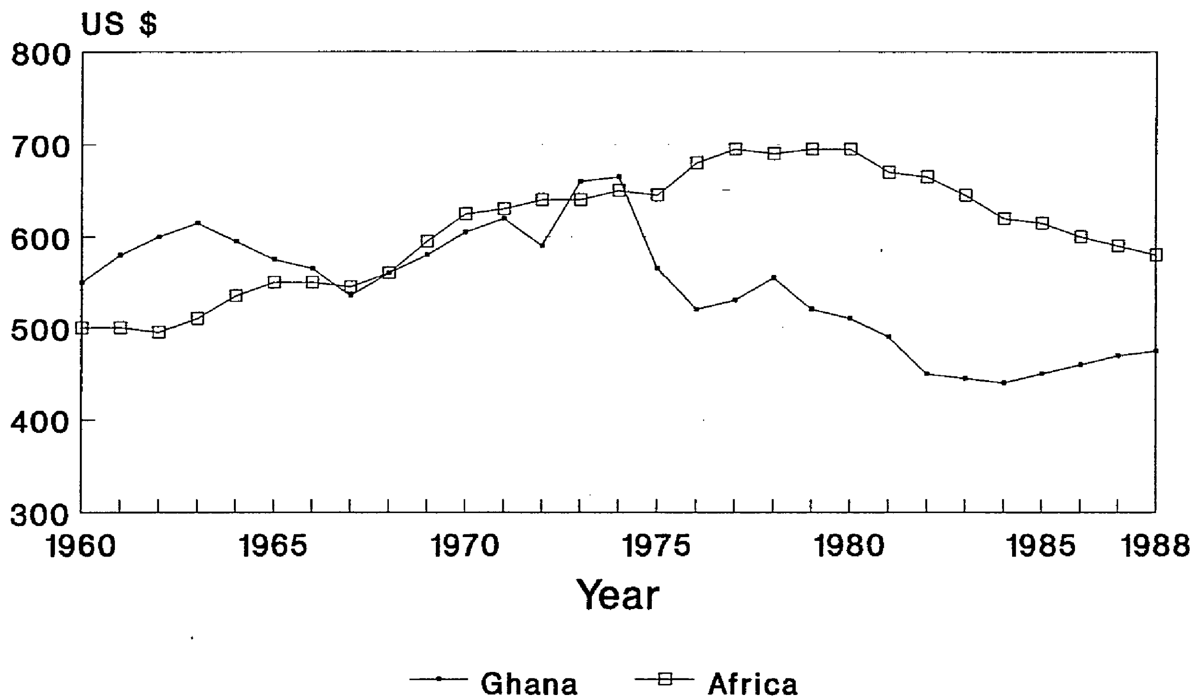
Therefore, despite a rising investment to GDP ratio between 1958-65, as indicated by Brown (1972), the real per capita GDP, which grew steadily in the period 1960-63 and was above the African average, fell sharply in the 1963-67 period and was by then below both its 1960 level and below the African average real per capita GDP as can be seen from Figure (2.1).

Steel (1972) therefore concludes that:

> "there is no evidence that the industrialisation programme was successful in stimulating a rise in income during the period under study, and it may have been partly responsible for the decline in real per capita income, to the extent that it diverted resources away from other sectors."

That the economic decline of this early period of independence was not more severe is explained by the following factors. Firstly, the export prices of cocoa and timber were buoyant,

Per Capita Real GDP for Ghana, Africa,
(US $ of 1985).
Figure 2.1.




Source: Africa see OECD, (1990);
Ghana see IMF, IFS yearbook, various.

while export volumes were increasing. Secondly, apart from the ill-considered industrial investments, Nkrumah spent more liberally than the colonial regime on health and education. Therefore, the physical indicators of welfare all showed significant improvement. And thirdly, as pointed out by Green (1987), sterling balances accumulated in the late colonial period were still there to be drawn from, while various other capital inflows had not yet dried up.

## 2.4. The Downturn of the 1970s and Early 1980s.

After only fifteen years of independence, and before the exasperating factors that led to the economic collapse of the early 1980s, key features of a counter-productive strategy were visible (Killick, 1978). During most of the 1970's and early 1980's Ghana suffered an economic malaise marked by shrinking output, high and accelerating inflation, and growing external imbalances.

With a population growth of about 3 per cent a year in this period (see population figures in Table (2.3)), per capita income was substantially eroded. Figure (2.1a) plots real per capita GDP for the period 1955 - 1988. Three trends are discernible: a fluctuating but rising trend from 1955 to 1974; a sharp declining trend from 1975 to an all time low real per capita GDP in 1984; and then a mild recovery from 1985 to 1988. Thus as ODI (1988) points out, and as revealed by Figure (2.1a), it was in the 1970s that Ghana changed from being a middle-income to becoming a low income country - the only African

# Real, Per Capita and Real Per Capita GDP, Population and Deflator. (1985 = 100)

# Table 2.3.

| | GDP in Billions of Cedis | GDP Deflator 1985=100 | Real GDP ('85=prices) Billions of Cedis | Population Millions | Per Capita GDP | Per Capita Real GDP '85 prices ('000s) |
|---|---|---|---|---|---|---|
| 1955 | 0.6 | 0.36 | 174.1 | 5.83 | 106.3 | 29.9 |
| 1956 | 0.6 | 0.36 | 177.2 | 6.02 | 106.8 | 29.4 |
| 1957 | 0.7 | 0.37 | 181.6 | 6.20 | 108.7 | 29.3 |
| 1958 | 0.7 | 0.38 | 188.6 | 6.39 | 111.3 | 29.5 |
| 1959 | 0.8 | 0.38 | 210.1 | 6.58 | 123.3 | 31.9 |
| 1960 | 0.9 | 0.41 | 224.8 | 6.78 | 128.5 | 33.2 |
| 1961 | 0.9 | 0.41 | 238.6 | 6.85 | 141.6 | 34.8 |
| 1962 | 1.0 | 0.42 | 250.2 | 6.93 | 143.9 | 36.1 |
| 1963 | 1.1 | 0.44 | 258.8 | 7.01 | 157.1 | 36.9 |
| 1964 | 1.2 | 0.47 | 264.4 | 7.40 | 162.2 | 35.7 |
| 1965 | 1.5 | 0.54 | 268.0 | 7.74 | 193.8 | 34.6 |
| 1966 | 1.5 | 0.57 | 268.3 | 7.91 | 189.6 | 33.9 |
| 1967 | 1.5 | 0.58 | 260.2 | 8.08 | 185.6 | 32.2 |
| 1968 | 1.7 | 0.62 | 277.0 | 8.26 | 205.8 | 33.5 |
| 1969 | 2.0 | 0.68 | 293.2 | 8.44 | 237.0 | 34.7 |
| 1970 | 2.3 | 0.71 | 313.1 | 8.61 | 267.1 | 36.4 |

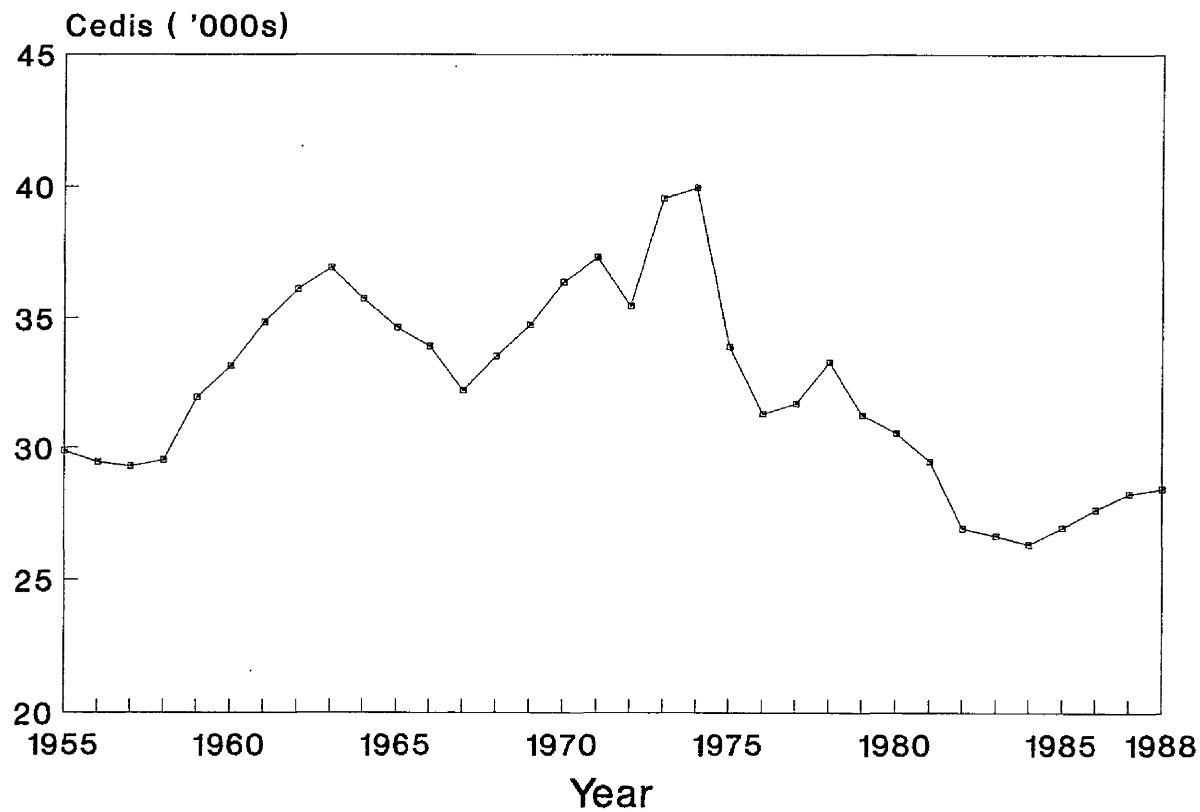
**Source: IMF, IFS yearbook, various.**

# Real, Per Capita and Real Per Capita GDP, Population and Deflator. (1985 = 100) Table 2.3 (cont)..

| | GDP in Billions of Cedis | GDP Deflator 1985=100 | Real GDP ('85 prices) Billions of Cedis | Population Millions | Per Capita GDP | Per Capita Real GDP '85 prices ('000s) |
|---|---|---|---|---|---|---|
| 1971 | 2.5 | 0.75 | 330.5 | 8.86 | 282.2 | 37.3 |
| 1972 | 2.8 | 0.87 | 322.2 | 9.09 | 308.0 | 35.4 |
| 1973 | 3.5 | 0.94 | 371.4 | 9.39 | 372.7 | 39.6 |
| 1974 | 4.7 | 1.21 | 384.0 | 9.61 | 489.1 | 40.0 |
| 1975 | 5.3 | 1.58 | 334.6 | 9.87 | 537.0 | 33.9 |
| 1976 | 6.5 | 2.03 | 322.8 | 10.31 | 630.5 | 31.3 |
| 1977 | 11.2 | 3.39 | 330.1 | 10.41 | 1,075.9 | 31.7 |
| 1978 | 21.0 | 5.86 | 358.1 | 10.75 | 1,953.5 | 33.3 |
| 1979 | 28.2 | 8.14 | 346.7 | 11.09 | 2,542.8 | 31.3 |
| 1980 | 42.9 | 12.36 | 346.7 | 11.34 | 3,783.3 | 30.6 |
| 1981 | 72.6 | 21.29 | 340.6 | 11.55 | 6,285.7 | 29.5 |
| 1982 | 86.5 | 27.35 | 316.0 | 11.73 | 7,374.3 | 26.9 |
| 1983 | 184.0 | 57.83 | 318.0 | 11.92 | 15,436.0 | 26.7 |
| 1984 | 270.6 | 82.90 | 326.4 | 12.39 | 21,840.0 | 26.3 |
| 1985 | 343.0 | 100.00 | 343.0 | 12.72 | 26,965.0 | 27.0 |
| 1986 | 511.4 | 141.70 | 360.9 | 13.05 | 39,187.0 | 27.7 |
| 1987 | 746.0 | 197.30 | 378.2 | 13.39 | 55,713.0 | 28.2 |
| 1988 | 1,057.9 | 263.30 | 401.7 | 14.13 | 74,869.0 | 28.4 |

**Source: IMF: IFS 1984,88, Jan. 91.**

Real Per Capita GDP (1985 prices).
Figure 2.1a.




Source: IMF; IFS yearbook, various.

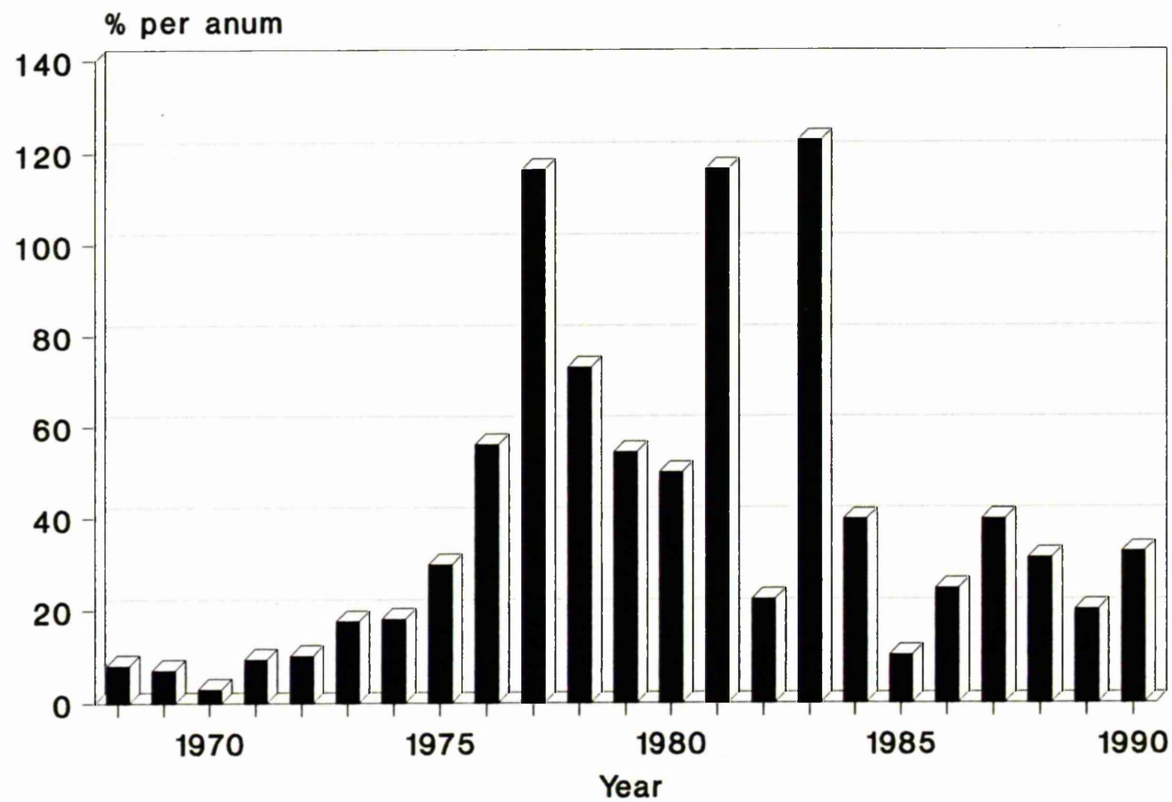
country known to have made such a transition.

The performance of inflation, for the period 1968 to 1990, is illustrated in Figure (2.3). This can also be divided into three periods: a period of relatively low inflation in the 1968-1974 period (i.e below 20 percent); a period of predominantly high inflation from 1975 to 1983, with three years, 1977, 1981 and 1983 having over 110 percent inflation and a peak of 123 percent in 1983; and a period of relatively moderate inflation from 1984 to 1990 with an average inflation value of approximately 23 percent. Thus we can see that the period 1975-83 was a period of extremely high inflation.

By 1982, the country had incurred large external payments arrears. Figure (2.8) shows Ghana's balance of payments situation in the period 1960 to 1989. The remarkable feature which can be seen from this figure is that there was a BOP deficit for 16 out of the 24 years in the period 1960 to 1983 with three years having a deficit of over $100m, (1974, 1976 and 1983), and one year, 1981, having a deficit of nearly $300m. In the period 1984 to 1989, this situation was drastically reversed with an overall surplus being recorded for every year except 1986, and a surplus of over $100m for each of the three years in the 1987-89 period. The conclusion to be drawn from this is that the BOP deficit in the 1970s and early 1980s was spiralling out of control.

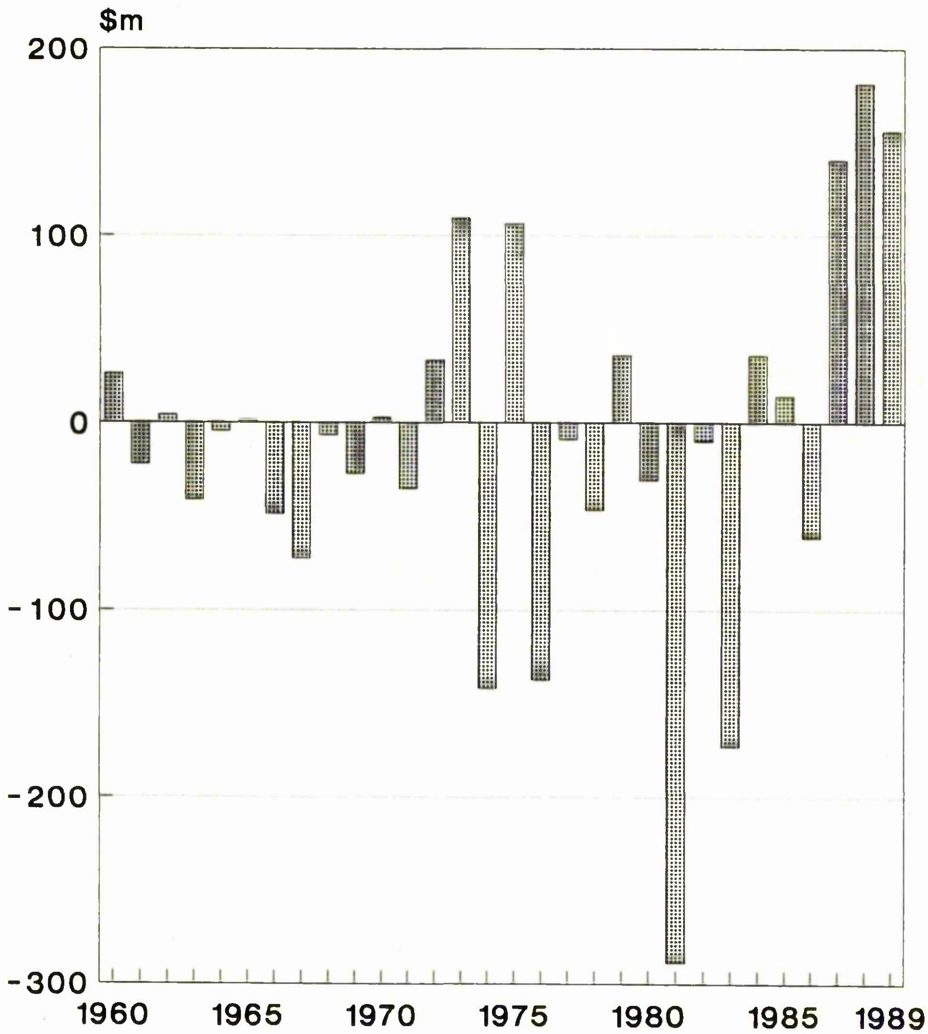
Figure (2.9) gives a graphic picture of government finances in real terms for the period 1965 to 1988. From this, it can be seen

Inflation in Ghana: 1968-1990.
Figure 2.3.



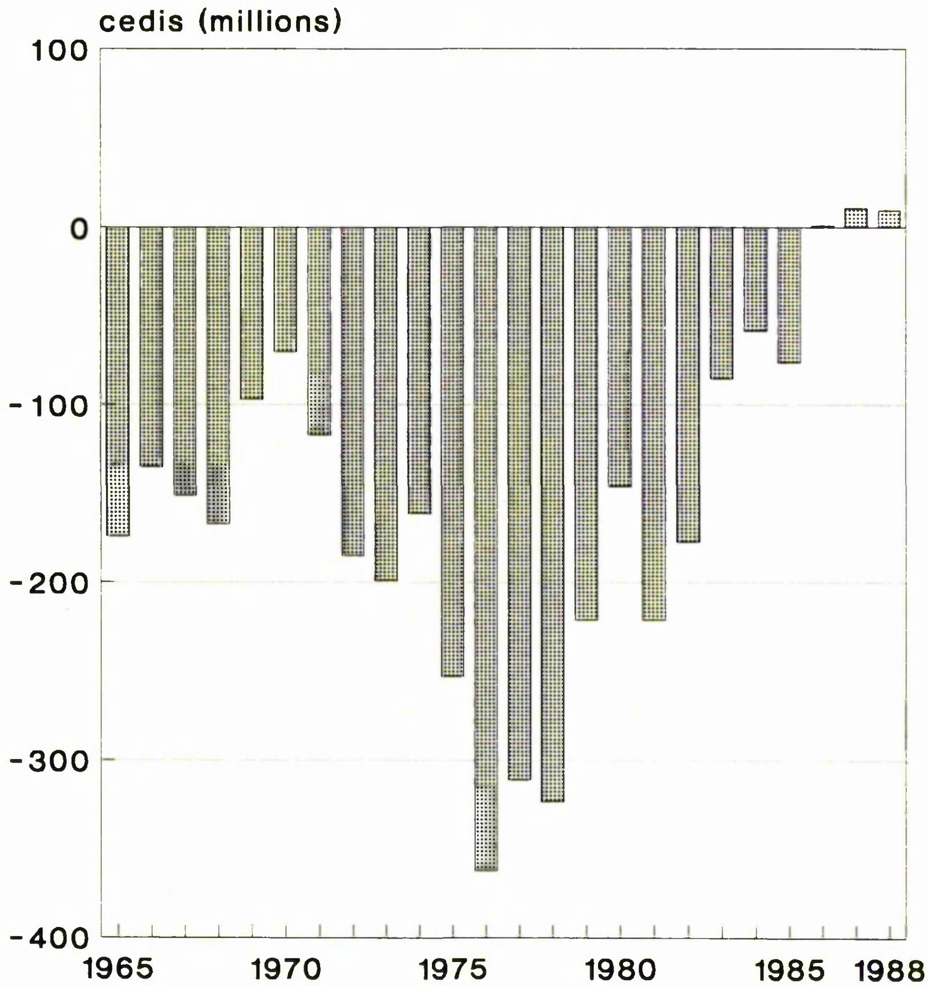

Source: IMF, IFS yearbook, various.

Balance of Payments: Overall Balance.
Figure 2.8.




Source: IMF, IFS Yearbook, various.

Real Government Finance: Deficit/Surplus
at 1985 prices
Figure 2.9.




Source: IMF, IFS Yearbook, various.

that a budget deficit was incurred in the twenty one year period between 1965 and 1985. This showed an accelerating trend in the 1965 to 1975 period with a high of over 350 million cedis being reached in 1975. A falling trend is shown in the 1975 to 1988 period, with the budget being in slight surplus in real terms for each year in the 1986-88 period. Thus a great deal of fiscal imprudence was exhibited by the respective Ghanaian governments for nearly three solid decades.

As can be seen from Table (2.4), domestic saving and investment fell away increasingly rapidly from an average of 10.9 percent of GDP and 11.5 percent of GDP respectively in the 1971-75 period, to 5.6 percent and 5.1 percent respectively in the 1976-82 period. Domestic savings was as low as 0.9 percent of GDP in 1983.

Figure (2.11) shows the increase in industrial output and employment from 1963 to peak in 1974. Then an exponential and rapid fall can be seen in both employment and output from 1975 to 1988. The volume of cocoa exports, given in Figure (2.5), showed a steady trend in the period 1960 to 1973, after which a sharply falling trend can be seen for the period 1974 to 1982, followed by a mild recovery in the 1983-88 period.

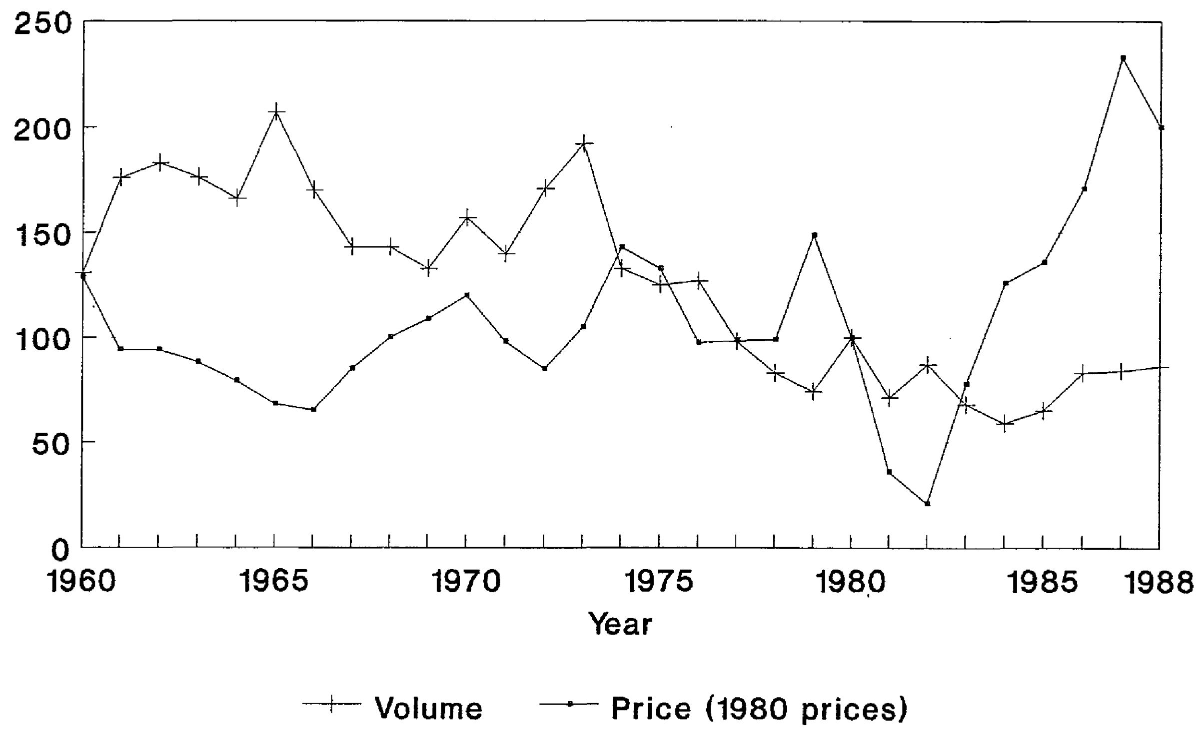
The above indicates that the productive base of the economy was rapidly eroded in this period. This was as a result of the emigration of skilled labour, lack of capital formation, and a deterioration of infrastructure.

## Selected Economic Indicators as % of GDP.
## Table 2.4.

| | 1971-75 | 1976-82 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| **Domestic Savings** | 10.9 | 5.6 | 0.9 | 4.4 | 5.1 | 10.2 | 9.1 |
| **Gross Investment** | 11.5 | 5.1 | 3.8 | 7.2 | 7.4 | 11.9 | 13.0 |
| **Budget Deficit** | -10.1 | -7.5 | -2.7 | -1.8 | -2.0 | 0.1 | 0.4 |

**Source: Chand and van Til, (1988).**

## Real Unit Price & Volume of Cocoa Exports, (1980=100). Figure 2.5.



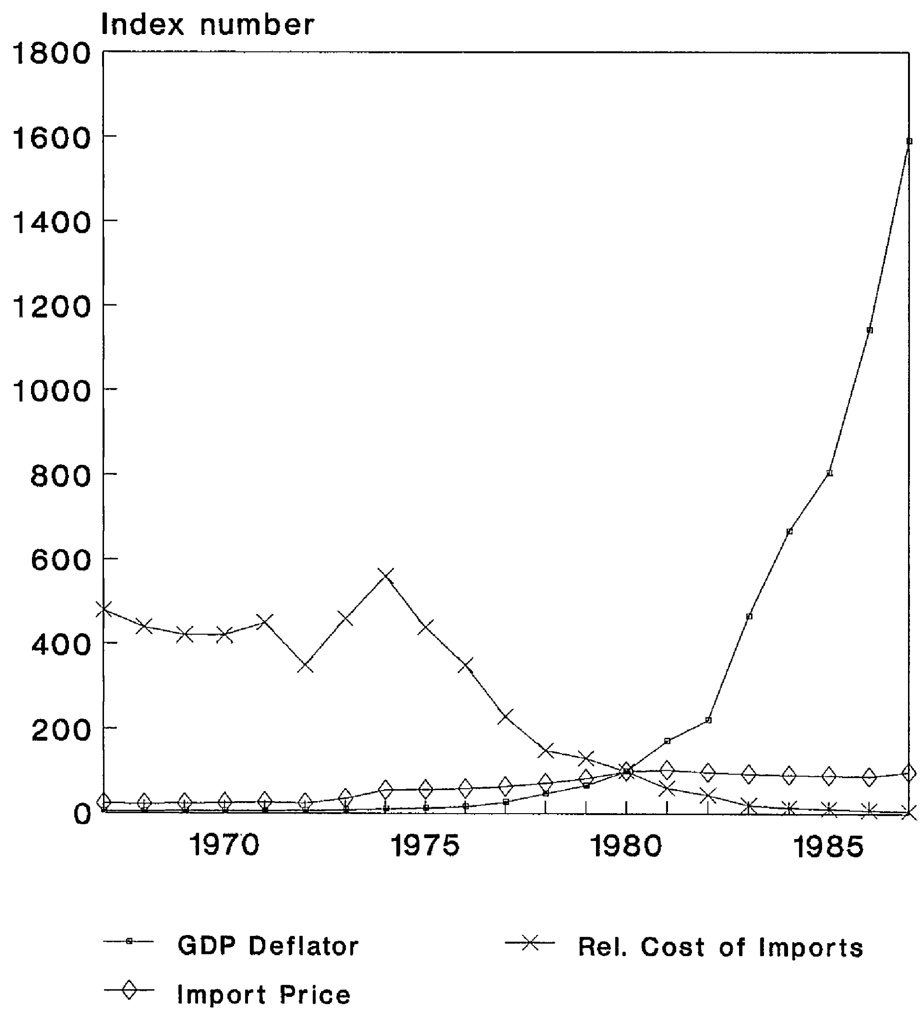

Source: IMF, IFS Yearbook, various.

These ills reflected a combination of exogenous factors and inappropriate economic policy signals. The latter discouraged production, exports, savings, and investment, while encouraging consumption, imports, and various corrupt practices, including a burgeoning underground economy.

One such policy signal was the maintenance of an over-valued cedi. This was caused by a combination of high domestic inflation and a failure to devalue the nominal value of the cedi in terms of foreign currencies. This made imported goods relatively cheaper than their domestic substitutes. As can be seen from Figure (2.2), the relative cost of imports, as measured by the ratio of the import price index to the GDP deflator, remained relatively high in the period 1967-74. But between 1974-80, despite an absolute rise in the unit cost of imports estimated at 139 per cent, the relative cost of imports fell by 450 per cent, and, by 1987, a 30 fold decrease in this figure had taken place, i.e., 3000 percent decrease.

The economic decline was fuelled by the policy favouring rapid industrialisation by an inefficient state enterprise sector to the neglect of an agricultural sector that traditionally had been the most important foreign exchange earner. Thus, as mentioned in Section (2.3) above, inward-looking industrialisation policy attached overwhelming importance to self-reliance by establishing import-substituting industries under highly protective trade and non-trade barriers. These enjoyed protection under an

## Relative Cost of Imports, (1980 = 100).
## Figure 2.2.




Source: IMF; IFS yearbook, various.

increasingly restrictive import-licensing system and high tariffs. Protection was indiscriminately extended to all industries and justified on infant-industry grounds, irrespective of their longer-term comparative advantage.

Despite, or even because of, these protectionist policies, an overwhelming majority of state enterprises suffered heavy losses, which were borne by the Government and ultimately financed by bank credit (Toye 1989, p.54).

Ghana's fiscal position was further burdened by a policy in which the Government assumed the role of employer of last resort. As Van Hear (1988, p.19) states, a large bureaucracy was built up containing many nonproductive and ghost workers (fictitious names on the payroll) 12,000 of whom were laid off in 1987 and a further 5,000 in the first half of 1988.

As discussed by Ewusi (1988, p.7), the revenue base shrank as a result of the sharp decline in cocoa exports in the 1974-82 period, and other trade flows on which the tax system heavily depended. Large budget deficits were financed through the banking system. This fuelled domestic demand under conditions of declining domestic supply and led to growing balance of payments deficits and accelerating inflation. A vicious circle developed in which successive governments tried to cure macroeconomic imbalances with controls on distribution and prices without addressing the expansionary fiscal and monetary policies. Inflation was countered by price controls; balance of payments deficits were countered by import controls; and scarcities were countered by distribution controls. These interventionist policies suppressed market forces, causing much of the economy to go underground and contributing to the corruption and inefficiency of the administration.

A study in the World Development Report (WDR) (1983) ranking developing countries according to the nature and intensity of distortions prevailing during 1970-80 found Ghana had the greatest distortion amongst the sample countries. These distortions, feeding on themselves, contributed to gross inefficiency through misallocation of resources, and destroyed incentives for production and exports.

In the early 1980's, when Ghana's fundamentally weakened economy was confronted with sharply deteriorating external conditions and a persistent drought, the economic crisis fully surfaced and the economy almost ground to a halt. By 1983, the year in which the economic recovery programme was launched, the economy had been largely devastated. Signs of collapse were everywhere. The real wage had fallen by 560 percent per cent of its 1974 level (see Figure (2.11)). As can be seen from Table (2.4), gross investment in the 1976-82 period amounted to 5.1 per cent of GDP - barely sufficient to replace the depreciated capital stock and providing no margin for economic growth. The economy was starved of imported inputs and, as a result, capacity utilisation in the manufacturing sector was reduced to only 18 per cent by 1984, (as can be seen from Figure (4.5) in Chapter (4)).

Signs were widespread that an inflationary psychology had become deeply entrenched. Inflation, which had been running for the previous decade at an average annual rate of over 50 per cent, surged to 123 per cent in 1983. The inflation rate reflected parallel market prices and not the controlled prices to which virtually all of the economy was subject. Nominal interest rates had been kept low - those on savings deposits, for example, amounted to only about 11 per cent a year (Financial Times 1989). Holding money had become so unattractive that the money balances, in particular savings deposits, held with the banking system had declined sharply and the income velocity of money had nearly doubled from an average of about five in earlier years to nine in 1983.

The external sector, too, was devastated. With the exchange rate pegged at 2.75 cedis to a dollar since 1978, the real exchange rate had appreciated by 816 per cent by 1983 from a relatively undisturbed rate in 1981[6]. The currency appreciation, together with the pervasive restrictions on Ghana's international trade and payments, caused official exports to plummet. As shown in Pick (1987), by the beginning of 1983, the parallel market rate for foreign exchange was about 40 times the official rate. Grave difficulties were being encountered in meeting payments for essential imports and for servicing the external debt. As pointed out by Financial Times (1989), external payments arrears equivalent to about a full year's export earnings accumulated.

The public sector was in a precarious state. As pointed out by Loxely (1988, p.25), tax revenues had collapsed to about 5 per cent of GDP, dragging expenditures down and seriously eroding the Government's ability to function and to maintain the economic and social infrastructure.

## 2.5.The Economic Recovery Programme.

Confronted with this situation, the Government formulated the Economic Recovery Programme in 1983. It was designed from the beginning with a series of (partially overlapping) phases; stabilisation was to give way to rehabilitation of the economy, and this in turn was to lead to a phase of economic liberalisation[7]. Support was intended to come from many sources such as, the IMF, the WB, bilateral aid donors, and eventually, private foreign investors.

The stabilisation effort was aimed at the domestic economy and at improving the balance of payments. In particular, inflation had to be controlled and a measure of price liberalisation introduced, so that the necessary adjustments in relative prices could be effected. As budgetary revenues continued to decline initially, the fiscal adjustment was achieved through a compression in government expenditures to 8.6 per cent of GDP from 10.2 per cent the year before (Loxely 1988). Real wages were frozen, government operating and maintenance expenditures were restrained, and development outlays were sharply reduced. These actions which were thought to be necessary to stabilise the economy, exacted a cost by depressing the level of economic activity and postponing the rehabilitation of the economy.

The centrepiece of external sector reform was depreciation of the exchange rate from 2.75 Cedis = $1 to 30 Cedis = $1 by the end of 1983. The exchange rate adjustment facilitated the first of a series of annual increases in the producer price of cocoa. Since much of the exchange rate adjustment merely made up for past inflation, the depreciation did not appear to add markedly to the increase in the domestic price level. However, , as indicated by Financial Times (1989), prices of important individual commodities, such as petroleum, increased sharply, and at the same time, many prices were decontrolled. Thus the principal of a full pass-through of exchange rate adjustments to local prices was established.

Ewusi (1987, p.20), amongst others, points out that it was not until late in 1984 that the economic outlook improved, as a result of the Government's perseverance with the stabilisation policies. Agricultural production recovered sharply, stimulating exports and domestic food supplies. Food prices declined markedly. The latter improvement contributed to a significant deceleration of inflation because prices of food items account for about half of the consumer price index. This improvement in the inflation outlook occurred despite a sharp acceleration in the growth of the money supply, reflecting the financing needs of a recovering economy.

The exchange rate depreciation benefited both the external and government sectors. As stated by Financial Times (1989), the domestic terms of trade moved in favour of tradables for the first time in more than a decade and an increased producer price stimulated production and official cocoa exports. The tax base improved as a result of the impact of the devaluation on trade-related taxes, which permitted an increase in government spending despite a further reduction in the fiscal deficit. The sizable increase in external assistance permitted a large increase in imports, while at the same time external payments arrears could be reduced.

Signs that the stabilisation strategy was succeeding permitted a change in emphasis in early 1985 toward the rehabilitation of some of the more severely damaged parts of the economy - in particular infrastructure, the key export industries, and the public sector. With support from the World Bank and bilateral donors, infrastructure rehabilitation projects were undertaken in the transport, power, communications, and water supply sectors (Ewusi 1987, p.40).

## 2.6. The ERP's Successes and Failures.

A brief review of the performance of selected economic indicators is given in what follows. For a more thorough account of economic performance under the ERP, see Green (1987), Loxely (1988), and Ewusi (1988). Agricultural aspects are focused on by Seini et. al. (1987), and Smith (1987). Social and regional aspects are covered by Norton (1988).

The reforms have transformed the economy. As can be seen from Figure (2.1), real gross domestic product has grown at 5 percent per annum since 1984, reversing a decade of falling living standards. cocoa exports, as shown in Figure (2.5), are on an upward trend since 1984, and in 1989 are put at 291,000 tonnes - almost double the 190,000 tonnes exported in 1984[8]. the government's finances were also put better shape. In 1983, the tax share in GDP was only approximately 5 percent, but it rapidly increased to approximately 15 percent (net of grants) in 1987 (Loxely, 1988, p. 25). Government expenditure grew less rapidly with the result that the budget deficit was eliminated by 1986 and a small surplus was generated, as can be seen from Figure (2.9). Thus, as can be seen from Table (2.4), a budget surplus of 0.1 percent of GDP was achieved in 1986 after an average deficit of 7.5 per cent of GDP in 1976-82. Inflation, which is shown in Figure (2.3), has been cut from 123 per cent in 1983 to 30 per cent in 1990; foreign payments arrears of $232m in 1984 have been virtually eliminated; and the balance of payments is in overall surplus to the tune of more than $100m a year (see Figure (2.8)). The share of gross fixed capital formation in GNP rose from a mere 4 percent in 1983 to over 10 percent in 1987 (Loxely, 1988, p.22), and as can be seen from Table (2.4), gross investment as a percentage of GDP rose from 3.8 percent in 1983 to 13.0 percent in 1987. The share of exports in GNP also rose from 6 percent in 1983 to over 10 percent in 1987.

But, it would be a mistake to think that applying sensible policies with regards to public finance will be enough to guarantee Ghana's future prosperity. A lot will depend on Ghana's terms of trade and the price of its leading exported commodities, i.e. cocoa and aluminium. It is also not advisable to look only to economic indicators such as real GDP, real per capita income, and inflation for signs that the economy is back to health. What is equally important is the state of the underlying features of the recovery - such as degree of aid dependency, prospects of future trade expansion, effects on manufacturing output, ability to boost private sector investment and foreign capital, effect on unemployment - which are inextricably linked with Ghana's ability to make the transition from aid-dependence to self-sustaining growth, and this, in the final analysis, is the main criterion by which to judge Ghana's economic recovery. A review, below, of these features paints a different, more gloomy, picture.

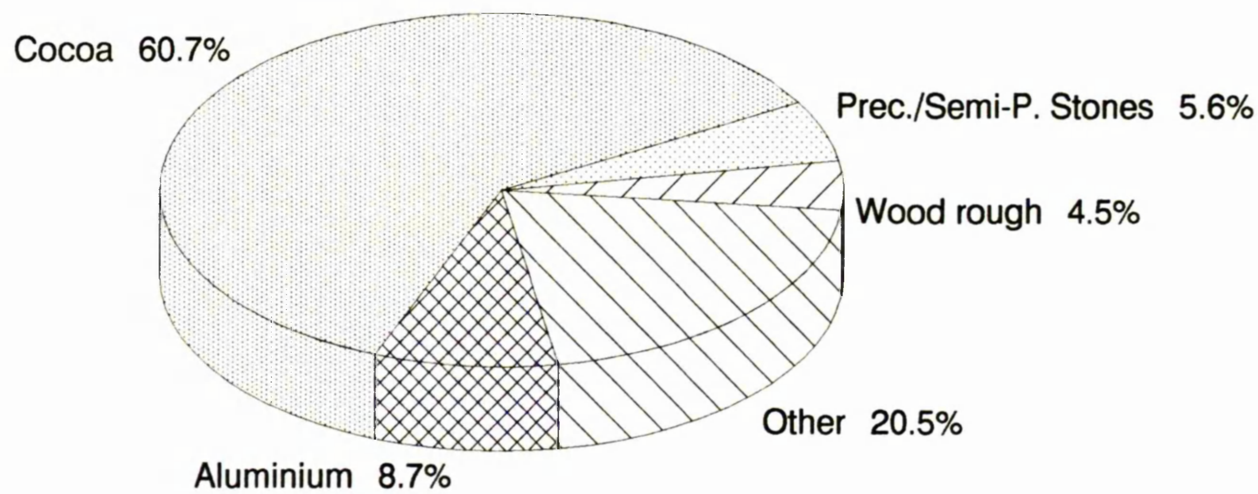
### 2.6.1. Trade and Commodity Prices.

Commodity prices are at their lowest level in real terms in at least fifty years[9]. This has compounded the budgetary, debt servicing, and balance of payments difficulties of developing countries. African countries have been badly affected: apart from facing declining nonfuel commodity prices they also lost shares in their main commodity markets [10].

Figure (2.4) shows Ghana's export structure. Cocoa's share alone accounts for 61 percent of total revenues in 1985. Thus, the export base is extremely narrow. Figure (2.5) shows Ghana's cocoa export volumes indexed at 1980 = 100 and cocoa unit price at constant 1980 prices and 1980 = 100 for the period 1960 to 1988. This shows export volumes remaining relatively constant in the period 1960-74 (except for the two peaks in 1965 and 1973) and then a falling trend in the period 1974-84, reaching an all time low in 1984 for the period shown. Unit value fluctuated along a horizontal trend for the period 1960-79. It then exhibited a sharply falling trend from 1979-82 to its lowest point in the 1960-88 period, and then recovered sharply to its highest point in 1987. Thus, Ghana's export revenues have been and remain dependent on world commodity prices.

Low cocoa prices are due to over supply and an inelastic demand. During the commodity boom of the mid- to late 1970s, traditional as well as potential cocoa (and coffee) producers were stimulated to increase production by expanding crop areas and

## Ghana's Export Structure: 1986.
## Figure 2.4.




Source: UNCTAD (1990).

developing new and efficient breeds. As trees began to mature and bear fruit seven to nine years later, supply surpassed demand substantially, creating a glut[11]. When the market was awash with supply, demand stagnated, not because of lagging growth in cocoa importing countries, but because consumption was inelastic. This means that an increase in real income in these countries leads to a less than proportionate increase in their demand for cocoa.

Empirical studies have revealed that income elasticity of demand for cocoa is positive but less than one, thus conforming to 'Engel's Law'[12]. It has also been suggested that the demand for cocoa tends to reach a saturation point beyond which the demand elasticity becomes zero at higher income levels[13], while the long-run price elasticity of world demand for cocoa has been estimated to be 0.4, suggesting, as Blomqvist (1973, p.11) indicates, that a reduction in unit price of cocoa leads to a less than proportionate increase in demand. In addition to this low income elasticity, some countries released previously built-up stocks. Others endeavoured to produce more in order to maintain their revenues as prices fell, which only depressed prices further. This therefore highlights the importance of Ghana's drive to develop non-traditional exports.

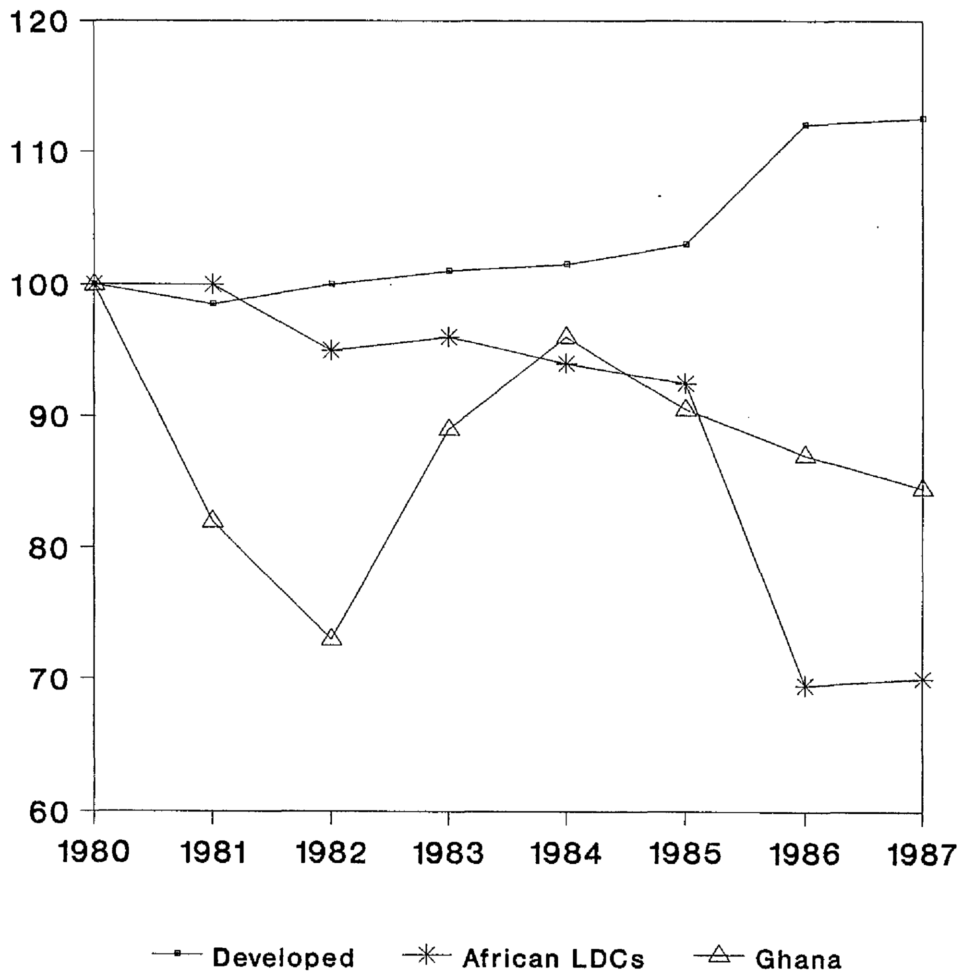
Earnings are also highly vulnerable to adverse climatic[14] and terms of trade (TOT) influences. The terms of trade shows the relationship between the price paid by a producer for the product he purchases and the price he receives for his own product. The producer is in a better position if his selling price rises more (or falls less) than the prices of the products he purchases. Thus, for a country, the TOT are unfavourable if import prices rise in comparison with export prices. The TOT are generally calculated by dividing the index of export prices by the index of import prices and then multiplying the quotient by 100 to get percentages. Thus a figure above 100 indicates favourable TOT, and vice versa.

Killick (1966, p.345), commenting on a study of Ghana's TOT for the period 1950-62, observed:

> "It is evident if we compare the later years with the 1954 base year, that Ghana has indeed suffered a deterioration in her terms of trade. In 1962 Ghana would have had to export 98 percent more in order to buy the same volume of imports that she bought in 1954."

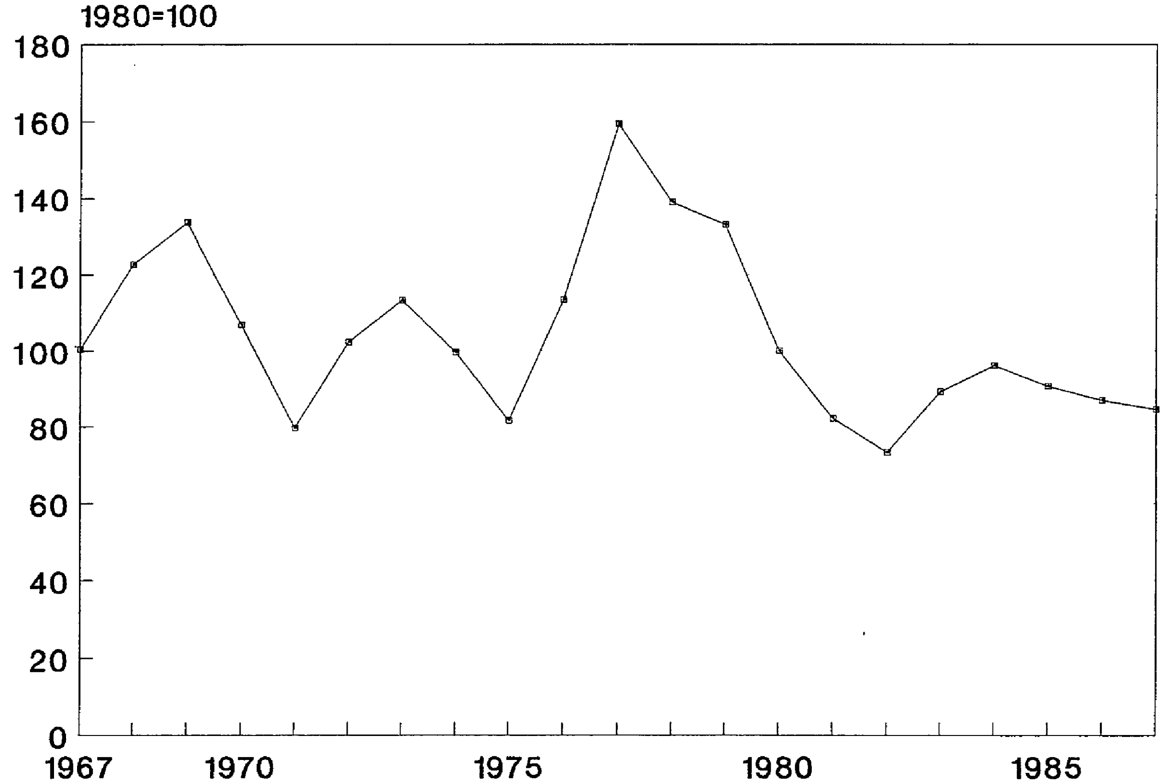
Data on the Developed, Ghanaian, and African LDCs' TOT, covering the period 1980-87, are shown in Figure (2.6). This reveals that while the Developed TOT have risen steadily in the 1980-87 period, the opposite has occurred for African LDCs, and both Ghana's and African LDCs' TOT are lower than their 1980 value for every year in the 1980-87 period. Thus Ghana's TOT in 1987 was 17.6 percent below its 1980 value indicating that Ghana had to export 17.6 percent more in 1987 in order to buy the same volume of imports that she bought in 1980. But, as can be seen from Figure (2.6a), if the longer time period of 1967-87 is looked at, Ghana's TOT is not seen to be declining, but rather to be fluctuating unpredictably reaching a peak in 1977 which is 60 percent higher than its 1967 value, and then declining to a trough in 1982 which is approximately 30 percent below

Terms of Trade of Selected Country Groupings, 1980-1989, (1980=100).
Figure 2.6.




Source: WB, World Tables, (1989-90).

Ghana's Terms of Trade: 1967-1987.
Figure 2.6a.




Source: World Tables (1988-89).

its 1967 value.

The gold outlook as stated by Financial Times (1989) - the current price weakness notwithstanding - is very bright. Industry spokesmen predict that output of 12 tonnes a year will more than double by 1995 and even treble by the turn of the century. Gold's share of total exports is forecast to average more than 20 per cent over the next five years and this could well turn out to be an understatement.

According to Financial Times (1989), the greatest momentum is expected to come from the non-traditionals, accounting for a mere 2 per cent of the total, or $2m in 1988. By 1995, it is hoped that these exports will match gold's 20 per cent stake.

For the rest, growth in timber volumes, after trebling since 1983 will decline sharply as a result of environmental considerations. As a result, the share of timber in total exports, which is currently at 4.5 per cent, will fall drastically (Financial Times 1989).

The obstacles are formidable. Given the absence of a viable packaging industry, transport bottlenecks, a lack of export marketing expertise and, above all, the fact that so many other countries, including many in Africa, are similarly engaged in seeking to develop new export lines, it will be difficult for countries such as Ghana to find exportable products in which it has a comparative advantage.

### 2.6.2. Investment.

Ghana's foreign investment track record is dismal. Private investment inflows since 1979 total $90m - the bulk of which went into the buoyant gold sector. Official forecasts are cautious, pointing to inflows averaging some $30m annually in the first half of the 1990's. By 1995, as indicated by Africa Recovery (1990, p.23) the private sector share of total investment in expected to rise to 50 percent from 34 percent in 1990. With private sector investment languishing at a mere 4 to 5 per cent of GDP, new policies to promote both foreign and domestic capital spending are vital.

It is felt, as indicated by Financial Times 1989, that greater autonomy is needed as far as the Ghana Investment Centre (GIC) is concerned. This, like so many so-called "one-stop investment shops" in Africa, is not the single channel that was intended as all mining and energy projects are routed through separate agencies. Its approval procedures are cumbersome and lengthy because it lacks adequate qualified staff but also because of overlapping jurisdiction with other government agencies. It is criticised too for preoccupation with controls rather than the promotion of new investment. Thus, Africa Recovery (1990, p.23) quotes the director of GIC thus:

"despite new investment in mining, petroleum exploration and such non-traditional exports as fresh pineapple, interest (from foreign investors) had been 'below expectations'".

The GIC answers criticism by stressing the impossibility of promoting foreign investment in the absence of a more responsive banking sector. They are not alone in believing that far reaching financial sector reform is a precondition for increased foreign capital inflows.

There is also an image problem. Ghana's investment climate is not viewed with favour by the international investment community. For example, capricious and arbitrary actions by the government, such as the detention without trial for long periods of businessmen accused of transfer pricing and corruption, has deterred foreign investors (Financial Times 1989).

Administrative delays by the GIC hamper investment. Approvals can take as long as six to eight months to come through. There are technical and political snags too, including the requirement that 100 per cent foreign ownership is permitted only where a new venture will be a net foreign exchange earner. This means that potential foreign investor must find an acceptable Ghanaian partner and - unless they are prepared to commit the entire capital of the new venture in foreign exchange - they must also find domestic finance.

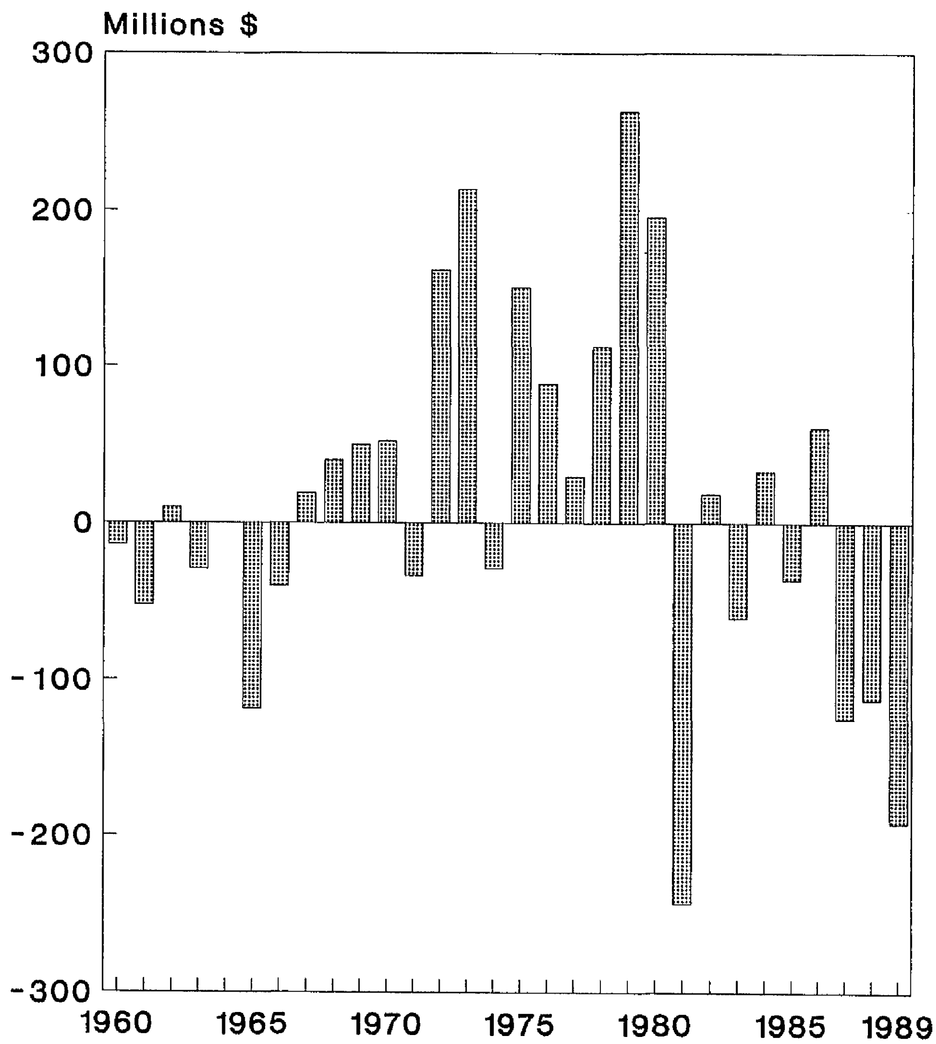
### 2.6.3. Aid Dependence.

Ghana's structural adjustment programme will stay on track only if donor assistance is maintained at current high levels, and underpinned by increased private sector investment and more rapid aid disbursement.

According to World Debt Tables (1991), the aid "pipeline" in 1989 was estimated at $1.4bn. This has since been supplemented at the March Consultative Group meeting by pledges of a further $971m - way above the forecast of new pledges of $800m. Just over half of the aid pledged in 1990 is bilateral with Japan ($190m) heading the donor table, followed by Britain with $61m and Canada with $55m (World Debt Tables 1991). On the multilateral side, the dominant donor is the World Bank's soft loan window - the IDA - with $236m followed by the African Development Bank with $110m, and the EC with $45m (World Debt Tables 1991).

The crucial role of aid inflows is apparent from the balance of payments figures given in Figure (2.7) which show a doubling in the trade gap from below $120m in 1987 to nearly $200m by the mid 1989. When invisible and debt-service obligations are taken into account, the resource gap widens to $400m in 1987. Since private sector inflows are forecast at no more than $30m annually, donors will have to close the gap with inflows averaging $500m a year between now and 1995.

## Trade Balance (Exports - Imports).
## Figure 2.7.




Source: IMF, IFS yearbook, various.

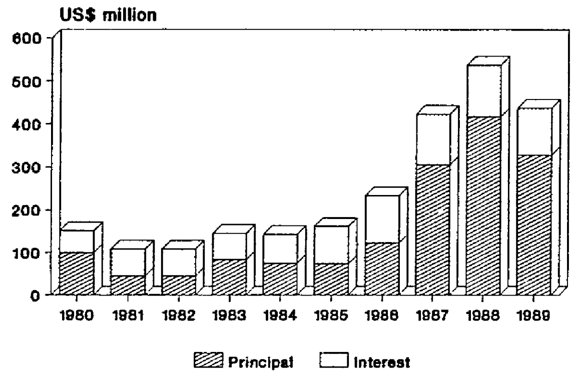
The prospect of inflows of this magnitude raises some worrisome issues. The first is whether Ghana has the "absorptive capacity" to utilise such aid efficiently. On present form, the answer must be no given the scarcity of administrative and managerial skills.

Figure (2.10) reveals alarming details about Ghana's foreign debt. The total debt outstanding (EDT) rose steadily from under $1.5 billion in 1982 to $3.2 billion in 1987, and has remained at approximately that level since. The total debt service to exports ratio (TDS/XGS) increased from 15 percent in 1982 to a peak of 56 percent in 1988 declining to 50 percent in 1989. The total debt outstanding to export ratio (EDT/XGS) rose disconcertingly from 100 percent in 1980 to 350 percent in 1989. The debt service figure remained around the $100m-$150m per alum level from 1980 to 1985, with interest payments accounting for approximately 50 percent of the total. It is only after 1987 that this figure has risen to the $400m level with interest payments accounting for less than 25 percent of the total. Thus all this indicates that Ghana's foreign debt is a cause for concern.

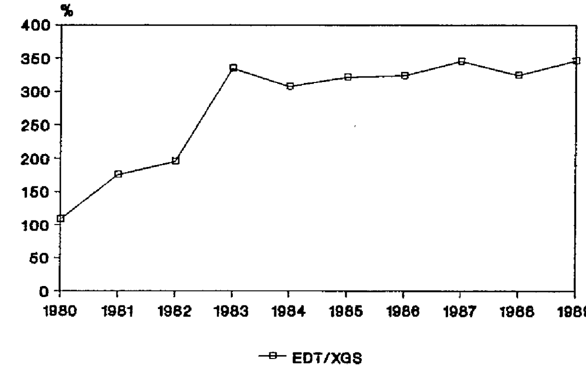
A particularly worrying aspect of aid dependence, as mentioned by Financial Times (1989), is reliance on foreign technical assistance, estimated in 1989 at some $85m. Clearly, the essence of a successful aid programme is building self-sufficiency but there is little evidence that this is being achieved. Thousands of Ghanaian professionals live abroad and seem unlikely to return home as long

# Debt.
## Figure 2.10.

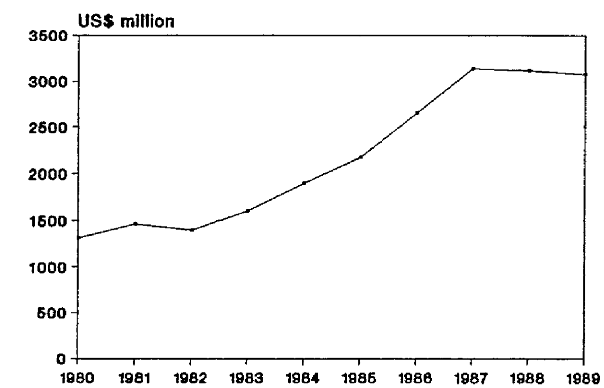
Debt Service.
Figure 2.10a




Debt-Export Ratio.
Figure 2.10b

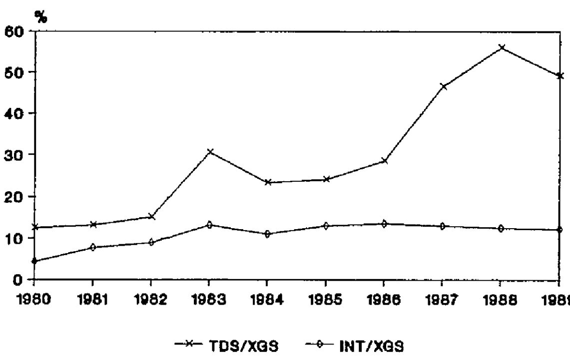



Total Debt Outstanding (EDT).
Figure 2.10c




Source: WB, World Debt Tables (various).

Debt Service Ratios.
Figure 2.10d




TDS - Total Debt Service, XGS - Exports,
INT - Interest.

as present salary scales apply. This scarcity of professional and managerial skills coincides with the next, more management-intensive, phase of the recovery programme. As stated by Ewusi (1988), reform of the civil service, the restructuring and divestiture of the 235 state-owned enterprises, root-and-branch reform of the financial sector, and the establishment of a capital market, are already constrained by the dearth of accounting and management skills, while bankers and businessmen believe the Government should be doing much more to promote foreign private investment to fill the inevitable void that will be left by aid inflows once these start to tail off.

**2.6.4. Banking and the Credit Squeeze.**

As mentioned by Toye (1989, p.58), Ghana's banking sector, squeezed between a high ratio of non-performing loans and tight government-imposed credit ceilings, is now a major constraint on economic expansion. Although the Government's credit policies make good sense given the impact of rapid monetary growth on inflation and the sliding currency, industrialists complain that the severe liquidity squeeze prevents them from undertaking the investment necessary to maintain growth.

During the decade of economic decline the banks suffered along with industry and commerce, building up high ratios of non-performing loans (Toye, 1989, p.58). Their accounting and management information systems are generally weak, operating costs are high reflecting both the lack of competition and the scarcity of expertise and professionalism, while some banks are highly exposed to foreign exchange risk. In this situation, the two most pressing tasks to be tackled are the cleaning up of bank portfolios by collecting arrears where possible and writing off bad debt, while restructuring and recapitalising the system. But given the skills constraint and the lack of an effective supervisory department at the central bank, financial sector reform is going to be a lengthy process.

As indicated by Financial Times (1989), by the end of 1988 the public sector's share of bank lending had fallen to 43 per cent from more than 70 per cent in 1985, and with the Ghanaian budget now in surplus the Government hopes to make net repayments to the banking system of some C6bn to C8bn annually in 1989-91. The combination of credit ceilings on the one hand and reduced lending to Government on the other has been instrumental in slowing the growth rate of bank lending from more than 50 per cent annually during the 1982-87 period to only 12 per cent in 1989.

But, as mentioned by Financial Times (1989), the credit squeeze has had two drawbacks : the build up of excess liquidity in the banking system on one side and the clamp on bank lending to viable private sector enterprises on the other. Bank profitability is being undermined by the accumulation of excess reserves which cannot be translated into profitable assets. As a result, banks are refusing to accept fixed deposits and cutting their savings deposit rates despite the fact that these are already more than 10 percentage points below the inflation rate. Given the need for increased savings in the economy and the severe liquidity crunch in the industrial sector this is unfortunate but if they were to charge positive real interest rates as advocated by the World Bank, they would wipe out a wide range of borrowers.

If real interest rates are to become positive, it will have to be the result of a significant reduction in the inflation rate, currently estimated at between 25 and 30 per cent rather than higher nominal rates. Sadly, monetarist prescriptions not withstanding, the credit crunch has failed to reduce inflation to acceptable levels. The authorities are faced with a "catch-22" situation. If they tighten the squeeze - to slow inflation and stabilise the Cedi - they run the risk of aborting the still fragile economic recovery, especially in the industrial sector.

On the surface the banks are operating with generous margins - savings deposit rates of 16 per cent and lending rates in excess of 20 per cent - but margins are under pressure from high operating costs and low lending ratios.

As mentioned by Toye (1989), there are two main areas where the banks will be called upon to play crucial roles in the immediate future - the foreign exchange market and the development of a capital market. The need for professionalism in the banking sector is underscored by its key role in the foreign exchange market. This is particularly so in the foreign exchange market where the auction system has been a great success, albeit one currently jeopardised by the 20 to 30 per cent gap between its rates and those ruling in the licensed foreign exchange bureau.

A major test for Ghana's Structural Adjustment Programme will come in mid-1990 by which time it has pledged to eliminate the gap between these two "free" foreign currency markets. The reality is that the freer of the two markets - the foreign exchange bureau - signals the more realistic exchange rate. So long as the authorities are prepared to accept this market-determined reality, all will be well. But should they seek to maintain a "realistic" rate, in defiance of market forces, forcing the bureau rate to appreciate rather than allowing the auction rate to depreciate further, the likely result would be the reemergence of a third tier - a black or parallel market, which was largely eliminated when the bureau opened last year.

The other looming challenge is ensuring that industrial recovery is not undermined by the liquidity squeeze. Bank restructuring and recapitalisation will play the lead role here but it is also essential to develop a capital market, including a stock exchange, to provide a longer-term funding, reducing dependence on term loans and overdraft finance.

