

THE EFFECTS OF UNITED STATES COTTON
EXPORT POLICIES ON THE PRICES AND
QUANTITIES OF RAW COTTON EXPORTED
BY FIVE MAJOR COMPETITORS - 1950-1962

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ABSTRACT

THE EFFECTS OF UNITED STATES COTTON EXPORT POLICIES ON THE PRICES AND QUANTITIES OF RAW COTTON EXPORTED BY FIVE MAJOR COMPETITORS — 1950-1962

by Jack Lee Hervey

The objectives of this study are: (1) identification of the effects of U. S. raw cotton export policies on U. S. cotton exports and on the raw cotton exports of five major competing exporters — the United Arab Republic (Egypt), Mexico, Pakistan, Brazil, and Sudan, (2) examination of the changes in the export market share of the six countries, and (3) consideration of apparent policy implications of U. S. cotton export policy changes.

The theoretical foundation is based on the assumption that the United States, by virtue of its relative importance in the cotton export market and the degree of federal government involvement in agricultural policy, possesses an "Institutional Advantage" over other cotton exporters. Thus, U. S. policy actions are expected to affect the prices and quantities of cotton exported from competing exporters as well as from the United States.

The primary tool of analysis utilizes graphic and tabular examination of the variations in U. S. cotton export policies and the subsequent effects on prices and exports of the six countries from 1950 through 1962. Supplementary analysis is based on a system of 12 multiple regression equations,

some of which utilize a recursive estimation of the export price and quantity variables. Within the regression system the statistical problem of multicollinearity proved troublesome. In particular, the independent variables reflecting U. S. policy actions were highly correlated; these variables include: (1) the rate of U. S. export subsidy, (2) the value of P.L. 480 exports, and (3) the value of export subsidy payments. The results of the model equations were used to indicate the relative importance of U. S. policy variables and selected export supply-demand variables on export prices and quantities.

The results indicate that although the United States remains the largest exporter of raw cotton, its world market share decreased steadily (absolutely and relatively) during the past 40 years. Conversely, the market shares of Brazil, Mexico, and Sudan have increased markedly, within an increasing world market.

Examination of the effects of U. S. cotton export policy actions centers on: (1) the imposition of export quotas for 11 months during the 1950 export year, (2) the initiation of P.L. 480 concessional sales in 1954, and (3) the introduction of export subsidies in 1955-1956. The analysis supports the hypothesis that U. S. policy actions affect cotton export prices and/or quantities of the United States and of competing exporters. The immediate effect of the export quotas and export subsidies is manifest in export price level changes, although export quantity changes are also apparent. The primary effect of P.L. 480 concessional sales is on quantity of exports;

the effect is reflected in importing countries by the substitution of concessional sale imports for regular commercial imports from the United States and/or other cotton exporters. The analysis supports the hypothesis that P.L. 480 cotton exports disrupted commercial exports during the early years of the program, especially 1956.

Except for the United States, the exporting countries considered are "developing nations;" indeed, most raw cotton exporting countries fall into this category. It is also true that cotton exports are the primary source of foreign exchange for a large number of these countries. The basic policy implication deriving from this fact and from the results of this study is that U. S. cotton export policy makers should constantly keep in perspective the potential consequences on competing exporters of any cotton export policy action. The position of "price leadership" under such circumstances carries with it the necessity for responsible action.

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By

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CHAPTER I

INTRODUCTION

Problem and Objectives

The Agricultural Adjustment Act of 1933 ushered in a new era for United States agriculture. The failure of the Federal Farm Board in its attempt to support agricultural prices through government storage programs without production controls implied the need for commodity supply controls in the implementation of the 1933 and subsequent Acts. The method of supply control incorporated restrictions on acreage planted to specific crops without direct consideration of the quantity of output produced and marketed. Thus because of higher prices (made possible by the Commodity Credit Corporation storage program), producers concentrated on increasing per acre output, thereby reducing the overall effect of the supply control program.

Within the price support program an inherent difficulty became apparent. The support of U. S. agricultural commodity prices above the level of the world market led to reductions in exports and a need for additional reductions in supply; yet the higher prices encouraged increased output. Countries formerly purchasing cotton from the United States turned increasingly to other sources. If less U. S. cotton is purchased, more cotton may be purchased from other countries, or man-made fibers may be imported and/or

produced domestically. The inconsistency of maintaining abnormally high domestic prices while trying to maintain a high level of exports, although ignored for many years, became a problem of real concern to the cotton industry and to government policy makers during the early 1950's.

Since the initiation of domestic price supports for cotton, several trends have become prominent. First, a declining world market (absolutely and relatively) for U. S. cotton is evident with a corresponding increase in the market for cotton from other producing countries. Second, a rapid increase in the use of man-made fibers as a substitute for cotton has caused a decreasing per capita consumption of cotton in the United States and a virtually stable total consumption of cotton, in spite of the continued increase in real income.

The period from the 1930's to the early 1950's allowed the cotton industry and the policy makers time to attack the domestic price support-foreign trade inconsistency. However, the need for change was not pressing; supply and demand remained reasonably well balanced as a result of the abnormal political and economic relationships of the period. The inherent problem, unrecognized by many and ignored by others, remained. By 1953, production pressure from the irrigated lands of the Southwest, coupled with an absence of the wartime level of demand, resulted in rapidly expanding U. S. stockpiles of raw cotton. As a result of the persistent arguments of economists and a few political leaders, in conjunction with the expanding stock, it was finally realized that something had to be done to cope with

the situation and to bring the supply-demand disequilibrium under control. Acreage allotments were cut, but acreage continued to move westward and yields increased; exports continued to decline; domestic consumption remained stable; stocks continued to increase.

Political pressures continued to grow for effective action in controlling the excessive stocks situation in cotton, as well as in several other commodities. This pressure was reduced by the export of cotton under provisions of the foreign aid program supporting agricultural exports, and by the initiation of the Agricultural Trade Development and Assistance Act of 1954 (Public Law 480). In addition, in 1955 and 1956 (stocks continued to increase into 1956) export subsidies for cotton were put into effect. The analysis of these export assistance programs is the core of this thesis.

This study is concerned with the price and quantity effects on cotton trade, domestic and foreign, of three aspects of U. S. cotton export policy: (1) P. L. 480, (2) the Commodity Credit Corporation export differentials on stocks and payments to exporters, and (3) the U. S. cotton export quotas of 1950.

The specific objectives of this study fall into three categories. The first objective is to identify the effects of U. S. raw cotton export policies on U. S. cotton exports (the largest of any single country) and on the raw cotton exports of five major competing exporters — United Arab Republic

(U.A.R.), Mexico, Pakistan, Brazil, and Sudan.¹ The inquiry delves into such factors as price, quantity exported, export subsidies, export taxes, and terms of trade. The second objective, closely related to and evolving from that above, is the measurement of changes in the export market share of the six countries considered. The logical third objective is to examine policy implications of changes in volume and market share as they become apparent.

Historical Perspective

Cotton production and export played a major role in the early industrial and foreign trade development of the United States. On the domestic scene cotton provided the raw material for expanding the textile industry during the 1800's. In the export sector, cotton accounted for 61 percent of U. S. export earnings in 1860.²

The relative importance of cotton as an export earner began a long-run decline after 1865, although the volume of exports continued to increase through the 1927-1928 crop year when 10.9 million bales were exported. During the period 1910-1914 cotton exports accounted for nearly

¹These five countries rank within the top seven world exporters of raw cotton. The U.S.S.R. (not considered in this study because of inadequate data) is also a major exporter of raw cotton and compares in quantity of cotton exported with the U.A.R. and Mexico. Excluding the six countries studied here, there are over 40 "Other" exporters of raw cotton. The aggregated acreage, production, and export of these "Other" countries are substantial, as exhibited in the tables below. However, the export roles of the individual countries, with the exception of the U.S.S.R., are relatively minor in the world raw cotton market.

²U. S. Department of Agriculture, 1940 Yearbook of Agriculture: Farmers in a Changing World (Washington: U. S. Government Printing Office, 1940), p. 209.

26 percent of total U. S. export earnings, but by 1948 only 4 percent of the total export earnings were derived from raw cotton.³

Within the world cotton market the United States is still the major exporter, although its position is declining. During 1930-1934 the United States accounted for 56 percent of the world export market share of raw cotton, off only 4 percentage points from 1910, but by 1960-1962 the U. S. market share had slipped to 31 percent. This decreasing export market share has caused substantial concern among those persons closely associated with the cotton industry. The weakening export position, in conjunction with stable domestic consumption and increasing production, did indeed put pressure on policy makers to "do something." That "something" during the 1950's consisted largely of U. S. surplus disposal and export subsidy programs. Analysis of these programs will be facilitated by turning first to several recent historical trends.⁴

Acreage Adjustments — Trends Mixed

World cotton acreage, in five year averages, remained relatively stable, approximately 80 million acres, from 1925 to 1962 except for the

³U. S. Bureau of the Census, Statistical Abstract of the United States, LII (Washington: U. S. Government Printing Office, 1930), p. 508; also LXX, 1949, p. 861.

⁴In order to maintain one's perspective of the cotton market it is important to realize that cotton fiber is produced as a joint product with cotton seed (cotton seed oil and meal resulting). Thus, the fats and oils market is interrelated with the cotton fiber market. For obvious reasons the fats and oils market cannot be considered in more detail here.

World War II decade. Individual country statistics generally reveal more prominent trends (see Tables 1 and 2), particularly for Brazil, Mexico, Sudan, and the United States. Brazil expanded its area of production by approximately four million acres during the 1930's. Mexico's acreage increased nearly seven times, to more than two million acres, from 1920-1924 to 1960-1962. Sudan, likewise, exhibits large relative gains — from 105 thousand acres in 1920-1925 to nearly 1.1 million acres in 1960-1962. In both Mexico and Sudan, the large acreage increases were the results of planned expansion of irrigation facilities. This expansion is expected to continue in the future.

In the United States, on the other hand, acreage declined substantially from 1920-1925 to 1960-1962. Acreage in cotton reached a peak during 1925-1929 at 42.6 million acres; after that, cotton acreage declined steadily to 15.5 million acres in 1960-1962. In spite of the decline in acreage, cotton output increased somewhat as a result of much higher yields. These increased yields are the result of improved varieties, better cultural practices, and especially a marked shift in acreage from the Atlantic Coast and Southeast to Texas and the high yielding irrigated lands of the Southwest.

Acreage data for Pakistan are available only after 1945; since then, cotton acreage has increased only slightly. Examination of the India-Burma-Pakistan complex prior to 1945 reveals that little long-term change in cotton acreage has taken place in that area. The 1920-1924 average was 22.4 million acres; the individual countries' combined average for 1960-1962 was 22.8 million acres.

Table 1. Cotton Acreage by Country, Five Year Averages, 1920-1962
(figures in thousands of acres)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | Other ^b | World Total |
|----------------------|--------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| 1920-24 | 33,899 | 1,748 | 306 | ... | 1,436 | 105 | 37,494 | 30,896 | 68,390 |
| 1925-29 | 42,600 | 1,828 | 472 | ... | 1,492 | 269 | 46,661 | 33,749 | 80,410 |
| 1930-34 | 34,657 | 1,743 | 349 | ... | 2,446 | 349 | 39,544 | 39,986 | 79,530 |
| 1935-39 | 27,788 | 1,821 | 725 | ... | 5,562 | 439 | 36,335 | 44,807 | 81,142 |
| 1940-44 | 21,992 | 1,163 | 855 | ... | 5,812 | 363 | 30,185 | 39,170 | 69,355 |
| 1945-49 | 21,258 | 1,366 | 978 | 3,026 | 4,520 | 370 | 31,519 | 29,229 | 60,748 |
| 1950-54 | 23,296 | 1,832 | 2,028 | 3,209 | 4,680 | 612 | 35,658 | 46,819 | 82,477 |
| 1955-59 | 14,613 | 1,858 | 2,291 | 3,490 | 4,320 | 784 | 27,356 | 53,450 | 80,806 |
| 1960-62 ^c | 15,504 | 1,908 | 2,085 | 3,388 | 5,333 | 1,074 | 29,293 | 50,980 | 80,273 |

^aAverages are calculated from: U. S. Department of Agriculture, Statistics on Cotton and Related Data, 1920-1956, Agricultural Marketing Service, Statistical Bulletin No. 99 (revised February 1957), 92-98; International Cotton Advisory Committee, Cotton - World Statistics, XVI (April 1963), 21-22; and XVII (April 1964), 11.

^bSee footnote 1, page 4.

^cAverage for the three years 1960-1962.

Table 2. Cotton Acreage by Country as a Percentage of the World Total, Five Year Averages, 1920-1962^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total Minus U.S. | Other ^b | World Total |
|----------------------|------|--------|-------------|---------------|--------|-------|--------------------------------|--------------------|----------------|
| 1920-24 | 49.6 | 2.6 | 0.4 | ... | 2.1 | 0.2 | 5.2 | 45.2 | 100 |
| 1925-29 | 50.5 | 2.2 | 0.6 | ... | 1.8 | 0.3 | 4.8 | 44.7 | 100 |
| 1930-34 | 43.6 | 2.2 | 0.4 | ... | 3.1 | 0.4 | 6.1 | 50.3 | 100 |
| 1935-39 | 34.2 | 2.2 | 0.9 | ... | 6.9 | 0.5 | 10.6 | 55.2 | 100 |
| 1940-44 | 31.7 | 1.7 | 1.2 | ... | 8.4 | 0.5 | 11.8 | 56.5 | 100 |
| 1945-49 | 34.9 | 2.2 | 1.6 | 5.0 | 7.4 | 0.6 | 17.0 | 48.1 | 100 |
| 1950-54 | 28.2 | 2.2 | 2.5 | 3.9 | 5.7 | 0.7 | 15.0 | 56.8 | 100 |
| 1955-59 | 18.1 | 2.3 | 2.8 | 4.3 | 5.3 | 1.0 | 15.8 | 66.1 | 100 |
| 1960-62 ^c | 19.3 | 2.4 | 2.6 | 4.2 | 6.6 | 1.3 | 17.2 | 63.5 | 100 |

^aPercentages are calculated from the averages presented in Table 1.

^bSub-total for the six countries equals "World Total" minus "Other."
See footnote 1, page 4.

^cAverages for the three years 1960-1962.

The acreage trend for the U.A.R. is approximately stable, except for a dip during the World War II period. The U.A.R.'s potential for expanding its cotton acreage is limited by the lack of sufficient water supplies.

In contrast to a stable world acreage, the total cotton acreage of the six countries considered has moved downward over the past 40 years. This is a result of the large decline in the U. S. acreage which was less than offset by acreage increases in the other five countries. During the 1920's, over 50 percent of the world cotton acreage was in these six

countries (see Table 2); indeed 50 percent of the world total was in the United States. By 1960-1962 these same countries accounted for 36.5 percent of the total and the United States for less than 20 percent of the total.

Raw Cotton Production — Trends Upward

World cotton output (see Tables 3 and 4) more than doubled to 47 million bales from 1920-1924 to 1960-1962. The U. S. output increased slightly over the 43-year period. Production was variable, reaching a peak of 15 million bales per year during 1925-1929; this production peak coincided with a record high acreage harvested. The U. S. share of world production did not increase, however, but declined from 54 percent in 1920-1924 to 31 percent in 1960-1962.

The U.A.R. found itself in much the same situation as did the United States. Total production increased somewhat during the 40-year period but not enough to keep pace with the world trend; the U.A.R.'s world production share fell by about 2 percentage points.

Mexican and Sudanese production, however, expanded both absolutely and relative to the world total. Increased acreage and substantial yield increases, especially in the case of Mexico, paced the production gains for these countries. The rapid expansion of irrigation facilities stimulated production increases both through increased acreage and through higher yields. Mexican production increased approximately 12 times to 2.2 million bales from 1920-1924 to 1960-1962. Sudan, starting from a

Table 3. Cotton Production by Country, Five Year Averages, 1920-1962
(figures in thousands of bales)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | Other ^b | World Total |
|----------------------|--------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| 1920-24 | 10,980 | 1,281 | 180 | ... | 547 | 30 | 13,017 | 7,343 | 20,360 |
| 1925-29 | 15,268 | 1,587 | 253 | ... | 504 | 126 | 17,738 | 9,420 | 27,158 |
| 1930-34 | 13,049 | 1,482 | 193 | ... | 772 | 163 | 15,659 | 10,784 | 26,443 |
| 1935-39 | 12,771 | 1,893 | 319 | ... | 1,956 | 257 | 17,197 | 14,185 | 31,382 |
| 1940-44 | 11,660 | 1,243 | 416 | ... | 2,169 | 262 | 15,750 | 11,532 | 27,282 |
| 1945-49 | 11,948 | 1,461 | 540 | ... | 1,368 | 257 | 15,573 | 10,618 | 26,191 |
| 1950-54 | 14,046 | 1,713 | 1,340 | 2,216 | 1,666 | 387 | 20,482 | 17,921 | 38,403 |
| 1955-59 | 12,945 | 1,815 | 2,049 | 1,381 | 1,490 | 499 | 20,179 | 23,724 | 43,903 |
| 1960-62 ^c | 14,607 | 1,954 | 2,167 | 1,517 | 2,250 | 740 | 23,234 | 24,081 | 47,315 |

^aAverages are calculated from: U. S. Department of Agriculture, Statistics on Cotton and Related Data, 1920-1956, Agricultural Marketing Service, Statistical Bulletin No. 99 (revised February 1957), 99-105; International Cotton Advisory Committee, Cotton - World Statistics, XVI (April 1963), 16-17; and XVII (April 1964), 8.

^bSee footnote 1, page 4.

^cAverage for the three years 1960-1962.

Table 4. Cotton Production by Country as a Percentage of the World Total, Five Year Averages, 1920-1962^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total Minus U.S. | Other ^b | World Total |
|----------------------|------|--------|-------------|---------------|--------|-------|--------------------------------|--------------------|----------------|
| 1920-24 | 53.9 | 6.3 | 0.9 | ... | 2.7 | 0.1 | 10.0 | 36.1 | 100 |
| 1925-29 | 56.2 | 5.8 | 0.9 | ... | 1.9 | 0.5 | 9.1 | 34.7 | 100 |
| 1930-34 | 49.3 | 5.6 | 0.7 | ... | 2.9 | 0.6 | 9.9 | 40.8 | 100 |
| 1935-39 | 40.7 | 6.0 | 1.0 | ... | 6.2 | 0.8 | 14.1 | 45.2 | 100 |
| 1940-44 | 42.7 | 4.6 | 1.5 | ... | 8.0 | 1.0 | 15.0 | 42.3 | 100 |
| 1945-49 | 45.6 | 5.6 | 2.1 | ... | 5.2 | 1.0 | 13.9 | 40.5 | 100 |
| 1950-54 | 36.6 | 4.5 | 3.5 | 3.5 | 4.3 | 1.0 | 17.2 | 46.2 | 100 |
| 1955-59 | 29.5 | 4.1 | 4.7 | 3.1 | 3.4 | 1.1 | 16.5 | 54.0 | 100 |
| 1960-62 ^c | 30.9 | 4.1 | 4.6 | 3.2 | 4.8 | 1.6 | 18.2 | 50.9 | 100 |

^aPercentages are calculated from the averages presented in Table 3.

^bSub-total for the six countries equals "World Total" minus "Other." See footnote 1, page 4.

^cAverages for the three years 1960-1962.

smaller base, increased production over 20 times to 740 thousand bales in 1960-1962. The surge, both in acreage and production, occurred largely after 1950 and reflects a recent emphasis on opening new land to irrigation.⁵

Brazilian cotton production parallels the pattern exhibited by changes in cotton acreage. Production expanded rapidly during the 1930's, slacked off somewhat during the late 1940's and the 1950's, and again in the early

⁵Frank Lowenstein, Extra Long Staple Cotton, Demand and Price Prospects, Report No. EC-125, a non-official report of the International Bank for Reconstruction and Development (April 1964), 33.

1960's increased substantially. As Witt noted in 1943, Brazilian cotton acreage and production are closely tied to the agronomic and economic fluctuations of the coffee industry. He argues that the rapid increase in cotton during the 1930's and early 1940's resulted mainly from large quantities of "old" coffee land being shifted to cotton production (new coffee plantings tend to be made in virgin land), along with better cotton varieties, and an increased cotton-coffee price ratio.⁶ An additional consideration in the Brazilian expansion is the parallel reduction of U. S. cotton production and exports during the 1930's which facilitated the Brazilian expansion by "releasing" export markets and to some extent supporting the world price.

Production data for Pakistan, since that country's separation from India, does not exhibit any strong trends. Since 1950, production decreased somewhat, contrary to the trend in acreage. The lack of significant yield improvements in Pakistan, as well as in the U.A.R. and to a lesser extent in Sudan, suggests that the competitive position of these three countries in the production of cotton, relative to the other major producers and for the world as a whole, is declining.

Cotton Exports — Trends Mixed

Since 1920, a gradual increase in the volume of trade in the world cotton market has occurred (see Tables 5 and 6). Considerable disruption

⁶Lawrence W. Witt, "Changes in the Agriculture of South Central Brazil," Journal of Farm Economics, XXV (August 1943), 626-628.

Table 5. Cotton Exports by Country, Five Year Averages, 1920-1962
(figures in thousands of bales)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | Other ^b | World Total |
|----------------------|-------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| 1920-24 | 6,277 | 1,263 | 77 | ... | 85 | 28 | 7,730 | 3,354 | 11,084 |
| 1925-29 | 8,575 | 1,479 | 97 | ... | 119 | 123 | 10,393 | 4,040 | 14,433 |
| 1930-34 | 7,244 | 1,560 | 29 | ... | 234 | 121 | 9,188 | 3,705 | 12,893 |
| 1935-39 | 5,300 | 1,742 | 98 | ... | 1,112 | 249 | 8,501 | 4,525 | 13,026 |
| 1940-44 | 1,372 | 758 | 49 | ... | 727 | 277 | 3,184 | 1,905 | 5,089 |
| 1945-49 | 3,929 | 1,456 | 340 | ... | 1,117 | 289 | 7,130 | 3,167 | 10,297 |
| 1950-54 | 3,977 | 1,352 | 981 | 1,591 | 729 | 351 | 8,344 | 4,062 | 12,406 |
| 1955-59 | 5,100 | 1,372 | 1,566 | 466 | 420 | 511 | 9,435 | 5,302 | 14,737 |
| 1960-62 ^c | 4,965 | 1,361 | 1,659 | 410 | 899 | 623 | 9,918 | 6,120 | 16,038 |

^aAverages are calculated from: U. S. Department of Agriculture, Statistics on Cotton and Related Data, 1920-1956, Agricultural Marketing Service, Statistical Bulletin No. 99 (revised February 1957), 34-35; International Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 41-42; and XVII (April 1964), 16.

^bSee footnote 1, page 4.

^cAverages for the three years 1960-1962.