### 2.6.5. Industry.

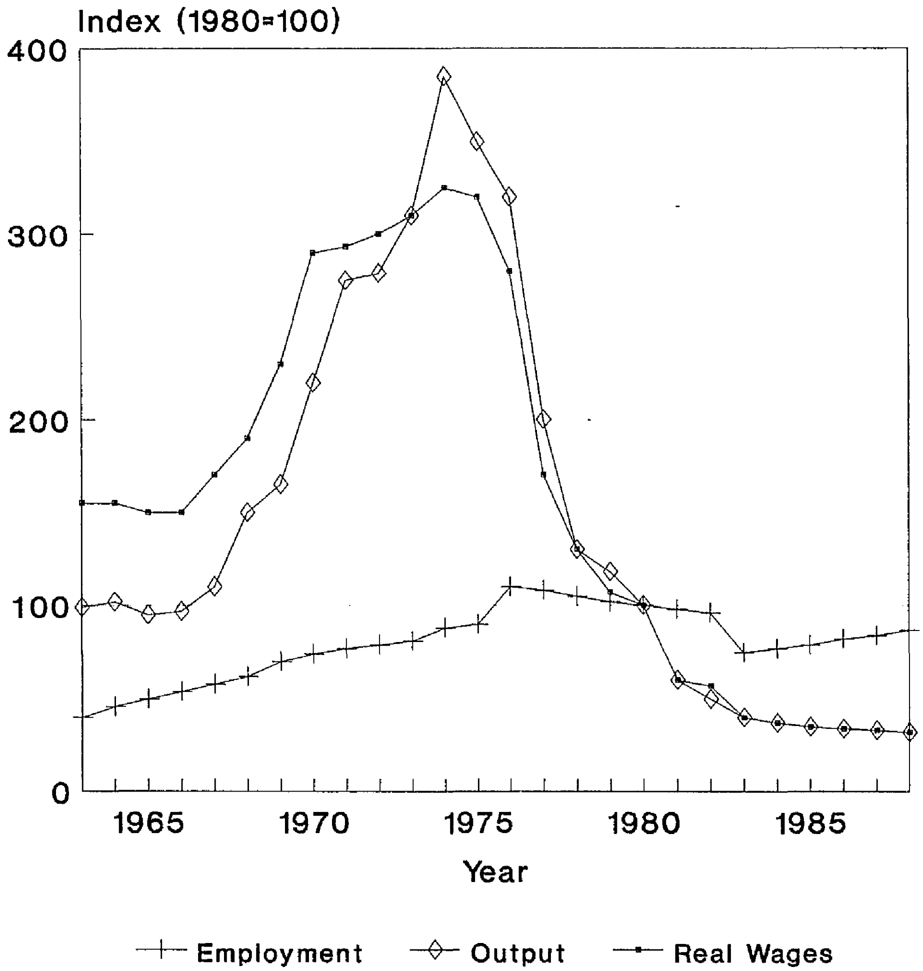
Figure (2.11), shows output real, wages and employment for the period 1963-88 indexed at 1980=100. This shows that real wages in 1988 was seven times less than the peak it reached in 1974. Industrial production in 1988 was nine times less than its peak value in 1974. Employment on the other hand has remained fairly constant throughout the 1963-88 period. While it might be argued that the reluctance to allow real wages to fall is responsible for the failure of many countries to achieve economic growth, this contention is not borne out by the facts in the case of Ghana. Figure (2.11) shows that Ghana has allowed real wages and output to move up and down together while maintaining employment in the period 1963-88.

By far the largest fall in manufacturing output in the period 1977-83 among the three sectors, textiles, wood, and non-ferrous metal, shown in Figure (2.12), occurred in the textiles sector. This showed a drop of 560 percent in that period, and it also experienced the worst recovery in the 1983-88 period, recovering to a drop of 230 percent from its 1977 level.

Capacity utilisation in manufacturing, as shown in Figure (4.19) of Chapter (4), showed a falling trend from 40 percent in 1978 to below 20 percent in 1984. It then increased back to 40 percent by 1988.

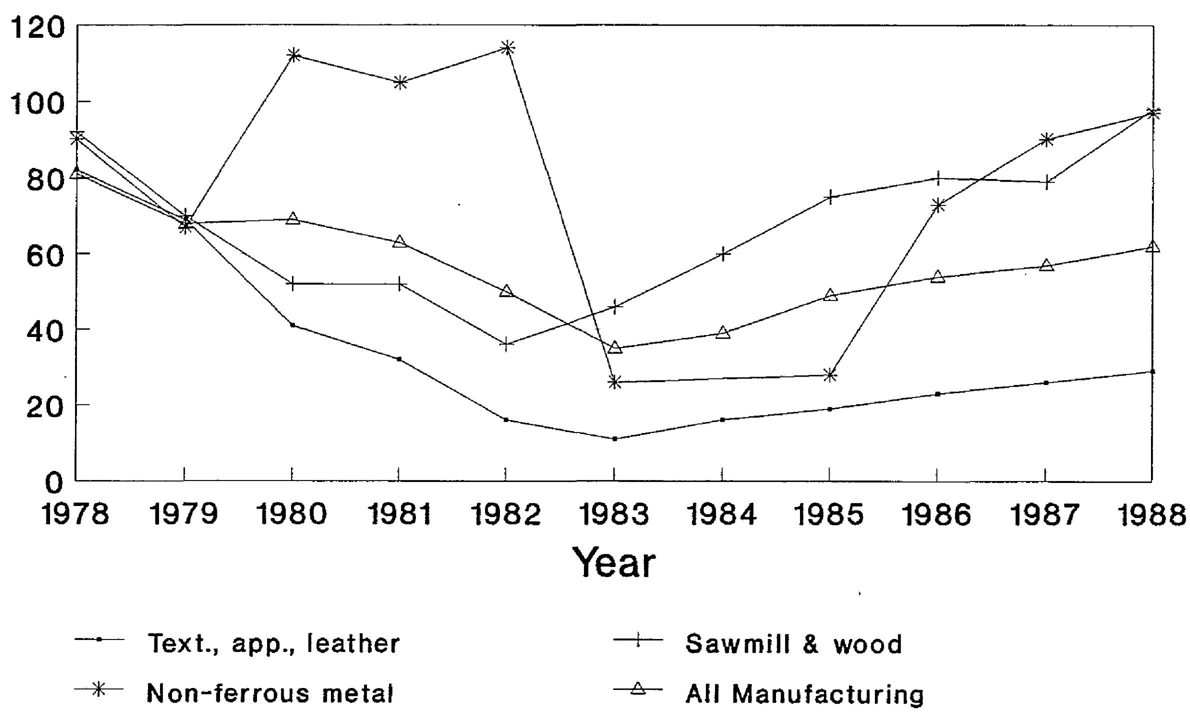
Figure (2.13) shows real manufacturing value added per

## Ghana's Industrial Output, Employment, and Real Wages.
## Figure 2.11.



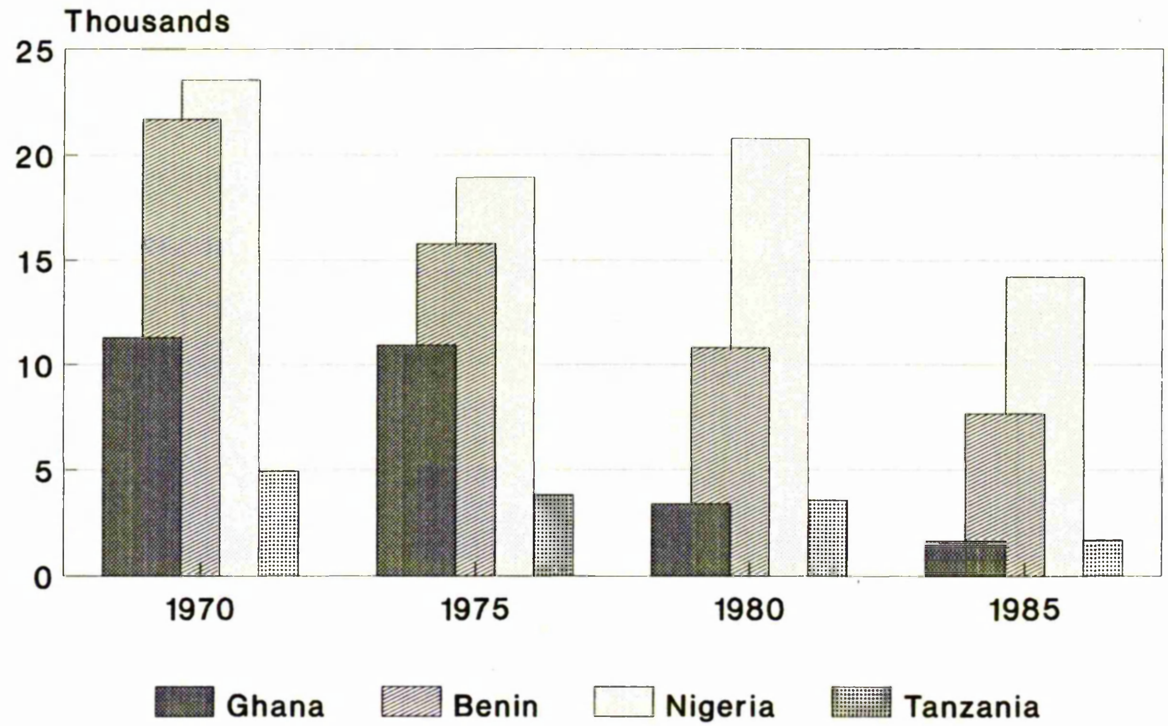

Source: UNIDO, (1990).

## Index Numbers of Manufacturing for Selected Items (1977 = 100)
Figure 2.12.




Source: CBS, Various.

Value Added Per Worker in Manufacturing in US $ at Constant 1980 prices.
Figure 2.13.




Source: UNIDO, (1990).

employee in Ghana, Benin, Nigeria, and Tanzania for every fifth year in the period 1970-85. All four countries registered a fall in value added during this period, but the largest fall, from $12,000 in 1970 to $2,000 in 1985 (a fall of 84%), is shown to have occurred in Ghana.

The collapse in manufacturing in the pre-ERP period (i.e pre-1983) is mainly attributable to the foreign exchange scarcity which Ghana faced in the mid-1970s to early 1980s. This in turn forced the manufacturing industries to curtail production because of shortages in imported inputs, equipment and spare parts.

With the introduction of the ERP, conditions in the manufacturing sector went from bad to worse. As Huq (1989) points out, industry now faced three problems - competition from imports, a rundown and obsolete capital stock, and tight liquidity. The exchange rate devaluation which took place under the ERP had the beneficial effect of increases the price of imports relative to domestic manufactures, but the removal of tariffs worked in an opposing direction by reducing the price of imports relative to domestic manufactures. Thus the overall effect of the liberalisation programme is undetermined, but some evidence of the degree of protection given to firms is shown by Steel's (1972) study using DRC to examine the efficiency of industries in 1967-68, in which he found only 15% of firms surveyed would have been competitive with imports at the official exchange rate. While Steel states that this figure rises to 25.6% with a 50 percent devaluation, the effect of the 300 percent devaluation which took place in the 1983-84 period (see Figure 9.14 in Chapter 9) would therefore be expected to increase the percentage of competitive firms substantially.

But competition from imports is particularly difficult to counter given industry's inability to reequip because of liquidity problems and high operating costs attributable to the state of plant and machinery on the one hand and excess capacity on the other. As indicated by Financial Times (1989), tight liquidity is a serious problem for small to medium sized companies forced to borrow from the banks at interest rates of 25 percent or more. A second category of companies faces horrendous domestic currency repayment obligations following the fall in the cedi from C54 to the dollar in 1985 the current level of C400.

Given the problem of tight liquidity, another major source of funds for industry would have been from foreign capital infusion, but as mentioned above, this will only take place when a significant improvement in the investment climate has taken place, and this is expected to occur only after the economy moves on to a sounder economic footing. In the meantime the entire manufacturing sector and a significant proportion of manufacturing know-how and expertise, built over decades of experience and at great expense, is disappearing[15]. Little effort has been made to identify industries that would benefit from an infusion of new physical and human capital. This means that if and when Ghana's investment climate does become favourable, as is anticipated will be the case some time in the future, the investment in capital and human resources will have to be that much greater.

## 2.7. Summary.

Ghana is today the World Bank's star pupil in Africa. And yet, that this is the case is not altogether surprising. That Ghana is perceived as such a success story is part a commentary on the continent-wide failure of structural adjustment programmes in Africa, part a reflection that in 1983, there was just no viable alternative strategy available, and part the consequence of an economy which, having reached rock-bottom, had nowhere to go but up, when pump-primed with aid inflows of $530m annually. The pump-priming was - and remains - conditional on the successful implementation of a wide range of complex, and often politically unpopular, economic reforms rendered more difficult by falling commodity prices.

Even though ERP has resulted in the stabilisation of the economy, it has also led Ghana towards heavy aid-dependency; great reliance on world demand with respect to its trade policy; a derelict manufacturing sector; and only a trickle of private investment inflow which is vital if she is to make the transition from aid-dependence to self-sustaining growth.

Furthermore, for the aid momentum to be maintained, the

Government of Ghana must continue its delicate high-wire balancing act, satisfying both its domestic and political constituency whose living standards are below their levels of 20 years ago, while meeting the exacting conditionalities of the donor community.

Thus, while industrialists are not in favour of returning to the system of import licensing and blanket protection by import controls, there is a vociferous lobby for increased industrial protection. Industry faces problems of tight liquidity, competition from imports and a run-down, obsolete capital stock. Manufacturers warn that the strategy of industrial-led expansion and the development of non-traditional exports of manufactures and processed foods is being jeopardised by the existing tariff/tax structure, thus seriously undermining the chances of survival of any sort of industrial sector in Ghana.

**Notes.**

(1) For size of various ethnic groups, see CBS Population Census, 1960, as reported in the Central Bureau of Statistics, Statistical Year Book, 1965-66, p. 45.

(2) For more information on the history of Ghana see, for example, Agbodeka (1972); Buah (1980); Dickson (1969); Fage (1969) and Nkrumah (1957).

(3) Gold Coast Industrial Development Ordinance 1947, Section 3(1) as quoted in Birmingham et al (1966), p. 287.

(4) Kwame Nkrumah, "Africa Must Unite", (New York, F. A. Praeger, 1963, p.111.

(5) W. F. Steel, "Import Substitution and Excess Capacity in Ghana", Oxford Economic Papers, New Series, Vol. 24, July 1972, p.213.

(6) See World Bank, (1983) , Ghana: Policies and Program for Adjustment.

(7) World Bank, 1984, Ghana Policies and Program for Adjustment, Washington D.C. p.xvii, 73.

(8) U.N., International Financial Statistics, 1991.

(9) A detailed commodity by commodity discussion of past and future short-term fluctuations and trends is found in WB, Price Prospects for Major Primary Commodities, (1989?).

(10) WB, Market Prospects of Raw Materials, (1987), p. 29.

(11) for mean lags in the response of capacity to prices see Chu and Morrison (1986) p. 139-84.

(12) Manu (1973), p.5. According to Engel's law, given tastes or preferences, the proportion of income spent on food will diminish with an increase in income.

(13) Ibid., p. 5. as based on FAO, 'Agricultural Projections for 1970, Commodity Review, Special Supplement 1969, pp. 11-38.

(14) For more details on the susceptability of agricultural commodities to the vagaries of weather see WB, Market Prospects of Raw Materials, (1987), p. 11.

(15) For a good account of industrial capabilities that have been aquired in African industrialisation, see Lall, S., (1990) Structural Problems of Industry in Sub-Saharan Africa.

# 3. COTTON CULTIVATION.

## 3.1. Introduction.

The liberalisation policies which began in the early 1980's have created a free market economy in Ghana. The textile industry, which for decades suffered from low capacity utilisation due to foreign exchange constraints, no longer faces such constraints and is free to import the quantity of raw materials it requires. At the same time cotton inputs from domestic production, which were not obtainable in any significant quantity during the days of foreign exchange scarcity, are now increasingly more available.

Textile mills are therefore faced with choosing between domestically produced cotton or importing. Their decision on which source of inputs to use depends largely on two factors: price and quality.

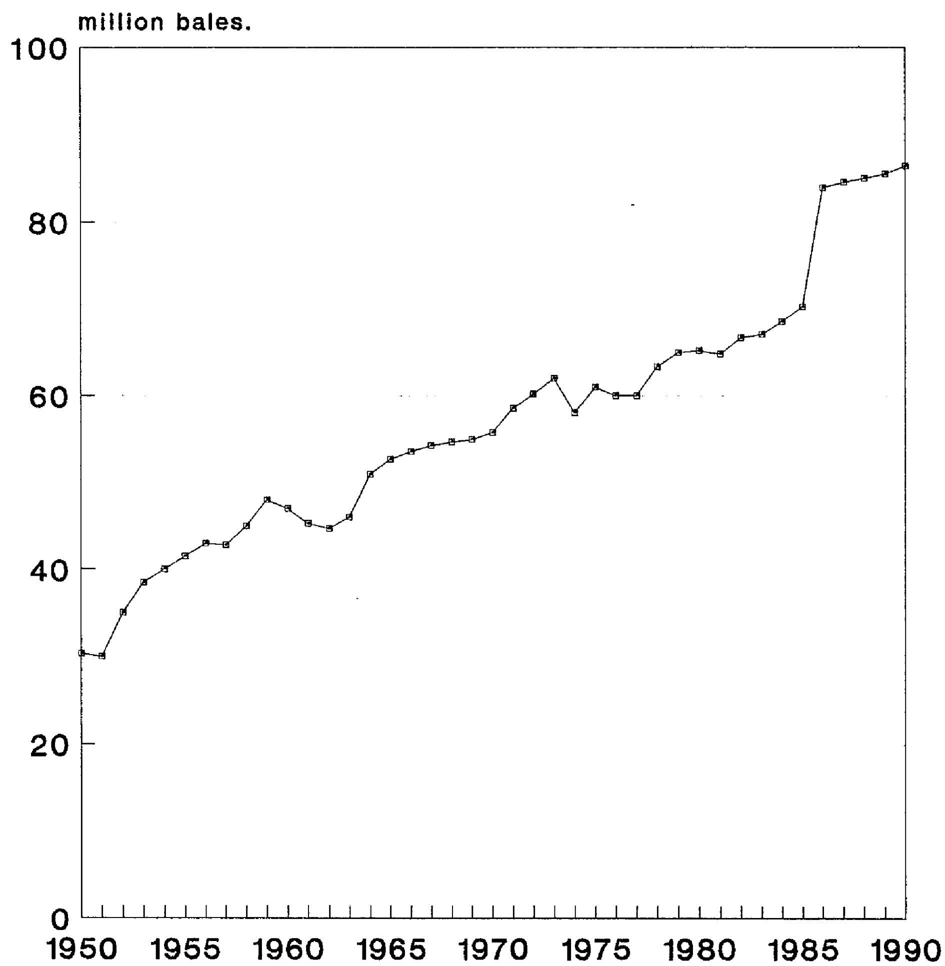
After the introduction in Section (3.1), cotton production in Africa is reviewed in Section (3.2). Section (3.2.1) reviews the price and not price factors which affect the performance of cotton cultivation. In Section (3.3), the history of cotton cultivation in Ghana is investigated, and so are the methods it has adopted to try and make cotton production viable (Sections (3.3.1. and 3.3.2.)). The cost, price, and quality of Ghanaian cotton are also researched, in Sections (3.4), (3.5), and (3.6) respectively, in an attempt to examine the future of this sector, and a demonstration of how price and non-price factors have been important in determining its competitiveness in domestic and international markets is made. The summary is in Section (3.7).

### 3.2. African Production in Perspective.

As can be seen from Figure (3.1), world cotton consumption (and production) has increased at an average of 1.2 million bales per year in the period 1950 to 1990. Furthermore, figures released by the International Cotton Advisory Committee (1990) show forecasts of a rise in world fibre consumption of 2.5 percent per annum in the period 1990-92. This is based on IMF estimates of average economic growth in industrialised countries of 3 percent during 1992-95.

While cotton is produced in 76 countries in the tropical and temperate climate zones, the three largest producers' (China, US and USSR) share of world production stood at 60 percent in 1986 (WB, Operations Evaluation Study (1988) p.1). Africa's share has been small and declining: 9% in 1974-76, 7% in 1990 (UNCTAD Commodity Yearbook 1991). Cotton production in Africa has increased by 1.3% per annum since 1961; significantly less than in Asia (2.7%). A comparison between the production increase of Francophone Africa and Anglophone Africa over the period 1960-1985 reveals an increase in output of 740 percent and 60 percent respectively. Francophone production accounted for 15% of production in 1960; by 1984 the

## World Cotton Consumption in Millions of Bales: 1950 - 1990.
## Figure 3.1.




Source: Int. Cotton Adv. Cmttee (1991).
Committee.

proportion had risen to approximately 45% (WB Operations Evaluation Study (1988)).

### 3.2.1. Performance: Price, Non-Price Factors.

#### 3.2.1.1. Price Factors.

Explanations of poor performance, particularly in Anglophone Africa, are the subject of much debate. The inadequacy of producer price incentives due to high taxation of the agricultural sector is one argument that has been put forward (World Bank 1981, 1984; Eicher 1982).

Another reason which is frequently given is adverse macroeconomic policies which are said to have an even more prominent effect on effective taxation rates in the agricultural sector than do sector-specific policies. Krueger, Schiff and Valdes (1988), for example, estimate the impact of sector-specific (direct) and economywide (indirect) policies on agricultural incentives for eighteen developing countries for the period 1975-84.

The direct effect is measured by the proportional difference between the producer price and the border price (adjusting for distribution , storage, transport, and other marketing costs). The indirect effect is split into two components. The first is the impact of the unsustainable portion of the current account deficit and of industrial protection policies on the real exchange rate and thus on the price of agricultural commodities relative to nonagricultural tradables. The second is the impact of industrial protection policies on the relative price of agricultural commodities to that of nonagricultural tradables.

They find that the indirect effect taxes agriculture by 27 percent on average, and also that:

> "...the impact of the indirect, economywide interventions generally dominates the direct effect, whether the direct effect is positive or negative."

This school of thought, therefore, stresses the need to get prices right.

#### 3.2.1.2. Non-Price Factors

Many have looked at non-price factors for explanations of poor performance (Delgado and Mellor (1984); Lipton (1987); Ray (1988); Lele (1988); Lele (1989)). These include: (a) human capital constraints, (b) technological constraints, (c) institutional constraints, (d) political constraints, and (e) environmental constraints.

#### (a) Human Capital Constraints

Delgado and Mellor, amongst others, point out that labour is the "key limiting resource to African agricultural production. Furthermore, as indicated by World Bank (1981), there has been a large labour outflow from agriculture, and urbanisation has occurred at the rate of 6.5 percent per annum over the 1960s and 1970s. Gbetibouo and Delgado (1984) highlight the fact that labour shortage is becoming particularly acute in West Africa, and is a significant factor in the decline of food production.

**(b) Technological Constraints**

Mundlak (1988) puts agricultural prices in the context of technological change and establishes that aggregate agricultural supply does not respond much to price without technological change. He also implies that misallocation of agricultural investment is most likely to be due to insufficient attention by governments to key elements of technological change, such as research, and input delivery systems.

Another aspect of technological constraints is mentioned by Delgado and Mellor (1984). They discuss the advantage of technological innovation that cuts per unit labour costs in view of the fact that the opportunity costs of labour are constantly being pushed upward by factors outside the agricultural sector.

Ranade, Jha, and Delgado (1988) indicate that the effect of a reduction in the cost of production resulting from technological change in agriculture normally has a far greater effect on incentives than a price change.

**(c) Institutional Constraints**

Institutional factors which have a role in ensuring the effectiveness of incentives in agriculture, and particularly in cotton cultivation can be subdivided into two headings:

(i) Those that bear directly on the profitability of cotton through their effect on price factors. These include prompt and stability of prices received by producers; timely delivery of inputs and their sale at predictable price levels; and the ability to secure credits to purchase inputs. For example, Desai (1988), and Rosegrant and Siamwalla (1988) state that fertilizer price and interest rate subsidies are much less important than policies to assure adequate and timely supply, and in the form desired by farmers.

(ii) Those that have enhanced technological know-how and support to the cotton industry. These include: research and extension; infrastructural complexity, especially the density of roads and buying posts in cotton-growing areas; and the quality of upstream activities to ensure the reliability of supply to ginneries. Thus, as argued by Olayide and Idachaba (1986), a major reason for low supply elasticity in Sub-Saharan Africa is the poor state of agricultural infrastructure and input distribution systems in Africa. It has also been argued that good price incentives themselves promote capital formation, and institutional innovation (Hayami and Ruttan 1985; Mundlak 1988).

MAIDA (1990) reviews the development of cotton in several African countries and attempts to find causes of relative success and failure of different cotton development schemes. It finds that a significant difference between Francophone and Anglophone countries is:

> "the role played by institutional factors in alleviating physical constraints and ensuring effective price incentives. Anglophone countries are characterised by a low input/low yield technology whereas the francophone countries, .... , feature a high input/high yield technology."

It concludes that:

> "while differences in macroeconomic and sectoral pricing policies appear to have been critical, institutional factors have been fundamental in explaining the sustained growth of cotton production in francophone countries."

**(d) Political Constraints**

Political factors constraining the performance of the agricultural sector are discussed by Bates (1981), Delgado and Mellor (1984) and MAIDA (1990) amongst others.

MAIDA points out that since cotton is often grown in "poor" regions, the cotton industry has become an important instrument in governments' development and income distribution strategies. Cotton development in Sahelian Francophone countries is often the cornerstone of a whole rural development strategy. Anglophone countries, on the other hand have shown a greater tendency to allow political and ethnic factors to dominate their cotton sectors.

An interesting point about the growth of parastatals is made by Delgado and Mellor who state that the rapid expansion of parastatal activity in Sub-Saharan Africa in the 1960s and 1970s was largely achieved through agricultural taxation.

**(e) Environmental Constraints**

Environmental constraints are also a reason for the poor performance of cotton cultivation. MAIDA (1990) gives some environmental and climatic conditions which favour cotton cultivation. These include relatively low altitudes, good soil drainage, and non-windy conditions. Pests and diseases are a serious problem.

But, as stated in World Bank (1988), by far the most serious and controversial problem concerns the environmental impact of cotton cultivation. The large increase in areas under cotton cultivation, especially in Francophone countries, has been associated with deforestation, erosion, and soil exhaustion. MAIDA points to evidence of declining soil fertility in Tanzania due to continuous cultivation, and cotton's lack of responsiveness to fertilisers during research trials, as suggesting that environmental problems are more complex than previously recognised and thus require more attention than they are receiving at present.

### 3.3. Cotton Cultivation in Ghana.

Some of the conclusions which MAIDA draws from its research seem to hold true in the case of Ghana's cotton sector. For example, the pre-1985 period, a period marked with adverse macroeconomic policy, unattractive producer pricing policies and institutional constraints, is a period of unsuccessful attempts at cotton cultivation. The post-1985 liberalised period saw the privatisation of the cotton sector. Cotton companies were free to set the price they offered farmers for seed cotton. At the same time macroeconomic policies which advocated liberalisation freed up the constraints caused by fixed exchange rates and foreign exchange scarcity.

Today, according to Ghanaian Times (1991), cotton production accounts for nearly 50 percent of the textile sector's cotton requirement and this figure is set to rise. This has not always been the case. In fact the period between the earliest attempts at commercial cotton production (in the mid-nineteenth century) till the mid 1980's consisted mainly of failed ventures.

### 3.3.1 Early attempts.

In trying to give an indication of the many pitfalls which today's cotton cultivators face, an outline of the earlier failures is instructive.

In 1909 the British Cotton Growing Association in conjunction with the Ghanaian (then the Gold Coast) Department of Agriculture made an attempt to develop a cotton export industry. They distributed American and Egyptian hybrid seeds amongst farmers in the northern parts of the country. The yields of seed cotton they obtained were so low (only 111 kgs. per hectare as against 1000 kgs. in 1991) that they retired from the field in 1916.

Another failure in production of cotton occurred when a cotton gin and bailing press installed in 1926 was reported to have ginned[1] and baled only one bale of cotton because the supply of seed cotton had been so low.

The Government then focused its attention on the factors which were limiting yields. A study was made by a foreign cotton growing company, and their report indicated that low yields were mainly due to (1) boll-shedding, believed to be caused by a physiological factor bound up perhaps with poor soil; (2) pink bollworm; (3) cotton stainers; (4) blackarm disease and other pests. But despite the fact that blackarm resistant varieties were planted in the period 1948 to 1951 yields continued to be low. It was therefore realised that although disease and pest losses had been reduced the problem of boll shedding and poor soil conditions needed to be solved if yields were to be improved.

Various organisations and institutions such as the Crop Research Institute, State Farms Corporation (Ministry of Agriculture), and the University of Ghana's Experimental Station were consequently set up to work on methods of improving yields. The Crop Research Institute has in fact shown, from field trials it conducted in 1969 and 1970, that the use of 'scientific' practices could obtain yields of 2.8 tonnes of seed cotton per hectare.

With the emergence of a local textiles sector in the early sixties the need to produce cotton locally took on even greater importance. Cotton consumption by Ghanaian spinning mills is now 14,000 tonnes. Up until the mid-1980's, a vast majority of this was being imported using scarce foreign exchange. The government's aim therefore shifted from trying to cultivate cotton for export to attempting to reduce the drain on foreign currency which cotton importation was causing. The Cotton Development Board (CDB), a government organisation, was set up in 1968 for this purpose.

Efforts by CDB to increase the production of cotton to a level which matched local demand met with little success. A study undertaken by the government in the 1960's expected cotton demand in 1970, 1975 and 1980 to be 12,000, 16,500 and 20,000 metric tonnes respectively[2]. Local production in those years turned out in fact to be 406, 2,200 and 2,400 tonnes respectively and there was worse to come as, by 1984, production had dropped to a mere 200 metric tonnes.

From the survey, conducted in 1991, the factors contributing to CDB's failure were found to be numerous. These included:

(1) The fact that CDB was controlled by the government resulted in institutional inefficiency. These inefficiencies resulted in:

(a) Inadequate timing in the purchase and distribution of fertilisers and insecticides leading to poor soil fertility and insect damage.

(b) Farm machinery such as tractors and accessories were badly maintained and in short supply.

(c) Transport equipment shortage, due in part to badly maintained stock, caused delays in the evacuation of seed cotton after picking. This meant that there was a discouraging delay in paying farmers.

(d) The quality of ginning was not always good and varied from year to year as well as from gin to gin. This was because the technical know-how involved in maintaining and operating gins was not available.

(2) Price factors, namely:

(a) The Cotton Development Board pursued an unprogressive seed cotton pricing policy - failing to review seed cotton prices upwards despite the general trend of price hikes of other commodities in the 1970's and early 1980's. Thus, farmers moved to competing crops, such as cocoa, which had more attractive prices. In fact, Koli (1973, P.xiv), finds that unattractive price of seed cotton was a problem as far back as the early 1920's.

(3) Macroeconomic factors. These are factors such as foreign exchange constraints which made it difficult for inputs like fertilisers to be purchased.

### 3.3.2. Today's Privatised Sector.

The turning point in cotton production came with the setting up of the Ghana Cotton Company (GCC) in 1985. The Government owns 30 percent of shares, and the remaining 70 percent are held by the major textile firms. The company has been allowed to operate with little government interference, and its aim from the start was to be a profit making operation. It went about achieving this aim by adopting a Francophone-style method of high input/high yield method of cultivation.

GCC has endeavoured to assure the availability of inputs, marketing and processing facilities. It made sure, in particular, that the small family farms that cultivated its crop received all that was required to produce maximum yields. Seeds were distributed and tractors, fertilisers and insecticides were made available on time. Transport vehicles were also supplied to evacuate the seed cotton at the end of the picking period (cotton is hand picked in Ghana). The prices payed to farmers were no longer arbitrarily set but were carefully calculated to maintain the incentive for cotton farming. Government macroeconomic policy, in terms of making foreign exchange more freely available, also favoured the drive for increase in production.

As can be seen from Table (3.1) which looks at the performance of GCC in terms of yields and areas cultivated for the period 1985-89, GCC has done extremely well. The figures for 1985 reflect the performance of the Cotton Development Board with only 1,475 hectares cultivated and a seed cotton yield of 168 Kgs. per hectare. In GCC's first season, in 1986, 7,625 hectares were cultivated with a yield of 865 Kgs. per hectare; a remarkable increase. This performance was maintained in the period 1987 to 1989 (see Figure (3.2) for graphic representation of planted area and production).

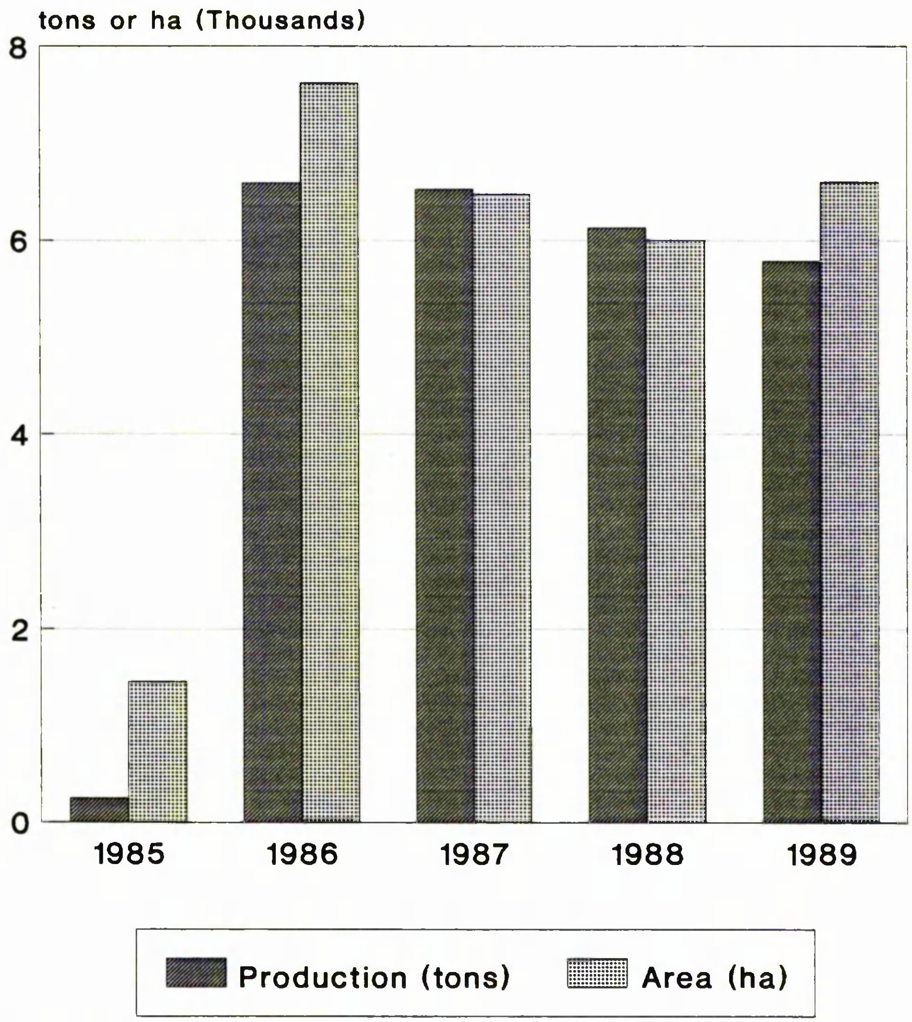
Table (3.2) compares GCC's yields of lint cotton with other cotton producing countries for the years 1986 and 1987. This shows that even though GCC's yields of between 260 to 300 kgs. per hectare are not as high as those of countries such as Greece (707-848 kgs./ha.)or Egypt (811-851 kgs./ha.), they are higher than yields in Uganda (20-20 kgs./ha) or Tanzania (123-131 kgs/ha). From the 1991 survey, it was learnt that GCC believes that it has achieved these relatively higher yields as a result of the price and non-price factors which it has introduced to the cotton farmers. These include,

## Performance of the Ghana Cotton Company.
## Table 3.1.

| | Area in Hectares | Volume of seed cotton in tonnes | Yield of seed cotton (Kgs. per hectare) | Volume of lint cotton in tonnes | Yield of lint cotton (Kgs. per hectare) |
|---|---|---|---|---|---|
| **1985** | 1,457 | 245 | 168 | 97 | 66 |
| **1986** | 7,625 | 6,592 | 865 | 1,977 | 259 |
| **1987** | 6,477 | 6,527 | 1,007 | 1,957 | 302 |
| **1988** | 6,000 | 6,125 | 1,021 | 1,837 | 306 |
| **1989** | 6,639 | 5,785 | 872 | 1,734 | 262 |

**Note: 1985 values are for Cotton Devel. Board**
**Source: 1991 fieldwork.**

Ghana Cotton Company
Cotton Area and Production
Figure 3.2.




Source: 1991 fieldwork.

## Production of Lint , in Kgs. per Hectare, by (GCC) and Selected Countries.
## Table 3.2.

| | Greece | United States | Egypt | Pakistan | Uganda | Tanzania | Ghana |
|---|---|---|---|---|---|---|---|
| **1986** | 848 | 568 | 811 | 463 | 20 | 123 | 259 |
| **1987** | 707 | 635 | 851 | 472 | 20 | 131 | 302 |

**Source: Data on GCC from 1991 fieldwork.**
**Rest of data from International Cotton Advisory Committee, (1990).**

for example, the supply of adequate quantities of fertiliser, under supervision, and on time.

With the liberalisation of cotton cultivation, other private cotton growing companies have emerged and have made a good contribution to total cotton output. In fact, the Ghanaian Times (1991) states that the total cotton production in Ghana as a whole rose from 360 tonnes cultivated over 1,700 hectares in 1985 to 5,000 tonnes cultivated over 12,000 hectares in 1990. Average national yields rose from 420 Kgs. of seed cotton per hectare to 1,000 Kgs. per hectare in the same period.

### 3.4. Structure of the Cost of Production.

The cost of growing cotton is shown in two formats. Table (3.3) gives a detailed account of cultivation costs incurred by GCC for 1000 hectares in 1991, and Table (3.4) shows costs incurred by GCC and selected countries itemised by specific types for 1991 as well.

As shown in Table (3.4), GCC, with a figure of 32.93 percent, has the lowest pre-harvesting cost as a percentage of total cost for the sample, even though its chemicals figure is the highest. This is because it has the smallest pre-harvesting labour and equipment component in all the sample. While Pakistan's labour component in the pre-harvesting cost is 9.3 percent, Greece's figure

**Detail of cotton growing costs of Ghana Cotton Company 1991.**
**Table 3.3.**

- Insecticide: Spray 7 times per year. Each spraying requires 1 litre per hectare at 4000 cedis per litre. Therefore 1000 hectares requires 28 million cedis -(A)
- Fertiliser: 2 bags of compound fertiliser at 6000 cedis per bag and 1 bag ammonia at 5000 cedis per bag. So 1000 Ha. requires 17 million cedis -(B)
- Seed: 30 Kgs. per Ha. required. Therefore 1000 Ha. cost 1.5 mil. cedis -(C)
- Ploughing: (refunded) at 8000 cedis per Ha.. So 1000 Ha. cost 8 mil. cedis -(C)
- Yield: 700 Kgs. per Ha.. Farmers payed 70 cedis per Kg. Therefore 1000 hectares cost 49 million cedis. -(D)
- Ginning: 50 cedis ginning cost per Kg. of lint cotton. Yield of lint cotton approximately 282 Kgs. Therefore 1000 Ha. cost 14.1 million cedis. -(E)
- Transport to and from gin: 20 cedis per Kg. of raw cotton. Therefore 1000 Ha. cost 14 million cedis. -(F)
- Staff: 1 senior paid 30,000 cedis a month, 2 supervisors paid 20,000 cedis each and 17 workers paid 16,000 cedis each are reqired for 1000 Ha. Therefore yearly cost of employees is 3.9 million cedis. -(G)
- Expatriate: one foreign cotton growing expert costs 6 million cedis as wages and 4.6 million cedis accomodation and transport. therfore total cost is 10.6 million cedis. -(H)
- Vehicles: car at 4 million cedis, 10 motorbikes at 4 million cedis, 5 tractors (second-hand) at 5 million cedis each. Therefore cost of vehicles is 33 million cedis. Therefore depretiation of 15 % means an annual cost of 4.95 million cedis. -(I)
- Interest on operating capital: Insecticide and fertilisers given on 120 days credit; Therefore interest rate of 30 % on rest of operating capital is 25 million cedis. -(J)
- Total Direct Costs equal (A) + (B) + (C) + (D) + (E) + (F) + (G) + (I) + (J) = 157.45 million cedis
- Overhead Costs equal (H) = 10.6 million cedis.
- Total Cost = 168.05 million cedis.
- Sales: Yield of 282 Kgs. lint per Ha. at 750 cedis per Kg. Therfore total sales equal 212 million cedis (i.e. $.5m).

Source: 1991 Fieldtrip.

## Cotton growing costs for Ghana Cotton Comany and Selected Countries (% of total cost).
## Table 3.4.

| | Egypt | Pakistan | Greece | GCC |
|---|---|---|---|---|
| I. Direct costs | | | | |
| A. Pre-harvesting | | | | |
| Labour | 20.24 | 9.30 | 16.82 | 2.32 |
| Power | 10.25 | 7.79 | 7.95 | -- |
| Equipment | -- | -- | 10.86 | 2.95 |
| Seed | 0.57 | 1.11 | 1.40 | .89 |
| Chemicals | 14.69 | 20.90 | 6.57 | 26.7 |
| Irrigation | -- | 5.59 | 1.68 | -- |
| Other | 2.83 | -- | -- | -- |
| Subtotal: | 48.58 | 44.69 | 45.28 | 32.93 |
| B. Harvesting | | | | |
| Labour | 34.17 | 6.74 | 1.85 | 29.16 |
| Power | -- | -- | 0.88 | -- |
| Other | -- | -- | 5.07 | -- |
| Subtotal: | 34.17 | 6.74 | 7.80 | 29.16 |
| C. Interest paid | -- | 5.36 | 7.89 | 14.88 |
| II. Off-farm costs | | | | |
| Transport (gin) | -- | 1.65 | 3.11 | 8.33 |
| Ginning | -- | 15.60 | 12.14 | 8.33 |
| Other | -- | -- | -- | -- |
| Subtotal: | -- | 17.25 | 15.55 | 16.66 |
| III. Ttl dirct. cost | 82.76 | 74.04 | 76.54 | 93.63 |
| IV. Overhead costs | | | | |
| Administrative | 17.23 | 1.98 | 1.03 | 6.30 |
| Land cost | -- | 21.97 | 22.43 | -- |
| Other | -- | 2.00 | -- | .07 |
| Subtotal: | 17.23 | 25.96 | 23.46 | 6.37 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 |

**Source: GCC data from 1991 fieldwork, other data from Industry and Development (1989/90).**

is 16.82 percent. But, Greece's chemical cost is 6.57 percent while Pakistan's is 20.9 percent. Egypt has both a high pre-harvest labour component, 20.24 percent, and a high chemical component, 14.69 percent.

Greece has a low labour cost (1.85 %) as a percentage of total cost for harvesting. It would seem that Greece has mechanised capital intensive harvesting since it has 5.07 percent of total cost under the other category of harvesting, while the others in the sample have no figure for this, implying that their cotton is hand picked. Egypt's labour component is 34.17 while Pakistan's is 6.74. GCC's harvest labour cost as a percentage of total cost is 29.16 percent. It seems that farmers are paid for their pre-harvest and harvest efforts only after harvest. Thus, while the pre-harvest labour figure is low, the harvest figure is relatively high.

Egypt has no ginning cost. No explanation can be given for this, and it seems, perhaps, that this is an error in the source material.

Both Pakistan and Greece have low administrative costs as a percentage of total cost. These are 1.98 percent and 1.03 percent respectively. GCC's figure is higher at 6.3 percent while Egypt's figure of 17.23 percent is higher still.

Thus, the striking features in this cost comparison are Pakistan's very low labour figure, Egypt's high labour and administrative figure, and GCC's high chemical figure.

Table (3.3) reflects the high input/high yield nature of GCC's approach. The optimum quantities of seeds, fertilisers and insecticides are used. The assumed yield of 700 kgs. per hectare is a four year average. This has been done in order to reduce the effects of yearly fluctuations on the costing schedule.

Subtracting total cost from value of sales we get a pre-tax profit figure of 43.95 million cedis per 1000 hectares. In dollar terms this means 116,000 dollars at 1991 rates of exchange (380 cedis to $1). Thus cotton cultivation shows a return on sales of 20.7%. There are increasing returns to scale as well in that costs such as overheads, vehicles, and staff do not increase in the same proportion when the hectarage being cultivated is increased.

Costs itemised by specific types are shown in Table (3.4). This is a comparison of differences in specific growing costs, expressed as a percentage of total costs. A review of the data suggests the following observations:

(a) For pre-harvesting, there is less emphasis on labour and power in the case of GCC than in the countries selected. This can be explained by the fact that farmers are paid after harvesting.

(b) Cost of chemicals as a percentage of total cost in the case of GCC is very high at 26.77% as compared to 6.57 in Greece, 14.69 in Egypt, or 16.65 in the United States, even though all of these countries achieve higher yields than GCC as can be seen from Table (3.2).

(c) Interest charges by banks of over 30% resulted in GCC having the highest interest payments as a percentage of total cost in the countries selected.

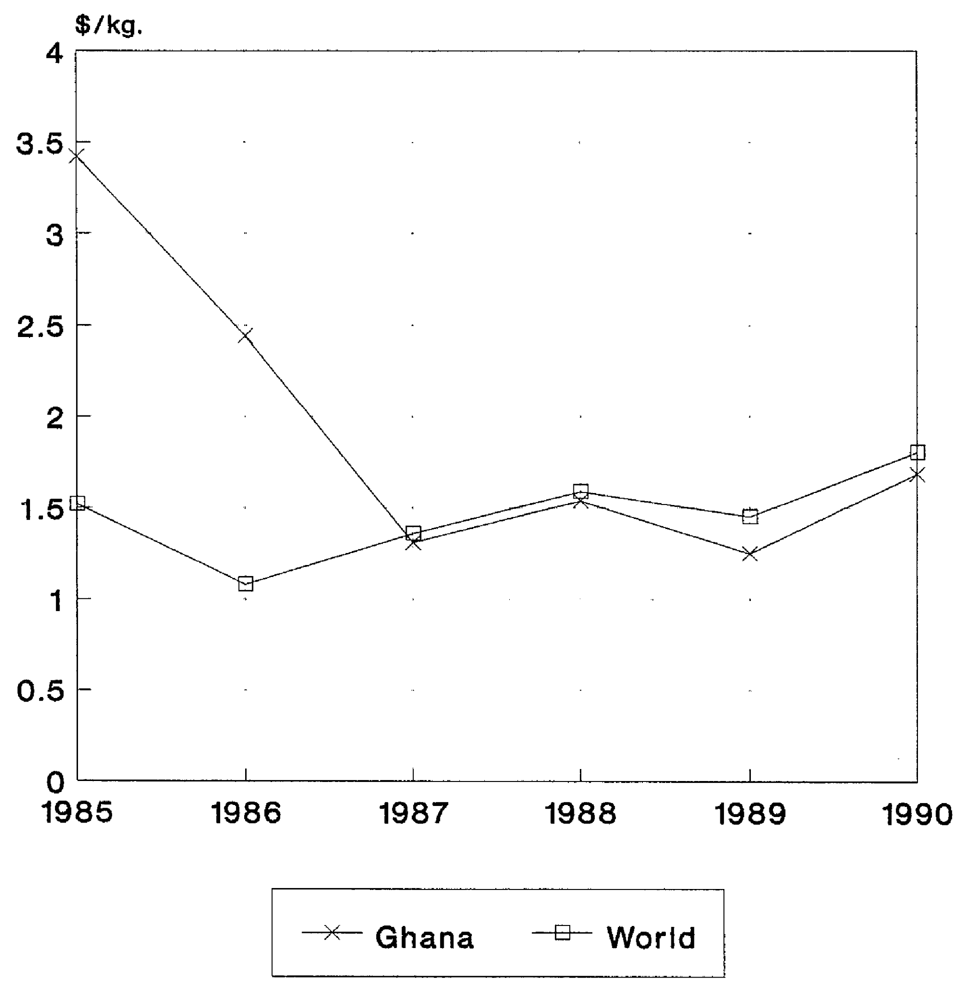
(d) GCC has the highest total direct cost percentage and therefore the lowest overhead costs as a percentage of total cost for the selected countries.

**3.5. Lint Cotton Price.**

A competitive price and adequate quality are important elements which Ghanaian cotton must aim for if it is to be competitive. They are important factors whether it is for export or intended for local consumption by the textile mills. This is because textile mills in Ghana are no longer constrained by foreign exchange scarcity. They are therefore free to import cotton if they are unhappy either about the price or quality of Ghanaian cotton.

Figure (3.3) compares Ghana's lint cotton price with C.I.F world prices. While the price of Ghanaian cotton, at $3.42/kg, was twice the world price of $1.52/kg in 1985, it fell sharply the following year. In 1987 it fell below the world price of $1.36 by reaching the $1.31 mark. In fact it was lower than world price for

Lint Cotton Price: Ghanaian vrs. World Price (US $).
Figure 3.3.




Source: Ghana cotton price from 1991 fieldwork. World price is C.I.F (nearby shipments), Int. Cot. Adv. Cmt. (1991).

every year in the period 1987-90, and with profits in the region of 20% (as indicated by Table (3.3)) it is anticipated that the Ghanaian cotton price is able to absorb possible decreases in the world price of cotton as well as the added cost of freight when production reaches exportable levels.

One advantage which Ghanaian cotton holds over imported cotton with respect to domestic consumption is that transport charges are far smaller in the case of the former as compared to the latter. This is due to the relatively shorter distances that domestically produced cotton has to travel to reach the local textile mills.

Another advantage is that domestic cotton is purchased on credit terms while imported cotton is paid for upon placement of order and then requires a period of time for shipment to be effected. Thus the purchase of domestic rather than imported cotton helps companies' cash flows and enables them to avoid the high cost of borrowing.

As we have seen above, Ghana has been price competitive in cotton production. But, as was discovered in fieldwork conducted in 1991, there are serious problems with the quality of the lint cotton. This is due to several factors and is discussed in the section below.

### 3.6. Quality of Ghanaian lint.

Before we can understand the findings made during the 1991 fieldwork on lint cotton quality it is important to know something about how cotton is harvested and ginned in Ghana, and how quality is evaluated.

### 3.6.1. Harvesting.

In spite of advances in mechanical harvesting, hand harvesting, which still accounts for the largest percentage of harvested cotton in the world, is practised in Ghana. The harvesting of cotton demands care in order to obtain good value for the lint. Cotton harvested improperly can be damaged by excessive moisture, trash and other contaminants which are difficult to remove in ginning without damaging the spinning quality of the fibre.

Hand harvesting is done by two methods: picking and "snapping". Picking is the removal of cotton seed from the burr with as little of the leaf or boll parts as possible. Pulling or "snapping" is the pulling of the entire open boll from the plant. Picking is the practice used in Ghana since the local gins are not equipped to clean snapped cotton.

Another point to note is that storage of unginned cotton, (i.e. cotton seed), in a humid atmosphere for a long period of time before it is ginned causes the lint to mould and should therefore be discouraged.

### 3.6.2. Classification and Evaluation.

Cotton is classed according to staple (i.e fibre) length, fineness, grade and character. Amongst measures of staple length are, "2.5% span length", "50% span length" and "maximum fibre length". These are determined by using an instrument known as a Fibrograph. 2.5% span lengths of less than 25 mm are considered short; so is a 50% span length of less than 18 mm. Longer staple cotton makes stronger yarn and is used in making finer count yarns i.e thinner yarns. Short staple cotton is used for less expensive items such as rugs, blankets and ropes.

Fineness is second only to length in determining the quality of a crop of cotton. The fineness of a variety of cotton is dependent on the average external diameter of the fibres. Fibres of small diameter result in a fine cotton, and fibres of large diameter in a coarse cotton.

The "Micronaire" instrument measures flow rates of air through a sample. A low reading by this instrument (denoting a low air flow) signifies that the sample being tested is of fine cotton; a high reading is obtained with a coarse sample. The reading is also affected by the maturity of the fibres. A mature fibre has a thick wall as a result of secondary thickening deposited on the inner side of the wall during boll ripening, while an immature fibre is thin-walled and is usually the result of unfavourable growing conditions during the boll ripening period. Cotton containing many thin-walled fibres is difficult to process. Micronaire values of 3.5 or above should mean that this problem has been avoided.

Other important characteristics are fibre strength and uniformity of length. Fibre strength is measured in thousands of pounds per square inch by a "Pressley strength tester" and is based on the strength of a square inch of fibres. Fibres with a measurement below 65 are considered weak, while a reading above 95 is very strong.

The length of fibres in a given sample can vary considerably. A sample has a high uniformity ratio if most of the fibres, excluding the very long and the very short, have a small length variance. When cotton with high uniformity ratio is spun, the yarn will have a relatively even thickness throughout and will be less easily broken.

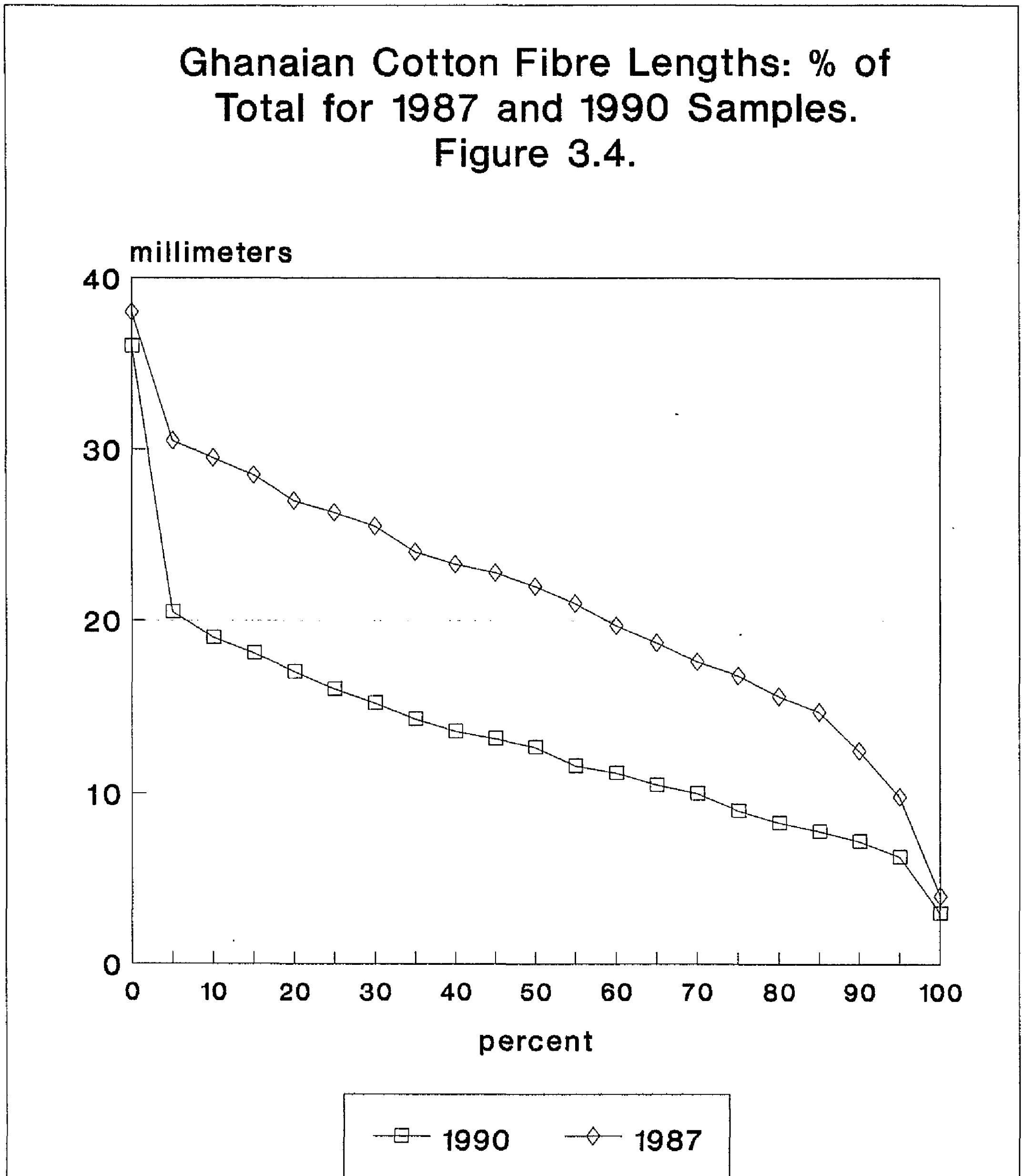
### 3.6.3. Results of Tests on Quality.

Results of two tests conducted on Ghanaian cotton fibre quality in 1987 and 1990 are given in Table (3.5) and Figure (3.4). These were obtained from a textile mill (referred to as Plant (B) in 1990 fieldwork) during fieldwork conducted in 1991. The data was compiled for the firm by a Swiss textiles laboratory.

## Comparison of Ghana Cotton Fibre Characteristics for 1987 and 1990.
## Table 3.5.

| | 1990 | 1987 |
|---|---|---|
| **2.5 % Span Length** | 27.5 mm | 33.0 mm |
| **50 % Span Length** | 12.7 mm | 22.0 mm |
| **Max. Fibre Length** | 36.0 mm | 38.0 mm |
| **Pressley lbs/sq inch** | 85,000 | NO CHANGE |
| **Micronaire** | 3.64 | NO CHANGE |
| **Trash Content** | 1.65 % | Not Available |
| **Dust Content** | 0.07 % | Not Available |
| **Fibre Fragments** | 0.08 % | Not Available |
| **Nep Count** | 485 neps/gr. | 315 neps/gr. |

**Source: 1991 fieldwork.**




Source: Data was obtained from Plant (B)
during 1991 fieldwork.

Table (3.5) gives data on 2.5% span length, 50% span length and maximum fibre length for 1987 and 1990. Although the maximum fibre length values do not vary greatly between the two years (38 mm and 36 mm for 1987 and 1990) the 2.5% and 50% span lengths show a drastic decrease in fibre lengths for those years. The 2.5% measure registered a decrease from 33 mm in 1987 to 27.5 mm in 1990 and the 50% measure was 22 mm in 1987 but only 12.7 mm in 1990. The explanation offered by an official at Plant (B) is:

> "In practical terms this means 50% of all (1990) fibres are considered short fibres and influence the yarn quality negatively. No cotton buying firm will purchase this type of cotton anywhere in a developed country, as the spinning results are extremely poor. Short fibres are influencing yarn regularity, tenacity and elasticity."

This relative shortness of the 1990 fibres is well illustrated in Figure (3.4). This is a cumulative frequency diagram comparing Ghanaian cotton fibre lengths for 1987 with 1990 figures. It can be seen from this that even though there are similar maximum and minimum fibre lengths for 1987 and 1990, the cumulative frequency curve for 1990 lies below 1987's curve. This means that fibres in 1990 are on average shorter than in 1987. For example, only 70 percent of fibres in the 1990 sample are at least 10 millimetres long, while 95 percent of fibres in the 1987 sample are at least 10 millimetres long.

Pressley and Micronaire readings of 85 thousand pounds per square inch and 3.64 respectively for the two years are considered good.

Trash content, i.e. seed and stalk particles, of 1.65% for 1990 is considered high , while dust content of .07% and fibre fragments, i.e. destroyed fibre during ginning, of .08% are considered high but acceptable. No figures for trash content dust content or fibre fragments are available for 1987. Neps, which are little knots formed either by irregular growth of cotton fibres or by the rubbing together of fibres especially in ginning, were more abundant in 1990 fibres than in 1987 fibres. A nep count of 485 neps per gram was obtained for 1990 fibres as against 315 neps per gram for 1987 fibres. A nep count of over 350 neps per gram is considered high.

Plant (B) officials comment on 1990 cotton thus:

> "We find that excessive contamination due to crushed oil seeds takes place during ginning. During sampling, complete seed capsules as well as seed fragments are being isolated. Together with the trash content - cotton is hand- picked - the high oil seed contamination as well as the low span lengths and high nep count point to serious deficiencies in ginning. This problem must be overcome before we can produce a standard yarn quality from local cotton."

GCC owns all gins in Ghana. Upon informing GCC officials of the problems a local textile mill was facing due to poor cotton ginning, the person in question disagreed. Further questioning revealed that GCC had no foreign technical assistance in operating their gins, and this gave the impression that local gin operators had little idea of the quality standards they had to meet. The Plant (B) official also suspects that either parts in the ginning plant are worn and need replacement, or the machine is not being operated correctly.

All private cotton producers rely on GCC for ginning. A few have decided to purchase their own gins in order to reduce this dependence. But, this does not necessarily mean that these producers will be able to run their gins correctly especially if they intend to do so without outside technical assistance.

### 3.7. Summary.

It is clear from the above that both price and non-price factors have been instrumental in increasing the production and price-competitiveness of cotton, but that non-price factors, namely technical know-how in the ginning process, are required to improve its quality. This is an important finding since this problem has serious implications on the future success of the sector.

One of the main reasons for the recent success achieved by the cotton producers in selling their output to domestic mills is either because most of these mills have not yet worked out the losses they incur in buying inferior cotton, or because they are strapped for cash and cannot pay for cotton imports in advance, as is currently required by the government. When one or either of these points is resolved, the demand for local cotton will face competition from imports.

Also, as the quantity of cotton produced increases in the future (Ghana could conveniently utilise approximately 500,000 hectares of land to produce 200,000 tonnes of cotton as mentioned in Ghanaian Times 1991), the exportability of this commodity will depend to a large extent on its quality since price does not, for now, appear to be a constraint.

**Notes.**

(1) Ginning is the process of separating the cotton lint from the seeds.

(2) Ghana Government, "Crop production goals and programmes", Agriculture Annexe II, Nathan Consortium for sector studies, Ministry of Finance and Economic Planning, Accra 1970, pp.203,213.

# 4. THE WORLD TEXTILE INDUSTRY.

## 4.1. Introduction

The biggest changes in the structure of the world textile industry took place between 1965 and 1980. Great improvements in productivity were achieved in spinning and weaving, and employment in textiles fell sharply in North America, Western Europe and Japan. Faced with a declining textile industry in the early 1960's, the developed world opted for non-tariff restrictions on trade in textiles to protect them from cheap imports from developing countries. These are still in place today in one form or another.

After the introduction in Section (4.1), the economic history of the world textile industry is reviewed in Section (4.2). Section (4.3) looks at the modern textile industry. This contains a summary of the following: world employment and output in Section (4.3.1); the LTA and MFA in Section (4.3.2); the effects of MFA on developing countries in Section (4.3.3); the new technologies and their impact on labour productivity and comparative advantage in Sections (4.3.4) and (4.3.5) respectively; technology diffusion in Section (4.3.6). The summary is in Section (4.4).

## 4.2. Economic History of World Textile Industry.

According to Ashton (1948, p.28), textiles have been one of the earliest offshoots of a peasant economy in all parts of the world. He points out, for example, that in Britain, for many generations, wool from sheep "provided the material for an activity second only to agriculture in the number of people it employed and the volume of trade it supported." But it was not until the wave of technical innovations swept Britain after 1760 that the textile industry began to grow at unprecedented rates.

As mentioned by Cipolla (1976), the two most original of the inventions that contributed to this growth were Kay's flying shuttle of 1733, which roughly doubled the weaver's output, and Lewis Paul's use of rollers, in 1738, to draw out the rovings (see section below for definition of rovings) as part of a power-driven spinning machine. Thus as Cipolla (1976) states:

> "The inventions did not initiate cotton's explosive expansion. But,..., once they had been made, the rate of expansion could rise to levels that would previously have been quite impossible. The hundred-fold growth in production between 1760 and 1827 could not have been achieved by a hundred-fold increase in the labour force, but only by the rises in productivity which the spinning machinery and eventually the power looms provided."

According to Knowles (1924, p.29), the introduction of iron products into textile machinery in the 1790s meant that steam powered engines could be used to power these machines. The wooden machinery, used previously, could not stand the strain of the power produced by steam engines. Thus, according to Knowles (1942), as far as textiles were concerned, machinery was introduced to cope with the rapid expansion of British trade during the eighteenth century.

Throughout the 19th century a succession of improvements in textile machinery steadily increased the volume of production, lowering prices of finished cloth and garments. The trend continued in the 20th century, with emphasis on fully automatic or nearly fully automatic systems of machinery.

## 4.3 Modern Industry.

Both industrialised and developing countries now have modern installations capable of highly efficient fabric production. In addition to mechanical improvements in yarn and fabric manufacture, there have been rapid advances in development of new fibres, processes to improve textile characteristics, and testing methods allowing greater quality control.

### 4.3.1. Employment and Output.

As indicated by the International Labour Organisation (1991), the textile industry employed 5.3 million workers in developing countries in 1985 or 16 percent of the industrial workforce. In the period 1967-1987 developed countries drastically reduced employment in the textile industry from 8.9 million to 6.8 million workers, mainly by better integrating the design, spinning, weaving, and finishing stages of production and by establishing large manufacturing units and long production runs. In many countries, the Government provided financial assistance for restructuring and modernisation of the industry. As a result, the value added per worker in 1985 in developed countries was $18,000, compared to $6,000 in developing countries, as indicated by Industry and Development (1987, p.123).

Between 1970 and 1985, textile output increased by 2.4 percent per annum in developing countries and 1.5 percent per annum in developed countries. As a result, the developing countries' share in world output increased from 19.5 to 21.7 percent on the basis of a sample of 82 countries, (Industry and Development , 1987, p.123). Textiles and clothing exports are therefore clearly of major importance to developing countries.

### 4.3.2. The LTA and the MFA.

The massive liberalisation of world trade since World War II has provided a continuing impetus to change in textile industries of industrialised countries. Pressures for change in these countries have been imposed from many sides. Shephard (1981) finds that these include fierce competition in foreign and domestic markets from low-wage countries, strong pressures from within the industry for structural reform and technical change and also competition for labour from other countries.

The prospect of decline has brought forth a variety of 'survival responses' from the governments and industries of the industrialised countries. Of these responses, government intervention aimed at stemming the tide of decline has been the most universal, and by far the most important form of intervention has been provided by non-tariff restrictions on trade, a history of which can be found in Keesing and Wolf (1980).

Mathur (1989, p.217) points out that protectionism in the name of voluntary export restraints dates back to the 1937 Osaka "Gentlemen's Agreement" between the American and Japanese textile trade associations. Cline (1990) highlights the fact that what followed was the beginning of a cycle that has plagued textile protection ever since: namely the spillover of imports from controlled to uncontrolled areas. Thus, under self-restraint, Japan's share of US imports of cotton textiles fell from 63 percent in 1958 to 26 percent in 1960, while Hong Kong 's share rose from 14 percent to 28 percent. Imports also surged from many other countries. Moreover, as indicated by Keesing and Wolf (1980, p.14-15), US agricultural policy aggravated import competition by forcing domestic textile mills to purchase cotton at an artificially high support price while foreign producers could buy exported US cotton at a lower price.

The General Agreement on Tariffs and Trade (GATT) discussions, led by US negotiators, developed the concept of "market disruption" in 1959-1960. This was defined as instances of sharp import increases associated with low import prices not attributable to dumping or foreign subsidies. In November 1960 GATT adopted the Decision on the Avoidance of Market Disruption, which meant that restrictions could be applied even if actual injury had not taken place. It also established the occurrence of a price differential between imports and comparable domestic goods as a basis for determining the need for restriction.

A waiver of GATT's rules on non-discrimination having been obtained, the Short Term Arrangement (STA) was adopted in 1961, and this applied the concept of market disruption, and it remained the cornerstone of textile and apparel protection thereafter in the Long Term Arrangement (LTA) and the Multifibre Arrangement (MFA).

The LTA came into effect for five years in 1962, and was largely meant to allow the industries of the importing (industrialised) countries a temporary 'breathing space' to adjust to increased imports from low wage countries. The 'breathing space' was seen as being too short, and the LTA was twice renewed before it was replaced in 1974 by an agreement that embraced all the major textile fibres, the MFA. The MFA was renewed for yet four more years in 1978 under significantly more restrictive conditions, and then renewed twice more in 1981 and 1986.

Today, world trade in textiles and clothing, continues to be regulated by the MFA. In 1986, the United States signed bilateral agreements with its three main Asian suppliers covering imports of textiles and clothing up to 1991. Hong Kong agreed to limit the growth of its exports by an average of 1 percent per annum in that period. Under similar agreements, the growth of exports from the Republic of Korea was limited to 0.8 percent per annum, and those of Taiwan Province to 0.5 percent per annum. The EEC has been a little more liberal than the United States in its bilateral agreements. With the extension of the MFA in 1986, it has agreed to annual increases of 1 to 2 percent higher than in the previous bilateral agreements.

### 4.3.3. Effects of MFA on Developing Countries.

Although the quota system restricts the expansion of exports, it guarantees the status quo. The existing suppliers are thus assured of a given share of the export market to which they can attach a market value. This market value, commonly referred to as the quota rent, is incorporated in the price of the exported textiles and clothing and becomes a guaranteed improvement to their terms of trade and export earnings. Trela and Whalley (1989, p.137) point out that it is therefore believed that this class of established exporters has a vested interest in maintaining the status quo and will favour the continued renegotiation of the MFA. Thus, Keesing and Wolf (1980, p. 125) state that developing countries' gain from quota rents more than outweighs the loss they suffer as a result of the restrictions on their market access. As a result, it is not in their interest to seek to terminate the MFA because of the loss of their quota rents.

On the other hand, it is argued by GATT (1984, p.152), and Mark (1985, p.8) that the quota rents only partially compensate the earnings foregone from the unrealised expansion of sales. Moreover, the MFA imposes a rigidity on production and export structures in both exporting and importing structures. This, as pointed out by Mathur (1989, p.197), may result in the "established" exporters actually losing market shares to new entrants into the market from unrestricted countries.

Various attempts have been made to estimate the magnitude of foregone exports and transferred rents from trade restrictions in textiles and clothing. Most studies have found the decline in export opportunities and revenues from the MFA to be substantial for developing countries. According to an estimate by Trela and Whalley (1988), if these bilateral export restraints were eliminated, exports of textiles and clothing by developing countries would increase by about $5 billion. Ending tariffs on these items would add another $6 billion in exports. By another estimate made by Laird and Yeats (1987), the removal of EC, Japanese, and U.S. barriers to imports from developing countries could increase developing country exports of textiles and clothing by 125 percent. UNCTAD (1986) estimated that complete nondiscriminatory liberalisation (involving both tariffs and the MFA quotas) could increase developing country exports of clothing by 135 percent and textiles by 78 percent. Another estimate by Kirmani et al. (1984) suggests that developing country exports to the major OECD countries could increase by 82 percent for textiles and 93 percent for clothing if both trade restrictions were removed.These estimates are of static effects only, and over time developing countries might reap further benefits from opportunities under liberalisation for economies of scale, product differentiation, and specialisation.