Table 6. Cotton Exports by Country as a Percentage of the World Total, Five Year Averages, 1920-1962^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total Minus U.S. | Other ^b | World Total |
|----------------------|------|--------|-------------|---------------|--------|-------|--------------------------------|--------------------|----------------|
| 1920-24 | 56.6 | 11.4 | 0.7 | ... | 0.8 | 0.3 | 13.1 | 30.3 | 100 |
| 1925-29 | 59.4 | 10.2 | 0.7 | ... | 0.8 | 0.9 | 12.6 | 28.0 | 100 |
| 1930-34 | 56.2 | 12.1 | 0.2 | ... | 1.8 | 0.9 | 15.1 | 28.7 | 100 |
| 1935-39 | 40.7 | 13.4 | 0.8 | ... | 8.5 | 1.9 | 24.6 | 34.7 | 100 |
| 1940-44 | 27.0 | 14.9 | 1.0 | ... | 14.3 | 5.4 | 35.6 | 37.4 | 100 |
| 1945-49 | 38.2 | 14.1 | 3.3 | ... | 10.8 | 2.8 | 31.0 | 30.8 | 100 |
| 1950-54 | 32.1 | 10.9 | 7.9 | 7.7 | 5.9 | 2.8 | 35.2 | 32.7 | 100 |
| 1955-59 | 34.6 | 9.3 | 10.6 | 3.2 | 2.9 | 3.5 | 29.4 | 36.0 | 100 |
| 1960-62 ^c | 31.0 | 8.5 | 10.3 | 2.6 | 5.6 | 3.9 | 30.8 | 38.2 | 100 |

^aPercentages are calculated from the averages presented in Table 5.

^bSub-total for the six countries equals "World Total" minus "Other."
See footnote 1, page 4.

^cAverages for the three years 1960-1962.

of trade occurred, however, during the world depression of the 1930's and World War II. As with acreage and production, world figures since 1920 generally mask the most significant trends and rearrangements of the export market share for the individual countries.

Historically, the United States has been the dominant exporter of raw cotton. In 1926 U. S. raw cotton exports reached a peak of 11.3 million bales for more than 67 percent of the world market; the 1925-1929 average export reached 8.6 million bales and 59 percent of the market. However,

since then the absolute and relative share of the United States in the world cotton market has declined, and in 1955-1956 reached a market share low of 17 percent. Some recovery has occurred — the average U. S. exports for 1960-1962 accounted for 31 percent of the market. Notably, during the years 1956 and 1957, exports rose to 7.6 million bales or 48 percent of the world total and 5.7 million bales or 41 percent of the world total respectively. This compares with 2.2 million and 2.8 million bales in 1955 and 1958 respectively; apparently these gyrations resulted from U. S. export policy decisions taken at that time. More comprehensive analysis of this factor will be made later.

In contrast to the United States, Sudan and especially Mexico markedly expanded their penetration of the world market. Although Sudan's production level is relatively low compared with the other five countries considered, the domestic level of consumption is also low, thus making a large portion of total production available for export. Sudan's exports reached 3.9 percent of the world total during 1960-1962 while production accounted for only 1.6 percent of the world production. The market share also moved upward after 1920 — 0.4 percent of the world market during 1920-1924 to 3.9 percent during 1960-1962.

Mexico is an outstanding example of steady advance in the world cotton market. Exports were negligible until after World War II. During the 1945-1949 period average annual exports reached 340 thousand bales, for 3.3 percent of the market. From the 1955 crop two million bales were

exported, constituting 15.5 percent of the world total (only 1.5 percentage points less than the United States for that year). Exports eased off after 1955, but for the period 1960-1962 still held at 10.3 percent of the total world market — 1.7 million bales.

Brazilian raw cotton exports, following the pattern of domestic acreage and production, increased rapidly during the 1930's for reasons previously discussed. Large purchases by Germany and Japan prior to the outbreak of hostilities in Europe and the Pacific further stimulated Brazilian exports; these two markets were lost during the war and did not regain importance for Brazil until the early 1950's. The peak market share occurred in 1940 with 19.8 percent of the world total. After 1940, annual exports were highly variable; only after 1957 did a trend begin to reappear, with exports moving from 216 thousand bales to 1.1 million bales in 1962, or from 1.5 percent to 7.2 percent of the market.

The U.A.R., like the United States, obtained a generally declining market share of world cotton exports during the 43 years from 1920 to 1962. A particularly interesting facet of the U.A.R.'s cotton export situation is the highly stable absolute level of exports over this period. This stability is particularly apparent if one omits the World War II period.

The export situation for Pakistan may best be characterized as following a downward trend in volume exported as well as in market penetration. Pakistan's market share dropped from 7.7 percent in 1950-1954 to 2.6 percent in 1960-1962.

Examination of the combined figures for the six countries suggests that the slight tendency to increase exports was not sufficient to maintain the six-country share of total trade. However, the share of the five U. S. competitors increased substantially.

Stock Accumulations

Cotton stock levels represent another factor of vital concern in the international movement of the commodity. Several factors affect the level of raw cotton stocks in a producing country; the obvious ones are the amounts of domestic stocks previously accumulated, domestic production, domestic consumption, and cotton exports for the current year. One other less obvious but nevertheless important factor is the availability of storage facilities in the exporting country. The United States has substantial storage facilities; to a large degree these facilities are a result of the CCC non-recourse loan activity. In addition there is the need for storage facilities by the large domestic textile producing sector.

The other five cotton exporting countries have held much smaller stocks of raw cotton than has the United States. Three reasons may be suggested for this — (1) the individual governments are not generally capable of financing domestic price supports through government storage programs, (2) these countries, unlike the United States, do not have major domestic textile manufacturing industries, and (3) cotton production and export are much smaller for these countries than for the United States. A characteristic more important than the absolute amount of stocks is the consistency

with which the level is maintained. Relatively little variation occurs from year to year or over longer periods. Except for the early post World War II period, the stocks of the U.A.R., Mexico, Pakistan, Brazil, and Sudan remained quite stable, absolutely and relative to total world stocks (see Tables 7 and 8). The trend in U. S. raw cotton stocks, on the other hand, exhibits sharp year-to-year fluctuations and substantial three-to-five-year cycles.

Table 7. Cotton Stocks by Country, Five Year Averages, 1945-1963
(figures in thousands of bales)^a

| Beginning Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | Other ^b | World Total |
|---------------------------------|--------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| 1945-49 | 5,877 | 1,214 | 544 | ... | 1,836 | 247 | 9,803 | 11,402 | 21,205 |
| 1950-54 | 5,449 | 611 | 202 | 324 | 1,185 | 183 | 7,955 | 9,038 | 16,993 |
| 1955-59 | 10,946 | 536 | 240 | 307 | 628 | 354 | 13,011 | 9,755 | 22,766 |
| 1960-63 ^c | 8,459 | 378 | 264 | 241 | 805 | 445 | 10,591 | 10,199 | 20,790 |

^aAverages are calculated from: International Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 24-25; and XVII (April 1964), 7.

^bSee footnote 1, page 4.

^cAverage for the four years 1960-1963.

Table 8. Cotton Stocks by Country as a Percentage of the World Total, Five Year Averages, 1945-1963^a

| Beginning Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total Minus U.S. | Other ^b | World Total |
|---------------------------------|------|--------|-------------|---------------|--------|-------|--------------------------------|--------------------|----------------|
| 1945-49 | 27.7 | 5.7 | 2.6 | ... | 8.7 | 1.2 | 18.5 | 53.8 | 100 |
| 1950-54 | 32.1 | 3.6 | 1.2 | 1.9 | 7.0 | 1.1 | 14.7 | 53.2 | 100 |
| 1955-59 | 48.1 | 2.4 | 1.1 | 1.3 | 2.8 | 1.6 | 9.1 | 52.8 | 100 |
| 1960-63 ^c | 40.7 | 1.8 | 1.3 | 1.2 | 3.9 | 2.1 | 10.2 | 49.1 | 100 |

^aPercentages are calculated from the averages presented in Table 7.

^bSub-total for the six countries equals "World Total" minus "Other."
See footnote 1, page 4.

^cAverages for the four years 1960-1963.

The majority of the cotton stocks are held in producing countries, in particular the United States. But, those countries in which textile manufacturing is an important industry normally have substantial buffer stocks of raw cotton held by their processing industry. Raw cotton stocks data for six of the important strictly importing countries are presented in Table 9. The most dramatic trends exhibited here are the sharp decrease in stocks held in England and the correspondingly sharp increase in stocks held in Japan. As one would expect, these stock levels are closely related to the cotton import trends exhibited by the respective importing countries, as well as to the changes in the relative importance of the textile industry in the respective countries. Year-to-year fluctuations may also reflect anticipated changes in cotton prices on the part of cotton importers.

Table 9. Cotton Stocks Held by Selected Consuming Countries, Five Year Averages, 1945-1962 (figures in thousands of bales)^a

| Beginning Aug. 1- July 31 | England | West Germany | Nether- lands | Belgium | France | Japan | Sub- total | Sub- total as a Per- centage of the World Total |
|---------------------------------|---------|-----------------|------------------|---------|--------|-------|---------------|---|
| 1945-49 | 1,758 | 173 | 51 | 145 | 496 | 188 | 2,810 | 13.3 |
| 1950-54 | 1,160 | 350 | 69 | 121 | 353 | 515 | 2,589 | 15.2 |
| 1955-59 | 503 | 354 | 89 | 142 | 379 | 548 | 2,015 | 8.9 |
| 1960-62 ^b | 368 | 417 | 112 | 192 | 360 | 958 | 2,406 | 11.6 |

^aAverages are calculated from: International Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 24-25; and XVII (April 1964), 7.

^bAverage for the three years 1960-1962.

The substantial fluctuations in U. S. stocks, coupled with the relative stability in the stocks of other major exporters, lends credence to the not uncommon suggestion that the United States is in fact a residual exporter of cotton. The fact that U. S. cotton exports are also highly variable provides additional evidence for the residual exporter idea. This concept is interrelated with the relative and absolute levels of cotton prices in the world market, to which we now turn.

Cotton Prices — Declining

The most obvious price phenomenon demonstrated by the price data of the six countries over the 12-year period is the steady decrease in the price level, as shown in Table 10. Cotton prices during the late 1940's

Table 10. Cotton Prices, Average C.I.F. Liverpool Quotations, 1951-1962
(prices quoted in U. S. cents per pound)^a

| Aug. 1- July 31 | U.S. | | U.A.R. | | Mexico | | Pakistan | | Brazil | | Sudan G3L |
|--------------------|------------------------------------|------------|--------------------|------|-------------------------|------------|----------------------|----------------------|---------------------|---------------------|----------------------|
| | Memphis Territory SM 1-1/16" | SM 1-1/16" | Ashmouni F.G. | F.G. | Matamoros SM 1-1/16" | SM 1-1/16" | 289 F Punjab S.G. | 289 F Punjab S.G. | Sao Paulo Type 5 | Sao Paulo Type 5 | |
| 1951-52 | 46.16 | | 67.85 | | 43.67 | | 58.21 | | 55.75 | | 57.98 ^d |
| 1952-53 | 41.14 | | 44.20 | | 39.66 ^c | | 39.08 | | 50.47 ^d | | 45.12 ^{d,e} |
| 1953-54 | 39.62 | | 47.35 | | 38.01 | | 39.63 | | 34.31 | | 51.42 ^{d,f} |
| 1954-55 | 40.68 | | 46.86 | | 39.10 | | 40.08 | | 37.31 | | 48.09 |
| 1955-56 | 39.75 | | 46.59 | | 35.03 | | 34.95 | | 32.53 | | 46.84 |
| 1956-57 | 33.35 | | 49.59 | | 32.63 | | 34.23 | | 30.14 ^d | | 55.22 |
| 1957-58 | 35.79 | | 39.75 | | 33.81 | | 33.89 | | 28.66 ^d | | 42.28 |
| 1958-59 | 32.70 | | 32.45 | | 28.97 | | 30.64 | | 25.51 ^d | | 32.82 |
| 1959-60 | 29.75 | | 42.14 | | 29.30 | | 30.55 | | 25.72 ^d | | 39.69 |
| 1960-61 | 31.08 | | 41.58 | | 30.35 | | 32.02 | | 27.80 ^d | | 40.14 |
| 1961-62 | 31.22 | | 38.20 ^b | | 30.08 | | 32.73 | | 27.53 ^d | | 36.90 |
| 1962-63 | 30.55 | | 36.45 | | 29.11 | | 29.70 | | 26.35 | | 35.13 |

^a International Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 82-87; and XVII (April 1964), 28-29.

^b Changed to Dendara F.G.

^c Effective May 21, 1953, changed to SM 1-1/32".

^d Average is for less than 12 months.

^e Effective December 11, 1952, changed to G4L.

^f Effective April 1, 1954, changed to G5L.

and early 1950's were high relative to previous and later periods due to short cotton supplies on the world market and the high domestic price supports of the United States (the major exporter). In addition, in September of 1950, shortly after the outbreak of hostilities in Korea, the United States established "interim export allocations for cotton, totaling 2 million bales, for all importing countries other than Canada."⁷ This action by the United States supported a high price level for other exporters although some upward adjustments were made in the allocations during the year 1950-51. In August of 1951 the United States removed the restrictions on cotton exports — this action was followed by a sharp decline in the cotton price for competitor countries between 1951 and 1953 (see Table 10).⁸

Two additional facets of the price relationships should be considered at this time — more details will be provided in Chapter IV. The price data shown in Table 10 support the contention that the U. S. price generally provides an umbrella for the prices of Mexican, Brazilian, and Pakistani cotton. The prices quoted for the United States and Mexico are for comparable qualities, whereas the Brazilian and Pakistani fibers are of a shorter staple. The second facet of interest relates to the price trends of long staple fibers. The prices quoted for the long staple growers, the U.A.R. and Sudan, are for varieties producing fiber in the shorter end of the long staple range. Over the time period considered the price spread

⁷ U. S. Department of Agriculture, The Cotton Situation, Bureau of Agricultural Economics, CS-130 (September-October 1950), 7.

⁸ The Cotton Situation, CS-135 (August 1951), 6.

between the long staple and short staple qualities has declined, thus making the higher quality long staple growths potentially more competitive with the short staple fiber. The price spread between the U. S. short staple fibers and the fine long staple fibers such as Egyptian Karnak (not shown in Table 10) also decreased substantially over the period.⁹

As indicated above, price differentials for cotton result from quality differentials among different lots of cotton. Staple length, or length of the cotton fiber, is a basic quality differentiation. Within staple length grades additional quality factors such as fiber color, fiber fineness, and fiber strength are important in determining price within a given staple length grade. Although staple length may range from as little as one half an inch to well over two inches the cotton trade uses the terms "short staple" and "long staple" to define two broad quality categories. Long staple cotton is commonly defined as that fiber with a length of 1-3/8 inches or more — short staple has a fiber length less than 1-3/8 inches. As indicated above, the U.A.R. and Sudan specialize in the production of long staple producing varieties. The United States also produces some long staple cotton but it is not a major portion of U. S. production. World long staple production accounts for approximately 10 percent of total world cotton production.

Long staple cotton has historically commanded a price premium over short staple qualities. This premium is a result of several inherent quality

⁹International Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 82-87. The comparisons are made from the "Prices" Table Number 21.

advantages generally found in the long staple fibers. Relative to short staple fiber the long staple fiber is finer, stronger, and more easily worked with. Because of these qualities long staple fiber is commonly used in the manufacture of relatively expensive high quality thread, yarn, and fabric. The increased use of man-made fibers in the manufacture of high quality materials (substituting for long staple cotton) is apparently forcing a reduction in the long staple price premium. Further contributing to the decrease in demand for long staple and thus the decline in the price premium is the increased use of coarser short staple cotton in the new cotton "wash and wear" fabrics (the coarser short staple fibers withstand the chemical treatments required for "wash and wear" fabrics better than do the long staple fibers).

Historically, short and long staple cotton have been quite different products. The increased substitution of man-made fiber for long staple cotton in particular and the new manufacturing technology that has increased the demand for short staple relative to long staple have resulted in a decline in the demand for long staple fiber. Correspondingly a narrowing of the short-long staple price differential has resulted. Naturally, at lower relative prices there is increased substitution between long and short staple qualities. As fiber and mill technology continue to advance, long and short staple cotton are increasingly becoming less differentiated products.¹⁰

¹⁰ A good yet brief consideration of the long staple cotton situation is contained in Lowenstein's report, Extra Long Staple Cotton, Demand and Price Prospects.

Consumption Characteristics

Total world consumption has increased substantially since the mid-1930's, with the bulk of the advance occurring after 1950 (see Table 11). From 1949 to 1962, with much of the post-war reconstruction completed, world consumption increased from 31 million bales to 46 million bales for a 48 percent increase; from 1935 to 1962 the increase was over 57 percent. The logical question then arises — since world consumption has increased, which countries have contributed to and which countries have detracted from that increase?

The United States has shown an increase in total cotton consumption since 1935; however, since 1949, while the world total increased significantly, U. S. consumption remained stable to slightly downward.¹¹ Consumption fared even less well in the traditional bastion of textile manufacturing; in England consumption declined over 700 thousand bales from 1935 to 1949 and more than one million bales from 1949 to 1962. Consumption in France and West Germany, except for the 1940's, remained stable to slightly upward. Japanese consumption increased nearly three-fold from 1949 to 1962; however, for the pre-war to post-war period of 1935 to 1962 there was an absolute decline. The countries with stable

¹¹ Consumption figures for individual countries may be somewhat misleading in that they include mill consumption and estimated consumption of cotton processed by individuals for home use. In addition, cotton yarn, fabric, and garments manufactured for export may be included. Thus domestic cotton consumption may be over-stated if the specified country is an exporter of fabricated cotton goods (India-Pakistan and Japan are good examples of this situation).

Table 11. Total Cotton Consumption for Selected Countries, Five Year Averages, 1935-1962
(figures in thousands of bales)^a

| Aug. 1- July 31 | U.S. | France | West Germany | U.K. | Japan | India- Pakistan | Italy | Sub- total | Other | World Total |
|----------------------|--------|--------|-----------------|-------|-------|--------------------|-------|---------------|--------|----------------|
| 1935-39 | 6,938 | 1,214 | 1,086 | 2,821 | 3,095 | 3,166 | 642 | 18,963 | 11,259 | 30,222 |
| 1940-44 | 10,301 | 185 | 146 | 1,734 | 684 | 4,122 | 71 | 17,242 | 7,583 | 24,825 |
| 1945-49 | 9,044 | 1,046 | 416 | 1,868 | 632 | 3,716 | 777 | 17,500 | 11,032 | 28,532 |
| 1950-54 | 9,317 | 1,247 | 1,112 | 1,811 | 2,013 | 4,065 | 885 | 20,448 | 16,718 | 37,166 |
| 1955-59 | 8,709 | 1,309 | 1,402 | 1,438 | 2,590 | 5,352 | 881 | 21,681 | 22,530 | 44,211 |
| 1960-62 ^b | 8,554 | 1,330 | 1,400 | 1,104 | 3,247 | 5,962 | 1,050 | 22,140 | 24,467 | 46,607 |

^aAverages are calculated from: International Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 26-31; and XVII (April 1964), 12-13.

^bAverage for the three years 1960-1962.

or declining cotton consumption are generally the more developed nations — these are the countries which are using increasingly large amounts of man-made fibers. Most of Western Europe, Canada, and the United States fall into this category. Thus the increase in cotton consumption is coming from the less developed nations.

In India-Pakistan, cotton consumption increased over three million bales from 1935 to 1963 (a 107 percent increase). Brazil and Columbia, and to a lesser extent several other Latin American nations, also had large percentage gains in consumption. In addition, substantial consumption gains occurred within the communist areas — the U.S.S.R., Mainland China, and Eastern Europe increased consumption by 99 percent between 1935 and 1962. This represents seven million bales, and nearly half of the total world increase for that period.

Competition from Man-Made Fiber

Any discussion of the demand for and consumption of cotton must consider the increasing substitution of man-made fibers for cotton. Various types of man-made fibers have been made for a number of decades. Before World War II, man-made fibers represented a serious challenge to natural fibers in general and to cotton in particular. The development of the non-cellulosic polymer fibers, such as nylon, during the 1930's and 1940's, along with technological improvements in the cellulose, resulted in a group of new fiber products that began encroaching upon the traditional cotton domain (see Table 12).

Table 12. World Production of Specified Textile Fibers in Millions of Pounds,
and as a Percentage of the World Total^a

| Year | <u>Rayon and Acetate</u> | | <u>Noncellulosics</u> | | <u>Total Man-Made</u> | | <u>Raw Cotton</u> | | <u>Raw Wool</u> | | <u>World Total</u> | |
|------|--------------------------|------------------|-----------------------|------------------|-----------------------|------------------|--------------------|------------------|--------------------|------------------|--------------------|------------------|
| | Millions of Pounds | Percent of Total | Millions of Pounds | Percent of Total | Millions of Pounds | Percent of Total | Millions of Pounds | Percent of Total | Millions of Pounds | Percent of Total | Millions of Pounds | Percent of Total |
| 1949 | 2,747 | 13 | 104 | <0.5 | 2,851 | 14 | 15,703 | 75 | 2,238 | 11 | 20,839 | |
| 1950 | 3,553 | 17 | 153 | 1 | 3,706 | 18 | 14,497 | 71 | 2,330 | 11 | 20,732 | |
| 1951 | 4,010 | 16 | 228 | 1 | 4,238 | 17 | 18,497 | 74 | 2,340 | 9 | 25,122 | |
| 1952 | 3,534 | 14 | 285 | 1 | 3,819 | 15 | 19,165 | 75 | 2,551 | 10 | 25,594 | |
| 1953 | 4,154 | 16 | 350 | 1 | 4,504 | 17 | 19,976 | 74 | 2,568 | 9 | 27,107 | |
| 1954 | 4,469 | 16 | 429 | 2 | 4,898 | 18 | 19,656 | 72 | 2,624 | 10 | 27,236 | |
| 1955 | 5,032 | 17 | 580 | 2 | 5,612 | 19 | 20,924 | 71 | 2,789 | 10 | 29,389 | |
| 1956 | 5,259 | 18 | 675 | 2 | 5,934 | 20 | 20,315 | 70 | 2,950 | 10 | 29,268 | |
| 1957 | 5,457 | 19 | 895 | 3 | 6,352 | 22 | 19,908 | 68 | 2,889 | 10 | 29,218 | |
| 1958 | 5,027 | 17 | 921 | 3 | 5,948 | 20 | 21,464 | 70 | 3,051 | 10 | 30,538 | |
| 1959 | 5,557 | 17 | 1,272 | 4 | 6,829 | 21 | 22,617 | 69 | 3,222 | 10 | 32,740 | |
| 1960 | 5,738 | 17 | 1,565 | 5 | 7,303 | 22 | 22,617 | 68 | 3,224 | 10 | 33,213 | |
| 1961 | 5,931 | 18 | 1,847 | 5 | 7,778 | 23 | 22,774 | 67 | 3,277 | 10 | 33,899 | |
| 1962 | 6,314 | 17 | 2,380 | 7 | 8,694 | 24 | 23,863 | 67 | 3,237 | 9 | 35,867 | |

^aTextile Economics Bureau Incorporated, Textile Organon, XXXIII (January 1963), 17; and XXXIV (June 1963), 79.

As of 1938, man-made fibers (largely rayon forms) accounted for a major part of European fiber consumption. Italy and Germany, both seeking national self sufficiency in fiber supply, relied heavily on man-made fibers for domestic consumption. Nearly 41 percent of all German fiber consumption was man-made in 1938; cotton made up 42 percent, and wool and other fibers accounted for the rest. Italian fiber consumption was derived 40 and 54 percent from man-made and cotton fiber respectively. Man-made fiber consumption in the rest of Western Europe, on the other hand, accounted for only 7.7 percent of the total, with cotton taking 66.5 percent. In the United States the figures were 9 and 82 percent respectively.¹²

Man-made fibers have continued to make inroads into the cotton market, particularly in the developed countries. From 1938 to 1957 man-made fiber consumption in France increased from 7 to over 23 percent of total fiber consumption while at the same time cotton consumption dropped from 66 to 57 percent. West Germany, however, moved back toward cotton — 50 percent of all fibers consumed in Germany in 1957 were cotton, up from 42 percent in 1938 (of course the Germany of 1938 is not strictly comparable to the West Germany of 1957). In England cotton consumption fell from 65 to 49 percent of the total from 1938 to 1957, while man-made fiber increased from 8 to 30 percent over the same period.¹³

¹²U. S. Department of Agriculture, Competition Between Cotton and Man-Made Fibers in Western Europe, Foreign Agriculture Service Report No. 118 (June 1961), 15.

¹³Ibid., 48-59, passim.

In the United States, as in Western Europe, the composition of the fiber consumption bundle was changing to the advantage of the man-made fiber industry. Cotton consumption as a percentage of all fibers slipped from 88 percent in 1920 to 81 percent in 1940, and by 1963 had fallen to 56 percent. Per capita consumption likewise decreased from 26.5 pounds in 1920 to 21.8 pounds in 1963. In sharp contrast, man-made fiber consumption spurted from 0.3 percent to 36.4 percent of the total between 1920 and 1963, and from a per capita consumption of 0.1 pounds to 14.2 pounds over the same period.¹⁴

One additional set of figures succinctly summarizes the magnitude of the man-made fiber challenge to cotton as the major world textile fiber. As early as 1946 the cotton equivalent of world man-made fiber production was a very substantial 5.2 million bales, or equivalent to 60.1 percent of the U. S. cotton production for that year. By 1962, the cotton equivalent increased by more than five times to a level of 26.4 million bales or 177 percent of the total U. S. production; in 1964 man-made fiber production reached 33.7 million cotton equivalent bales.¹⁵

Numerous reasons have been suggested to account for the rapid increase in the use of man-made fibers. Among these reasons are the desire

¹⁴U. S. Department of Agriculture, Statistics on Cotton and Related Data, 1920-1956, Agricultural Marketing Service, Statistical Bulletin No. 99 (revised February 1957), 19. U. S. Department of Agriculture, Statistics on Cotton and Related Data 1925-1962, Economic Research Service, Supplement for 1964 to Statistical Bulletin 329 (October 1964), 7.

¹⁵Ibid., Economic Research Service, 116.

for national power and self sufficiency, various desirable manufacturing and use characteristics of man-made fibers, and the short supply of natural fibers during certain critical periods in recent history. The factor of most interest to this study, however, is the possible role U. S. cotton price support policy might have had in encouraging or retarding the growth of the man-made fiber industry in cotton importing-textile manufacturing nations. However, this problem is to some degree peripheral to the main body of this study and will, therefore, not be considered in detail in the analysis. Indeed it is an important problem and warrants high priority in future research.

Review of Cotton Policy

An analysis of the effects of governmental programs relating to cotton production, pricing, and export is central to this inquiry. The programs of special interest are those directly affecting cotton exports, such as surplus disposal or export subsidies on commercial exports. But the seed of these direct export programs arose initially from domestic agricultural price support legislation.

The first large-scale manifestation of federal price support assistance to agriculture came into being with the passage of the Agricultural Marketing Act of 1929 and the subsequent establishment of the ill-fated Federal Farm Board. One of the essential functions of the Farm Board was to finance the storage of specified commodities; it was anticipated that through the storage program the marketing of these commodities would be more uniform

and orderly, and that domestic prices would be raised as a result. The Board, however, had no power to curb production. Subsequently, with the bumper crops of the early 1930's, the national economic depression, and dwindling congressional support, the Board failed at the job it was ill-equipped to do.

The Agricultural Adjustment Acts of 1933 and 1938, along with the executive establishment of the Commodity Credit Corporation in 1933, modified or eliminated some of the problems that had plagued the Federal Farm Board. Since the 1933 Act, government policy with respect to cotton has incorporated three basic elements: (1) price supports facilitated by CCC loans and storage programs, (2) supply control via acreage allotments, and (3) export assistance programs.

Central to the purpose of the government policy is the support of the commodity price at some "parity" level (equivalent purchasing power for a given quantity of product relative to some base period — "parity price"). The support price is guaranteed to those producers satisfying the requirements of the Act. The function of the CCC is to stand ready to make non-recourse loans to the producers at the price support level. The loan and storage features of the CCC raise cotton prices to the support level and stabilize prices during and among marketing years.

Supply control is a long-standing feature of domestic cotton policy. The function of supply control, ideally, is to prevent undue downward pressure on prices in the market resulting from too large a supply, and

to avert large stock accumulations of cotton by the CCC. From the beginning supply control has depended on acreage allotments. Allotments were in effect during the years 1933-1936, 1938-1942, 1950, and 1954-1965, but as noted previously, such controls have not been particularly effective in controlling the cotton supply.

During the early 1950's the combined effects of sagging exports, stable domestic consumption, ineffective supply control, and the consequent rapidly increasing domestic stocks led to several significant direct cotton export programs. As we examine these programs, we begin with the aid and assistance export programs of the 1940's.

In 1941 the United States began exporting cotton to our allies under authorization of the Lend-Lease Act of the same year. During the six years of the program's existence it financed the export of nearly 3.4 million bales.¹⁶ Although Lend-Lease was terminated at the close of the war, by 1947 small amounts of aid and assistance cotton were being exported under the Army Civilian Relief Program. In addition, the Foreign Aid Act of 1947 permitted the export of surplus agricultural products to specified countries as part of the foreign aid program. The Economic Cooperation Act of 1948 provided for an expansion of exports, including surplus and non-surplus agricultural commodities, by the U. S. government in the rehabilitation and reconstruction of war-torn nations. This Act

¹⁶ U. S. Department of Agriculture, The Cotton Situation, Agricultural Marketing Service, CS-194 (May 1961), 19.

provided the basis for future aid and development acts which authorized substantial shipments of cotton as well as other commodities from CCC stocks. The acts of major importance over the next six years were the Mutual Security Acts of 1951, 1953, and 1954. The 1951 Act contained a new and interesting provision. It permitted the small scale sale of commodities, not only agricultural, to needy countries for their local non-convertible currency. The local currency provision was expanded considerably in the 1953 Act (Section 550), and was aimed particularly at the use of surplus agricultural commodities. Moreover, Congress specifically directed that a minimum amount of foreign aid should be expended under Section 550.

By 1954 the Korean conflict requirements for fiber had subsided and agricultural production was rapidly exceeding disappearance in domestic and commercial export channels. Faced with this problem, the Eisenhower administration supported and the 83d Congress passed the Agricultural Trade Development and Assistance Act of 1954 (P.L. 480). In addition, the Mutual Security Act was extended in 1954 and Section 550 was expanded in the form of Section 402 of the 1954 Act.

The prime objectives of P.L. 480 as stated in the Act were:

1. To increase the consumption of United States agricultural commodities in foreign countries (and) to expand international trade among the United States and friendly nations.
2. To facilitate the convertibility of currency.

3. To promote the economic stability of American agriculture and the national welfare.
4. To make maximum efficient use of surplus agricultural commodities in furtherance of the foreign policy of the United States.
5. To stimulate and facilitate the expansion of foreign trade in agricultural commodities produced in the United States by providing a means whereby surplus agricultural commodities in excess of the usual marketings of such commodities may be sold through private trade channels, and foreign currencies accepted in payment therefor.¹⁷

Public Law 480 was originally conceived as an inward-looking program — a temporary surplus disposal program to take care of the presumably temporary agricultural surplus problem. Subsequent events led policy makers to the conclusion that the temporary agricultural surplus was not at all temporary; P.L. 480 was further expanded throughout the latter half of the 1950's and into the 1960's.

The first three years of P.L. 480 were not easy ones. Heated protests from competing exporter countries as well as from domestic commercial exporters forced significant modification of parts of the law in 1957 and more judicious administration of it after that.¹⁸ One of the most significant changes in the administration of P.L. 480 after 1957 was in the increased emphasis on using the provisions of the law for economic development and assistance in the recipient countries, as compared with the early objectives of surplus disposal.¹⁹

¹⁷ Agricultural Trade Development and Assistance Act of 1954, in U.S. Statutes at Large, LXVIII, Part I, 454.

¹⁸ Elmer L. Menzie, Lawrence W. Witt, Carl K. Eicher, and Jimmye S. Hillman, Policy for United States Agricultural Export Surplus Disposal, University of Arizona Technical Bulletin 150 (August 1962), 53.

¹⁹ Ibid.

As P.L. 480 was initially enacted it contained three titles. Title I authorizes sales of surplus commodities for foreign currency — most cotton exports under P.L. 480 provisions were, and continue to be, exported under this title. Sections 550 and 402 of the Mutual Security Act are similar to Title I of P.L. 480. Title II provides gifts and grants for relief of famine and other such emergencies. Title III allots surplus commodities for domestic and international welfare distribution; Title III also allows barter operations using surplus commodities to procure strategic materials. This section of the program was bitterly criticized as a disrupter of normal market channels and was subsequently revised in 1957. In 1959 the addition of Title IV provided for the extension of long-term credits to be repaid in dollars by the countries contracting for the purchase of agricultural commodities. It was not until 1961 that Title IV was implemented.²⁰ Comparatively small amounts of cotton have been exported under this title.

Local currency sales account for the bulk of the cotton exports under P.L. 480 (see Table 13). Title I sales from 1954-1955 to 1962-1963 amounted to more than 7.5 million bales. Cotton exports under the Mutual Security Act, Sections 550 and 402, from 1954 to 1961 when the program was discontinued, added 5.1 million bales sold for foreign currency. Over 2.1 million bales were exported under Title III barter agreements from 1954-1955

²⁰The Menzie, Witt, Eicher, and Hillman bulletin provides an excellent discussion of the basic factors involved in the operation of P.L. 480 and the domestic and foreign ramifications inherent in it. For further detail the reader is referred to the bulletin.

Table 13. Value and Quantity of U. S. Government Financial Assistance to Cotton Exports, 1951-1962^a

| Year Beginning July 1 | Mutual Security Act | | Army Civilian Relief | | P. L. 480 Title I | | P. L. 480 Title II and IV | | P. L. 480 Barter— Title III | | Export- Import Bank | | Payments to Exporters | | Export Differential | | Total Government Financing | |
|-----------------------------|---------------------------|--------------------|----------------------------|--------------------|----------------------|--------------------|---------------------------------|--------------------|-----------------------------------|--------------------|---------------------------|--------------------|-----------------------------|--------------------|------------------------|--------------------|----------------------------------|--------------------|
| | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars | 1,000 Bales | Million Dollars |
| | Dollars | | Dollars | | Dollars | | Dollars | | Dollars | | Dollars | | Dollars | | Dollars | | Dollars | |
| 1951 | 791 | 169.4 | 52 | 8.4 | ... | ... | ... | ... | ... | ... | 420 | 89.2 | ... | ... | ... | ... | 1,263 | 267.0 |
| 1952 | 1,056 | 190.0 | 33 | 4.1 | ... | ... | ... | ... | ... | ... | 285 | 52.3 | ... | ... | ... | ... | 1,374 | 246.4 |
| 1953 | 836 | 159.2 | 11 | 1.5 | ... | ... | ... | ... | ... | ... | 634 | 112.5 | ... | ... | ... | ... | 1,481 | 273.2 |
| 1954 | 1,218 | 210.8 | ... | ... | ... | ... | ... | ... | ... | ... | 340 | 58.8 | ... | ... | ... | ... | 909 | 163.1 |
| 1955 | 683 | 105.8 | ... | ... | ... | ... | ... | ... | ... | ... | 412 | 63.3 | ... | ... | ... | ... | 2,641 | 298.3 ^c |
| 1956 | 906 | 140.6 | ... | ... | ... | ... | ... | ... | ... | ... | 403 | 66.7 | ... | ... | ... | ... | 11,396 | 843.7 ^c |
| 1957 | 670 | 100.4 | ... | ... | ... | ... | ... | ... | ... | ... | 770 | 113.7 | ... | ... | ... | ... | 8,678 | 589.5 ^c |
| 1958 | 798 | 106.2 | ... | ... | ... | ... | ... | ... | ... | ... | 403 | 50.8 | 407 | 13.2 | 2,359 | 68.4 | 4,968 | 381.3 ^c |
| 1959 | 417 | 49.1 | ... | ... | ... | ... | ... | ... | ... | ... | 298 | 36.0 | 6,901 | 276.0 | 2 | 0.1 | 8,448 | 472.0 ^c |
| 1960 | 316 | 42.4 | ... | ... | ... | ... | ... | ... | ... | ... | 335 | 42.9 | 6,651 | 201.6 | ... | ... | 8,723 | 480.2 ^c |
| 1961 | 59 | 8.3 | ... | ... | ... | ... | ... | ... | ... | ... | 431 | 57.4 | 4,897 | 208.0 | ... | ... | 6,464 | 422.3 ^c |
| 1962 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 427 | 54.9 | 3,368 | 143.1 | 1,147 | 52.3 | 6,166 | 420.3 ^c |

^a U. S. Department of Agriculture, The Cotton Situation, CS-194 (May 1961), 19. Additional information for the years 1960-1962 was obtained by letter dated July 30, 1965 from the Cotton Division, Economic Research Service, U. S. Department of Agriculture.

^b Data for P. L. 480 Title IV.

^c Some cotton exports are covered by two or more programs.

to 1962-1963.²¹ Total cotton exports under these two programs exceeded total cotton exports of any one of the five competing countries studied here for that same period. Further analysis of local currency sales is postponed until Chapter IV.

Two other major U. S. government actions in the 1950's might be expected to have affected exports of the five competing countries. The first was the initiation in September, 1950, of cotton licensing controls and export allocations in order to maintain satisfactory emergency supplies for domestic use. Although the export allocations were lifted after 11 months, the restriction on cotton exports provided interesting effects to be considered later.

More far-reaching actions were taken in August, 1955, when the Secretary of Agriculture announced that "after January 1, 1956 . . . the CCC may sell for export gradually and on an open competitive bid basis not more than a million bales of its lower quality short staple stocks. Such sales might be made at prices below the minimum levels that are generally applicable for sales by CCC."²² In February, 1956, the Secretary released another statement announcing "that CCC owned stocks of upland cotton would be sold at competitive prices for export in the 1956-57 marketing year . . . all qualities of upland cotton will be available under the program.

²¹The Cotton Situation, CS-194 (May 1961), 19. Additional information for the years 1960-1963 was obtained by letter dated July 30, 1965 from the Cotton Division, Economic Research Service, U. S. Department of Agriculture.

²²The Cotton Situation, CS-160 (August 1955), 4.

This program is designed to stimulate exports in 1956-57."²³ And "stimulate exports" it did! Only 2.2 million bales were exported in 1955-1956 (partly as a result of the advance announcement of the 1956-1957 program), but in 1956-1957 exports soared to 7.6 million bales, the largest quantity exported since the 8.4 million bales of 1932-1933. The export subsidy initially assumed the form of an "export differential" or a discount on quantities purchased for export from CCC stocks. In 1958 the program was expanded to include a subsidy-in-kind, or a direct cash payment to exporters when CCC stocks were not available. The rate of subsidy ranged from a low of 5.8 cents per pound to a high of 8.5 cents per pound (see Table 14).

Table 14. Export Subsidy Rates of Payment to Exporters, and Export Differentials on CCC Stocks, 1951-1962^a

| Year | Rate of Cash Payment in Cents Per Pound | Average Rate of Export Differential Paid on CCC Stocks in Cents Per Pound |
|----------------------------------|---|--|
| August 1, 1951 - January 5, 1956 | ... | ... |
| January 6, 1956 - March 2, 1956 | ... | 8.30 ^b |
| August 1, 1956 - August 15, 1957 | ... | 7.68 |
| August 16, 1957 - July 31, 1958 | ... | 6.22 |
| August 15, 1958 - July 31, 1959 | 6.50 | 5.80 |
| August 1, 1959 - July 31, 1960 | 8.00 | ... |
| August 1, 1960 - July 31, 1961 | 6.00 | ... |
| August 1, 1961 - July 31, 1962 | 8.50 | ... |
| August 1, 1962 - July 31, 1963 | 8.50 | ... ^c |

^aThis information was obtained from various issues of the U. S. Department of Agriculture publication, The Cotton Situation.

^bApplied to a maximum of one million bales of low quality cotton.

^cNot available.

²³The Cotton Situation, CS-163 (March 1956), 4.

The United States is not unique in the use of governmental programs to affect prices and promote exports. The five major competing countries also have government regulations on cotton.²⁴ The most common type of policy involves a fixed rate or an ad valorem export tax on the raw cotton. Except for the United States, all of the countries studied have at one time or another collected such a tax. Because of the relative importance of cotton exports as a foreign exchange earner for these countries, the export tax constitutes an important revenue source for the respective governments. It should be noted, however, that an increase in the export price of cotton resulting from the tax will discourage the foreign purchase of the cotton.

Export programs have also been used; one example is the Mexican "compensatory exchange program." "This is a system whereby the export of agricultural products can be used to obtain import permits for items subject to import licenses."²⁵ The program especially affects machinery, assembly parts for cars and trucks, and railroad equipment. Such a program in essence puts the weight of a firm such as General Motors, which has automotive interests in Mexico, behind the cotton exports of that country. In 1963, cotton accounted for 40 percent of the "compensatory exchange program."

²⁴International Cotton Advisory Committee, Government Regulations on Cotton, 1962, a report by the Secretariat to the 21st Plenary meeting (May 1962), passim.

²⁵U. S. Department of Agriculture, Cotton in Mexico — Trends and Outlook, Foreign Agricultural Service M-163 (November 1964), 14.

The U.A.R. provides an example of an export program involving barter. Through arrangements with the Soviet bloc, military aircraft and equipment were exchanged for cotton during the late 1950's.

Although export taxes are the most common form of government action, domestic price support programs have been used as well. In 1962, both the U.A.R. and Brazil operated domestic price support programs.²⁶ However, the level of the domestic price support, unlike that of the United States, typically remains substantially below the world market price. In addition, there are often production incentives such as special credit facilities, government-supported irrigation projects, or fertilizer use programs that assist and encourage farmers in the growing of cotton.

The governmental programs of the U.A.R., Mexico, Pakistan, Brazil, and Sudan, relative to those of the United States, are less complex. Furthermore, their direct agricultural programs emphasize revenue receipt (taxes) as opposed to revenue dispersal (subsidies). The low degree of economic development and the inability of these countries to compete with the U. S. Treasury probably accounts for the emphasis on revenue collection programs.

²⁶International Cotton Advisory Committee, Government Regulations . . . , passim.

CHAPTER II

THEORETICAL ANALYSIS

Theoretical Basis

The fact that the United States is the largest single exporter of raw cotton suggests that institutional changes made by the United States with respect to the world cotton market should logically affect the cotton exports of competing countries. The theoretical basis of this study is that the United States, by virtue of its size in the cotton export market and the financial strength of its government, possesses sufficient market power to substantially affect the foreign cotton export market.

Assume initially that the United States and some other raw cotton exporter, country "A", produce cotton for domestic and for foreign consumption (a majority of "A's" production is exported); in addition, assume that initially there are no governmental interferences within the domestic or foreign markets, save that both countries can restrict imports of foreign cotton through import quotas. Now, suppose that the United States initiates a domestic price support program in conjunction with effective acreage restriction controls. With effective controls a new equilibrium is reached with a higher export price for cotton and no excess stocks. However, if the acreage controls are not wholly effective, because of increases in yields along with technological advance, excess production and an accumulation of surpluses result.

As a result of the U. S. domestic price support and consequent higher prices for cotton, the demand for "A's" cotton exports (a near perfect substitute for U. S. cotton) will shift to the right with a correspondingly higher price and quantity exported. Of course, since the markets for the United States and country "A" are interrelated, second and third order effects will take place before a final equilibrium is established. Nevertheless, the general trends suggested will hold — the magnitude of the changes will depend upon the relative demand, supply, and cross-elasticities of the cotton from the two countries.

To summarize, the expected result of the U. S. initiation of a domestic price support program similar to the one in operation, and with the assumptions as stated above, would be: (1) an increase in the U. S. cotton price on the world market, (2) a decrease in foreign consumption of U. S. cotton, the magnitude depending upon the elasticity of supply and demand for U. S. cotton and the cross-elasticity of demand for foreign and U. S. cotton, (3) an accumulation of cotton surpluses in the United States, (4) an increase in the price of "A's" cotton exported, the magnitude depending on the cross-elasticity of demand and the supply elasticity of "A's" cotton production, and (5) an increased quantity of "A's" cotton exported, again the magnitude depending upon the cross-elasticity between cotton and other fibers, and the supply elasticity of cotton and other fibers. As a result of the institutional change in the domestic U. S. cotton market, country "A" is able to sell more of its cotton on the foreign market, and at

a higher price than previously; thus, "A's" competitive position relative to that of the United States is improved.

In this study the above argument is taken as given. The theoretical question then asked is: Given the institutional factors in the market, in particular the domestic price support for U. S. cotton, what will be the consequences on the United States and on "A" of an export subsidy for cotton, or of a program of grants or concessional sales for U. S. cotton?

Consider a case where the United States initiates an export subsidy of "Y" cents per pound (assume that "A's" production and exports have adjusted to the price umbrella held by the United States). The domestic price for cotton remains at the domestic support level; however, the foreign price for U. S. cotton drops by "Y" cents per pound, with the difference in price being absorbed by the Treasury. At the lower export price more U. S. cotton will be demanded and the U. S. supply for export, no longer restricted by the higher level of the domestic subsidy, shifts to the right. An increased quantity is exported. The problem has now largely reduced to a standard price discrimination problem. Whether or not the cotton surplus will be eliminated or by how much it will be reduced depends largely on the magnitude of the export subsidy and the relative demand elasticities in the domestic and foreign markets.

Country "A" does not remain unaffected. The near-perfect substitute for "A's" cotton exports, that is U. S. cotton exports, has fallen in price; thus, the foreign demand for "A's" cotton shifts to the left (cross-elasticity

is positive) resulting in a decrease in the price and in the quantity exported. Presumably, since "A" is assumed to have no significant price adjustment restrictions (domestic price supports), the export price will tend toward a level at which surpluses will not exist. However, a prime factor determining how much adjustment will actually occur is the supply elasticity of cotton in country "A". If the elasticity of supply for "A" is very inelastic (resources are unable to shift out of cotton production) it is clear that the major burden of the change must fall on price. Thus, only a small decrease in quantity exported will result. Excess stocks may also accumulate, but this is not likely for more than a short period of time.