Cable (1989, p.148) points out that, the MFA, by relying on quantitative restrictions, has the effect of forcing the foreign suppliers to upgrade the added value content of their exports. It has therefore increased competition in the upper end of the market in importing countries - precisely the part of the market where the importing (industrial) countries have the greatest comparative advantages.

Cline (1990, p.128-130) shows that the MFA also has an indirect impact on the economic structure of both industrialised and developing countries. For example, a distorted price structure in the textile and clothing industries hampers the needed structural adjustment which would have enabled a shift of investment in importing countries to other sectors. At the same time, exporting countries, in response to the MFA, have been forced to develop the export potential of other industries, causing tension in the increasing number of industrial sectors in industrialised countries.

Developing country policymakers frequently argue that the more serious implications of the MFA are those which affect individual country's growth and development. OECD (1985) argued that:

> "the expansion of textile and clothing exports had become for the developing countries an increasingly important determinant of their economic development."

Their view was that they had seen the highly beneficial results of both economic growth and social development from export-led growth in countries such as Japan, Hong-Kong, Korea, Singapore, and Taiwan. They argued that in order to shift to outward-oriented trade policies, developing countries needed not only continued, but expanded access to markets of the major industrial countries, and removing the MFA restrictions played a major role in this. Moreover, as Keesing and Wolf (1980) argue:

> "if the MFA quotas did not exist the developing countries would have the opportunity to follow much the same path to industrialisation that Hong Kong, Korea, Singapore, and Taiwan have been taking and to supplant them as leading clothing exporters."

Further unfavourable consequences of the MFA restrictions follow from their adverse impact on investment opportunities in developing countries. Thus, as Chaudhry and Hamid (1988) point out in discussing the effects of the MFA on Pakistan's textile industry, it has:

> "hampered modernisation of the sector, led to expansion of the low cost power-loom sector, and generally put Pakistan technically behind in textiles."

However, Trela and Whalley (1990) argue that MFA restrictions do not seem to have affected the overall growth performance of certain developing countries. They cite the high growth rates of the Asian Big Three (Korea, Singapore, and Taiwan) through the 1970s and 1980s as an example. They also point out that a key factor behind this high growth rate has been a rapid expansion of exports, fuelled to a large extent by the growth of exports of textiles and clothing.

### 4.3.4. Textiles Manufacturing and New Technologies.

Essentially, the processes involved in producing textiles are designing, fibre preparation, spinning weaving or knitting, and finishing; making clothes involves designing and pattern making, cutting, sewing and finishing. These are summarised below, but a more detailed elaboration of the technical activities in spinning is given in Hamby (1966), and Lord (1981) amongst others, and a detailed account of the weaving process can be found in Marks and Robinson (1976), Aitken (1964) and Lord and Mohamed (1976). A good account of the effects of new technologies on these processes can be found in Toyne et al. (1984 ch.3), and Cline (1990).

Two important technological changes have taken place in the textile industry since 1945. The first came as a result of the competition that occurred between man-made fibres and natural fibres in the 1950s and 1960s. Thus, as FAST (1986), this resulted in an impressive rationalisation in spinning and weaving operations after 1950. The second wave of technological change in the textile industry, which began in the 1970s, was driven to a large extent by the rapid advances in microelectronics.

## Designing.

Computer-aided design (CAD) techniques offer extensive opportunities in making textile designing a more efficient process. Textile manufacturers have traditionally had to prepare several samples of cloth for their potential customers, which can be a time consuming task. With the CAD techniques, hundreds of examples can be presented to a customer on a computer screen, and only a few are then woven into samples before a final choice is made. Moreover, the computer has all the information ready for setting the loom for production.

## Fibre Preparation.

Fibre preparation before spinning involves blending, carding and drawing out of fibres. These processes have undergone various degrees of mechanisation. Latest equipment is highly automated and can be operated with the use of computers.

Bales of fibre arrive at the textile mill, as shown in Figure (4.1), from different sources. Fibre from a selected number of bales are then blended to produce a clean, uniform quality of material for further processing. The purpose of the opening room machinery is to loosen up and break the fibre layers taken from the bales into smaller pieces and deliver this pre-opened stock to the cleaning machines for further opening and cleaning. If the fibres are

Figure 4.1. Bales of Fibre at Textile Mill

not properly selected and properly fed at this stage of processing, production efficiency will be decreased and the product produced may not have the expected quality characteristics.

Toyne (1984) observed that computers are now widely in use for selecting the best combination of bales for a specific end-use product. The criterion for bale selection is based on how each fibre quality contributes to the manufacturing performance and product attributes. Bale pluckers and automatic feeds, as shown in Figure (4.2), can be programmed to feed a specific amount from bales at very high speeds while assuring homogeneous blending. These programmable machines, with their precision blending, minimise the within-bale and between-bale variations to a degree which is unattainable in manual feeding. Automated equipment in the opening room that is completely controlled by microprocessors can deliver a well-opened stock to the cards which are shown in Figure (4.4). These remove any remaining dirt or excessively short or immature fibres, and arranges the remaining fibres in a roughly parallel disentangled form (called a sliver) that becomes the input for drawing.

The development of new card clothing and the use of chute feeding, as shown in Figure (4.3), and electronics have greatly contributed to carding speed increases in the last decade. Metallic card wire was an important technological invention. It allowed automation in carding, and it improved both production speed and textile quality because it provided tighter, closer settings which enabled a better integration of fibres and reduced weight variation.

Figure 4.2. Automatic Bale Plucker/Feed

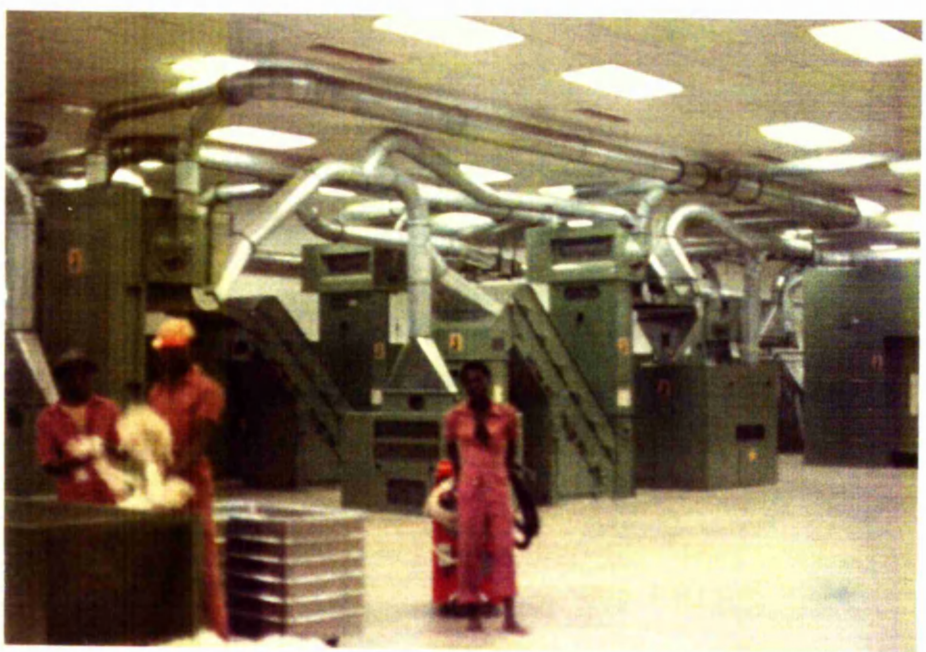


Figure 4.3. Chute Feeds

Figure 4.4. Carding

Figure 4.5. Rotor or Open-End Spinning

The use of electronic clutches, solid state circuitry, microprocessors, DC motors and minicomputers has provided greater control and higher carding efficiency, and now that carding can be programmed directly from the control room, the need for workers in the carding area has been virtually eliminated.

Pre-spinning operations include combing, drawing and roving. The importance of combing depends on the quality and fineness of the yarn demanded. Improvements in machine design, resulting in the elimination of uncontrolled acceleration, weight reduction, balancing of swinging masses, and stronger rocker shafts have made higher speeds possible.

The drawing frame straightens and parallels the fibres in the sliver, improves the uniformity of the slivers, blends the fibres by feeding several slivers through the drawframe, and delivers a sliver of a specific weight. This is done by passing the sliver between successive sets of rollers, each of which moves more rapidly than the preceding one. Modern high-speed draw frames are equipped with antifriction bearings to support the coiler, automatic stop motions at the break of the sliver, automatic can chargers and larger cans, power-driven creels, and levelling devices.

The roving frame attenuates the drawing sliver into a roving so that it will be suitable for the ring spinning frame. This is also done by means of employing increasingly fast rollers. The sliver is simultaneously twisted slightly to strengthen it. The continued use and development of ring spinning encouraged efforts to improve and automate roving frames. Frames with automatic doffing are now available.

## Yarn Spinning

The purpose of spinning is to obtain a still finer yarn from the roving and to twist previously parallel strands into a spiral so that they adhere together and make yarn strong enough to bear the stress placed on it in succeeding operations.

The spinning process takes one of two forms: ring-frame spinning or open-ended spinning which is shown in Figure (4.5). The ring frame spinning process which was first introduced in the United States in 1830 is still widely used today, though in a much improved form. For example, between 1950 and 1975 the speed of output doubled while the quality of yarn and reliability of operation also increased. Industry and Development (1987) states that as limits on the ring-frame spinning equipment were approached, open-ended spinning machines were developed which operate at four times the speed of ring-frames (partly because they integrate three previously separate processes: roving, spinning and winding). Although fabrics woven from open-end spun yarns are reported to be inferior to those from ring-spun yarns, the open-end technique accounted for more than 15 percent of all yarns produced in the US in the late 1980's, compared to only 3 percent in 1975.

Progress has recently been made in improving the rotor system. Otemas (1989) states that a textile machine manufacturer claims to have produced a rotor capable of spinning yarns in the fine count range and which had outstanding efficiency and which could be "opening up new fields of application for rotor yarns." UNIDO (1989) points out that jet spinning, a relatively recent Japanese innovation, spins yarn even faster than open-end spinning and does it finely enough for high quality shirting and blouse materials.

**Weaving**

Weaving involves interlacing lengthwise yarns (warp) and crosswise filling yarns (weft) and is carried out on a loom. The simplest weaving is accomplished by raising alternate warp yarns and inserting one length of weft (a pick) through the "tunnel" formed by raised and lowered ends and then reversing the pattern of raised and lowered warp yarns and inserting a second pick. The product of this pattern is called a plain weave.

The major innovation, in weaving, since the mid-1950s has been in the method of weft insertion. Traditionally, shuttles of approximately one foot were used on shuttle looms similar to those shown in Figure (4.7). But the development of the shuttleless loom means that either small projectiles or no projectiles at all are used. Missiles (small projectiles used to travel across the loom from

Figure 4.6. Rapier Weaving Looms (Shuttleless)

Figure 4.7. Shuttle Looms

one end to the other), rapiers (two small projectiles which meet in the centre and one hands over the weft to the other to carry across, see Figure (4.6)) , water-jets and air-jets were all efforts in this direction.

Shuttleless looms were estimated by Industry and Development (1989) to account for around half the looms in use in Europe in the late 1980's. They have the advantage of requiring less power and space than conventional power looms, as well as being faster. The more recent use of multiphase weaving has allowed up to 600 picks (number of weft insertions) per minute, as against 180 on high-speed conventional looms, with weft insertion rates rising from 400 metres per minute to 1840 metres. Further improvements of up to 170 metres per man hour have been achieved with the use of microelectronics to control the looms and to monitor the quality of the cloth produced.

As a result of the high level of automation that has been achieved, weaving is more computerised than any other textile process. Some of the latest machines use robotics, and the microprocessors in the machines can automatically adjust the winding speed according to the yarn requirements of the loom. The robots are capable of evaluating acceleration in order to reduce weft stress to a minimum. Other machines use systems which can adjust the weft feed while the machine is still running. UNIDO (1989) state that in one textile mill in the United States, computer control and automated materials handling devices allow production of about 1 million metres of fabric per week in 300 different styles compared to 275,000 meters a week in 100 styles without the computer.

**Finishing**

Finishing involves some or all of the following processes: washing; bleaching; dyeing or printing; and heat setting. Washing, as shown in Figure (4.9), is undertaken to clean the fabric in preparation for the other finishing processes. Bleaching is done in preparation for dyeing or printing. Dyeing can be either of the fibre-dyeing type, the yarn-dyeing type (as shown in Figure (4.8), or the fabric-dyeing type, while printing is done either manually on flat screens, or on a rotary printing machine. Another method of printing is called transfer printing where the design is transferred from a paper-like material onto the fabric.

Figures (4.11 a,b), (4.12 a,b), and (4.13 a,b) show real wax prints, imitation wax prints and machine woven kente cloth respectively, all of which are manufactured by Ghanaian mills. These represents some of the fabrics which can be produced using some of the finishing processes discussed above, and a brief review of the actual processes involved is given in Chapter (5).

Certain finishing processes involve heat setting the fabric in order to limit shrinkage, or to give the fabric a specific "feel". This is done using Stenters as can be seen in Figure (4.10.).

Textile finishing, has become more automated thanks largely

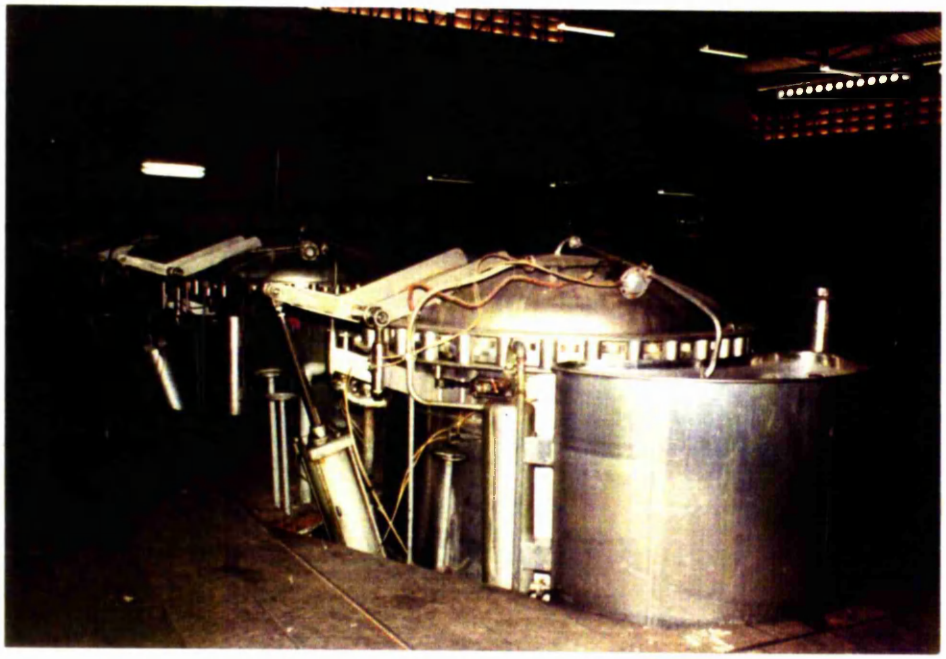


Figure 4.8. Yarn Dyeing

Figure 4.9. Continuous Washing

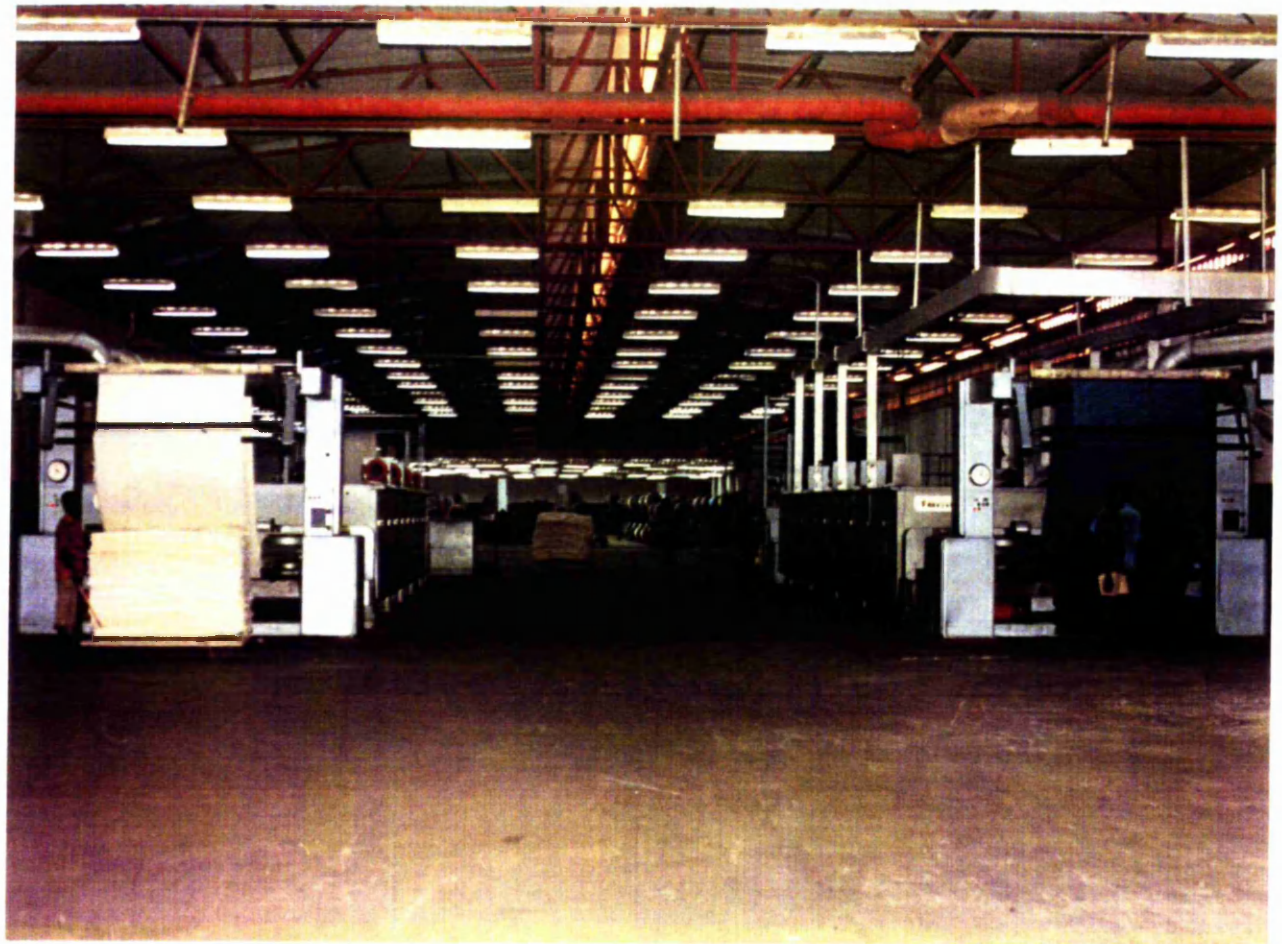


Figure 4.10. Stenters -Continuous Finishing

Figure 4.11a. Real Wax Print

Figure 4.11b. Real Wax Print

Figure 4.12a. Imitation Wax/Java Print

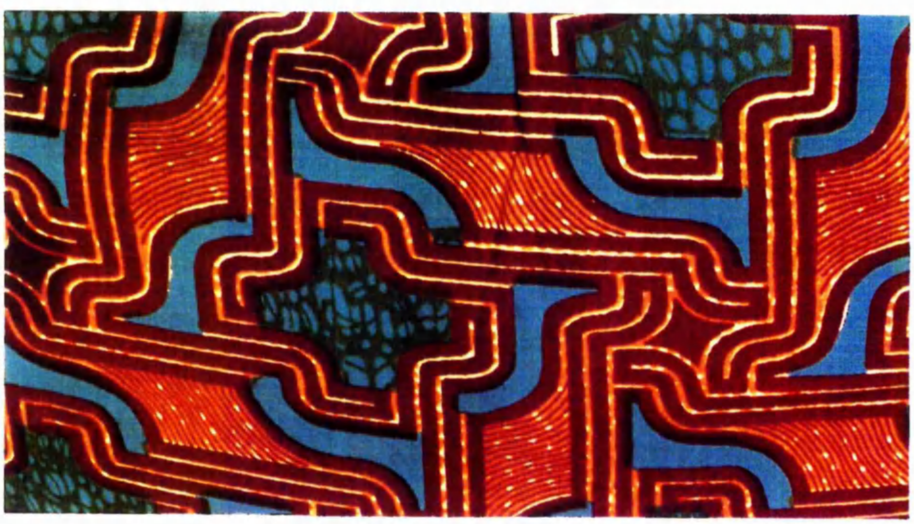


Figure 4.12b. Imitation Wax/Java Print

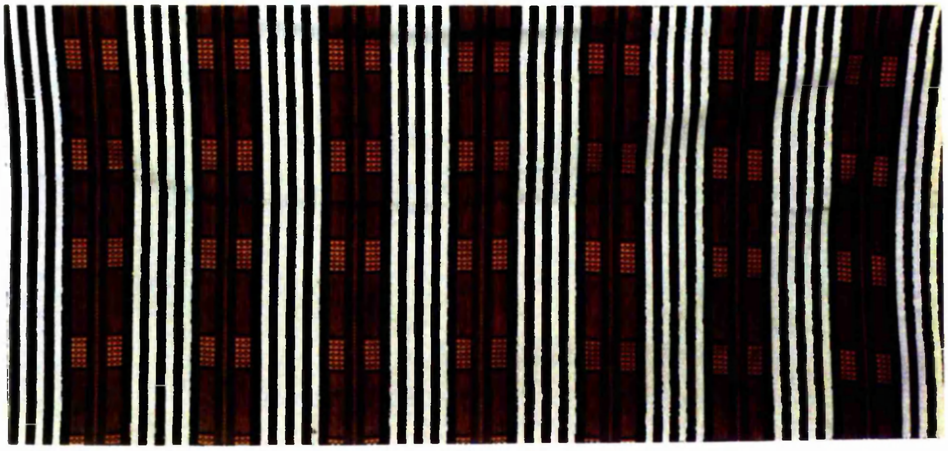


Figure 4.13a. Machine Woven Kente

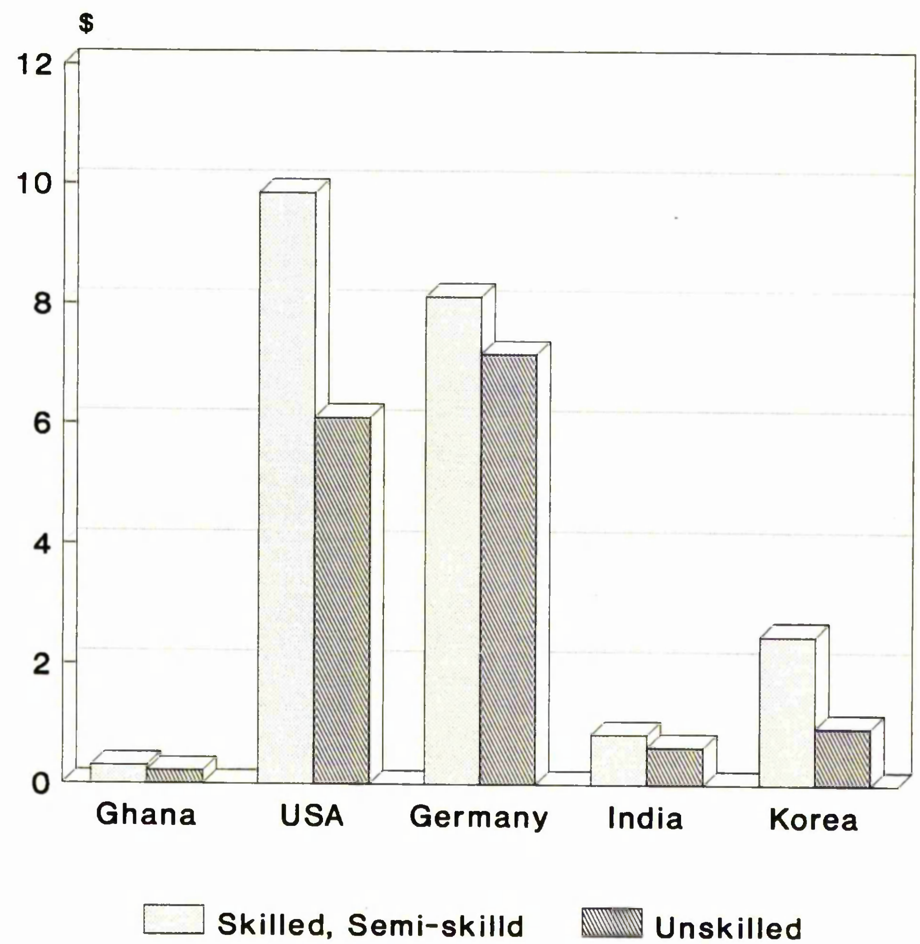
Figure 4.13b. Machine Woven Kente

to the incorporation of automatic control and computer systems which have allowed continuous processing and quality improvements. Recent advances in colour physics combined with microelectronics have led to the use of computer based spectrophotometers. These can define shades numerically, allowing colours to be repeated accurately, and also scan a piece of cloth for colour consistency. Computers are also being used to control continuous finishing, while computer controlled lasers can be used to detect faults in cloth before it is finished, scanning an average of 270 metres per minute compared to the 50 metres achieved with manual techniques. Further modifications are likely as manufacturers seek to reduce the hot water needed for dyeing, thereby cutting energy costs.

### 4.3.5. Impact of Technology on Labour Productivity and Comparative Advantage

It is often argued that developing countries have a comparative advantage in labour intensive spinning and weaving technology. It is true that wages in developing countries are significantly lower than in developed countries. For example, Figure (4.14) gives the 1985 hourly wages of skilled and unskilled workers in the textiles sector of five selected countries. From this, it is found that skilled and unskilled wages are far higher in the two developed countries (USA and Germany) than in the newly developed/developing countries (Ghana, India and Korea), with Ghana having the lowest wages of all. But, as stated in Industry and

## Hourly Wages (US $) in Textiles Sector of Selected Countries, 1985. Figure 4.14.




Source: Data for Ghana from 1990 fieldwork. All other data from Interntnl Production Cost Comparison (1985).

Development (1987), the outstanding productivity increases achieved by the latest textile technology has offset these higher wages in developed countries, and has made their industries highly competitive. For example, a shuttleless loom in 1982 was 3.5 times the cost of a fly-shuttle loom in 1950 (adjusting for inflation), but it was up to 4 times faster (UNIDO (1989)). Rotor spinning, as mentioned above and also by UNIDO (1989), can raise the speed of yarn output by up to 4 times.

In the opening rooms, automation of bale-opening, cleaning, picking, and mixing has reduced the need for human labour to the bare minimum. According to UNIDO (1989) efficiency improvements at this stage are estimated to be at least 200 percent since the 1960s.

Thus, new technology has been raising productivity while lowering labour content in the textile industry. This has transformed the industry into a capital-intensive operation in industrialised countries. Cline (1990, p.122) therefore states that enterprises adopting new technologies often enjoy an edge over their competitors. He further states that:

> "The indicator of relative productivity divided by relative wage gives the surprising result that for both textiles and apparel, the United States tends to be competitive with the developing countries. Higher productivity offsets higher US wages, even for apparel. ....the estimates here do suggest a much greater ability of the textile and apparel industries in the United States (and other industrial countries, especially Italy) to stand up to competition from the developing countries than would be expected from the progressive recourse to greater protection under the Multi-Fibre Arrangement."

Unskilled labour has been replaced by a smaller number of jobs which require some knowledge and training in the running of computer software. Many of the new technologies in spinning and weaving have centred on saving labour costs. ILO (1991) gives an example in Argentina were approximately 2,700 jobs were displaced by the introduction of open-end (rotor) spinning machines in 1987 and 4,500 jobs were lost because of shuttleless looms. Two thirds of the lost jobs were machine operators, mainly spinners and weavers.

One significant impact of new technologies on comparative advantages in the textile industry is the decline of labour cost as the absolute criterion. Curiskis (1989) compared the percentage change in manufacturing costs in Hong Kong and in the United States for the period 1967-88 in spinning and weaving. Due to the increased capital-intensity in the textile industry, the labour cost of spinning in making one standard unit of textile output in the United States has remained virtually unchanged in money terms from 1967 to 1988 (15.9 cents and 16.1 cents, respectively). The relative share of labour in total manufacturing cost, however, has fallen.

In Hong Kong the labour cost of spinning in 1988 was 60 percent of the 1967 level, while mill expenses (though still lower than in the US) increased by almost seven times. Overall, the relative share of the labour cost dropped from 9 percent to only 2 percent over the period.

Thus, Curiskis' results show that the importance of unit labour costs in the overall cost of spinning and weaving, in the US and Hong Kong, has decreased over the 1967-88 period.

**4.3.6. Technology Diffusion.**

The impact of these new technologies on the world's textiles industries depends on their rate of diffusion. But, the evidence available suggests that the diffusion of microelectronics-based technologies has been fairly slow, being restricted for the most part to large firms in developed countries, though there are exceptions such as leading firms in Hong Kong, South Korea and Singapore. A survey by the Policy Studies Institute (1985) of the industries in Germany, France and the United Kingdom, for example found that between 20 and 40 percent of textiles and clothing factories used microelectronics, a lower proportion than for any other manufacturing industry. This has meant that the technologies most commonly used in developed countries' textiles and clothing industries are well behind the 'state of the art' technologies, let alone the frontier microelectronics-based innovations. According to an estimate by Hoffman and Rush (1980), average productivity could be improved by as much as 33 percent if all firms used the former, while even greater gains would be made with the latter. In the future, the pace of technological change in textile industries of the developed countries may have to increase if the MFA is relaxed allowing increased competition from developing countries.

The introduction of 'state of the art' technologies, let alone frontier microelectronic-based technologies, in developing countries faces certain barriers. For example, local yarn supplies may not be of sufficiently high quality, or energy supplies sufficiently reliable to use automatic looms. The share of automated looms varies considerably amongst major developing countries. This ranges from 45 percent in Brazil, 78 percent in Egypt, and 81 percent in Pakistan to 100 in Hong Kong.

**4.4. Summary.**

The developed world, faced with declines in their textile sector in the early 1960's, applied non-tariff restrictions on trade in textiles to protect themselves from cheap imports from developing countries. These are still in place today.

New technology has resulted in increased productivity and a reduction in labour content in the textile industry. This has led Cline (1990) to state that enterprises adopting new technologies often enjoy an edge over their competitors in the sense that the higher productivity achieved with these new technologies often offsets higher wages of countries such as the US, thus enabling them to be competitive with developing countries.

# 5. THE GHANAIAN TEXTILE SECTOR.

## 5.1. Introduction.

This chapter looks at the history and structure of the Ghanaian textile sector. After the introduction in Section (5.1), Section (5.2) looks at the traditional textile sector. Section (5.3) looks at the modern textile sector. A plant by plant resumee of the firms reviewed is given in Section (5.4). The summary is in Section (5.5).

## 5.2. The Traditional Textile Sector.

According to African Textiles (1981, p.47), the earliest materials used for clothing in Ghana (then the Gold Coast) were animal skins and tree barks. Subsequently, the development of cotton cultivation, hand spinning and hand weaving made woven materials available. Then, as materials began to be dyed and printed, cloth designs (such as "Adinkra" and "Kente") which had a special significance in Ghanaian culture, were developed.

Indigenous textile production has been centred in three areas: the Volta, Ashanti and Northern regions. Each tribe has its own distinctive fabric which portrays the tribe's ideals and beliefs. The "Kente" and "Adinkra" are woven in both the Ashanti and Volta regions but with varying designs, while the weaving of "Batakari" is customary in the North.

Ewe tribe of the Volta acquired their weaving skills from the Yoruba of Nigeria, while the Northerners were influenced by the Arabs. Ashanti weaving originates from the Ivory Coast (African Textiles, (1981) p.47)

Hand weaving still survives today. This is due mainly to the uniqueness of its products. It is also due to the fact that the components of the looms used are self-made and cheap and the weaving site is mobile. But modern spinning technology has made hand spinning obsolete. This has meant that Kente weaving must depend on modern factory yarn since this is cheaper and more robust. However, the hand-made Kente cloth is still high-priced since labour cost accounts for a large proportion of total cost of the product.

### 5.3. The Modern Textile Industry.

As mentioned by Anyomi (1985), the first modern textile factory was established in Ghana in 1962 and, by the late 1960's, the majority of mills had been set-up. Some firms began their operations with textiles finishing only, but have subsequently integrated backwards into weaving and spinning. Many firms have also undergone expansion in terms of the number of spindles, looms and dyeing or finishing facilities they operate. This is clarified by the fact that 20.1 million cedis was invested in textile machinery importation in 1978 (Anyomi, 1985). Thus, in 1987, there were 20 spinning/weaving or finishing firms, i.e woven textiles, employing

8,583 persons in the establishments employing 30 or more persons (see Tables (5.1) and (5.2)).

The main products produced in this sector are shown in Figures (4.11a,b), Figures (4.12a,b), and Figures (4.13a,b) of Chapter (4). Figures (4.11a,b) show samples of Real Wax Prints. These are produced by printing the designs on waxed cloth. Figures (4.12a,b) show samples of Imitation/Java Prints. These involve printing designs on unwaxed cloth. Figures (4.13a,b) show machine-woven Kente fabrics. These are produced by weaving designs using pre-dyed yarns. Thus, this process does not involve printing.

### 5.3.1. Size.

The size of a manufacturing firm may be measured by the number of workers employed, by capital stock, by production or by value added. Table (5.3) gives the annual average output and employment in woven textiles for the periods 1970-72 and 1973-75. From this, an indication of the importance of textiles in the manufacturing and industrial sector in Ghana can be obtained. Textiles contributed 23-24 percent of medium and large-scale manufacturing employment between 1970 and 1975. But, the contribution of textiles to value added was significantly smaller - 11 to 12 percent between 1970 and 1975.

The textile sector has been in decline since the mid 1970s. Figure (5.1) gives cloth production in millions of metres for the

# Establishments by Employment Size Class and Textiles Sub-Divisions, 1987.
# Table 5.1.

| Employment Size Class | Textiles Total | Spinning, Weaving and Finishing | Made-Up Textiles | Knitting Mills | Carpets and Rugs | Rope and Cordage | Others |
|---|---|---|---|---|---|---|---|
| Total | 177 | 129 | 10 | 19 | 7 | 10 | 2 |
| 1-4 | 26 | 20 | 1 | 2 | 3 | 0 | 0 |
| 5-9 | 69 | 61 | 1 | 4 | 1 | 2 | 0 |
| 10-19 | 29 | 22 | 2 | 4 | 0 | 1 | 0 |
| 20-29 | 12 | 6 | 1 | 3 | 1 | 1 | 0 |
| 30-49 | 12 | 6 | 2 | 1 | 0 | 1 | 2 |
| 50-99 | 13 | 4 | 2 | 3 | 1 | 3 | 0 |
| 100-199 | 5 | 3 | 0 | 0 | 1 | 1 | 0 |
| 200-499 | 4 | 1 | 1 | 2 | 0 | 0 | 0 |
| 500+ | 7 | 6 | 0 | 0 | 0 | 1 | 0 |

Source: Central Bureau of Statistics (CBS) 1990.

# Persons Engaged by Employment Size Class and Textile Industry Group, 1987.

## Table 5.2.

| Employment Size Class | Spinning, Weaving and Finishing | Made-Up Textiles | Knitting Mills | Carpets and Rugs | Rope and Cordage | Others |
|---|---|---|---|---|---|---|
| Total | 9,445 | 625 | 832 | 261 | 1,588 | 74 |
| 1-4 | 60 | 2 | 6 | 7 | 0 | 0 |
| 5-9 | 376 | 6 | 25 | 5 | 15 | 0 |
| 10-19 | 289 | 26 | 58 | 0 | 12 | 0 |
| 20-29 | 137 | 25 | 74 | 22 | 22 | 0 |
| 30-49 | 223 | 92 | 39 | 0 | 41 | 74 |
| 50-99 | 313 | 174 | 167 | 77 | 211 | 0 |
| 100-199 | 396 | 0 | 0 | 150 | 113 | 0 |
| 200-499 | 421 | 300 | 463 | 0 | 0 | 0 |
| 500+ | 7,230 | 0 | 0 | 0 | 1,174 | 0 |

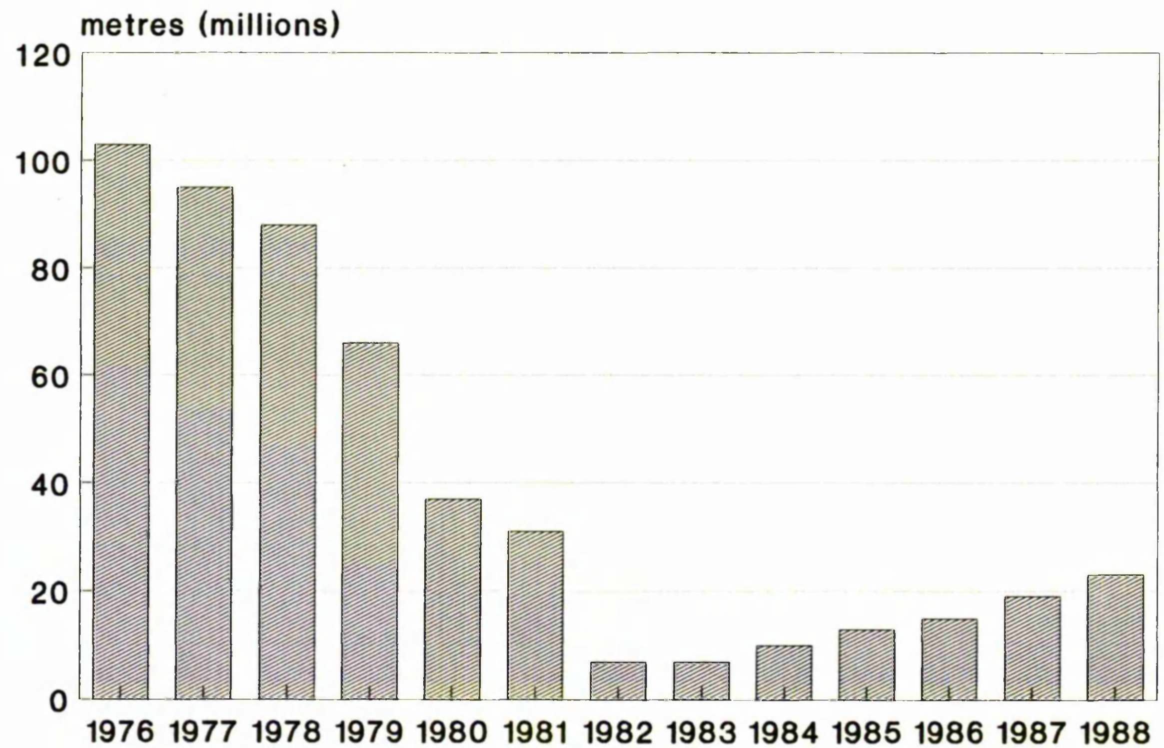
Source: Central Bureau of Statistics (CBS) 1990.

## Output and Employment in Woven Textiles, Annual Averages 1970-72, and 1973-75
## Table 5.3.

| | EMPLOYMENT | | | OUTPUT (Value Added) | | |
|---|---|---|---|---|---|---|
| | Number | % of Manuf. | %of Indust. | Cedis ('000s) | % of Manuf. | % of Indust. |
| Woven Textiles 70-72 | 10,234 | 17.0 | 11.8 | 16,502 | 7.9 | 5.8 |
| Woven Textiles 73-75 | 11,809 | 16.0 | 11.6 | 36,797 | 9.4 | 7.0 |
| All Textiles 70-72 | 14,625 | 24.3 | 16.9 | 23,485 | 11.2 | 8.3 |
| All Textiles 73-75 | 17,517 | 23.1 | 16.8 | 48,421 | 12.4 | 9.3 |
| All Manufact. 70-72 | 60,256 | -- | 69.5 | 209,590 | -- | 74.0 |
| All Manufact. 73-75 | 74,217 | -- | 72.7 | 389,678 | -- | 74.5 |
| All Industry 70-72 | 86,718 | -- | -- | 283,106 | -- | -- |
| All Industry 73-75 | 102,079 | -- | -- | 523,213 | -- | -- |

Source: Central Bureau of Statistics (CBS) 1990.

Production of Cloth, 1976-88.
Figure 5.1

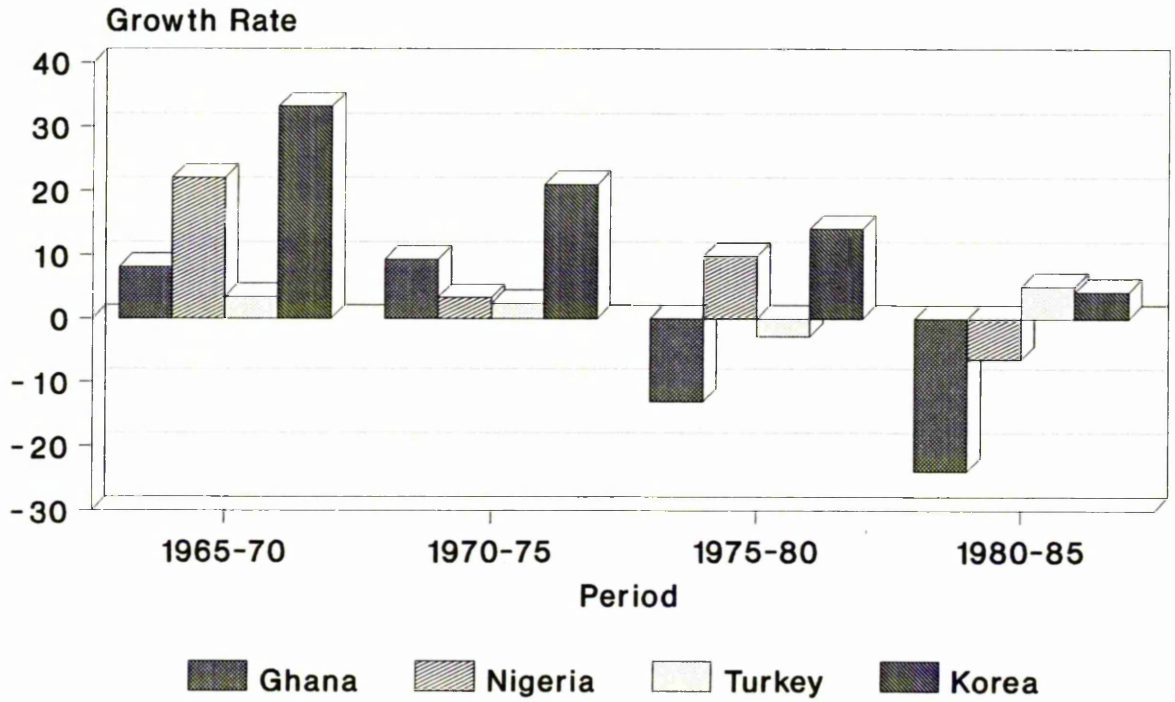



Source: CBS, Various Issues

period 1976-80. It shows cloth production declined from a peak of over 100 million meters per annum in 1976 to below 10 million meters per annum in 1982 and 1983, and by 1988 this figure had risen only to just over 20 million meters per annum. Figure (5.2) gives real textile growth rates of four selected countries (Ghana, Nigeria, Turkey, and Korea) for the period 1965-85. This shows a declining trend for all four countries in that period, with an all positive growth rate in the 1965-70 period declining to give a negative growth rate of between 15 and 25 percent for Ghana in the 1975 to 85 period, a negative growth rate of under 5 percent for Turkey in the 1975-80 period, and a negative growth rate of nearly 10 percent for Nigeria in the 1980-85 period. Thus, Ghana, amongst the four countries looked at, showed the greatest decline in textile growth rate over the 1965 to 1985 period, even though all growth rates are observed, in general, to have declined over that period.

In terms of employment, the textile sector, with 12,800 employees out of a manufacturing total of 157,100, is one of the ten largest employers in Ghanaian manufacturing (CBS (1990)). Figure (5.3) gives establishments and persons engaged by employment size class in spinning, weaving and finishing, (i.e. woven textiles), for 1987. This shows that the 5 percent of establishments which employ 500 persons or more had 77 percent of all persons engaged in woven textiles. Figure (5.4) gives the number of establishments and persons engaged in textiles in 1987. From this, it can be seen that woven textiles was by far the largest sub-sector in the textiles sector with 74 percent of total employment, and 73 percent of the total

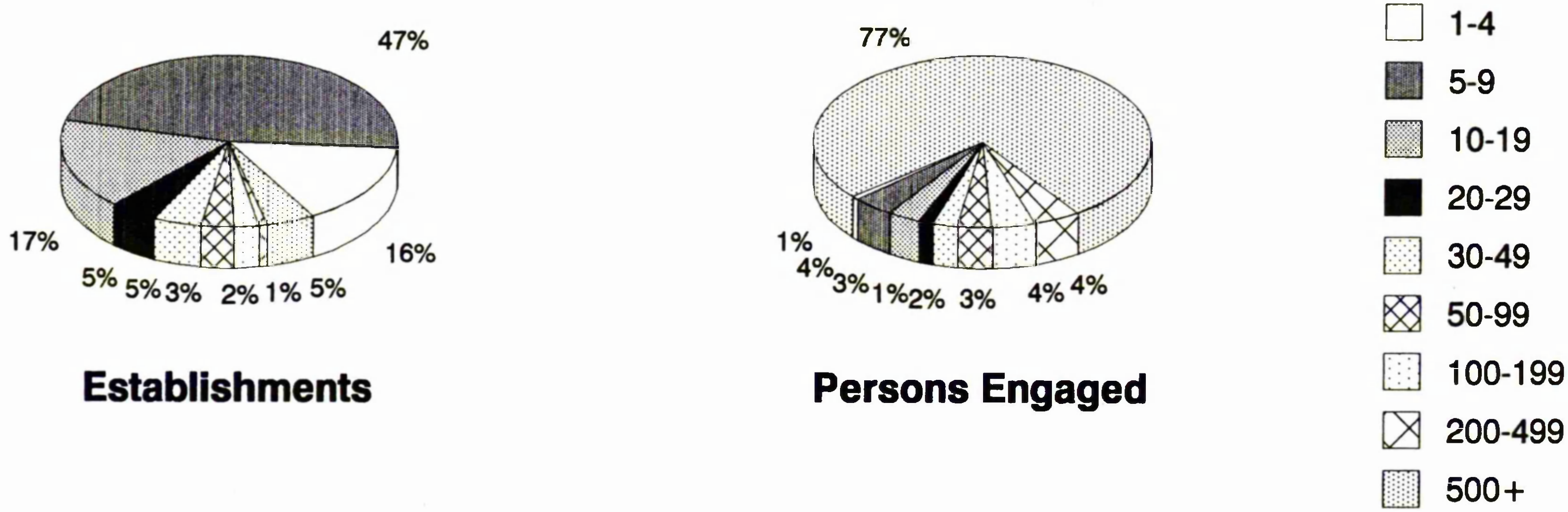
Textile Growth Rates 1965-85
for Selected Countries (con. 1980 price)
Figure 5.2




Source: UNIDO, (1987), Industry & Devel.
Global Report.

## Establishments and Persons Engaged in Spinning Weaving and Finishing, 1987.

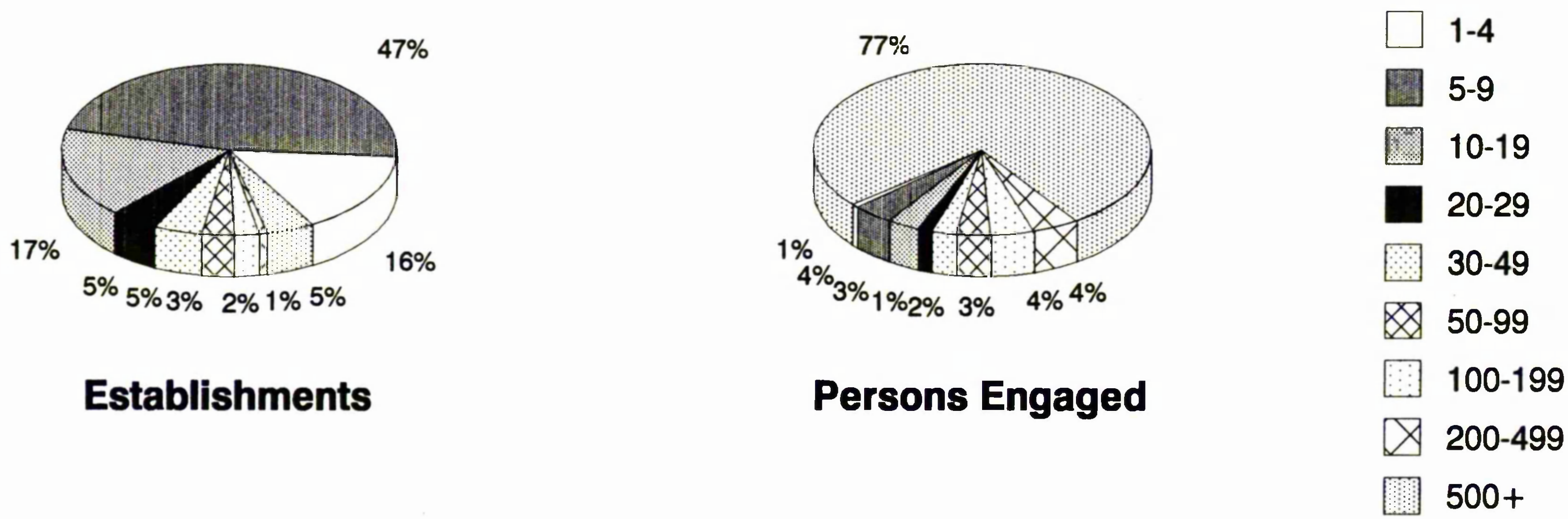
## Figure 5.3.




Source: CBS, Industrial Statistics (1990).

## Establishments and Persons Engaged in Spinning Weaving and Finishing, 1987.

## Figure 5.3.




Source: CBS, Industrial Statistics (1990).

number of establishments.

In terms of hourly wages of skilled and unskilled workers in 1985, both stood at less than $0.25 per hour as shown in Figure (4.14) of Chapter (4). As mentioned in Chapter (4), this hourly wage is the lowest amongst the countries looked at.

### 5.3.2. Location.

The textiles sector in Ghana like most other manufacturing industries is heavily reliant on imported raw materials. Table (5.4) gives the percentage distribution of source of inputs for selected medium and large scale industries. As can be seen from this, foreign inputs in the textiles sector accounted for 73 percent of total inputs in 1970. This declined to 65 percent in 19775 and 1980, but was up again to 74 percent in 1984. It is therefore no coincidence that this has resulted in the concentration of this sector in the Accra-Tema area, with easy access to the port facilities of Tema. This region also has large, mature urban markets and a comparatively efficient transportation and communication network. It is connected to the national electricity grid, and has fairly reliable pipe-borne water supplies.

Table (5.5) shows the persons engaged and number of establishments by selected regions in 1987. Out of a total of 177 textile establishments, 92 are located in the Accra-Tema (or Greater

## Percentage Distribution of Sources of Inputs for Selected Medium and Large-Scale Industries.

## Table 5.4.

| | 1970 | | 1975 | | 1980 | | 1984 | |
|---|---|---|---|---|---|---|---|---|
| | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign |
| **Food** | 71 | 29 | 50 | 50 | 64 | 36 | 57 | 43 |
| **Textiles** | 27 | 73 | 35 | 65 | 35 | 65 | 26 | 74 |
| **Wood** | 48 | 52 | 59 | 41 | 62 | 38 | 51 | 49 |
| **Chemical** | 12 | 88 | 8 | 92 | 4 | 96 | 6 | 94 |
| **Building** | 8 | 92 | 22 | 78 | 21 | 79 | 18 | 82 |
| **Metal** | 5 | 95 | 8 | 92 | 6 | 94 | 27 | 73 |

**Source: CBS/Industrial Statistics, Various Issues.**

# Persons Engaged and Establishments by Selected Regions, 1987.

Table 5.5.

| | | Spinning, Weaving and Finishing | Made-Up Textiles | Knitting Mills | Carpets and Rugs | Rope and Cordage | Others |
|---|---|---|---|---|---|---|---|
| TOTAL | Persons | 9,445 | 625 | 832 | 261 | 1,588 | 74 |
| | Establishm. | 129 | 10 | 19 | 7 | 10 | 2 |
| Greater Accra | Persons | 5,622 | 608 | 818 | 106 | 291 | 74 |
| | Establishm. | 54 | 8 | 18 | 5 | 5 | 2 |
| Eastern | Persons | 1,248 | 0 | 0 | 0 | 94 | 0 |
| | Establishm. | 7 | 0 | 0 | 0 | 2 | 0 |
| Volta | Persons | 1,728 | 0 | 0 | 150 | 0 | 0 |
| | Establishm. | 11 | 0 | 0 | 1 | 0 | 0 |
| Ashanti | Persons | 182 | 0 | 14 | 5 | 1,203 | 0 |
| | Establishm. | 20 | 0 | 1 | 1 | 3 | 0 |

Source: CBS, Industrial Statistics, (1990).

Accra) region. This reflects a figure of 52 percent of establishments being in this region. With regards to woven textiles, 54 out of 129 woven textile establishments, i.e 42 percent, are in the Accra-Tema area. In terms of employment, the Accra-Tema textile industry engaged 7,519 out of a textile industry total of 12,825, reflecting an employment rate of 59 percent of the textile industry total. Woven textiles accounted for 5,622 employees in this area. This means that 44 percent of the entire employment of the textile industry in 1987 occurred in the woven textiles sector of the Accra-Tema area. Other small concentrations of textile establishments and employment are in the Eastern and Volta regions. The Volta region establishments take advantage of their proximity to the hydroelectricity generating plant.

### 5.3.3. Ownership.

The industry is dominated by joint state-private ventures followed by Private Limited Companies. Table (5.6) gives the type of ownership measured by the number of persons engaged in the textiles industry. This shows that the share of state-owned and joint state-private establishments as a percentage of the textile industry total was 55 percent in 1987. Private Limited Companies and partnerships accounted for another 30 percent.

Foreign control of firms, both administratively and technically, has been considerable. In a bid to restrict this,

# Persons Engaged by Type of Ownership, 1987.
# Table 5.6.

| | Manufacturing | | Textiles | |
|---|---|---|---|---|
| | No. | % | No. | % |
| **Total** | 157,084 | 100.0 | 12,825 | 100.0 |
| **State-Owned** | 27,301 | 17.4 | 1,591 | 11.9 |
| **Joint State/Private** | 15,693 | 10.0 | 5,472 | 42.2 |
| **Co-Op.** | 13,993 | 8.8 | 0 | 0.0 |
| **Public Ltd. Co.** | 3,431 | 2.2 | 116 | 0.9 |
| **Private Ltd. Co.** | 39,154 | 24.9 | 3,055 | 24.5 |
| **Partnership** | 5,582 | 3.6 | 1,361 | 10.8 |
| **Sole Proprietorship** | 35,000 | 22.3 | 581 | 4.6 |
| **Associations** | 16,930 | 10.8 | 649 | 5.1 |

**Source: CBS, Industrial Statistics, (1990).**

Foreign control of firms, both administratively and technically, has been considerable. In a bid to restrict this, foreign ownership between 1970 and 1976 was not permitted by the government to exceed 49 percent of an establishment. After 1976, this figure was reduced to 45 percent.

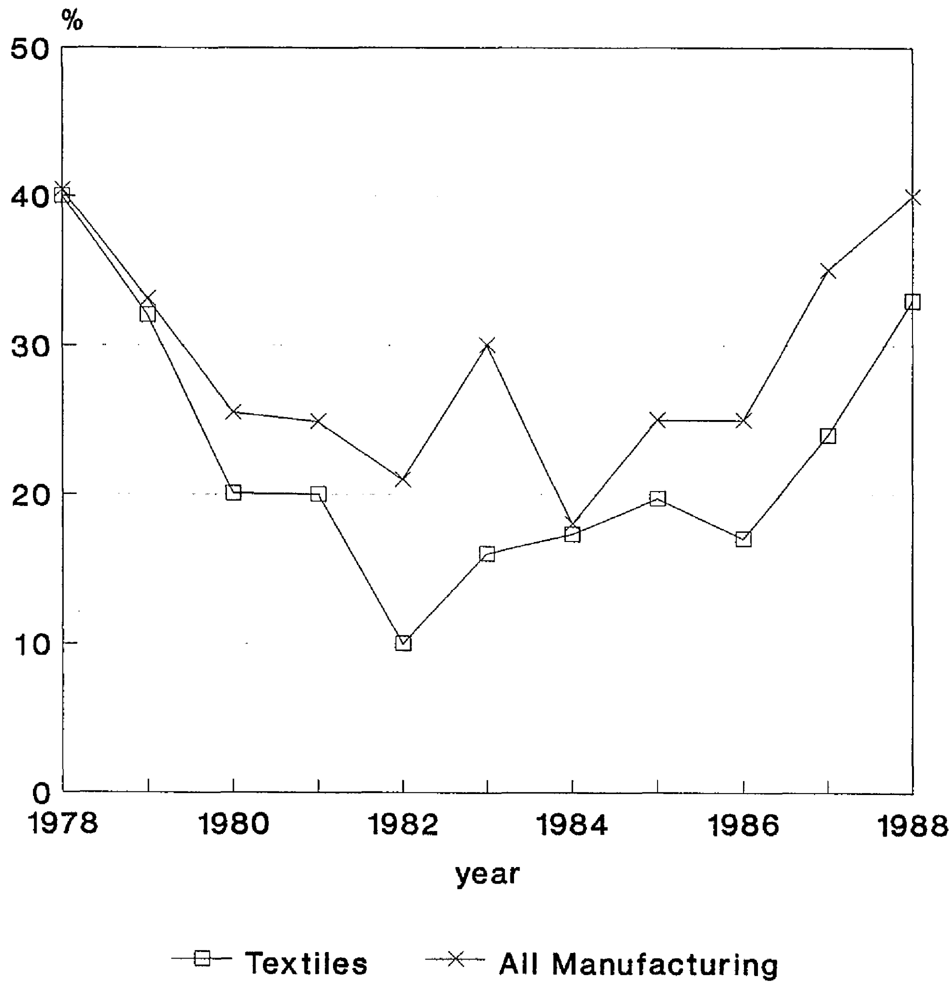
### 5.3.4. Capacity Utilisation.

The Central Bureau of Statistics has published figures for capacity utilisation in textiles for the large and medium-scale enterprises, and these are shown in Figure (5.5). From this, it can be seen that in 1978 the average capacity utilisation was found to be as low as 40 percent. It declined further to 32 percent in 1979, still further to 20 percent in 1980 and 1981, and down again to 10 percent in 1982. This dramatic decline was subsequently reversed rising to 24 percent in 1987 and 33 percent in 1988.

This problem of low capacity utilisation is not peculiar to the textile industry. It has in fact been a difficulty for Ghana's manufacturing sector since the early 1960's. Actual manufacturing output in 1966 has been estimated at only 20 percent of the single shift capacity installed. Data on non-agricultural capacity utilisation between 1966 and 1968 show it to be at less than 50 percent of the 1960 level[1].

In light of the above, a question that arises is: Why were most of the textile firms established even at a time of low capacity utilisation in Ghanaian manufacturing. The answer lies

## Estimated Rate of Capacity Utilisation in Large and Medium Scale Firms: %.
## Figure 5.5




Source: CBS, (various issues).

mainly in the industrialisation strategies that were being adopted in successive development plans at that time (as discussed previously in Chapter (2)). Nkrumah began the industrialisation drive by demanding a "total break with primitive methods" through large-scale importation of foreign technology (Killick, T., (1978) p.192)). Although at the time the raw materials base in Ghana was not developed, newly established firms were expected to integrate backwards sooner or later. Moreover, infant industry arguments had large policy implications. Interest rates were lowered and rapid capital depreciation rates were accepted. Capital goods importation was encouraged by the imposition of protection rates on consumer goods production (see Chapter (2) on the economy of Ghana).

**5.4. Plant by Plant Resumee.**

The best way, perhaps, to describe the textile industry as it appeared during field-work is to offer a firm by firm account, a summary of which is given in Tables (5.7) and (5.8). A more detailed description of the firms is given below. While this draws much from the work by Anyomi (1985) (especially some figures for the pre-1983 period), an effort has been made to put forward the observed state of the industry as at when the survey was conducted in 1990.

As can be seen in what follows, 12 firms, employing 20 workers or more, were in existence in Ghana the 1979. Of these only

## Summary of Textile Firms Surveyed.
## Table 5.7.

| | Year Establd. | Ownership | Level of Verticl. Integ. | Lab. Force 1986 | Output Mio. Cedis, 1986 | No. of Expatriates | Products |
|---|---|---|---|---|---|---|---|
| **Plant A** | 1966 | Gvt/Prv 45F/55Gh | Finishing | 1000 | 883 | 0 | Wax/Java prints |
| **Plant B** | 1980 | Private 40F/60Gh | Spin/Weav/Fin. | 500 | 470 | 10 | Kente/Dyed Fabric |
| **Plant C** | 1962 | Private 45F/65Gh | Spin/Weav/Fin. | 1600 | 756 | 10 | Java prints |
| **Plant E** | 1967 | Gvt/Prv 45F/55Gh | Spin/Weav. | 1500 | 405 | 1 | Grey Cloth |
| **Plant G** | 1968 | Private 45F/55Gh | Spin/Weav/Fin. | 400 | 153 | 5 | Java prints |
| **Plant H** | 1967 | Private 40F/60Gh | Spin/Weav/Fin. | 1300 | 786 | 7 | Wax/Java prints |
| **Plant J** | 1964 | Gvt/Prv 40F/60Gh | Spin/Weav/Fin. | 1200 | 470 | 6 | Java prints |

**Source: 1990 fieldwork.**

## Level of Technology in Plants.
## Table 5.8.

| | Plant A | Plant B | Plant C | Plant E | Plant F | Plant G | Plant H | Plant J |
|---|---|---|---|---|---|---|---|---|
| **Spinning Dept.** | | | | | | | | |
| **Opening & Clng.** | -- | Manual Feed | Manual | Manual Feed | -- | Manual | Manual | Manaual |
| **Doffing** | -- | Auto-Doffer | Automatic | Automatic | -- | Automatic | Automatic | Manual |
| **Carding** | -- | High Speed | High Speed | High Speed | -- | High Speed | High Speed | High Speed |
| **Drawing** | -- | Auto-Conventional | Conventional | Conventional | -- | Conventional | Conventional | Conventional |
| **Roving** | -- | High Speed | High Speed | High Speed | -- | High Speed | High Speed | High Speed |
| **Spinning** | -- | Ring & O-E | Ring | Ring | -- | Ring | Ring | Ring |
| **Doffing** | -- | Automatic | Manual | Manual | -- | Manual | Manual | Manual |
| **Cone Winding** | -- | Auto-Advanced | Manual | Manual | -- | Automatic | Manual/Auto | Automatic |
| **Weaving Dept.** | | | | | | | | |
| **Warping** | -- | Automatic | Automatic | Automatic | Automatic | Automatic | Automatic | Automatic |
| **Sizing** | -- | Conventional | Conventional | Conventional | Conventioal | Conventional | Conventional | Conventional |
| **Drawing-In** | -- | Reaching-In | Manual | Manual | Reaching-In | Reaching-In | Reaching-In | Manual |
| **Pirn Winding** | -- | Fully-Auto | Semi-Automatic | Fully Auto. | Fully-Auto. | Fully-Auto. | Fully-Automatic | Fully-Automatic |
| **Weaving** | -- | Magazn&Shtless | Magzne&Boxloader | Magazn/Batt. | Box_Loader | Magazn/Batt. | Shuttle&Box Ldr. | Shtl.,Mgzn./Batt. |
| **Finishing Dept.** | | | | | | | | |
| **Finishing** | Wax Printing, R.M.P. | Dyeing (Yarn & Piece dyeing) | Print (Rotary), Dyeing&Bleaching | -- | Bleaching, Dyeing | Flat bed sreen printing | Flat bed scr. print, R.M.P., Wax Printing | R.M.P. |

**Source: Anyomi, (1985).**

8 firms were still in operation by 1989. All the closures took place after the liberalisation which began in 1983.

**Plant A**

Negotiations between the government of Ghana and a foreign consortium, Adatig[2], for a calico printing enterprise began in August 1960. The final agreement was signed in January 1966 and production began in April of that year. Initial share holdings were 51 and 49 percent for Ghana and Adatig respectively, but this was altered to 55 and 45 percent after 1976. Although this plant began production as a roller printing mill, producing the 48 inch African or "Imitation" wax prints for which it is well known, a wax printing line was introduced by 1969 which enabled it to produce Real Wax or "Holland" Wax prints.

Management control of this firm was in the hands of the foreign partners until the PNDC government took over in December 1981. Soon after, the new government gave control of the firm to its workers and they have, together with the government, managed the company since then.

Grey baft (woven unfinished cloth), which is one of the raw materials, is obtained from a local plant with imports as supplements. The firm has been in the habit of purchasing only a small percentage of the spare parts required for its machinery. This has led to a reduction in the level of production and employment.

The labour force which stood at 1,806 in 1977 has fallen steadily since then to 1,328 in 1981, 1,090 in 1985, 1,080 in 1986 and 996 in 1988. This compares to an estimated full capacity labour force of 2,635. Average monthly earnings for the years 1981, 1985, 1986 and 1988 were 1,389, 6,916, 10,750 and 18,700 cedis respectively. This reflects earnings at constant 1981 prices of 1,640, 2,050 and 1,930 cedis for 1985, 1986 and 1988 respectively.

Value added in production was 22.8 million cedis in 1981, but the firm made an operating loss of over one million cedis. In the five years up to 1981 operations were profitable only in 1979 when a 14 million cedis profit was made. Pre-tax profits of 37 million and 43 million cedis were made in 1985 and 1986 respectively. This corresponds to 3 million and 2.5 million cedis at constant 1979 prices. Capacity utilisation fell from 58 percent in 1977 to a low of 17.3 percent in 1980. It has remained at the 20 percent level since then.

This firm is only involved in finishing. It does not have any spinning or weaving capacity. Besides roller printing machine, it has approximately one hundred wax printing tables. Most of the firm's equipment was obtained from the Netherlands and dates from 1966-69.

Welfare facilities at this plant have been good. They include a factory clinic, canteen services, a fleet of buses for workers' transportation and many sporting facilities.

**Plant B**

This privately held company, located on the Accra-Tema motorway, is a vertically integrated set-up consisting of spinning, weaving and finishing departments. The manufacturing license was issued on the 6th of August 1974, and the factory was commissioned on the 1st of March 1980. While the spinning department has been operational since mid-1980, the weaving operations commenced in early 1982. The company is owned by British and Ghanaian concerns with shares in the ratio of 25/75 percent respectively.

The technical management of the plant is in the hands of expatriate experts. In 1987, nine such expatriates were employed by this firm. These included engineers from the Philippines, the Indian sub-continent, and Austria.

The striking feature of this plant is its stock of fairly advanced equipment which includes the open end rotor spinning machines, card control equipment, and electronic facilities for blending fibres. A new twisting machine, purchased from Switzerland, was installed in 1991 to add to the stock of existing twisters which date from 1981. There are 10,296 ring spindles and 144 rotors for open-end spinning; most of the equipment in the spinning department is automatic. Moreover, the entire spinning mill is air-conditioned and the humidity level in the factory is controlled to provide optimum conditions for the spinning process. The weaving department has 38 looms of the shuttleless variety out of 144 installed looms. This department also has automatic warping and pirn winding machinery as well as conventional sizing equipment and a reach-in mode of drawing-in.

The spinning and weaving equipment comes from Switzerland and Germany (West Germany), while the finishing equipment is Swiss and British. It was observed at the time this survey was conducted that this firm's machinery were well maintained with an abundance of spares. The premises were clean and well decorated and the lawns and garden surrounding the factory were in good condition. Welfare facilities are good, and include a factory clinic, a canteen and buses for workers' transportation.

Rather than operating a printing facility, this firm has been set-up with yarn-dyeing and piece-dyeing capabilities. The range of products include polyester/viscose, polyester/cotton and cotton yarn as well as machine woven Kente and Adinkra cloth which are far less labour intensive than their traditional counterparts. Materials suitable for suiting are also produced.

The labour force in the spinning department was 423 in 1981. This is compared to an estimated full capacity of 467 employees. Average monthly earnings per worker were 536 cedis - much lower than for plant A. The total number of persons engaged in 1985, 1986, 1987 and 1988 was 505, 513, 596 and 837 respectively, with average monthly earnings per employee for those years being 3,250, 7,580, 8,080 and 14,800 cedis respectively. This translates to 770, 1,440, 1,100 and 1,530 cedis at constant 1981 prices for the years 1985-1988.

In November 1987, plant F, a sister company to this firm was amalgamated with it. The more modern looms from plant F were moved into this plant's premises, and the two management staffs were merged. This has added towels manufacturing to the list of plant B's processes .

**Plant C**

This vertically integrated firm, which is located in the Tema Industrial Area, was established in 1962. It has ginning, spinning, weaving and finishing capabilities. 55 percent of the firm's shares are held by local partners who include Ghana Commercial Bank, Agricultural Development Bank and private businessmen.Investors from Hong-Kong, who hold the remaining 45 percent, manage the affairs of the company.

A variety of products are manufactured. These include grey baft, white, dyed and printed shirting materials, dusters and bags for holding rice, flour or sugar. A fire in 1979 destroyed approximately half of the original set of 22,400 spindles. The remaining 11,632 spindles serve 1054 looms. The spinning equipment originated from the USA and Japan while the weaving equipment was obtained from China and dates period between 1960 and 1969.