Indeed, two factors probably make the supply function for "A" highly inelastic. First, in country "A", cotton is a primary crop and alternative crops may be few, and/or may be grown only at a comparative disadvantage with respect to cotton. The lack of alternatives and the relatively low degree of agricultural development (compared to the United States), tends to result in a commitment of assets to cotton production for a considerable period of time. The second factor contributing to the low supply elasticity for "A" is its low level of economic development and its financial inability or unwillingness to compete with the United States in the control of its own production through price supports and commodity storage programs. Thus, the burden of adjustment falls primarily on "A's" export price level.

The situation often is more complex since some cotton exporting nations impose an export tax on their own cotton exports. In this case the supply function will be to the left of the no tax supply function. The price will increase by some fraction of the tax (the magnitude will depend on the relative demand and supply elasticities); the quantity exported will again decrease. If the level of the tax is decreased over time the supply function will shift to the right from the high tax position. This, in fact, has been the case since 1951 (as might be expected because of the imposition of export subsidies by the United States). But as long as a tax is imposed, the supply function will remain to the left of its no-tax position. Again the second and third order effects are present but they only modify the general trends.

A summation of the situation indicates the following: (1) the institutional price change evolving from the U. S. export subsidy results in an increased quantity exported by the United States, (2) there is decreased pressure for the accumulation of surpluses in the United States, (3) assuming the standard price discrimination assumptions of a separated market and a different price elasticity in the foreign market than in the domestic market, total returns to the U. S. cotton industry will increase,²⁷

²⁷ The assumption of a separated market is not wholly realistic in the United States cotton case. This was particularly in evidence during the late 1950's and the early 1960's when the U. S. mills found that Japan could purchase cotton at the export subsidy price, and then re-export the finished product to the United States at a lower price than could be met by mills in the United States without the benefit of the export subsidy advantage. In 1964 the U. S. mills obtained an offsetting subsidy for domestic mill use. The possibility of substituting man-made and/or other fibers for cotton further qualifies the realism of the separated market assumption.

(4) as a result of the U. S. export subsidy, country "A" is faced with the prospect of a decreased quantity exported, and in addition, with a lower price per unit of export than prior to the export subsidy. Clearly "A's" foreign exchange earnings from cotton exports decline.

Consider now the theoretical implications of U. S. export policy centering on the disposal of cotton stocks through grants or sales for non-convertible foreign currency such as authorized under Title I of P.L. 480. First of all it should be noted that the U. S. "official position," as expressed in P.L. 480, on such programs is that exports under these programs should not disrupt "normal trade channels," or in other words, exports under these programs should be to those countries which did not before import cotton, or to those countries that normally import cotton but only in addition to "normal" cotton imports through regular commercial channels (demand expansion is the intent). To the extent that the "official position" is not attained (trade channels are disrupted) such a program is of interest in this study. Furthermore, it is of interest to determine whether trade channels were in fact disrupted.

The theoretical implications of the P.L. 480 program are basically the same as considered in the previous discussion, and as such need not be repeated. It is sufficient to note that foreign currency sales or other concessional contracts imply the price discrimination argument; in general, the effects on the countries competing with the United States in cotton exports will be similar to those discussed above. The magnitude of the

effects depends largely on the success with which the United States in fact insulates the surplus disposal, or economic aid if you prefer, from the commercial market.

The intent of the above discussion has been to point out the basic theoretical implications of institutional change in the pricing mechanism. In essence it is an application of "Institutional Advantage." It is herein suggested that a country capable of supporting institutional change in the pricing mechanism through government action possesses an "Institutional Advantage" over those countries that cannot support such action. As should be clear from the foregoing discussion, a premise of this study is that the United States possesses such a capability and thereby has an advantage over other cotton exporting nations. To the extent that the United States presses this advantage it can substantially affect the quantity and price of competing country cotton exports.

Statement of Hypotheses

The theoretical consequences outlined above and the historical trends of cotton trade presented in Chapter I, provide a basis for general hypotheses relating to the anticipated effects of United States cotton export policy. Five major hypotheses are presented below.

First, the United States Government policy to sell cotton in the international market at a competitive price via export subsidies has adversely and measurably affected the prices of raw cotton sold by five major export competitors. The effects are expected to be greater for the close substitute

short staple exporters — Mexico, Pakistan and Brazil. Because of the inelastic supply of raw cotton from these five countries, the effect of the U. S. export subsidy on the quantity of cotton exported by these competitors has been minor.

Second, raw cotton exports under concessional sales and grants have adversely affected cotton prices and exports of the five competing countries. In other words, even though concessional sales were established with the intent of expanding exports without disrupting normal trade channels, such has not been the case — normal trade channels have been disrupted.

Third, as a corollary to the second hypothesis, the effects of concessional sales on cotton prices and exports are less in magnitude than the effects of export subsidies.

Fourth, as a coordinating hypothesis it is suggested that domestic cotton price supports, cotton export subsidies, and concessional sales are important determinants of U. S. cotton exports. Therefore, United States cotton export variations, reflecting subsidies and export programs, measurably affect cotton exports of the five competing countries considered in this study, especially the short staple producers.

Thus, the fifth and final hypothesis is implied: United States cotton export policies have an inverse effect upon the income terms of trade of those countries where cotton is a major foreign exchange earner — in particular, the U.A.R., Sudan, Pakistan, and possibly Mexico.²⁸

²⁸The unit value of imports index is not available from the United Nations for Mexico; therefore, the income terms of trade index is not developed in this study for that country.

CHAPTER III

SOURCES OF DATA AND ANALYTICAL PROCEDURES

Historical data were presented in Chapter I which bear on the measurement of the effects of U. S. cotton export policy. But more than a historical record is needed for a meaningful analysis; the development of a relevant analytical framework is essential. Thus a consideration of the sources and shortcomings of the data is in order, as is the development of the statistical methods used in the analysis.

Sources of Data

A quantitative analysis must rely upon data that are as complete, accurate, and consistent as possible. The data for this study are taken from three major sources: The quarterly publications of the International Cotton Advisory Committee (ICAC), Cotton — World Statistics; The Cotton Situation and various statistical bulletins of the United States Department of Agriculture (USDA); and trade statistics publications of the United Nations (U.N.), the Yearbook of International Trade Statistics, and the Yearbook of Statistics. Some unpublished data were supplied by the USDA. Additional complementary data were obtained from various trade sources.

The types of data required for the analysis were: (1) world and individual country acreage, exports, production, consumption, and stocks for raw cotton, (2) uniform export price data for the countries included (preferably

price quotations from a single market), (3) U. S. domestic price support rates and export subsidy rates, (4) the quantity and value of cotton exports under U. S. export programs, (5) the value of total exports and of cotton exports for the countries concerned, and (6) the unit value index of imports for the countries studied. The ICAC publications are a prime source for data groups (1) and (2). Data groups (3) and (4) are from USDA sources for the most part. United Nations publications provide data of groups (5) and (6).

Although the data are quite accessible and reasonably complete, certain difficulties exist. First of all, the data used by the ICAC comes largely from official government sources of the member countries; the ICAC Secretariat does, however, make warranted adjustments in the data "necessary for the balancing of supply and distribution figures."²⁹ Where possible, the ICAC data were compared with the data reported by the USDA; this was done to check the consistency of the data from the two sources. The data for acreage, exports, and production were very similar. The USDA-reported data for consumption and stocks (world aggregates, and totals for countries other than the United States) were originally gathered by the ICAC; thus the data are identical. But a high degree of consistency between two sources of data does not settle the question of accuracy or reliability.

Researchers who have first-hand experience with the "official statistics"

²⁹International Cotton Advisory Committee, XVI (April 1963), 7.

of less developed countries in particular, point out that production or consumption estimates may be influenced by political factors within the specific country, to say nothing of possible errors as a result of inadequate sources of information. The degree to which the data used here are subject to these criticisms cannot be fully determined — the difficulty in obtaining accurate data estimates in the areas of acreage, yield, production, and consumption suggests that such criticism may be partially justified; government production and consumption estimates may be inflated to reap political capital. In addition the world and regional data have weaknesses because of the uncertain reliability of data from the communist nations; fortunately the world and regional data are not vital to the core of this study. But, on the positive side, the high degree of correspondence between the ICAC data and the data collected by USDA sources adds confidence to the data used; in any case the data are as good as are available.

Data on exports, which are more important in the analysis than the types of data discussed above, are superior in reliability and accuracy. The reason for this is that exports normally travel through formal trade channels during the export operation; the error due to poor or non-existent information is greatly reduced. Export quantities can be further verified by checking raw cotton imports of importing countries.

The primary price data are the C.I.F. (including cost, insurance, and freight paid to port) quotations of the Liverpool, England Cotton

Exchange.³⁰ The figures are non quantity-weighted yearly averages (August 1 to July 31) for the qualities selected. Prices from this source are limited to post-1951, since importation of cotton before then was handled by the British State Raw Cotton Commission (a government agency). Records of the Commission's prices are not available.³¹ Spot price data, obtained from USDA sources, for the 1948-1953 period are utilized in the analysis of U. S. export allocation quotas.

Two other minor problems are apparent in the price data but they do not cause serious concern because of the manner in which prices are employed in this study. First, the price quotations are for different fiber qualities for different countries; in particular, the ICAC prices for Egyptian and Sudanese cotton refer to long staple qualities, while price quotations

³⁰ Price data are generally available from two major international cotton markets, Liverpool, England, and Bremen, Germany. The ICAC reports Liverpool prices. The USDA reports price data for both the Liverpool and the Bremen markets; however, the USDA data covers fewer countries than that reported by the ICAC. The USDA also reports foreign spot price data for specified foreign markets. These foreign spot prices are not strictly comparable to the Liverpool or Bremen prices because of price discounts, varying transport costs, and taxes for cotton exported relative to cotton not exported. The C.I.F. prices of Liverpool and Bremen account for price discounts, export taxes, and transport charges. The relationship between Liverpool and Bremen prices was quite high for the two countries for which it was possible to correlate the price quotations for specific qualities. For the period 1953 through 1962 the correlation between the prices quoted in the two markets for United States and Mexican cotton was .90 and .82 respectively. The correlation between the prices quoted in the Liverpool and the Alexandria, Egypt markets for Ashmouni cotton, 1951 through 1962, was .81. The primary advantage in using Liverpool data is in its uniformity, completeness, and availability.

³¹ According to J. C. Gardner, Director of the Liverpool Cotton Services, Ltd. of Liverpool, England, in a letter dated August 9, 1965.

for the other four countries are for short staple qualities — direct price comparisons can be made only with caution. Second, the quantities of cotton exported which do not go through the regular market channels cannot be reflected in the price for all the cotton changing hands in the world market. Such exports include gifts, grants, and concessional sales by the United States, "tie-in" sales by Mexico, or barter sales by the U.A.R. The analysis of the importance of such sales is part of the thesis problem. Other than the above problems the price data appear accurate and appropriate.

One adjustment is made in all price data used in the statistical models. Prices are originally quoted in U. S. cents per pound; the Bureau of Labor Statistics wholesale commodity price index is used to convert the prices to constant U. S. cents per pound on the 1957-1959 base. Other value figures used in the statistical analysis are also converted to constant dollar values. Such figures include the value of total exports, of cotton exports, and of shipments under export programs.

The only major variables for which data are not directly available involve the terms of trade. The "income terms of trade" concept, as defined by Dorrance, suggests a procedure for the development of the total income terms of trade variable.³² The income terms of trade formulation ($_tT_1$) uses an index of the value of total exports (V_x or $P_x \cdot Q_x$) divided by an index of

³²G. C. Dorrance, "The Income Terms of Trade," Review of Economic Studies, XVI (1949-1950), 52.

the price of goods imported (P_m). The rationale for using this form of the terms of trade concept is that it reflects the trend in foreign exchange earnings relative to the price of imports. This appears to be a more relevant policy concept than, for example, the "commodity terms of trade" (the price ratio of exports to imports). The policy maker, although interested in the price ratio of exports to imports, is more vitally interested in the exchange earnings of exports relative to the price of imports than in the relative prices of exports and imports per se. The income terms of trade tells the policy maker how many units of imports can be obtained given the import price.

The unit value of imports index (P_m) based on the year 1958 for all of the countries studied except Mexico was obtained from the U. N. Yearbook of International Trade Statistics (the Mexican government does not provide adequate data for the calculation of this index). The numerator of the income terms of trade index was calculated from value of exports data provided in the U. N. Statistical Yearbook.

The second terms of trade variable, the "cotton income terms of trade" (${}_CT_i$), is a slight modification of the total income terms of trade. The denominator, that is the price index of imports, is the same as for the total income terms of trade (P_m). The numerator is an index (base 1958) of the value of cotton exports (V_{CX} or $P_{CX} \cdot Q_{CX}$).³³ The price and value data underlying the indexes are in constant U. S. dollars, 1957-1959 base.

³³The value of cotton exports is not in all cases quoted in U. S. dollars; in some cases local currency is used as the unit. The following

The basic problem of data aggregation is inherent in the terms of trade indexes. By the nature of the index there must be an aggregation of diverse data. The diversity of such data plus the possibility of error or bias in the process of assembling the data raises the question of whether meaningful statistical analysis can be performed on the data. This question is not specifically answered in this thesis, but the analysis of Chapter IV does indicate a major statistical difficulty, that is, multicollinearity among independent variables.

Analytical Procedures

The primary problem to which this study is addressed is the effects, both qualitative and quantitative, of U. S. cotton export policy upon the cotton prices and exports of specified countries. The method of analysis applied to this problem takes two forms. The first section of Chapter IV ("Trend Analysis") explores the major trends in prices and exports associated with changes in U. S. cotton policy from 1950 to 1962. The second section ("Multiple Regression Analysis") deals with statistical measures of the effects of changes in U. S. cotton export policy (1951 to 1962) on cotton prices and on cotton exports of the United States and of major export competitors.

procedure is used to facilitate the conversion to U. S. dollars. The value of total exports and of cotton exports in local currency are available in the U. N. Yearbook of Trade Statistics; cotton exports as a percentage of total exports can, therefore, be calculated by country and year. The appropriate percentage of the value of exports accounted for by cotton is then applied to the total value of exports by country in U. S. dollars as recorded in the U. N. Statistical Yearbook, thus giving an estimate of the value of cotton exports by country and year in U. S. dollars.

The "Trend Analysis" is, to some extent, a qualitative investigation of three specific U. S. government policy actions designated and initiated with the intent of affecting U. S. cotton exports or prices. The three actions investigated are (1) export allocation quotas, September 1950 to August 1951, (2) initiation of P.L. 480 in July 1954, and (3) cotton export subsidies initiated in February 1956. For each of the U. S. actions, the changes in export price and export quantity of U. S. raw cotton are studied. Since a major hypothesis is that such actions by the U. S. do affect the prices and exports of competitors, the next step of the analysis is to examine the parallel reactions of export competing countries.

Reactions are expected in several areas. The two variables for which the greatest reaction is expected are price and quantity of the fiber exported. Several other variables may be affected, however, depending upon the rapidity with which a given country can adjust its domestic price and production situation; these secondary variables include acreage, production, and stock accumulations.

The major tool of analysis is the inspection of trends via tabular and graphic presentation. This type of analysis facilitates an overall view of the U. S. export programs, while at the same time permitting year-to-year examination of the programs' consequences on export competing countries. Furthermore, such an approach provides a "general" analysis of the time period under study — "general" in the sense that the analytical framework allows consideration and evaluation of non-quantifiable exogenous

variables affecting the system. But the strength in flexibility of the "general" analysis is also a weakness in that the measurement of policy effects, to the extent that they are measurable, is largely limited to a directional statement. Even a directional statement relating to the observed trends of two variables may be misleading since many variables affect a given market system; the observed trends may be the result of several interacting variables. Because more than a directional statement of policy effects is desired in the analysis, and because it is desirable to explore the effects of several variables simultaneously, a more rigorous, albeit a more confining, statistical analysis is developed to supplement the "Trend Analysis."

The statistical model developed is not purely an export demand or export supply system, but rather is a combination of the two in a single equation multiple regression form.³⁴ The objective underlying this model is the explanation of the variations in raw cotton export price and/or export quantity for specified countries. Whereas the objective of the "Trend Analysis" was to examine and identify the gross effects of U. S. export policy, the objective of the statistical model is to indicate the relative importance of various quantifiable variables affecting export price and export quantity. In accordance with this objective, five categories of equations are developed. The first category of equations examines the

³⁴ Statistical computations were performed at Michigan State University using the "SCOPE" least squares regression routine, "SWED" library code, with the Control Data Corporation "3600" computer.

major determinants of the U. S. export price. The second category deals with U. S. cotton exports and their determinants. The third and fourth categories explore the effect of U. S. export policy on prices and exports of five competing raw cotton exporters in the world market. The fifth category considers the relationship of U. S. policy to the terms of trade of four of the five competing countries studied.

Prior to the examination of the model equations, the variables of interest in the system are presented. The 21 variables include:

- X_1 = Quantity of raw cotton exported by country i during period t (in thousands of bales). One bale equals approximately 500 pounds gross weight or 478 pounds net weight.
- X_2 = A sorting variable by country: $i = 1 = \text{U. S.}$, $i = 2 = \text{U.A.R.}$, $i = 3 = \text{Mexico}$, $i = 4 = \text{Pakistan}$, $i = 5 = \text{Brazil}$, $i = 6 = \text{Sudan}$.
- X_3 = Domestic stocks of raw cotton in i at the beginning of t (in thousands of bales).
- X_4 = Net available for export in i during t — domestic production minus consumption (in thousands of bales).
- X_5 = World production during t (in thousands of bales).
- X_6 = Yearly average raw cotton price for i in cents per pound — C.I.F. Liverpool quotations (adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_7 = Total income terms of trade index for i during t — base 1958 = 100 (value of total exports in the numerator of the index is adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_8 = Cotton income terms of trade index for i during t — base 1958 = 100 (value of cotton exports in the numerator of the index is adjusted by BLS wholesale commodity price index, base 1957-1959).

- X_9 = Value of cotton exports for i during t in millions of U. S. dollars (adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_{10} = Estimated U. S. raw cotton exports during t (in thousands of bales).
- X_{11} = Cotton stocks on hand at the beginning of t in six major consuming countries — Belgium, England, France, Japan, the Netherlands, and West Germany (in thousands of bales).
- X_{12} = U. S. government price support level for middling 1-1/16 inch upland cotton (in cents per pound, adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_{13} = Value of P. L. 480 exports in millions of U. S. dollars during t — Titles I, II, and IV (adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_{14} = Value of export differentials and payments to exporters in millions of dollars during t (adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_{15} = Value of P. L. 480 Title III barter out of CCC stocks during t in millions of U. S. dollars (adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_{16} = Value of raw cotton exports under the Mutual Security Act authorization during t in millions of U. S. dollars (adjusted by BLS wholesale commodity price index, base 1957-1959).
- X_{17} = Export tax rate in i during t in cents per pound.
- X_{18} = Estimated average U. S. raw cotton price C.I.F. Liverpool during t in cents per pound.
- X_{19} = Estimated average raw cotton price for country i (excluding the United States) C.I.F. Liverpool during t in cents per pound.
- X_{20} = Average rate of U. S. export subsidy during t in cents per pound.
- X_{21} = Quantity of U. S. commercial channel raw cotton exports during t (in thousands of bales).

The period covered by the statistical analysis is August 1, 1951, to July 31, 1963. Time period "t" refers to the crop year August 1 to July 31 except for variables X_{13} , X_{14} , X_{15} , and X_{16} , which refer to the fiscal year July 1 to June 30. Variables X_7 and X_8 refer to the calendar year, January 1 to December 31.

These 21 variables represent a considerable simplification of the overall cotton export market. They are, nevertheless, variables considered economically relevant on an a priori basis in the various price, export, and terms of trade equations. The economic relationships, and thus the statistical relationships, stem from the arguments of Chapter II and from a schematic model of the cotton export market developed early in the study; a simplification of this market model is presented in Figure 1. The heavy lines in Figure 1 indicate the major relationships dealt with in this study.

The statistical equations relate the variables in a multiple regression form, supplemented by a recursive estimation of price and export quantity variables when such variables appear as independent variables in an equation. The price and export variables are endogenous, that is determined simultaneously within the system; thus the two variables in their observed form cannot be used in a single equation model, since the requirements of "identification" are not met.³⁵ Three estimating equations are required

³⁵"Estimates of the structural coefficients that are statistically consistent are obtained from the recursive approach only when the system of equations has a special form; . . . (1) At least one equation contains only

in the system, U. S. export price (X_{10}), U. S quantity exported (X_{18}), and the export price for country "i" other than the United States (X_{19}). Two criteria are established for determining the variable composition of these estimating equations. The first is the inclusion of variables that appear, in an a priori sense, as particularly relevant economically. The second criterion is to obtain as good a statistical fit of the equation as possible (measured by the coefficient of multiple determination corrected for degrees of freedom $-\bar{R}^2$) while maintaining economic reason. In all cases the variables used are institutionally determined variables which affect price and quantity exported, or they are major export supply or export demand variables that may be expected to influence price and quantity relationships in the export market. In addition the estimating equations are in some cases used as a basis for analysis.

The equations of the model development presented here are, in general, second or third generation equations — variables found to be of little

a single endogenous variable . . . (2) At least one other equation must contain only one endogenous variable in addition to those contained in the first set. Consistent estimates of the coefficients in these equations can be obtained if they are fitted directly by least squares, provided calculated values of the endogenous variable included in the equations referred to in item (1) are substituted for actual values before making the computations and the single new endogenous variable is treated as dependent. (3) The recursive system as a whole must be of such a nature that by successive steps each of the equations can be transformed into one that contains only a single endogenous variable other than those which have been treated as dependent in prior analysis." Richard J. Foote, Analytical Tools for Studying Demand and Price Structures, U. S. Department of Agriculture, Agricultural Marketing Service, Agricultural Handbook No. 146 (Washington: U. S. Government Printing Office, August 1963), pp. 64-65.