The labour force in 1973 was 3,295 and of these 53 were Chinese citizens. The number of employees has fallen steadily since then. It was down in 1981 to 2,415 of which 24 were expatriates, and down still further in 1986 to 1,632 of which 10 were expatriates. These figures compare with an estimated full capacity utilisation labour force of 3700.

Average monthly earnings per worker have been similar to those earned in plant B. In 1981 they were 523 cedis, while in 1985 and 1986 they stood at 2,750 cedis and 7,666 cedis respectively. This reflects figures of 653 cedis and 1,462 cedis at constant 1981 prices for 1985 and 1986 respectively.

In the protectionist or pre-1983 period, this company did well. In 1972, for example, it exported over 3.5 million yards of various cotton fabrics to the USA, the UK, Belgium, Germany and Nigeria. But raw material shortages meant that capacity utilisation fell steadily from 84 percent in 1977 to 24 percent in 1981. Value added in 1981 was 12.7 million cedis, having decreased in real terms since 1979. The operating loss in 1981 was 6.1 million cedis, with the only profitable years in the 1977-1981 period being 1977 and 1979. Efforts were made to alleviate the raw material shortage by setting up joint venture cotton farms with the National Investment Bank and the Agricultural Development Bank. But these were not successful and raw material shortages persisted.

Raw material constraints eased in the post-1983 or liberalised period. The company made pre-tax profits of 85.5 million, 65.3 million, 71.8 million and 225.8 million for the years 1985, 86, 87 and 1988 respectively. These reflect profits of 20.3 million, 12.4 million, 9.8 million and 23.3 million at constant 1981 prices.

Welfare facilities are fairly extensive and include a factory clinic, canteen and a fleet of buses for workers' transportation. There are also a number of sporting facilities.

**Plant E**

This factory, which is situated on the Accra-Ho road, was established in 1965 as a joint venture between the Government of Ghana and the People's Republic of China. Following the coup of 1966, the construction work which was being undertaken by Chinese technicians was abandoned. Work on the project was suspended until the formation of the existing company in June 1967. Manufacturing commenced in March 1968 with a weaving section only, producing grey cloth, but backward integration was achieved in December 1978 with the commissioning of a spinning mill. The firm is now a joint state/private enterprise with foreign partners from the UK and Hong Kong holding a 45 percent share. The foreign partners administer the affairs of the company.

Capacity utilisation in this plant declined from 79 percent in 1971 to 23 percent in 1980 and 1981. Value added in 1981 was 7.6 million cedis while the only profitable year in the period 1977-1981 was 1978. Pre-tax profits in 1985, 1986 and 1987 were 49.9 million, 45.1 million and 161.7 million cedis respectively. This shows pre-tax profits of 11.8 million, 8.6 million and 22.1 million cedis for 1985, 1986 and 1987 at constant 1981 prices.

Two cotton farms were started in conjunction with local financial institutions in order to forestall problems of cotton shortage. But, these have not been successful and the firm continues to rely on the Cotton Development Board or on imported cotton.

The labour force declined from 2,343 in 1978 to 1,703 in 1981. By 1985 and 1986, it had dropped even further to approximately 1,450. This compares to a full capacity total of 3,060. Average monthly per employee earnings in 1981, 1985 and 1986 were 700 cedis, 8,170 cedis and 7,583 cedis respectively. These indicate earnings for 1985 and 1986 of 1,940 cedis and 1,446 cedis at constant 1981 prices.

The spinning mill is reasonably modern but basic and uses manual processes of feeding, doffing and cone winding as well as conventional drawing. The 35,000 ring spindles date from 1978. The weaving section operates automatic warping, conventional sizing, manual drawing-in and automatic pirn winding. Of 882 magazine/battery shuttle looms, 660 date from 1968 and 222 were purchased in the 1970-74 period. There is no finishing department. Equipment for this firm was obtained from China, Switzerland, Japan, the USA, Hong Kong, West Germany and the UK.

Welfare facilities are relatively good and include a canteen, a clinic and buses for the transportation of workers. The firm also has some sporting facilities.

**Plant F**

This firm, established in the early sixties, was located in the industrial area of Accra. In November 1987, it moved its premises to its sister company, plant B, and they have been under joint management since.

The principal activity of this firm is the manufacture of towels. Raw materials have been imported, but some cotton is purchased locally. Modernisation of the capital stock continued up to 1980, and the technical management is in the hands of expatriates.

The labour force was maintained at around 210 between 1985 and 1987, while in 1988, employment stood at 174. Average monthly earnings per worker were 3,200 cedis, 7,500 cedis, 8,100 cedis and

15,100 cedis for the years 1985 to 1988 respectively. These were 765 cedis, 1,400 cedis, 1,100 cedis and 1,600 cedis in terms of 1981 constant prices, and are similar to earnings in plant B.

This firm has in fact been profitable over the whole period between 1977 and 1988. Pre-tax profits from 1985 to 1988 were put at 12.2 million, 19.1 million, 16.9 million and 18.6 million cedis respectively, and at 1981 prices they would be 2.9 million, 3.6 million, 2.3 million and 1.9 million cedis respectively. Capacity utilisation has averaged at 40 percent in the 1985-88 period.

The weaving process includes automatic warping and pirn winding, conventional sizing and reaching-in drawing. The box loader shuttle looms used are from the 1973-74 period, and were purchased from Switzerland.

**Plant G**

This firm was established in 1968, and for some time after that it operated as a finishing plant only. It was involved in bleaching, dyeing and printing of fabrics. The spinning and weaving departments were completed and operational by 1978, but lack of adequate electricity supplies delayed the commencement of production until 1980. The company is owned by Ghanaian and foreign partners in the ratio of 55 to 45 percent, and apart from the 5 percent share held by the factory's workers, all other shareholders are private individuals. The firm is managed by the foreign partners.

The spinning department processes consist of manual opening and doffing, conventional drawing and automatic cone winding, while the 12,240 ring spindles in operation date from 1978. The weaving department has automatic warping, reaching-in drawing and 240 magazine battery looms which also date from 1978. The finishing department has 3 flat bed screen printing machines. The equipment in this plant come from China, Japan and Switzerland.

Employment in 1981 stood at 204. This increased to 248 by 1985 and 381 by 1986, of which 5 in each year were expatriate. By 1988 the workforce totalled 418, compared to an estimated full capacity labour force of 1,105. Average monthly earnings per worker were 762 cedis in 1981, while in 1985 and 1986 these stood at 2,916 cedis and 3,800. and by 1988, these had risen to 7,291 cedis. But when compared at constant 1981 prices, these earnings were 689 cedis, 725 cedis and 754 cedis, for the years 1985, 1986 and 1988 respectively.

Value added in 1980 was 11.3 million cedis while profits earned were 8.9 million cedis, while in 1981 these stood at 7.04 million and 4.7 million cedis respectively.

**Plant H**

This plant, which is located in the Akosombo Industrial Area, was commissioned in 1967. It is vertically integrated, with spinning weaving, printing and dyeing capabilities. The shareholding structure is 60 percent Ghanaian and 40 percent foreign, with the two foreign partners, Cha Chi Ming of Hong Kong and Trawaco of Bermuda, holding 36 percent and 4 percent of shares respectively. The Ghanaian shareholders are private groups and individuals while management control is in the hands of the foreign partners. The main products manufactured by this firm are real wax and imitation African wax prints.

The technical management of the plant is in the hands of expatriates. In spite of the difficult export climate, the firm has continued to export some of its products, although the trend is declining. Recently, moreover, a considerable portion of its exports have been in the form of processing foreign customers' raw materials on commission.

The labour force in 1978 was 2,506 as compared to an estimated full capacity labour force of 3,750. By 1981 it was down to 1,701, and by 1985 it stood at 1,324. Employment had fallen even further to 1,093 in 1986 before rising to 1,548. Monthly earnings per worker averaged 676 cedis, 6,417 cedis, 7,667 and 13,750 cedis in 1981, 1985, 1986 and 1988 respectively. At constant 1981 prices, earnings in 1985, 1986 and 1988 were 1,524 cedis, 1,462 cedis and 1421 cedis respectively.

Value added in 1981 was 23.3 million cedis, up in real terms from its 1980 value, but only one fifth of its peak 1979 value in real terms. The firm was profitable, except for 1980, in the 1977-1981 period. Profits of 4.8 million, 133.3 million and 260.8 million cedis were made in 1981, 1986 and 1987 respectively. The 1986 and 1987 values equate to 25.4 million and 35.6 million cedis respectively at constant 1981 prices.

The spinning department has manual opening and cleaning, manual doffing and cone winding and conventional drawing equipment as well as 35,240 ring spindles. The machinery in the weaving department includes automatic warping and pirn winding, conventional sizing and reaching-in drawing equipment as well as 1,064 looms, most of which are of the box loader type except for 120 which are of the smaller whole shuttle change type. Half of the ring spindles and looms date from the 1970-74 period, while the other half is from the 1975-80 period. The finishing department has flat bed screen printing, roller machine printing, real wax printing and bleaching machinery. The equipment dates from the 1965 to 1969 period and was purchased from numerous sources including Japan, Holland, Switzerland and West Germany.

In common with the other larger plants, welfare facilities in this plant are good. These include a fleet of buses for the transportation of its workers, a canteen service and a factory clinic.

### Plant J

This vertically integrated firm was commissioned as a state enterprise in 1964. Actual production commenced in October 1964 under the control of a French management consulting company, with initial equipment also being supplied by a French company (SCAM). It became a division of a public institution, the Ghana Industrial Holding Corporation (GIHOC), from January 1968 until September 1969 after which foreign partners, Winner and CO. of Hong Kong, were allowed to take a 40 percent stake in the company. Local shareholders remained public institutions, namely, GIHOC with its 40 percent share and the Ghana National Trading Corporation with its 20 percent share. Management control is in the hands of the foreign partner.

The firm produces its own yarn and fabrics for final processing, but local grey baft is supplemented by imported yarn and fabric whenever required. The main products are imitation African wax prints and dress prints some of which have been exported in the past, but there have been no exports since 1980.

The labour force has declined from a full capacity level of 2,600 between 1973-75 to 1,275 in 1981. It fell further to 1,207 in 1985, and still further to 1,185 by 1986. Technical control has been in the hands of expatriate engineers. In 1985 and 1986, for example, this firm employed 6 expatriate technicians.

Average monthly earnings per worker in 1981, 1985 and 1986 were 1,007 cedis, 5,833 cedis and 8,583 cedis respectively. This means that at 1981 constant prices, earnings for 1985 and 1986 increased to 1,386 cedis and 1,637 cedis respectively.

Value added, having declined steadily in the period 1978-1981, was 9.5 million cedis in 1981. Even though profits were recorded in 1978 and 1979, a loss of 5.2 million cedis was made in 1981. But profits of 36.4 million, 47.4 million and 63.2 million cedis were again produced in 1985, 1986 and 1987 respectively. These reflect profits of 8.6 million, 9.1 million and 8.6 million cedis respectively for the above mentioned years.

The spinning process involves manual feeding and doffing, and automatic cone minding. While most of the 20,304 ring spindles date from the 1965-1969 period, 864 were purchased between 1975 and 1980. The weaving process includes manual drawing-in, automatic warping and conventional sizing as well as 498 looms of the battery or whole shuttle change type all of which date from the 1975-1980 period. The sources of equipment include France, Japan, Switzerland and Germany.

Like with the other lager firms, the welfare facilities of this firm are good. These include a clinic, canteen, and buses.

Plants D, I, J, and L below make-up only a small proportion of total output of the sample firms. At the time this survey was conducted, plants D, I, and K were not in production, and firm L, while still in production, produced an output of insignificant value in comparison to other firms in the sample. But, even though raw data for the econometric analysis on inefficiency estimation as well as the cost sensitivity analysis undertaken in Chapter (9) was not obtained, it is still of interest to provide a descriptive resumee of these firms as given below.

**Plant D**

This private limited company was incorporated in January 1975. The business started as a joint venture between two Ghanaian businessmen but subsequently became a sole proprietorship. At the start of operations, the company employed two expatriates to fill the posts of production and mill manager, but by the end of 1979 they had both left and the company operated with no expatriate help.

Cotton yarn is the main product, and this is normally dyed before being sold to traditional Kente weavers. The capacity output of 2.44 million kilograms of yarn has never been attained, while the highest output reached was 1 million kilograms in 1978. A capacity utilisation of 5 percent in 1981 was among lowest in the sample, with value added being 0.5 million cedis. The plant had been profitable between 1977 and 1980 but made a loss of 3.1 million cedis in 1981.

The labour force stood at 239 in 1981, compared to a total of 590 in 1979 and an estimated full capacity workforce of 600. Monthly earnings per worker were 740 cedis in 1981. Operations which are confined to a spinning and dyeing process use manual methods of feeding and doffing and manual cone winding.

At the time this survey was conducted in June 1990, this plant was at the point of closing down. Among the problems it had been facing was competition both from imports and from other firms in the industry. No data, apart from the above mentioned is available on this firm and numerous efforts to obtain additional figures were unsuccessful.

**Plant I**

Little is known about this firm except that it had shut down sometime after the 1983 ERP. Its products were mainly towels and vests which it sold through its own retail outlet, and its labour force, while it was still in operation, is estimated at no more than 100. The factory had weaving and knitting machines, and no spinning or finishing facility, and thus relied on the importation of dyed (expensive) yarn. This method of operation proved unsustainable under liberalised market conditions.

**Plant K**

This family run firm was established in 1960. It is a partnership between Ghanaian individuals and expatriates of Indian descent. The main products of the firm are warp knitted and circular knitted fabrics, shirting materials and bed sheets.

The liberalisation of the Ghanaian economy has put this firm in a lot of difficulty. It employed an average of 170 workers per annum between 1986 and 1989. But in 1989, it began to face hardships and workers were obliged to work a 24 hour week rather than 40 hours per week, with a monthly income, subsequently, of 1,949 cedis.

Output, which was valued at 8.3 million cedis, 7.14 million cedis and 10.1 million cedis in 1986 to 1988 respectively, had fallen dramatically to 1.17 million cedis by 1989. In terms of 1981 constant prices, these reflect figures of 1.6 million, 0.9 million, 1.0 million and 0.1 million cedis for 1986, 1987, 1988 and 1989 respectively. Likewise, capacity utilisation, which stood at 30 percent in 1985, fell sharply in subsequent years reaching 10 percent in 1989.

By 1990, the firm had wound-up its operation; employees were being layed-off, and the management was interested in expanding its trading business instead.

### Plant L

Although this family owned firm was established in 1969 by a Ghanaian businessman, it has remained rather small with the number of full time employees averaging around 25 between 1985 and 1990.

The products of this firm are elastic bands, tapes, wicks and laces. Output, which was a very small percentage of the sample total, stood at 12.4 million cedis in 1986. It grew slightly to 14.5 in 1987, and was 33.5 in 1988. At constant 1981 prices, these figures reflect outputs valued at 2.3 million, 2.0 million and 3.5 million cedis for the years 1986 to 1988 respectively.

With regards to monthly earnings perper employee, this stood at 6,513 cedis in 1986, and 10,000 cedis in 1988. These are comparable to ot ot other firms in the industry.

## 5.5 Summary.

Most of the textile firms were established during a time of low capacity utilisation in Ghanaian manufacturing, and the main reason for their establishment was the industrialisation strategies adopted in successive development plans at that time. Nkrumah, for example, began the industrialisation drive by demanding a "total break with primitive methods" through large-scale importation of foreign technology (Killick, T., (1978) p.192)).

Ghana's adoption of liberalised trade policies has put an enormous pressure on the textiles industry, amongst others, to compete with imports after years of surviving behind protectionist barriers.

Of the 12 textile firms (employing 20 workers or more) in Ghana the 1979, only 8 firms were still in operation by 1989. All the closures took place after the liberalisation which began in 1983. Average capacity utilisation dropped from 40 percent in 1978 to 10 percent in 1982. This dramatic decline was subsequently reversed rising to 33 percent in 1988.

**Notes:**

(1) These rates were 47 percent and 4 percent for consumer and capital goods respectively in 1966; Killick, T. p.203.

(2) Adatig is a consortium of foreign business interests comprising United Africa Company, and Calico Printers Association Ltd. of Lancashire.

# 6. THE MEASUREMENT OF PRODUCTIVE EFFICIENCY.

## 6.1. Introduction.

Today's interest in efficient frontier estimation stems from Farrell's (1957) paper on the measurement of productive efficiency. He stated that:

> 'The problem of measuring the productive efficiency of an industry is important to both the economic theorist and the economic policy maker. If the theoretical arguments as to the relative efficiency of different economic systems are to be subjected to empirical testing, it is essential to be able to make some actual measurements of efficiency. Equally, if economic planning is to concern itself with a particular industry, it is important to know how far a given industry can be expected to increase its output by simply increasing its efficiency, without absorbing further resources.'

Since Farrell's article, several researchers have studied the possibilities of estimating the potential or frontier production function of a firm. This is defined as a production function giving the maximum possible output for a given set of inputs i.e. a direct, or primal, description of production technology. Thus, by definition, there cannot be any point above the frontier production function. Corresponding to the primal description of production technology are three value duals. The cost function gives the minimum level of cost at which it is possible to produce a given level of output, given input prices, while the profit function gives the maximum profit that can be attained, given output price and input prices. The revenue function describes the maximum revenue obtainable from certain inputs with given output prices and technology.

This interest in defining the production frontier had been inspired by a concern to know exactly the level of actual production in relation to the production frontier and from this how to reach this frontier by increasing the total productivity of the firm under consideration. Thus, the amounts by which a firm lies below its production and profit frontiers, and the amount by which it lies above its cost frontier, is regarded as measures of inefficiency.

Typically, empirical production functions are 'average' rather than frontier functions, and are thus unable to provide information on efficiency. This is because they attribute differences from the estimated function to symmetric random disturbances. It was Farrell's pioneering contribution which developed a method that not only measured the production frontier but also abandoned the average productivity approach replacing it with a total productivity method.

This chapter highlights and compares four approaches that are currently being employed to measure and estimate productive efficiency. The designation of only four approaches is somewhat arbitrary, but is convenient for expository purposes. These approaches differ in many ways, but the two most significant differences occur in the method used to determine the shape and placement of the relevant frontier, and in the interpretation given to deviations from the frontier. Section (6.1) is the introduction. Section (6.2) explains the measurement of efficiency while Section (6.3) looks at the various approaches to production frontiers. In Sections (6.4 - 6.7), the four approaches to specification and estimation are examined. Greater emphasis is put on Section (6.7), the stochastic frontier production approach, as it is the approach chosen for future research into productive efficiency of Ghanaian textile firms (see Chapter (8)). The summary is in Section (6.8).

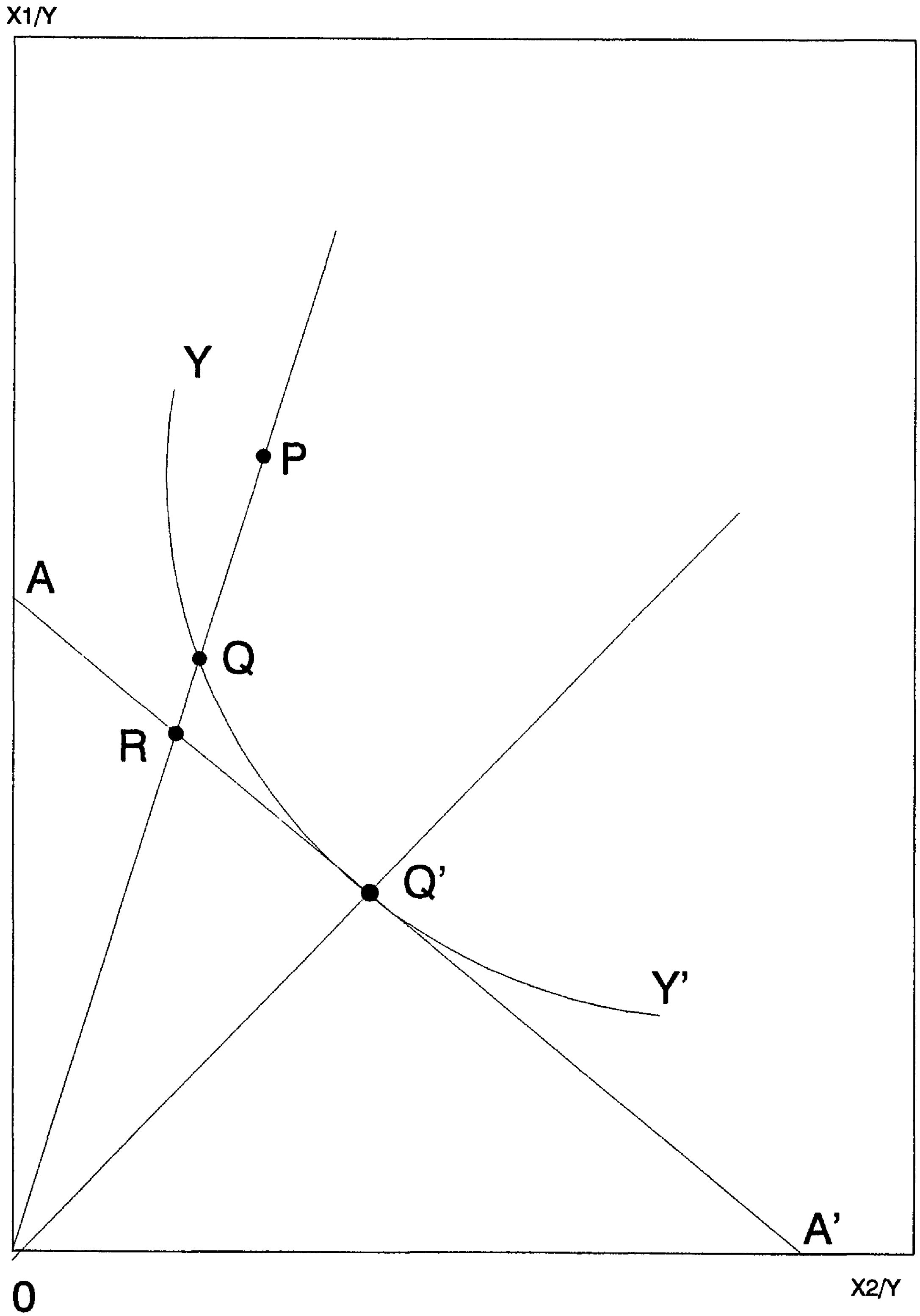
## 6.2. Efficiency Measurement.

A production process can be inefficient in two ways. It can be technically inefficient, in the sense that it fails to produce maximum output from a given set of inputs. This means that technical inefficiency results in an overutilisation of all inputs in equal proportions. It can also be allocatively inefficient in the sense that the marginal revenue product of an input might not be equal to the marginal cost of that input. Therefore, allocative inefficiency results in utilisation of inputs in the wrong proportions, given input prices.

Figure (6.1) shows how Farrell measured technical and allocative efficiency. Consider a production activity which employs two inputs $x_1$ and $x_2$(an assumption made for graphical simplicity

# Technical And Allocative Efficiency.

Figure 6.1.



only) to produce a single output $y$, so that the production frontier is $y = f(x_1,x_2)$. Assume constant returns to scale, so that $1 = f(x_1/y,x_2/y)$, and therefore the frontier is characterised by the efficient unit isoquant YY'.

We assume the firm uses $(x_1^*,x_2^*)$ to produce output $y^*$. If we let point P in Figure (6.1) be the point $(x_1^*/y^*,x_2^*/y^*)$, (which by definition cannot be below YY'), then the technical efficiency of the firm is OQ/OP.It measures the proportion of $(x_1^*,x_2^*)$ which is actually necessary to produce $y^*$. Thus 1-OQ/OP, the technical inefficiency of the firm, measures the proportion by which $(x_1^*,x_2^*)$ could be reduced (holding the input ratio $x_1/x_2$ constant) without reducing output. It also measures the possible reduction in cost (holding the input ration constant) of producing $y^*$.

Let us assume that AA' represents the ratio of input prices, so that the cost minimisation point is Q'. We define the allocative efficiency of the firm as OR/OQ, since the cost at R is the same as the cost at Q'. Allocative inefficiency is correspondingly defined as 1-OR/OQ, and it measures the possible reduction in cost from using the correct input proportions.

The total efficiency of the firm is defined as OR/OP. The total inefficiency, 1-OR/OP, measures the possible reduction in cost from moving from P (the observed point) to Q' (the cost minimising point). The total efficiency can be shown to be equal to the product of technical and allocative efficiency, and total inefficiency can be shown to be approximately equal to the sum of technical and allocative inefficiency.

Even if we relax the assumption of constant returns to scale, we can still think in terms of Figure (6.1), where the units of measurement on the axis become simply, $x_1$ and $x_2$. Therefore, if the firm uses $(x_1^*, x_2^*)$ to produce $y^*$, point P is simply $(x_1^*, x_2^*)$. The measures of technical, allocative, and total efficiency are, as before, OQ/OP, OR/OQ, and OR/OP, respectively. This is suggested by Kopp (1981) amongst others.

Another potential problem, as pointed out by Forsund and Hjalmarsson (1974), is that unless technology is homothetic (a production function is said to be homothetic if $f(x)$ can be written as $h(g(x)$ where $h$ is monotonic and $g$ is homogenous of degree 1), the breakdown between technical and allocative inefficiency requires some assumption about what the firm's expected output was.

**6.3. Approaches to Production Frontiers.**

There is a fundamental difference between statistical and non-statistical approaches to production frontiers. A statistical approach depends on assumptions about the stochastic properties of the data, while a non-statistical approach does not.

Among non-statistical approaches, there is a further distinction between those that are parametric and those that are non-parametric. Basically, parametric approaches assume a particular functional form(e.g., Cobb-Douglas, CES, translog) for the production or cost function, while non-parametric approaches do not.

## 6.4. The Pure Programming Approach.

### 6.4.1. Data Envelopment Analysis.

This is a non-statistical, non-parametric efficiency measurement technique known as "data envelopment analysis" (DEA). It was originally developed by Charnes, Cooper and Rhodes(1978) (see also Banker 1984, Banker, Charnes and Cooper 1984) as a new technique in operations research for measuring and comparing the relative efficiency of a set of decision-making units (DMUs).

The DEA approach utilises a sequence of linear programmes to construct a transformation frontier and to compute primal and dual efficiency relative to the frontier. It applies the basic concept of Pareto Optimality by stipulating that a given DMU is not relatively efficient, if it can be shown that some other DMU or, combination of DMUs can produce more of some outputs without producing less of any other and without utilising more of any input. This technique has been found very useful in measuring efficiency for various public sector DMUs and/or quasi-market or non-market agencies e.g., schools, recruitment and training programmes in defense industries, hospitals, extension services and family planning programmes, where price data are mostly unavailable and there are multiple goals pursued. Sengupta (1988) provides a good overview of the current status of the DEA approach emphasising mainly its applied economic and econometric aspects.

### 6.4.2. Consistency Approach Through Data Adjustment.

Two major questions arise when the efficiency hypothesis characterised by a production frontier or, an efficient production set is set up. One is: how can we estimate the production frontier when the observed data have the property that they contain points not satisfying the efficiency hypothesis? A second question concerns the consistency of the data. A literature has developed (e.g., Afriat (1972), Hanoch and Rothschild (1972), Diewert and Parkan (1983), Varian (1984)), on non-parametric tests of certain hypothesis i.e., one can test the consistency of the data with hypothesis such as (i) the existence of a production function; (ii) constant returns to scale; (iii) homotheticity; or (iv) cost minimisation, without assuming a functional form for the production or cost function.

These tests involve checking for the satisfaction of certain inequalities, often by the solution of some linear program. Varian (1984), for example, gives a condition which is necessary and sufficient for the existence of a production function which 'rationalises' the data in the sense that the data could be generated by cost-minimising behaviour given that production function. Given that the condition holds, Varian goes on to derive the tightest possible inner and outer bounds for any (set of) production functions which rationalise the data. His inner bound is essentially identical to the (set of) production functions constructed by the DEA approach in the sense that their efficient subsets coincide.

Banker and Maindiratta (1988) extend Varian's work to the case in which the data do not satisfy Varian's rationalisability condition; that is, the data could not (all) have arisen from cost-minimising behaviour. Hence, they introduce the concept of subset rationalisation, in which they construct inner and outer bounds for all possible (set of) production functions that rationalise the rationalisable subset of observations. The inner bound is essentially the same as Varian's, while the outer bound is the same as Varian's except that it is computed only from the rationalisable subset of observations. By using this subset rationalisation criterion they have developed technical, allocative and aggregate efficiency measures, which are consistent with Farrell's approach.

Another way to interpret the data consistency problem is in terms of the existence of suitable Lagrange multipliers, which is the approach of Diewert and Parkan. For a good resumee of this approach, see Sengupta (1988).

Perhaps the most advantageous characteristic of the pure programming approach is that the (set of) production functions it constructs are the smallest well-behaved set containing all the data. Such a set is piecewise linear, and the construction process achieves considerable flexibility because the breaks among the pieces are determined endogenously so as to fit the data as closely as possible, (see for example, Banker and Maindiratta (1986), and Charnes, Cooper, Seiford, and Stutz (1982,1983)).

But, the major problem with the pure programming approach lies in the fact that the sample data are enveloped by a deterministic frontier. Consequently the entire deviation of an observation from the frontier is attributed to inefficiency. Since the frontier is non-stochastic, no accommodation is made for environmental heterogeneity, random external shocks, noise in the data, measurement error, omitted variables etc.. All sorts of influences, favourable and unfavourable, beyond the control of the firm are combined together with inefficiency and called inefficiency. Furthermore, since the approach is non-stochastic, there is no way of making probability statements about the shape and placement of the frontier, or about the computed inefficiencies relative to the frontier.

**6.5. The Modified Programming Approach.**

This approach also uses a sequence of linear or quadratic programming techniques to construct a transformation frontier and to compute primal and dual efficiency relative to the frontier. The only difference between the modified and pure programming approaches is that the frontier constructed by the modified programming approach is parametric. The modified programming approach was first suggested by Farrell (1957), and has been refined and extended by Ainger and Chu (1968), Forsund and Jansen (1977), and Forsund and Hjalmarsson (1979a,b) among others.

The modified programming approach has two drawbacks that limit its appeal. The first is that the approach, like the pure programming approach, is entirely deterministic, with no allowance made for noise, measurement error, etc.. Since the computed frontier is supported by a subset of the data, its shape and placement are highly sensitive to outliers. It is this deficiency that led to the development of probabilistic production frontiers by Timmer (1971), in which he eliminated a certain percentage of the total observations. Such a selection procedure, however, is not based on statistical theory, making hypothesis testing impossible. Thus the neglect of the statistical error is a serious disadvantage of this method.

The second drawback of the modified programming approach is its inability to deal easily with multiple outputs. A remedy draws on a proposal of Kopp and Diewert (1982) and Zieschang (1983) to compute primal and dual efficiency relative to the dual cost frontier.

## 6.6. The Deterministic Statistical Frontier Approach.

This approach, in contrast to the two programming approaches, uses statistical techniques to estimate a transformation frontier and to estimate primal and dual efficiency relative to the estimated frontier. The technique was first proposed by Afriat (1972) and has been extended by Richmond (1974) and Green (1980a,b), among others. A one-sided (non-positive) disturbance is explicitly assumed, of some particular form (e.g., truncated normal, exponential or gamma). As in both programming approaches, the data are enveloped by a deterministic frontier. As in the modified programming approach, the deterministic frontier is parametric. In contrast to both programming approaches, the deterministic frontier is estimated rather than computed.

Schmidt (1976) showed that the Ainger-Chu linear programming "estimator" is the maximum likelihood estimator (MLE) if the errors are exponential, while their quadratic programming "estimator" is the MLE if the errors are half-normal. However, since the regularity conditions for the consistency and asymptotic normality of MLEs are violated by this specification, (namely, that the range of the random variable should not depend on the parameters), estimation of frontiers is not completely straightforward since the properties of the MLEs are, in general, uncertain. This range problem which was pointed out by Schmidt (1976), was partially solved by Green (1980a), who found sufficient conditions on the distribution of the error term such that maximum likelihood is consistent and asymptotically efficient. A gamma distribution for the error term satisfies these conditions, for example.

Since a deterministic statistical primal or dual frontier and their related efficiencies are estimated by statistical techniques, a large sample size is required. Furthermore, it is a disadvantage to have to specify a distribution for technical efficiency if a production frontier is estimated, or for allocative efficiency if a cost frontier is estimated. Ideally the specification would be based on a knowledge of the forces, economic or otherwise, that generate that inefficiency. However such information is rarely available.

There being no a priori arguments for a particular distribution, choice is typically based on analytical manageability. Unfortunately, estimates of the parameters of the exogenous variables and of the magnitude of efficiency are not invariant with respect to the specification of a distribution for the efficiency term. Specification tests to evaluate half-normal and truncated normal distributions have been developed by Lee (1983a) for stochastic frontier models. These can be applied to deterministic frontier models as well. The advantage of a statistical approach is the possibility of statistical inference based on the results, although such inference is conditional on the specified distribution being the true distribution.

## 6.7. The Stochastic Frontier Approach.

Like the deterministic statistical frontier approach, the stochastic frontier approach uses statistical techniques to estimate a transformation frontier and to estimate efficiency relative to the estimated frontier. In contrast to the deterministic statistical frontier approach, but in accordance with the typical nonfrontier approach to the estimation of economic relationships, this allows the frontier to be stochastic.

### 6.7.1. Technical Efficiency Only.

The technique was first proposed by Ainger, Lovell, and Schmidt (1977), and Meeusen and van den Broek (1977). Their approach takes into account statistical error and uses a production model with a composed error. This filters out the statistical error and calculates a less biased efficiency measure. Composed error distributions which have been employed in the literature include: the half-normal and exponential distributions proposed by Ainger et al. (1977) (among others), the truncated normal proposed by Stevenson (1980), and the two- parameter Gamma distribution proposed by Greene (1990). Tests of the appropriateness of these distributions can be made using Lagrange multiplier techniques proposed by Lee (1983) and Schmidt and Lin (1984).

To illustrate the basic econometric approach to estimating technical efficiency using a stochastic frontier, consider a

Cobb-Douglas production function:

$$Y = \alpha_0 \left( \prod_{j=1}^{n} X_j^{\alpha_j} \right) e^{\varepsilon}, \tag{1}$$

where $Y$ is output, $X_j$ is the level of input j (j= 1,2...,k), $\varepsilon$ is a random disturbance, and $\alpha_0$ and $\alpha_j$ are parameters to be estimated. The disturbance is assumed to be of the form

$$\varepsilon = v - u.$$

Here $v \sim N(0,\sigma_v^2)$,is the stochastic (symmetric disturbance term) representing random exogenous shocks, such as machine breakdown, weather variation, etc., and $u \sim N\ (0,\sigma_u^2)$ for $u \geq 0$, is a one-sided disturbance term which represents technical inefficiency differing across firms. The production frontier is derived by setting u = 0, thereby giving the maximum possible output, given the inputs. A nonzero value of u shows that potential output could be (u.100 per cent) higher than the actual output. The production frontier is stochastic since the random (exogenous) shocks, v, can affect output.

To discuss the implications of the presence of technical inefficiency which is often viewed as unobserved firm-specific effects, we write (1) in logarithmic form where subscript f indexes firm (f =1,..,F). Equation (1) is rewritten as:

$$ln\ Y_f = ln\ \alpha_0 + \sum_j \alpha_{jf} lnX_{jf} + (v_f - u_f)\ , \qquad f=1,2...,F. \qquad (2)$$

If the two errors are assumed independent of each other and of the inputs, and specific distributional assumptions are made (e.g. normal and half-normal, respectively), then the likelihood function can be defined and estimation of the parameters can be carried out using MLE techniques. This will generally require a numerical maximisation of the likelihood function. Computational issues are discussed by Waldman (1982), Greene (1982), Lee (1983b) and Huang (1984). The basic approach is as follows:

We can specify the density function of $\varepsilon$ as follows:

$$f(\varepsilon) = \frac{2}{\sigma}\{f^*\left(\frac{\varepsilon}{\sigma}\right)\left[1-F^*(\varepsilon,\lambda,\sigma^{-1})\right],$$

where:

$\sigma^2 = \sigma_u^2 + \sigma_v^2$ ,

$\lambda = \frac{\sigma_u}{\sigma_v}$ ,

$f^*$ = standard normal density function,

$F^*$ = standard normal distribution function.

The likelihood function can be written as follows:

$$lnL(y/\beta,\lambda,\sigma^2) = N\ ln\frac{\sqrt{2}}{\sqrt{\Pi}} + N\ ln\sigma^{-1}$$

$$+\sum_{i=1}^{N} ln\left[1-F^{*}(\varepsilon_i,\lambda,\sigma^{-1})\right] - \frac{1}{2\sigma^2}\sum_{i=1}^{N}\varepsilon_i^2 \qquad (3)$$

Estimates of this model can be obtained using corrected ordinary least squares (COLS) or by maximising the likelihood function (MLE) directly with respect to $\beta$, $\lambda$ and $\sigma$. Olson Schmidt and Waldman (1980) used a Monte Carlo approach to examine the relative advantages of these two estimation techniques. MLE tended to outperform COLS in sample sizes larger than 400, wheras COLS tended to outperform MLE in sample sizes of less than 400. i.e MLE estimates are asymptotically more efficient. They also find the COLS estimator performs virtually as well as the MLE, for the normal/half-normal case. Note that the range problem that plagues the MLE technique in the deterministic statistical frontier approach does not appear in the stochastic frontier approach because of the presence of u.

Having estimated the model, one obtains a fitted value for ($v_f$-$u_f$). In earlier studies that applied this new approach (stochastic method), the disadvantage seemed to be the impossibility of individualising the inefficiency measure, i.e., we need an estimate of u alone. A start on solving this problem was provided by Materov

(1981). A real breakthrough was only achieved with the publication of the article by Jondrow, Lovell, Materov and Schmidt (1982). They propose to individualise technical efficiency via a conditional distribution of the efficiency deviation given the total error for each firm. They give an explicit formula for $E(u/\varepsilon)$ for the normal/half-normal case as follows:

$$E(u/\varepsilon) = \sigma_*^2 \left[ \frac{f\left(\frac{\varepsilon\lambda}{\sigma}\right)}{1-F\left(\frac{\varepsilon\lambda}{\sigma}\right)} - \frac{\varepsilon\lambda}{\sigma} \right] , \qquad (4)$$

Where:

$$\lambda = \frac{\sigma_u}{\sigma_v} \qquad (5)$$

$$\sigma^2 = (\sigma_u^2 + \sigma_v^2) \qquad (6)$$

$$\sigma_*^2 = \frac{\sigma_u^2 \sigma_v^2}{\sigma^2} \qquad (7)$$

From equations (5) and (6) we get the following:

$$\sigma_u^2 = \frac{\lambda^2 \sigma^2}{1+\lambda^2} \qquad (8)$$

$$\sigma_v^2 = \frac{\sigma^2}{1+\lambda^2} \qquad (9)$$

Minimising equation (3) yields estimates of $\sigma^2$, and $\lambda$. These can be substituted into eqs. (8) and (9) in order to work out a value for $\sigma_*^2$ using equation (7). We can then substitute $\sigma_*^2$ , $\lambda$, and $\sigma$ into eq.(4) to estimate the firm and year specific technical inefficiency, (u) for the textile firms.

The drawback to these estimates of (u) is that they are not consistent; the variance of the conditional distribution remains no matter how large the sample. A second disadvantage of the Jondrow et. al. (1982) measure is that it only estimates technical efficiency. Thus, there is a serious limitation in the information it provides on production efficiency since allocative inefficiency is not measured.

### 6.7.2. Technical and Allocative Efficiency.

Although we have so far discussed efficiency in terms of production frontiers, it can also be discussed in terms of cost frontiers (see below for profit function). Just as output should lie below the production frontier, so should cost lie below the cost frontier.

It is also possible to estimate a system of equations consisting of production or cost frontier together with auxiliary equations for whichever problem the firm is attempting to solve (i.e. output maximisation or cost minimisation). The reason for doing this is so as to increase the efficiency of the parameter estimates, by exploiting the cross equation restrictions that implicitly appear because the production/cost function parameters appear in the auxiliary equations.

Allocative inefficiency has been introduced in the literature by estimating cost systems. Estimating cost systems that impose as few assumptions as possible, particularly ones that minimise arbitrary assumptions about the distribution of disturbances, functional forms, and independence of the level of inefficiency with the regressors, has proven to be a difficult task. Using Farrell definitions for technical and allocative inefficiency, cost systems that allow for cost inefficiency can be written as:

$$lnC_f = lnC(y_f, p_f) + lnT_f + lnA_f + v_f \,, \qquad (10)$$

$$s_{fj} = s_j(y_f, p_f) + e_{fj} \quad \text{for:} j = 1,..,M-1, \; f = 1,..,N. \qquad (11)$$

where $C_f$ is the observed cost, $C(.)$ is the deterministic minimum cost frontier, $y_f$ is a vector of outputs, $p_f$ is a vector of input prices, $lnT_f$ is a nonnegative term reflecting the increase in cost due to technical inefficiency, $lnA_f$ is a nonnegative term reflecting the increase in cost due to allocative inefficiency, $v_f$ represents statistical noise, $s_{fj}$ is the observed share of the jth input, $s_j(.)$ is the efficient share of the jth input, $e_{fj}$ is the disturbance on the jth input share equation (a mixture of allocative inefficiency and noise), M is the number of inputs and N is the number of observations.

The characteristics of this system are as follows. Firstly, the disturbances representing technical and allocative inefficiency in the cost equation increase observed cost, whereas statistical noise can either increase or decrease observed cost. Secondly, allocative inefficiency and noise may increase or decrease a given input's cost share in the input share equations. Technical inefficiency does not appear in the input share equations when considered from a cost perspective, since output is exogenously determined in this framework. Lastly, the allocative inefficiency disturbance in the cost equation is related to the allocative inefficiency disturbances in the input share equations.

A key problem, when employing such systems, is how to model the relationship between the two sided disturbances on the input share equations (which are composed in part of allocative inefficiency, i.e., over- or underemployment of a given input) with the nonnegative allocative inefficiency disturbance in the cost equation. This problem, which is sometimes referred to as the 'Greene problem', was first discussed by Greene (1980), and then by Nadiri and Schankerman (1981).

The 'Greene problem' can be overcome in three ways: 1) by looking for the analytic relationship between the allocative inefficiency disturbances, $e_{fj}$ and $lnA_f$ (as in Schmidt and Lovell

(1979) or Kumbhakar (1989)); 2) by modelling the relationship using an approximation function, and impose, *a priori*, all the structure that is known (e.g., Shmidt (1984)); 3) by ignoring the relationship among the disturbances in the cost and input share equations (e.g., Greene (1980) treats these disturbances as independent.).

**6.7.2.1. Analytic Solutions.**

This approach is generally to be preferred, since it derives the exact analytic representation of the relationship. However, an analytic relationship can only be found when fairly restrictive functional forms are imposed. The Cobb-Douglas functional form is a closed form representation of both the cost and production functions, and thus an analytic representation of the relationship among allocative inefficiency disturbances in equations (10) and (11) is possible. Schmidt and Lovell (1979, 1980) were the first to develop this systems approach.

Thus, assuming Cobb-Douglas technology , and following Schmidt and Lovell, we consider the system:

$$y = \alpha_0 + \sum_{j=1}^{k} \alpha_j x_{jf} + v_f - u_f \qquad (12)$$

$$x_{1f} - x_{jf} = P_{jf} - P_{1f} + ln\alpha_1 - ln\alpha_j + E_{jf} \text{ , } j = 2, \ldots, k. \qquad (13)$$

$y$ is log of output, $x$'s are log of inputs, $P$'s are log of prices, f indexes firms , j indexes inputs and $E_{jf}$ represents the amount by which the jth first-order condition for cost minimisation fails to hold. Schmidt and Lovell estimate this system under fairly strong assumptions. The $v_f$'s are iid $N(0,\sigma^2)$; the $u_f$'s are iid half-normal; and the vectors $(E_{2f}, \ldots, E_{kf})$ are iid $N(\mu,\Sigma)$. Also $v_f$ is independent of $u_f$ and $E_{jf}$ , and $u_f$ is either independent of $E_{jf}$ or else uncorrelated with $E_{jf}$ but correlated with $|E_{jf}|$ in a particular way. This leads to a complex MLE procedure, and then to straightforward measures of technical and allocative inefficiency. (12) is a stochastic production frontier, while (13) is the set of first order conditions for cost minimisation. The errors in (13) represent allocative inefficiency. From (12) and (13) we can derive the cost function:

$$lnC_f = K + \frac{1}{r} y_f + \sum_{j=1}^{k} \frac{\alpha_j}{r} P_{jf} - \frac{1}{r} (v_f - u_f) + (E_f - lnr) \qquad (14)$$

where:

$$K = lnr - \frac{1}{r} \alpha_0 - \frac{1}{r} ln \left[ \prod_{j=1}^{k} \alpha_j^{\alpha_j} \right],$$

$$|r = \sum_{j=1}^{k} \alpha| \text{ is returns to scale,}$$

$$E_f = \sum_{f=2}^{k} \frac{\alpha_f}{r} E_f + ln \left[ \alpha_1 + \sum_{f=2}^{k} \alpha_f e^{-E_f} \right].$$

The cost of technical inefficiency is $\frac{1}{r}\ u_f$, while the cost of allocative inefficiency is $(E_f - \mathit{ln}r)$. The Green problem is 'solved' in that the disturbances in the factor demand equations are functionally mapped into the allocative inefficiency term in the cost equation ($\mathit{lnA} = E - \mathit{ln}r$). Technical inefficiency is simply a function of the returns to scale and the one-sided disturbance in the production frontier ($\mathit{lnT} = \frac{u}{r}$).

Kopp (1981) identified a deficiency in Ainger et. al. and Meeusen and van den Broeck's (1977) notion of technical inefficiency which encompasses the inefficiency of total factor employment. He pointed out that these aggregative measures are incapable of identifying inefficiency of individual input inefficiency. Thus, recognising the importance of disaggregating total factor efficiency, he suggested a measure of single-factor technical efficiency and decomposition of total cost of inefficiency into cost of technical and allocative inefficiency. This decomposition was further extended by Kopp and Diewert (1982) and Zieschang (1983). They assumed the parameters to be known or capable of being estimated in some way.

Kumbhakar (1988a,b) extends the idea of technical inefficiency to a factor-specific technical and allocative inefficiency, assuming the production technology to be Cobb-Douglas. Estimation of such models is carried out using special distributional assumptions for input-specific technical inefficiency - inefficiency attributed to each of the endogenous inputs used by a firm. This is a nonradial approach and differs from Farrell's radial definitions of technical efficiency by explicitly allowing some inputs to be used more efficiently than others.

His model is based on the approach used by Lau and Yotopoulos (1971), Levy (1981), Schmidt (1988), in which a non-unitary factor of proportionality in the first-order conditions is used. One advantage of this approach as pointed out by Schmidt and Lin (1984) is that the existence of allocative inefficiency can be tested without making the first order conditions deterministic. In other words allocative inefficiency can be separated from random errors in the first-order conditions. This, however, is not possible in the Schmidt and Lovell model. Separation of random errors in optimisation and allocative inefficiency is important because the former comes from e.g., measurement errors, uncertainty in input prices, and quality of inputs, etc. which are not under the control of the firm, whereas the latter comes from, e.g., managerial errors out of ignorance, etc. which are under the control of the firm. Thus lumping the effect of exogenous factors like uncertainty together with measurement errors and allocative inefficiency into one single error term and calling it 'allocative' inefficiency is questionable.

Following Kumbhakar (1988a,) in which he considers the generalised production function (GPF) developed by Zellner and Revankar (1969), we have:

$$F(Y) = Ye^{\phi_y} = \alpha_0 \left( \prod_{j=1}^{k} X_j^{\alpha_j} \right) e^{v-u} \qquad (15)$$

where y is output, are inputs, and are the parameters to be estimated. v is the general statistical noise and $u(\geq 0)$ is a one sided random variable that represents the differences in technical efficiency of the firms. The assumption is made of cost minimisation. Allocative inefficiency is modelled as:

$$\frac{MP_{X_f}}{MP_{X_1}} = k_f \left(\frac{W_f}{W_1}\right) e^{z_f}, \quad f = 2, \ldots, k \qquad (16)$$

where factor of proportionality $k_f$ are firm and input specific, $z_f$ are random errors in cost minimisation, $MP_{X_f}$ are marginal products of $X_f$, and $W_f$ are input prices. Thus exact cost minimisation (except for the random error) is a special case when $k_f = 1$ (f = 2,..., k) and non-unitary $k_f$ represents allocative inefficiency in the input pair (1,f). Specification (16) goes beyond Lau and Yotopoulos (1971), Levy (1981), and Lovell and Sickles (1983) since it separates allocative inefficiency from random errors.

Solving $X_f$ from equations (15) and (16) yields the following input demand functions:

$$\begin{aligned} lnX_f = {} & a_f + \sum_{j=1}^{k}\left(\frac{\alpha_j}{r} - \delta_{fj}\right) lnk_j + \frac{1}{r}\, ln F(Y) \\ & + \sum_{j=1}^{k}\left(\frac{\alpha_j}{r}\right) ln \left(\frac{W_j}{W_f}\right) + \sum_{j=2}^{k}\left(\frac{\alpha_j}{r} - \delta_{fj}\right) z_j - \frac{1}{r}(v - u) \end{aligned} \qquad (17)$$

where:

$$a_f = \frac{ln\alpha_f - \left(ln\alpha_0 + \sum_{j=1}^{k} \alpha_j ln\alpha_j\right)}{r} \quad ,$$

$$r = \sum_{f=1}^{k} \alpha_f \quad ,$$

$$\delta_{fj} = \begin{cases} 1 \text{ if } f=j \\ 0 \text{ otherwise} \end{cases} , \qquad f = 1, 2, \ldots k.$$

The input demand function in (17) shows that the presence of technical inefficiency increases input demand by $\frac{u}{r}$ percent. But the impact of allocative inefficiency on input demand is indeterminate. The percentage change in the demand for input f is:

$$\sum_{j=2}^{k} \left(\frac{\alpha_j}{r}\right) lnk_j - lnk_f \lesseqgtr 0 \text{ depending on } k_j \text{ and } \alpha_j, (j = 2, \ldots, k).$$

However, whatever the effect is, it varies across inputs.

Kumbhakar then investigates the impact of inefficiency on the cost of production. Following Schmidt and Lovell (1979,1980) he derives the cost function when there is both technical and allocative inefficiency:

$$lnC = -\frac{1}{r}\left(ln\alpha_0 + \sum_{j=1}^{k}\alpha_j\right) + \frac{1}{r}\,lnF(Y) + \frac{1}{r}\sum_{j=1}^{k}\alpha_j lnW_j$$

$$+ ln\left(\alpha_1 + \sum_{j=2}^{k}\alpha_j e^{-z_j}\right) + \frac{1}{r}\sum_{j=2}^{k}\alpha_j z_j - \frac{1}{r}(v-u) + E \qquad (18)$$

where:

$$E = ln\left[\alpha_1 + \sum_{j=2}^{k}\alpha_j\left(k_j e^{z}\right)\right] + \frac{1}{r}\sum_{j=2}^{k}\alpha_j lnk_j - ln\left(\alpha_1 + \sum_{j=2}^{k}\alpha_j e^{-z}\right)$$

The stochastic cost frontier is given by putting $u = lnk_j = 0$ in (18).Thus the presence of technical inefficiency increases $\frac{u}{r}$ percent. E = 0 if $k_j = 1$ ($j = 2,\ldots,k$) which is the case where firms operate on the least cost expansion path. Non-negative value of E can be viewed as the percentage increase in cost due to allocative inefficiency.

Though otherwise inflexible, the major advantage of this approach is that we can derive analytically the expression for both technical and allocative inefficiency and increase in cost associated with each of these. Once the relevant parameters are estimated, each of these components can be estimated separately. the only problem is that the effect of random error in cost-minimisation ($z_j$) cannot be disentangled from the cost of allocative inefficiency.

The main difficulties with Kumbhakar's (1988a,b) model are (a) the proposed methodology cannot be extended to a more flexible functional form and (b) estimation involves computation of n-variate cumulative normal-density functions when there are n variable inputs. With the flexible functional form proposed by Kumbhakar (1989) in which he uses a symmetric generalised McFadden (SGM) cost function, (which is a slight extension of Diewert and Wales (1987)), he is unable to specify allocative inefficiency. Thus more flexibility in the functional form specified is achieved at the expense of being able to formulate technical but not allocative inefficiency.

Since the cost equation is not needed to identify all the parameters for the Kumbhakar's (1989) functional form and one equation must be dropped from the system in any case, the cost equation is dropped and only input demand equation is estimated. Thus there is no problem in relating inefficiency in the input share equations to the cost equation.

6.7.2.2. Approximate Solutions.

Schmidt (1984) proposes modeling the relationship between allocative inefficiency in the cost and input share equations for a system such as equations (10) and (11) as follows:

$$ln\ A_f = e_f' F e_f \ , \tag{19}$$

where $e_f = (e_{f1}, e_{f2}, \ldots, e_{fM})'$ and F is an M $\times$ M positive semidefinite matrix. This specification ensures that $ln\ A_f = 0$ when $e_f = 0$ and that $ln\ A_f$ *and* $|e_{fj}|$ are positively correlated for all j. Schmidt also suggests that:

$$F = D^{1/(M-1)}\Sigma^{+} , \tag{20}$$

where $e_f \sim N(0,\Sigma)$, D is the product of the positive eigenvalues of $\Sigma$, and $\Sigma^{+}$ is the generalised inverse of $\Sigma$ (the covariance of the input share equation disturbances). Given these assumptions, $ln\ A_f$ is distributed as a chi-squared random variable and is positively correlated with the variances of the disturbances on the input share equations.

This model has not yet been used to obtain empirical estimates, since the resulting likelihood function would be fairly formidable to maximise.

Melfi (1984) simplifies Schmidt's specification to obtain a more conformable maximum likelihood procedure. Most of the complexity of the above model comes from the assumptions required to ensure that $ln\ A_f$ is fixed given $e_f$. Melfi reduces this complexity by first demonstrating how the likelihood function for the system can be derived given the relation of the disturbances in the input share equations to the allocative inefficiency term in the cost equation by noting:

$$f(ln\ T_f + ln\ A_f + v_f) = g(ln\ T_f + v_f | e_f)\ h(e_f)\ ,$$

where $f,g$ and $h$ are the density functions for $(lnT_f + lnA_f + v_f)$, $(lnT_f + v_f)$, and $e_f$. Since the allocative inefficiency term here, $lnA_f$, is a function of $e_f$, then $lnA_f$ is fixed given $e_f$. Thus distributional assumptions need only be made for $lnT_f$, $v_f$, and $e_f$, which are assumed to follow half-normal, normal, and multivariate normal distributions respectively. For manageability, Melfi modeled $F = I_M$ and assumed no cross equation correlation among the input share equations, so that $lnA_f$ is the sum of the squared errors on all the share equations.

A disadvantage of this specification is that the estimates of allocative inefficiency are forced towards zero. The input share residuals are less than one in absolute value and so the sum of the squares will almost necessarily be small. One way of overcoming this problem is to set $F = cI$, where $c$ is a scalar to be estimated. The sum of squared errors from the input share equations can be scaled up (or down) by $c$ in order to model the effects of allocative inefficiency more flexibly.

Several extensions are made to Melfi's approach by Bauer (1985) in order to develop a more flexible estimation technique. Firstly, F is modeled as a positive semidefinite diagonal matrix whose elements are treated as parameters to be estimated. Secondly, $e_f$ is modeled as $e_f \sim N(\alpha,\Sigma)$, allowing $e_f$ to have a nonzero mean (Schmidt and Lovell (1979) section 4, modeled the factor demand equations in this way). This enables a firm to persistently (and still temporarily) over- or underemploy a given input relative to its cost-minimising employment.

There are problems remaining despite these modifications. Firstly, even when dealing with a small number of outputs and inputs, there is a large number of parameters to estimate. Also, some of these parameters, such as the off-diagonal elements of F and $\Sigma$, would be very difficult to estimate in practice without imposing additional structure. Bauer, for example, restricted both F and $\Sigma$ to be diagonal matrices. Secondly, solving the Green problem by flexibly modeling the relationship between the allocative inefficiency disturbances does not necessarily lead to better estimates of the cost frontier. Ignoring these relationships, as is discussed in the section below, may yield better estimates than modeling them imperfectly.

6.7.2.3. Qualitative Solutions.

It is possible to develop estimation techniques that ignore the link between the allocative inefficiency disturbances across the equations in the system. This approach was first put forward by Greene (1980) in a full frontier framework in which he constructed a translog cost system using a Gamma distribution for the cost inefficiency disturbance. The disturbances on the input share equations were assumed to follow a multivariate normal distribution with mean zero. While recognising the relationships among these disturbances, he treated them as statistically independent of the inefficiency term in the cost equation when deriving the likelihood function.

It must be realised that this approach is not fully efficient statistically in that the information about the relationship among the allocative inefficiency disturbances is being ignored. However, this does not necessarily yield worse results than an approach which models the relationship incorrectly.

### 6.7.3. Other System Approaches.

Frontier estimation techniques have also been developed for relationships other than production and cost functions. The application of cost or production frontier techniques is simple only when a single equation is considered. When estimating other systems, such as a profit function, output supply equations, and input demand equations, problems similar to those faced with the cost system estimation techniques (i.e. in integrating the error structures) arise.

Kumbhakar (1987a), paralleling the Schmidt and Lovell approach for cost systems, extended the use of frontier production models to firms under the behavioural goal of profit maximisation for the single product firm. A system with composed error terms is constructed using a Cobb-Douglas production function and the first order conditions for profit maximisation, and it is estimated using maximum likelihood estimation.

This framework is extended by Kumbhakar (1987b) to multi-product firms facing constant elasticity of transformation (CET) output (introduced by Powell and Gruen (1968)) and Cobb-Douglas input functions. He constructs the likelihood function for the system composed of the production function with a composed error term made up of technical inefficiency and noise, and the first-order conditions for profit maximisation containing allocative inefficiency.

A drawback to the analytic approach in the stochastic frontier profit system, as in the cost function approach, is the relatively inflexible functional forms required in order to obtain closed-form solutions.

### 6.7.4. Avoiding Disturbance Term Assumptions.

#### 6.7.4.1. Panel Data.

Panel data, by which we mean data on a cross-section of firms each observed for a number of time periods, has recently been made use of to avoid difficulties faced with stochastic frontier models, especially with disturbance term assumptions. This is shown in Schmidt and Sickles (1984).

With panel data, the crucial question is whether the firm's efficiency level changes over time. At one extreme, the error term reflecting inefficiency can be taken to be independent over time (as well as over firms), in which case the panel nature of the data is irrelevant. At the other extreme, we can assume that firm inefficiency is constant over time, in which case the panel data literature is highly relevant. It is this assumption of unchanging inefficiency over time, while not being a particularly attractive assumption, which allows us to remedy certain serious problems of frontiers models. Three such problems discussed at below, and the sense in which they can be remedied model is:

$$y_{ft} = \alpha_0 + x_{ft}'\beta + v_{ft} - u_f , \quad u_f \geq 0, \tag{21}$$

$f = 1, \ldots, N, \ldots, T.$

This is a Cobb-Douglas production function, with noise($v_{ft}$) and with technical inefficiency ($u_{ft}$) that is constant over time. By defining $\delta_f = \alpha_0 - u_f$ , we have:

$$y_{ft} = x'_{ft}\beta + \delta_f + v_{ft}, \tag{22}$$

a panel data model with a firm effect ($\delta_f$) but no time effect. We assume $x_{ft}$ uncorrelated with $v_{ft}$.

One problem with stochastic frontier models is the strength of the distributional assumptions on which they rely. The estimation of the model and the separation of technical inefficiency from statistical noise require specific assumptions about the distribution of technical inefficiency (e.g.,half-normal) and statistical noise (e.g., normal). It is not clear how robust one's results are to departures from these assumptions. But with panel data, such assumptions are unnecessary. We can still impose such distributional assumptions, presumably to gain efficiency; Pitt and Lee (1981) do so, for example. Since the model can be estimated with or without making distributional assumptions, then following Hausman (1978) or Ruud (1984) we can test these assumptions.

A second problem with frontiers models is that inefficiency and input levels (or whatever variables are exogenous) are assumed to be independent. This may be unreasonable, since if a firm can foresee its level of technical inefficiency, this should affect its input choices. With panel data, no such assumption is necessary. In particular, the fixed effects ('within') estimator does not make or require any assumption of independence between the effects and the explanatory variables. we can still make such an assumption, in which case more efficient estimation is possible; and therefore the assumption is again testable.

Finally, a serious problem with stochastic frontier models (though not with deterministic frontier models) is that the technical inefficiency of a particular firm can be estimated but not consistently. We can consistently estimate the (whole) error term for a given observation, but it contains statistical noise as well as technical inefficiency. The variance of the distribution of technical inefficiency, conditional on the whole error term, does not disappear when the sample size increases (see Jondrow et. al. 1982 for a discussion of this point). With panel data we can estimate technical inefficiency better because we get to observe it T times instead of once. At the simplest level, the fixed effects ($\delta_f$ in (22) can be decomposed into overall intercept ($\alpha_0$) and inefficiency ($u_f$) by defining $\alpha_0 = \max \delta_f$ and $u_f = \alpha_0 - \delta_f$. This should work well provided that N is large enough for the normalisation of $\alpha_0$ to be accurate, and that T is large enough for estimation of the $\delta_f$ to have been precise. Intuitively, we are just averaging away the noise ($v_f$) in the residuals ($v_f - u_f$).

### 6.7.4.2. Panel Data With Time Varying Inefficiency.

If one finds the panel data assumption of time-invariant technical inefficiency untenable, inefficiency could be modeled as being statistically independent over time. However, panel data then ceases to have any qualitative advantage over time series or cross-sectional data.

Cornwell, Schmidt, and Sickles (1990) develop an approach that attempts to combine the qualitative advantages of panel data without imposing the assumption of time invariancy. This is done by specifying some structure on the variation of inefficiency over time. Thus, the intercept as well as the slope coefficients are allowed to vary over firms and time, allowing the levels of efficiency to vary over time by firm. They generalise Schmidt and Sickles (1984) by replacing the firm effects, $\delta_f$, by:

$$\delta_{ft} = \varphi_{f1} + \varphi_{f2} t + \varphi_{f3} t^2. \tag{23}$$

If we let:

$$w'_{ft} = \left[1, t, t^2\right] ,$$

$$\Psi'_f = \left[\varphi_{f1}, \varphi_{f2}, \varphi_{f3}\right]$$

the model can be written:

$$y_{ft} = x'_{ft}\beta + w'_{ft}\Psi_f + v_{ft} , \tag{24}$$

Time varying firm productivity and efficiency levels and rates of productivity growth can be derived from the residuals based on the 'within', GLS, Hausman-Taylor, or MLE, depending on the number of assumptions one is willing to make about the independence and the distribution of the firm effects. In Schmidt and Sickles (1984), using the model specified in equation (21), the residuals $(y_{ft}-x_{ft}'\hat{\beta})$ are an estimate of $(v_{ft}-u_{f})$, and the firm effect (for a given firm) is estimated by averaging its residuals over time. Specifically, the estimate of $\hat{\delta}$ is:

$$\hat{\delta}_f = \bar{y}_f - \bar{x}_f\hat{\beta} \ .$$

This estimate is consistent as $T \rightarrow \infty$. The analogous procedure for the Cornwell et al. (1990) model is to estimate $\Psi_f$ by regressing the residuals $(y_{ft}- x_{ft}'\hat{\beta})$ for firm f on $w_{ft}$; that is, on a constant, time and time squared. The fitted values from this regression provide an estimate of $\delta_{ft}$ in equation (23) that is consistent (for all f and t) as $T \rightarrow \infty$. Furthermore, the frontier intercept $\alpha_0$ and the firm specific level of inefficiency for firm f are estimated in Schmidt and Sickles (1984) respectively as:

$$\hat{\alpha}_0 = \max_j(\hat{\alpha}_j) \text{ and } \hat{u}_f = \hat{\alpha}_0 - \hat{\alpha}_f .$$

The analogous procedure in Cornwell et al. is to estimate the frontier intercept at time t and the firm specific level of technical inefficiency of firm f at time t as follows:

$$\hat{\delta} = \max_j (\hat{\delta}_{jt}) \text{ and } \hat{u}_{ft} = \delta_t - \hat{\delta}_{ft}.$$

The disadvantage of the Cornwell et al. model is that it does not capture allocative inefficiency. This is because it has a single equation framework in which only the production function is used.

Kumbhakar (1990) presents a model that accommodates both types of inefficiency using a cost minimising framework. He begins with an equation similar to equation (21), but proposes the following formulation for $u_{ft}$:

$$u_{ft} = \tau(t)u_f, \qquad t=1,2,\ldots,T.$$

where

$$\tau(t) = \left[1 + \exp(bt + ct^2)\right]^{-1},$$

where b and c are coefficients to be estimated. The resulting system must be estimated using MLE.

A criticism of both the Cornwell et al. model and the Kumbhakar (1990) model is that inefficiency has been forced to change over time in a specified way (in this case quadratically) and this may not model, adequately, the relationship between inefficiency and time.

## 6.8. Summary.

The biggest advantage of the stochastic frontier approach is that, unlike all three other approaches, it introduces a disturbance term representing noise, measurement error, and exogenous shocks beyond the control of the production unit. None of the other approaches makes any accommodation for such phenomena, which affect every economic relationship. This in turn permits a decomposition of the deviation of an observation from the deterministic part of a frontier into two components, inefficiency and noise. Without such an accommodation statistical noise is bound to be counted as inefficiency.

While the Jondrow et. al. (1982) measure, using the stochastic frontier approach, does give estimates of firm and year specific technical inefficiency, these are not consistent. Also, only technical inefficiency can be measured using this method.

Both technical and allocative efficency can be estimated by estimating a system of equations consisting of production or cost frontier together with auxiliary equations. This is done so as to increase the efficiency of the parameter estimates by exploiting the cross equation restrictions that implicitly appear because the production/cost function parameters appear in the auxiliary equations. A problem that can appear when employing certain versions of this system is called the 'Greene problem'. The problem faced is how to model the relationship between the two sided disturbances on the input share equations with the nonnegative allocative inefficiency disturbance in the production/cost equation.

This problem can be overcome in three ways: (1) by looking for the analytic relationship between the allocative inefficiency disturbances; (2) by modelling the relationship using an approximation function, and impose, *a priori*, all the structure that is known; (3) by ignoring the relationship among the disturbances in the cost and input share equations.

Finally, panel data has recently been made use of to avoid difficulties faced with stochastic frontier models, especially with disturbance term assumptions. But if the firm's efficiency level is beleived to change over time, then the usual panel data literature becomes irrelevant. However, Kumbhakar (1990) has developed a model that accomodates both technical and allocative inefficiency with time varying inefficiency. A major criticism of his approach is that he specifies the way in which inefficiency is expected to change over time, but his specification may not adequately model the change in inefficiency over time.

# 7. DATA COLLECTION.

## 7.1. The Questionnaire.

Two fieldwork trips were made, one in 1990, and the other in 1991/92. A total of three sets of questionnaires were implemented, and these are discussed in what follows. Questionnaire forms are given in Appendix (1).

## 7.2. First Field Trip

During the first trip of April-June 1990, interviews took place with six textile firms in order to complete the Textiles Questionnaires given in the Appendix.

It was decided from the outset to make every attempt to administer the questionnaires personally. This necessitated several visits as a lot of the required data was historical (i.e. beginning with 1979), and thus some time was necessary for their retrieval from archives. It was also felt that this method of data collection was a more reliable method than sending questionnaires, for completion, by post as it was felt that the latter method would lead to poor completion rates and inaccurate returns from firms.

The Textiles Questionnaire is divided into three sections: Section (1) is concerned with general details about the firm concerned. This section formed the basis of the plant-by-plant discussion given in Chapter (5). Section (2) is concerned with data on wages, output, and value of assets for the period 1979-89. This provided the data for the technical efficiency estimation made in Chapter (8). Section (3) is concerned with electricity consumption, in terms of units consumed (in KWh) and maximum demand (in KVA), of firms in 1989. This formed the basis of the discussion of electricity cost comparisons made in Chapter (9).

Firms were encouraged to provide the relevant data on asset values in the form of photocopies of the relevant pages from the audited accounts, if they preferred. If they were reluctant to do so, or if completion of Sections (2) and (3) were incomplete, visits were made to other sources of data such as the Central Bureau of Statistics, the Ministry of Industries, the Internal Revenue Services, Customs and Excise, the Price and Incomes Board, and the Ghana Electricity Corporation, in an effort to complete the questionnaire, or crosscheck, wherever possible, the accuracy of the data collected. This approach helped to eliminate some inconsistencies.

### 7.2.1. Capital, Labour, and Output Data for Technical Efficiency Estimation.

Capital measurements are concerned with the unobservable use-up of capital reflected in the shorter remaining working life. On ex-post basis, annual capital inputs on summation over the lifetime of the asset must equal the original installation price of the asset while, on an ex-ante basis, potential capital services must reflect the potential income flows to be derived from the asset. Therefore, with an appropriate discount rate, the present value of capital must equal the discounted value of the expected total future yields.

In this study, the concern is with ex-post measures of capital. Two common measures of capital are the net book value and the replacement value. The net book value is the original cost of purchases plus (or minus) the value of additions (or disposals) made thereon, minus the amount of depreciation presumed written off. The replacement cost is frequently estimated at the insured value of assets. Another way of obtaining this information is to enquire directly from the firms as to how much they would expect to get for the equipment if it is offered for sale in a perfect capital goods market, or to enquire from second hand machinery dealers, who have experience in reselling machinery, as to the expected value of capital, and likewise, buildings can be professionally valued.

Net book value of assets are used as the basis of the measure of capital. Capital is classified into building, plant and machinery, furniture and equipment, and motor vehicles, with depreciation being provided on a straight line basis at rates calculated to write off the cost of each fixed asset over its estimated useful life. The rates in use are as follows: Buildings 5%, plant and machinery 12%, furniture and equipment 7.5%, and motor vehicles 25%.

Net book values of assets, as they stand, may be a poor guide to the current values of assets. Firstly, official, legally-determined depreciation allowances may be greater than the actual physical deterioration of the capital stock. Secondly, and more importantly, the rapid rise in inflation means that current additions and disposals are given greater weight in the valuation process not because they are worth more in real terms, but because their price has risen in nominal terms due to inflation. It was decided to revalue each type of fixed asset (be it building, machinery, etc.) in a way that takes this fact into account. This has been done by first adjusting the initial value of each type of asset for inflation, then depreciating it for the necessary number of years, and finally adding (or subtracting) the value of additions (or disposals). It is then possible to compare these estimates with the revaluation of assets which some firms have recently undertaken. From this, it is found that the inflation-adjusted book value estimates corresponded fairly well to such revaluations as had been made. These are given in Table (8.1) of Chapter (8).

The measure of labour input added together the yearly salaries and bonuses of all categories of labour, namely skilled, semi-skilled, and unskilled. This is given in Table (8.2) of Chapter (8). The measure of output took the form of annual pre-tax sales of each firm. This is given in Table (8.3) of the same chapter.

### 7.3. Second Fieldtrip.

During the second field trip of December-February 1991/92, interviews were obtained with several representatives of the Ghana Cotton Company (GCC), whence the Ghana Cotton Company Questionnaire (GCCQ) (shown in Appendix), which formed the basis of the information required for Chapter (3) on cotton, was completed. The Cost Structure Questionnaire (also in Appendix) was completed by Plant B, and this provided the data required for the Total Manufacturing Costs section of Chapter (9).

#### 7.3.1. The Ghana Cotton Company Questionnaire.

The GCC questionnaire (and interviews) was primarily aimed at obtaining data on the performance of the cotton cultivation sector, and its cost structure. Data, on the quality of Ghanaian cotton was obtained from Plant B. These results are given in the chapter on cotton cultivation.

The GCCQ is divided into three sections: Section (1) deals with general information about the firm. Section (2) looks at the performance of GCC in the period 1985-1989. This requires data such as the area cultivated in each year, the volume of seed and lint cotton produced, and the price of lint cotton in each year. Section (3) is concerned with GCC's cost structure in 1991. This requires data on (a) cost and application of insecticides, (b) cost and application of fertilisers, (c) cost of seed required, (d) cost of ploughing, (e) the yield for that year, (f) ginning costs for that year, (g) transport costs, (h) wages of employees, (i) cost of vehicles, (j) credit facilities and cost of capital.

**7.3.2. Cost Structure Questionnaire.**

The Cost Structure Questionnaire was conducted to collect data on manufacturing cost comparisons in spinning and weaving, which meant that data on both yarn manufacturing costs per kilogramme and fabric manufacturing costs per meter were required. This data, obtained only from plant B, formed the basis of yarn and fabric manufacturing cost comparison made in Chapter (9).

The data required in Section (1) of the questionnaire concerned yarn manufacturing costs. These included the blend and count of yarns; overheads per Kg; the cost of cotton, polyester, and viscose; and the cost of waste per Kg. Section (2) collected data on the type/width of fabric; the labour cost per yard; power cost per yard; supplies, depreciation and interest charges per yard; yarn cost per yard; raw material cost; and waste.

Very useful data on the cost structure of several firm's products was obtained from the Price and Incomes Board. Data was provided on the following: description of product; unit of measure (usually 12 yards or 10.968 meters); period of inquiry. Cost per unit was obtained under the following sub-sections: imported raw materials; imported packing materials; duty on imported materials; other local cost on raw materials; local raw materials; direct labour; fuel cost; power cost; water cost; spares and replacement cost; administration cost; other overheads; delivery expenses; profit margin; selling expenses; excise duty; sales tax; and ex-factory price. This data formed the basis of the cost sensitivity analysis made in Chapter (9).

Finally, the various tax rates were collected during the visits to Customs and Excise, and the Internal Revenue Service.

### 7.4. Summary.

This chapter looked at the two fieldtrips conducted in 1990 and 1991/1992 during which a total of three questionnaires, the Textiles Questionnaire, the Ghana Cotton Company Questionnaire, and the Cost Structure Questionnaire, were implemented. These questionnaires are briefly reviewed above, and so is the method of data collection.

# 8. ESTIMATING TECHNICAL INEFFICIENCY FOR THE PERIOD 1979-89.

## 8.1. Introduction.

As mentioned previosly in Chapter (6), a production process can be inefficient in two ways. It can be technically inefficient, in the sense that it fails to produce maximum output from a given set of inputs. It can also be allocatively inefficient in the sense that the marginal revenue product of an input might not be equal to the marginal cost of that input. Therefore, allocative inefficiency results in utilisation of inputs in the wrong proportions, given input prices.

As also discussed in Chapter (6), the greatest advantage thestochastic frontier approach has over the pure, and modified programming approaches, as well as the deterministic statistical frontier approach is that, unlike these three other approaches, it introduces a disturbance term representing noise, measurement error, and exogenous shocks beyond the control of the production unit. This in turn permits a decomposition of the deviation of an observation from the deterministic part of a frontier into inefficiency and noise.

It was intended to estimate the allocative as well as the technical inefficiency component in Ghanaian manufacturing, but the data required, namely cost of capital, labour and output, to specify the cost functions required were unobtainable at the time the fieldwork was conducted. Thus, only technical inefficiency is estimated here using Jondrow et. al.'s (1982) measure. This is based on the stochastic frontier approach, and estimates of firm and year specific technical inefficiency can be obtained. It must be pointed out, as has already been done in Chapter (6), that these estimates are not consistent.

Thus, in this chapter, the empirical model used to estimate technical inefficiency in six Ghanaian textile mills is discussed, and the results of technical inefficiency estimation for the period 1979-89, are presented.

## 8.2. Empirical Model.

The model that was estimated follows the stochastic Cobb-Douglas frontier production function approach discussed in Section (6.7.1) of Chapter (6). The data on inputs and output used wascollected from the 1990 fieldtrip, as discussed in Chapter (7). The model is specified as in equation (2) of Chapter (6), and even though the data being analaysed covers several firms and for several years we find that a particular firm's inefficiency varies over time. Thus the data is treated as cross section data, and the subscript (i) indexes firms over time. The model used is as follows:

$$\ln Y_i = \ln \alpha_0 + \alpha_{1i} \ln X_{1i} + \alpha_{2i} \ln X_{2i} + (v_i - u_i), \qquad i=1,2\ldots,N.$$

where $\ln Y$ is the log of output, $\ln X_{1i}$ is the log of capital, $\ln X_{2i}$ is the log of labour, $\alpha_0$, $\alpha_{1i}$, and $\alpha_{2i}$ are the parameters to estimated, $V \sim N(0,\sigma_v^2)$ is the stochastic error which is assumed to be normally distributed, $U \sim N(0,\sigma_u^2)$ for $u \geq 0$, is a one sided disturbance term, assumed to have a half-normal distribution, which represents technical inefficiency differing across firms or time. V and U are also assumed to be independent of each other. The data for capital, labour, and output are given in Tables (8.1), (8.2), and (8.3) respectively.

Given the error term assumptions made above, the log-likelihood function can be defined, as in equation (3) of Chapter (6), thus:

$$\ln L\ (y/\beta,\lambda,\sigma^2) = N \ln \frac{\sqrt{2}}{\sqrt{\Pi}} + N \ln \sigma^{-1}$$

$$+ \sum_{i=1}^{N} \ln\left[1-F^* \ (\varepsilon_i,\lambda,\sigma^{-1})\right] - \frac{1}{2\sigma^2} \sum_{i=1}^{N} \varepsilon_i^2 ,$$

where $F^*$ = standard normal distribution function,

$\sigma^2 = (\sigma_u^2 + \sigma_v^2)$,

# Capital of Firms in Ghanaian Textile Sector, Million Cedis, 1979-1989.
# Table 8.1.

| | Firm B | Firm C | Firm E | Firm G | Firm H | Firm J |
|---|---|---|---|---|---|---|
| 1979 | ** | 27.1 | 23.5 | 12.7 | ** | 38.8 |
| 1980 | 55.5 | 24.4 | 20.5 | 11.0 | ** | 33.8 |
| 1981 | 59.5 | 22.1 | 17.8 | 9.5 | ** | 28.7 |
| 1982 | 64.0 | 19.1 | 15.3 | 9.2 | 24.1 | 24.4 |
| 1983 | 627.7 | 180.8 | 144.0 | 86.7 | 228.0 | 230.3 |
| 1984 | 877.0 | 248.9 | 178.1 | 119.1 | 311.8 | 313.7 |
| 1985 | 993.7 | 261.8 | 187.5 | 121.5 | 329.6 | 328.2 |
| 1986 | 1272.4 | 340.6 | 253.3 | 161.0 | 452.0 | 422.9 |
| 1987 | 2141.0 | 572.3 | 491.7 | 272.4 | 759.6 | 707.9 |
| 1988 | 2413.6 | 622.7 | 621.1 | 308.2 | 878.8 | 812.9 |
| 1989 | 2714.9 | 692.0 | 720.7 | 331.5 | 1018.4 | 977.1 |

**Source: Data 1990/91 Questionnaire.**
**** means not available.**

# Labour of Firms in Ghanaian Textile Sector, Million Cedis, 1979-1989.
# Table 8.2.

| | Firm B | Firm C | Firm E | Firm G | Firm H | Firm J |
|---|---|---|---|---|---|---|
| **1979** | ** | 13.4 | 8.0 | 1.0 | ** | 7.6 |
| **1980** | .9 | 13.6 | 8.3 | 1.0 | ** | 5.4 |
| **1981** | 3.5 | 18.4 | 13.8 | 1.2 | ** | 7.6 |
| **1982** | 5.5 | 19.6 | 11.6 | 1.4 | 7.5 | 7.3 |
| **1983** | 5.8 | 25.4 | 9.6 | 1.4 | 5.2 | 6.9 |
| **1984** | 12.2 | 36.1 | 15.7 | 2.0 | 10.3 | 9.4 |
| **1985** | 16.0 | 72.9 | 39.5 | 7.0 | 102.3 | 36.0 |
| **1986** | 43.0 | 127.0 | 77.3 | 7.5 | 101.3 | 48.5 |
| **1987** | 63.0 | 141.8 | 136.0 | 12.9 | 140.0 | 77.6 |
| **1988** | 109.8 | 295.3 | 165.9 | 20.3 | 256.2 | 126.3 |
| **1989** | 145.7 | 297.9 | 427.3 | 28.9 | 298.8 | 171.0 |

**Source: Data from 1990/91 Questionnaire.**
**** means not available.**

# Output of Firms in Ghanaian Textile Sector, Million Cedis, 1979-1989.
# Table 8.3.

| | Firm B | Firm C | Firm E | Firm G | Firm H | Firm J |
|---|---|---|---|---|---|---|
| **1979** | ** | 65.7 | 43.0 | 18.3 | ** | 58.8 |
| **1980** | 18.9 | 42.9 | 18.3 | 9.8 | ** | 29.7 |
| **1981** | 40.4 | 57.4 | 36.3 | 10.6 | ** | 26.7 |
| **1982** | 24.0 | 50.3 | 14.6 | 11.6 | 52.6 | 35.5 |
| **1983** | 43.0 | 109.0 | 31.6 | 7.6 | 48.6 | 40.2 |
| **1984** | 131.1 | 294.4 | 152.3 | 48.0 | 192.0 | 145.9 |
| **1985** | 183.3 | 412.7 | 358.3 | 87.9 | 387.2 | 287.4 |
| **1986** | 470.3 | 756.0 | 405.8 | 153.7 | 786.9 | 470.0 |
| **1987** | 827.2 | 1262.1 | 966.1 | 266.7 | 1360.0 | 877.0 |
| **1988** | 1424.7 | 3499.2 | 1232.2 | 506.3 | 2590.0 | 1220.0 |
| **1989** | 1956.3 | 3851.3 | 2284.0 | 630.6 | 3929.0 | 1838.0 |

**Source: Data from 1990/91 Questionnaire.**
**** means not available.**

$$\lambda = \frac{\sigma_u}{\sigma_v}$$

$$\varepsilon_i = (v_i - u_i)$$

This model was estimated by maximising the likelihood function with respect to $\beta$, $\lambda$, and $\sigma$, or conversely, by minimising the negative of the likelihood function. Thus the actual function which was minimised, using Limdep (1989) computer software, is thus:

$$\mathit{ln}\,l(y/\beta,\lambda,\sigma^2) = \mathit{ln}\,\sigma - \mathit{ln}(1-F^*((y - \beta_0 - \beta_1 x_1 - \beta_2 x_2)/\sigma))$$

$$+ (y - \beta_0 - \beta_1 x_1 - \beta_2 x_2)^2/(2\sigma^2),$$

where $y = \mathit{ln}Y$,

$x_1 = \mathit{ln}X_1$,

$x_2 = \mathit{ln}X_2$,

8.3. Results of Estimation.

Several combinations of starting points were attempted, and one such combination which led to a global minimum in the minimisation process was as follows: $\beta_0 = 0$, $\beta_1 = 0$, $\beta_2 = 0$, $\sigma = 1$, and $\lambda = 1$.The result of this minimisation are given in Table (8.4). The $R^2$ value , using Ordinary Least Squares regression, was found to be .927 indicating that 92.7 percent of the variability in y is explained by $x_1$ and $x_2$. The parameters of $\beta_1$, $\beta_2$, and $\sigma$ were found to be significant at the 5% level, while those of $\lambda$ and $\beta_0$ were insignificant at the 5% level. The fact that at least $\sigma$, which contains the variance of technical inefficiency, was significant, encouraged further use of this model for estimating firm and year specific technical inefficiency. The fact that $\lambda$ was found to be insignificant was disappointing, and perhaps the significance of the inefficiency estimates is slightly reduced by this fact.

The estimates shown in Table (8.4) were substituted into equations (8) and (9) of Chapter (6) in order to work out $\sigma_*^2$ using equation (7) of Chapter (6). $\sigma_*^2$, $\lambda$, and $\sigma$ were then substituted into equation (4) of Chapter (6) and estimates of firm and year specific technical inefficiency, for firms B, C, E, G, H, and J for the period 1979-89, were thus obtained. These are given in Table (8.5).

From Table (8.5), it can be seen that the average value of inefficiency for all firms in 1980 (excluding firm H) stood at 13.8 percent, with the lowest and highest values for that year being 6.2 percent and 25.5 percent respectively. Average

## Result of Maximising Likelihood Function.
## Table (8.4).

| Variable | Coefficient | Estimate |
|---|---|---|
| x1 (log capital) | B1 | .4089<br>(.0573) |
| x2 (log labour) | B2 | .6910<br>(.0508) |
| Constant | B0 | .0160<br>(.7797) |
| Lambda | | 1.8933<br>(1.3813) |
| Sigma | | .6675<br>(.1474) |

**Note: Figures in parentheses are standard errors of estimates.**

# Technical Inefficiency (u) of Firms in Ghanaian Textile Industry (in %).
# Table 8.5.

| | Firm B | Firm C | Firm E | Firm G | Firm H | Firm J |
|---|---|---|---|---|---|---|
| **1979** | -- | 9.8 | 9.8 | 3.6 | -- | 8.1 |
| **1980** | 6.2 | 16.4 | 25.5 | 7.1 | -- | 13.7 |
| **1981** | 8.1 | 14.0 | 17.4 | 6.7 | -- | 19.2 |
| **1982** | 23.6 | 16.2 | 32.8 | 6.6 | 7.1 | 12.0 |
| **1983** | 31.8 | 23.7 | 33.1 | 30.6 | 18.8 | 27.1 |
| **1984** | 21.9 | 11.1 | 10.3 | 5.8 | 6.9 | 9.2 |
| **1985** | 19.9 | 13.9 | 7.8 | 8.2 | 21.6 | 13.3 |
| **1986** | 16.7 | 11.9 | 14.7 | 4.9 | 10.7 | 10.3 |
| **1987** | 15.0 | 8.8 | 11.2 | 5.1 | 9.2 | 9.2 |
| **1988** | 13.0 | 4.7 | 11.0 | 3.7 | 7.3 | 10.0 |
| **1989** | 11.8 | 4.5 | 12.6 | 4.0 | 5.3 | 8.4 |

**Note: No values available for B (1979) and H (1979-81).**

inefficiency rose sharply to 27.5 percent in 1983 with the lowest and highest values being 18.8 percent and 33.1 percent respectively. By 1989, this figure had fallen to 7.7 percent with the lowest and highest values for that year standing at 4.0 percent and 12.6 percent respectively. These results are discussed further in Chapter (9) which is on the cost structure of the textile industry.

**8.4. Summary.**

In this chapter, the stochastic Cobb-Douglass frontier production function approach, discussed in Section (6.7.1) of Chapter (6), is used to estimate technical inefficiency in six Ghanaian textile mills for period 1979-89.

The results of this estimation show that technical inefficiency was on an upward trend in the 1979-1983 period, and was subsequently on a declining trend in the 1984-89 period. This finding forms part of the cost structure analysis undertaken in Chapter (9).

# 9. COSTS IN GHANAIAN TEXTILE INDUSTRY.

## 9.1. Introduction.

This chapter focuses on the costs faced by the textiles sector. Reasons why firms need to cut costs are discussed, and the main areas where cost reductions are possible are highlighted, be they exogenous areas (i.e. beyond the firm's control but within Government's control) or endogenous areas (i.e. directly under the firm's control).

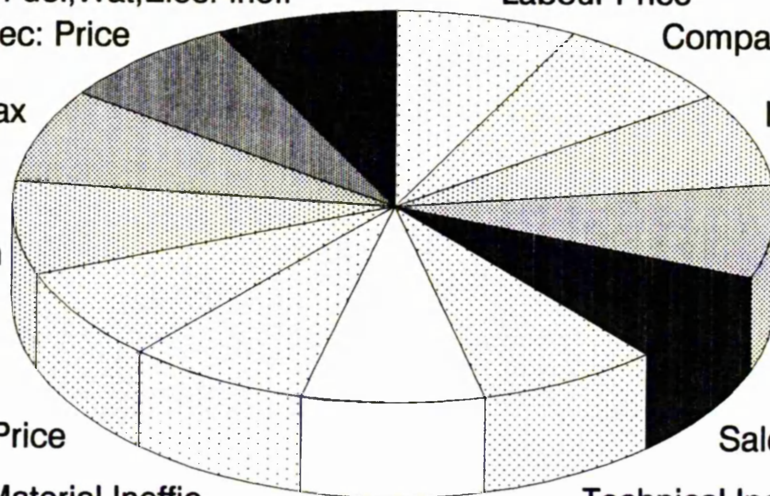
After the introduction in Section (9.1), a summary of the costs faced by textiles firms is given in Section (9.2). Section (9.3) looks at why firms need to cut costs, while Section (9.4) discusses total yarn and fabric manufacturing cost. The endogenous costs are given in Section (9.5), while the exogenous costs are given in Section (9.6). Section (9.7) discusses sensitivity analysis of costs. The summary is in Section (9.8).

## 9.2. Costs Faced By Textile Firms.

Figure (9.1) illustrates the main components of total cost in the Ghanaian textile sector. These can be classified into two groups: "endogenous costs" and "exogenous costs". Endogenous costs, i.e., costs which firms can control, include:

- Cost of labour (i.e post-tax wages).

**Possibilties for Cost Reduction in Ghanaian Textiles Manufacturing.**
**Chart 9.1.**




**Note: The size of each slice is not to scale, but is only for the purpose of demonstration.**

- Cost reductions due to improved labour productivity.
- Raw material cost.
- Cost reductions from efficient use of raw materials.
- Cost reductions occurring from efficient use of fuel, electricity, and water.
- Cost reductions with improved technical and allocative efficiency.

Exogenous costs, i.e. costs not directly under the firms control, include:

- Cost due to high price of, and tax on, electricity, fuel and water.
- Direct taxes: income tax, and company tax.
- Indirect taxes: sales tax, raw material tax.
- Cost changes as a result of exchange rate changes.

### 9.3. Why Firms Need to Cut Costs.

The question as to why firms need to cut costs can be answered with reference to two periods: pre- and post-liberalisation periods. In the pre-liberalisation period before 1983, "rent seeking" costs and cost due to "directly unproductive" activities were incurred as a result of protectionism (see Tullock 1967, Krueger 1974, and Bhagwati 1980 for a review of costs due to protectionism). There were difficulties in acquiring imported inputs due to the import licensing system. The import licensing system placed a great strain on the smaller establishments making it difficult for them to obtain inputs. Problems with maintenance of machinery, due to shortages of spare parts, led to high down times. Strikes by workers also played a part in high down time. The granting of import licenses on the basis of capacity in existence and the need to exploit scale economies led to the establishment of large plants, and this over-supply of capacity in turn contributed to its underutilisation.

But this situation did not improve post-liberalisation. What many had seen as the major constraints to improving the level of capacity utilisation, namely foreign exchange constraints and the fixing of output prices, had all been removed by the end of 1986, but still in 1988, the level of capacity utilisation in textiles was 10 percent lower than in 1978 (see Figure (5.5) on capacity utilisation in Chapter (5)). This suggests that the low capacity utilisation levels were not entirely due to constraints from outside the industry, but that the problem was partly from within. Many years of protection had made firms complacent about controlling costs. The shelter from competition had, with few exceptions, allowed ill-maintained or inadequate capital to stay in production and not much effort was put into improving the efficiency of labour. This meant that firms operated with relatively low productivity of factors. As discussed in Section (2.3) of Chapter (2), Steel (1972), using Domestic Resource Cost to examine the efficiency of industries, found that only 15 percent of firms surveyed in 1967-68 would have been competitive with imports at the official exchange rate, and devaluation by 50 percent would have raised that figure only up to 25.6 percent.

As discussed in Section (2.6.5) of Chapter (2), industry began to face difficulties with the introduction of the ERP in 1983. These were mainly due to competition from imports, a rundown and obsolete capital stock, and tight liquidity. The 300 percent exchange rate devaluation in the 1983-1984 period, as shown in Figure (9.14), had the effect of converging the nominal and PPP rates, and meant that domestic goods became relatively more competitive as compared to imported goods. But, the removal of tariffs and quotas worked in an opposing direction to the devaluation, leading to a reduction in the price of imported goods as compared to domestic manufactures. Thus, the overall effect of the market liberalisation programme (devaluation, removal of tariffs and quotas, etc.) is undetermined. What has already been mentioned above is that Steel (1972) found a high degree of inefficiency amongst the firms he surveyed. Also some evidence of the adverse effect of the initial stages of liberalisation can be seen from Chapter (5), where 8 of the 12 textile firms in existence in 1979 were still in operation in 1989. All the closures took place after the 1983 liberalisation programme. Thus even though a devaluation and removal of tariffs work in opposite directions in terms of the effect they have on competitiveness with imports, it is felt that the removal of tariffs had the greater effect.

In view of the fact that at the time of the survey, only one firm had modern machinery, and no firms had made provisions for the required reinvestment in plant, machinery and training, and that neither the government nor foreign investors have been willing to commit funds to this process, the long-term prospect for survival of the Ghanaian textile industry is in question. Thus production cost cutting is essential, and the role of both firms and the government in achieving this is discussed in this chapter.

### 9.4. Total Manufacturing Costs.

Prior to considering the endogenous and exogenous costs in detail, a comparison of plant B's manufacturing costs with those of other selected countries is made. This would give an indication of its competitiveness and of the gap which it has to close if it is to stand up to the competition it now faces from imports.

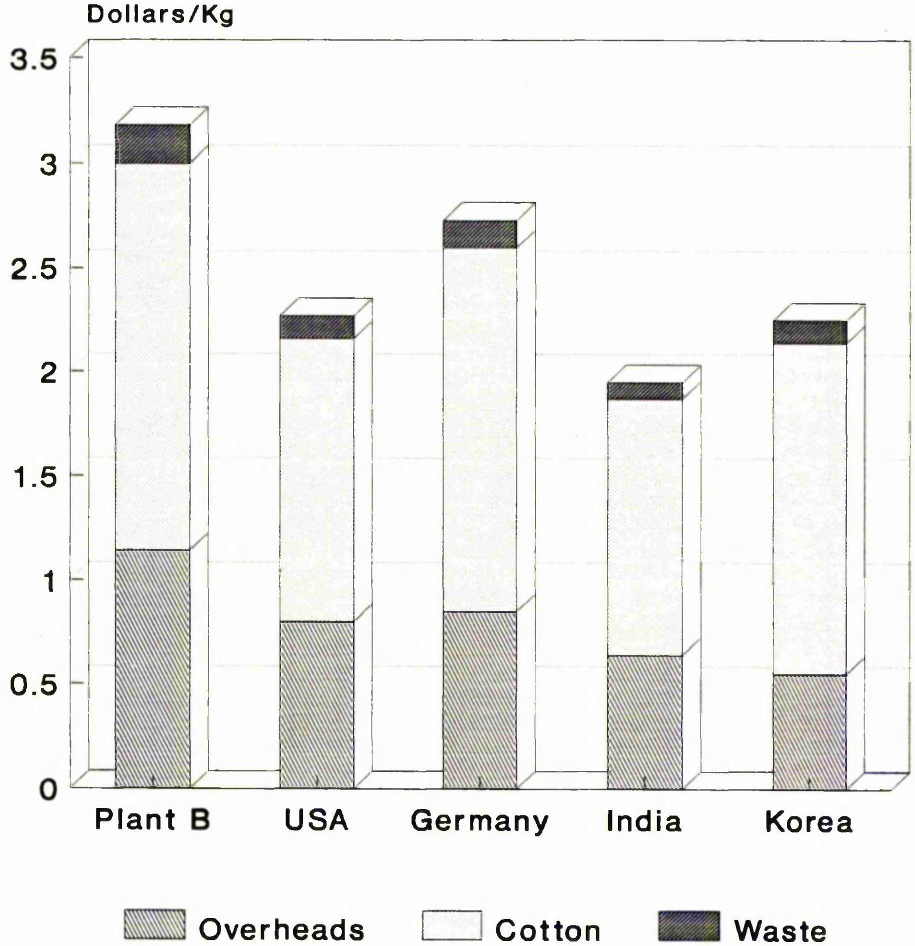
#### 9.4.1. Yarn Manufacturing Costs.

Ideally, the cost structure for products of several firms would be needed to give a clear picture of industry costs, but this was not obtainable. Nevertheless, the costs of the best equipped and arguably the best maintained firm, Plant B, was obtained during 1990 fieldwork. As seen earlier in Chapter (5), Plant B has installed open-end rotor spinning, and uses shuttleless looms (both modern capital intensive techniques). This, generally, is comparable with Curiskis' (1989) capital intensive techniques in the USA discussed in that chapter, and is commensurable to the 20 to 40 percent of firms in the textiles industries of Germany, France, and the United

Kingdom, found by the Policy Studies Institute (1985) to be using microelectronics. It is therefore felt that a comparison of plant B's costs with those of countries such as the USA, Germany, is apt since, the disparity in capital intensity between these three samples is not as large as might be expected, and so differences in costs would, by and large, be attributable to management efficiency, labour productivity and other overheads, rather than to inefficiency due to technological disparity.

Figure (9.2) gives the total cost of yarn manufacture in dollars per Kilogramme, in 1985, for Plant B in Ghana, and other selected countries, i.e. USA, Germany, India, Korea. The highest yarn manufacture cost was Plant B, at 3.2, and the lowest was India, at 1.9. This means that Plant B's cost was 68 percent higher than India's average cost in 1985. It is true that this is probably not a like with like comparison because firstly, the quality of Plant B's yarn would be expected to be higher than the average Indian yarn. This is because Plant B is a modern well maintained plant, while "over half the spinning and weaving equipment in India is estimated to be over 20 years old and much of it over 40 years" (Technical Change, 1987). Secondly, the yarn counts (thicknesses) that are being compared are not known. Also, a review of count and quality premiums by Cotton Outlook (1992) reveals that, for the two commonest counts, 20s and 30s, the price spread is from $2 per Kg. to $3 per Kg. for 20s count, and from $2.3 per Kg. to $4 per Kg. for 30s count. Thus for the evidence from Figure (9.2) to be conclusive, the yarn counts and qualities being compared would be required. Nevertheless, it is

Total Cost of Yarn in Selected Countries
and for Plant B in Ghana, 1985.
Figure 9.2.




Source:Data for Plant B from 1990 questionnaire, rest from International Production Cost Comparison (1985).

possible to conclude that Plant B (and by inference, other plants in Ghana) is expected to have significantly higher yarn manufacturing costs all things being equal.

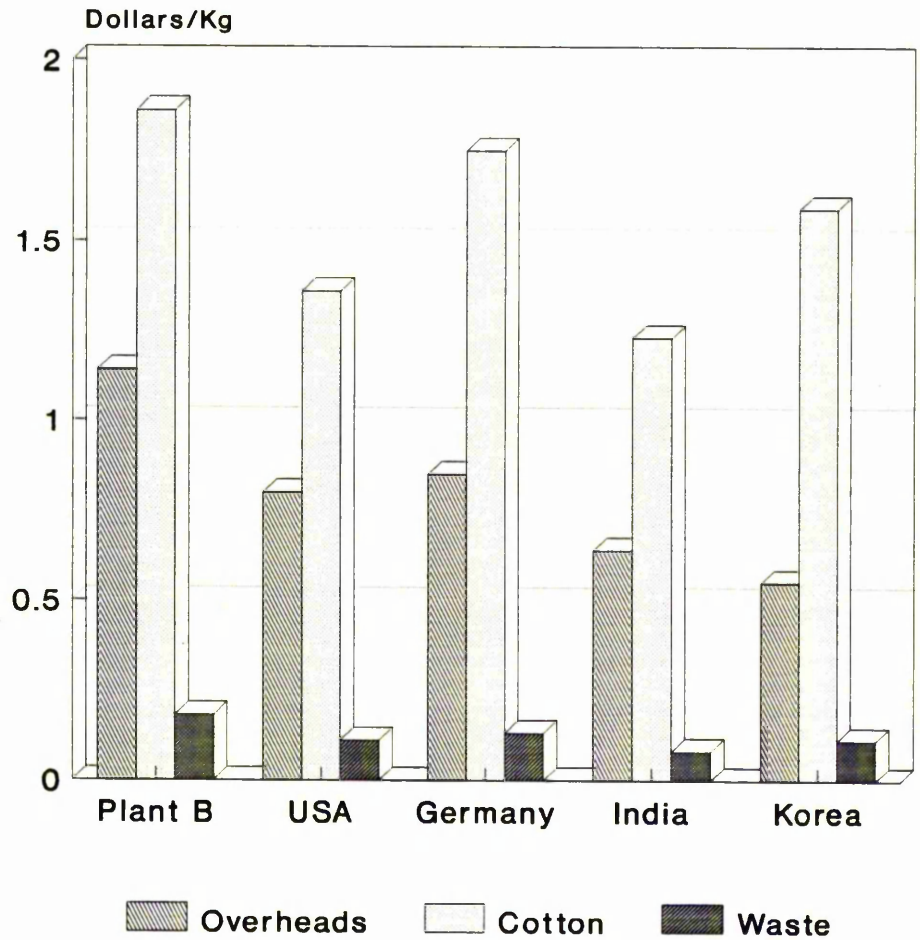
When yarn manufacturing costs, in dollars per Kilogramme, are split into overheads, cotton cost, and waste, as in Figure (9.3), Plant B's overheads, at 1.1 are found to be roughly twice the size of Korea's, at 0.6. Plant B also has the highest cotton cost, at 1.9, while India has the lowest, at 1.2. The cost of waste varies from .2 for Plant B to about .1 for the rest.

Thus, if Plant B is to achieve a reduction in yarn manufacturing costs, it will have to improve its raw material (i.e cotton) sourcing, as well as cut down its overheads.

### 9.4.2. Fabric Manufacturing Costs.

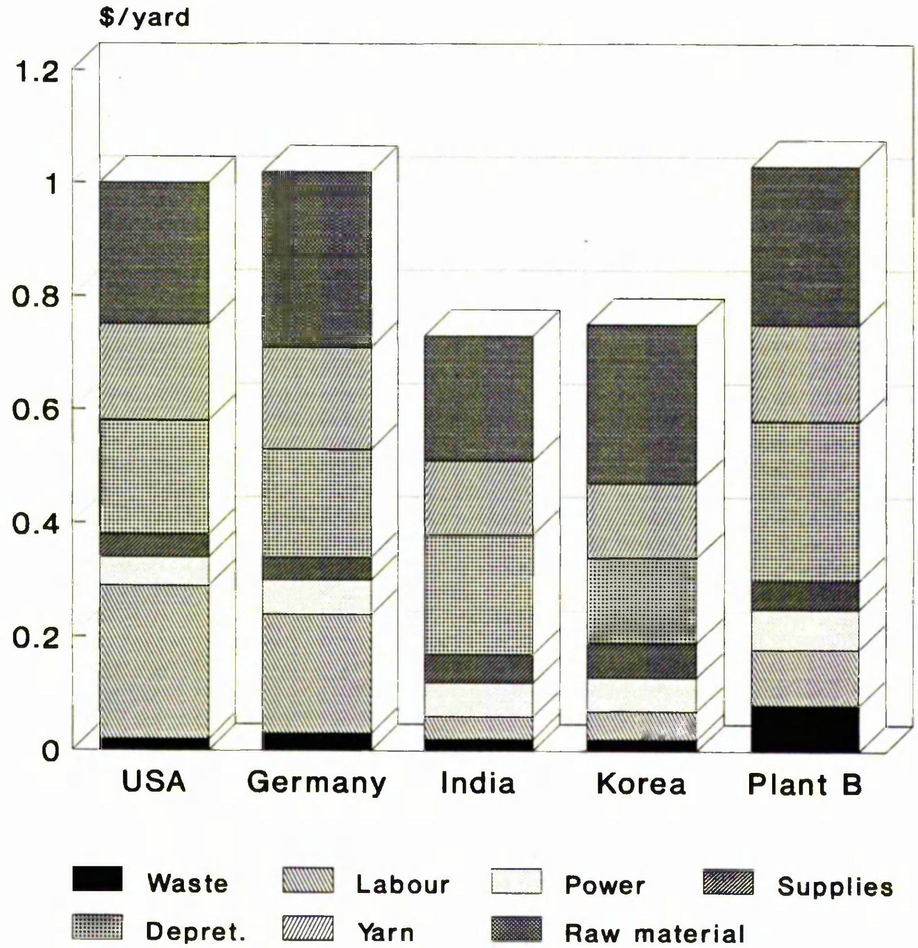
Figure (9.4) is a stack Figure comparing fabric manufacturing cost for Plant B in 1989 with the fabric manufacturing cost in USA, Germany, India, and Korea, for 1985. Although this is not strictly a like with like comparison, as firstly, costs are not being compared for the same year, and secondly, the quality of the different fabric being compared is unknown, an indication of where Plant B's cost is in comparison to developed (USA, Germany), newly developed (Korea), and developing (India) countries can still be obtained.

Cost of Yarn in Selected Countries
and for Plant B in Ghana, 1985.
Figure 9.3.




Source:Data for Plant B from 1990 Questionnaire, other data from Production Cost Comparison (1985).

Total Cost of Fabric in Plant B (1989)
and Selected Countries (1985).
Figure 9.4.




Source: Plant B data 1990 Questionnaire,
Other data from Int Prod Cost Comp(1985)
Assume Plant B's prodn. 100% cotton grey

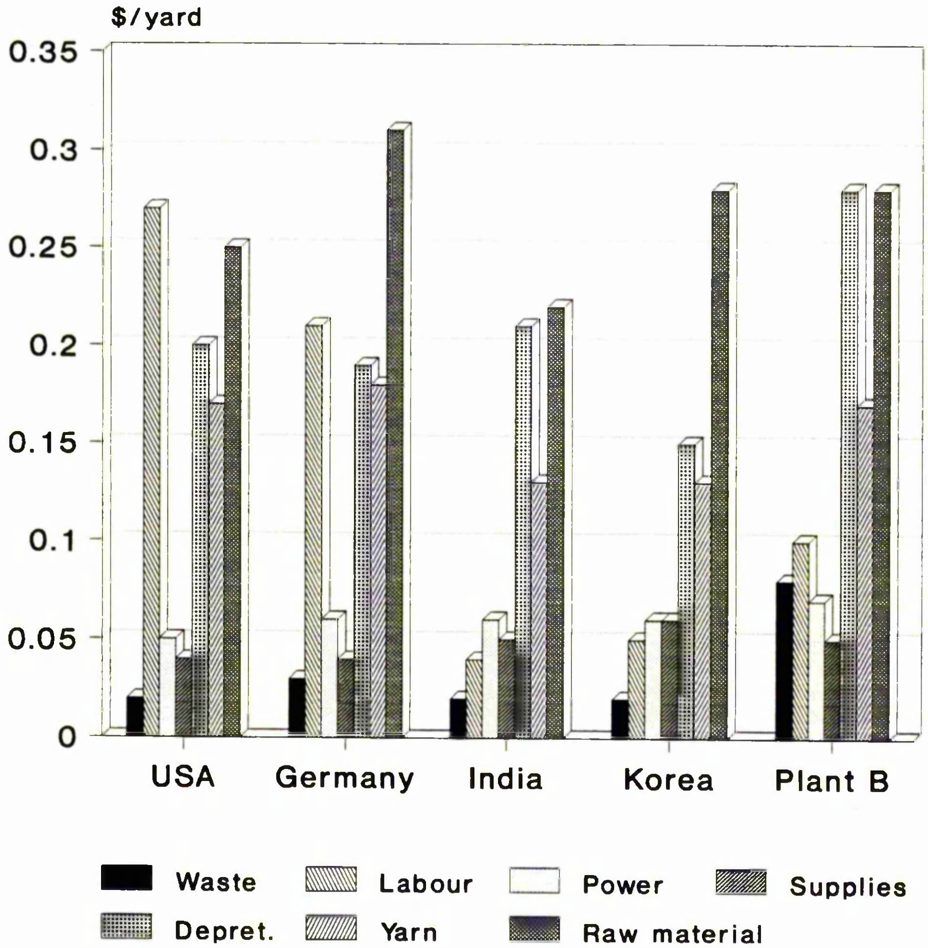
Plant B's cost, at approximately 1 $/yard, is similar to those of USA and Germany. India and Korea's costs are approximately 0.75 $/yard; 25 percent less. From Figure (9.5), which is a sided-by-side bar chart of costs, shows that Plant B has a higher waste cost than the other countries. Labour cost, at 0.1 $/yd, while being lower than that of USA (0.27 $/yd.) and Germany (0.21 $/yd), is higher than for India (0.04 $/yd) and Korea (0.05 $/yd).

Electricity cost per yard for Plant B are the highest amongst the five samples. Yarn manufacturing costs and raw material costs vary considerably. India and Korea have the lowest yarn manufacturing cost at approximately 0.13 $/yd. while Plant B, USA, and Germany have yarn manufacturing costs of ranging from 0.16-0.17 $/kg. Raw material cost is lowest for India (0.22 $/yd), followed by USA (A (A (0.25 $/yd), and Korea and Plant B (both at 0.28 $/yd).

Thus, if Plant B is to reduce its fabric manufacturing cost, it will have to firstly, improve its raw material sourcing. Secondly, it will have to cut down on the amount of wastage that occurs, and thirdly (and importantly) it will have to find a way to increase labour productivity and thus reduce labour costs to Indian and Korean levels. It will also have to consume electricity more efficiently, and perhaps press for a review of electricity supply charges.

The ability of Plant B and the other plants in the Ghanaian textile sector to reduce their costs and increase their

Cost of Fabric in Plant B (1989)
and Selected Countries (1985).
Figure 9.5.




Source: Plant B data 1990 Questionnaire,
Other data from Int Prod Cost Comp(1985)
Assume Plant B's prodn. 100% cotton grey

competitiveness will depend crucially on their capacity to adapt to the new liberalised climate. This in turn will depend to some extent on their adeptness at improving their productive efficiency (i.e technical and allocative efficiency). An attempt to estimate this is made below by estimating the change in their technical efficiency over the pre- and post- trade liberalisation period.

### 9.5. Endogenous Costs.

The endogenous costs of the firms are now considered. These include: labour cost; raw material cost; efficiency of raw material use; efficiency of fuel, power, and water use; and technical and allocative efficiency.

#### 9.5.1. Labour: Price and Productivity.

As shown in Figures (9.4) and (9.5) above, Plant B's labour cost per yard is higher than in India or Korea. But, as shown in Figure (4.14) of Chapter (4), hourly wages (i.e labour price) in Ghanaian textiles are much lower than in the USA and Germany, and they are at least half the rates in India and Korea. Thus, the relatively high labour costs per yard exhibited by plant B means that plant B's labour productivity is lower than India's and Korea's productivity. This also implies that the labour productivity of the other textile mills surveyed is also lower than the productivity in

India and Korea since, as can be seen from Figure (9.10), Plant B has one of the lowest labour to output ratios (implying that plant B's labour productivity is one of the highest amongst the Ghanaian textile firms).

### 9.5.2. Raw Material Cost/Quality and Efficiency of Use.

Raw materials used by some of the textile firms include cotton, dyestuffs, polyester, and viscose. The discussion concentrates on cotton as it is the main raw material.

Figure (9.3) shows that Plant B's cotton cost in 1985 was the highest amongst the USA, Germany, India, and Korea. But, as indicated in Figure (3.3) of Chapter (3), the Ghanaian lint cotton price did fall sharply from a level of nearly twice the world price in 1985, to a level which was marginally lower than world price in 1987. This price differential was also maintained during the 1987-1990 period. Thus it would initially appear that local mills are able to purchase cotton at a marginally lower price than the world cotton price. But, as also pointed out in Section (3.6) of Chapter (3) this is not entirely to the benefit of local mills due to the deteriorating quality of the Ghanaian cotton. This has been attributed to the poor ginning process which caused fibre damage.

In terms of efficient use of raw materials, an indication of this can be seen from the level of raw material waste in manufacturing. Figures (9.3) and (9.4), show that Plant B had the highest cost of waste in both the spinning and weaving processes as compared to all the other countries examined.

### 9.5.3. Efficiency of Fuel, Power, and Water Use.

Fuel and water are required mainly in the finishing process. The steam required in the dyeing process is generated by boilers which burn fuel. Water is required for washing, bleaching and dying.

Figure (9.5) shows that electricity cost per yard was highest for plant B in 1989 as compared to the other countries' costs for 1985. But in Table (9.1), electricity price for the five firms shown averaged $0.04/kWh in 1992. This is comparable with USA price of $.049/kWh, and India's 1985 price of $0.04/kWh, as can be seen from Table (9.2) which gives light fuel oil prices ( i.e fuel with a density of between 0.8-0.9 mt/kl, and a calorific value of between 10100-10350 kcal/kg.) and electricity prices for selected cases. It must be stressed, before making any inferences from these data, that this is not an entirely comparable comparison. This is because compared costs are not for similar years, and also because Figure (9.5), on cost of fabric, does not indicate whether the same quality, or width of fabrics are being compared. Nevertheless there are indications that Plant B is not as efficient with electricity use as India or the USA. If this is the case, then plant B has cost cutting

# Electricity Prices for Textile Firms (1992).
# Table 9.1.

| | Firm C | Firm E | Firm G | Firm H | Firm J |
|---|---|---|---|---|---|
| (a) Units (kWh) | 10,506,000 | 10,848,000 | 1,961,000 | 15,439,100 | 1,866,000 |
| (b) 1992 Cedis/Unit | 14.00 | 14.00 | 14.00 | 14.00 | 14.00 |
| (c) Max. Demand: KVA | 2500 | 3200 | 824 | 3000 | 1530 |
| (d) 1992 Cedis/KVA | 1,300.00 | 1,300.00 | 1,300.00 | 1,300.00 | 1,300.00 |
| (e) MD,Ced/yr:d*12*c | 39,000,000 | 49,920,000 | 12,854,4000 | 46,800,000 | 23,868,000 |
| (f) MD,Ced/kWh:e/a | 3.71 | 4.60 | 6.56 | 3.03 | 12.79 |
| (g) Tot. Price: b+f | 17.71 | 18.60 | 20.56 | 17.03 | 26.79 |
| (h) Tot. In $ | 0.043 | 0.0448 | 0.050 | 0.041 | 0.065 |

**Source: 1991/92 fieldwork.**
**Note: All units and max. demand figures are for 1989, except Firm H which is for 1988.**

potential if electricity is used more efficiently.

No figures on the cost of water or fuel per yard of fabric are available, therefore an inference on the efficiency of their use cannot be made at this stage.

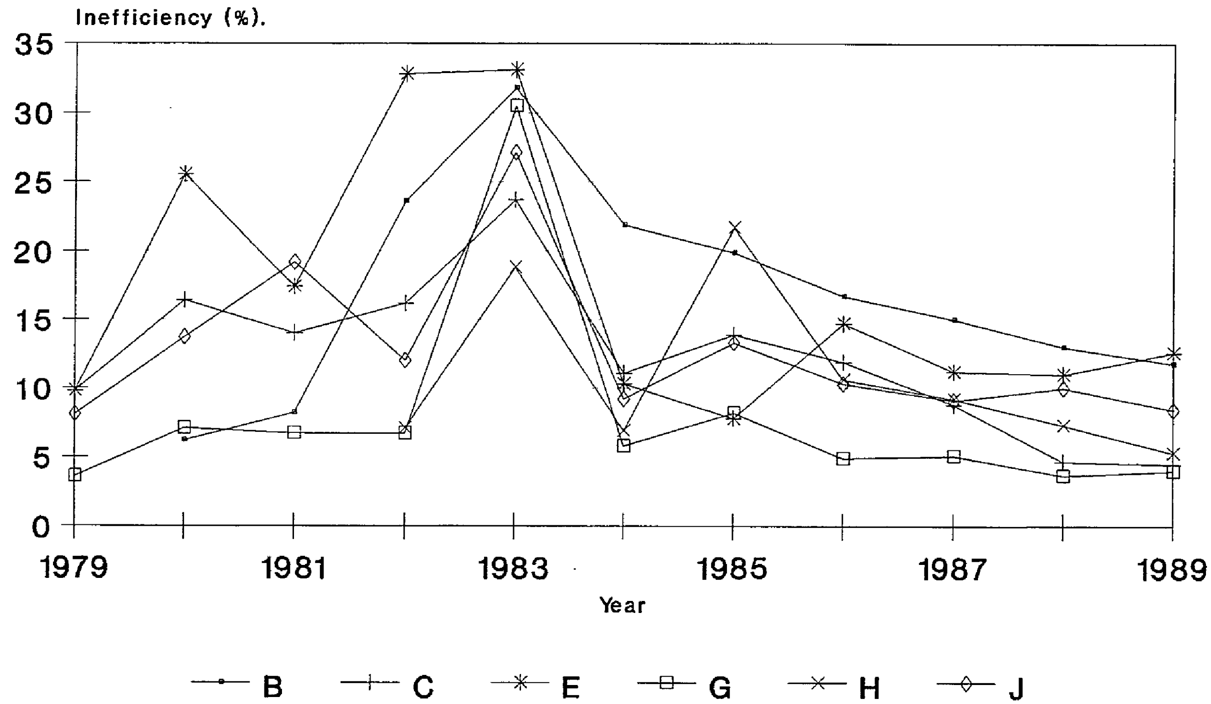
### 9.5.4. Summary of Results of Technical Inefficiency Estimation.

The results of the technical inefficiency estimation made in Chapter (6) are summarised in Figure (9.6). This shows two distinct patterns: a steeply rising trend in technical inefficiency in the pre-ERP (i.e pre-1983) period of 1979-83, and a generally falling trend in technical inefficiency in the post-ERP period of 1984-89.

Technical inefficiency, on the whole, peaked in 1983 with three firms' (B, E, and G) inefficiency estimated at over 30 percent for that year. This means that these firms could have increased their outputs by over thirty percent given the same quantity of capital and labour employed. But the foreign exchange scarcity, which became acute in 1983, meant that firms faced shortages of imported foreign inputs, equipment and spare parts, and thus had reduced outputs, but, at the same time, they did not seem to reduce their labour force. Even if they had been able or willing to do this, they would still have been left with idle plant and machinery whose value was deteriorating with time, even if they were not in operation.

With the introduction of the ERP in 1983, the removal of the

Technical Inefficiency (u) of Firms in
Ghanaian Textile Industry.
Figure 9.6.



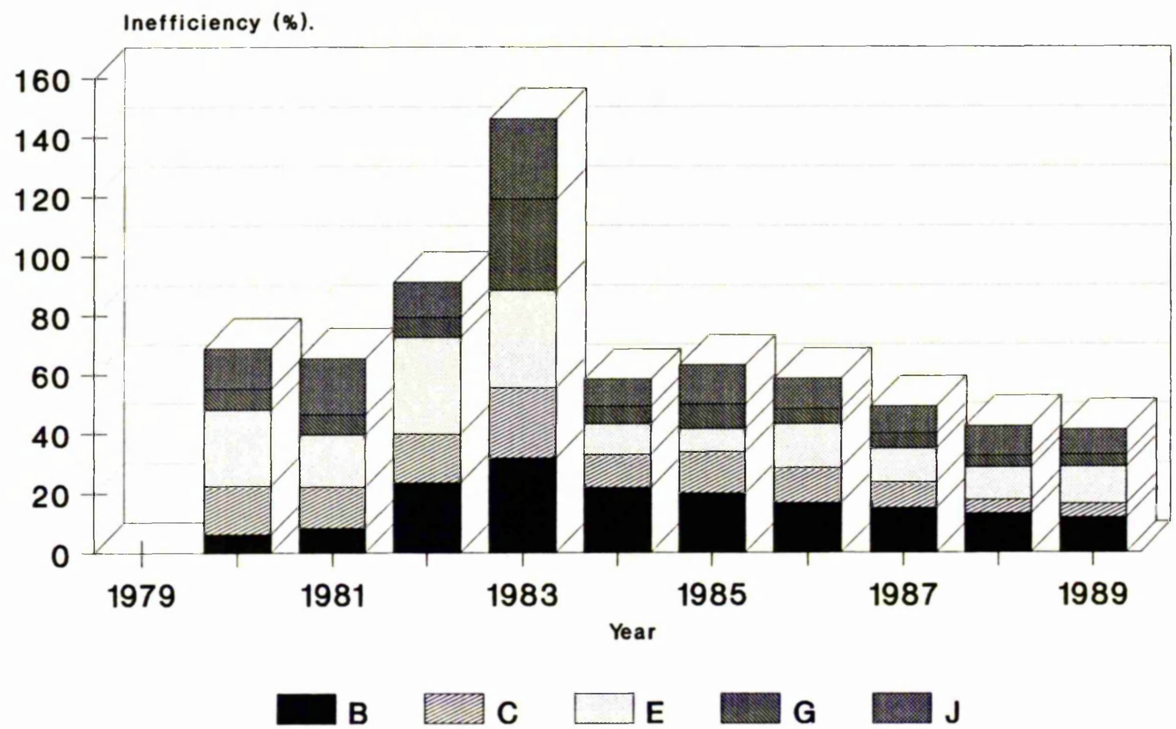

Note: No values available for B (1979)
and H (1979-81).

foreign exchange bottleneck mixed with the effect of competition from foreign imports meant that firms now had to compete, but they also had some of the conditions, such as foreign exchange availability, they required to be competitive. This is reflected by the aggregate inefficiency value shown in Figure (9.7). This shows that the stacked values of inefficiency (excluding firm H's values) in 1989 was nearly half its 1980 value, and also nearly four times less the than 1983 peak value.

Figures (9.8), (9.9), and (9.10) give the capital labour ratios, the capital output ratios, and the labour output ratios for the 1979-89 period, with the exception of the values for firm B (for 1979) and firm H (for 1979-81).

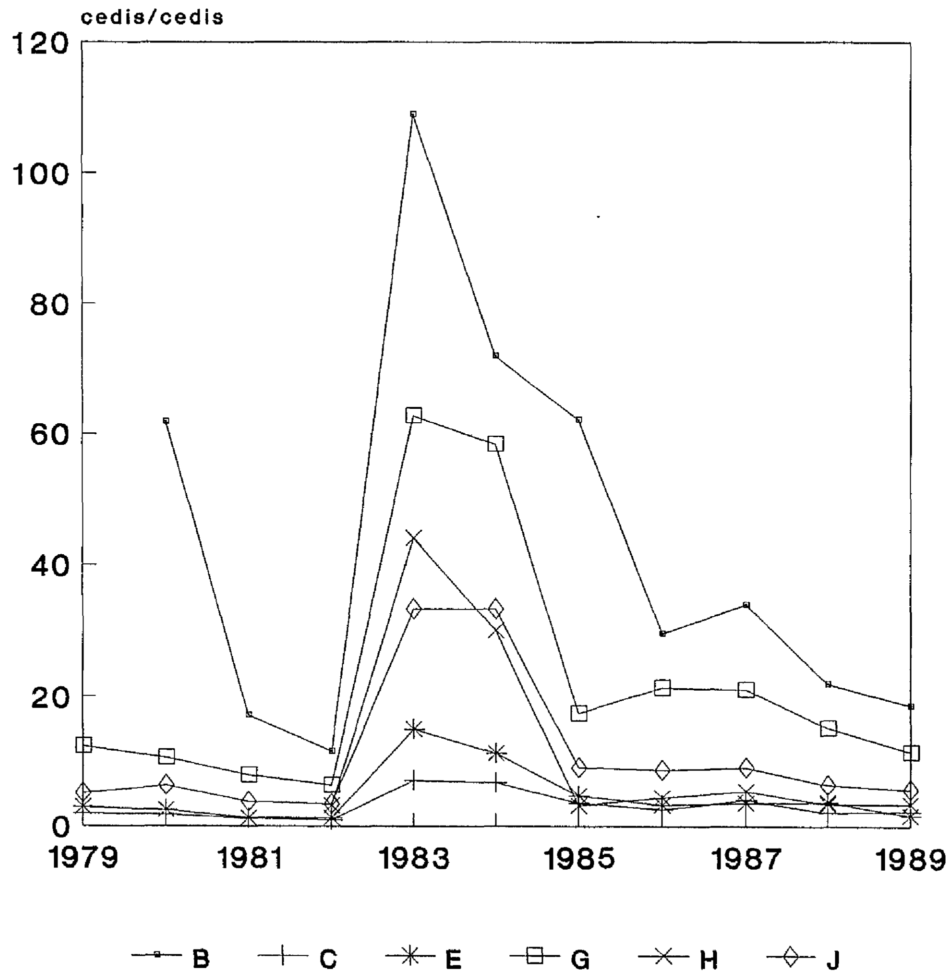
Table (8.5) of Chapter (8) shows the inefficiency estimate for firm B standing at 6.2 percent in 1980, rising to a peak of 31.8 percent in 1983, and then falling steadily to 11.8 percent by 1989. As can be seen from Figure (9.6), this firm, although being amongst the most efficient firms in terms of technical efficiency in the 1980-81 period, was the second most inefficient firm in 1983. It can also be seen from this that its post-83 recovery has been the slowest. This is reflected in this firm having the highest average inefficiency value in the 1984-89 period, as can be calculated from Table (8.5) of Chapter (8). An explanation for this firms slower recovery can be seen in Figures (9.8), (9.9) and (9.10). While its capital-labour ratios and capital output ratios have been the largest, especially in the 1984-89 period, its labour-output ratios

## Technical Inefficiency (u) of Firms in Ghanaian Textile Industry.
## Figure 9.7.



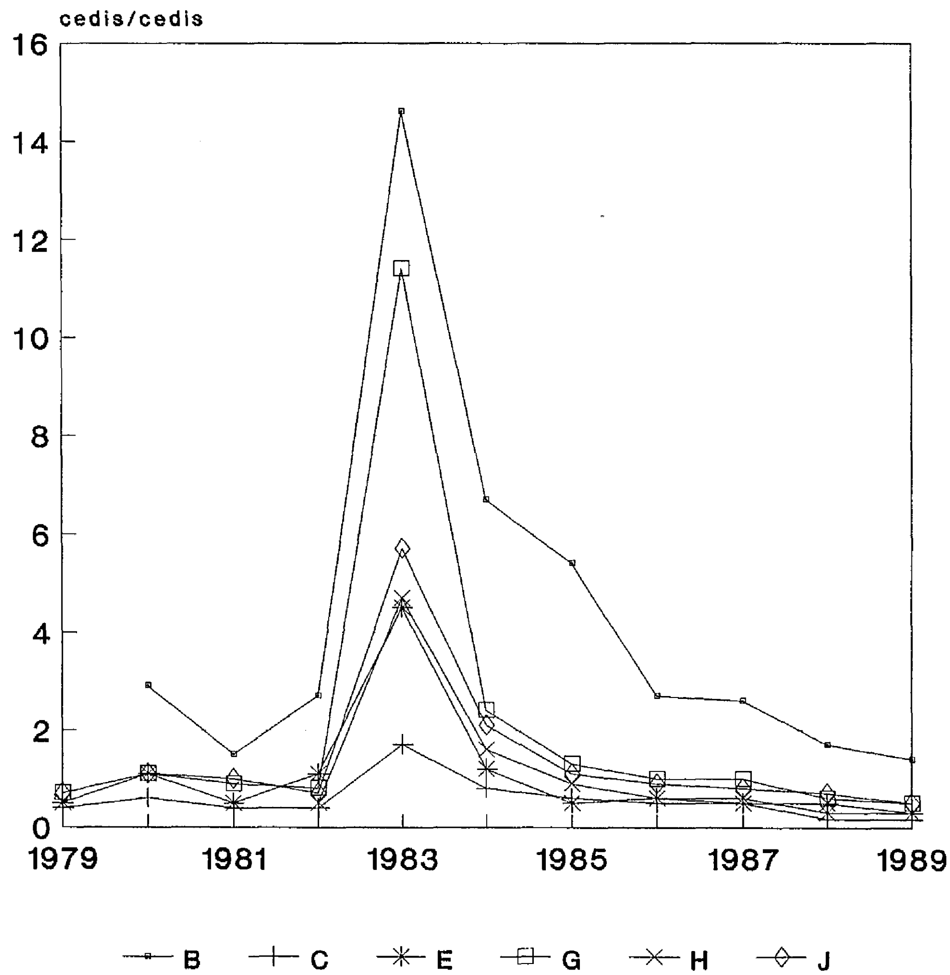

Note: 1979, and H values deleted.

## Capital Labour Ratios in Ghanaian Textile Firms: 1979-89.
## Figure 9.8.



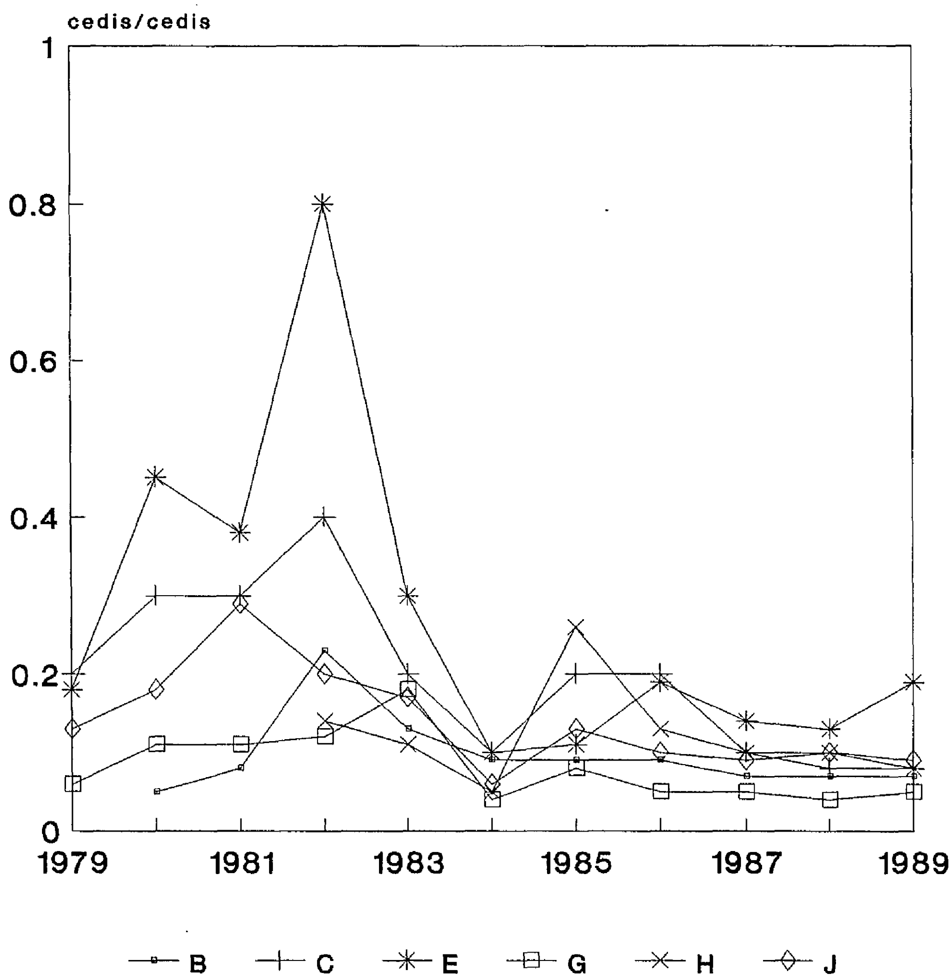

Source: 1990 fieldwork.

## Capital Output Ratios in Ghanaian Textile Firms: 1979-89.
## Figure 9.9.




Source: 1990 fieldwork.

# Labour Output Ratios in Ghanaian Textile Firms: 1979-89.
Figure 9.10.




Source: 1990 fieldwork.

have been some of the lowest in the sample for that period. This means that with the shortage of foreign exchange in 1982-83, this firm had to reduce its output, but it still had, as mentioned in Chapter (5), the most modern, and thus expensive, capital stock. This is reflected by the larger capital-output ratios. On the other hand, this firm has managed to keep its labour-output ratios low in relation to the other firms, and seems to have layed-off workers when its production decreased, and controlled wage increases when output picked up.

The best performing firm, in terms of improvement in technical efficiency in the period 1983-89, was firm G. Its inefficiency value dropped from 30.6 percent in 1983 to only 4.0 percent in 1984; a difference of 26.6 percent.

It can be concluded that with an estimated average inefficiency value for the six largest Ghanaian textile mills in 1989 standing at 7.7 percent (i.e. the average of the six inefficiency values), and the lowest value being 4.0 percent (for firm G), technical efficiency has responded favourably to the competitive free-trade market it now finds itself in. Some firms such as, B, E, and J, with inefficiency levels of 11.8 percent, 12.6 percent, and 8.4 percent, still have some way to go in reducing their inefficiency values to a sub-five percent level, this being roughly the technical inefficiency level attained by firms C, G, and H.

## 9.6. Exogenous Costs.

Exogenous costs, as mentioned above, are costs imposed on firms either by monopolistic inputs suppliers, or by governments. These include: fuel, power and water prices; direct taxes (income tax paid by employees, and company tax which companies pay on profits); indirect taxes (such as sales tax, raw materials tax) and other taxes which affect firm's costs indirectly, such as taxes on fuel, power and water consumption. Another form of cost reduction can be achieved as a result of exchange rate devaluation. This produces a decrease in cost relative to world prices as demonstrated in Section (9.6.3) below.

### 9.6.1. Electricity, Fuel, and Water, Price/Tax.

Industrial electricity rates in Ghana are worked out by adding a "maximum demand" (MD) rating to the units or kilowatt hours (kWh) consumed. These units are recorded by a meter. The MD rating, is measured in KVAs, and reflects the power requirement of a mill at maximum production capacity. So, even if only one unit of electricity is consumed, the full MD charge is incurred for the month. This is therefore punishing firms when they reduce their electricity consumption. Table (9.1) works out the effective cost per unit of electricity for firms C, E, G, H, and J. This is done by spreading the annual charge on maximum demand onto the number of units consumed. Thus, firm H, which seems to have a high unit consumption relative to its MD rating, has a relatively low effective unit charge of \$0.041 (i.e low total charge per unit), while, firm J has a higher effective unit charge of \$0.065 because it consumed a relatively small amount of units in relation to its MD rating.

Table (9.2) compares light fuel (i.e. fuel of 0.85mt/kl. and net calorific value of 10350 kcal/kg.) and electricity prices in seven countries. In terms of fuel prices per thousand litres, Italy and Portugal, with prices of \$761 and \$646 respectively, have two of the highest prices in Europe. This is partly because Italy levies a 64.5 percent tax on light fuel for industrial use, while Portugal's tax is 56.3 percent. On the other hand, India (\$191), Canada (\$216), Germany (\$270) and the USA (\$184) all have fuel prices below the \$300 mark. This is mainly because the taxes levied on light fuel for industrial use are low, or because no taxes are levied at all. For example, India applies a 4 percent tax, Germany applies a 15.4 percent tax, while Canada, and the USA levy no tax at all. Ghana's fuel price of \$395, while not being as high as Italy's and Portugal's price, is nevertheless more than twice India's and the USA's price. This large differential is mainly attributable to the tax levied by the government.

Table (9.2) also shows that the price of electricity per Kilowatt Hour in Italy (\$0.097), Portugal (\$0.128), and Germany (\$0.088) is relatively high as compared to the price in India (\$0.04), Canada (\$0.038) and the USA (\$0.049). One of the reasons for these large differences is the taxes levied on electricity in these countries. Tax in Italy, Portugal and Germany is 14.2 percent, 7.4

## Light Fuel Oil Price, and Electricity Prices for Industry in Selected Cases (1991)
## Table 9.2.

| | Light Fuel in US$/1000 litres | Electricity in US$/kWh. |
|---|---|---|
| **Italy** | 761 | 0.097 |
| **Portugal** | 646 | 0.128 |
| **India** | 191 (1990) | 0.040 (1985) |
| **Canada** | 216 | 0.038 |
| **Germany** | 270 | 0.088 |
| **USA** | 184 | 0.049 |
| **Ghana** | 395 | 0.063 (Firm J) |

**Source: Ghana 1991 fieldwork, others IEA (1992).**

percent, and 7.6 percent respectively, while tax in the USA is between 2-6 percent depending on the State. Firm J's price of $0.063 is 58 percent higher than India's price, but the other textile firms in Ghana experience electricity prices of $0.04-$0.05/kWh (see Table 7.1). The reasons for this difference has been discussed above.

Water rates in Ghana are shown in Table (9.3). These are on a multi-tiered progressive basis and thus penalise the bulk use of water. United Kingdom rates, obtained from Thames Water (1992), are fixed at $2.78 per thousand gallons, while the top rate in Ghana is $3.33/1000 gallons. Thus, water rates in Ghana are relatively high, and the progressive nature of the tariff means that the obvious economies of scale involved in the purchase of large volumes of water is not passed on to the consumer.

### 9.6.2. Taxes.

This section looks at the rates and possible disincentive effects and added costs which direct taxes (on employee incomes, and company profits) and indirect taxes (on sales, and raw materials) place on Ghanaian textiles.

#### 9.6.2.1. Direct and Indirect Tax Incidence.

Studies on the redistributive effects of taxes in developing

## Price of Water in Ghanaian Industry (1992). Table 9.3.

| | Cedis per 1000 Gals. per Month | $ per 1000 Gals. per Month |
|---|---|---|
| 0-3,000 gals. | 300.00 | .73 |
| 3,000-10,000 gals. | 732.00 | 1.76 |
| 10,000-25,000 gals. | 1,040.00 | 2.51 |
| 25,000-50,000 gals. | 1,200.00 | 2.89 |
| 50,000-100,000 gals. | 1,250.00 | 3.01 |
| over 100,000 gals. | 1,380.00 | 3.33 |

**Source: (1991/92) fieldwork.**

countries calculate annual tax incidence on the basis of assumptions on the shifting of the different taxes onto consumers, producers, and other groups (see, for example, Musgrave et al. (1951); Gillespie (1980); Pechman and Okner (1974); Musgrave, Caves, and Leonard (1974); Browning (1978)). The five main kinds of taxes usually considered are income, corporate, sales and inputs, property, and social security taxes. Each tax has side effects on sources (capital income, labour income, or transfers) or uses (savings and expenditure patterns by households) or both that reflect how the tax is assumed to be spatially or fully borne. In the literature, the terms "shifting assumptions", and "incidence assumptions" refer to the methods adopted to allocate tax burdens.

Shallizi and Squire (1988) state that taxation, in addition to redistributing resources from the private sector to the public sector, changes the structure of incentives. For example, taxes on company profits generate revenue but, by reducing the return to investment, they discourage capital accumulation and hence growth. Shallizi and Squire also point out that since, for administrative reasons, tax bases in Sub-Saharan Africa are relatively small, there is a strong presumption that rates of taxation, and hence the economic cost of taxation, are high.