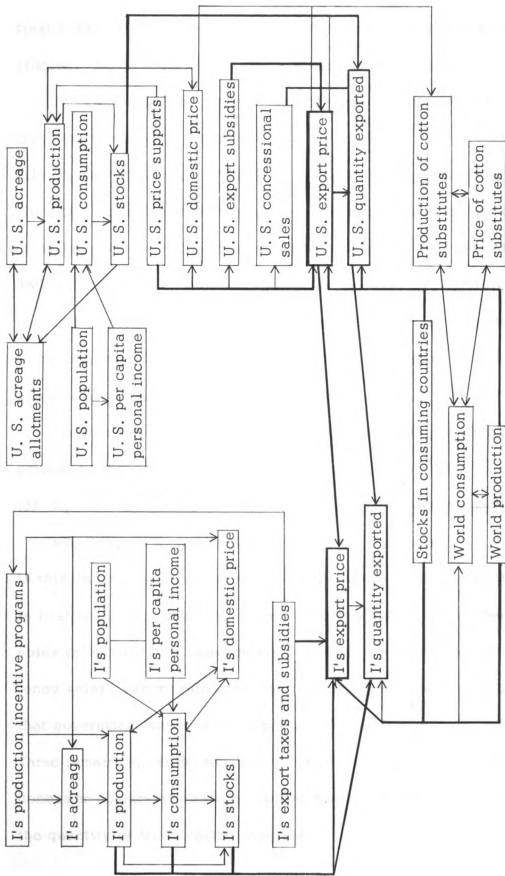


Figure 1. A Schematic Representation of the Cotton Export Market

significance in the early development of the model were eliminated from final consideration; the variables dropped were not identical for all countries studied. Development of the estimating equations follows:

The first equation of the system is the U. S. cotton export price equation with the general form:

$$(1) \quad X_6 = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13} + b_{20}X_{20} + U$$

The three variables of particular interest in this equation are the institutionally controlled U. S. domestic price support level, the value of P.L. 480 exports, and the rate of export subsidy (X_{12} , X_{13} , and X_{20}). The four remaining independent variables are included because they are considered to be economically relevant with respect to the supply of U. S. cotton for export (X_3 and X_4) and to the export demand for U. S. cotton (X_5 and X_{11}).

Equation two of the system estimates the U. S. quantity of cotton exported, with the general form:

$$(2) \quad X_1 = a + b_3X_3 + b_5X_5 + b_{11}X_{11} + b_{13}X_{13} + b_{14}X_{14} + b_{15}X_{15} + b_{18}X_{18} + U$$

where $X_{18} = \hat{X}_6$ for the U. S.

In this equation the recursive estimation of the U. S. export price (X_{18}) is first required. Equation (2) is strongly weighted with independent variables reflecting U. S. government action in the cotton market — foreign currency sales, export subsidies, barter from CCC stocks, and to the extent that government action affects prices, the estimated U. S. export price. Three remaining variables, U. S. domestic stocks, world production, and consumer country stocks are supply-demand variables expected to affect the quantity of U. S. cotton exported.

There are three different price estimating equations for the five competing countries studied; however, the differences among them are minor and will become clear presently. Three of the countries, Mexico, Pakistan, and Sudan share the same price estimating equation form.

$$(3) \quad X_6 = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{11}X_{11} + b_{15}X_{15} + b_{17}X_{17} + b_{18}X_{18} + U$$

The independent variables of particular interest are the estimated U. S. price (X_{18}) and the value of U. S. barter exports (X_{15}) as these are the variables that will reflect the effect, if any, of U. S. policy actions on competitor prices. Variables X_3 , X_4 , and X_{17} reflect the domestic supply and policy factors of country "i"; variables X_5 and X_{11} reflect export demand factors.

The price estimation equation for the U.A.R. is a modification of equation (3) above:

$$(4) \quad X_6 = a + b_3X_3 + b_5X_5 + b_{11}X_{11} + b_{13}X_{13} + b_{15}X_{15} + b_{17}X_{17} + U$$

Variable X_4 , net available for export, is excluded because there is little change in the level of this variable over time. The most significant change in this estimation equation from equation (3) above is the exclusion of the estimated U. S. price, X_{18} , and the inclusion of value of P.L. 480 exports, X_{13} ; this adjustment resulted in a better statistical fit for the price estimate. Estimated U. S. price is re-introduced in an analysis equation to be considered later.

The modification of the Brazilian price estimating equation involves the exclusion of the export tax variable (X_{17}). From 1953 through 1958 no

export tax was levied, and the rate is not available for 1959 through 1962.

The equation is:

$$(5) \quad X_6 = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{11}X_{11} + b_{13}X_{13} + b_{15}X_{15} + b_{18}X_{18} + U$$

This completes the consideration of the equations whose initial function is the estimation of key endogenous variables. We now turn to the development of the analysis relationships. Once again the reader may find it helpful to refer to Figure 1 and to note the most important relationships exhibited there. In addition, it should be noted that the estimating equations above are incorporated in the analysis of U. S. export price and quantity, and in "i's" export price with only slight modification. Equations (1), (2), and (3) remain unchanged. For analysis purposes equations (4) and (5), for the U.A.R. and Brazil, are modified so as to be approximately parallel in form to equation (3).

For the U.A.R. the price equation takes the form:

$$(6) \quad X_6 = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{11}X_{11} + b_{15}X_{15} + b_{17}X_{17} + b_{18}X_{18} + U$$

For Brazil the price equation takes the form:

$$(7) \quad X_6 = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{11}X_{11} + b_{15}X_{15} + b_{18}X_{18} + U$$

The question of the effect of U. S. policy on the quantity of exports of the five competitor countries is the basis for another equation. The basic equation form is applied to the data of the U.A.R., Mexico, Pakistan, Brazil, and Sudan. The quantity of raw cotton exported is the dependent variable in all cases. The independent variables of particular interest relate to U. S. export policy-affected variables such as value of P.L. 480

exports, U. S. export price, U. S. quantity exported, and value of export subsidies. Several supply and demand variables such as net available for export, domestic stocks, world production, and stocks of consuming countries are included. The export quantity equation form is:

$$(8) \quad X_1 = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{10}X_{10} + b_{11}X_{11} + b_{18}X_{18} + b_{19}X_{19} + U$$

where $X_{10} = \hat{X}_1$ for the U. S. , and $X_{19} = \hat{X}_6$ for $i \neq 1$.

For purposes of analysis a modification of equation (2), U. S. export quantity, is undertaken. The quantity of U. S. commercial raw cotton exports, total exports minus all P.L. 480 and Mutual Security Act exports, is set as the dependent variable; the independent variables of particular interest in this equation are the estimated U. S. export price, and the value of export subsidies. The intent of this equation is to explore the effects of export subsidies, in particular, on commercial U. S. exports.

$$(9) \quad X_{21} = a + b_3X_3 + b_4X_4 + b_5X_5 + b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13} + b_{14}X_{14} + \\ + b_{18}X_{18} + U$$

One additional modification is made for purposes of analysis. This modification, based on a discussion by Foote, permits a test of whether the composite effect of the variables reflecting U. S. cotton export policy affect prices or quantity of exports.³⁶ As an example, the following modification is performed with equation (3). Variables X_{15} and X_{18} , both U. S. policy-related variables, are dropped from the equation; equation (3) is then re-run and an F test performed to determine whether there is a statistically

³⁶Ibid., pp. 182-183.

significant effect on the explained variation of the equation resulting from the deletion of variables X_{15} and X_{18} . This test is performed on equations (1) through (10) with the appropriate U. S. policy variables dropped from each equation.

The last set of equations to be considered are somewhat peripheral to the system as outlined above, but relate to a logical extension of the above system. That extension is the effect of U. S. export policy on the income terms of trade index of other cotton exporters. The primary interest here is in the cotton income terms of trade ${}_cT_i$ as defined earlier in this chapter. The equation takes the form:

$$(10) \quad X_7 = a + b_{10}X_{10} + b_{11}X_{11} + b_{18}X_{18} + b_{19}X_{19} + U$$

Variables X_{10} and X_{18} , estimated U. S. cotton exports and cotton prices, are included to reflect the effect of U. S. export policy on the cotton income terms of trade.

Equation (11) is developed in order to amplify upon the results of equation (10). The value of cotton exports, by country, is the dependent variable of equation (11) — the independent variables are the same for the two equations. Since the cotton income terms of trade is composed of two factors, an index of the value of cotton exports, and an index of import prices, and since the independent variables of equation (10) are primarily directed toward explanation of the value of cotton exports, equation (11) should clarify the importance of the independent variables on the cotton income terms of trade.

$$(11) \quad X_9 = a + b_{10}X_{10} + b_{11}X_{11} + b_{18}X_{18} + b_{19}X_{19} + U$$

The greater the importance of cotton exports in a country's export package, the greater will be the probable effect of the cotton income terms of trade on the total income terms of trade. This relationship between the total income terms of trade and the cotton income terms of trade is expressed as follows:

$$(12) \quad X_7 = a + b_8X_8 + U$$

The terms of trade equations are designed to reflect the general effect of U. S. cotton export policy on the export economy of the designated competing countries. The greater the effect of U. S. cotton export policy on country "i's" cotton export price and/or quantity, and the more important cotton is as a component in country "i's" export package (indicated by the relationship between the cotton income terms of trade and the total income terms of trade, and also by the value of cotton exports relative to total exports), the greater is the potential significance of U. S. cotton export policy action on "i's" total income terms of trade and on its ability to take part in international commerce. This problem is itself of considerable interest and is worthy of more study than is feasible in this particular thesis.

CHAPTER IV

RESULTS AND ANALYSES

Trend Analysis

In this chapter we are concerned with the analysis of three major U. S. policy actions pertaining to the export of cotton. Let us review briefly these policy actions and the situations in which they occurred.

After World War II and until 1954, U. S. financial assistance to cotton exports took the form of Export-Import Bank loans and exports under the authorization of foreign aid and assistance acts, especially the Mutual Security Acts. These export arrangements declined in importance in the late 1950's and early 1960's.

The first major policy action, taken during the 1950-1951 crop year, placed quotas on the exports of cotton (except to Canada). This policy assured an adequate fiber supply for the United States during the early stages of the Korean conflict. U. S. cotton was in short supply as a result of the imposition of acreage allotments on upland cotton during the 1950 crop year for the first time in a decade.

The second major policy action taken by the United States was the extension of Sections 550 and 402 of the Mutual Security Act and the 1954 passage of P.L. 480 — specifically sales for foreign currency. Less important barter contracts expanded in volume during the early years of P.L. 480.

This policy action occurred during a period of rapidly increasing stock accumulations.

The third and last major action occurred late in the 1955 export year with the initiation of export differentials (export subsidies) on a limited quantity of CCC stocks (stock accumulations were at a record level); in 1956-1957 these quantity limitations were removed. A direct payment subsidy and/or a payment-in-kind to exporters was introduced so that cotton not in CCC inventory could benefit from the export subsidy. In addition, there were year-to-year changes in the subsidy rate.

United States Export Allocations

During the 1950 crop year cotton production was short, cotton consumption rose as a result of the war effort, stocks declined rapidly, and exports dropped primarily because of export quotas; consequently domestic spot prices increased during this period. The effects of the short U. S. export supply following the initiation of export allocation quotas brought an abrupt increase in the price of foreign cotton — such a reaction is predictable since the short-run supply elasticity of cotton is very low and since the United States is the dominant exporter. Less abrupt changes occurred in the quantity of exports, level of stocks, acreage harvested, and production.

The data for the U.A.R. reveals a close association between price changes for Egyptian cotton and the timing of U. S. export allocations — initiation in September 1950 and termination in August 1951 (see Table 15).

Table 15. Prices of Cotton in Specified Foreign Markets,
Yearly Averages, 1948-1949 to 1952-1953
— Monthly Averages from August 1950 to September 1951^a

| Beginning Aug. 1- July 31 | U.S. Ten Spot Average Middling 15/16" ^b | Alexandria Egypt Ashmouni Good | Karachi Pakistan 289 F Punjab S.G. | Sao Paulo Brazil Type 5 | Torreón Mexico Middling 15/16" |
|---------------------------------|---|---|--|-------------------------------|---|
| 1948 | 32.15 | 42.10 | 36.00 | 33.05 | 25.25 |
| 1949 | 31.83 | 45.96 | 30.08 | 32.35 | 25.30 |
| 1950 | 42.58 | 67.13 | 46.96 | 58.79 | 44.61 |
| August | 38.06 | 41.90 | 34.44 | 43.27 | 31.30 |
| September | 40.68 | 48.54 | 40.60 | 45.66 | 35.15 |
| October | 39.81 | 63.36 | 47.48 | 54.89 | 40.53 |
| November | 42.24 | 66.32 | 42.77 | 60.92 | 44.31 |
| December | 42.59 | 71.91 | 38.59 | 64.08 | 44.88 |
| January | 44.20 | 78.05 | 43.95 | 69.71 | 48.76 |
| February | ... ^c | 81.96 | 53.35 | 71.78 | 60.43 |
| March | 45.14 | 76.94 | 63.03 | 71.57 | 63.95 |
| April | 45.17 | 70.02 | 53.07 | 64.50 | 62.32 |
| May | 45.23 | 68.20 | 54.04 | 64.86 | 39.90 |
| June | 45.22 | 67.83 | 48.95 | 51.87 | 35.06 |
| July | 40.07 | 70.56 | 43.31 | 42.32 | 28.78 |
| August | 34.97 | 72.29 | 40.25 | 46.53 | 28.86 |
| September | 35.09 | 43.85 | 35.20 | 50.92 | 30.09 |
| 1951 | 39.42 | 50.06 | 39.09 | 50.29 | 30.58 |
| 1952 | 34.52 | 32.42 | 28.59 | 44.54 | 27.58 |
| 1953 | 33.55 | 31.56 | 28.96 | 33.78 | ... ^d |

^aU. S. Department of Agriculture, The Cotton Situation, Bureau of Agricultural Economics, CS-137 (October 1951), 31; and The Cotton Situation, Economic Research Service, CS-157 (March 1955), 26.

^bThe Cotton Situation, Economic Research Service, CS-155 (October 1954), 43.

^cNo quotation.

^dComparable data are not available.

The U.A.R.'s cotton price rose from 46 cents per pound in 1949-1950 to 67 cents per pound in 1950-1951, and in 1951-1952 fell to 50 cents per

pound. U.A.R. exports declined somewhat during this period of high prices but in 1952-1953 increased again at considerably lower prices (see Table 16). U.A.R. stock levels continued a post-war decline until the 1952-1953 and 1953-1954 crop years, when stocks increased to well over 800 thousand bales (see Table 17). This high level of stocks did not, apparently, result from a lagged effect of the U. S. cancellation of export allocations, but rather resulted from unusually large yields during these two crop years. Acreage and production were not apparently affected by the U. S. export allocations either during the quota period or immediately after the quotas were dropped.

The Brazilian cotton industry was much more affected by the U. S. export allocation than was the U.A.R., or any of the other countries studied. Brazilian cotton prices, like those in the U.A.R., exhibited a marked increase coincidental with the initiation of U.S. export allocations; however, the corresponding decrease in the price level shortly after cancellation of the allocations did not occur (see Table 15). During the period in which the U. S. export allocations were in effect the Brazilian government initiated high domestic price supports to encourage production so as to take advantage of the high world price.³⁷ The abrupt cancellation of the export restriction by the United States 11 months after its initiation left Brazil embarrassingly unable to meet world price competition. The Brazilian miscalculation of U. S. intentions had repercussions throughout the Brazilian

³⁷ The Cotton Situation, CS-143 (September-October 1952), 9.

Table 16. Cotton Exports by Country, 1949 to 1962 (figures in thousands of bales)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | | World Total |
|--------------------|-------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| | | | | | | | Minus U.S. | Other ^b | |
| 1949-50 | 5,771 | 1,647 | 655 | 864 | 600 | 326 | 3,228 | 3,709 | 12,708 |
| 1950-51 | 4,108 | 1,538 | 742 | 1,043 | 698 | 373 | 4,394 | 3,603 | 12,105 |
| 1951-52 | 5,520 | 912 | 981 | 906 | 350 | 399 | 3,548 | 3,198 | 12,266 |
| 1952-53 | 3,048 | 1,735 | 988 | 1,275 | 153 | 268 | 4,419 | 4,446 | 11,913 |
| 1953-54 | 3,761 | 1,491 | 948 | 898 | 1,402 | 415 | 5,154 | 4,480 | 13,395 |
| 1954-55 | 3,446 | 1,086 | 1,248 | 650 | 1,040 | 299 | 4,323 | 4,583 | 12,352 |
| 1955-56 | 2,215 | 1,439 | 2,018 | 726 | 814 | 561 | 5,558 | 5,226 | 12,999 |
| 1956-57 | 7,598 | 928 | 1,304 | 508 | 381 | 334 | 3,455 | 4,749 | 15,802 |
| 1957-58 | 5,717 | 1,262 | 1,411 | 385 | 216 | 394 | 3,668 | 4,702 | 14,087 |
| 1958-59 | 2,789 | 1,386 | 1,800 | 376 | 243 | 674 | 4,479 | 6,221 | 13,489 |
| 1959-60 | 7,182 | 1,845 | 1,298 | 334 | 448 | 591 | 4,516 | 5,608 | 17,306 |
| 1960-61 | 6,632 | 1,589 | 1,602 | 245 | 698 | 439 | 4,573 | 5,607 | 16,812 |
| 1961-62 | 4,913 | 1,126 | 1,488 | 301 | 851 | 640 | 4,406 | 6,125 | 15,444 |
| 1962-63 | 3,351 | 1,367 | 1,888 | 685 | 1,149 | 790 | 5,879 | 6,629 | 15,859 |

^aInternational Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 40-42; and XVII (April 1964), 16.

^bSub-total for the six countries equals "World Total" minus "Other." See footnote 1, page 4.

Table 17. Cotton Stocks by Country, 1949 to 1963 (figures in thousands of bales)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | | World Total |
|--------------------|--------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| | | | | | | | U.S. | Other ^b | |
| 1949-50 | 5,287 | 587 | 250 | 120 | 620 | 185 | 1,762 | 8,344 | 15,393 |
| 1950-51 | 6,846 | 487 | 200 | 150 | 530 | 160 | 1,527 | 8,658 | 17,031 |
| 1951-52 | 2,278 | 430 | 265 | 190 | 680 | 225 | 1,790 | 8,232 | 12,300 |
| 1952-53 | 2,789 | 855 | 250 | 450 | 1,475 | 90 | 3,120 | 9,784 | 15,693 |
| 1953-54 | 5,605 | 825 | 180 | 500 | 2,050 | 220 | 3,775 | 9,312 | 18,692 |
| 1954-55 | 9,728 | 460 | 115 | 330 | 1,190 | 220 | 2,315 | 9,205 | 21,248 |
| 1955-56 | 11,205 | 615 | 290 | 325 | 800 | 325 | 2,355 | 8,774 | 22,334 |
| 1956-57 | 14,529 | 305 | 50 | 235 | 630 | 270 | 1,490 | 8,563 | 24,582 |
| 1957-58 | 11,373 | 440 | 130 | 300 | 515 | 545 | 1,930 | 10,277 | 23,580 |
| 1958-59 | 8,737 | 600 | 330 | 400 | 595 | 365 | 2,290 | 11,101 | 22,128 |
| 1959-60 | 8,885 | 720 | 400 | 275 | 600 | 265 | 2,260 | 10,061 | 21,206 |
| 1960-61 | 7,559 | 435 | 270 | 200 | 660 | 250 | 1,815 | 10,954 | 20,328 |
| 1961-62 | 7,228 | 475 | 265 | 240 | 660 | 330 | 1,970 | 11,021 | 20,219 |
| 1962-63 | 7,831 | 250 | 255 | 360 | 1,000 | 650 | 2,515 | 9,317 | 19,663 |
| 1963-64 | 11,216 | 350 | 265 | 165 | 900 | 550 | 2,230 | 9,502 | 22,948 |

^aInternational Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 24-25; and XVII (April 1964), 7.

^bSub-total for the six countries equals "World Total" minus "Other." See footnote 1, page 4.

domestic cotton industry. Average yearly cotton prices remained comparatively high until the 1953-1954 marketing year. Sharp acreage and production increases followed the high price supports and, indirectly, the U. S. export restrictions. Brazilian cotton acreage expanded by 800 thousand acres between the 1949-1950 and 1950-1951 seasons and remained high through the 1951-1952 season; production expanded considerably as a result (see Tables 18 and 19). Exports increased in 1950-1951; however, in 1951-1952 and 1952-1953, after the U. S. export limitation was cancelled, but while Brazil retained its high domestic price supports, exports declined markedly (see Table 16). As a result of this chain of events, Brazilian cotton stocks increased 287 percent from 1950 to 1953 (see Table 17).

Of the three remaining major countries, the reaction in Pakistan to the U. S. export limitations most closely resembles that of Brazil. The primary difference between the two countries in the initial reaction is that the reaction is smaller in Pakistan than in Brazil (perhaps due to a lower elasticity of supply in Pakistan or less certainty by the growers that prices would remain high). The more rapid adjustment by Pakistan, after export restrictions were dropped by the United States, seems to be largely the result of a more rapid downward adjustment in the price of Pakistan's cotton (Table 15), thus discouraging additional production, encouraging exports, and thereby reducing excess stock accumulations more rapidly.

Table 18. Cotton Acreage by Country, 1949 to 1962 (figures in thousands of acres)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total Minus U.S. | Other ^b | World Total |
|--------------------|--------|--------|-------------|---------------|--------|-------|--------------------------------|--------------------|----------------|
| 1949-50 | 27,439 | 1,756 | 1,356 | 2,799 | 4,500 | 429 | 10,840 | 32,717 | 70,996 |
| 1950-51 | 17,843 | 2,050 | 1,879 | 3,071 | 5,300 | 539 | 12,839 | 39,832 | 70,514 |
| 1951-52 | 26,949 | 2,055 | 2,183 | 3,375 | 5,100 | 571 | 13,284 | 48,821 | 89,054 |
| 1952-53 | 28,096 | 2,042 | 1,938 | 3,480 | 4,500 | 615 | 12,575 | 46,920 | 87,591 |
| 1953-54 | 24,341 | 1,375 | 1,862 | 2,927 | 4,000 | 652 | 10,816 | 47,428 | 82,585 |
| 1954-55 | 19,251 | 1,639 | 2,279 | 3,193 | 4,500 | 685 | 12,296 | 51,095 | 82,642 |
| 1955-56 | 16,928 | 1,885 | 2,617 | 3,529 | 5,000 | 598 | 13,629 | 53,649 | 84,206 |
| 1956-57 | 15,615 | 1,715 | 2,158 | 3,607 | 4,300 | 764 | 12,544 | 54,414 | 82,573 |
| 1957-58 | 13,558 | 1,888 | 2,263 | 3,641 | 3,700 | 728 | 12,220 | 53,374 | 79,152 |
| 1958-59 | 11,849 | 1,977 | 2,552 | 3,305 | 4,000 | 887 | 12,721 | 53,654 | 78,224 |
| 1959-60 | 15,117 | 1,827 | 1,863 | 3,370 | 4,600 | 942 | 12,602 | 52,159 | 79,878 |
| 1960-61 | 15,309 | 1,944 | 2,234 | 3,242 | 5,000 | 940 | 13,360 | 51,453 | 80,122 |
| 1961-62 | 15,634 | 2,061 | 1,963 | 3,488 | 5,500 | 1,176 | 14,188 | 50,399 | 80,221 |
| 1962-63 | 15,569 | 1,720 | 2,058 | 3,435 | 5,500 | 1,106 | 13,819 | 51,088 | 80,476 |

^aInternational Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 20, 22; and XVII (April 1964), 11.

^bSub-total for the six countries equals "World Total" minus "Other." See footnote 1, page 4.