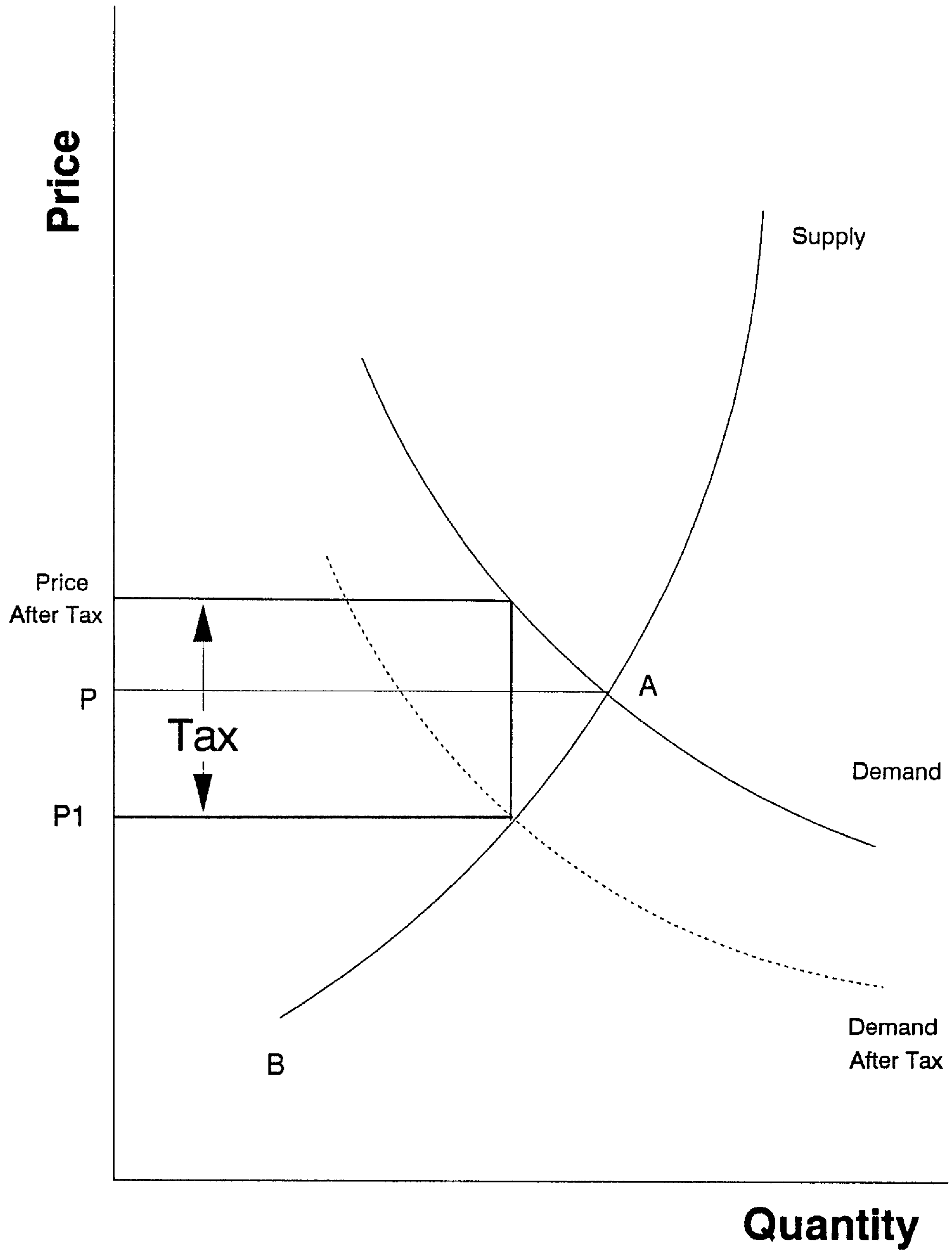
In the case of a tax on the production of a commodity, we can distinguish between the effect on the profits of the producer, on the incomes of those who supply factors or intermediate products, and on the consumers of the product. To the extent that the price of the product rises, we say that the tax has been shifted forward onto consumers, since their real income is, other things equal, reduced. If producers profit margins are cut as a result of taxes in order to resist increasing the price of their products, then we could say that the tax is shifted backwards onto producers.

The incidence of taxation can be described using the partial equilibrium approach of Atkinson and Stiglitz (1987). Even though this approach has its limitations, it is useful in pointing out the possible effects of taxation on producer costs. The partial equilibrium approach is illustrated in Figure (9.11). If the assumption is made that a textile firm produces fabrics using machines which it cannot use for any other purpose, and it also uses labour (L) that is in perfectly elastic supply at a wage (w), and if F(L) is the production function (where $F'>0, F''<0$), then in competitive equilibrium $pF' = w$, where (p) is the price of output. This generates the supply curve in Figure (9.11). A demand curve of the usual shape is also shown.

If a tax is imposed on the consumption of fabrics (i.e a sales tax), the new equilibrium will be at P1. The after price tax is above the old equilibrium price P1, but not by the full amount of the tax, i.e. the distance P to price after tax is less than P1 to price after tax. This means that some of the tax on consumption is borne by the producer, i.e. the tax is partially shifted backwards.

Shah and Whalley (1991) point out that when considered as a

## Tax Incidence: Partial Equilibrium.
## Figure 9.11



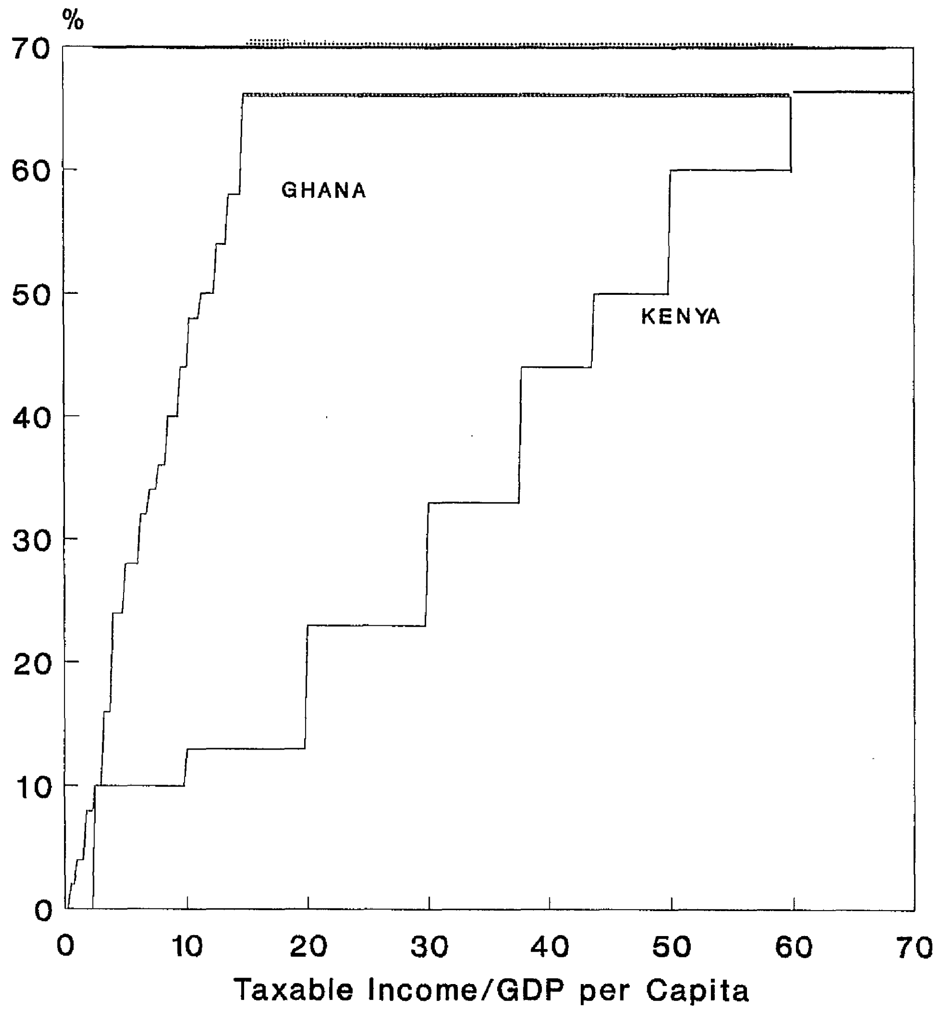

**Source: Atkinson and Stiglitz (1987).**

group, indirect taxes are almost universally assumed to be shifted forward to consumers of taxed commodities. With few exceptions (Radhu (1965)), backward shifting and incomplete forward shifting have not received much attention. Thus, full forward shifting of sales taxes at the manufacturer level is generally assumed even though we can see from our partial equilibrium analysis that there can be partial backward shifting of taxes onto producers, and in an open economy with foreign competition producers typically cut into their profit margins to reduce the effect of taxes on their product price. This, for example, is demonstrated by Jeetun's (1978) study of Pakistan which finds only 35 percent forward shifting from increases in the sales tax at the manufacturer level. A common assumption when looking at the incidence of company tax, as stated by Shah and Whalley (1991), is that 50 percent of the tax is borne by the owners of the capital, and 50 percent is shifted forward to consumers. Personal income taxes are assumed to fall on the individuals who pay them.

#### 9.6.2.2. Taxes in Textiles Sector

Figure (9.12) shows the marginal rates of personal income tax for Ghana and Kenya. The two cases differ with respect to the standard exemption rate and the degree of progressivity. The standard exemption level in Ghana is much lower than in Kenya. Thus, in Ghana, taxation for single persons begins when their income exceeds 70 percent of GDP per capita, while in Kenya, the corresponding figure is almost twice GDP per capita. Also, as pointed out by Shallizi and

## Rates of Personal Income Tax in Ghana and Kenya (Marginal Tax Rates). Figure 9.12.




Source: Shallivi and Squire (1988).

Squire (1988), since effective collection is usually confined to large scale manufacturing, a low exemption (as in Ghana) implies taxation of numerous, low-paid employees.

In terms of progressivity, it is noted from Figure (9.12) that marginal tax rates in Kenya are lower than those in Ghana for all incomes up to 60 times GDP per capita. According to Shallizi and Squire, this suggests that the effect of taxation on incentives to work and save are much more severe in Ghana than in Kenya. They find that the interests of improved administration and economic efficiency are better served, and a reasonable degree of equity is preserved by a tax structure corresponding to that of Kenya, with a combination of high exemption and slowly increasing marginal rates, rather than that of Ghana.

From the above it can thus be concluded that if taxes on employees' incomes are reduced then firms can benefit from a certain proportion of this reduction by saving on labour wages, and employees will benefit by an increase in take home pay (without necessarily having their post-tax wages altered). This can be demonstrated using Figure (9.11) where a reduction in income tax reduces the wage paid to workers (by moving the price after tax point down towards P) and increases the take home pay of workers (by moving P1 up towards P). This means that the windfall gain in income due to a reduction in income tax rates can benefit both employer and employee. As at 1991, a typical worker earning 17,600 cedis per month paid 1,600 cedis income tax, i.e. approximately 9 percent of his or her income

(Figures from 1991 Questionnaire).

Company tax rates in Ghana, as obtained from 1991/92 Questionnaire, are fixed at 35 percent of chargeable income. Sales tax on finished goods for each year in the period 1985 to 1990, also obtained from 1991/92 Questionnaire, was 10%, 10%, 20%, 25%, 22.5%, 22.5% respectively, and excise duty for each year in the same period was 15%, 15%, for the first 2 years and was removed completely from 1987 onwards. Tax on raw materials varies depending on the type of import (i.e. whether fibre, or dyestuffs) in 1985 it was in the region of 30 percent, declining to 15 percent by 1988, and 10 percent by 1990. A reduction in any or all of these rates means a reduction in firm's costs, i.e. a reduction in these rates means a windfall gain to the firm and a loss of revenue to the Treasury.

### 9.6.3 Exchange Rate Devaluation and Fiscal/Monetary Contraction.

Exchange rate devaluation can have a favourable effect on firm's competitiveness if it is introduced with the right fiscal/monetary contraction policy.

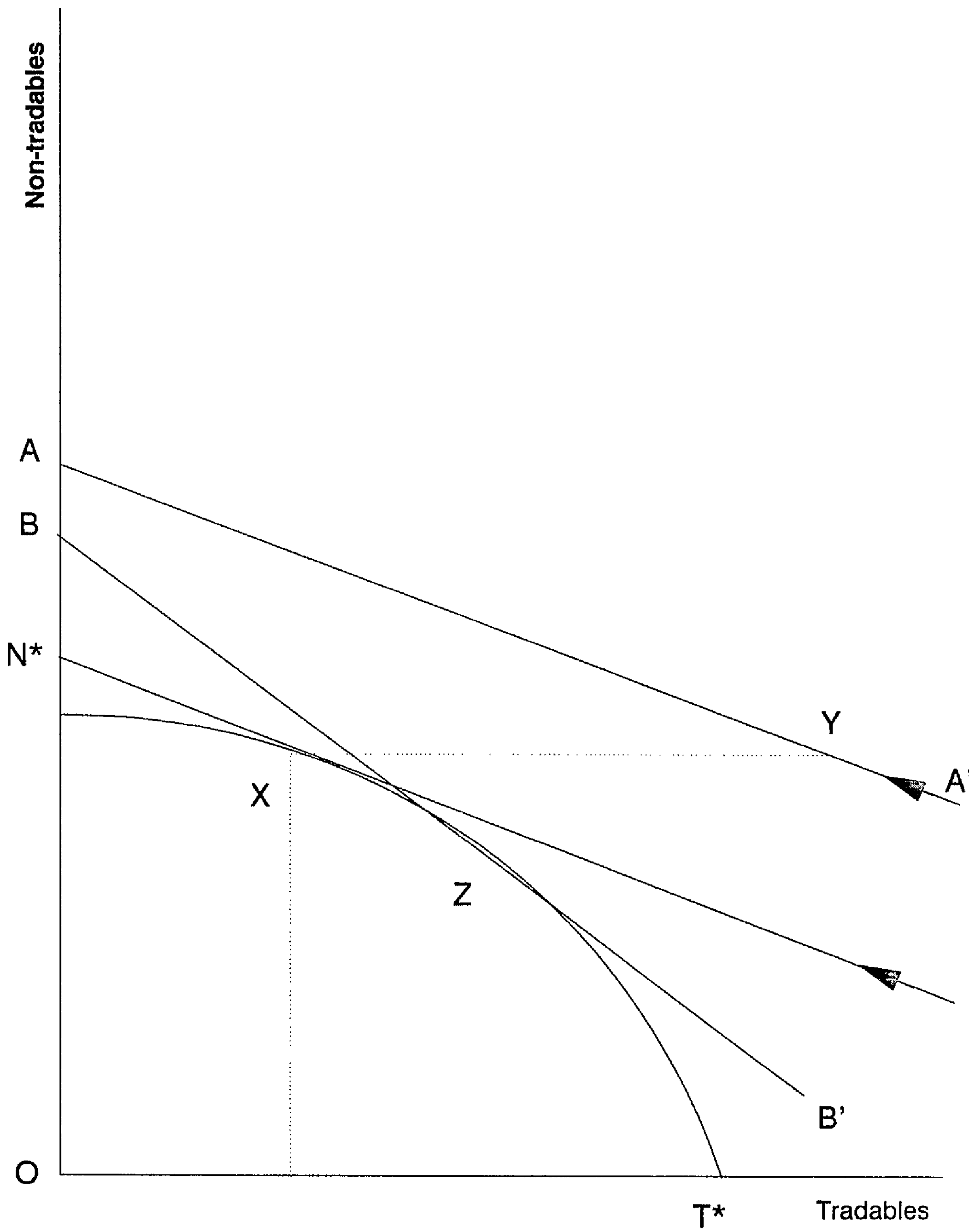
In considering the effects of a devaluation, we follow the approach of the Meade-Salter-Swan model as stated in World Bank Study (1990). We assume a small open economy which is a price taker in international product markets. If the domestic relative price of exportables to importables ($P_x/P_m$) is fixed, they can be regarded as a composite commodity - tradables. The domestic price of tradables ($P_t$) will be determined by the world price and the exchange rate, and since, by definition nontradables are not traded in world markets, their price ($P_n$) is determined solely by domestic supply and demand.

The World Bank Study points out that the analytical framework must incorporate both expenditure-switching policies (i.e depreciating the exchange rate) and expenditure reducing policies (i.e. fiscal/monetary contraction as shown by the budget balance performance indicator). Depreciation of the real exchange rate, $P_n/p_t$, induces a shift or switch in production from nontradables to tradables. This switching policy therefore affects the product markets by changing the relative price regime in favour of tradables. This is illustrated in Figure (9.13) which shows the production possibilities of nontradables and the composite tradables as the curve $N_*T_*$. In the initial disequilibrium position, production is at X and expenditure is at Y, reflecting the fact that supply equals demand in the nontradables market but there is a tradables (i.e. external) deficit of OY. A policy of reducing absorption from OA to OB (measured in nontradables) and exchange rate devaluation which shifts the price line from AA′ to BB′, will restore equilibrium with both production and expenditure shifting to Z. This means that a deprecation in the real exchange rate induces resource shifts into the tradables sectors (exports and imports).

This analysis points to a key element in the switching strategy: namely, governments must be able to change the underlying

## Effect of Exchange Rate Devaluation.

## Figure 9.13



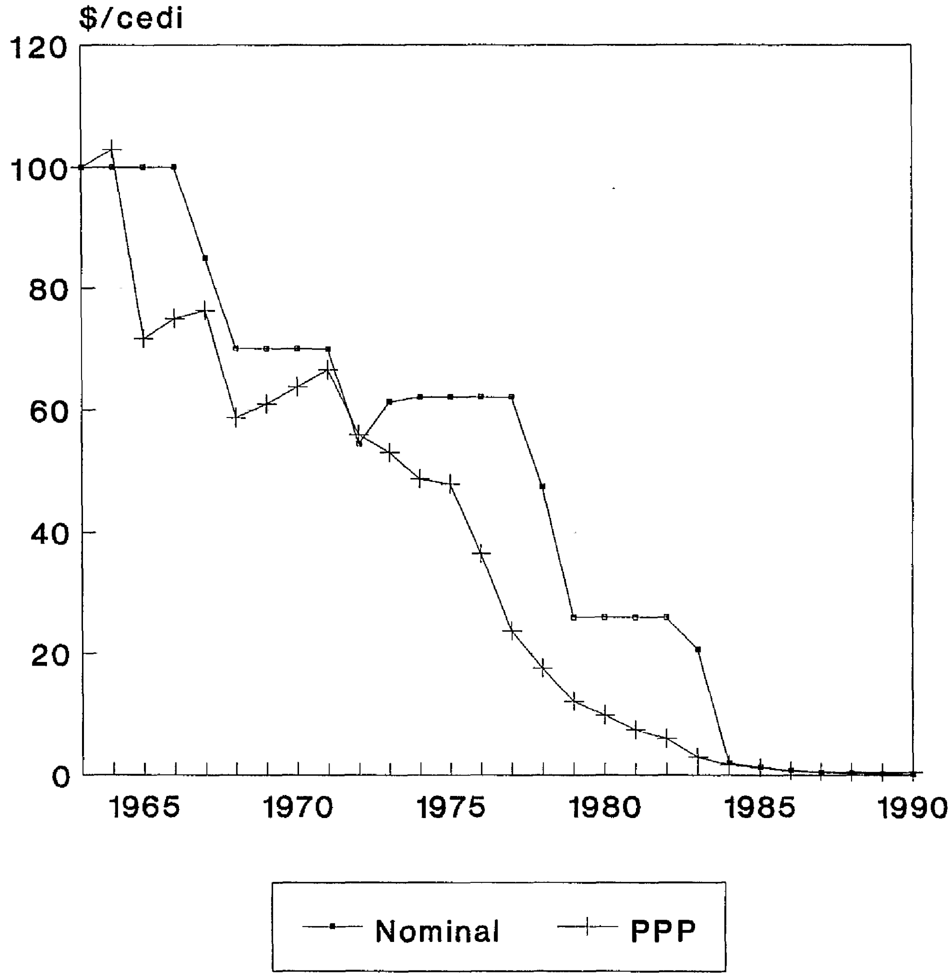

**Source: World Bank Study (1990).**

structure of relative prices, i.e., change the real exchange rate. But, governments can only manipulate nominal instruments such as the money supply and the nominal exchange rate, and whether the application of these instruments leads to the desired change in relative prices or not will depend on the accompanying macroeconomic policies and the structural characteristics of the economy. If, as Edwards (1988) points out, these lead to an increase in $P_n$, the depreciation in the real exchange rate will be either reduced or prevented altogether. Factors which lead to an increase in $p_n$ include a continued fiscal/monetary expansion; real wage expansion; and the use of imported intermediate inputs.

Figure (9.14) plots Ghana's nominal exchange rates and Purchasing power parity (PPP) for the period 1963-1990 indexed at 1963=100. 1963 was chosen as the index year because according to data, from Pick (1972), on the "black market" exchange rate in 1963 as compared to the official exchange rate for that year, obtained from IMF's IFS (1983), the official exchange rate was not found to be significantly overvalued in 1963. Thus looking at Figure (9.14), a sharply falling trend in both nominal exchange rates and PPP is observed for the period 1963-1983, while a levelling off in both rates occurred in the 1984-1990 period. PPP was higher than nominal exchange rates from 1964 to 1971, and also for the period 1973-1983. It can be seen from Figure (9.14a) (indexed at 1963=100) that both values converge closely in the 1984 to 1990 period.

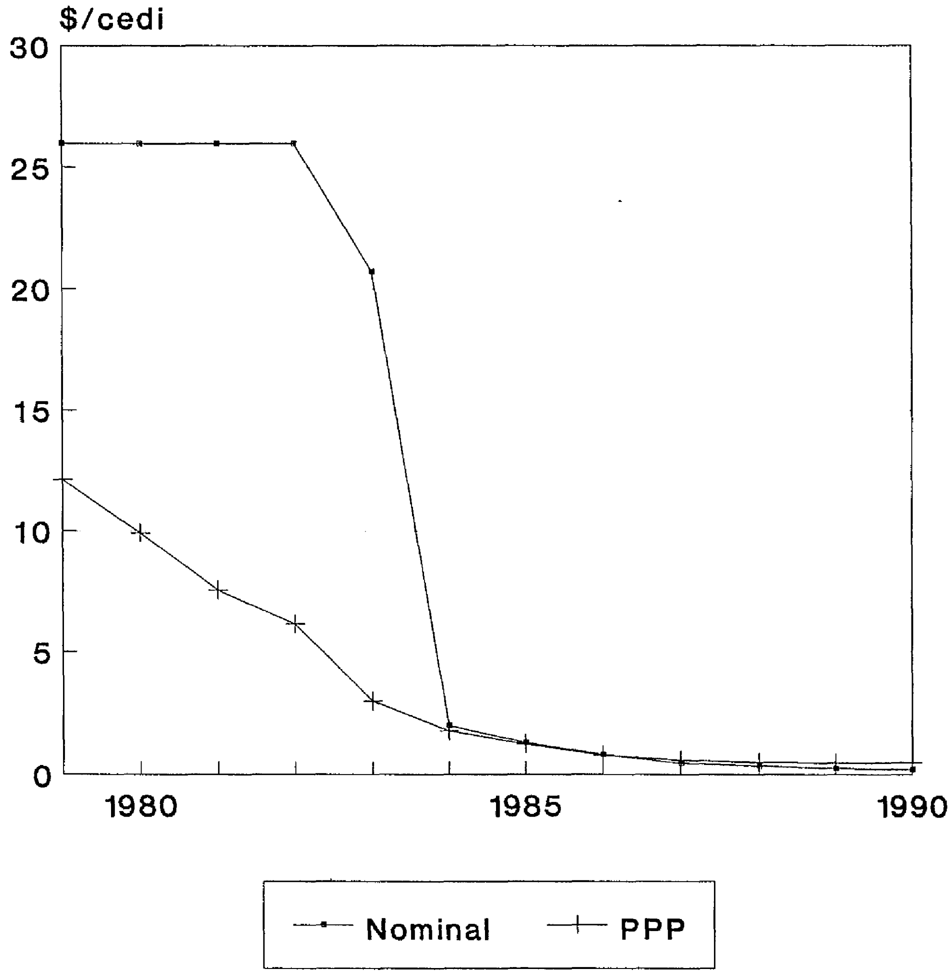
Thus, while devaluation of nominal exchange rates pre-1983

## Nominal Exchange Rates and Purchasing Power Parity (PPP) in Ghana: 1963=100.
## Figure 9.14.




Source: IMF, IFS Yearbook, Various.
PPP is calculated as the ratio of world wholesale price to Ghana wholesale price

## Nominal Exchange Rates and Purchasing Power Parity in Ghana: 1963=100.
## Figure 9.14a.




Source: IMF, IFS Yearbook, Various.
PPP is calculated as the ratio of world wholesale price to Ghana wholesale price

has brought these rates in line with PPP, and has meant that domestic prices reflect true world prices, the potential benefits of a devaluation on competitiveness of local manufacturers (which was discussed above) still remain. This is discussed in the section below.

### 9.7. Sensitivity Analysis of Cost

In this section, the effect of various combinations of cost cutting measures on the selling price (i.e. price including profit margin and sales and excise taxes if any) of Real Wax prints and Imitation Java prints (African prints) is investigated using data obtained during the 1991 fieldtrip.

The possible cost reductions are based on the findings of the above sections of this chapter, and they are as follows: In terms of fuel price, a 30 percent reduction in Ghana's 1991 price will still leave it higher than the price of fuel in India (1990), Canada, Germany, and the USA. A 30 percent cut in Ghana's 1991 electricity charges will bring them roughly in line with charges in India (1985), Canada, and the USA. The highest water rates in Ghana, charged for relatively high consumption, are 20 percent higher than British rates. Technical inefficiency in the period 1985-89 was in the range of 5% to 15%. Thus a 5% improvement in costs due to technical inefficiency reduction is used in the sensitivity analysis.

The income tax paid by a typical worker was found to add up to 9 percent of his or her income. Thus, if an assumption of a 5 percent reduction in income tax is made, and assuming, also, that 50 percent of the tax is borne by the employee, and 50 percent by the employer (which is an assumption usually made when investigating company tax incidence and not income taxes) then the firm will benefit by a 2.5% reduction in labour cost.

Other policy effects investigated below include: an exchange rate devaluation of 30%; reduction of raw material tax to 5% or 0%; reduction of sales tax to 15% or 0%; eliminating excise duty.

The data used is for plant (J) producing Imitation Java Prints and plant (A) producing Real Wax prints, both for the period 1985-1990, plant (H), for 1986, producing Imitation Wax prints, and plant (H), for 1986, producing Real Wax prints. The analysis involves investigating the effect on the ex-factory price of various combinations of some or all of the policies discussed above. The raw results are given in Appendix (2). From this, it can be seen that the calculations were as follows:

Step (i): The dollar per meter price of imported raw materials was introduced. This was multiplied by the dollar to cedi exchange rate to give the cedi per 12 yards (10.968 meters) price (see (1) in spreadsheet) of imported raw materials. Thus, when a devaluation is introduced, it increases the cedi price of the imported raw material. The effect of a devaluation on imported packing materials was ignored to reduce complexity as their cost was relatively small. The percentage duty on imported raw materials was multiplied by the cedi price of imported raw materials (the duty on imported packing materials being ignored for simplicity), to give the cedi value of the duty (see (2)). Total cost of raw materials (9) was obtained by adding total cost of imported materials (5) to local costs (6), (7), (8).

Step (ii): Cost of labour (10) was calculated by multiplying the percentage reduction in labour cost due to a reduction in income tax by the direct labour cost. Fuel oil (11a), power (11b), and water (11c), were calculated by multiplying the actual cost of fuel, power, and water by their corresponding percentage cost reductions. Here, a devaluation is not assumed to have a effect on the cost of spares and replacement. This is not entirely so as some spares are imported and thus their cost would be affected by a devaluation, but this is ignored for simplicity, since the imported to local manufactured spares ratio is unknown. Thus, materials and labour cost per 12 yards (12) was obtained by summing (9), (10), and sum(11), and total cost (17a) was obtained by adding (12), (13), (14), (15) and (16). The total cost including efficiency improvement (17b) was calculated by multiplying the percentage improvement in technical efficiency by total cost. The grand total (19) was obtained by adding (17b) to bank charges and interest (18), and after adding a 10% profit margin to the grand total, the ex-factory price (21) was obtained.

Step (iii): The excise duty (22) was obtained by multiplying the percentage excise tax with the ex-factory price (21). The sales tax (23) was obtained by multiplying the percentage sales tax with the sum of excise duty (22) and ex-factory price (21). Finally, the ex-factory price plus tax (24) was the sum of (21), (22), and (23).

A summary of the results is given in Table (9.4) for firm (C), Table (9.5) for firm (H), Table (9.6) for firm (A), and Table (9.7) for firm (J). These tables show the effect of various scenarios on the $ per meter price, and on the cedi per meter price, and also the percentage change from the actual $ per meter price and cedi per meter price. The first scenario, shows the actual, unchanged values. Scenario (2), is a 30% devaluation only. The third scenario, Scenario (3), imposes a 5% raw material tax, and a 15% sales tax. Scenario (4), has a 5% raw material tax, a 15% sales tax, a 30% reduction in fuel and power charges, a 20% in water rates, and a 5% improvement in technical efficiency. Scenario (5), involves all the policies of the preceding case plus a 30% devaluation, and a 2.5% reduction in labour cost due to an income tax reduction. Scenario (6) involves only a 2.5% reduction due to income tax.

The effect of a devaluation, seen by looking at Scenario (2), is to reduce the $/meter price (thus making goods more competitive, at least in foreign markets) but to increase the cedi/meter price. For example, a 30% devaluation causes a 10.2% decrease in firm (J's) 1987 $/meter price , but the cedi/meter price for that year rises by 16.5%.

## Price of Firm (C) Producing IMI. JAVA Prints, and Result of Cost Cutting Measures.

## Table 9.4.

| | Sc. (1) | Sc. (2) | Scenario (3) | Scenario (4) | Scenario (5) | Sc. (6) |
|---|---|---|---|---|---|---|
| | **actual value** | **d=30%** | **rm=5%,st= 15%,ex=0%** | **rm5%,st15%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm5%,st15%,ex0% f30%,p30%,w20,ef5%, rit2.5%** | **rit2.5%** |
| **1987: $/meter** | 3.51 | 2.89 | 3.31 | 3.11 | 2.55 | 4.50 |
| **% change actual $/m** | 0% | -17.7% | -5.6% | -11.4% | -27.1% | 0% |
| **cedi/meter** | 5,890 | 6,322 | 5,559 | 5,216 | 5,575 | 4,394 |
| **% change actual c/m** | 0% | +7.3% | -5.6% | -11.4% | -5.2% | 0% |

**Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,f.=fuel,p.= power,w.=water,ef.=efficiency,rit=red. due to** decrease in Income Tax.

## Price of Firm (H) Producing REAL WAX Prints, and Result of Cost Cutting Measures.
## Table 9.5.

| | Sc. (1) | Sc. (2) | Scenario (3) | Scenario (4) | Scenario (5) | Sc. (6) |
|---|---|---|---|---|---|---|
| | **actual value** | **d=30%** | **rm=5%,st=15%,ex=0%** | **rm5%,st15%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm5%,st15%,ex0% f30%,p30%,w20,ef5%, rit2.5%** | **rit2.5%** |
| **1986: $/meter** | 4.52 | 4.08 | 3.81 | 3.52 | 3.16 | 4.50 |
| **% change actual $/m** | 0% | -9.7% | -15.6% | -22.0% | -29.9% | 0% |
| **cedi/meter** | 4,411 | 5,176 | 3,721 | 3,440 | 4,003 | 4,394 |
| **% change actual c/m** | 0% | +17.3% | -15.6% | -22.0% | -8.9% | 0% |

**Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,f.=fuel,p.= power,w.=water,ef.=efficiency,rit=red. due to** decrease in Income Tax.

## Price of Firm (A) Producing REAL WAX Prints, and Result of Cost Cutting Measures.

### Table 9.6.

| | Sc. (1) | Sc. (2) | Scenario (3) | Scenario (4) | Scenario (5) | Sc. (6) |
|---|---|---|---|---|---|---|
| | **actual value** | **d=30%** | **rm=5%,st= 15%,ex=0%** | **rm5%,st15%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm5%,st15%,ex0% f30%,p30%,w20,ef5%, rit2.5%** | **rit2.5%** |
| **1985: $/meter** | 5.64 | 4.45 | 5.05 | 4.71 | 3.69 | 5.63 |
| **% change actual $/m** | 0% | -21.1% | -10.5% | -16.5% | -34.4% | 0% |
| **cedi/meter** | 3,342 | 3,426 | 2,990 | 2,792 | 2,844 | 3,335 |
| **% change actual c/m** | 0% | +2.5% | -10.5% | -16.5% | -14.7% | 0% |
| **1986: $/meter** | 4.10 | 3.26 | 3.67 | 3.39 | 2.68 | 4.09 |
| **% change actual %/m** | 0% | -20.0% | -10.5% | -17.3% | -34.4% | 0% |
| **cedi/meter** | 4,000 | 4,142 | 3,583 | 3,308 | 3,406 | 3,990 |
| **% change actual c/m** | 0% | +4.6% | -10.5% | -17.3% | -14.6% | 0% |
| **1987: $/meter** | 3.58 | 2.9 | 3.35 | 3.11 | 2.51 | 3.58 |
| **% change actual $/m** | 0% | -18.9% | -6.4% | -13.1% | -29.9% | 0% |
| **cedi/meter** | 6,013 | 6,345 | 5,631 | 5,219 | 5,474 | 6,004 |
| **% change actual c/m** | 0% | +5.5% | -6.4% | -13.1% | -8.8% | 0% |

**Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,f.=fuel,p.= power,w.=water,ef.=efficiency,rit=red. due to** decrease in Income Tax.

## Price of Firm (A) Producing REAL WAX Prints, and Result of Cost Cutting Measures.
## Table 9.6. (Continued).

| | Sc. (1) | Sc. (2) | Scenario (3) | Scenario (4) | Scenario (5) | Sc. (6) |
|---|---|---|---|---|---|---|
| | **actual value** | **d=30%** | **rm=5%,st= 15%,ex=0%** | **rm5%,st15%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm5%,st15%,ex0% f30%,p30%,w20,ef5%, rit2.5%** | **rit2.5%** |
| **1988: $/meter** | 3.71 | 3.03 | 3.36 | 3.13 | 2.54 | 3.71 |
| **% change actual $/m** | 0% | -18.3% | -9.5% | -15.7% | -31.5% | 0% |
| **cedi/meter** | 8,141 | 8,625 | 7,361 | 6,857 | 7,234 | 8,132 |
| **% change actual c/m** | 0% | +5.9% | -9.5% | -15.7% | -11.0% | 0% |
| **1989: $/meter** | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **% change actual %/m** | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **cedi/meter** | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **% change actual c/m** | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **1990: $/meter** | 3.75 | 3.21 | 3.41 | 3.18 | 2.71 | 3.75 |
| **% change actual $/m** | 0% | -14.4% | -9.1% | -15.2% | -27.7% | 0% |
| **cedi/meter** | 13,981 | 15,484 | 12,708 | 11,874 | 13,120 | 13,978 |
| **% change actual c/m** | 0% | +10.8% | -9.1% | -15.2% | -6.1% | 0% |

**Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,f.=fuel,p.= power,w.=water,ef.=efficiency,rit=red. due to** decrease in Income Tax.

## Price of Firm (J) Producing IMI JAVA Prints, and Result of Cost Cutting Measures.

## Table 9.7.

| | Sc. (1) | Sc. (2) | Scenario (3) | Scenario (4) | Scenario (5) | Sc. (6) |
|---|---|---|---|---|---|---|
| | **actual value** | **d=30%** | **rm=5%,st=15%,ex=0%** | **rm5%,st15%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm5%,st15%,ex0% f30%,p30%,w20,ef5%, rit2.5%** | **rit2.5%** |
| **1985: $/meter** | 5.38 | 4.63 | 4.48 | 4.15 | 3.52 | 5.36 |
| **% change actual $/m** | 0% | -13.9% | -16.8% | -22.8% | -34.3% | 0% |
| **cedi/meter** | 3,187 | 3,569 | 2,653 | 2,459 | 2,707 | 3,172 |
| **% change actual c/m** | 0% | +12.0% | -16.8% | -22.8% | -14.7% | 0% |
| **1986: $/meter** | 3.07 | 2.62 | 2.58 | 2.36 | 1.98 | 3.06 |
| **% change actual %/m** | 0% | -14.7% | -16.0% | -23.2% | -35.2% | 0% |
| **cedi/meter** | 2,999 | 3,322 | 2,519 | 2,304 | 2,514 | 2,987 |
| **% change actual c/m** | 0% | +10.1% | -16.0% | -23.2% | -15.8% | 0% |
| **1987: $/meter** | 2.83 | 2.54 | 2.52 | 2.33 | 2.08 | 2.82 |
| **% change actual $/m** | 0% | -10.2% | -10.8% | -17.5% | -26.5% | 0% |
| **cedi/meter** | 4,750 | 5,535 | 4,239 | 3,918 | 4,530 | 4.735 |
| **% change actual c/m** | 0% | +16.5% | -10.8% | -17.5% | -4.3% | 0% |

**Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,f.=fuel,p.=power,w.=water,ef.=efficiency,rit=red. due to** decrease in Income Tax.

## Price of Firm (J) Producing IMI JAVA Prints, and Result of Cost Cutting Measures. Table 9.7. (Continued).

| | Sc. (1) | Sc. (2) | Scenario (3) | Scenario (4) | Scenario (5) | Sc. (6) |
|---|---|---|---|---|---|---|
| | **actual value** | **d=30%** | **rm=5%,st= 15%,ex=0%** | **rm5%,st15%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm5%,st15%,ex0% f30%,p30%,w20,ef5%, rit2.5%** | **rit2.5%** |
| **1988: $/meter** | 2.85 | 2.55 | 2.50 | 2.32 | 2.06 | 2.84 |
| **% change actual $/m** | 0% | -10.5% | -12.3% | -18.8% | -27.7% | 0% |
| **cedi/meter** | 6,321 | 7,338 | 5,544 | 5,130 | 5,922 | 6,299 |
| **% change actual c/m** | 0% | +16.1% | -12.3% | -18.8% | -6.0% | 0% |
| **1989: $/meter** | 2.88 | 2.58 | 2.57 | 2.39 | 2.13 | 2.87 |
| **% change actual %/m** | 0% | -10.4% | -10.6% | -17.0% | -25.7% | 0% |
| **cedi/meter** | 8,527 | 9,928 | 7,624 | 7,080 | 8,198 | 8,501 |
| **% change actual c/m** | 0% | +16.4% | -10.6% | -17.0% | -3.6% | 0% |
| **1990: $/meter** | 2.87 | 2.59 | 2.63 | 2.44 | 2.19 | 2.86 |
| **% change actual $/m** | 0% | -9.8% | -8.5% | -15.0% | -23.3% | 0% |
| **cedi/meter** | 10,710 | 12,565 | 9,790 | 9,101 | 10,655 | 10,681 |
| **% change actual c/m** | 0% | +17.3% | -8.5% | -15.0% | -0.3% | 0% |

**Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,f.=fuel,p.= power,w.=water,ef.=efficiency,rit=red. due to** decrease in Income Tax.

Furthermore, a devaluation causes a larger decrease in the $/m price and a lower increase in the C/m price if the amount of foreign inputs as a percentage of total inputs is relatively low. For example, a 30% devaluation causes firm (A's) 1985 $/m price, with 16.1 percent of the cost of raw materials resulting from imported materials, to fall by 21.1%, while the cedi/m price rises by only 2.5%. On the other hand, the effect of the devaluation on firm (A's) 1990 $/m price, with 50 percent of raw material cost being attributable to imports, is a fall of only 14.4%, while the cedi/m price rises by 10.8 percent. Thus, if the percentage of foreign inputs is relatively high, a devaluation causes a relatively higher increase in the cedi/meter price.

Domestic consumption of local manufactures may increase or decrease as a result of a devaluation depending on the price elasticity of demand, and the substitution effects between local manufactures and imports of competing finished goods. A devaluation has a greater percentage increase in the c/meter price of competing imported goods as compared to domestic manufactures. If locally manufactured goods and imported goods are perfect substitutes, and the price elasticity of demand of local goods is relatively inelastic, then a devaluation will increase consumption of local manufactures even if the c/meter price rises. In this case, a devaluation makes domestic manufactures more competitive with imports. Conversely, if the substitution effect between domestic goods and imported goods is small, and the price elasticity of demand is high, then the increase in the c/meter price resulting from a devaluation will reduce local demand for the good. In this case, the only positive effect of a devaluation is to reduce the $/meter price thus making the domestic good more competitive in foreign markets, i.e. more exportable.

The least effective policy was the 2.5% reduction in labour cost due to an income tax reduction, Scenario (6). This failed to register any significant change (i.e. greater than 0.1%) from the actual value for any of the cases looked at.

The scenarios which result in equal percentage changes in local and domestic prices are those which do not involve a devaluation, i.e. Scenarios (3) and (4). For example Scenario (4) in the case of firm (H) in 1986 produces a 22% decrease in both $/meter price and C/meter price.

The scenario with the greatest decrease in $/meter price is Scenario (5), while the greatest decrease in the cedi/meter price is achieved in Scenario (4). For example, in the case of firm (J) 1985, the $/meter price is affected as follows: Scenario (2) -13.9%; Scenario (3) -16.8%, Scenario (4) -22.8%; Scenario (5) -34.3%. Thus Scenario (5) has the greatest $/meter price decrease. In terms of cedi/meter price for the same firm and year, the effects are as follows: Scenario (2) +12%; Scenario (3) -16.8%; Scenario (4) -22.8%; Scenario (5) -14.7%. Thus the greatest decrease in cedi/meter price occurs in Scenario (4).

### 9.7.1 Export Potential.

Sibald (1991) produced a report, for the Commonwealth Secretariat, on the market potential of Ghanaian textiles in North America. They find that "a review of the existing prices is essential to penetrating the U.S. markets." The F.O.B. (freight on board) price of Ghanaian Real Wax they tested on the market was $3.35/yard ($3.66/meter). This was found to be high as "some buyers quoted $2.85/yard F.O.B. Ghana ($3.12/meter),..". Thus, "the consultants concluded from the reaction to the prices that the manufacturers will have to develop a new pricing structure, if they are to compete in the market."

Table (9.8) shows two scenarios, Scenario (7) and Scenario (8), for firms (J) and (A) in 1990. These are similar to Scenarios (4) and (5), but with both sales tax and raw material tax set at 0%, as is currently the case under the Ghanaian export promotion programme. This means that firms do not pay these taxes if they export.

The interesting result shown in Table (9.8) is that firm (A,s) 1990 price for Real Wax, which stood at 3.75 $/meter was decreased to 2.72 $/meter under Scenario (7), and to 2.31 $/meter under Scenario (8). Even though a small handling charge should be added to these prices to make them F.O.B., they are much lower than the 3.12 $/meter quoted by Sibald (1991) as being attractive to the U.S. market. This indicates that the export potential of Ghanaian

## Export Potential of Firm (J) IMI JAVA Prints and Firm (A) REAL WAX Prints: 1990.
## Table 9.8.

| | Scenario (1) | Scenario (7) | Scenario (8) |
|---|---|---|---|
| | **actual value** | **rm0%,st0%,ex0% f30%,p30%,w20%,ef5%** | **d30%,rm0%,ex0% f30%,p30%,w20%,ef5%** |
| **Firm (J) $/meter** | 2.87 | 2.06 | 1.86 |
| **% change actual $/m** | 0% | -28.1% | -35.2% |
| **cedi/meter** | 10,710 | 7,696 | 9,004 |
| **% change actual c/m** | 0% | -28.1% | -15.9% |
| **Firm (A) $/meter** | 3.75 | 2.72 | 2.31 |
| **% change actual $/m** | 0% | -27.5% | -38.4% |
| **cedi/meter** | 13,981 | 10,153 | 11,187 |
| **% change actual c/m** | 0% | -27.4% | -20.0% |

Source: Questionnaire (1991). d=devaluation, r.m=raw material tax,s.t.=sales tax,ex.=excise, f.=fuel,p.=power,w.=water,ef.=efficiency.

Real Wax prints (and possibly other textiles) is great, given the right policies which result in the required reduction in price.

## 9.8. Summary.

The degree to which the Ghanaian textile sector will cope with competition from imports will firstly depend on each individual firm's ability to adequately improve its productive efficiency and cut its costs. The firms' competitiveness will also be enhanced by government policy such as: (1) cutting the tax burden which these firms and their employees face; (2) macroeconomic policy, such as devaluation and monetary/fiscal contraction, which is argued will improve the competitiveness of tradables such as textiles; (3) reviewing the cost of fuel/water/ and electricity faced by firms.

it has been shown in this chapter that, given certain cost cutting measure, domestic price reductions, i.e. reduction in cedis per meter price, of up to 23.2% was possible. The export potential of Ghanaian textiles, i.e. reduction in the dollar per meter price, can also be greatly improved with the adoption of certain tax and cost cutting measures.

# 10. POLICY.

## 10.1. Introduction.

This chapter begins by reviewing the trade policy debate in order to put the current liberalised Ghanaian trade policy in a proper theoretical perspective. Then, having established, from the evidence given, that a liberalised trade regime is in Ghana's best interest, the discussion then focuses on why and how, given a free trade regime, the textiles sector (and by implication manufacturing) might be assisted by government policy. Finally, some policy options are explored.

After the introduction in Section (10.1), a review of the trade policy debate is given in Section (10.2). Section (10.3) looks at reasons for the review of macroeconomic policy. Section (10.4) looks at the benefits of a production-enhancing programme, while Section (10.5) makes policy recommendations that can be incorporated in this programme. The summary is in Section (10.6).

## 10.2. Trade and Economic Growth.

The main proposition of neoclassical trade theory is that, given certain assumptions, free trade is superior in economic efficiency terms to protection. The static case for free trade is demonstrated by the fact that the removal of barriers to foreign trade expands the feasible set of consumption possibilities. This is because it provides, in effect, "an indirect technology for transforming domestic resources into the goods and services that yield current and future utility for consumers" (Lal and Rajapatirana (1987).

The law of comparative advantage underpins the gains from trade. This is demonstrated by the Heckscher-Ohlin theory (summarised in Jones and Neary, 1984, p.14-21) which develops a two-factor (labour and capital), two commodity model and demonstrates and demonstrates how each country will have a comparative advantage in, and therefore should specialise in, the production of the commodity which is relatively intensive in the use of the relatively abundant factor. Suggested benefits from dynamic versions of the law of comparative advantage include increased domestic savings formation and foreign capital inflows (Bhagwati, 1978, Ch. 6), improved quality of entrepreneurship resulting from the exposure to foreign competition (Keesing, 1967), access to new technology, and the elimination of domestic market constraints and the benefits of economies of scale (Krueger, 1978).

Findlay (1984, p. 26) argued that the demonstration of the superiority of free trade is a comparative static analysis and "is silent about the rate of economic growth over time,...". But, as Lal and Rajapatirana (1987) argue, the result of moving towards free trade is a higher level of per capita income and not a permanently faster rate of growth.

### 10.2.1. Empirical Studies on Exports and Growth.

Many statistical studies have looked at the links between trade and growth. For example, Michalopoulos and Jay (1973) estimated an aggregate neoclassical production function for thirty nine countries. Exports were found to be highly significant, and GNP growth was significantly correlated to the growth rate of exports. Krueger (1978), in her study for the National Bureau of Economic Research on foreign trade regimes and economic development, regressed GNP growth for each of ten countries against the rate of export growth. She found a positive and significant relationship between the two. Similarly, Balassa (1978), estimated the equations in Michaely's (1977) study and incorporating the Michalopoulos-Jay factors, found a robust relationship between exports and GNP growth for eleven countries. Feder (1983) not only found a positive relationship between exports and GNP growth, but also provided evidence to support the hypothesis that export oriented policies led the economy to an optimal allocation of resources as well as generally enhancing productivity. The World Development Report (WDR) (1987) finds that when countries are grouped in four categories, that is, strongly outward-oriented, moderately outward-oriented, moderately inward-oriented and strongly inward oriented, their economic performance, including GNP growth, tends to decline as one moves along the scale from the strongly outward-oriented towards the strongly inward-oriented group.

But, as in most statistical matters, there is an opposing point of view of Krueger, Balassa, Feder, and the others mentioned above. Singer (1988) in his criticism of the WDR's (1987) findings makes the point that the category of inward-oriented countries, and especially the strongly inward-oriented countries, consist of poorer countries than the outward-oriented countries. As one moves along the scale, there is a regression in per capita income level which is even clearer and more striking than the regression in economic performance highlighted by the WDR (1987).

Thus, Singer argues, what the WDR (1987) analysis tells us is that poorer countries find it more difficult to progress than countries already further up the development ladder, such as the NICs and middle-income countries. This is none other than the old principle of vicious circles of cumulative causation emphasised by Myrdal (1958), Nurkse (1961) and other 'structuralists'.

The fact that outward orientation does not work as well for the low-income developing countries, particularly in Sub-Saharan Africa, as it does for the middle-income countries, has been noted in a study by Helleiner (1986). He concludes that if there is a lesson in the experience of the African countries' interactions with the global economy during the 1960s and 1970s, it would seem to have more to do with the desirability of stabilising import volume than with that of increasing the degree of outward orientation. He finds that for the low-income countries, there is no evidence to support the proposition that the degree of export orientation is associated with growth performance either in Africa or in poor countries generally, and that there is support, especially powerful in Africa, for the view that greater import volume instability is associated with slower growth.

Other evidence that high growth rates of export earnings occur only when external demand is strong thus suggesting that adverse changes in world demand carried greater weight in determining export performance than changes in trade policy is put forward by Kavoussi (1985). He claims that for the first period he looked at, 1967-73, when world market conditions were generally favourable, there was a strong positive correlation between export orientation and growth performance. However, for the second period, 1973-77, when world market conditions became more unfavourable, the correlation was weaker and doubtfully significant. These results seem to imply that when external demand is weak, gains from openness are likely to be offset by its negative effects. On the other hand, when world demand is strong, the benefits of openness clearly outweigh its dangers. Singer et al. (1988) who extended Kavoussi's analysis to the period 1977-83 confirm his results that countries achieve high growth rates of export earnings only when external demand is strong. During a period of slack demand, this no longer holds irrespective of trade policy. In their regional analysis they find that for Africa, only a weak correlation between export orientation and growth in the period 1967-73 existed, both when facing above and below average world demand. In the period 1977-83, there was virtually no correlation between trade orientation and growth rate of GNP; the above average group went from a weak correlation to virtually no correlation at all. The below average group maintained a weak correlation in both periods. These results are very much in line with the findings of Michaely (1977), Mosley (1987) and Wheeler (1984). Michaely finds: "the positive association of the economy's growth rate with the growth of the export share appears to be particularly strong among the more developed countries, and not to exist at all among the least developed...This seems to indicate that growth is affected by export performance only once countries achieve some minimum level of development" (p.52).

### 10.2.2. Causality.

All the studies reviewed above use conventional statistical tests for establishing an association between exports and growth. But correlation does not indicate causality. The making of causal inferences requires an underlying theoretical model, whose validity can be tested by standard econometric techniques. Recently, however, a statistical technique, the Granger-Sims causality test, has become widely used to find the direction of causality. This technique seeks to establish whether, over time, a particular variable regularly precedes another.

Jung and Marshall (1985) have applied the Granger causality test to data for thirty seven developing countries for the period

1950-81, in order to determine whether exports "Granger-cause" growth, or vise versa. They find that only four countries provide evidence for export promotion, and "more interestingly, many of the countries most famous for the miraculous growth rates that appeared to arise from export promotion policies (e.g. Korea, Taiwan, Brazil) provide no statistical support for the export promotion hypothesis" (p.10). Darrat (1986) has also applied the Granger-causality test to time series data for exports and growth for Hong-Kong, Korea, Singapore, and Taiwan for the period 1962-1982, and finds that "neither exports cause economic growth nor economic growth causes exports" for the first three countries. For Taiwan, he finds that "economic growth unidirectionally causes exports" (p.697). But as Lal and Rajapatirana (1987) argue, if the cases in which output growth causes export growth are included as supporting the outward orientation theory in the Jung and Marshall study, then the list of countries with growth rates arising from export promotion policies rises to fourteen.

### 10.3. Reasons for Macroeconomic Policy Review.

#### 10.3.1. Terms of Trade.

There is considerable debate in the literature as to the validity of the various trade and industrialisation policies. Structuralists, have criticised the neoclassical analysis of trade and industrialisation on a number of grounds. Singer (1950), and Prebisch (1950) argued that the long run trend in terms of trade moved against primary products as compared to manufactures which meant that Developing Countries needed to change from a reliance on trade and primary exports, and rely more heavily on domestic-market based industrialisation. Myrdal (1958) argued that the liberal international trade system would ultimately make the rich richer and the poor poorer. But the theoretical and factual basis of Singer's and Prebisch's thesis have been questioned by Lipsey (1963) and Spraos (1980) amongst others. Morawetz (1977), and Lal (1984), amongst others, have attempted to disprove Myrdal's predictions. Morawetz, for example, finds "....no clear relation between initial income level and subsequent growth rates".

Nurkse (1962) argued that in contrast to the nineteenth century, international trade in the post war period could no longer act as an "engine of growth" for Developing Countries, and that an alternative "engine", in the form of import substituting industrialisation, must be sought. But the view that international trade was an engine of growth in the nineteenth century was questioned by Kravis (1970). He states that though a strong external demand for a country's exports may be useful, it "is neither a necessary nor sufficient condition for growth....". He therefore suggested that the term "handmaiden of growth" (p.869) might better convey the role which can be played by trade.

With regards to Ghana's terms of trade (TOT), it was seen in Section (2.6.1) of Chapter (2) that while short term fluctuations did occur in the period 1967-87, there was no discernible decline in

TOT during that period. What has also been discussed in Chapter (2) is that Ghana's export base is primarily reliant on primary products. If world commodity prices decline, then Ghana's TOT will deteriorate. Thus in order to reduce this reliance on commodity prices, Ghana has to encourage the export of manufactured goods as well. This combination of primary product exports and manufactures exports reduces the risk of fluctuations in her TOT.

### 10.3.2. Investment.

As mentioned in Chapter (5), Ghana is in urgent need of foreign direct investment. The textiles sector, with its aging capital stock needs investment in new plant and machinery. But with private sector investment languishing at a mere 4 to 5 percent of GDP, new policies to promote both foreign and domestic capital spending are vital.

### 10.3.3. Sunk Costs.

Given that machinery has a finite life of say 20 years, and given that most of the investments in plant and machinery were made in the 1960s, most of the textile mills in Ghana have now outlived their useful working lives and are ready for replacement. A few mills do however have substantial capital assets in the form of modern machinery (see plant B below), and the industry as a whole has decades of accumulated know-how and a tangible amount of skilled labour. This is reflected by CBS, Industrial Statistics (1990), which gives persons engaged by level of skill in textiles, manufacturing, and industry as a whole, for 1987. We see from this that there were 451 managers, 1,632 technical or clerical staff and 6,238 skilled workers in the woven textiles sector.

Given the difficulty of recouping these investments in machinery and know-how, or transforming plant and equipment to other uses, capital costs must be treated as a sunk rather than a variable cost of operating existing equipment. These costs, together with the accumulated know-how would be irretrievable if this industry perished. If this accumulated know-how is allowed to perish with the disappearing manufacturing sector, then a great opportunity for industrialisation under liberalised market conditions would have been passed-up. Thus government might wish to take the above into account when formulating policy.

### 10.3.4. The Adjustment Process Argument.

As discussed in Chapter (2), with the introduction of the ERP in 1983, industry began to face problems due to competition from imports, a rundown and obsolete capital stock, and tight liquidity.

Firms will obviously benefit if they succeed in cutting production costs. It will also be helpful if macroeconomic policy softens the impact of liberalisation as capital market imperfection may make it impossible for firms with long-term viability to survive through the adjustment process.

### 10.3.5. The Late Industrialisation Argument.

Amsden (1989), Westphal (1978), and others have looked at Korea's industrialisation strategy which Amsden called 'late industrialisation'. Amsden states that low wages in cotton-spinning and weaving firms were found to be insufficient as a basis on which to compete against Japan. She states that Korean firms "appear to have required subsidies to begin to compete in world markets." These took the form of industrial incentives that generally favour exports over import substitution. Westphal summarised these incentives as follows:

> "unrestricted access to and tariff exemptions on imported intermediate and capital goods; exemption from payment of indirect taxes both on major intermediate inputs, whether imported or purchased domestically, and on export sales; generous wastage allowances in determining duty and indirect tax-free raw material imports, which permitted the use of some of these imports in production for the domestic market; reduced prices for several overhead inputs including electricity and railroad transport,...; a 50 percent reduction in direct taxes on income earned in exporting, along with accelerated depreciation; and, immediate access to subsidised short- and medium-term credit to finance working capital and fixed investment respectively."

Subsidised credit in a capital scarce country meant that its price diverged greatly from its true market value, and subsidised long-term credit had a negative real price due to inflation. This meant that the price of credit was not "right". Also, the foreign exchange rate, even though not greatly distorted, did succeed in stimulating exports when this distortion was used in conjunction with other policies.

Coupled with these different incentives was a determination from government that performance standards which it set should be reached by industries. This according to Amsden:

> "induced a level of productivity, and willingness to invest on the part of the private sector, that made greater price 'distortions' unnecessary, and the ample price 'distortions' that did exist more effective.
>
> Therefore it may be said that growth has been faster in Korea not because markets have been allowed to operate more freely but because the subsidisation process has been qualitatively superior...".

Thus the case of Korea is an example of when "wrong" prices are right, when operated with other incentives and an insistence on performance standards is adhered to by the government.

**10.3.6. Level Playing Field Argument.**

As seen in Chapter (7), fuel, electricity, and water charges are higher in Ghana than in some of the other countries shown. Thus in order to have a "level playing field", there is a case for these rates to be reviewed, and monopoly pricing, wherever present, eliminated.

## 10.4. Benefits of Productivity Improvements.

In this section, the benefits of simultaneously introducing trade liberalisation policies and productivity-enhancing programmes (PEPs) are considered. Pack's (1987, p.158) approach is followed, in which he demonstrates these gains in terms of a diagram as shown in Figure (10.1).

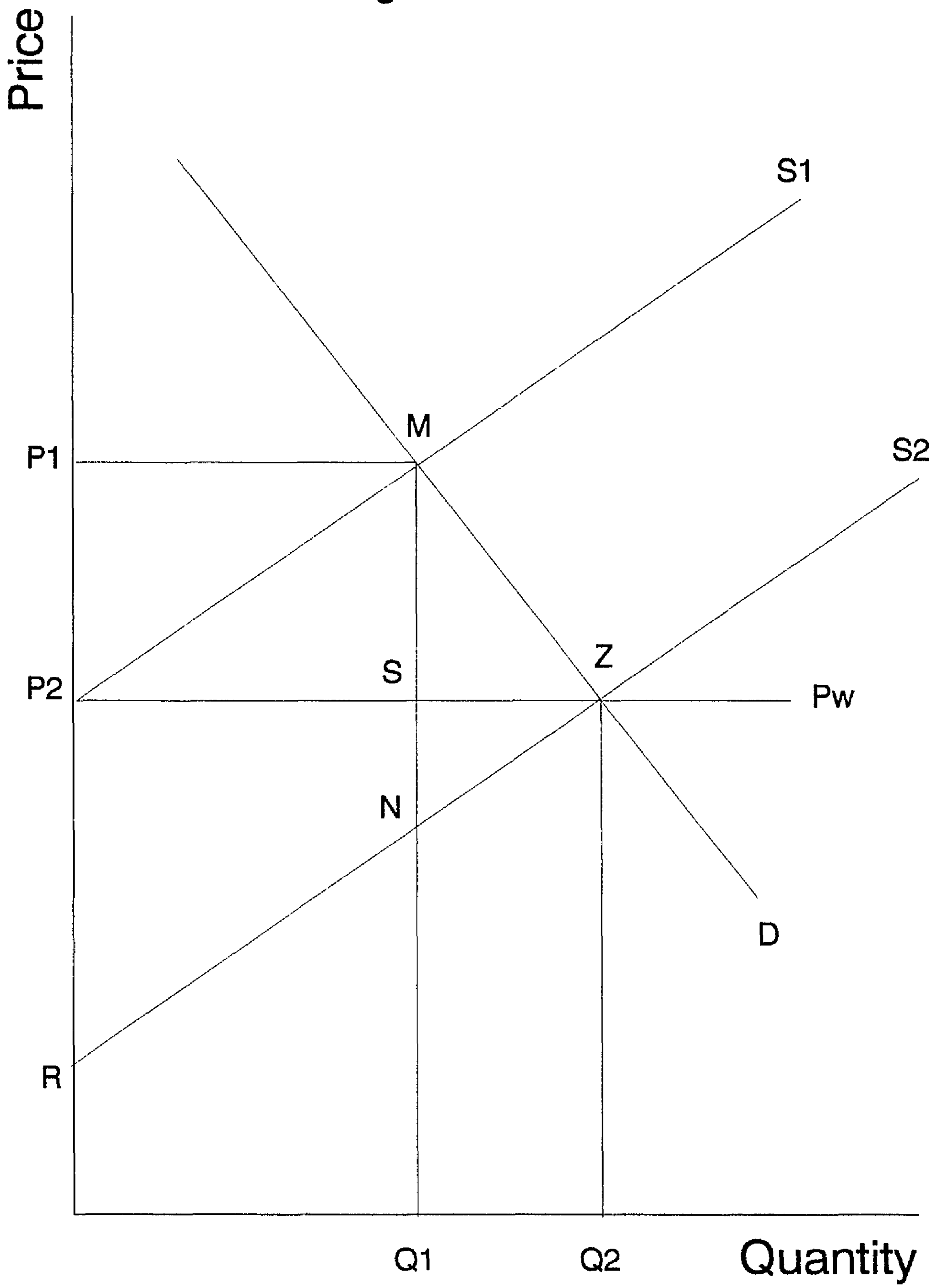
Assume, initially, that the sector is in equilibrium at point M. A made-to-measure tariff excludes imports of competing products by being set so that the least efficient firm can survive and the more efficient ones collect rents. Thus output is initially $Q_1$, domestic price $P_1$, world price $P_2$=Pw, and the made-to measure tariff $P_1P_2$.

If tariffs are removed without an accompanying PEP, then a gain of $P_2$MZ would be accrued which equals the net cost imposed by the initial protective regime, namely, excess production cost plus the loss in consumer surplus minus the increase in producer surplus.

The introduction of a PEP leads to a downward shift in the supply curve to $S_2$, and if this is undertaken simultaneously with the elimination of tariffs, two effects result: (1) an increase in consumer surplus of $P_1P_2$ZM, and (2) a change in producer surplus of $P_2$ZR - $P_1P_2$M. The net gain is thus $P_2$MZR which is greater than $P_2$MZ (the gain from liberalisation only). $P_2$MZR can be decomposed into two

**Benefits and Costs of Productivity Improvements.**

**Figure 10.1.**




**Source: Pack (1987).**

areas: $P_2$MNR and MNZ. $P_2$MNR represents a fall in the (private) marginal cost of producing initial output $Q_1$, since a downward shift in the industry's supply curve reflects the shift in the marginal cost curves of the component firms. Thus $P_2$MNR can be approximated by the decrease in the sum of the marginal costs of the firms making-up the sector. MNZ is the social gain from the expansion of output from $Q_1$ to $Q_2$ and consists of the additional producer surplus, SNZ, and consumer surplus, MSZ.

Given that the area $P_2$MZ could be obtained simply by eliminating tariffs without a concurrent PEP, the "pure" effect of the PEP would therefore be $P_2$ZMR - $P_2$MZ which equals the true benefit $RP_2Z$. Some might argue that even this smaller measure represents an overstatement due to the possibility that liberalisation, even if not supplemented explicitly by PEPs, would cause a downward shift in the industry supply curve as individual firms facing more intense competition would seek to reduce costs on their own. This was seen in the gradual reduction in technical inefficiency of the firms surveyed in the post-liberalisation period in Ghana (given in Chapter 8). But, as also seen in Chapter (8), there is still room for more cost reductions as a result of PEPs. Thus, the implication of this is that the time required for adjustment of the supply curve is likely to be longer, and the ultimate height of the supply curve is likely to be greater, if firms are left to their own devices rather than if a PEP focusing directly on productivity issues is implemented.

PEPs can be undertaken by both firms and the government.

PEPs that can be undertaken by firms include: measures, such as reviewing working conditions or perhaps better incentives or even better worker/management training, to improve labour productivity; more efficient use of fuel power and water. The PEPs which the government is envisaged to consider are as follows: bear some of the cost of worker/management training programmes; provide favourable terms and conditions for firm to renew their aged plant and machinery.

In the above discussion, the supply curve shifts not as a result of passive-but-inevitable learning by doing, as in the infant industry argument, but in response to investment explicitly designed to shift it quickly. If the learning period in the infant industry argument does lead to a shift in the supply curve from $S_1$ to $S_2$, then the producer surplus $RP_2Z$ accrues over time even if nothing is done to force the pace of learning. If this were the likely evolution over time (for an evaluation of the realism of this view see Bell et al. (1984)), the benefit from the PEP would be overstated, and the true benefit would consist of the discounted differences in producer surplus given by the two time paths of shifting supply curves, i.e. the difference between the benefits of a fast shift in the supply curve and a slower shift. It must be highlighted at this point that the expected shift in the supply curve resulting from a PEP does not only occur more rapidly, but it would also be expected to be greater. This is because the perceived PEP could produce a fall in costs not only as a result of individual firm's efforts, but also as a result of government policy designed to achieve this.

### 10.5. Policy Prescription.

From the evidence shown in Section (10.2), gains from trade argument and the benefits of comparative advantage highlighted by the Heckscher-Ohlin theory are accepted, even though it is realised that this view has been debated in the literature by Wheeler, Michaely, and others. Thus, assuming Ghana's trade policy remains export-oriented in nature, it can be seen from Sections (10.3) that textiles in particular and manufacturing in general have been greatly neglected. Section (10.4) shows that a production-enhancing programme or policy (PEP) can be devised, within a liberalised export oriented framework, that will produce benefits for firms and society.

Chapter (9), uncovered many areas where textile firms faced relatively high exogenous costs. In what follows, policy suggestions are made, some of which have already been shown in Chapter (9) to reduce exogenous costs, which would be expected to produce a reduction in these exogenous costs and thus improve competitiveness. These exogenous cost reducing policy recommendations are as follows:

(a) Taxes: Here arbitrary figures are chosen to demonstrate the possible reductions in taxation. Sales tax could be reduced from 17.5 percent in 1991/2 to under 15% percent; company tax could be reduced from 35 percent to 20 percent; raw material tax of 10 percent could be abolished (it must be pointed out here that in terms of export promotion, exported textiles are already exempt from raw material tax and sales tax); income tax rates could be reviewed and drastically reduced. The top rate of income tax , for example could be reduced from 67 percent for income exceeding a taxable income to GDP per capita ratio of 13, to say 45 percent for incomes exceeding an income to GDP ratio of 60 percent. The exemption level could be increased from an income to GDP ratio of nearly 0 to an exemption level of income to GDP ratio of say 5. This will reduce the tax on low-paid employees. Even though this was not shown to have any significant cost reducing effect on ex-factory price in Chapter (9), it is nevertheless felt that reducing the taxes paid by low income workers, which means a higher take home pay is beneficial for at least two reasons: Firstly, it may result in higher productivity since higher paid workers are more reluctant to loose their jobs than lower paid workers. Secondly, this higher take home pay will reduce the pressure on firms to increase wages by the amount they otherwise would have.

(b) Optimal pricing policy does not support water charges that are multi-tiered progressive. Optimal charges are multi-tiered regressive, with industries consuming large volumes getting discounts on rates. Rates could be comparable to the United Kingdom rate of $2.78/1000 gallons as compared to Ghana's highest rate of $3.33/1000 gallons.

(c) If fuel prices were reduced from $395/1000 litres to a level comparable to India's or Canada's fuel price this would give a rate of $200/1000 litres. This could be achieved by reducing the tax on fuel, and also by reducing fuel price itself.

(d) If electricity prices were reduced from $0.063/kwh (calculated for firm J as an aggregate of charge per Kwh and charge per max. demand) to levels comparable with Canada ($0.038/kwh), India ($0.040/kwh), and USA ($0.049/kwh), a big step would have been taken in producing a more "level playing field" environment for the Ghanaian textile industry. Again this could be achieved by reducing the tax on electricity consumption, and by reducing the price itself.

(e) Devaluation: As was seen in Chapter (7), a devaluation of the exchange rate can have a favourable effect on competitiveness if it is introduced with a fiscal and/or monetary contraction. This is because it changes the relative prices of tradables and nontradables in favour of tradables. But a devaluation, by reducing the relative price of nontradables, causes unemployment, in the short to medium term, in the nontradables goods sector and thus has a social cost which may be politically unacceptable.

(f) While accelerated depreciation on new capital is already practised, it is felt that subsidised long-term credit for capital investment would result in private investment in industry. This would therefore result in the greatly needed injection of new capital in the industry.

### 10.6. Summary.

With the gains from trade argument and the Heckscher-Ohlin theory of comparative advantage discussed in Section (2) above, it is argued in this chapter that an export-oriented trade policy is, on balance, preferable to import-substituting-industrialisation.

Given this, the focus then turns to the reasons why a macroeconomic policy review might be advisable, and these are as follows: Ghana's terms of trade, while not observed to have declined over the 1967-87 period looked at, did show a lot of short term fluctuation over that period and can thus be said to be unpredictable; aging capital stock in the textiles sector requires an investment promotion effort; little of the sunk-costs in capital and technical know-how would be retrievable if textile firms shut-down; capital market imperfections make it difficult for firms with long term viability to survive through the adjustment process thus measures are required to ease the difficulties faced during adjustment; there is the late industrialisation argument put forward by Amsden (1989), amongst others, in which it is argued that in an industrialising country, a system of industrial subsidy coupled with policies that maintain high levels of productivity lead to high growth rates, as has been the case in Korea; and finally the "level playing field" argument is discussed in which it is envisaged that fuel, power, and water charges could be reduced to levels found in other selected countries.

Finally, policy options are explored. These include: reviewing tax policies; reducing fuel, water, and power charges; devaluation of the exchange rate; incentives for capital investment.

## 11. SUMMARY.

This study has been concerned with assessing the efficiency and cost structure of the Ghanaian textile sector. A summary of the main findings is made here together with a brief review of the discussion made in each chapter.