Table 19. Cotton Production by Country, 1949 to 1962 (figures in thousands of bales)^a

| Aug. 1- July 31 | U.S. | U.A.R. | Mex- ico | Pak- istan | Brazil | Sudan | Sub- total | | World Total |
|--------------------|--------|--------|-------------|---------------|--------|-------|---------------|--------------------|----------------|
| | | | | | | | Minus | Other ^b | |
| | | | | | | | U.S. | | |
| 1949-50 | 16,005 | 1,804 | 917 | 1,039 | 1,350 | 305 | 5,415 | 11,437 | 32,857 |
| 1950-51 | 9,878 | 1,762 | 1,145 | 1,244 | 1,700 | 440 | 6,291 | 14,350 | 30,519 |
| 1951-52 | 15,155 | 1,673 | 1,280 | 1,353 | 1,980 | 265 | 6,551 | 17,000 | 38,706 |
| 1952-53 | 15,167 | 2,057 | 1,250 | 1,558 | 1,550 | 400 | 6,815 | 18,143 | 40,125 |
| 1953-54 | 16,402 | 1,467 | 1,215 | 1,184 | 1,450 | 420 | 5,736 | 19,511 | 41,649 |
| 1954-55 | 13,630 | 1,605 | 1,810 | 1,309 | 1,650 | 410 | 6,784 | 20,602 | 41,016 |
| 1955-56 | 14,680 | 1,541 | 2,242 | 1,450 | 1,700 | 510 | 7,443 | 21,556 | 43,679 |
| 1956-57 | 13,027 | 1,498 | 1,877 | 1,415 | 1,300 | 615 | 6,705 | 22,434 | 42,166 |
| 1957-58 | 10,960 | 1,870 | 2,106 | 1,412 | 1,350 | 215 | 6,953 | 23,661 | 41,574 |
| 1958-59 | 11,504 | 2,057 | 2,359 | 1,270 | 1,400 | 575 | 7,661 | 25,663 | 44,828 |
| 1959-60 | 14,555 | 2,109 | 1,660 | 1,360 | 1,700 | 580 | 7,409 | 25,302 | 47,266 |
| 1960-61 | 14,453 | 2,205 | 2,100 | 1,405 | 1,950 | 525 | 8,185 | 24,298 | 46,936 |
| 1961-62 | 14,448 | 1,548 | 1,990 | 1,510 | 2,500 | 980 | 8,528 | 23,131 | 46,107 |
| 1962-63 | 14,920 | 2,109 | 2,410 | 1,635 | 2,300 | 715 | 9,169 | 24,815 | 48,904 |

^aInternational Cotton Advisory Committee, Cotton — World Statistics, XVI (April 1963), 15-17; and XVII (April 1964), 8-9.

^bSub-total for the six countries equals "World Total" minus "Other." See footnote 1, page 4.

Mexico appears to have been least affected by the U. S. action. Prices did indeed increase initially during 1950-1951, but then adjusted to a lower level throughout the 1950-1951 marketing year as the United States gradually increased its export allocation quotas. Stocks remained stable. Acreage, production, and exports continued an upward trend throughout 1950-1951 and thereafter.

Spot price data, as used above, are not readily available for Sudan. Acreage, production, export, and stock accumulation data suggest that the U. S. export allocations were of limited consequence to Sudan's cotton industry; acreage generally moved upward during the early 1950's and variations in production, exports, and stocks reflect years in which unusually poor yields occurred.

The consequences of the U. S. export allocation quotas during 1950-1951 support the contention that the United States is the "price leader" in the export market.³⁸ The price reaction discussed was not a result of deliberate price administration on the part of the United States, such as in the case of export subsidies, but rather was a consequence of inadvertant supply control in the world cotton market in combination with an increase in speculative demand resulting from uncertainties regarding the possible expansion of the Korean War. Thus, the 1950-1951 situation represents a special case of short cotton supplies which has not been repeated since then.

³⁸The term "price leader" used in this paper is not used in the sense of an oligopolistic price leader but rather as a "price influencer."

United States Concessional Sales

An abrupt reversal in cotton supplies, especially in the United States, forced policy makers to begin thinking of the disposal of surplus cotton rather than the restriction of exports. In July 1954, Congress passed P.L. 480, and with it sanctioned a major foreign surplus disposal program. In addition, during 1954, Section 402 of the Mutual Security Act was expanded to designate more funds for local currency sales of surplus agricultural commodities. In 1955-1956, U. S. stock accumulations reached a record high; this prompted aggressive sales for local currency during 1956.

The effect of local currency sales on the price of cotton in the commercial export market is neither direct, nor is it obvious. If local currency sales are effectively insulated from commercial markets, as the preamble of P.L. 480 indicates should be the case, then there should be no effect on commercial prices of exports. It is unlikely that local currency sales have significantly affected U. S. export prices, for even if such sales were not insulated from the commercial market, the domestic price supports provide a price floor below which the price is unlikely to fall. But the quantity exported commercially does not face such a floor and thus may decline as a result of the substitution of local currency sales for regular dollar sales (the demand schedule for commercial cotton shifts to the left). The price effects of concessional sales upon competing exporters are impossible to identify directly since these sales are outside of regular market channels. Therefore, the effects of sales for local currency

must be inferred from changes in demand by importing countries for a given exporting country's cotton. This change in demand is reflected by the importing country substituting local currency purchases from the U. S. for normal commercial channel imports, either of U. S. or foreign origin; such a shift in demand would result in a downward pressure on commercial prices.

A definite scarcity of data regarding the division between pre-P.L. 480 federal government cotton export assistance and commercial cotton exports, restricts analysis of the substitution, if any, of P.L. 480 local currency sales for normal commercial sales to specific importing countries. In addition, the near simultaneous initiation of export subsidies (see below), and the aggressive promotion of local currency sales, mixes the individual effects of the two programs upon the relative price and export quantity changes. However, data available for the period 1955 to 1962 permit an approximate division of exports to specific countries into local currency sales and barter, and commercial sales; considerable emphasis is placed on this data division for the analysis of the P.L. 480 program.

Figures 2, 3, 4, and 5 present three cotton importing country cases. From these graphs several factors are apparent. First, from 1951 to 1962 there were substantial year-to-year fluctuations in import levels even though the overall trend was upward (Figure 2). Second, for the selected cases (representative of the general case), the percentage of total imports coming from the United States, or conversely from all other cotton exporters, has been highly variable (Figures 3, 4, and 5). And third, concessional

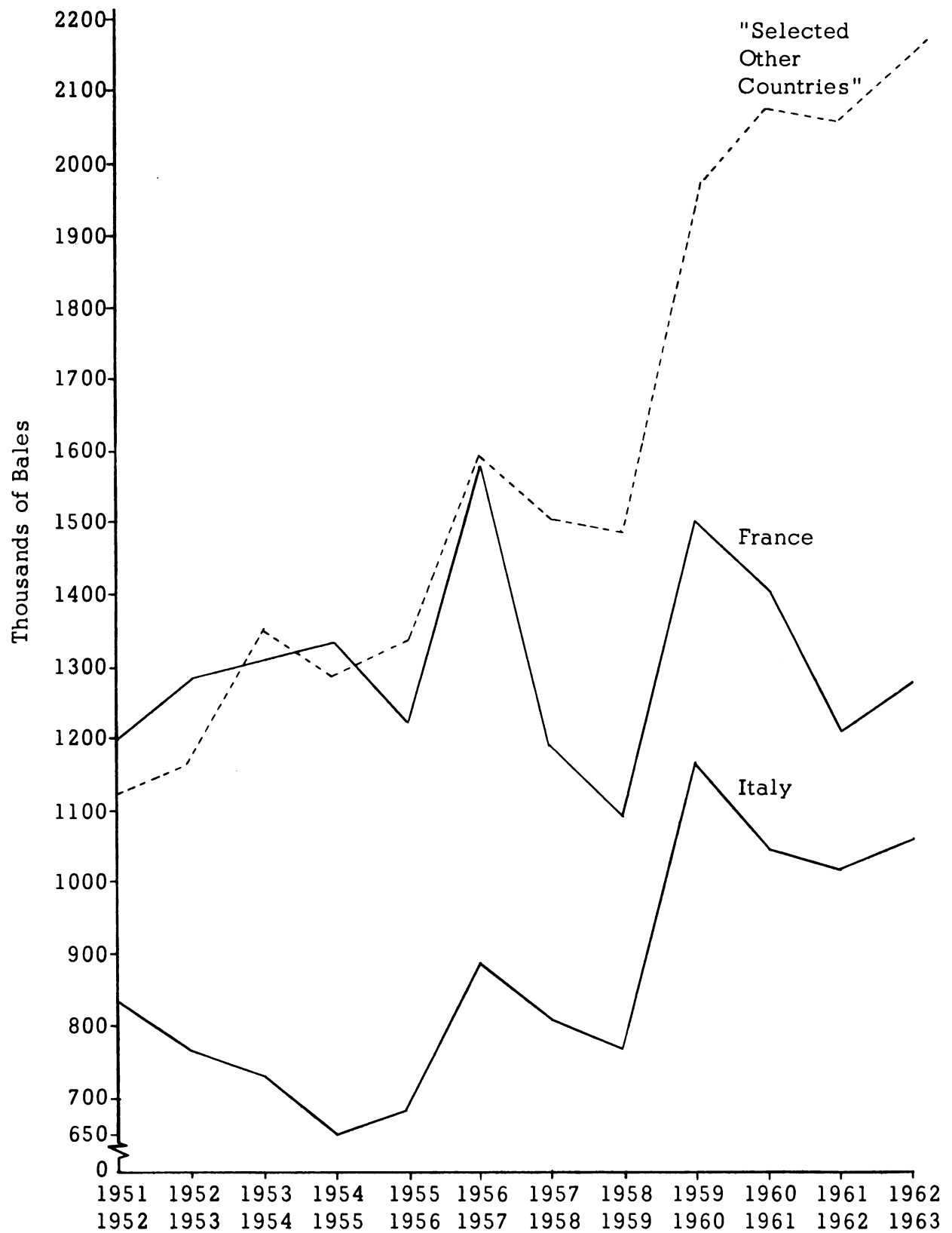


Figure 2. Total Raw Cotton Imports by Selected Countries, 1951-1962

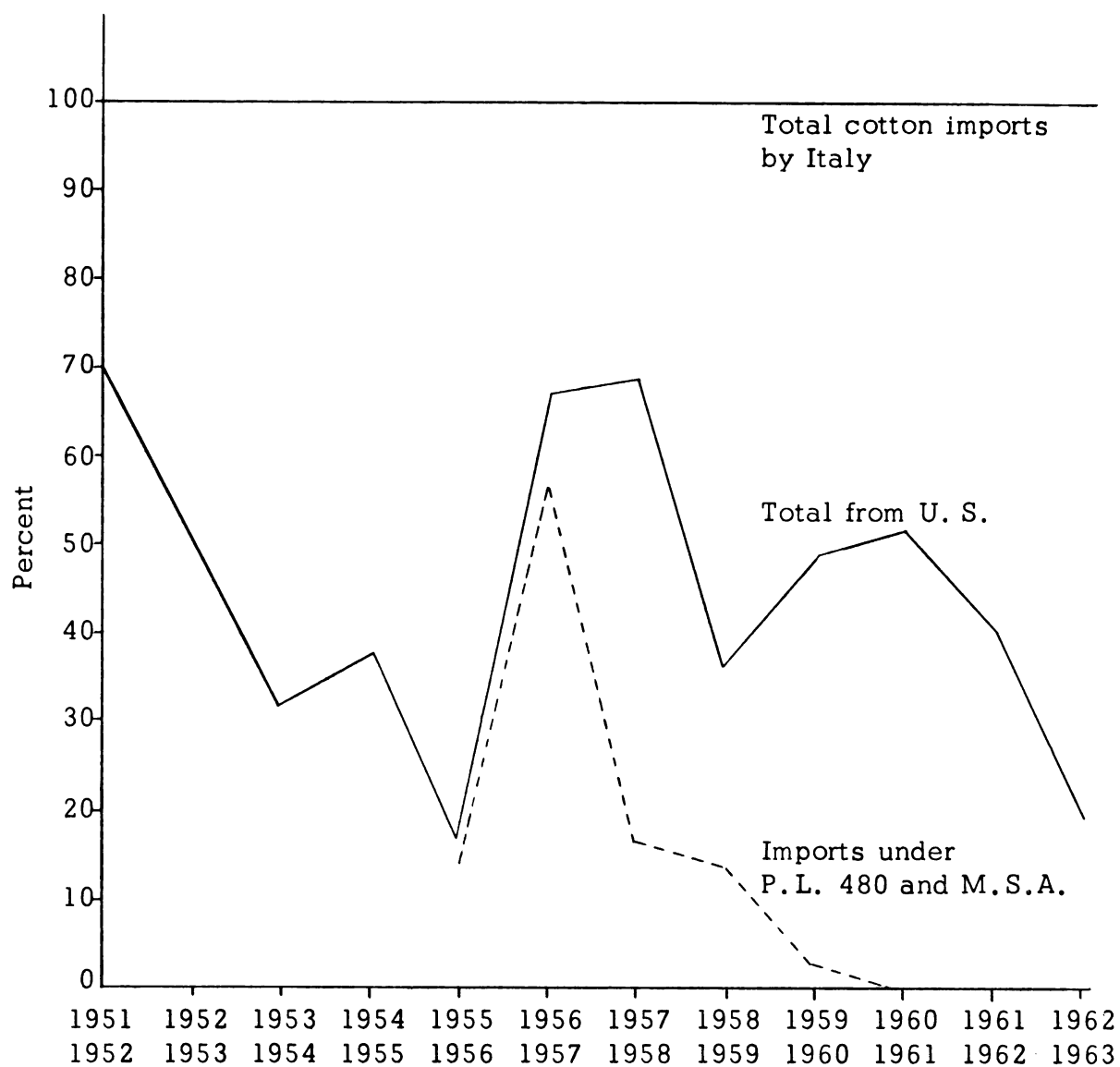


Figure 3. Cotton Imports by Italy in Percentage Terms, 1951-1962

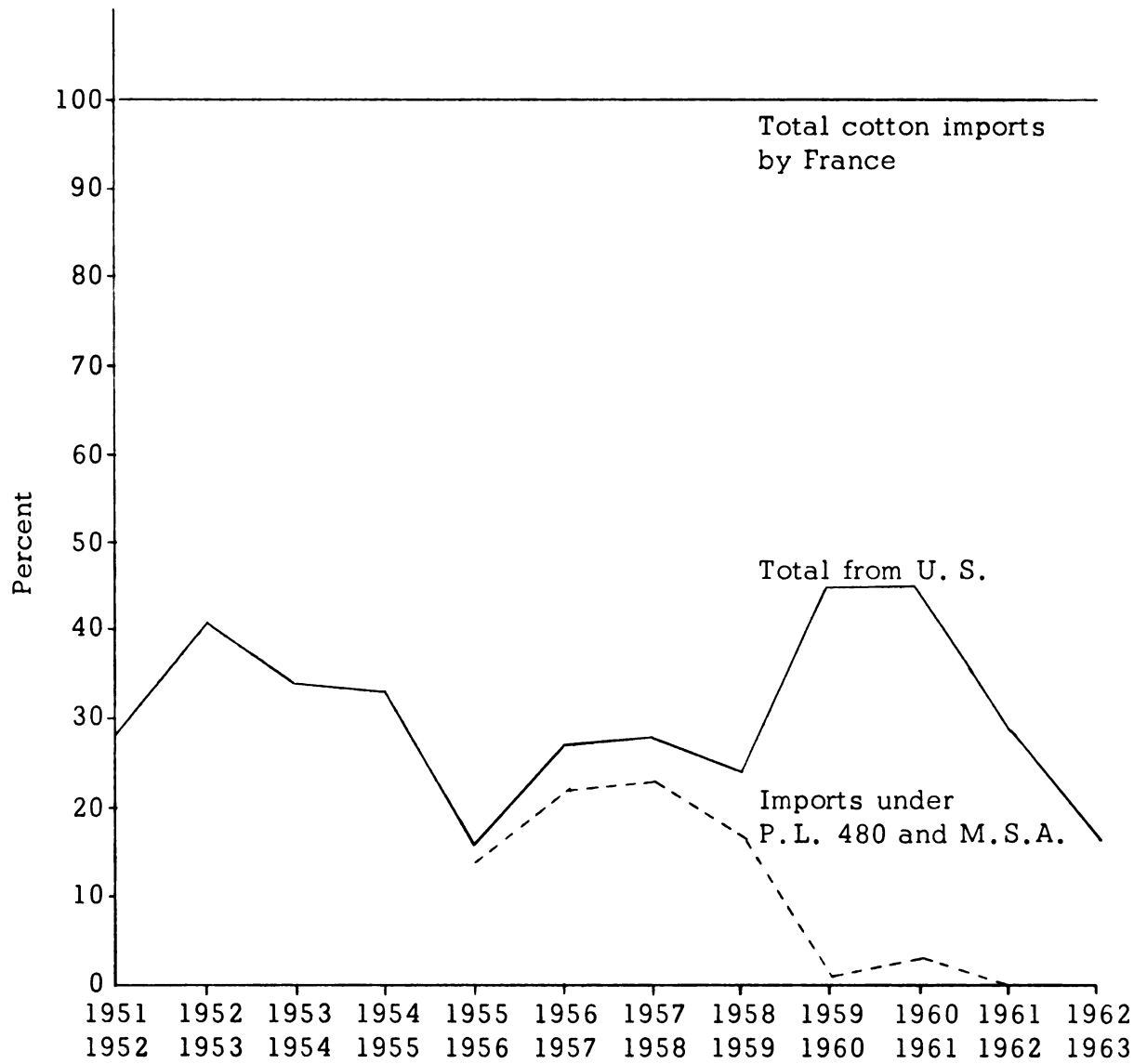
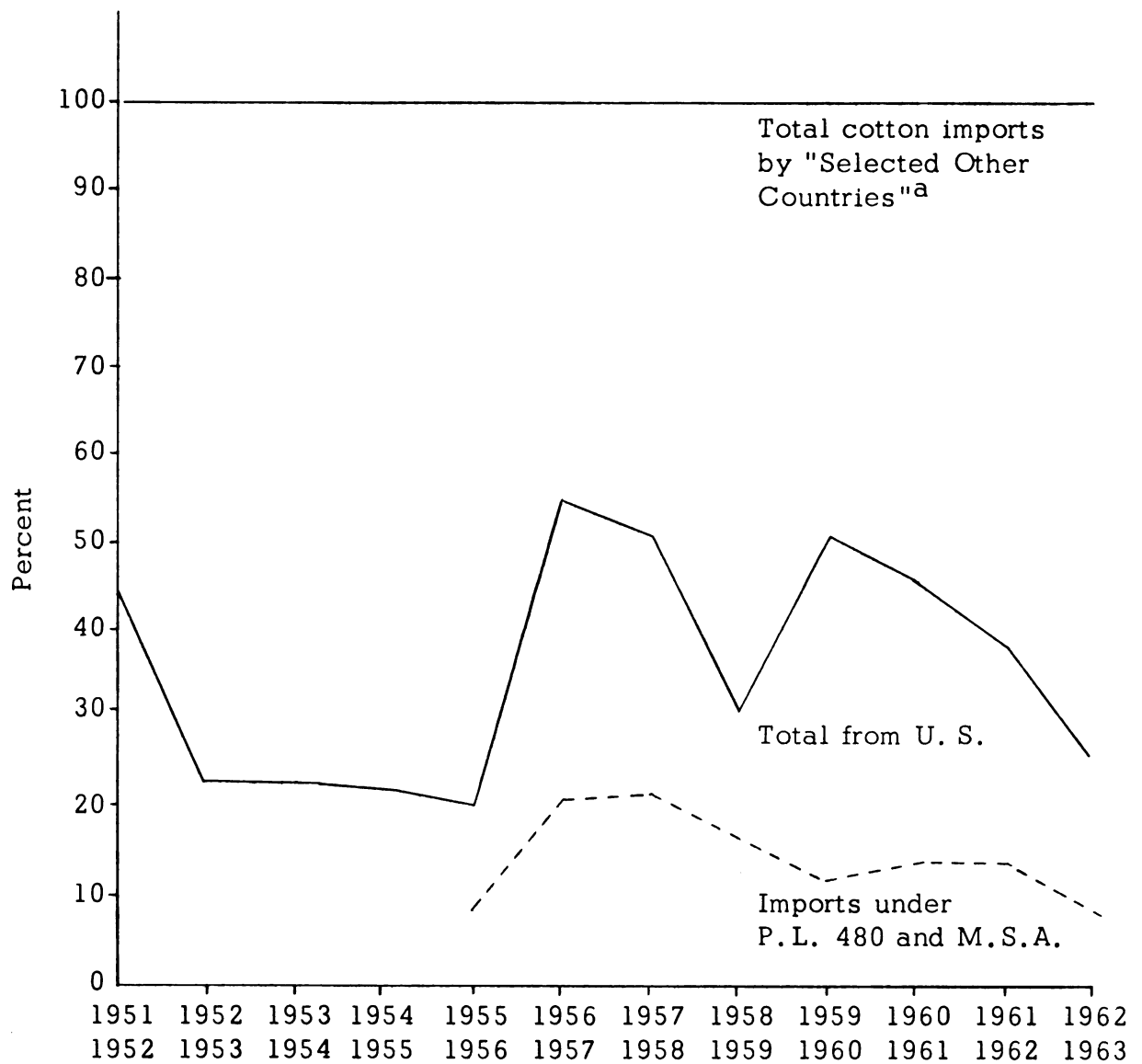


Figure 4. Cotton Imports by France in Percentage Terms, 1951-1962



^aIncludes all non-communist bloc importers of cotton except Canada, U.S.A., Belgium, France, West Germany, Italy, Netherlands, Spain, Sweden, United Kingdom, Yugoslavia, Formosa, India, Japan, and South Korea.

Figure 5. Cotton Imports by "Selected Other"
Cotton Importers in Percentage Terms, 1951-1962

sales of cotton through P.L. 480 and Section 402 of the Mutual Security Act accounted for a substantial portion of U. S. exports to the selected importers. This was especially true during the market years 1956 and 1957 when P.L. 480 exports were aggressively promoted.

Public Law 480 exports by the United States to Italy in 1956 very definitely expanded the quantity of U. S. exports to that country, largely at the expense of decreased Italian imports from other exporters. Total cotton imports by Italy increased nearly 200 thousand bales from 1955 to 1956. Commercial imports from the United States increased 70 thousand bales (partially a reflection of export subsidies) and P.L. 480 imports increased by 400 thousand bales (Table 20). The position of U. S. export competitors was damaged both relatively and absolutely by the aggressive promotion of P.L. 480 during 1956.

A similar pattern is exhibited in the cotton imports of a group of developing nations, "Selected Other Cotton Importers." Again, between 1955 and 1956 total cotton imports increased by approximately 250 thousand bales, imports from other exporters decreased by 350 thousand bales, and P.L. 480 imports increased by 220 thousand bales. In addition, commercial imports from the United States increased nearly 400 thousand bales. Thus we are faced with the question of how much damage was done to U. S. competing exporters by P.L. 480 exports and how much by the export subsidy based commercial sales. The data in Table 20 and Figure 5 indicates that a definite readjustment of the market share between the United States

Table 20. Cotton Imports by Selected Countries According to Source^a

| | France | | Italy | | Belgium | | Japan | | Selected Others ^b | |
|---------------|-------------|------------|-------------|------------|-------------|------------|-------------|------------|------------------------------|------------|
| | 1,000 Bales | % of Total | 1,000 Bales | % of Total | 1,000 Bales | % of Total | 1,000 Bales | % of Total | 1,000 Bales | % of Total |
| 1951-52 | | | | | | | | | | |
| Total imports | 1,206 | 100 | 843 | 100 | 436 | 100 | 1,641 | 100 | 1,116 | 100 |
| From U.S. | 353 | 29 | 594 | 70 | 310 | 71 | 1,064 | 65 | 498 | 45 |
| PL 480, MSA | | | | | | | | | | |
| Commercial | | | | | | | | | | |
| All others | 853 | 71 | 249 | 30 | 126 | 29 | 577 | 35 | 618 | 55 |
| 1952-53 | | | | | | | | | | |
| Total imports | 1,284 | 100 | 773 | 100 | 377 | 100 | 2,055 | 100 | 1,174 | 100 |
| From U.S. | 523 | 41 | 390 | 50 | 114 | 30 | 625 | 30 | 268 | 23 |
| PL 480, MSA | | | | | | | | | | |
| Commercial | | | | | | | | | | |
| All others | 761 | 59 | 383 | 50 | 263 | 70 | 1,430 | 70 | 906 | 67 |
| 1953-54 | | | | | | | | | | |
| Total imports | 1,314 | 100 | 735 | 100 | 464 | 100 | 2,431 | 100 | 1,348 | 100 |
| From U.S. | 451 | 34 | 233 | 32 | 101 | 22 | 942 | 39 | 312 | 23 |
| PL 480, MSA | | | | | | | | | | |
| Commercial | | | | | | | | | | |
| All others | 863 | 66 | 502 | 68 | 363 | 78 | 1,489 | 61 | 1,036 | 67 |
| 1954-55 | | | | | | | | | | |
| Total imports | 1,335 | 100 | 655 | 100 | 451 | 100 | 2,037 | 100 | 1,294 | 100 |
| From U.S. | 443 | 33 | 251 | 38 | 86 | 19 | 753 | 37 | 288 | 22 |
| PL 480, MSA | | | | | | | | | | |
| Commercial | | | | | | | | | | |
| All others | 892 | 67 | 404 | 62 | 365 | 81 | 1,284 | 63 | 1,006 | 68 |
| 1955-56 | | | | | | | | | | |
| Total imports | 1,221 | 100 | 693 | 100 | 389 | 100 | 2,376 | 100 | 1,340 | 100 |
| From U.S. | 195 | 16 | 121 | 17 | 44 | 11 | 768 | 32 | 268 | 20 |
| PL 480, MSA | 171 | 14 | 99 | 14 | 2 | ... | 634 | 27 | 121 | 9 |
| Commercial | 24 | 2 | 22 | 3 | 42 | 11 | 134 | 5 | 147 | 11 |
| All others | 1,026 | 84 | 572 | 83 | 345 | 89 | 1,608 | 68 | 1,072 | 80 |
| 1956-57 | | | | | | | | | | |
| Total imports | 1,576 | 100 | 886 | 100 | 515 | 100 | 2,929 | 100 | 1,595 | 100 |
| From U.S. | 422 | 27 | 593 | 67 | 289 | 56 | 1,425 | 49 | 872 | 55 |
| PL 480, MSA | 339 | 22 | 501 | 57 | 71 | 13 | 825 | 28 | 340 | 21 |
| Commercial | 83 | 5 | 92 | 10 | 218 | 43 | 600 | 21 | 532 | 34 |
| All others | 1,154 | 73 | 293 | 33 | 226 | 44 | 1,504 | 51 | 723 | 45 |
| 1957-58 | | | | | | | | | | |
| Total imports | 1,190 | 100 | 811 | 100 | 368 | 100 | 2,394 | 100 | 1,512 | 100 |
| From U.S. | 334 | 28 | 557 | 69 | 194 | 53 | 1,050 | 44 | 771 | 51 |
| PL 480, MSA | 272 | 23 | 140 | 17 | 37 | 10 | 806 | 34 | 333 | 22 |
| Commercial | 62 | 5 | 417 | 52 | 157 | 43 | 244 | 10 | 438 | 29 |
| All others | 856 | 72 | 254 | 31 | 174 | 47 | 1,344 | 56 | 741 | 49 |
| 1958-59 | | | | | | | | | | |
| Total imports | 1,087 | 100 | 773 | 100 | 374 | 100 | 2,525 | 100 | 1,492 | 100 |
| From U.S. | 264 | 24 | 288 | 37 | 74 | 20 | 646 | 26 | 462 | 31 |
| PL 480, MSA | 186 | 17 | 106 | 13 | 20 | 5 | 388 | 15 | 258 | 17 |
| Commercial | 78 | 7 | 182 | 24 | 54 | 15 | 256 | 11 | 204 | 14 |
| All others | 823 | 76 | 485 | 63 | 300 | 80 | 1,881 | 74 | 1,030 | 69 |
| 1959-60 | | | | | | | | | | |
| Total imports | 1,503 | 100 | 1,172 | 100 | 466 | 100 | 3,276 | 100 | 1,946 | 100 |
| From U.S. | 682 | 45 | 570 | 49 | 194 | 41 | 1,608 | 49 | 985 | 51 |
| PL 480, MSA | 22 | 1 | 30 | 3 | 3 | ... | 382 | 12 | 237 | 12 |
| Commercial | 660 | 44 | 540 | 46 | 191 | 41 | 1,226 | 37 | 748 | 39 |
| All others | 821 | 55 | 602 | 51 | 272 | 59 | 1,668 | 51 | 961 | 49 |
| 1960-61 | | | | | | | | | | |
| Total imports | 1,408 | 100 | 1,047 | 100 | 430 | 100 | 3,535 | 100 | 2,078 | 100 |
| From U.S. | 637 | 45 | 544 | 52 | 204 | 47 | 1,881 | 53 | 965 | 46 |
| PL 480, MSA | 43 | 3 | 1 | ... | ... | ... | 390 | 11 | 299 | 14 |
| Commercial | 594 | 42 | 543 | 52 | 204 | 47 | 1,491 | 42 | 666 | 32 |
| All others | 771 | 55 | 503 | 48 | 226 | 53 | 1,654 | 47 | 1,113 | 54 |
| 1961-62 | | | | | | | | | | |
| Total imports | 1,206 | 100 | 1,016 | 100 | 386 | 100 | 2,843 | 100 | 2,060 | 100 |
| From U.S. | 349 | 29 | 413 | 41 | 96 | 25 | 1,103 | 39 | 796 | 39 |
| PL 480, MSA | 2 | ... | ... | ... | ... | ... | 430 | 15 | 286 | 14 |
| Commercial | 347 | 29 | 413 | 41 | 96 | 25 | 663 | 24 | 510 | 25 |
| All others | 857 | 71 | 603 | 39 | 290 | 75 | 1,740 | 61 | 1,264 | 61 |
| 1962-63 | | | | | | | | | | |
| Total imports | 1,282 | 100 | 1,063 | 100 | 359 | 100 | 3,070 | 100 | 2,154 | 100 |
| From U.S. | 202 | 16 | 215 | 20 | 78 | 22 | 889 | 29 | 559 | 26 |
| PL 480, MSA | ... | ... | ... | ... | ... | ... | 517 | 17 | 196 | 9 |
| Commercial | 202 | 16 | 215 | 20 | 78 | 22 | 372 | 12 | 363 | 17 |
| All others | 1,080 | 84 | 848 | 80 | 281 | 78 | 2,181 | 71 | 1,595 | 74 |

^aThe data are accumulated from: International Cotton Advisory Committee, *Cotton—World Statistics*, XVI (April 1963), 47-49; and XVII (April 1964), 27. In addition: U. S. Department of Agriculture, *Statistics on Cotton and Related Data, 1925-1962*, Economic Research Service, Statistical Bulletin 329 (April 1963), 27-33, 151, 154, 157, 158; and the "Supplement for 1964" to Statistical Bulletin 329 (October 1964), 16-17, 90, 91, 93.

^bSee Figure 5.

and other exporters took place as a result of both U. S. export programs, and that both programs contributed to the decline in the market of U. S. competing exporters. The only conclusion that can be drawn is that the intent of P.L. 480 — sales are to be made only ". . . in excess of the usual marketings of such commodities. . ." ³⁹ — was grossly overridden during the 1956 export year.

The data for France are similar to the two noted above, except that imports from exporters other than the United States increased nearly 125 thousand bales. The P.L. 480 imports by France may have been in addition to normal commercial imports. But even that statement must be made cautiously because data prior to 1955 are not available for the division of U. S. exports to specific countries according to concessional sales and commercial sales; thus direct comparisons to the pre-1955 period are not possible.

The data, summarized in Table 20 and Figures 2-5, indicate that P.L. 480 cotton exports did replace some of the cotton exports of competing exporters. However, this characteristic is not apparent in the data after the initial aggressive export period of 1956. The fact that the P.L. 480 program had a disruptive influence on the export market is clear, but obvious disruption of substantial proportions is apparent only during the early states of the program — during 1956-1957 in particular. To some extent the change in emphasis from surplus disposal to an aid and development

³⁹ Objective 5, page 35.

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program reduced the pressure for disruptive sales under the P.L. 480 program. However, the diplomatic protests from competing exporters, as well as the commercial protests, against the disruptive effects of concessional sales and barter arrangements were probably the most immediate reasons for the more judicious administration of the program.

Although P.L. 480 sales were not intended to compete with commercial sales of foreign cotton exporters, no such intention was tied to the initiation of export subsidies; rather the objective of the export subsidy program was to enable U. S. cotton to compete directly on a price-quality basis with foreign cotton exports. We now turn to an analysis of the export subsidy program.

United States Export Subsidies

Beginning with the 1956 market year, the United States initiated export subsidies on all qualities of upland cotton (long staple not included) in the form of export differentials on CCC stocks. Prior to the initiation of the export subsidy program U. S. domestic price supports established a price floor that put U. S. commercial cotton exports at a definite competitive disadvantage in the world market.

The price reaction of the U. S. action is shown by the C.I.F. Liverpool price data presented in Table 10.⁴⁰ The average price level of U. S. SM 1-1/16 inch cotton dropped 6.4 cents per pound between the 1955-1956

⁴⁰It must be remembered that the price effects as shown may also include indirect price effects resulting from the concessional sales programs.

and 1956-1957 market years, and thereafter continued at a lower level. Exports increased by 5.4 million bales between 1955-1956 and 1956-1957 — over four million bales of the increase were commercial exports. The increase in commercial exports between 1955-1956 and 1956-1957 was in part the result of consumer country expectations that the United States would impose an export subsidy in the near future. During 1954 and 1955 consumer countries were decreasing their cotton inventories in anticipation of the U. S. export subsidy and the subsequent decrease in raw cotton prices. This reduction of inventory levels is reflected in Table 17, "Other."

The value of federal financial aid through export subsidy payments accounted for 26.6 percent of the value of all U. S. cotton exports during the first full year in which the subsidy was in operation; during 1962-1963 the value of federal financial aid through export subsidy payments reached a high of 39.8 percent of the total value of all U. S. cotton exports (see Table 21).

If the United States is the world "price leader" for raw cotton, then repercussions of the U. S. action should be noticeable in the cotton export data of competing countries. And indeed the price data show such an effect. Figure 6 exhibits price trends of the six countries from 1951 to 1962. The most noticeable characteristic is the universally declining price level over the 12-year period.

The price level of the competing short staple fibers tends to remain very close to but slightly below the U. S. level; this includes the sharp

Table 21. U. S. Financial Aid for Cotton Exports — Value of Aid, and Value of Aid as a Percentage of the Total Value of Cotton Exported, 1950-1962^a

| July 1 - June 30 | Total Value of Exports —Millions of Dollars (1) | Average Rate of Export Subsidy in Cents Per Pound (2) | Value of Export Subsidy Payments— Millions of Dollars (3) | (3) as a Per- centage of (1) | Value of P. L. 480 Title I Exports— Millions of Dollars (4) | (4) as a Per- centage of (1) | Value of P. L. 480 Title II, III, & IV Exports— Millions of Dollars (5) | (5) as a Per- centage of (1) | Value of M. S. A. Exports— Millions of Dollars (6) | (6) as a Per- centage of (1) | (4) + (5) + (6) | (7) as a Per- centage of (1) | Total — (3)+(4)+ (5)+(6) (8) | (8) as a Per- centage of (1) |
|---------------------|---|---|---|---------------------------------------|---|---------------------------------------|--|---------------------------------------|---|---------------------------------------|-----------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 1950 | 934.6 | ... | ... | ... | ... | ... | ... | ... | 408.0 | 43.7 | 408.0 | 43.7 | 408.0 | 43.7 |
| 1951 | 1,188.8 | ... | ... | ... | ... | ... | ... | ... | 169.4 | 14.2 | 169.4 | 14.2 | 169.4 | 14.2 |
| 1952 | 571.1 | ... | ... | ... | ... | ... | ... | ... | 190.0 | 33.3 | 190.0 | 33.3 | 190.0 | 33.3 |
| 1953 | 673.9 | ... | ... | ... | ... | ... | ... | ... | 159.2 | 23.6 | 159.2 | 23.6 | 159.2 | 23.6 |
| 1954 | 684.3 | ... | ... | ... | 9.8 | 1.4 | 1.1 | 0.2 | 210.8 | 30.8 | 221.7 | 32.4 | 221.7 | 32.4 |
| 1955 | 371.9 | 8.30 ^b | 41.5 ^b | 11.2 | 77.6 | 20.9 | 10.1 | 2.7 | 105.8 | 28.4 | 193.5 | 52.0 | 235.0 | 63.2 |
| 1956 | 1,115.6 | 7.68 | 297.1 | 26.6 | 211.6 | 19.0 | 127.5 | 11.4 | 140.6 | 12.6 | 479.7 | 43.0 | 776.8 ^e | 69.6 |
| 1957 | 841.0 | 6.22 | 182.2 | 21.7 | 131.8 | 15.7 | 61.1 | 7.3 | 100.4 | 11.9 | 293.3 | 34.9 | 475.5 ^e | 56.5 |
| 1958 | 412.7 | 5.91 ^c | 81.6 | 19.8 | 95.4 | 23.1 | 47.2 | 11.4 | 106.2 | 25.7 | 248.8 | 60.3 | 330.4 ^e | 80.1 |
| 1959 | 825.6 | 8.00 | 277.9 | 33.7 | 94.8 | 11.5 | 14.1 | 1.7 | 49.1 | 5.9 | 158.0 | 19.1 | 435.9 ^e | 52.8 |
| 1960 | 936.7 | 6.00 | 201.6 | 21.5 | 177.8 | 19.0 | 15.5 | 1.7 | 42.4 | 4.5 | 235.7 | 25.2 | 437.3 ^e | 46.7 |
| 1961 | 662.8 | 8.50 | 208.0 | 31.4 | 146.3 | 22.1 | 10.6 | 1.6 | 8.3 | 1.3 | 165.2 | 24.9 | 373.2 ^e | 56.3 |
| 1962 | 491.4 | 8.50 | 195.4 | 39.8 | 144.0 | 29.3 | 26.0 | 5.3 | ... | ... | 170.0 | 34.6 | 365.4 ^e | 74.4 |

^aThe data are compiled from: U. S. Department of Agriculture, The Cotton Situation, CS-194 (May 1961), 19. Additional information for the years 1960-1963 was obtained by letter dated July 30, 1965 from the Cotton Division, Economic Research Service, U. S. Department of Agriculture.

^bExports under this program were limited to one million bales in 1955-56.

^cCalculated as a weighted average of direct payment and export differential rates.

^dProgram discontinued.

^eSome exports are covered by more than one program.

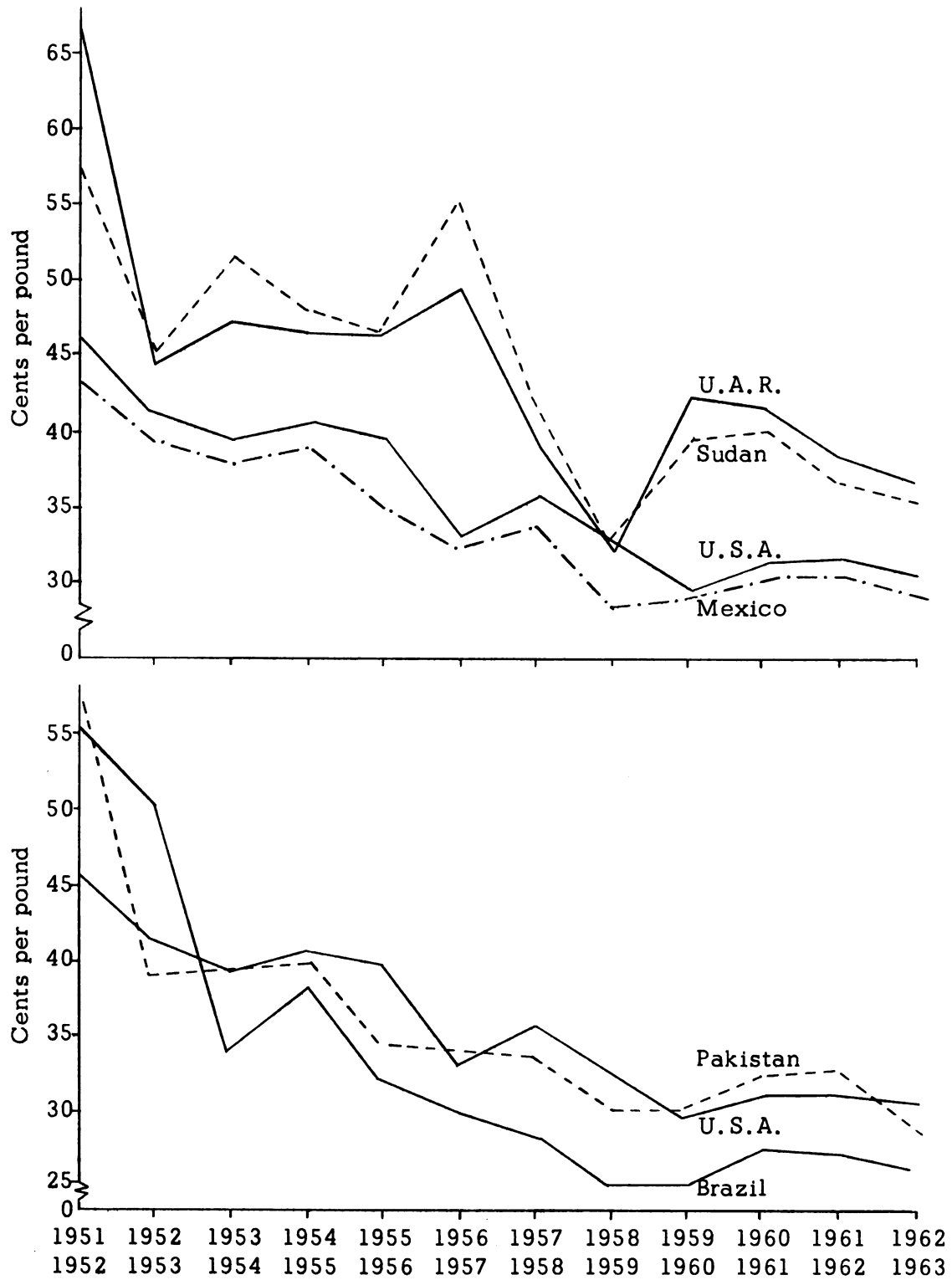


Figure 6. Cotton Prices, C.I.F. Liverpool Quotations, 1951-1962

U. S. price decline that resulted from the initiation of the export subsidy. The price ratios of foreign to U. S. price (see Table 22) bring into sharp focus the highly stable relationship of competing short staple prices relative to U. S. short staple prices (note especially the stable Mexico-United States ratio). The price level trends of foreign short staple cotton, relative to U. S. cotton, strongly support the U. S. "price leadership" contention.

Table 22. Price Ratios of Foreign Cotton Relative to U. S. Cotton —
Derived from C.I.F. Liverpool Quotations, 1951 to 1962

| Aug. 1- July 31 | <u>U.A.R.</u> U.S. | <u>Mexico</u> U.S. | <u>Pakistan</u> U.S. | <u>Brazil</u> U.S. | <u>Sudan</u> U.S. |
|--------------------|-----------------------|-----------------------|-------------------------|-----------------------|----------------------|
| 1951-52 | 1.47 | .95 | 1.26 | 1.21 | 1.27 |
| 1952-53 | 1.07 | .96 | .95 | 1.22 | 1.10 |
| 1953-54 | 1.20 | .96 | 1.05 | .87 | 1.30 |
| 1954-55 | 1.15 | .96 | .99 | .92 | 1.18 |
| 1955-56 | 1.17 | .88 | .88 | .82 | 1.17 |
| 1956-57 | 1.49 | .98 | 1.03 | .90 | 1.66 |
| 1957-58 | 1.11 | .94 | .95 | .80 | 1.18 |
| 1958-59 | .99 | .89 | .94 | .78 | 1.00 |
| 1959-60 | 1.42 | .98 | 1.03 | .86 | 1.33 |
| 1960-61 | 1.34 | .98 | 1.03 | .90 | 1.29 |
| 1961-62 | 1.22 | .96 | 1.05 | .88 | 1.18 |
| 1962-63 | 1.19 | .95 | .97 | .86 | 1.15 |

The price relationship between the long staple producers and the United States is not as clearly defined as is the short staple - U. S. comparison. Historically long staple prices appear highly variable and at a substantially higher level than short staple prices. Reference to Table 22 and Figure 6 shows that the prices of Egyptian and Sudanese cotton were highly variable with respect to the U. S. price level, and in an absolute

sense during the 1951 to 1962 period. It is significant to note that the price movements of these two long staple producers are highly related (the U.A.R. is the world's largest producer of long staple cotton fiber). The large price drop from 1951 to 1952 is very likely a carryover from the U. S. export allocation quotas of 1950. The major contradiction to the U. S. price trend occurs in 1956. While short staple prices decreased, long staple prices increased sharply. Examination of the situation reveals that the contrary price movement of long staple and short staple cotton in 1956 was partially a result of a short supply of long staple cotton in Western markets; large quantities of Egyptian cotton were shipped to Eastern Europe, the U.S.S.R., and Mainland China during this period. In addition, the Suez crisis of 1956 resulted in a disruption of exports during that year. The U.A.R. continued to export large quantities to the communist bloc nations after 1956 (outside of normal market channels), thus tending to reduce the long staple supply available to Western importers. While one would expect the price of long staple cotton to remain high under such circumstances, its price fell sharply during the market years 1957 and 1958. This decline in prices apparently stemmed from the "cut rate" prices of re-exported Egyptian long staple cotton from the U.S.S.R. During the early 1960's long staple cotton prices returned to a traditional but declining premium over short staple qualities.