Chapter (2) reviewed the Ghanaian economy. This highlighted the import-substituting industrialisation drive which led to the formation of the textiles sector (amongst others). The decline of the 1970s and early 1980s is discussed, and so are the resulting liberalisation policies of the ERP. The chapter then highlighted the fact that while the ERP has been largely successful in "reviving" the economy, it has left Ghana with a high degree of aid-dependency, a derelict manufacturing sector, and very little private sector investment and foreign capital investment.

Chapter (3) discussed the Ghanaian cotton cultivation industry in an attempt to examine its viability as a competitively priced alternative to cotton importation. While this chapter highlighted the fact that cotton cultivation has increased dramatically since being privatised in 1985, and accounts today for over 50 percent of Ghana's cotton consumption, and that both price and non-price factors were instrumental in increasing the production and price-competitveness of cotton, technical know-how in the ginning process is required to improve its quality. It was pointed out that this was a limiting factor in the future success of cotton both for the domestic and export markets.

Chapter (4) discussed the state of the world textile industry. Its history was reviewed, and the origins of the Multifibre Arrangement (MFA), as well as its effect on developing countries were discussed. Most of the studies looked at found that the MFA caused a substantial decline in export opportunities and revenues of developing countries. The textile manufacturing process was also reviewed in Chapter (4), and so were the productivity improvements due to technological advances. The discussion focused on the high degree of automation in the spinning and weaving processes, and on the fact that new technology, in general, has been raising productivity while lowering labour content in the textile industry.

It was thus found in Chapter (4) that, in industrialised countries, enterprises adopting new technologies often enjoyed an edge over their competitors in the sense that the higher productivity achieved with these new technologies often offsets higher wages of countries such as the US, thus enabling them to be competitive with developing countries.

The Ghanaian textile sector was reviewed in Chapter (5). While cloth production was found to have declined from over 100 million meters in 1976 to under 10 million in 1982, it recovered only slightly to over 20 million meters by 1988. In 1987, employment in this sector stood at 12,800 employees with a high proportion of total employment being in the largest five establishments. Also included in this chapter is a plant by plant summary of 12 textile firms.

Chapter (6) reviewed the approaches to production frontiers. These include non-statistical parametric and non-statistical non-parametric approaches as well as deterministic statistical frontier and stochastic statistical frontier approaches. The main finding of this chapter is that the stochastic frontier approach, unlike the three other approaches, introduces a disturbance term representing noise or measurement error, which can then be decomposed into two components: inefficiency and noise. Also, using the Jondrow et. al. (1982) measure, with the stochastic frontier approach, gives non-consistent estimates of firm and year specific technical inefficiency.

Chapter (7) discussed the method of data collection. This took the form of implementing a total of three questionnaires on two fieldtrips. One questionnaire was directed at selected textile mills, and the results obtained provided the data for the technical efficiency estimation of Chapter (8). A second questionnaire was intended to collect cotton growing data, and this provided the data for the cotton cultivation costs which were estimated in Chapter (3). The third questionnaire collected data on fabric manufacturing cost structure. This formed the basis of the fabric manufacturing cost comparison made in Chapter (9). Data was also obtained from the Price and Incomes Board, and this was used in the cost sensitivity analysis made in Chapter (9).

Chapter (8) estimated technical inefficiency in six selected textile mills using a stochastic Cobb-Douglas production function, and data collected from the fieldtrip. The main finding of this chapter is that estimates of technical inefficiency, in 1980, averaged 13.8 percent, with the lowest and highest values of 6.2 percent and 25.5 percent respectively. In 1983, the average of technical inefficiency rose to 27.5 in 1983, with lowest and highest values being 18.8 percent and 33.1 percent respectively. By 1989, the average had fallen to 7.7 percent with the lowest and highest values for that year standing at 4.0 percent and 12.6 percent respectively.

Chapter (9) looked at the costs faced by textile firms classified into endogenous and exogenous costs. The endogenous costs which were identified included: labour cost; raw material cost; efficiency of raw material use; efficiency of fuel, water and power use; technical and allocative efficiency. The exogenous costs discussed included: fuel, power and water prices; direct and indirect taxes; and cost reduction as a result of an exchange rate devaluation.

The main findings of this chapter, in terms of efficiency and cost cutting potential of the prescribed policies, are as follows: firstly the textile firms looked at in this study have reacted to foreign competition by becoming more technically efficient; secondly, in terms of domestic competition with imports, the competitive situation of textile firms can be greatly enhanced by policies which affect the ex-factory price of their products (i.e.

policies such as reduction of all forms of taxes, and reduction in cost of fuel, power, and water inputs); and thirdly, in terms of export potential, it can be concluded that some firms can become internationally competitive given certain policies which lead to a reduction in the price of their product.

Policy recommendations were made in Chapter (10). After the gains from trade argument and the benefits of comparative advantage are discussed, it is argued that an export-oriented trade policy is preferable to an import-substituting-industrialisation policy. Given this, the discussion then turns to justifying a macroeconomic policy review on the grounds of the following arguments: terms of trade fluctuations; aging capital stock; sunk costs; capital market imperfections; late industrialisation argument; and finally, the "level playing field" argument.

Finally, some policy options are explored. These included: reviewing tax policies; reducing fuel, power and water charges; devaluation of the exchange rate; and incentives for capital investment.

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## APPENDIX 1.

TEXTILES QUESTIONNAIRE

**Section (1) - Establishment Identification.**

| | |
|---|---|
| Date: | ..................... |
| Name of establishment: | ..................... |
| Year established: | ..................... |
| Type of ownership: | ..................... |
| Nationality of Ownership: | ..................... |
| Location: | ..................... |
| Number of Ghanaian employees: | ..................... |
| Number of Expatriate employees: | ..................... |
| Products: | ..................... |

**Section (2) - Wages, Output, Value of assets: (1979-1989).**

| | | |
|---|---|---|
| (a) Wages of workers in Cedis | 1979: | ..................... |
| | 1980: | ..................... |
| | 1981: | ..................... |
| | 1982: | ..................... |
| | 1983: | ..................... |
| | 1984: | ..................... |
| | 1985: | ..................... |
| | 1986: | ..................... |
| | 1987: | ..................... |

| | | |
|---|---|---|
| | 1988: | ...................... |
| | 1989: | ...................... |
| (b) Output (sales) in cedis | 1979: | ...................... |
| | 1980: | ...................... |
| | 1981: | ...................... |
| | 1982: | ...................... |
| | 1983: | ...................... |
| | 1984: | ...................... |
| | 1985: | ...................... |
| | 1986: | ...................... |
| | 1987: | ...................... |
| | 1988: | ...................... |
| | 1989: | ...................... |

(c) Value of assets in cedis:

Initial Value of factory building: ......................

Initial value of machinery: ......................

Initial value of motor vehicles: ......................

Initial value of furniture and equipment: ......................

IN 1979: (Disposals are -ve).

Value of factory building: ........................

Additions to building: ........................

Value of Machinery: ......................

Additions to Machinery: ......................

Value of motor vehicles: ......................

Additions to motor vehicles: ......................

Value of furniture and equipment: ......................

Additions to furniture and equipment: ......................

IN 1980: (Disposals are -ve).

Value of factory building: ......................

Additions to building: ......................

Value of Machinery: ......................

Additions to Machinery: ......................

Value of motor vehicles: ......................

Additions to motor vehicles: ......................

Value of furniture and equipment: ......................

Additions to furniture and equipment: ......................

IN 1981: (Disposals are -ve).

Value of factory building: ......................

Additions to building: ......................

Value of Machinery: ......................

Additions to Machinery: ......................

Value of motor vehicles: ......................

Additions to motor vehicles: ......................

Value of furniture and equipment: ......................

Additions to furniture and equipment: ......................

In 1982: (Disposals are -ve).

| | |
|---|---|
| Value of factory building: | ...................... |
| Additions to building: | ...................... |
| Value of Machinery: | ...................... |
| Additions to Machinery: | ...................... |
| Value of motor vehicles: | ...................... |
| Additions to motor vehicles: | ...................... |
| Value of furniture and equipment: | ...................... |
| Additions to furniture and equipment: | ...................... |

In 1983: (Disposals are -ve).

| | |
|---|---|
| Value of factory building: | ...................... |
| Additions to building: | ...................... |
| Value of Machinery: | ...................... |
| Additions to Machinery: | ...................... |
| Value of motor vehicles: | ...................... |
| Additions to motor vehicles: | ...................... |
| Value of furniture and equipment: | ...................... |
| Additions to furniture and equipment: | ...................... |

IN 1984: (Disposals are -ve).

| | |
|---|---|
| Value of factory building: | ...................... |
| Additions to building: | ...................... |
| Value of Machinery: | ...................... |
| Additions to Machinery: | ...................... |
| Value of motor vehicles: | ...................... |

Additions to motor vehicles: ......................

Value of furniture and equipment: ......................

Additions to furniture and equipment: ......................

IN 1985: (Disposals are -ve).

Value of factory building: ......................

Additions to building: ......................

Value of Machinery: ......................

Additions to Machinery: ......................

Value of motor vehicles: ......................

Additions to motor vehicles: ......................

Value of furniture and equipment: ......................

Additions to furniture and equipment: ......................

IN 1986: (Disposals are -ve).

Value of factory building: ......................

Additions to building: ......................

Value of Machinery: ......................

Additions to Machinery: ......................

Value of motor vehicles: ......................

Additions to motor vehicles: ......................

Value of furniture and equipment: ......................

Additions to furniture and equipment: ......................

IN 1987: (Disposals are -ve).

Value of factory building: ......................

| | |
|---|---|
| Additions to building: | ...................... |
| Value of Machinery: | ...................... |
| Additions to Machinery: | ...................... |
| Value of motor vehicles: | ...................... |
| Additions to motor vehicles: | ...................... |
| Value of furniture and equipment: | ...................... |
| Additions to furniture and equipment: | ...................... |

IN 1988: (Disposals are -ve).

| | |
|---|---|
| Value of factory building: | ...................... |
| Additions to building: | ...................... |
| Value of Machinery: | ...................... |
| Additions to Machinery: | ...................... |
| Value of motor vehicles: | ...................... |
| Additions to motor vehicles: | ...................... |
| Value of furniture and equipment: | ...................... |
| Additions to furniture and equipment: | ...................... |

IN 1989: (Disposals are -ve).

| | |
|---|---|
| Value of factory building: | ...................... |
| Additions to building: | ...................... |
| Value of Machinery: | ...................... |
| Additions to Machinery: | ...................... |
| Value of motor vehicles: | ...................... |
| Additions to motor vehicles: | ...................... |
| Value of furniture and equipment: | ...................... |
| Additions to furniture and equipment: | ...................... |

STATE DATE AND VALUE OF ANY REVALUATIONS: ......................

......................

......................

......................

**Section (3) - Electricity consumption in 1989**

Units consumed in KWh.: ......................

Maximum Demand in KVA.: ......................

## COST STRUCTURE QUESTIONNAIRE

**Section (1) - Yarn Manufacturing Cost.**

Blend of yarn: ...................

Yarn count: ...................

Overheads in cedis per kg.: ...................

Cotton cost in C/Kg.: ...................

Polyester cost in C/Kg.: ...................

Viscose cost in C/Kg.: ...................

Waste cost in Cedis/Kg.: ...................

**Section (2) - Fabric Manufacturing Cost.**

Type of fabric: ...................

Width of fabric in inches.: ...................

Labour cost in cedis per yard: ...................

Power cost in C/yd.: ...................

Supplies cost in C/yd.: ...................

Depreciation + interest in C/yd.: ...................

Yarn cost in C/yd.: ...................

Raw material cost in C/yd.: ...................

Waste in C/yd.: ...................

## GHANA COTTON COMPANY (GCC) QUESTIONNAIRE

**Section (1) - General Information.**

| | |
|---|---|
| Year Established: | .................... |
| Type of ownership: | .................... |
| Location: | .................... |
| Number of employees: | .................... |

**Section (2) - Performance of GCC for 1985-1989.**

| | | |
|---|---|---|
| Area cultivated in Hectares | 1985: | .................... |
| | 1986: | .................... |
| | 1987: | .................... |
| | 1988: | .................... |
| | 1989: | .................... |
| Volume seed cotton (tonnes) | 1985: | .................... |
| | 1986: | .................... |
| | 1987: | .................... |
| | 1988: | .................... |
| | 1989: | .................... |
| Lint cotton price in Cedis | 1985: | .................... |

| | | |
|---|---|---|
| | 1986: | .................... |
| | 1987: | .................... |
| | 1988: | .................... |
| | 1989: | .................... |
| Volume lint cotton (tonnes) | 1985: | .................... |
| | 1986: | .................... |
| | 1987: | .................... |
| | 1988: | .................... |
| | 1989: | .................... |

**Section (3) - Cost Structure in 1991.**

(a) Insecticide.

How many times applied per year: ....................

Quantity per hectare: ....................

Cost per litre: ....................

(b) Fertilisers.

Quantity of compound fertiliser (bags/Ha): .....................

Price of fertiliser per bag: .....................

Quantity of ammonia fertiliser (bags/Ha): .....................

Price of ammonia fertiliser per bag: .....................

(c) Seed.

Quantity required in Kgs./Ha.: .....................

Cost of Kg. of seed: .....................

(d) Ploughing.

Cost per Ha.: ....................

(e) Yield.

Yield per Ha.: ....................

Price payed to farmers per Ha.: ....................

(f) Ginning.

Cost per Kg. of lint cotton: ....................

Yield of lint per Ha.: ....................

(g) Transport.

Transport to + from gin in Kg of raw cotton: ....................

(h) Staff.

No. of senior staff per 1000 Ha: ....................

Wages of senior staff per month: ....................

No. of supervisors per 1000 Ha: ....................

Wages of supervisor per month: ....................

No. of workers per 1000 Ha: ....................

Wages of workers per month: ....................

Cost of 1 expatriate wages and accomodation: ....................

(i) Vehicles.

Number of cars per 1000Ha: ....................

Cost of 1 car: ....................

Number of motorbikes per 1000 Ha: ....................

Cost of 1 motorbike: .....................

Number of tractors per 1000 Ha.: .....................

Price per tractor: .....................

(j) Capital.

What operating capital is given on credit: .....................

How long is credit: .....................

What is interest paid on capital: .....................

# APPENDIX 2.

FIRM (J) IMI JAVA, 1985.

| dollar/cedi rate | 54 CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.16411 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 689 | 1.164 |
| imported pack mat(2) | 22 | 0.037 |
| duty imported mat(3) | 228 | 0.384 |
| other cost (local)(4) | 222 | 0.375 |
| tot cst imp 1+2+3+4=(5) | 1,161 | 1.960 |
| percent duty on raw | 33.00% | |
| local r mat(6) | 109 | 0.184 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,270 | 2.144 |
| direct labour(10) | 413 | 0.697 |
| cost fuel oil | 97 | 0.164 |
| cost power | 39 | 0.066 |
| cost water | 57 | 0.096 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 97 | 0.164 |
| power(11b) | 39 | 0.066 |
| water(11c) | 57 | 0.096 |
| spares replacement(11d) | 31 | 0.052 |
| sum 11 | 224 | 0.378 |
| mat+lab 9+10+11a.d=(12) | 1,907 | 3.220 |
| general admin (13) | 170 | 0.287 |
| other o'heads(14) | 180 | 0.304 |
| deliv sell exp (15,16) | 10 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,267 | 3.828 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,267 | 3.828 |
| bank charges/int (18) | 23 | 0.039 |
| grand total 17(b)+18=(19) | 2,290 | 3.866 |
| profit margin % | 10.00% | |
| profit margin (20) | 229 | 0.387 |
| ex-fac price 19+20=(21) | 2,519 | 4.253 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 378 | 0.638 |
| sales tax (23) | 290 | 0.489 |
| ex-fact pri+tax 21.23=(24) | 3,187 | 5.380 |

FIRM (J) IMI JAVA, 1985:d.30%

| dollar/cedi rate | 70.2 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 1.16411 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 896 | 1.164 |
| imported pack mat(2) | | 22 | 0.029 |
| duty imported mat(3) | | 296 | 0.384 |
| other cost (local)(4) | | 222 | 0.288 |
| tot cst imp 1+2+3+4=(5) | | 1,436 | 1.865 |
| percent duty on raw | | 33.00% | |
| local r mat(6) | | 109 | 0.142 |
| local pack (7) | | 0 | 0.000 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 1,545 | 2.007 |
| direct labour(10) | | 413 | 0.536 |
| cost fuel oil | | 97 | 0.126 |
| cost power | | 39 | 0.051 |
| cost water | | 57 | 0.074 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 97 | 0.126 |
| power(11b) | | 39 | 0.051 |
| water(11c) | | 57 | 0.074 |
| spares replacement(11d) | | 31 | 0.040 |
| sum 11 | | 224 | 0.291 |
| mat+lab 9+10+11a.d=(12) | | 2,182 | 2.834 |
| general admin (13) | | 170 | 0.221 |
| other o'heads(14) | | 180 | 0.234 |
| deliv sell exp (15,16) | | 10 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 2,542 | 3.302 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 2,542 | 3.302 |
| bank charges/int (18) | | 23 | 0.030 |
| grand total 17(b)+18=(19) | | 2,565 | 3.331 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 257 | 0.333 |
| ex-fac price 19+20=(21) | | 2,822 | 3.665 |
| excise tax (percent) | | 15.00% | |
| sales tax (percent) | | 10.00% | |
| excise duty (22) | | 423 | 0.550 |
| sales tax (23) | | 324 | 0.421 |
| ex-fact pri+tax 21.23=(24) | | 3,569 | 4.636 |

Firm (J) IMI JAVA, 1985:r.i.t.2.5%
dollar/cedi rate 54

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.16411 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 689 | 1.164 |
| imported pack mat(2) | 22 | 0.037 |
| duty imported mat(3) | 228 | 0.384 |
| other cost (local)(4) | 222 | 0.375 |
| tot cst imp 1+2+3+4=(5) | 1,161 | 1.960 |
| percent duty on raw | 33.00% | |
| local r mat(6) | 109 | 0.184 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,270 | 2.144 |
| direct labour | 413 | 0.697 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 402.675 | 0.680 |
| cost fuel oil | 97 | 0.164 |
| cost power | 39 | 0.066 |
| cost water | 57 | 0.096 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 97 | 0.164 |
| power(11b) | 39 | 0.066 |
| water(11c) | 57 | 0.096 |
| spares replacement(11d) | 31 | 0.052 |
| sum 11 | 224 | 0.378 |
| mat+lab 9+10+11a.d=(12) | 1,897 | 3.202 |
| general admin (13) | 170 | 0.287 |
| other o'heads(14) | 180 | 0.304 |
| deliv sell exp (15,16) | 10 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,257 | 3.810 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,257 | 3.810 |
| bank charges/int (18) | 23 | 0.039 |
| grand total 17(b)+18=(19) | 2,280 | 3.849 |
| profit margin % | 10.00% | |
| profit margin (20) | 228 | 0.385 |
| ex-fac price 19+20=(21) | 2,508 | 4.234 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 376 | 0.635 |
| sales tax (23) | 288 | 0.487 |
| ex-fact pri+tax 21.23=(24) | 3,172 | 5.356 |

FIRM (J) IMI JAVA, 1985:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 54 | |
| --- | --- | --- |
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.16411 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 689 | 1.164 |
| imported pack mat(2) | 22 | 0.037 |
| duty imported mat(3) | 34 | 0.058 |
| other cost (local)(4) | 222 | 0.375 |
| tot cst imp 1+2+3+4=(5) | 968 | 1.634 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 109 | 0.184 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,077 | 1.818 |
| direct labour(10) | 413 | 0.697 |
| cost fuel oil | 97 | 0.164 |
| cost power | 39 | 0.066 |
| cost water | 57 | 0.096 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 97 | 0.164 |
| power(11b) | 39 | 0.066 |
| water(11c) | 57 | 0.096 |
| spares replacement(11d) | 31 | 0.052 |
| sum 11 | 224 | 0.378 |
| mat+lab 9+10+11a.d=(12) | 1,714 | 2.894 |
| general admin (13) | 170 | 0.287 |
| other o'heads(14) | 180 | 0.304 |
| deliv sell exp (15,16) | 10 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,074 | 3.502 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,074 | 3.502 |
| bank charges/int (18) | 23 | 0.039 |
| grand total 17(b)+18=(19) | 2,097 | 3.541 |
| profit margin % | 10.00% | |
| profit margin (20) | 210 | 0.354 |
| ex-fac price 19+20=(21) | 2,307 | 3.895 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 346 | 0.584 |
| ex-fact pri+tax 21.23=(24) | 2,653 | 4.479 |

FIRM (J) IMI JAVA, 1985:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 54 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.16411 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 689 | 1.164 |
| imported pack mat(2) | 22 | 0.037 |
| duty imported mat(3) | 34 | 0.058 |
| other cost (local)(4) | 222 | 0.375 |
| tot cst imp 1+2+3+4=(5) | 968 | 1.634 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 109 | 0.184 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,077 | 1.818 |
| direct labour(10) | 413 | 0.697 |
| cost fuel oil | 97 | 0.164 |
| cost power | 39 | 0.066 |
| cost water | 57 | 0.096 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 68 | 0.115 |
| power(11b) | 27 | 0.046 |
| water(11c) | 46 | 0.077 |
| spares replacement(11d) | 31 | 0.052 |
| sum 11 | 171.8 | 0.290 |
| mat+lab 9+10+11a.d=(12) | 1,662 | 2.806 |
| general admin (13) | 170 | 0.287 |
| other o'heads(14) | 180 | 0.304 |
| deliv sell exp (15,16) | 10 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,022 | 3.414 |
| efficiency saving | 101 | 0.171 |
| tot cost incl.eff.(17b) | 1,921 | 3.243 |
| bank charges/int (18) | 23 | 0.039 |
| grand total 17(b)+18=(19) | 1,944 | 3.282 |
| profit margin % | 10.00% | |
| profit margin (20) | 194 | 0.328 |
| ex-fac price 19+20=(21) | 2,138 | 3.610 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 321 | 0.541 |
| ex-fact pri+tax 21.23=(24) | 2,459 | 4.151 |

Firm (J) IMI JAVA, 1985:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%
dollar/cedi rate 70.2 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.16411 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 896 | 1.164 |
| imported pack mat(2) | 22 | 0.029 |
| duty imported mat(3) | 45 | 0.058 |
| other cost (local)(4) | 222 | 0.288 |
| tot cst imp 1+2+3+4=(5) | 1,185 | 1.539 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 109 | 0.142 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,294 | 1.681 |
| direct labour | 413 | 0.536 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 402.675 | 0.523 |
| cost fuel oil | 97 | 0.126 |
| cost power | 39 | 0.051 |
| cost water | 57 | 0.074 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 68 | 0.088 |
| power(11b) | 27 | 0.035 |
| water(11c) | 46 | 0.059 |
| spares replacement(11d) | 31 | 0.040 |
| sum 11 | 171.8 | 0.223 |
| mat+lab 9+10+11a.d=(12) | 1,869 | 2.427 |
| general admin (13) | 170 | 0.221 |
| other o'heads(14) | 180 | 0.234 |
| deliv sell exp (15,16) | 10 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,229 | 2.894 |
| efficiency saving | 111 | 0.145 |
| tot cost incl.eff.(17b) | 2,117 | 2.750 |
| bank charges/int (18) | 23 | 0.030 |
| grand total 17(b)+18=(19) | 2,140 | 2.780 |
| profit margin % | 10.00% | |
| profit margin (20) | 214 | 0.278 |
| ex-fac price 19+20=(21) | 2,354 | 3.058 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 353 | 0.459 |
| ex-fact pri+tax 21.23=(24) | 2,707 | 3.516 |

FIRM (J) IMI JAVA, 1986.

| dollar/cedi rate | 89 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.59763 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 583 | 0.598 |
| imported pack mat(2) | 50 | 0.051 |
| duty imported mat(3) | 193 | 0.197 |
| other cost (local)(4) | 99 | 0.101 |
| tot cst imp 1+2+3+4=(5) | 925 | 0.947 |
| percent duty on raw | 33.00% | |
| local r mat(6) | 121 | 0.124 |
| local pack (7) | 29 | 0.030 |
| transport handling(8) | 112 | 0.115 |
| tot c raw 5+6+7+8=(9) | 1,187 | 1.216 |
| direct labour(10) | 334 | 0.342 |
| cost fuel oil | 140 | 0.143 |
| cost power | 57 | 0.058 |
| cost water | 84 | 0.086 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 140 | 0.143 |
| power(11b) | 57 | 0.058 |
| water(11c) | 84 | 0.086 |
| spares replacement(11d) | 45 | 0.046 |
| sum 11 | 326 | 0.334 |
| mat+lab 9+10+11a.d=(12) | 1,847 | 1.892 |
| general admin (13) | 132 | 0.135 |
| other o'heads(14) | 140 | 0.143 |
| deliv sell exp (15,16) | 13 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,132 | 2.184 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,132 | 2.184 |
| bank charges/int (18) | 23 | 0.024 |
| grand total 17(b)+18=(19) | 2,155 | 2.208 |
| profit margin % | 10.00% | |
| profit margin (20) | 215 | 0.221 |
| ex-fac price 19+20=(21) | 2,370 | 2.428 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 356 | 0.364 |
| sales tax (23) | 273 | 0.279 |
| ex-fact pri+tax 21.23=(24) | 2,999 | 3.072 |

FIRM (J) IMI JAVA, 1986:d.30%

| | | | |
|---|---|---|---|
| dollar/cedi rate | 115.7 | | |
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.59763 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 758 | 0.598 |
| imported pack mat(2) | | 50 | 0.039 |
| duty imported mat(3) | | 250 | 0.197 |
| other cost (local)(4) | | 99 | 0.078 |
| tot cst imp 1+2+3+4=(5) | | 1,158 | 0.912 |
| percent duty on raw | | 33.00% | |
| local r mat(6) | | 121 | 0.095 |
| local pack (7) | | 29 | 0.023 |
| transport handling(8) | | 112 | 0.088 |
| tot c raw 5+6+7+8=(9) | | 1,420 | 1.119 |
| direct labour(10) | | 334 | 0.263 |
| cost fuel oil | | 140 | 0.110 |
| cost power | | 57 | 0.045 |
| cost water | | 84 | 0.066 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 140 | 0.110 |
| power(11b) | | 57 | 0.045 |
| water(11c) | | 84 | 0.066 |
| spares replacement(11d) | | 45 | 0.035 |
| sum 11 | | 326 | 0.257 |
| mat+lab 9+10+11a.d=(12) | | 2,080 | 1.639 |
| general admin (13) | | 132 | 0.104 |
| other o'heads(14) | | 140 | 0.110 |
| deliv sell exp (15,16) | | 13 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 2,365 | 1.863 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 2,365 | 1.863 |
| bank charges/int (18) | | 23 | 0.018 |
| grand total 17(b)+18=(19) | | 2,388 | 1.882 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 239 | 0.188 |
| ex-fac price 19+20=(21) | | 2,626 | 2.070 |
| excise tax (percent) | | 15.00% | |
| sales tax (percent) | | 10.00% | |
| excise duty (22) | | 394 | 0.310 |
| sales tax (23) | | 302 | 0.238 |
| ex-fact pri+tax 21.23=(24) | | 3,322 | 2.618 |

Firm (J) IMI JAVA, 1986:r.i.t.2.5%
dollar/cedi rate 89

| | | CEDIS/10.968m | $ per m |
|---|---|---|---|
| imp. raw matl. $ | | | 0.59763 |
| imp. pack matl. $ | | | 0 |
| imported raw mat (1) | | 583 | 0.598 |
| imported pack mat(2) | | 50 | 0.051 |
| duty imported mat(3) | | 193 | 0.197 |
| other cost (local)(4) | | 99 | 0.101 |
| tot cst imp 1+2+3+4=(5) | | 925 | 0.947 |
| percent duty on raw | | 33.00% | |
| local r mat(6) | | 121 | 0.124 |
| local pack (7) | | 29 | 0.030 |
| transport handling(8) | | 112 | 0.115 |
| tot c raw 5+6+7+8=(9) | | 1,187 | 1.216 |
| direct labour | | 334 | 0.342 |
| % red due to inc tax | | 2.50% | |
| cost of labour (10) | | 325.65 | 0.334 |
| cost fuel oil | | 140 | 0.143 |
| cost power | | 57 | 0.058 |
| cost water | | 84 | 0.086 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 140 | 0.143 |
| power(11b) | | 57 | 0.058 |
| water(11c) | | 84 | 0.086 |
| spares replacement(11d) | | 45 | 0.046 |
| sum 11 | | 326 | 0.334 |
| mat+lab 9+10+11a.d=(12) | | 1,839 | 1.883 |
| general admin (13) | | 132 | 0.135 |
| other o'heads(14) | | 140 | 0.143 |
| deliv sell exp (15,16) | | 13 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 2,124 | 2.175 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 2,124 | 2.175 |
| bank charges/int (18) | | 23 | 0.024 |
| grand total 17(b)+18=(19) | | 2,147 | 2.199 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 215 | 0.220 |
| ex-fac price 19+20=(21) | | 2,361 | 2.419 |
| excise tax (percent) | | 15.00% | |
| sales tax (percent) | | 10.00% | |
| excise duty (22) | | 354 | 0.363 |
| sales tax (23) | | 272 | 0.278 |
| ex-fact pri+tax 21.23=(24) | | 2,987 | 3.060 |

FIRM (J) IMI JAVA, 1986:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 89 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.59763 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 583 | 0.598 |
| imported pack mat(2) | 50 | 0.051 |
| duty imported mat(3) | 29 | 0.030 |
| other cost (local)(4) | 99 | 0.101 |
| tot cst imp 1+2+3+4=(5) | 762 | 0.780 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 121 | 0.124 |
| local pack (7) | 29 | 0.030 |
| transport handling(8) | 112 | 0.115 |
| tot c raw 5+6+7+8=(9) | 1,024 | 1.049 |
| direct labour(10) | 334 | 0.342 |
| cost fuel oil | 140 | 0.143 |
| cost power | 57 | 0.058 |
| cost water | 84 | 0.086 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 140 | 0.143 |
| power(11b) | 57 | 0.058 |
| water(11c) | 84 | 0.086 |
| spares replacement(11d) | 45 | 0.046 |
| sum 11 | 326 | 0.334 |
| mat+lab 9+10+11a.d=(12) | 1,684 | 1.725 |
| general admin (13) | 132 | 0.135 |
| other o'heads(14) | 140 | 0.143 |
| deliv sell exp (15,16) | 13 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 1,969 | 2.017 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 1,969 | 2.017 |
| bank charges/int (18) | 23 | 0.024 |
| grand total 17(b)+18=(19) | 1,992 | 2.040 |
| profit margin % | 10.00% | |
| profit margin (20) | 199 | 0.204 |
| ex-fac price 19+20=(21) | 2,191 | 2.244 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 329 | 0.337 |
| ex-fact pri+tax 21.23=(24) | 2,519 | 2.581 |

FIRM (J) IMI JAVA, 1986:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 89 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.59763 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 583 | 0.598 |
| imported pack mat(2) | 50 | 0.051 |
| duty imported mat(3) | 29 | 0.030 |
| other cost (local)(4) | 99 | 0.101 |
| tot cst imp 1+2+3+4=(5) | 762 | 0.780 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 121 | 0.124 |
| local pack (7) | 29 | 0.030 |
| transport handling(8) | 112 | 0.115 |
| tot c raw 5+6+7+8=(9) | 1,024 | 1.049 |
| direct labour(10) | 334 | 0.342 |
| cost fuel oil | 140 | 0.143 |
| cost power | 57 | 0.058 |
| cost water | 84 | 0.086 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 98 | 0.100 |
| power(11b) | 40 | 0.041 |
| water(11c) | 67 | 0.069 |
| spares replacement(11d) | 45 | 0.046 |
| sum 11 | 250.1 | 0.256 |
| mat+lab 9+10+11a.d=(12) | 1,608 | 1.647 |
| general admin (13) | 132 | 0.135 |
| other o'heads(14) | 140 | 0.143 |
| deliv sell exp (15,16) | 13 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 1,893 | 1.939 |
| efficiency saving | 95 | 0.097 |
| tot cost incl.eff.(17b) | 1,798 | 1.842 |
| bank charges/int (18) | 23 | 0.024 |
| grand total 17(b)+18=(19) | 1,821 | 1.866 |
| profit margin % | 10.00% | |
| profit margin (20) | 182 | 0.187 |
| ex-fac price 19+20=(21) | 2,003 | 2.052 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 300 | 0.308 |
| ex-fact pri+tax 21.23=(24) | 2,304 | 2.360 |

Firm (J) IMI JAVA, 1986:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 115.7 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.59763 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 758 | 0.598 |
| imported pack mat(2) | 50 | 0.039 |
| duty imported mat(3) | 38 | 0.030 |
| other cost (local)(4) | 99 | 0.078 |
| tot cst imp 1+2+3+4=(5) | 945 | 0.745 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 121 | 0.095 |
| local pack (7) | 29 | 0.023 |
| transport handling(8) | 112 | 0.088 |
| tot c raw 5+6+7+8=(9) | 1,207 | 0.951 |
| direct labour | 334 | 0.263 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 325.65 | 0.257 |
| cost fuel oil | 140 | 0.110 |
| cost power | 57 | 0.045 |
| cost water | 84 | 0.066 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 98 | 0.077 |
| power(11b) | 40 | 0.031 |
| water(11c) | 67 | 0.053 |
| spares replacement(11d) | 45 | 0.035 |
| sum 11 | 250.1 | 0.197 |
| mat+lab 9+10+11a.d=(12) | 1,783 | 1.405 |
| general admin (13) | 132 | 0.104 |
| other o'heads(14) | 140 | 0.110 |
| deliv sell exp (15,16) | 13 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,068 | 1.630 |
| efficiency saving | 103 | 0.081 |
| tot cost incl.eff.(17b) | 1,965 | 1.548 |
| bank charges/int (18) | 23 | 0.018 |
| grand total 17(b)+18=(19) | 1,988 | 1.566 |
| profit margin % | 10.00% | |
| profit margin (20) | 199 | 0.157 |
| ex-fac price 19+20=(21) | 2,186 | 1.723 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 328 | 0.258 |
| ex-fact pri+tax 21.23=(24) | 2,514 | 1.981 |

FIRM (J) IMI JAVA, 1987.

| dollar/cedi rate | 153 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.98257 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 1,649 | 0.983 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 330 | 0.197 |
| other cost (local)(4) | | 130 | 0.077 |
| tot cst imp 1+2+3+4=(5) | | 2,109 | 1.257 |
| percent duty on raw | | 20.00% | |
| local r mat(6) | | 229 | 0.136 |
| local pack (7) | | 6 | 0.004 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 2,344 | 1.397 |
| direct labour(10) | | 458 | 0.273 |
| cost fuel oil | | 169 | 0.101 |
| cost power | | 69 | 0.041 |
| cost water | | 100 | 0.060 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 169 | 0.101 |
| power(11b) | | 69 | 0.041 |
| water(11c) | | 100 | 0.060 |
| spares replacement(11d) | | 54 | 0.032 |
| sum 11 | | 392 | 0.234 |
| mat+lab 9+10+11a.d=(12) | | 3,194 | 1.903 |
| general admin (13) | | 229 | 0.136 |
| other o'heads(14) | | 164 | 0.098 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 3,587 | 2.137 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 3,587 | 2.137 |
| bank charges/int (18) | | 12 | 0.007 |
| grand total 17(b)+18=(19) | | 3,599 | 2.144 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 360 | 0.214 |
| ex-fac price 19+20=(21) | | 3,958 | 2.359 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 792 | 0.472 |
| ex-fact pri+tax 21.23=(24) | | 4,750 | 2.831 |

FIRM (J) IMI JAVA, 1987:d.30%

| dollar/cedi rate | 199 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.98257 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 2,145 | 0.983 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 429 | 0.197 |
| other cost (local)(4) | | 130 | 0.060 |
| tot cst imp 1+2+3+4=(5) | | 2,704 | 1.239 |
| percent duty on raw | | 20.00% | |
| local r mat(6) | | 229 | 0.105 |
| local pack (7) | | 6 | 0.003 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 2,939 | 1.346 |
| direct labour(10) | | 458 | 0.210 |
| cost fuel oil | | 169 | 0.077 |
| cost power | | 69 | 0.032 |
| cost water | | 100 | 0.046 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 169 | 0.077 |
| power(11b) | | 69 | 0.032 |
| water(11c) | | 100 | 0.046 |
| spares replacement(11d) | | 54 | 0.025 |
| sum 11 | | 392 | 0.180 |
| mat+lab 9+10+11a.d=(12) | | 3,789 | 1.736 |
| general admin (13) | | 229 | 0.105 |
| other o'heads(14) | | 164 | 0.075 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 4,182 | 1.916 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 4,182 | 1.916 |
| bank charges/int (18) | | 12 | 0.005 |
| grand total 17(b)+18=(19) | | 4,194 | 1.921 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 419 | 0.192 |
| ex-fac price 19+20=(21) | | 4,613 | 2.113 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 923 | 0.423 |
| ex-fact pri+tax 21.23=(24) | | 5,535 | 2.536 |

Firm (J) IMI JAVA, 1987:r.i.t.2.5%

| dollar/cedi rate | 153 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.98257 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 1,649 | 0.983 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 330 | 0.197 |
| other cost (local)(4) | 130 | 0.077 |
| tot cst imp 1+2+3+4=(5) | 2,109 | 1.257 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 229 | 0.136 |
| local pack (7) | 6 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,344 | 1.397 |
| direct labour | 458 | 0.273 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 446.55 | 0.266 |
| cost fuel oil | 169 | 0.101 |
| cost power | 69 | 0.041 |
| cost water | 100 | 0.060 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 169 | 0.101 |
| power(11b) | 69 | 0.041 |
| water(11c) | 100 | 0.060 |
| spares replacement(11d) | 54 | 0.032 |
| sum 11 | 392 | 0.234 |
| mat+lab 9+10+11a.d=(12) | 3,182 | 1.896 |
| general admin (13) | 229 | 0.136 |
| other o'heads(14) | 164 | 0.098 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 3,575 | 2.130 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 3,575 | 2.130 |
| bank charges/int (18) | 12 | 0.007 |
| grand total 17(b)+18=(19) | 3,587 | 2.138 |
| profit margin % | 10.00% | |
| profit margin (20) | 359 | 0.214 |
| ex-fac price 19+20=(21) | 3,946 | 2.351 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 20.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 789 | 0.470 |
| ex-fact pri+tax 21.23=(24) | 4,735 | 2.822 |

FIRM (J) IMI JAVA, 1987:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 153 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.98257 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 1,649 | 0.983 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 82 | 0.049 |
| other cost (local)(4) | | 130 | 0.077 |
| tot cst imp 1+2+3+4=(5) | | 1,861 | 1.109 |
| percent duty on raw | | 5.00% | |
| local r mat(6) | | 229 | 0.136 |
| local pack (7) | | 6 | 0.004 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 2,096 | 1.249 |
| direct labour(10) | | 458 | 0.273 |
| cost fuel oil | | 169 | 0.101 |
| cost power | | 69 | 0.041 |
| cost water | | 100 | 0.060 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 169 | 0.101 |
| power(11b) | | 69 | 0.041 |
| water(11c) | | 100 | 0.060 |
| spares replacement(11d) | | 54 | 0.032 |
| sum 11 | | 392 | 0.234 |
| mat+lab 9+10+11a.d=(12) | | 2,946 | 1.756 |
| general admin (13) | | 229 | 0.136 |
| other o'heads(14) | | 164 | 0.098 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 3,339 | 1.990 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 3,339 | 1.990 |
| bank charges/int (18) | | 12 | 0.007 |
| grand total 17(b)+18=(19) | | 3,351 | 1.997 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 335 | 0.200 |
| ex-fac price 19+20=(21) | | 3,686 | 2.197 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 15.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 553 | 0.330 |
| ex-fact pri+tax 21.23=(24) | | 4,239 | 2.526 |

FIRM (J) IMI JAVA, 1987:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 153 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.98257 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,649 | 0.983 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 82 | 0.049 |
| other cost (local)(4) | 130 | 0.077 |
| tot cst imp 1+2+3+4=(5) | 1,861 | 1.109 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 229 | 0.136 |
| local pack (7) | 6 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,096 | 1.249 |
| direct labour(10) | 458 | 0.273 |
| cost fuel oil | 169 | 0.101 |
| cost power | 69 | 0.041 |
| cost water | 100 | 0.060 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 118 | 0.070 |
| power(11b) | 48 | 0.029 |
| water(11c) | 80 | 0.048 |
| spares replacement(11d) | 54 | 0.032 |
| sum 11 | 300.6 | 0.179 |
| mat+lab 9+10+11a.d=(12) | 2,855 | 1.701 |
| general admin (13) | 229 | 0.136 |
| other o'heads(14) | 164 | 0.098 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 3,248 | 1.935 |
| efficiency saving | 162 | 0.097 |
| tot cost incl.eff.(17b) | 3,086 | 1.839 |
| bank charges/int (18) | 12 | 0.007 |
| grand total 17(b)+18=(19) | 3,098 | 1.846 |
| profit margin % | 10.00% | |
| profit margin (20) | 310 | 0.185 |
| ex-fac price 19+20=(21) | 3,407 | 2.030 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 511 | 0.305 |
| ex-fact pri+tax 21.23=(24) | 3,918 | 2.335 |

Firm (J) IMI JAVA, 1987:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 199 f.30%,p.30%,w.20%,ef.5% CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.98257 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 2,145 | 0.983 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 107 | 0.049 |
| other cost (local)(4) | 130 | 0.060 |
| tot cst imp 1+2+3+4=(5) | 2,382 | 1.091 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 229 | 0.105 |
| local pack (7) | 6 | 0.003 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,617 | 1.199 |
| direct labour | 458 | 0.210 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 446.55 | 0.205 |
| cost fuel oil | 169 | 0.077 |
| cost power | 69 | 0.032 |
| cost water | 100 | 0.046 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 118 | 0.054 |
| power(11b) | 48 | 0.022 |
| water(11c) | 80 | 0.037 |
| spares replacement(11d) | 54 | 0.025 |
| sum 11 | 300.6 | 0.138 |
| mat+lab 9+10+11a.d=(12) | 3,364 | 1.541 |
| general admin (13) | 229 | 0.105 |
| other o'heads(14) | 164 | 0.075 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 3,757 | 1.721 |
| efficiency saving | 188 | 0.086 |
| tot cost incl.eff.(17b) | 3,569 | 1.635 |
| bank charges/int (18) | 12 | 0.005 |
| grand total 17(b)+18=(19) | 3,581 | 1.641 |
| profit margin % | 10.00% | |
| profit margin (20) | 358 | 0.164 |
| ex-fac price 19+20=(21) | 3,939 | 1.805 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 591 | 0.271 |
| ex-fact pri+tax 21.23=(24) | 4,530 | 2.076 |

FIRM (J) IMI JAVA, 1988.

| dollar/cedi rate | 202 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.9675 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 2,144 | 0.968 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 322 | 0.145 |
| other cost (local)(4) | 162 | 0.073 |
| tot cst imp 1+2+3+4=(5) | 2,627 | 1.186 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 309 | 0.139 |
| local pack (7) | 9 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,945 | 1.329 |
| direct labour(10) | 651 | 0.294 |
| cost fuel oil | 212 | 0.096 |
| cost power | 86 | 0.039 |
| cost water | 126 | 0.057 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 212 | 0.096 |
| power(11b) | 86 | 0.039 |
| water(11c) | 126 | 0.057 |
| spares replacement(11d) | 68 | 0.031 |
| sum 11 | 492 | 0.222 |
| mat+lab 9+10+11a.d=(12) | 4,088 | 1.845 |
| general admin (13) | 287 | 0.130 |
| other o'heads(14) | 206 | 0.093 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 4,581 | 2.068 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 4,581 | 2.068 |
| bank charges/int (18) | 16 | 0.007 |
| grand total 17(b)+18=(19) | 4,597 | 2.075 |
| profit margin % | 10.00% | |
| profit margin (20) | 460 | 0.207 |
| ex-fac price 19+20=(21) | 5,057 | 2.282 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 25.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,264 | 0.571 |
| ex-fact pri+tax 21.23=(24) | 6,321 | 2.853 |

FIRM (J) IMI JAVA, 1988:d.30%

| dollar/cedi rate | 262.6 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.9675 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 2,787 | 0.968 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 418 | 0.145 |
| other cost (local)(4) | | 162 | 0.056 |
| tot cst imp 1+2+3+4=(5) | | 3,367 | 1.169 |
| percent duty on raw | | 15.00% | |
| local r mat(6) | | 309 | 0.107 |
| local pack (7) | | 9 | 0.003 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 3,685 | 1.279 |
| direct labour(10) | | 651 | 0.226 |
| cost fuel oil | | 212 | 0.074 |
| cost power | | 86 | 0.030 |
| cost water | | 126 | 0.044 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 212 | 0.074 |
| power(11b) | | 86 | 0.030 |
| water(11c) | | 126 | 0.044 |
| spares replacement(11d) | | 68 | 0.024 |
| sum 11 | | 492 | 0.171 |
| mat+lab 9+10+11a.d=(12) | | 4,828 | 1.676 |
| general admin (13) | | 287 | 0.100 |
| other o'heads(14) | | 206 | 0.072 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 5,321 | 1.847 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 5,321 | 1.847 |
| bank charges/int (18) | | 16 | 0.006 |
| grand total 17(b)+18=(19) | | 5,337 | 1.853 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 534 | 0.185 |
| ex-fac price 19+20=(21) | | 5,870 | 2.038 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 25.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,468 | 0.510 |
| ex-fact pri+tax 21.23=(24) | | 7,338 | 2.548 |

Firm (J) IMI JAVA, 1988:r.i.t.2.5%
dollar/cedi rate 202

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.9675 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 2,144 | 0.968 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 322 | 0.145 |
| other cost (local)(4) | 162 | 0.073 |
| tot cst imp 1+2+3+4=(5) | 2,627 | 1.186 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 309 | 0.139 |
| local pack (7) | 9 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,945 | 1.329 |
| direct labour | 651 | 0.294 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 634.725 | 0.286 |
| cost fuel oil | 212 | 0.096 |
| cost power | 86 | 0.039 |
| cost water | 126 | 0.057 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 212 | 0.096 |
| power(11b) | 86 | 0.039 |
| water(11c) | 126 | 0.057 |
| spares replacement(11d) | 68 | 0.031 |
| sum 11 | 492 | 0.222 |
| mat+lab 9+10+11a.d=(12) | 4,072 | 1.838 |
| general admin (13) | 287 | 0.130 |
| other o'heads(14) | 206 | 0.093 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 4,565 | 2.060 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 4,565 | 2.060 |
| bank charges/int (18) | 16 | 0.007 |
| grand total 17(b)+18=(19) | 4,581 | 2.068 |
| profit margin % | 10.00% | |
| profit margin (20) | 458 | 0.207 |
| ex-fac price 19+20=(21) | 5,039 | 2.274 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 25.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,260 | 0.569 |
| ex-fact pri+tax 21.23=(24) | 6,299 | 2.843 |

FIRM (J) IMI JAVA, 1988:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 202 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.9675 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 2,144 | 0.968 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 107 | 0.048 |
| other cost (local)(4) | 162 | 0.073 |
| tot cst imp 1+2+3+4=(5) | 2,413 | 1.089 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 309 | 0.139 |
| local pack (7) | 9 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,731 | 1.233 |
| direct labour(10) | 651 | 0.294 |
| cost fuel oil | 212 | 0.096 |
| cost power | 86 | 0.039 |
| cost water | 126 | 0.057 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 212 | 0.096 |
| power(11b) | 86 | 0.039 |
| water(11c) | 126 | 0.057 |
| spares replacement(11d) | 68 | 0.031 |
| sum 11 | 492 | 0.222 |
| mat+lab 9+10+11a.d=(12) | 3,874 | 1.748 |
| general admin (13) | 287 | 0.130 |
| other o'heads(14) | 206 | 0.093 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 4,367 | 1.971 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 4,367 | 1.971 |
| bank charges/int (18) | 16 | 0.007 |
| grand total 17(b)+18=(19) | 4,383 | 1.978 |
| profit margin % | 10.00% | |
| profit margin (20) | 438 | 0.198 |
| ex-fac price 19+20=(21) | 4,821 | 2.176 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 723 | 0.326 |
| ex-fact pri+tax 21.23=(24) | 5,544 | 2.502 |

FIRM (J) IMI JAVA, 1988:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 202 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.9675 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 2,144 | 0.968 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 107 | 0.048 |
| other cost (local)(4) | 162 | 0.073 |
| tot cst imp 1+2+3+4=(5) | 2,413 | 1.089 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 309 | 0.139 |
| local pack (7) | 9 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 2,731 | 1.233 |
| direct labour(10) | 651 | 0.294 |
| cost fuel oil | 212 | 0.096 |
| cost power | 86 | 0.039 |
| cost water | 126 | 0.057 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 148 | 0.067 |
| power(11b) | 60 | 0.027 |
| water(11c) | 101 | 0.045 |
| spares replacement(11d) | 68 | 0.031 |
| sum 11 | 377.4 | 0.170 |
| mat+lab 9+10+11a.d=(12) | 3,759 | 1.697 |
| general admin (13) | 287 | 0.130 |
| other o'heads(14) | 206 | 0.093 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 4,252 | 1.919 |
| efficiency saving | 213 | 0.096 |
| tot cost incl.eff.(17b) | 4,040 | 1.823 |
| bank charges/int (18) | 16 | 0.007 |
| grand total 17(b)+18=(19) | 4,056 | 1.830 |
| profit margin % | 10.00% | |
| profit margin (20) | 406 | 0.183 |
| ex-fac price 19+20=(21) | 4,461 | 2.014 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 669 | 0.302 |
| ex-fact pri+tax 21.23=(24) | 5,130 | 2.316 |

Firm (J) IMI JAVA, 1988:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 262.6 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.9675 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 2,787 | 0.968 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 139 | 0.048 |
| other cost (local)(4) | 162 | 0.056 |
| tot cst imp 1+2+3+4=(5) | 3,088 | 1.072 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 309 | 0.107 |
| local pack (7) | 9 | 0.003 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,406 | 1.183 |
| direct labour | 651 | 0.226 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 634.725 | 0.220 |
| cost fuel oil | 212 | 0.074 |
| cost power | 86 | 0.030 |
| cost water | 126 | 0.044 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 148 | 0.052 |
| power(11b) | 60 | 0.021 |
| water(11c) | 101 | 0.035 |
| spares replacement(11d) | 68 | 0.024 |
| sum 11 | 377.4 | 0.131 |
| mat+lab 9+10+11a.d=(12) | 4,418 | 1.534 |
| general admin (13) | 287 | 0.100 |
| other o'heads(14) | 206 | 0.072 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 4,911 | 1.705 |
| efficiency saving | 246 | 0.085 |
| tot cost incl.eff.(17b) | 4,665 | 1.620 |
| bank charges/int (18) | 16 | 0.006 |
| grand total 17(b)+18=(19) | 4,681 | 1.625 |
| profit margin % | 10.00% | |
| profit margin (20) | 468 | 0.163 |
| ex-fac price 19+20=(21) | 5,150 | 1.788 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 772 | 0.268 |
| ex-fact pri+tax 21.23=(24) | 5,922 | 2.056 |

FIRM (J) IMI JAVA, 1989.

| | | |
|---|---|---|
| dollar/cedi rate | 270 | |
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.01777 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 3,014 | 1.018 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 452 | 0.153 |
| other cost (local)(4) | 195 | 0.066 |
| tot cst imp 1+2+3+4=(5) | 3,661 | 1.236 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 523 | 0.177 |
| local pack (7) | 14 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 4,198 | 1.418 |
| direct labour(10) | 770 | 0.260 |
| cost fuel oil | 252 | 0.085 |
| cost power | 103 | 0.035 |
| cost water | 149 | 0.050 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 252 | 0.085 |
| power(11b) | 103 | 0.035 |
| water(11c) | 149 | 0.050 |
| spares replacement(11d) | 81 | 0.027 |
| sum 11 | 585 | 0.198 |
| mat+lab 9+10+11a.d=(12) | 5,553 | 1.875 |
| general admin (13) | 433 | 0.146 |
| other o'heads(14) | 319 | 0.108 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 6,305 | 2.129 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 6,305 | 2.129 |
| bank charges/int (18) | 23 | 0.008 |
| grand total 17(b)+18=(19) | 6,328 | 2.137 |
| profit margin % | 10.00% | |
| profit margin (20) | 633 | 0.214 |
| ex-fac price 19+20=(21) | 6,961 | 2.351 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 22.50% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,566 | 0.529 |
| ex-fact pri+tax 21.23=(24) | 8,527 | 2.879 |

FIRM (J) IMI JAVA, 1989:d.30%

| dollar/cedi rate | 351 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 1.01777 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 3,918 | 1.018 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 588 | 0.153 |
| other cost (local)(4) | | 195 | 0.051 |
| tot cst imp 1+2+3+4=(5) | | 4,701 | 1.221 |
| percent duty on raw | | 15.00% | |
| local r mat(6) | | 523 | 0.136 |
| local pack (7) | | 14 | 0.004 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 5,238 | 1.361 |
| direct labour(10) | | 770 | 0.200 |
| cost fuel oil | | 252 | 0.065 |
| cost power | | 103 | 0.027 |
| cost water | | 149 | 0.039 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 252 | 0.065 |
| power(11b) | | 103 | 0.027 |
| water(11c) | | 149 | 0.039 |
| spares replacement(11d) | | 81 | 0.021 |
| sum 11 | | 585 | 0.152 |
| mat+lab 9+10+11a.d=(12) | | 6,593 | 1.713 |
| general admin (13) | | 433 | 0.112 |
| other o'heads(14) | | 319 | 0.083 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 7,345 | 1.908 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 7,345 | 1.908 |
| bank charges/int (18) | | 23 | 0.006 |
| grand total 17(b)+18=(19) | | 7,368 | 1.914 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 737 | 0.191 |
| ex-fac price 19+20=(21) | | 8,105 | 2.105 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 22.50% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,824 | 0.474 |
| ex-fact pri+tax 21.23=(24) | | 9,928 | 2.579 |

Firm (J) IMI JAVA, 1989:r.i.t.2.5%

| | | CEDIS/10.968m | $ per m |
|---|---|---|---|
| dollar/cedi rate | 270 | | |
| imp. raw matl. $ | | | 1.01777 |
| imp. pack matl. $ | | | 0 |
| imported raw mat (1) | | 3,014 | 1.018 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 452 | 0.153 |
| other cost (local)(4) | | 195 | 0.066 |
| tot cst imp 1+2+3+4=(5) | | 3,661 | 1.236 |
| percent duty on raw | | 15.00% | |
| local r mat(6) | | 523 | 0.177 |
| local pack (7) | | 14 | 0.005 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 4,198 | 1.418 |
| direct labour | | 770 | 0.260 |
| % red due to inc tax | | 2.50% | |
| cost of labour (10) | | 750.75 | 0.254 |
| cost fuel oil | | 252 | 0.085 |
| cost power | | 103 | 0.035 |
| cost water | | 149 | 0.050 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 252 | 0.085 |
| power(11b) | | 103 | 0.035 |
| water(11c) | | 149 | 0.050 |
| spares replacement(11d) | | 81 | 0.027 |
| sum 11 | | 585 | 0.198 |
| mat+lab 9+10+11a.d=(12) | | 5,534 | 1.869 |
| general admin (13) | | 433 | 0.146 |
| other o'heads(14) | | 319 | 0.108 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 6,286 | 2.123 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 6,286 | 2.123 |
| bank charges/int (18) | | 23 | 0.008 |
| grand total 17(b)+18=(19) | | 6,309 | 2.130 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 631 | 0.213 |
| ex-fac price 19+20=(21) | | 6,940 | 2.343 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 22.50% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,561 | 0.527 |
| ex-fact pri+tax 21.23=(24) | | 8,501 | 2.871 |

FIRM (J) IMI JAVA, 1989:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 270 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.01777 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 3,014 | 1.018 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 151 | 0.051 |
| other cost (local)(4) | 195 | 0.066 |
| tot cst imp 1+2+3+4=(5) | 3,360 | 1.135 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 523 | 0.177 |
| local pack (7) | 14 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,897 | 1.316 |
| direct labour(10) | 770 | 0.260 |
| cost fuel oil | 252 | 0.085 |
| cost power | 103 | 0.035 |
| cost water | 149 | 0.050 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 252 | 0.085 |
| power(11b) | 103 | 0.035 |
| water(11c) | 149 | 0.050 |
| spares replacement(11d) | 81 | 0.027 |
| sum 11 | 585 | 0.198 |
| mat+lab 9+10+11a.d=(12) | 5,252 | 1.773 |
| general admin (13) | 433 | 0.146 |
| other o'heads(14) | 319 | 0.108 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 6,004 | 2.027 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 6,004 | 2.027 |
| bank charges/int (18) | 23 | 0.008 |
| grand total 17(b)+18=(19) | 6,027 | 2.035 |
| profit margin % | 10.00% | |
| profit margin (20) | 603 | 0.204 |
| ex-fac price 19+20=(21) | 6,629 | 2.239 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 994 | 0.336 |
| ex-fact pri+tax 21.23=(24) | 7,624 | 2.574 |

FIRM (J) IMI JAVA, 1989:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate 270 | f.30%,p.30%,w.20%,ef.5% CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.01777 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 3,014 | 1.018 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 151 | 0.051 |
| other cost (local)(4) | 195 | 0.066 |
| tot cst imp 1+2+3+4=(5) | 3,360 | 1.135 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 523 | 0.177 |
| local pack (7) | 14 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,897 | 1.316 |
| direct labour(10) | 770 | 0.260 |
| cost fuel oil | 252 | 0.085 |
| cost power | 103 | 0.035 |
| cost water | 149 | 0.050 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 176 | 0.060 |
| power(11b) | 72 | 0.024 |
| water(11c) | 119 | 0.040 |
| spares replacement(11d) | 81 | 0.027 |
| sum 11 | 448.7 | 0.152 |
| mat+lab 9+10+11a.d=(12) | 5,115 | 1.727 |
| general admin (13) | 433 | 0.146 |
| other o'heads(14) | 319 | 0.108 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 5,867 | 1.981 |
| efficiency saving | 293 | 0.099 |
| tot cost incl.eff.(17b) | 5,574 | 1.882 |
| bank charges/int (18) | 23 | 0.008 |
| grand total 17(b)+18=(19) | 5,597 | 1.890 |
| profit margin % | 10.00% | |
| profit margin (20) | 560 | 0.189 |
| ex-fac price 19+20=(21) | 6,157 | 2.079 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 924 | 0.312 |
| ex-fact pri+tax 21.23=(24) | 7,080 | 2.391 |

Firm (J) IMI JAVA, 1989:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 351 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.01777 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 3,918 | 1.018 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 196 | 0.051 |
| other cost (local)(4) | 195 | 0.051 |
| tot cst imp 1+2+3+4=(5) | 4,309 | 1.119 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 523 | 0.136 |
| local pack (7) | 14 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 4,846 | 1.259 |
| direct labour | 770 | 0.200 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 750.75 | 0.195 |
| cost fuel oil | 252 | 0.065 |
| cost power | 103 | 0.027 |
| cost water | 149 | 0.039 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 176 | 0.046 |
| power(11b) | 72 | 0.019 |
| water(11c) | 119 | 0.031 |
| spares replacement(11d) | 81 | 0.021 |
| sum 11 | 448.7 | 0.117 |
| mat+lab 9+10+11a.d=(12) | 6,046 | 1.570 |
| general admin (13) | 433 | 0.112 |
| other o'heads(14) | 319 | 0.083 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 6,798 | 1.766 |
| efficiency saving | 340 | 0.088 |
| tot cost incl.eff.(17b) | 6,458 | 1.677 |
| bank charges/int (18) | 23 | 0.006 |
| grand total 17(b)+18=(19) | 6,481 | 1.683 |
| profit margin % | 10.00% | |
| profit margin (20) | 648 | 0.168 |
| ex-fac price 19+20=(21) | 7,129 | 1.852 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,069 | 0.278 |
| ex-fact pri+tax 21.23=(24) | 8,198 | 2.129 |

FIRM (J) IMI JAVA, 1990.

| dollar/cedi rate | 340 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 4,173 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 417 | 0.112 |
| other cost (local)(4) | 226 | 0.061 |
| tot cst imp 1+2+3+4=(5) | 4,816 | 1.291 |
| percent duty on raw | 10.00% | |
| local r mat(6) | 664 | 0.178 |
| local pack (7) | 17 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 5,497 | 1.474 |
| direct labour(10) | 863 | 0.231 |
| cost fuel oil | 309 | 0.083 |
| cost power | 126 | 0.034 |
| cost water | 184 | 0.049 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 309 | 0.083 |
| power(11b) | 126 | 0.034 |
| water(11c) | 184 | 0.049 |
| spares replacement(11d) | 99 | 0.027 |
| sum 11 | 718 | 0.193 |
| mat+lab 9+10+11a.d=(12) | 7,078 | 1.898 |
| general admin (13) | 462 | 0.124 |
| other o'heads(14) | 380 | 0.102 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 7,920 | 2.124 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 7,920 | 2.124 |
| bank charges/int (18) | 28 | 0.008 |
| grand total 17(b)+18=(19) | 7,948 | 2.131 |
| profit margin % | 10.00% | |
| profit margin (20) | 795 | 0.213 |
| ex-fac price 19+20=(21) | 8,743 | 2.344 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 22.50% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,967 | 0.527 |
| ex-fact pri+tax 21.23=(24) | 10,710 | 2.872 |

FIRM (J) IMI JAVA, 1990:d.30%

| dollar/cedi rate | 442 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 5,424 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 542 | 0.112 |
| other cost (local)(4) | 226 | 0.047 |
| tot cst imp 1+2+3+4=(5) | 6,193 | 1.277 |
| percent duty on raw | 10.00% | |
| local r mat(6) | 664 | 0.137 |
| local pack (7) | 17 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 6,874 | 1.418 |
| direct labour(10) | 863 | 0.178 |
| cost fuel oil | 309 | 0.064 |
| cost power | 126 | 0.026 |
| cost water | 184 | 0.038 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 309 | 0.064 |
| power(11b) | 126 | 0.026 |
| water(11c) | 184 | 0.038 |
| spares replacement(11d) | 99 | 0.020 |
| sum 11 | 718 | 0.148 |
| mat+lab 9+10+11a.d=(12) | 8,455 | 1.744 |
| general admin (13) | 462 | 0.095 |
| other o'heads(14) | 380 | 0.078 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 9,297 | 1.918 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 9,297 | 1.918 |
| bank charges/int (18) | 28 | 0.006 |
| grand total 17(b)+18=(19) | 9,325 | 1.923 |
| profit margin % | 10.00% | |
| profit margin (20) | 932 | 0.192 |
| ex-fac price 19+20=(21) | 10,257 | 2.116 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 22.50% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 2,308 | 0.476 |
| ex-fact pri+tax 21.23=(24) | 12,565 | 2.592 |

Firm (J) IMI JAVA, 1990:r.i.t.2.5%

| dollar/cedi rate | 340 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 1.11892 |
| imp. pack matl. $ | | | 0 |
| imported raw mat (1) | | 4,173 | 1.119 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 417 | 0.112 |
| other cost (local)(4) | | 226 | 0.061 |
| tot cst imp 1+2+3+4=(5) | | 4,816 | 1.291 |
| percent duty on raw | | 10.00% | |
| local r mat(6) | | 664 | 0.178 |
| local pack (7) | | 17 | 0.005 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 5,497 | 1.474 |
| direct labour | | 863 | 0.231 |
| % red due to inc tax | | 2.50% | |
| cost of labour (10) | | 841.425 | 0.226 |
| cost fuel oil | | 309 | 0.083 |
| cost power | | 126 | 0.034 |
| cost water | | 184 | 0.049 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 309 | 0.083 |
| power(11b) | | 126 | 0.034 |
| water(11c) | | 184 | 0.049 |
| spares replacement(11d) | | 99 | 0.027 |
| sum 11 | | 718 | 0.193 |
| mat+lab 9+10+11a.d=(12) | | 7,056 | 1.892 |
| general admin (13) | | 462 | 0.124 |
| other o'heads(14) | | 380 | 0.102 |
| deliv sell exp (15,16) | | 0 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 7,898 | 2.118 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 7,898 | 2.118 |
| bank charges/int (18) | | 28 | 0.008 |
| grand total 17(b)+18=(19) | | 7,926 | 2.126 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 793 | 0.213 |
| ex-fac price 19+20=(21) | | 8,719 | 2.338 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 22.50% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,962 | 0.526 |
| ex-fact pri+tax 21.23=(24) | | 10,681 | 2.864 |

FIRM (J) IMI JAVA, 1990:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 340 CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 4,173 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 209 | 0.056 |
| other cost (local)(4) | 226 | 0.061 |
| tot cst imp 1+2+3+4=(5) | 4,607 | 1.235 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 664 | 0.178 |
| local pack (7) | 17 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 5,288 | 1.418 |
| direct labour(10) | 863 | 0.231 |
| cost fuel oil | 309 | 0.083 |
| cost power | 126 | 0.034 |
| cost water | 184 | 0.049 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 309 | 0.083 |
| power(11b) | 126 | 0.034 |
| water(11c) | 184 | 0.049 |
| spares replacement(11d) | 99 | 0.027 |
| sum 11 | 718 | 0.193 |
| mat+lab 9+10+11a.d=(12) | 6,869 | 1.842 |
| general admin (13) | 462 | 0.124 |
| other o'heads(14) | 380 | 0.102 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 7,711 | 2.068 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 7,711 | 2.068 |
| bank charges/int (18) | 28 | 0.008 |
| grand total 17(b)+18=(19) | 7,739 | 2.075 |
| profit margin % | 10.00% | |
| profit margin (20) | 774 | 0.208 |
| ex-fac price 19+20=(21) | 8,513 | 2.283 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,277 | 0.342 |
| ex-fact pri+tax 21.23=(24) | 9,790 | 2.625 |

FIRM (J) IMI JAVA, 1990:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 340 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 4,173 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 209 | 0.056 |
| other cost (local)(4) | 226 | 0.061 |
| tot cst imp 1+2+3+4=(5) | 4,607 | 1.235 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 664 | 0.178 |
| local pack (7) | 17 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 5,288 | 1.418 |
| direct labour(10) | 863 | 0.231 |
| cost fuel oil | 309 | 0.083 |
| cost power | 126 | 0.034 |
| cost water | 184 | 0.049 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 216 | 0.058 |
| power(11b) | 88 | 0.024 |
| water(11c) | 147 | 0.039 |
| spares replacement(11d) | 99 | 0.027 |
| sum 11 | 550.7 | 0.148 |
| mat+lab 9+10+11a.d=(12) | 6,702 | 1.797 |
| general admin (13) | 462 | 0.124 |
| other o'heads(14) | 380 | 0.102 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 7,544 | 2.023 |
| efficiency saving | 377 | 0.101 |
| tot cost incl.eff.(17b) | 7,167 | 1.922 |
| bank charges/int (18) | 28 | 0.008 |
| grand total 17(b)+18=(19) | 7,195 | 1.929 |
| profit margin % | 10.00% | |
| profit margin (20) | 719 | 0.193 |
| ex-fac price 19+20=(21) | 7,914 | 2.122 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,187 | 0.318 |
| ex-fact pri+tax 21.23=(24) | 9,101 | 2.441 |

Firm (J) IMI JAVA, 1990:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 442 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 5,424 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 271 | 0.056 |
| other cost (local)(4) | 226 | 0.047 |
| tot cst imp 1+2+3+4=(5) | 5,922 | 1.221 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 664 | 0.137 |
| local pack (7) | 17 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 6,603 | 1.362 |
| direct labour | 863 | 0.178 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 841.425 | 0.174 |
| cost fuel oil | 309 | 0.064 |
| cost power | 126 | 0.026 |
| cost water | 184 | 0.038 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 216 | 0.045 |
| power(11b) | 88 | 0.018 |
| water(11c) | 147 | 0.030 |
| spares replacement(11d) | 99 | 0.020 |
| sum 11 | 550.7 | 0.114 |
| mat+lab 9+10+11a.d=(12) | 7,995 | 1.649 |
| general admin (13) | 462 | 0.095 |
| other o'heads(14) | 380 | 0.078 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 8,837 | 1.823 |
| efficiency saving | 442 | 0.091 |
| tot cost incl.eff.(17b) | 8,395 | 1.732 |
| bank charges/int (18) | 28 | 0.006 |
| grand total 17(b)+18=(19) | 8,423 | 1.737 |
| profit margin % | 10.00% | |
| profit margin (20) | 842 | 0.174 |
| ex-fac price 19+20=(21) | 9,265 | 1.911 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,390 | 0.287 |
| ex-fact pri+tax 21.23=(24) | 10,655 | 2.198 |

FIRM (J) IMI JAVA, 1990:r.m.0%,s.t.0%,ex.0%,

| dollar/cedi rate | 340 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 4,173 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 0 | 0.000 |
| other cost (local)(4) | 226 | 0.061 |
| tot cst imp 1+2+3+4=(5) | 4,399 | 1.180 |
| percent duty on raw | 0.00% | |
| local r mat(6) | 664 | 0.178 |
| local pack (7) | 17 | 0.005 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 5,080 | 1.362 |
| direct labour(10) | 863 | 0.231 |
| cost fuel oil | 309 | 0.083 |
| cost power | 126 | 0.034 |
| cost water | 184 | 0.049 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 216 | 0.058 |
| power(11b) | 88 | 0.024 |
| water(11c) | 147 | 0.039 |
| spares replacement(11d) | 99 | 0.027 |
| sum 11 | 550.7 | 0.148 |
| mat+lab 9+10+11a.d=(12) | 6,493 | 1.741 |
| general admin (13) | 462 | 0.124 |
| other o'heads(14) | 380 | 0.102 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 7,335 | 1.967 |
| efficiency saving | 367 | 0.098 |
| tot cost incl.eff.(17b) | 6,969 | 1.869 |
| bank charges/int (18) | 28 | 0.008 |
| grand total 17(b)+18=(19) | 6,997 | 1.876 |
| profit margin % | 10.00% | |
| profit margin (20) | 700 | 0.188 |
| ex-fac price 19+20=(21) | 7,696 | 2.064 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 0.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 0 | 0.000 |
| ex-fact pri+tax 21.23=(24) | 7,696 | 2.064 |

FIRM (J) IMI JAVA, 1990:d.30%,r.m.0%,s.t.0%,ex.0%,

| dollar/cedi rate | 442 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.11892 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 5,424 | 1.119 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 0 | 0.000 |
| other cost (local)(4) | 226 | 0.047 |
| tot cst imp 1+2+3+4=(5) | 5,650 | 1.166 |
| percent duty on raw | 0.00% | |
| local r mat(6) | 664 | 0.137 |
| local pack (7) | 17 | 0.004 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 6,331 | 1.306 |
| direct labour(10) | 863 | 0.178 |
| cost fuel oil | 309 | 0.064 |
| cost power | 126 | 0.026 |
| cost water | 184 | 0.038 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 216 | 0.045 |
| power(11b) | 88 | 0.018 |
| water(11c) | 147 | 0.030 |
| spares replacement(11d) | 99 | 0.020 |
| sum 11 | 550.7 | 0.114 |
| mat+lab 9+10+11a.d=(12) | 7,745 | 1.598 |
| general admin (13) | 462 | 0.095 |
| other o'heads(14) | 380 | 0.078 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 8,587 | 1.771 |
| efficiency saving | 429 | 0.089 |
| tot cost incl.eff.(17b) | 8,158 | 1.683 |
| bank charges/int (18) | 28 | 0.006 |
| grand total 17(b)+18=(19) | 8,186 | 1.689 |
| profit margin % | 10.00% | |
| profit margin (20) | 819 | 0.169 |
| ex-fac price 19+20=(21) | 9,004 | 1.857 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 0.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 0 | 0.000 |
| ex-fact pri+tax 21.23=(24) | 9,004 | 1.857 |

FIRM (A), REAL WAX , 1985.

| dollar/cedi rate | 54 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.25971 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 154 | 0.260 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 46 | 0.078 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 200 | 0.338 |
| percent duty on raw | 30.00% | |
| local r mat(6) | 1,614 | 2.725 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,814 | 3.063 |
| direct labour(10) | 203 | 0.343 |
| cost fuel oil | 118 | 0.199 |
| cost power | 6 | 0.010 |
| cost water | 15 | 0.025 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 118 | 0.199 |
| power(11b) | 6 | 0.010 |
| water(11c) | 15 | 0.025 |
| spares replacement(11d) | 17 | 0.029 |
| sum 11 | 156 | 0.263 |
| mat+lab 9+10+11a.d=(12) | 2,173 | 3.669 |
| general admin (13) | 120 | 0.203 |
| other o'heads(14) | 109 | 0.184 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,402 | 4.056 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,402 | 4.056 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 2,402 | 4.056 |
| profit margin % | 10.00% | |
| profit margin (20) | 240 | 0.406 |
| ex-fac price 19+20=(21) | 2,642 | 4.461 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 396 | 0.669 |
| sales tax (23) | 304 | 0.513 |
| ex-fact pri+tax 21.23=(24) | 3,342 | 5.643 |

FIRM (A), REAL WAX , 1985:d.30%

dollar/cedi rate 70.2

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.25971 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 200 | 0.260 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 60 | 0.078 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 260 | 0.338 |
| percent duty on raw | 30.00% | |
| local r mat(6) | 1,614 | 2.096 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,874 | 2.434 |
| direct labour(10) | 203 | 0.264 |
| cost fuel oil | 118 | 0.153 |
| cost power | 6 | 0.008 |
| cost water | 15 | 0.019 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 118 | 0.153 |
| power(11b) | 6 | 0.008 |
| water(11c) | 15 | 0.019 |
| spares replacement(11d) | 17 | 0.022 |
| sum 11 | 156 | 0.203 |
| mat+lab 9+10+11a.d=(12) | 2,233 | 2.900 |
| general admin (13) | 120 | 0.156 |
| other o'heads(14) | 109 | 0.142 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,462 | 3.198 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,462 | 3.198 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 2,462 | 3.198 |
| profit margin % | 10.00% | |
| profit margin (20) | 246 | 0.320 |
| ex-fac price 19+20=(21) | 2,708 | 3.517 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 406 | 0.528 |
| sales tax (23) | 311 | 0.404 |
| ex-fact pri+tax 21.23=(24) | 3,426 | 4.449 |

Firm (A), REAL WAX, 1985:r.i.t.2.5%

dollar/cedi rate 54

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.25971 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 154 | 0.260 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 46 | 0.078 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 200 | 0.338 |
| percent duty on raw | 30.00% | |
| local r mat(6) | 1,614 | 2.725 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,814 | 3.063 |
| direct labour | 203 | 0.343 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 197.925 | 0.334 |
| cost fuel oil | 118 | 0.199 |
| cost power | 6 | 0.010 |
| cost water | 15 | 0.025 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 118 | 0.199 |
| power(11b) | 6 | 0.010 |
| water(11c) | 15 | 0.025 |
| spares replacement(11d) | 17 | 0.029 |
| sum 11 | 156 | 0.263 |
| mat+lab 9+10+11a.d=(12) | 2,168 | 3.660 |
| general admin (13) | 120 | 0.203 |
| other o'heads(14) | 109 | 0.184 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,397 | 4.047 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,397 | 4.047 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 2,397 | 4.047 |
| profit margin % | 10.00% | |
| profit margin (20) | 240 | 0.405 |
| ex-fac price 19+20=(21) | 2,637 | 4.452 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 395 | 0.668 |
| sales tax (23) | 303 | 0.512 |
| ex-fact pri+tax 21.23=(24) | 3,335 | 5.631 |

FIRM (A), REAL WAX , 1985:r.m.5%, s.t.15%,ex.0%,

| dollar/cedi rate | 54 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.25971 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 154 | 0.260 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 8 | 0.013 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 162 | 0.273 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 1,614 | 2.725 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,776 | 2.998 |
| direct labour(10) | 203 | 0.343 |
| cost fuel oil | 118 | 0.199 |
| cost power | 6 | 0.010 |
| cost water | 15 | 0.025 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 118 | 0.199 |
| power(11b) | 6 | 0.010 |
| water(11c) | 15 | 0.025 |
| spares replacement(11d) | 17 | 0.029 |
| sum 11 | 156 | 0.263 |
| mat+lab 9+10+11a.d=(12) | 2,135 | 3.604 |
| general admin (13) | 120 | 0.203 |
| other o'heads(14) | 109 | 0.184 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,364 | 3.991 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,364 | 3.991 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 2,364 | 3.991 |
| profit margin % | 10.00% | |
| profit margin (20) | 236 | 0.399 |
| ex-fac price 19+20=(21) | 2,600 | 4.390 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 390 | 0.658 |
| ex-fact pri+tax 21.23=(24) | 2,990 | 5.048 |

FIRM (A), REAL WAX , 1985:r.m.5%, s.t.15%,ex.0%,
dollar/cedi rate 54 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.25971 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 154 | 0.260 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 8 | 0.013 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 162 | 0.273 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 1,614 | 2.725 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,776 | 2.998 |
| direct labour(10) | 203 | 0.343 |
| cost fuel oil | 118 | 0.199 |
| cost power | 6 | 0.010 |
| cost water | 15 | 0.025 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 83 | 0.139 |
| power(11b) | 4 | 0.007 |
| water(11c) | 12 | 0.020 |
| spares replacement(11d) | 17 | 0.029 |
| sum 11 | 115.8 | 0.196 |
| mat+lab 9+10+11a.d=(12) | 2,094 | 3.536 |
| general admin (13) | 120 | 0.203 |
| other o'heads(14) | 109 | 0.184 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,323 | 3.923 |
| efficiency saving | 116 | 0.196 |
| tot cost incl.eff.(17b) | 2,207 | 3.727 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 2,207 | 3.727 |
| profit margin % | 10.00% | |
| profit margin (20) | 221 | 0.373 |
| ex-fac price 19+20=(21) | 2,428 | 4.099 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 364 | 0.615 |
| ex-fact pri+tax 21.23=(24) | 2,792 | 4.714 |

Firm (A), REAL WAX, 1985:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%
dollar/cedi rate 70.2 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.25971 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 200 | 0.260 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 10 | 0.013 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 210 | 0.273 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 1,614 | 2.096 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 1,824 | 2.369 |
| direct labour | 203 | 0.264 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 197.925 | 0.257 |
| cost fuel oil | 118 | 0.153 |
| cost power | 6 | 0.008 |
| cost water | 15 | 0.019 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 83 | 0.107 |
| power(11b) | 4 | 0.005 |
| water(11c) | 12 | 0.016 |
| spares replacement(11d) | 17 | 0.022 |
| sum 11 | 115.8 | 0.150 |
| mat+lab 9+10+11a.d=(12) | 2,138 | 2.776 |
| general admin (13) | 120 | 0.156 |
| other o'heads(14) | 109 | 0.142 |
| deliv sell exp (15,16) | 0 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,367 | 3.074 |
| efficiency saving | 118 | 0.154 |
| tot cost incl.eff.(17b) | 2,248 | 2.920 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 2,248 | 2.920 |
| profit margin % | 10.00% | |
| profit margin (20) | 225 | 0.292 |
| ex-fac price 19+20=(21) | 2,473 | 3.212 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 371 | 0.482 |
| ex-fact pri+tax 21.23=(24) | 2,844 | 3.694 |

FIRM (A), REAL WAX , 1986.

| | | |
|---|---|---|
| dollar/cedi rate | 89 | |
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.29079 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 284 | 0.291 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 57 | 0.058 |
| other cost (local)(4) | 8 | 0.008 |
| tot cst imp 1+2+3+4=(5) | 349 | 0.357 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 1,614 | 1.653 |
| local pack (7) | 12 | 0.012 |
| transport handling(8) | 6 | 0.006 |
| tot c raw 5+6+7+8=(9) | 1,981 | 2.029 |
| direct labour(10) | 298 | 0.305 |
| cost fuel oil | 235 | 0.241 |
| cost power | 13 | 0.013 |
| cost water | 31 | 0.032 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 235 | 0.241 |
| power(11b) | 13 | 0.013 |
| water(11c) | 31 | 0.032 |
| spares replacement(11d) | 34 | 0.035 |
| sum 11 | 313 | 0.321 |
| mat+lab 9+10+11a.d=(12) | 2,592 | 2.655 |
| general admin (13) | 158 | 0.162 |
| other o'heads(14) | 85 | 0.087 |
| deliv sell exp (15,16) | 23 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,858 | 2.927 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,858 | 2.927 |
| bank charges/int (18) | 17 | 0.017 |
| grand total 17(b)+18=(19) | 2,875 | 2.945 |
| profit margin % | 10.00% | |
| profit margin (20) | 287 | 0.294 |
| ex-fac price 19+20=(21) | 3,162 | 3.239 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 474 | 0.486 |
| sales tax (23) | 364 | 0.373 |
| ex-fact pri+tax 21.23=(24) | 4,000 | 4.098 |

FIRM (A), REAL WAX , 1986:d.30%

dollar/cedi rate 115.7

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.29079 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 369 | 0.291 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 74 | 0.058 |
| other cost (local)(4) | 8 | 0.006 |
| tot cst imp 1+2+3+4=(5) | 451 | 0.355 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 1,614 | 1.272 |
| local pack (7) | 12 | 0.009 |
| transport handling(8) | 6 | 0.005 |
| tot c raw 5+6+7+8=(9) | 2,083 | 1.641 |
| direct labour(10) | 298 | 0.235 |
| cost fuel oil | 235 | 0.185 |
| cost power | 13 | 0.010 |
| cost water | 31 | 0.024 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 235 | 0.185 |
| power(11b) | 13 | 0.010 |
| water(11c) | 31 | 0.024 |
| spares replacement(11d) | 34 | 0.027 |
| sum 11 | 313 | 0.247 |
| mat+lab 9+10+11a.d=(12) | 2,694 | 2.123 |
| general admin (13) | 158 | 0.125 |
| other o'heads(14) | 85 | 0.067 |
| deliv sell exp (15,16) | 23 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,960 | 2.332 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,960 | 2.332 |
| bank charges/int (18) | 17 | 0.013 |
| grand total 17(b)+18=(19) | 2,977 | 2.346 |
| profit margin % | 10.00% | |
| profit margin (20) | 298 | 0.235 |
| ex-fac price 19+20=(21) | 3,274 | 2.580 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 491 | 0.387 |
| sales tax (23) | 377 | 0.297 |
| ex-fact pri+tax 21.23=(24) | 4,142 | 3.264 |

Firm (A), REAL WAX, 1986:r.i.t.2.5
dollar/cedi rate 89

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.29079 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 284 | 0.291 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 57 | 0.058 |
| other cost (local)(4) | 8 | 0.008 |
| tot cst imp 1+2+3+4=(5) | 349 | 0.357 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 1,614 | 1.653 |
| local pack (7) | 12 | 0.012 |
| transport handling(8) | 6 | 0.006 |
| tot c raw 5+6+7+8=(9) | 1,981 | 2.029 |
| direct labour | 298 | 0.305 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 290.55 | 0.298 |
| cost fuel oil | 235 | 0.241 |
| cost power | 13 | 0.013 |
| cost water | 31 | 0.032 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 235 | 0.241 |
| power(11b) | 13 | 0.013 |
| water(11c) | 31 | 0.032 |
| spares replacement(11d) | 34 | 0.035 |
| sum 11 | 313 | 0.321 |
| mat+lab 9+10+11a.d=(12) | 2,584 | 2.647 |
| general admin (13) | 158 | 0.162 |
| other o'heads(14) | 85 | 0.087 |
| deliv sell exp (15,16) | 23 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,850 | 2.920 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,850 | 2.920 |
| bank charges/int (18) | 17 | 0.017 |
| grand total 17(b)+18=(19) | 2,867 | 2.937 |
| profit margin % | 10.00% | |
| profit margin (20) | 287 | 0.294 |
| ex-fac price 19+20=(21) | 3,154 | 3.231 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 473 | 0.485 |
| sales tax (23) | 363 | 0.372 |
| ex-fact pri+tax 21.23=(24) | 3,990 | 4.087 |

FIRM (A), REAL WAX , 1986:r.m.5%,s.t.15%,ex.0%,
dollar/cedi rate 89

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.29079 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 284 | 0.291 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 14 | 0.015 |
| other cost (local)(4) | 8 | 0.008 |
| tot cst imp 1+2+3+4=(5) | 306 | 0.314 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 1,614 | 1.653 |
| local pack (7) | 12 | 0.012 |
| transport handling(8) | 6 | 0.006 |
| tot c raw 5+6+7+8=(9) | 1,938 | 1.985 |
| direct labour(10) | 298 | 0.305 |
| cost fuel oil | 235 | 0.241 |
| cost power | 13 | 0.013 |
| cost water | 31 | 0.032 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 235 | 0.241 |
| power(11b) | 13 | 0.013 |
| water(11c) | 31 | 0.032 |
| spares replacement(11d) | 34 | 0.035 |
| sum 11 | 313 | 0.321 |
| mat+lab 9+10+11a.d=(12) | 2,549 | 2.611 |
| general admin (13) | 158 | 0.162 |
| other o'heads(14) | 85 | 0.087 |
| deliv sell exp (15,16) | 23 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,815 | 2.884 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,815 | 2.884 |
| bank charges/int (18) | 17 | 0.017 |
| grand total 17(b)+18=(19) | 2,832 | 2.901 |
| profit margin % | 10.00% | |
| profit margin (20) | 283 | 0.290 |
| ex-fac price 19+20=(21) | 3,115 | 3.191 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 467 | 0.479 |
| ex-fact pri+tax 21.23=(24) | 3,583 | 3.670 |

FIRM (A), REAL WAX , 1986:r.m.5%,s.t.15%,ex.0%,

| dollar/cedi rate | 89 f.30%,p.30%,w.20%,ef.5% CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.29079 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 284 | 0.291 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 14 | 0.015 |
| other cost (local)(4) | 8 | 0.008 |
| tot cst imp 1+2+3+4=(5) | 306 | 0.314 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 1,614 | 1.653 |
| local pack (7) | 12 | 0.012 |
| transport handling(8) | 6 | 0.006 |
| tot c raw 5+6+7+8=(9) | 1,938 | 1.985 |
| direct labour(10) | 298 | 0.305 |
| cost fuel oil | 235 | 0.241 |
| cost power | 13 | 0.013 |
| cost water | 31 | 0.032 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 165 | 0.169 |
| power(11b) | 9 | 0.009 |
| water(11c) | 25 | 0.025 |
| spares replacement(11d) | 34 | 0.035 |
| sum 11 | 232.4 | 0.238 |
| mat+lab 9+10+11a.d=(12) | 2,468 | 2.529 |
| general admin (13) | 158 | 0.162 |
| other o'heads(14) | 85 | 0.087 |
| deliv sell exp (15,16) | 23 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,734 | 2.801 |
| efficiency saving | 137 | 0.140 |
| tot cost incl.eff.(17b) | 2,598 | 2.661 |
| bank charges/int (18) | 17 | 0.017 |
| grand total 17(b)+18=(19) | 2,615 | 2.679 |
| profit margin % | 10.00% | |
| profit margin (20) | 261 | 0.268 |
| ex-fac price 19+20=(21) | 2,876 | 2.946 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 431 | 0.442 |
| ex-fact pri+tax 21.23=(24) | 3,308 | 3.388 |

Firm (A), REAL WAX, 1986:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%
dollar/cedi rate 115.7 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.29079 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 369 | 0.291 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 18 | 0.015 |
| other cost (local)(4) | 8 | 0.006 |
| tot cst imp 1+2+3+4=(5) | 395 | 0.312 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 1,614 | 1.272 |
| local pack (7) | 12 | 0.009 |
| transport handling(8) | 6 | 0.005 |
| tot c raw 5+6+7+8=(9) | 2,027 | 1.598 |
| direct labour | 298 | 0.235 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 290.55 | 0.229 |
| cost fuel oil | 235 | 0.185 |
| cost power | 13 | 0.010 |
| cost water | 31 | 0.024 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 165 | 0.130 |
| power(11b) | 9 | 0.007 |
| water(11c) | 25 | 0.020 |
| spares replacement(11d) | 34 | 0.027 |
| sum 11 | 232.4 | 0.183 |
| mat+lab 9+10+11a.d=(12) | 2,550 | 2.010 |
| general admin (13) | 158 | 0.125 |
| other o'heads(14) | 85 | 0.067 |
| deliv sell exp (15,16) | 23 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,816 | 2.219 |
| efficiency saving | 141 | 0.111 |
| tot cost incl.eff.(17b) | 2,676 | 2.108 |
| bank charges/int (18) | 17 | 0.013 |
| grand total 17(b)+18=(19) | 2,693 | 2.122 |
| profit margin % | 10.00% | |
| profit margin (20) | 269 | 0.212 |
| ex-fac price 19+20=(21) | 2,962 | 2.334 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 444 | 0.350 |
| ex-fact pri+tax 21.23=(24) | 3,406 | 2.684 |

FIRM (A), REAL WAX , 1987.

| | | | |
|---|---|---|---|
| dollar/cedi rate | 153 | | |
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.41498 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 696 | 0.415 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 139 | 0.083 |
| other cost (local)(4) | | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | | 836 | 0.498 |
| percent duty on raw | | 20.00% | |
| local r mat(6) | | 2,424 | 1.444 |
| local pack (7) | | 0 | 0.000 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 3,260 | 1.942 |
| direct labour(10) | | 298 | 0.178 |
| cost fuel oil | | 322 | 0.192 |
| cost power | | 17 | 0.010 |
| cost water | | 43 | 0.026 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 322 | 0.192 |
| power(11b) | | 17 | 0.010 |
| water(11c) | | 43 | 0.026 |
| spares replacement(11d) | | 47 | 0.028 |
| sum 11 | | 429 | 0.256 |
| mat+lab 9+10+11a.d=(12) | | 3,987 | 2.376 |
| general admin (13) | | 392 | 0.234 |
| other o'heads(14) | | 114 | 0.068 |
| deliv sell exp (15,16) | | 30 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 4,523 | 2.695 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 4,523 | 2.695 |
| bank charges/int (18) | | 33 | 0.020 |
| grand total 17(b)+18=(19) | | 4,556 | 2.715 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 456 | 0.271 |
| ex-fac price 19+20=(21) | | 5,011 | 2.986 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,002 | 0.597 |
| ex-fact pri+tax 21.23=(24) | | 6,013 | 3.583 |

FIRM (A), REAL WAX , 1987:d.30%

| dollar/cedi rate | 199 CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.41498 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 906 | 0.415 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 181 | 0.083 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 1,087 | 0.498 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 2,424 | 1.111 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,511 | 1.609 |
| direct labour(10) | 298 | 0.137 |
| cost fuel oil | 322 | 0.148 |
| cost power | 17 | 0.008 |
| cost water | 43 | 0.020 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 322 | 0.148 |
| power(11b) | 17 | 0.008 |
| water(11c) | 43 | 0.020 |
| spares replacement(11d) | 47 | 0.022 |
| sum 11 | 429 | 0.197 |
| mat+lab 9+10+11a.d=(12) | 4,238 | 1.942 |
| general admin (13) | 392 | 0.180 |
| other o'heads(14) | 114 | 0.052 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 4,774 | 2.187 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 4,774 | 2.187 |
| bank charges/int (18) | 33 | 0.015 |
| grand total 17(b)+18=(19) | 4,807 | 2.202 |
| profit margin % | 10.00% | |
| profit margin (20) | 481 | 0.220 |
| ex-fac price 19+20=(21) | 5,288 | 2.423 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 20.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,058 | 0.485 |
| ex-fact pri+tax 21.23=(24) | 6,345 | 2.907 |

Firm (A), REAL WAX, 1987:r.i.t.2.5%

| dollar/cedi rate | 153 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.41498 |
| imp. pack matl. $ | | | 0 |
| imported raw mat (1) | | 696 | 0.415 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 139 | 0.083 |
| other cost (local)(4) | | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | | 836 | 0.498 |
| percent duty on raw | | 20.00% | |
| local r mat(6) | | 2,424 | 1.444 |
| local pack (7) | | 0 | 0.000 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 3,260 | 1.942 |
| direct labour | | 298 | 0.178 |
| % red due to inc tax | | 2.50% | |
| cost of labour (10) | | 290.55 | 0.173 |
| cost fuel oil | | 322 | 0.192 |
| cost power | | 17 | 0.010 |
| cost water | | 43 | 0.026 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 322 | 0.192 |
| power(11b) | | 17 | 0.010 |
| water(11c) | | 43 | 0.026 |
| spares replacement(11d) | | 47 | 0.028 |
| sum 11 | | 429 | 0.256 |
| mat+lab 9+10+11a.d=(12) | | 3,979 | 2.371 |
| general admin (13) | | 392 | 0.234 |
| other o'heads(14) | | 114 | 0.068 |
| deliv sell exp (15,16) | | 30 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 4,515 | 2.691 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 4,515 | 2.691 |
| bank charges/int (18) | | 33 | 0.020 |
| grand total 17(b)+18=(19) | | 4,548 | 2.710 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 455 | 0.271 |
| ex-fac price 19+20=(21) | | 5,003 | 2.981 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,001 | 0.596 |
| ex-fact pri+tax 21.23=(24) | | 6,004 | 3.578 |

FIRM (A) REAL WAX, 1987: ,r.m.5%,s.t.15%,ex.0%,
dollar/cedi rate 153

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.41498 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 696 | 0.415 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 35 | 0.021 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 731 | 0.436 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 2,424 | 1.444 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,155 | 1.880 |
| direct labour(10) | 298 | 0.178 |
| cost fuel oil | 322 | 0.192 |
| cost power | 17 | 0.010 |
| cost water | 43 | 0.026 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 322 | 0.192 |
| power(11b) | 17 | 0.010 |
| water(11c) | 43 | 0.026 |
| spares replacement(11d) | 47 | 0.028 |
| sum 11 | 429 | 0.256 |
| mat+lab 9+10+11a.d=(12) | 3,882 | 2.313 |
| general admin (13) | 392 | 0.234 |
| other o'heads(14) | 114 | 0.068 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 4,418 | 2.633 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 4,418 | 2.633 |
| bank charges/int (18) | 33 | 0.020 |
| grand total 17(b)+18=(19) | 4,451 | 2.653 |
| profit margin % | 10.00% | |
| profit margin (20) | 445 | 0.265 |
| ex-fac price 19+20=(21) | 4,896 | 2.918 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 734 | 0.438 |
| ex-fact pri+tax 21.23=(24) | 5,631 | 3.355 |

FIRM (A), REAL WAX , 1987:r.m.5%,s.t.15%,ex.0%,
dollar/cedi rate 153 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.41498 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 696 | 0.415 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 35 | 0.021 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 731 | 0.436 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 2,424 | 1.444 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,155 | 1.880 |
| direct labour(10) | 298 | 0.178 |
| cost fuel oil | 322 | 0.192 |
| cost power | 17 | 0.010 |
| cost water | 43 | 0.026 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 225 | 0.134 |
| power(11b) | 12 | 0.007 |
| water(11c) | 34 | 0.020 |
| spares replacement(11d) | 47 | 0.028 |
| sum 11 | 318.7 | 0.190 |
| mat+lab 9+10+11a.d=(12) | 3,772 | 2.248 |
| general admin (13) | 392 | 0.234 |
| other o'heads(14) | 114 | 0.068 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 4,308 | 2.567 |
| efficiency saving | 215 | 0.128 |
| tot cost incl.eff.(17b) | 4,093 | 2.439 |
| bank charges/int (18) | 33 | 0.020 |
| grand total 17(b)+18=(19) | 4,126 | 2.458 |
| profit margin % | 10.00% | |
| profit margin (20) | 413 | 0.246 |
| ex-fac price 19+20=(21) | 4,538 | 2.704 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 681 | 0.406 |
| ex-fact pri+tax 21.23=(24) | 5,219 | 3.110 |

Firm (A), REAL WAX, 1987:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 199 | f.30%,p.30%,w.20%,ef.5% |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.41498 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 906 | 0.415 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 45 | 0.021 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 951 | 0.436 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 2,424 | 1.111 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 3,375 | 1.546 |
| direct labour | 298 | 0.137 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 290.55 | 0.133 |
| cost fuel oil | 322 | 0.148 |
| cost power | 17 | 0.008 |
| cost water | 43 | 0.020 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 225 | 0.103 |
| power(11b) | 12 | 0.005 |
| water(11c) | 34 | 0.016 |
| spares replacement(11d) | 47 | 0.022 |
| sum 11 | 318.7 | 0.146 |
| mat+lab 9+10+11a.d=(12) | 3,984 | 1.825 |
| general admin (13) | 392 | 0.180 |
| other o'heads(14) | 114 | 0.052 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 4,520 | 2.071 |
| efficiency saving | 226 | 0.104 |
| tot cost incl.eff.(17b) | 4,294 | 1.967 |
| bank charges/int (18) | 33 | 0.015 |
| grand total 17(b)+18=(19) | 4,327 | 1.983 |
| profit margin % | 10.00% | |
| profit margin (20) | 433 | 0.198 |
| ex-fac price 19+20=(21) | 4,760 | 2.181 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 714 | 0.327 |
| ex-fact pri+tax 21.23=(24) | 5,474 | 2.508 |

FIRM (A) REAL WAX, 1988.

| dollar/cedi rate | 200 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.465003 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 1,020 | 0.465 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 153 | 0.070 |
| other cost (local)(4) | | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | | 1,173 | 0.535 |
| percent duty on raw | | 15.00% | |
| local r mat(6) | | 3,520 | 1.605 |
| local pack (7) | | 0 | 0.000 |
| transport handling(8) | | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | | 4,693 | 2.139 |
| direct labour(10) | | 287 | 0.131 |
| cost fuel oil | | 253 | 0.115 |
| cost power | | 21 | 0.010 |
| cost water | | 160 | 0.073 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 253 | 0.115 |
| power(11b) | | 21 | 0.010 |
| water(11c) | | 160 | 0.073 |
| spares replacement(11d) | | 22 | 0.010 |
| sum 11 | | 456 | 0.208 |
| mat+lab 9+10+11a.d=(12) | | 5,436 | 2.478 |
| general admin (13) | | 370 | 0.169 |
| other o'heads(14) | | 71 | 0.032 |
| deliv sell exp (15,16) | | 30 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 5,907 | 2.693 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 5,907 | 2.693 |
| bank charges/int (18) | | 14 | 0.006 |
| grand total 17(b)+18=(19) | | 5,921 | 2.699 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 592 | 0.270 |
| ex-fac price 19+20=(21) | | 6,513 | 2.969 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 25.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,628 | 0.742 |
| ex-fact pri+tax 21.23=(24) | | 8,141 | 3.711 |

FIRM (A) REAL WAX, 1988:dev.30%

dollar/cedi rate 260

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.465003 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,326 | 0.465 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 199 | 0.070 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 1,525 | 0.535 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 3,520 | 1.234 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 5,045 | 1.769 |
| direct labour(10) | 287 | 0.101 |
| cost fuel oil | 253 | 0.089 |
| cost power | 21 | 0.007 |
| cost water | 160 | 0.056 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 253 | 0.089 |
| power(11b) | 21 | 0.007 |
| water(11c) | 160 | 0.056 |
| spares replacement(11d) | 22 | 0.008 |
| sum 11 | 456 | 0.160 |
| mat+lab 9+10+11a.d=(12) | 5,788 | 2.030 |
| general admin (13) | 370 | 0.130 |
| other o'heads(14) | 71 | 0.025 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 6,259 | 2.195 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 6,259 | 2.195 |
| bank charges/int (18) | 14 | 0.005 |
| grand total 17(b)+18=(19) | 6,273 | 2.200 |
| profit margin % | 10.00% | |
| profit margin (20) | 627 | 0.220 |
| ex-fac price 19+20=(21) | 6,900 | 2.420 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 25.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,725 | 0.605 |
| ex-fact pri+tax 21.23=(24) | 8,625 | 3.025 |

Firm (A), REAL WAX, 1988:r.i.t.2.5%
dollar/cedi rate 200

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.465003 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 1,020 | 0.465 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 153 | 0.070 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 1,173 | 0.535 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 3,520 | 1.605 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 4,693 | 2.139 |
| direct labour | 287 | 0.131 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 279.825 | 0.128 |
| cost fuel oil | 253 | 0.115 |
| cost power | 21 | 0.010 |
| cost water | 160 | 0.073 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 253 | 0.115 |
| power(11b) | 21 | 0.010 |
| water(11c) | 160 | 0.073 |
| spares replacement(11d) | 22 | 0.010 |
| sum 11 | 456 | 0.208 |
| mat+lab 9+10+11a.d=(12) | 5,429 | 2.475 |
| general admin (13) | 370 | 0.169 |
| other o'heads(14) | 71 | 0.032 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 5,900 | 2.690 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 5,900 | 2.690 |
| bank charges/int (18) | 14 | 0.006 |
| grand total 17(b)+18=(19) | 5,914 | 2.696 |
| profit margin % | 10.00% | |
| profit margin (20) | 591 | 0.270 |
| ex-fac price 19+20=(21) | 6,505 | 2.966 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 25.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,626 | 0.741 |
| ex-fact pri+tax 21.23=(24) | 8,132 | 3.707 |

FIRM (A) REAL WAX, 1988:r.m.5%,s.t.15%, ex.0%

| dollar/cedi rate | 200 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.465003 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,020 | 0.465 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 51 | 0.023 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 1,071 | 0.488 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 3,520 | 1.605 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 4,591 | 2.093 |
| direct labour(10) | 287 | 0.131 |
| cost fuel oil | 253 | 0.115 |
| cost power | 21 | 0.010 |
| cost water | 160 | 0.073 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 253 | 0.115 |
| power(11b) | 21 | 0.010 |
| water(11c) | 160 | 0.073 |
| spares replacement(11d) | 22 | 0.010 |
| sum 11 | 456 | 0.208 |
| mat+lab 9+10+11a.d=(12) | 5,334 | 2.432 |
| general admin (13) | 370 | 0.169 |
| other o'heads(14) | 71 | 0.032 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 5,805 | 2.646 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 5,805 | 2.646 |
| bank charges/int (18) | 14 | 0.006 |
| grand total 17(b)+18=(19) | 5,819 | 2.653 |
| profit margin % | 10.00% | |
| profit margin (20) | 582 | 0.265 |
| ex-fac price 19+20=(21) | 6,401 | 2.918 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 960 | 0.438 |
| ex-fact pri+tax 21.23=(24) | 7,361 | 3.356 |

FIRM (A) REAL WAX, 1988:r.m.5%,s.t.15%, ex.0%,
dollar/cedi rate 200 f.30%,p.30%,w.20%, ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.465003 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,020 | 0.465 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 51 | 0.023 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 1,071 | 0.488 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 3,520 | 1.605 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 4,591 | 2.093 |
| direct labour(10) | 287 | 0.131 |
| cost fuel oil | 253 | 0.115 |
| cost power | 21 | 0.010 |
| cost water | 160 | 0.073 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 177 | 0.081 |
| power(11b) | 15 | 0.007 |
| water(11c) | 128 | 0.058 |
| spares replacement(11d) | 22 | 0.010 |
| sum 11 | 341.8 | 0.156 |
| mat+lab 9+10+11a.d=(12) | 5,220 | 2.380 |
| general admin (13) | 370 | 0.169 |
| other o'heads(14) | 71 | 0.032 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 5,691 | 2.594 |
| efficiency saving | 285 | 0.130 |
| tot cost incl.eff.(17b) | 5,406 | 2.465 |
| bank charges/int (18) | 14 | 0.006 |
| grand total 17(b)+18=(19) | 5,420 | 2.471 |
| profit margin % | 10.00% | |
| profit margin (20) | 542 | 0.247 |
| ex-fac price 19+20=(21) | 5,962 | 2.718 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 894 | 0.408 |
| ex-fact pri+tax 21.23=(24) | 6,857 | 3.126 |

Firm (A), REAL WAX, 1988:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 260 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.465003 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 1,326 | 0.465 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 66 | 0.023 |
| other cost (local)(4) | 0 | 0.000 |
| tot cst imp 1+2+3+4=(5) | 1,392 | 0.488 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 3,520 | 1.234 |
| local pack (7) | 0 | 0.000 |
| transport handling(8) | 0 | 0.000 |
| tot c raw 5+6+7+8=(9) | 4,912 | 1.723 |
| direct labour | 287 | 0.101 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 279.825 | 0.098 |
| cost fuel oil | 253 | 0.089 |
| cost power | 21 | 0.007 |
| cost water | 160 | 0.056 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 177 | 0.062 |
| power(11b) | 15 | 0.005 |
| water(11c) | 128 | 0.045 |
| spares replacement(11d) | 22 | 0.008 |
| sum 11 | 341.8 | 0.120 |
| mat+lab 9+10+11a.d=(12) | 5,534 | 1.941 |
| general admin (13) | 370 | 0.130 |
| other o'heads(14) | 71 | 0.025 |
| deliv sell exp (15,16) | 30 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 6,005 | 2.106 |
| efficiency saving | 300 | 0.105 |
| tot cost incl.eff.(17b) | 5,705 | 2.000 |
| bank charges/int (18) | 14 | 0.005 |
| grand total 17(b)+18=(19) | 5,719 | 2.005 |
| profit margin % | 10.00% | |
| profit margin (20) | 572 | 0.201 |
| ex-fac price 19+20=(21) | 6,291 | 2.206 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 944 | 0.331 |
| ex-fact pri+tax 21.23=(24) | 7,234 | 2.537 |

FIRM (a), REAL WAX (2 colour way), 1990.

dollar/cedi rate 340

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 3,300 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 495 | 0.133 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 3,803 | 1.020 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 4,817 | 1.292 |
| local pack (7) | 11 | 0.003 |
| transport handling(8) | 94 | 0.025 |
| tot c raw 5+6+7+8=(9) | 8,725 | 2.340 |
| direct labour(10) | 99 | 0.027 |
| cost fuel oil | 392 | 0.105 |
| cost power | 48 | 0.013 |
| cost water | 214 | 0.057 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 392 | 0.105 |
| power(11b) | 48 | 0.013 |
| water(11c) | 214 | 0.057 |
| spares replacement(11d) | 79 | 0.021 |
| sum 11 | 733 | 0.197 |
| mat+lab 9+10+11a.d=(12) | 9,557 | 2.563 |
| general admin (13) | 399 | 0.107 |
| other o'heads(14) | 232 | 0.062 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 10,192 | 2.733 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 10,192 | 2.733 |
| bank charges/int (18) | 183 | 0.049 |
| grand total 17(b)+18=(19) | 10,375 | 2.782 |
| profit margin % | 10.00% | |
| profit margin (20) | 1,038 | 0.278 |
| ex-fac price 19+20=(21) | 11,413 | 3.061 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 22.50% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 2,568 | 0.689 |
| ex-fact pri+tax 21.23=(24) | 13,981 | 3.749 |

FIRM (a), REAL WAX (2 colour way), 1990:d.30%

| dollar/cedi rate | 440 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.8848 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 4,270 | 0.885 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 640 | 0.133 |
| other cost (local)(4) | | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | | 4,919 | 1.019 |
| percent duty on raw | | 15.00% | |
| local r mat(6) | | 4,817 | 0.998 |
| local pack (7) | | 11 | 0.002 |
| transport handling(8) | | 94 | 0.019 |
| tot c raw 5+6+7+8=(9) | | 9,841 | 2.039 |
| direct labour(10) | | 99 | 0.021 |
| cost fuel oil | | 392 | 0.081 |
| cost power | | 48 | 0.010 |
| cost water | | 214 | 0.044 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 392 | 0.081 |
| power(11b) | | 48 | 0.010 |
| water(11c) | | 214 | 0.044 |
| spares replacement(11d) | | 79 | 0.016 |
| sum 11 | | 733 | 0.152 |
| mat+lab 9+10+11a.d=(12) | | 10,673 | 2.212 |
| general admin (13) | | 399 | 0.083 |
| other o'heads(14) | | 232 | 0.048 |
| deliv sell exp (15,16) | | 4 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 11,308 | 2.343 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 11,308 | 2.343 |
| bank charges/int (18) | | 183 | 0.038 |
| grand total 17(b)+18=(19) | | 11,491 | 2.381 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 1,149 | 0.238 |
| ex-fac price 19+20=(21) | | 12,641 | 2.619 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 22.50% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 2,844 | 0.589 |
| ex-fact pri+tax 21.23=(24) | | 15,485 | 3.209 |

FIRM (A) REAL WAX (2cw), 1990:r.i.t.2.5%

| dollar/cedi rate | 340 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 3,300 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 495 | 0.133 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 3,803 | 1.020 |
| percent duty on raw | 15.00% | |
| local r mat(6) | 4,817 | 1.292 |
| local pack (7) | 11 | 0.003 |
| transport handling(8) | 94 | 0.025 |
| tot c raw 5+6+7+8=(9) | 8,725 | 2.340 |
| direct labour | 99 | 0.027 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 96.525 | 0.026 |
| cost fuel oil | 392 | 0.105 |
| cost power | 48 | 0.013 |
| cost water | 214 | 0.057 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 392 | 0.105 |
| power(11b) | 48 | 0.013 |
| water(11c) | 214 | 0.057 |
| spares replacement(11d) | 79 | 0.021 |
| sum 11 | 733 | 0.197 |
| mat+lab 9+10+11a.d=(12) | 9,555 | 2.562 |
| general admin (13) | 399 | 0.107 |
| other o'heads(14) | 232 | 0.062 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 10,190 | 2.733 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 10,190 | 2.733 |
| bank charges/int (18) | 183 | 0.049 |
| grand total 17(b)+18=(19) | 10,373 | 2.782 |
| profit margin % | 10.00% | |
| profit margin (20) | 1,037 | 0.278 |
| ex-fac price 19+20=(21) | 11,410 | 3.060 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 22.50% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 2,567 | 0.688 |
| ex-fact pri+tax 21.23=(24) | 13,978 | 3.748 |

FIRM (a), REAL WAX (2 cw), 1990:r.m.5%,s.t.15%,ex.0%,
dollar/cedi rate 340

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 3,300 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 165 | 0.044 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 3,474 | 0.931 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 4,817 | 1.292 |
| local pack (7) | 11 | 0.003 |
| transport handling(8) | 94 | 0.025 |
| tot c raw 5+6+7+8=(9) | 8,396 | 2.251 |
| direct labour(10) | 99 | 0.027 |
| cost fuel oil | 392 | 0.105 |
| cost power | 48 | 0.013 |
| cost water | 214 | 0.057 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 392 | 0.105 |
| power(11b) | 48 | 0.013 |
| water(11c) | 214 | 0.057 |
| spares replacement(11d) | 79 | 0.021 |
| sum 11 | 733 | 0.197 |
| mat+lab 9+10+11a.d=(12) | 9,228 | 2.474 |
| general admin (13) | 399 | 0.107 |
| other o'heads(14) | 232 | 0.062 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 9,863 | 2.645 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 9,863 | 2.645 |
| bank charges/int (18) | 183 | 0.049 |
| grand total 17(b)+18=(19) | 10,046 | 2.694 |
| profit margin % | 10.00% | |
| profit margin (20) | 1,005 | 0.269 |
| ex-fac price 19+20=(21) | 11,050 | 2.963 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,658 | 0.444 |
| ex-fact pri+tax 21.23=(24) | 12,708 | 3.408 |

FIRM (A) REAL WAX (2cw), 1990:r.m.5%,s.t.15%,ex.0%,
dollar/cedi rate 340 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 3,300 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 165 | 0.044 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 3,474 | 0.931 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 4,817 | 1.292 |
| local pack (7) | 11 | 0.003 |
| transport handling(8) | 94 | 0.025 |
| tot c raw 5+6+7+8=(9) | 8,396 | 2.251 |
| direct labour(10) | 99 | 0.027 |
| cost fuel oil | 392 | 0.105 |
| cost power | 48 | 0.013 |
| cost water | 214 | 0.057 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 274 | 0.074 |
| power(11b) | 34 | 0.009 |
| water(11c) | 171 | 0.046 |
| spares replacement(11d) | 79 | 0.021 |
| sum 11 | 558.2 | 0.150 |
| mat+lab 9+10+11a.d=(12) | 9,053 | 2.428 |
| general admin (13) | 399 | 0.107 |
| other o'heads(14) | 232 | 0.062 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 9,688 | 2.598 |
| efficiency saving | 484 | 0.130 |
| tot cost incl.eff.(17b) | 9,203 | 2.468 |
| bank charges/int (18) | 183 | 0.049 |
| grand total 17(b)+18=(19) | 9,386 | 2.517 |
| profit margin % | 10.00% | |
| profit margin (20) | 939 | 0.252 |
| ex-fac price 19+20=(21) | 10,325 | 2.769 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,549 | 0.415 |
| ex-fact pri+tax 21.23=(24) | 11,874 | 3.184 |

FIRM (A) REAL WAX (2cw), 1990:d.30%,r.m.5%,s.t.15%,ex.0%,r.i.t.2.5
dollar/cedi rate 442 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 4,289 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 214 | 0.044 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 4,513 | 0.931 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 4,817 | 0.994 |
| local pack (7) | 11 | 0.002 |
| transport handling(8) | 94 | 0.019 |
| tot c raw 5+6+7+8=(9) | 9,435 | 1.946 |
| direct labour | 99 | 0.020 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 96.525 | 0.020 |
| cost fuel oil | 392 | 0.081 |
| cost power | 48 | 0.010 |
| cost water | 214 | 0.044 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 274 | 0.057 |
| power(11b) | 34 | 0.007 |
| water(11c) | 171 | 0.035 |
| spares replacement(11d) | 79 | 0.016 |
| sum 11 | 558.2 | 0.115 |
| mat+lab 9+10+11a.d=(12) | 10,090 | 2.081 |
| general admin (13) | 399 | 0.082 |
| other o'heads(14) | 232 | 0.048 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 10,725 | 2.212 |
| efficiency saving | 536 | 0.111 |
| tot cost incl.eff.(17b) | 10,188 | 2.102 |
| bank charges/int (18) | 183 | 0.038 |
| grand total 17(b)+18=(19) | 10,371 | 2.139 |
| profit margin % | 10.00% | |
| profit margin (20) | 1,037 | 0.214 |
| ex-fac price 19+20=(21) | 11,408 | 2.353 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 1,711 | 0.353 |
| ex-fact pri+tax 21.23=(24) | 13,120 | 2.706 |

FIRM (A) REAL WAX (2cw), 1990:r.m.0%,s.t.0%,ex.0%,

| dollar/cedi rate | 340 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 3,300 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 0 | 0.000 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 3,309 | 0.887 |
| percent duty on raw | 0.00% | |
| local r mat(6) | 4,817 | 1.292 |
| local pack (7) | 11 | 0.003 |
| transport handling(8) | 94 | 0.025 |
| tot c raw 5+6+7+8=(9) | 8,231 | 2.207 |
| direct labour(10) | 99 | 0.027 |
| cost fuel oil | 392 | 0.105 |
| cost power | 48 | 0.013 |
| cost water | 214 | 0.057 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 274 | 0.074 |
| power(11b) | 34 | 0.009 |
| water(11c) | 171 | 0.046 |
| spares replacement(11d) | 79 | 0.021 |
| sum 11 | 558.2 | 0.150 |
| mat+lab 9+10+11a.d=(12) | 8,888 | 2.383 |
| general admin (13) | 399 | 0.107 |
| other o'heads(14) | 232 | 0.062 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 9,523 | 2.554 |
| efficiency saving | 476 | 0.128 |
| tot cost incl.eff.(17b) | 9,047 | 2.426 |
| bank charges/int (18) | 183 | 0.049 |
| grand total 17(b)+18=(19) | 9,230 | 2.475 |
| profit margin % | 10.00% | |
| profit margin (20) | 923 | 0.248 |
| ex-fac price 19+20=(21) | 10,153 | 2.723 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 0.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 0 | 0.000 |
| ex-fact pri+tax 21.23=(24) | 10,153 | 2.723 |

FIRM (A) REAL WAX (2cw), 1990:d.30%,r.m.0%,s.t.0%,ex.0%,

| dollar/cedi rate | 442 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.8848 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 4,289 | 0.885 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 0 | 0.000 |
| other cost (local)(4) | 9 | 0.002 |
| tot cst imp 1+2+3+4=(5) | 4,298 | 0.887 |
| percent duty on raw | 0.00% | |
| local r mat(6) | 4,817 | 0.994 |
| local pack (7) | 11 | 0.002 |
| transport handling(8) | 94 | 0.019 |
| tot c raw 5+6+7+8=(9) | 9,220 | 1.902 |
| direct labour(10) | 99 | 0.020 |
| cost fuel oil | 392 | 0.081 |
| cost power | 48 | 0.010 |
| cost water | 214 | 0.044 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 274 | 0.057 |
| power(11b) | 34 | 0.007 |
| water(11c) | 171 | 0.035 |
| spares replacement(11d) | 79 | 0.016 |
| sum 11 | 558.2 | 0.115 |
| mat+lab 9+10+11a.d=(12) | 9,878 | 2.038 |
| general admin (13) | 399 | 0.082 |
| other o'heads(14) | 232 | 0.048 |
| deliv sell exp (15,16) | 4 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 10,513 | 2.169 |
| efficiency saving | 526 | 0.108 |
| tot cost incl.eff.(17b) | 9,987 | 2.060 |
| bank charges/int (18) | 183 | 0.038 |
| grand total 17(b)+18=(19) | 10,170 | 2.098 |
| profit margin % | 10.00% | |
| profit margin (20) | 1,017 | 0.210 |
| ex-fac price 19+20=(21) | 11,187 | 2.308 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 0.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 0 | 0.000 |
| ex-fact pri+tax 21.23=(24) | 11,187 | 2.308 |

FIRM (H), REAL WAX , 1986.

| | | |
|---|---|---|
| dollar/cedi rate | 89 | |
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.56408 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,527 | 1.564 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 305 | 0.313 |
| other cost (local)(4) | 150 | 0.154 |
| tot cst imp 1+2+3+4=(5) | 1,982 | 2.031 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 140 | 0.143 |
| local pack (7) | 58 | 0.059 |
| transport handling(8) | 22 | 0.023 |
| tot c raw 5+6+7+8=(9) | 2,202 | 2.256 |
| direct labour(10) | 499 | 0.511 |
| cost fuel oil | 145 | 0.149 |
| cost power | 60 | 0.061 |
| cost water | 87 | 0.089 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 145 | 0.149 |
| power(11b) | 60 | 0.061 |
| water(11c) | 87 | 0.089 |
| spares replacement(11d) | 46 | 0.047 |
| sum 11 | 338 | 0.346 |
| mat+lab 9+10+11a.d=(12) | 3,039 | 3.113 |
| general admin (13) | 50 | 0.051 |
| other o'heads(14) | 52 | 0.053 |
| deliv sell exp (15,16) | 21 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 3,162 | 3.239 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 3,162 | 3.239 |
| bank charges/int (18) | 8 | 0.008 |
| grand total 17(b)+18=(19) | 3,170 | 3.248 |
| profit margin % | 10.00% | |
| profit margin (20) | 317 | 0.325 |
| ex-fac price 19+20=(21) | 3,487 | 3.572 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 523 | 0.536 |
| sales tax (23) | 401 | 0.411 |
| ex-fact pri+tax 21.23=(24) | 4,411 | 4.519 |

FIRM (H), REAL WAX , 1986:d.30%

| dollar/cedi rate | 115.7 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 1.56408 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 1,985 | 1.564 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 397 | 0.313 |
| other cost (local)(4) | | 150 | 0.118 |
| tot cst imp 1+2+3+4=(5) | | 2,532 | 1.995 |
| percent duty on raw | | 20.00% | |
| local r mat(6) | | 140 | 0.110 |
| local pack (7) | | 58 | 0.046 |
| transport handling(8) | | 22 | 0.017 |
| tot c raw 5+6+7+8=(9) | | 2,752 | 2.168 |
| direct labour(10) | | 499 | 0.393 |
| cost fuel oil | | 145 | 0.114 |
| cost power | | 60 | 0.047 |
| cost water | | 87 | 0.069 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 145 | 0.114 |
| power(11b) | | 60 | 0.047 |
| water(11c) | | 87 | 0.069 |
| spares replacement(11d) | | 46 | 0.036 |
| sum 11 | | 338 | 0.266 |
| mat+lab 9+10+11a.d=(12) | | 3,589 | 2.828 |
| general admin (13) | | 50 | 0.039 |
| other o'heads(14) | | 52 | 0.041 |
| deliv sell exp (15,16) | | 21 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 3,712 | 2.925 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 3,712 | 2.925 |
| bank charges/int (18) | | 8 | 0.006 |
| grand total 17(b)+18=(19) | | 3,720 | 2.931 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 372 | 0.293 |
| ex-fac price 19+20=(21) | | 4,092 | 3.224 |
| excise tax (percent) | | 15.00% | |
| sales tax (percent) | | 10.00% | |
| excise duty (22) | | 614 | 0.484 |
| sales tax (23) | | 471 | 0.371 |
| ex-fact pri+tax 21.23=(24) | | 5,176 | 4.079 |

Firm (H) REAl wax 1986:r.i.t.2.5%

| dollar/cedi rate | 89 | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 1.56408 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 1,527 | 1.564 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 305 | 0.313 |
| other cost (local)(4) | 150 | 0.154 |
| tot cst imp 1+2+3+4=(5) | 1,982 | 2.031 |
| percent duty on raw | 20.00% | |
| local r mat(6) | 140 | 0.143 |
| local pack (7) | 58 | 0.059 |
| transport handling(8) | 22 | 0.023 |
| tot c raw 5+6+7+8=(9) | 2,202 | 2.256 |
| direct labour | 499 | 0.511 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 486.525 | 0.498 |
| cost fuel oil | 145 | 0.149 |
| cost power | 60 | 0.061 |
| cost water | 87 | 0.089 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 145 | 0.149 |
| power(11b) | 60 | 0.061 |
| water(11c) | 87 | 0.089 |
| spares replacement(11d) | 46 | 0.047 |
| sum 11 | 338 | 0.346 |
| mat+lab 9+10+11a.d=(12) | 3,027 | 3.101 |
| general admin (13) | 50 | 0.051 |
| other o'heads(14) | 52 | 0.053 |
| deliv sell exp (15,16) | 21 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 3,150 | 3.227 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 3,150 | 3.227 |
| bank charges/int (18) | 8 | 0.008 |
| grand total 17(b)+18=(19) | 3,158 | 3.235 |
| profit margin % | 10.00% | |
| profit margin (20) | 316 | 0.323 |
| ex-fac price 19+20=(21) | 3,473 | 3.558 |
| excise tax (percent) | 15.00% | |
| sales tax (percent) | 10.00% | |
| excise duty (22) | 521 | 0.534 |
| sales tax (23) | 399 | 0.409 |
| ex-fact pri+tax 21.23=(24) | 4,394 | 4.501 |

FIRM (H), REAL WAX , 1986:r.m.5%,s.t15%,ex.0%,
dollar/cedi rate 89

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.56408 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,527 | 1.564 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 76 | 0.078 |
| other cost (local)(4) | 150 | 0.154 |
| tot cst imp 1+2+3+4=(5) | 1,753 | 1.796 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 140 | 0.143 |
| local pack (7) | 58 | 0.059 |
| transport handling(8) | 22 | 0.023 |
| tot c raw 5+6+7+8=(9) | 1,973 | 2.021 |
| direct labour(10) | 499 | 0.511 |
| cost fuel oil | 145 | 0.149 |
| cost power | 60 | 0.061 |
| cost water | 87 | 0.089 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 145 | 0.149 |
| power(11b) | 60 | 0.061 |
| water(11c) | 87 | 0.089 |
| spares replacement(11d) | 46 | 0.047 |
| sum 11 | 338 | 0.346 |
| mat+lab 9+10+11a.d=(12) | 2,810 | 2.879 |
| general admin (13) | 50 | 0.051 |
| other o'heads(14) | 52 | 0.053 |
| deliv sell exp (15,16) | 21 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 2,933 | 3.005 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 2,933 | 3.005 |
| bank charges/int (18) | 8 | 0.008 |
| grand total 17(b)+18=(19) | 2,941 | 3.013 |
| profit margin % | 10.00% | |
| profit margin (20) | 294 | 0.301 |
| ex-fac price 19+20=(21) | 3,235 | 3.314 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 485 | 0.497 |
| ex-fact pri+tax 21.23=(24) | 3,721 | 3.811 |

FIRM (H), REAL WAX , 1986:r.m.5%,s.t15%,ex.0%,
dollar/cedi rate 89 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.56408 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 1,527 | 1.564 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 76 | 0.078 |
| other cost (local)(4) | 150 | 0.154 |
| tot cst imp 1+2+3+4=(5) | 1,753 | 1.796 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 140 | 0.143 |
| local pack (7) | 58 | 0.059 |
| transport handling(8) | 22 | 0.023 |
| tot c raw 5+6+7+8=(9) | 1,973 | 2.021 |
| direct labour(10) | 499 | 0.511 |
| cost fuel oil | 145 | 0.149 |
| cost power | 60 | 0.061 |
| cost water | 87 | 0.089 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 101 | 0.104 |
| power(11b) | 42 | 0.043 |
| water(11c) | 70 | 0.071 |
| spares replacement(11d) | 46 | 0.047 |
| sum 11 | 259.1 | 0.265 |
| mat+lab 9+10+11a.d=(12) | 2,731 | 2.798 |
| general admin (13) | 50 | 0.051 |
| other o'heads(14) | 52 | 0.053 |
| deliv sell exp (15,16) | 21 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 2,854 | 2.924 |
| efficiency saving | 143 | 0.146 |
| tot cost incl.eff.(17b) | 2,712 | 2.778 |
| bank charges/int (18) | 8 | 0.008 |
| grand total 17(b)+18=(19) | 2,720 | 2.786 |
| profit margin % | 10.00% | |
| profit margin (20) | 272 | 0.279 |
| ex-fac price 19+20=(21) | 2,991 | 3.065 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 449 | 0.460 |
| ex-fact pri+tax 21.23=(24) | 3,440 | 3.524 |

Firm (H) REAl wax 1986:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%
dollar/cedi rate 115.7 f.30%,p.30%,w.20%,ef.5%

| | CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 1.56408 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 1,985 | 1.564 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 99 | 0.078 |
| other cost (local)(4) | 150 | 0.118 |
| tot cst imp 1+2+3+4=(5) | 2,234 | 1.760 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 140 | 0.110 |
| local pack (7) | 58 | 0.046 |
| transport handling(8) | 22 | 0.017 |
| tot c raw 5+6+7+8=(9) | 2,454 | 1.934 |
| direct labour | 499 | 0.393 |
| % red due to inc tax | 2.50% | |
| cost of labour (10) | 486.525 | 0.383 |
| cost fuel oil | 145 | 0.114 |
| cost power | 60 | 0.047 |
| cost water | 87 | 0.069 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 101 | 0.080 |
| power(11b) | 42 | 0.033 |
| water(11c) | 70 | 0.055 |
| spares replacement(11d) | 46 | 0.036 |
| sum 11 | 259.1 | 0.204 |
| mat+lab 9+10+11a.d=(12) | 3,200 | 2.521 |
| general admin (13) | 50 | 0.039 |
| other o'heads(14) | 52 | 0.041 |
| deliv sell exp (15,16) | 21 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 3,323 | 2.618 |
| efficiency saving | 166 | 0.131 |
| tot cost incl.eff.(17b) | 3,157 | 2.487 |
| bank charges/int (18) | 8 | 0.006 |
| grand total 17(b)+18=(19) | 3,165 | 2.494 |
| profit margin % | 10.00% | |
| profit margin (20) | 316 | 0.249 |
| ex-fac price 19+20=(21) | 3,481 | 2.743 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 522 | 0.411 |
| ex-fact pri+tax 21.23=(24) | 4,003 | 3.155 |

FIRM (C), JAVA, 1987.

| | | | |
|---|---|---|---|
| dollar/cedi rate | 153 | | |
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.5786 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 971 | 0.579 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 117 | 0.069 |
| other cost (local)(4) | | 25 | 0.015 |
| tot cst imp 1+2+3+4=(5) | | 1,112 | 0.663 |
| percent duty on raw | | 12.00% | |
| local r mat(6) | | 2,359 | 1.406 |
| local pack (7) | | 18 | 0.011 |
| transport handling(8) | | 10 | 0.006 |
| tot c raw 5+6+7+8=(9) | | 3,499 | 2.085 |
| direct labour(10) | | 306 | 0.182 |
| cost fuel oil | | 100 | 0.060 |
| cost power | | 41 | 0.024 |
| cost water | | 60 | 0.036 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 100 | 0.060 |
| power(11b) | | 41 | 0.024 |
| water(11c) | | 60 | 0.036 |
| spares replacement(11d) | | 32 | 0.019 |
| sum 11 | | 233 | 0.139 |
| mat+lab 9+10+11a.d=(12) | | 4,038 | 2.407 |
| general admin (13) | | 109 | 0.065 |
| other o'heads(14) | | 278 | 0.166 |
| deliv sell exp (15,16) | | 37 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 4,462 | 2.659 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 4,462 | 2.659 |
| bank charges/int (18) | | 0 | 0.000 |
| grand total 17(b)+18=(19) | | 4,462 | 2.659 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 446 | 0.266 |
| ex-fac price 19+20=(21) | | 4,909 | 2.925 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 982 | 0.585 |
| ex-fact pri+tax 21.23=(24) | | 5,890 | 3.510 |

FIRM (C), JAVA, 1987:d.30%

| dollar/cedi rate | 199 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.5786 |
| imp. pack matl. $ | | | |
| imported raw mat (1) | | 1,263 | 0.579 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 152 | 0.069 |
| other cost (local)(4) | | 25 | 0.011 |
| tot cst imp 1+2+3+4=(5) | | 1,439 | 0.659 |
| percent duty on raw | | 12.00% | |
| local r mat(6) | | 2,359 | 1.081 |
| local pack (7) | | 18 | 0.008 |
| transport handling(8) | | 10 | 0.005 |
| tot c raw 5+6+7+8=(9) | | 3,826 | 1.753 |
| direct labour(10) | | 306 | 0.140 |
| cost fuel oil | | 100 | 0.046 |
| cost power | | 41 | 0.019 |
| cost water | | 60 | 0.027 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 100 | 0.046 |
| power(11b) | | 41 | 0.019 |
| water(11c) | | 60 | 0.027 |
| spares replacement(11d) | | 32 | 0.015 |
| sum 11 | | 233 | 0.107 |
| mat+lab 9+10+11a.d=(12) | | 4,365 | 2.000 |
| general admin (13) | | 109 | 0.050 |
| other o'heads(14) | | 278 | 0.127 |
| deliv sell exp (15,16) | | 37 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 4,789 | 2.194 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 4,789 | 2.194 |
| bank charges/int (18) | | 0 | 0.000 |
| grand total 17(b)+18=(19) | | 4,789 | 2.194 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 479 | 0.219 |
| ex-fac price 19+20=(21) | | 5,268 | 2.414 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 1,054 | 0.483 |
| ex-fact pri+tax 21.23=(24) | | 6,322 | 2.897 |

Firm (C) JAVA, 1987:r.i.t.2.5%

| dollar/cedi rate | 153 | | |
|---|---|---|---|
| | | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | | 0.5786 |
| imp. pack matl. $ | | | 0 |
| imported raw mat (1) | | 971 | 0.579 |
| imported pack mat(2) | | 0 | 0.000 |
| duty imported mat(3) | | 117 | 0.069 |
| other cost (local)(4) | | 25 | 0.015 |
| tot cst imp 1+2+3+4=(5) | | 1,112 | 0.663 |
| percent duty on raw | | 12.00% | |
| local r mat(6) | | 2,359 | 1.406 |
| local pack (7) | | 18 | 0.011 |
| transport handling(8) | | 10 | 0.006 |
| tot c raw 5+6+7+8=(9) | | 3,499 | 2.085 |
| direct labour | | 306 | 0.182 |
| % red due to inc tax | | 2.50% | |
| cost of labour (10) | | 298.35 | 0.178 |
| cost fuel oil | | 100 | 0.060 |
| cost power | | 41 | 0.024 |
| cost water | | 60 | 0.036 |
| percent red in fuel | | 0.00% | |
| percent red in power | | 0.00% | |
| percent red in water | | 0.00% | |
| fuel oil(11a) | | 100 | 0.060 |
| power(11b) | | 41 | 0.024 |
| water(11c) | | 60 | 0.036 |
| spares replacement(11d) | | 32 | 0.019 |
| sum 11 | | 233 | 0.139 |
| mat+lab 9+10+11a.d=(12) | | 4,031 | 2.402 |
| general admin (13) | | 109 | 0.065 |
| other o'heads(14) | | 278 | 0.166 |
| deliv sell exp (15,16) | | 37 | |
| efficiency improvement | | 0.00% | |
| total cost 12...16=(17a) | | 4,455 | 2.655 |
| efficiency saving | | 0 | 0.000 |
| tot cost incl.eff.(17b) | | 4,455 | 2.655 |
| bank charges/int (18) | | 0 | 0.000 |
| grand total 17(b)+18=(19) | | 4,455 | 2.655 |
| profit margin % | | 10.00% | |
| profit margin (20) | | 445 | 0.265 |
| ex-fac price 19+20=(21) | | 4,900 | 2.920 |
| excise tax (percent) | | 0.00% | |
| sales tax (percent) | | 20.00% | |
| excise duty (22) | | 0 | 0.000 |
| sales tax (23) | | 980 | 0.584 |
| ex-fact pri+tax 21.23=(24) | | 5,880 | 3.504 |

FIRM (C), JAVA, 1987:r.m.5%,s.t.15%,ex.o%

| | | |
|---|---|---|
| dollar/cedi rate | 153 | |
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.5786 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 971 | 0.579 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 49 | 0.029 |
| other cost (local)(4) | 25 | 0.015 |
| tot cst imp 1+2+3+4=(5) | 1,044 | 0.622 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 2,359 | 1.406 |
| local pack (7) | 18 | 0.011 |
| transport handling(8) | 10 | 0.006 |
| tot c raw 5+6+7+8=(9) | 3,431 | 2.045 |
| direct labour(10) | 306 | 0.182 |
| cost fuel oil | 100 | 0.060 |
| cost power | 41 | 0.024 |
| cost water | 60 | 0.036 |
| percent red in fuel | 0.00% | |
| percent red in power | 0.00% | |
| percent red in water | 0.00% | |
| fuel oil(11a) | 100 | 0.060 |
| power(11b) | 41 | 0.024 |
| water(11c) | 60 | 0.036 |
| spares replacement(11d) | 32 | 0.019 |
| sum 11 | 233 | 0.139 |
| mat+lab 9+10+11a.d=(12) | 3,970 | 2.366 |
| general admin (13) | 109 | 0.065 |
| other o'heads(14) | 278 | 0.166 |
| deliv sell exp (15,16) | 37 | |
| efficiency improvement | 0.00% | |
| total cost 12...16=(17a) | 4,394 | 2.619 |
| efficiency saving | 0 | 0.000 |
| tot cost incl.eff.(17b) | 4,394 | 2.619 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 4,394 | 2.619 |
| profit margin % | 10.00% | |
| profit margin (20) | 439 | 0.262 |
| ex-fac price 19+20=(21) | 4,834 | 2.881 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 725 | 0.432 |
| ex-fact pri+tax 21.23=(24) | 5,559 | 3.313 |

FIRM (C), JAVA, 1987:r.m.5%,s.t.15%,ex.o%

| dollar/cedi rate | 153 f.30%,p.30%,w.20%,ef.5% CEDIS/10.968m | $ per m |
|---|---|---|
| imp. raw matl. $ | | 0.5786 |
| imp. pack matl. $ | | |
| imported raw mat (1) | 971 | 0.579 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 49 | 0.029 |
| other cost (local)(4) | 25 | 0.015 |
| tot cst imp 1+2+3+4=(5) | 1,044 | 0.622 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 2,359 | 1.406 |
| local pack (7) | 18 | 0.011 |
| transport handling(8) | 10 | 0.006 |
| tot c raw 5+6+7+8=(9) | 3,431 | 2.045 |
| direct labour(10) | 306 | 0.182 |
| cost fuel oil | 100 | 0.060 |
| cost power | 41 | 0.024 |
| cost water | 60 | 0.036 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 70 | 0.042 |
| power(11b) | 29 | 0.017 |
| water(11c) | 48 | 0.029 |
| spares replacement(11d) | 32 | 0.019 |
| sum 11 | 178.7 | 0.106 |
| mat+lab 9+10+11a.d=(12) | 3,916 | 2.334 |
| general admin (13) | 109 | 0.065 |
| other o'heads(14) | 278 | 0.166 |
| deliv sell exp (15,16) | 37 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 4,340 | 2.586 |
| efficiency saving | 217 | 0.129 |
| tot cost incl.eff.(17b) | 4,123 | 2.457 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 4,123 | 2.457 |
| profit margin % | 10.00% | |
| profit margin (20) | 412 | 0.246 |
| ex-fac price 19+20=(21) | 4,536 | 2.703 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 680 | 0.405 |
| ex-fact pri+tax 21.23=(24) | 5,216 | 3.108 |

Firm (C) JAVA, 1987:d.30%,r.m5%,s.t15%,ex.0%,r.i.t.2.5%

| dollar/cedi rate | 199 f.30%,p.30%,w.20%,ef.5% | |
|---|---|---|
| | CEDIS/10.968m | $ per m |
| imp. raw matl. $ | | 0.5786 |
| imp. pack matl. $ | | 0 |
| imported raw mat (1) | 1,263 | 0.579 |
| imported pack mat(2) | 0 | 0.000 |
| duty imported mat(3) | 63 | 0.029 |
| other cost (local)(4) | 25 | 0.011 |
| tot cst imp 1+2+3+4=(5) | 1,351 | 0.619 |
| percent duty on raw | 5.00% | |
| local r mat(6) | 2,359 | 1.081 |
| local pack (7) | 18 | 0.008 |
| transport handling(8) | 10 | 0.005 |
| tot c raw 5+6+7+8=(9) | 3,738 | 1.713 |
| direct labour | 306 | 0.140 |
| '% red due to inc tax | 2.50% | |
| cost of labour (10) | 298.35 | 0.137 |
| cost fuel oil | 100 | 0.046 |
| cost power | 41 | 0.019 |
| cost water | 60 | 0.027 |
| percent red in fuel | 30.00% | |
| percent red in power | 30.00% | |
| percent red in water | 20.00% | |
| fuel oil(11a) | 70 | 0.032 |
| power(11b) | 29 | 0.013 |
| water(11c) | 48 | 0.022 |
| spares replacement(11d) | 32 | 0.015 |
| sum 11 | 178.7 | 0.082 |
| mat+lab 9+10+11a.d=(12) | 4,215 | 1.931 |
| general admin (13) | 109 | 0.050 |
| other o'heads(14) | 278 | 0.127 |
| deliv sell exp (15,16) | 37 | |
| efficiency improvement | 5.00% | |
| total cost 12...16=(17a) | 4,639 | 2.125 |
| efficiency saving | 232 | 0.106 |
| tot cost incl.eff.(17b) | 4,407 | 2.019 |
| bank charges/int (18) | 0 | 0.000 |
| grand total 17(b)+18=(19) | 4,407 | 2.019 |
| profit margin % | 10.00% | |
| profit margin (20) | 441 | 0.202 |
| ex-fac price 19+20=(21) | 4,848 | 2.221 |
| excise tax (percent) | 0.00% | |
| sales tax (percent) | 15.00% | |
| excise duty (22) | 0 | 0.000 |
| sales tax (23) | 727 | 0.333 |
| ex-fact pri+tax 21.23=(24) | 5,575 | 2.554 |