The effect of the U. S. export subsidy program on the quantity of cotton exported is less easy to assess than is the effect of the subsidy program

on prices. In part, the difficulty in assessing the effects on quantity exported stems from the aggressive promotion of P. L. 480 by the United States during the period in which export subsidies were first paid, and in part, to the lack of a pre-1955 division of commercial and concessional exports to specific importers. A breakdown of total U. S. exports into two groups, (1) exports under P. L. 480 and the Mutual Security Act, and (2) other or commercial exports, facilitates consideration of the effects of export subsidies upon commercial cotton exports. Commercial cotton exports increased abruptly from 1.0 million bales in 1955-1956 to 4.3 million bales in 1956-1957. Throughout the period during which export subsidies were in effect, 1956-1962, U. S. cotton exports maintained a substantially higher level than during the seven preceding years. Average U. S. commercial exports from 1949 through 1955, excluding 1950 when export limitations were in effect, equalled 2.5 million bales or 60 percent of total U. S. exports; the 1956 to 1962 average increased to 3.7 million bales for 65 percent of total U. S. exports (see Table 23 for yearly data). The abrupt change in the level of U. S. commercial exports after the initiation of export subsidies provides strong evidence that export subsidies increased U. S. commercial exports and/or countered the retarding effects of the price support program.

Several observations can be made pursuant to the data presented in Figures 2-5 and Table 20 above. It is clear that the increase in imports from the United States by France and Italy, and the subsequent decrease

Table 23. U. S. Cotton Exports, 1949 to 1962 — Total, Commercial, and Concessional Sales (figures in thousands of bales)

| Aug. 1- July 31 ^a | Total U. S. Exports (1) | U. S. Com- mercial Exports ^b (2) | (2) as a Percentage of (1) | U. S. Grants and Conces- sional Sales ^c (3) | (3) as a Percentage of (1) |
|---------------------------------|-------------------------------|--|----------------------------------|---|----------------------------------|
| 1949-50 | 5,771 | 2,358 | 40.9 | 3,413 | 59.1 |
| 1950-51 | 4,108 | 2,158 | 52.5 | 1,950 | 47.5 |
| 1951-52 | 5,520 | 4,677 | 84.7 | 843 | 15.3 |
| 1952-53 | 3,048 | 1,959 | 64.3 | 1,089 | 35.7 |
| 1953-54 | 3,761 | 2,914 | 77.5 | 847 | 22.5 |
| 1954-55 | 3,446 | 1,824 | 52.9 | 1,622 | 47.1 |
| 1955-56 | 2,215 | 986 | 44.5 | 1,229 | 55.5 |
| 1956-57 | 7,598 | 4,339 | 57.1 | 3,259 | 42.9 |
| 1957-58 | 5,717 | 3,667 | 64.1 | 2,050 | 35.9 |
| 1958-59 | 2,789 | 990 | 35.5 | 1,799 | 64.5 |
| 1959-60 | 7,182 | 5,935 | 82.6 | 1,247 | 17.4 |
| 1960-61 | 6,632 | 4,895 | 73.8 | 1,737 | 26.2 |
| 1961-62 | 4,913 | 3,777 | 76.9 | 1,136 | 23.1 |
| 1962-63 | 3,351 | 2,126 | 63.4 | 1,225 | 36.6 |

^aTotal export figures are based on August 1 to July 31 data — U. S. commercial exports and U. S. grants and concessional sales, are based on data from July 1 to June 30.

^bCommercial exports are total exports minus exports under P. L. 480, the Mutual Security Act, and Army Civilian Relief.

^cIncludes exports under P. L. 480 (Titles I, II, III, and IV), the Mutual Security Act, and Army Civilian Relief.

in imports from other exporters (for Italy) between 1955 and 1956, is largely a result of increased U. S. P. L. 480 sales rather than of commercial sales and export subsidies. On the other hand the increased imports by Belgium, Japan, and "Selected Others" comes largely from export subsidy-promoted U. S. commercial sales. Again in 1959 the surge in U. S. commercial exports occurred for the five importing groups shown in Table 20; the 1959 increase may also be a reflection of a two cent per pound increase in the

subsidy rate over the 1958 marketing year. The price ratios shown in Table 22 also reflect the changes in the subsidy rate and the consequent increases or decreases in U. S. exports (the higher the price ratio the greater the U. S. price advantage, and vice versa). Figure 2 shows that Italy and "Selected Others" substantially increased cotton imports between 1956 and 1962. To the extent that the United States shared in this increase, as shown in Figures 3 and 5, commercial exports, encouraged by export subsidies, accounted for the major part of the U. S. share.

An overriding impression is the importance of federal financial aid in the export of raw cotton. During the 1962-1963 export year, total federal assistance to cotton exports (export subsidies and all P.L. 480 titles) amounted to 74 percent of the total value of U. S. cotton exported (see Table 21). For the eight year period 1955 to 1962, federal assistance to cotton exports in the form of export subsidy payments, P.L. 480 Titles I, II, III, and IV, and Mutual Security Act exports averaged \$429 million per year, or 61 percent of the average value of total U. S. cotton exports for that period.

In summation, the "Trend Analysis" supports the general hypothesis that U. S. government cotton export policy does affect the export prices and quantity exported of domestic and foreign cotton. The export restriction program of 1950, and more importantly, the initiation of export subsidies to make U. S. cotton price competitive, resulted in substantial

export price adjustments for the U. S. and the competing cotton exporters, in particular short staple cotton exporters. The effect of export subsidies on the price of long staple cotton is less obvious as the substitution between the two qualities has not been large given the historical price spread. No price effects were discernable as a result of P.L. 480 exports, although one might expect that some downward pressure on prices occurred during 1956, when P.L. 480 exports apparently adversely affected the commercial exports of U. S. competing exporters. But any possible price effects were masked by the direct price effects of U. S. export subsidies. Indeed, during the surplus disposal phase of P.L. 480, especially 1956-1957, the program did not remain insulated from the commercial market. However, during the late 1950's and early 1960's the insulation of P.L. 480 exports from the commercial market appears to have been accomplished to a substantial degree.

The primary effect of U. S. export subsidies is on the price and quantity flow of U. S. cotton through commercial channels. The rate of the subsidy and the quantity exported appear highly related — in quantity terms commercial exports have increased substantially since the initiation of the subsidy program. The effect of U. S. export policies on the quantity of foreign cotton exports has been reduced by the expanding world consumption of cotton and by the general price decrease of the competing countries' cotton. Thus the quantity of foreign cotton exports continues to increase but perhaps at a slower rate than if U. S. cotton exports were not subsidized.

The above analysis has necessarily been general, because of the impossibility of examining more than one or two variables simultaneously. With many variables affecting the system, it is desirable to consider jointly a number of the factors affecting price and quantity exported in order to determine the relative importance of these variables, and whether the effect of a particular variable on price or quantity, when considered in a system of variables, exhibits the same characteristics as when examined singly in the "Trend Analysis." With this objective in mind, we now turn to the regression analysis.

Multiple Regression Analysis

Multicollinearity

Before the results of the regression equations can be considered, a statistical problem requires brief discussion in order to clarify what can be concluded from the statistical model. The problem, discovered early in the statistical analysis, is that of multicollinearity. This is "the name given to the general problem which arises when some or all of the explanatory variables in a relation are so highly correlated one with another that it becomes very difficult, if not impossible, to disentangle their separate influences and obtain a reasonably precise estimate of their relative effects."⁴¹ This statistical problem is such that estimates of structural coefficients (such as export price elasticities), which can normally be

⁴¹J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, Inc., 1963), p. 201.

determined from the appropriate partial regression coefficients, cannot be relied upon as being "good" estimates. Thus the statistical model as developed, and the results from it, must be viewed as a determination of the relative importance of specific independent variables as reflected by the coefficients of partial correlation. The coefficients of partial correlation are not free from the effects of multicollinearity, but they are unitless and therefore more clearly represent the relative importance of the independent variables.

Multicollinearity occurs among some variables of special interest in this study; in particular the following U. S. policy-determined variables are highly intercorrelated: the value of P.L. 480 exports, export subsidy rates, value of export subsidy payments, and U. S. export prices. In addition, the U. S. export price tends to be highly correlated with the cotton export prices and the rate of export taxes of competing cotton exporters. Thus, when more than one of these highly interrelated variables are designated as independent variables in a particular equation, the standard errors of the partial regression coefficients increase markedly, thereby decreasing the confidence that can be placed in the statistical significance of the estimates.⁴² In addition, when the simple correlation between two independent variables is high, overlapping effects between the two variables are possible; such effects might be reflected in the signs of the coefficients. If one of the two correlated independent variables is

⁴²Ibid., p. 206.

dropped from the equation, then the remaining variable acts as a proxy for the deleted variable as well as for itself. Therefore, the partial regression coefficient is related to the combined effect of the two variables, rather than to the single variable retained in the equation; the partial regression coefficient is, as a result, biased since we do not know to what extent it reflects the retained variable and to what extent it reflects the deleted variable.

The problem of multicollinearity is present in all of the equations of the model except (12). The interpretation of the results is modified to take account of this fact. Results presented in the text include the partial correlation coefficients and the coefficients of multiple determination corrected for degrees of freedom; analysis is based on these results.⁴³ Results of the test for the composite effect of U. S. policy variables are also contained in the analysis — multicollinearity affects this test but the bias should be in the direction which would indicate that the composite effect of the U. S. policy variables is not significantly different from zero (at some given significance level), when in fact the composite effect may be significantly different from zero (an underestimation of the statistical significance level).

Statistical Results

The statistical model results, discussed below, are summarized in Tables 24 through 30. Price and export quantity equations are considered jointly for each of the six countries studied.

⁴³Complete regression equation results are presented in the Appendix.

The primary interest underlying the development of equation (1), estimation of the U. S. export price, relates to the importance of U. S. governmental programs in the determination of the export price level. Of particular interest are the effects of P.L. 480 exports and cotton export subsidies. The results presented in Table 24 indicate that the rate of export subsidy is the most important variable in explaining the variation of U. S. export prices, relative to the other variables considered. However, the value of P.L. 480 exports contributes little to the explanation of the price variation, and in fact surpasses only U. S. stock accumulations in relative importance. World cotton production is of substantial importance in the explanation of the relationship. Domestic price support levels rank fourth in importance out of the seven variables considered; in addition, the direction of the price support effect is contrary to that expected (negative sign). No obvious explanation of this reaction is apparent, but a plausible hypothesis is that domestic price supports encourage increased output, which in turn results in a downward pressure on prices. Since the domestic price is supported and therefore cannot fall appreciably, the downward pressure on price shifts to the export price, which can decline by the amount of the export subsidy; as CCC stocks increase there is the tendency to increase the export subsidy rate and thus decrease export prices. Because the domestic and foreign markets are to some degree separated, by virtue of the export subsidy, domestic price supports may have a depressing effect on the export price. Finally

the statistical test pertaining to the effect of the composite of U. S. policy variables in equation (1) indicates that the effect of the three variables X_{11} , X_{12} , and X_{19} is significantly different from zero at the .05 level of significance.

Table 24. Partial Correlation Coefficients for U. S. Cotton Export Price, Equation (1). The U. S. Export Price is the Dependent Variable.

| Independent Variables | Partial Correlation Coefficient | Expected Sign |
|---|---------------------------------|---------------|
| X_3 U. S. stocks | -0.0102 | (-) |
| X_4 U. S. production minus consumption | 0.1638 | (-) |
| X_5 World production | -0.7513 | (-) |
| X_{11} Stocks of major consumer countries | -0.4325 | (-) |
| X_{12} U. S. price support level | -0.4176 | (+) |
| X_{13} Value of P.L. 480 exports | -0.1069 | (-) |
| X_{20} Rate of U. S. export subsidy | -0.8280 | (-) |
| $\bar{R}^2 = 0.9336$ | | |

The effects of U. S. policy variables on U. S. exports follow the same general pattern exhibited by prices (see Table 25). The relative effect of the export subsidy is especially dominant with respect to both total and commercial cotton exports. The stocks on hand in major consumer countries are second in importance, but for reasons that are not clear the signs do not conform to those expected. The variables relating to P.L. 480 actions are also relatively important in the explanation of the variation in U. S. cotton exports; however, the contrary signs for X_{13} , value of P.L. 480

Title I, II, and IV exports, and X_{1g} , U. S. export price, require some explanation. The apparent reason for the positive sign for "export price" is the "identification problem" cited by Working in 1927.⁴⁴ A possible explanation for the negative sign on the variable "value of P.L. 480 exports (except barter)" in equation (2) is suggested by the negative sign of that variable in the commercial exports equation (9). If P.L. 480 sales are not sufficiently insulated from the commercial market then one would expect that commercial exports would be adversely affected, as is indicated by the negative sign. And, if commercial exports are a sufficiently large part of total exports, then it may be possible that the negative effect of P.L. 480 exports would be reflected in total cotton exports. Essentially such a statement implies that the negative effect on exports through commercial sales outweighs the positive effect on exports through concessional sales and grants. In general we can say that these results suggest far more interaction between the commercial market and the concessional sale exports than U. S. policy makers accept. As was the case with the export price, the composite effect of the U. S. policy variables, with respect to total and commercial exports, is significantly different from zero — equation (2) at the .01 level of significance, and equation (9) at the .05 level of significance.

⁴⁴E. J. Working, "What Do Statistical 'Demand Curves' Show?" The Quarterly Journal of Economics, XLI (1927), 212-215. The regression coefficient may reflect the effects of the demand and/or supply schedules depending on the relative stability of the two functions — for example, if the demand function is not stable then the regression coefficient may reflect the movement of the demand function along the supply schedule and thus yield a positive sign.

Table 25. Partial Correlation Coefficients for U. S. Total Cotton Export Quantity, Equation (2), and for U. S. Commercial Cotton Export Quantity, Equation (9). Total U. S. Cotton Exports and Commercial U. S. Cotton Exports are the Respective Dependent Variables.

| Independent Variables | Partial Correlation Coefficient | | Expected Sign |
|---|---------------------------------|--------------------|---------------|
| | Total Exports | Commercial Exports | |
| X ₃ U. S. cotton stocks | 0.3596 | 0.0350 | (+) |
| X ₄ U. S. production minus consumption | ... | 0.1965 | (+) |
| X ₅ World production | 0.6092 | 0.1941 | (+) |
| X ₁₁ Stocks in major consumer countries | 0.8048 | 0.6857 | (-) |
| X ₁₂ U. S. price support level | ... | -0.0195 | (-) |
| X ₁₃ Value of PL 480 export (minus barter) | -0.7462 | -0.5836 | (+)(-) |
| X ₁₄ Value of export subsidies | 0.9478 | 0.8660 | (+) |
| X ₁₅ Value of PL 480 barter exports | 0.6438 | ... | (+) |
| X ₁₈ Estimated U. S. export price | 0.7706 | 0.4169 | (-) |
| \bar{R}^2 | 0.8434 | 0.6561 | |

The export price of Egyptian cotton (see Table 26) is most affected by the U.A.R.'s export tax, while the U. S. export price is second in relative importance. Public Law 480 barter exports rank third in relative importance; however, the sign is contrary to that expected. United States policy variables rank far down in their influence on the quantity of Egyptian cotton exported (see Table 27). The effects of domestic stocks, production and consumption, and world production rank well above the effects of U. S. export quantity and U. S. export price in the explanation of the U.A.R.'s cotton export variation. The composite effect of the U. S. policy variables

Table 26. Partial Correlation Coefficients by Country for the Cotton Export Price Equations: Equation (3) for Mexico, Pakistan, and Sudan; Equation (6) for the U.A.R.; and Equation (7) for Brazil. Country "i's" Export Price is the Dependent Variable.

| Independent Variables | Partial Correlation Coefficients | | | | | Expected Sign |
|---|----------------------------------|---------|----------|---------|---------|---------------|
| | U.A.R. | Mexico | Pakistan | Brazil | Sudan | |
| X ₃ Country i's cotton stocks | -0.1223 | -0.6287 | -0.2469 | -0.3003 | -0.3983 | (-) |
| X ₄ Country i's production minus consumption | -0.5386 | -0.5586 | 0.1984 | 0.6467 | 0.3592 | (-) |
| X ₅ World production | 0.5022 | -0.0783 | -0.0322 | -0.0508 | 0.3592 | (-) |
| X ₁₁ Stocks of major consumer countries | 0.0707 | 0.0118 | 0.0518 | 0.1048 | -0.1024 | (-) |
| X ₁₅ Value of U.S. P.L. 480 barter exports | 0.5410 | -0.6098 | -0.2339 | 0.1853 | 0.4879 | (-) |
| X ₁₇ Country i's export tax rate | 0.7109 | 0.3190 | 0.6688 | ... | 0.6481 | (+) |
| X ₁₈ Estimated U.S. export price | 0.5926 | 0.4444 | 0.1878 | 0.5388 | 0.5300 | (+) |
| \overline{R}^2 | 0.6030 | 0.9568 | 0.8006 | 0.7883 | 0.6494 | |

Table 27. Partial Correlation Coefficients by Country for the Cotton Export Quantity Equation (8).
The Quantity of Cotton Exported by Country "i" is the Dependent Variable.

| Independent Variables | Partial Correlation Coefficients | | | | Expected Sign |
|---|----------------------------------|---------|----------|---------|---------------|
| | U.A.R. | Mexico | Pakistan | Brazil | Sudan |
| X ₃ Country i's cotton stocks | 0.9137 | 0.4392 | 0.9124 | 0.5145 | 0.3823 |
| X ₄ Country i's production minus consumption | 0.8834 | 0.8571 | 0.9924 | 0.4507 | 0.0295 |
| X ₅ World production | 0.8676 | 0.5387 | 0.9230 | 0.0446 | 0.5558 |
| X ₁₀ Estimated U.S. cotton exports | 0.6821 | 0.2047 | -0.0909 | -0.0734 | -0.6185 |
| X ₁₁ Stocks of major consumer countries | -0.4531 | -0.3984 | -0.9011 | -0.1762 | 0.2949 |
| X ₁₈ Estimated U.S. export price | 0.6839 | 0.1945 | 0.7957 | 0.2303 | -0.3745 |
| X ₁₉ Estimated country i's export price | -0.4681 | 0.0230 | -0.1519 | -0.3368 | 0.4799 |
| \bar{R}^2 | 0.9095 | 0.9113 | 0.9919 | 0.0488 | 0.6751 |

is significantly different from zero at the .01 level of significance with respect to the U.A.R.'s export price; however, the composite effect on the quantity of exports is not significantly different from zero at the .05 level of significance.

United States policy variables appear as important variables in the determination of Mexican cotton export prices. Public Law 480 barter exports and the U. S. export price rank second and fourth out of the seven variables (see Table 26); these two variables as a composite show a statistically significant effect on the Mexican export price at the .05 significance level. Unlike the other five countries studied, Mexico's production and consumption appear as important variables in the export price determination. Mexican export variation is apparently affected very little by U. S. policy actions (see Table 27). As with the U.A.R., Mexican export volume is affected largely by the net available for export from current production, world production, and domestic stocks. The composite effect of U. S. export quantity and price on the quantity of cotton exported is not significantly different from zero at the .05 level of significance.

The Pakistani case differs somewhat from the previous cases in that U. S. policy variables are relatively unimportant in the explanation of the variation in the export price level. In fact, all variables except the export tax rate exhibit a partial correlation with respect to the export price of less than 0.25. With regard to the quantity of Pakistani exports, the U. S. export price exhibits a partial correlation of 0.80; however, it is of

relatively minor importance when compared to the level of explanation contributed by domestic stocks, production and consumption, world production, and stocks of major consumer countries. The composite effect of the U. S. policy variables does not have an effect significantly different from zero, at the .05 level of significance for either the price or the export equations.

For Brazil, the U. S. export price ranks relatively high in the explanation of the export price variation, but as with Pakistan, the composite effect of the U. S. variables is not significantly different from zero at the .05 level of significance. The cotton export equation from Brazil indicates practically no explanation of the export variation ($\bar{R}^2 = 0.05$). The equation does show the general pattern prevalent in previous export equations — the most important variables in the relation tend to be domestic supply variables.

The export price results for Sudan follow the general trend exhibited by the U.A.R., Mexico, Pakistan, and Brazil. The Sudanese analysis is similar to those of the U.A.R. and Pakistan, in that the rate of the export tax provides the largest relative explanation of the variation in export price. The U. S. policy variables rank second and third in relative importance in the explanation of the variation in Sudan's cotton export price level. In addition the variable "U. S. cotton exports" ranks high in the explanation of Sudan's cotton exports. However, the composite effect of the U. S. variables is not significantly different from zero at the .05 level of significance.

Terms of Trade

The results of the cotton income terms of trade equation (10) and the value of cotton exports equation (11) are at best "mixed" (see Tables 28 and 29). The level of explanation achieved as measured by the \bar{R}^2 is consistently poor for Brazil and Sudan. The signs of the coefficients are not generally consistent with those expected. The high level of multicollinearity (on the order of 0.7 to 0.9) between the U. S. export price and the country "i" export price, and to a lesser extent between U. S. export price and U. S. export quantity, may account for the contrary signs of the coefficients. No other plausible explanation is apparent. One general statement can be made pertaining to the results of equations (10) and (11). The two price variables, X_{18} and X_{19} , generally exhibit the largest partial correlation coefficients. This effect is expected since the price for country "i" is also reflected in the level of the cotton income terms of trade index, and therefore should be an important variable in the explanation of the variation in the index.

Equation (12), a simple regression equation exploring the effect of cotton income terms of trade variation upon the total income terms of trade, provides quite reasonable results (see Table 30). This equation should reflect the importance of cotton in a country's export package (Table 31 presents the value of cotton exports as a percentage of the value of total exports by country), and indeed the results do reflect the expected relationship. The regression coefficients (b_i) are significantly different from

Table 28. Partial Correlation Coefficients by Country for Cotton Income Terms of Trade, Equation (10).
The Cotton Income Terms of Trade is the Dependent Variable.

| Independent Variables | Partial Correlation Coefficients | | | Expected Sign |
|--|----------------------------------|----------|---------|---------------|
| | U.A.R. | Pakistan | Brazil | Sudan |
| X ₁₀ Estimated U. S. cotton exports | -0.7050 | 0.1383 | -0.2698 | 0.3112 (-) |
| X ₁₁ Stocks of major consumer countries | 0.4345 | 0.1615 | -0.2183 | -0.1117 (-) |
| X ₁₈ Estimated U. S. export price | -0.7023 | 0.7796 | -0.1992 | -0.5507 (+) |
| X ₁₉ Estimated country "i" export price | 0.8370 | -0.1949 | 0.3382 | 0.6290 (+) |
| \bar{R}^2 | 0.7326 | 0.7998 | 0.0000 | 0.4379 |

Table 29. Partial Correlation Coefficients by Country for the Value of Cotton Exports, Equation (11).
The Value of Cotton Exports is the Dependent Variable.

| Independent Variables | Partial Correlation Coefficients | | | Expected Sign |
|--|----------------------------------|----------|---------|---------------|
| | U.A.R. | Pakistan | Brazil | Sudan |
| X ₁₀ Estimated U. S. cotton exports | 0.5263 | 0.1370 | -0.2442 | 0.0039 (-) |
| X ₁₁ Stocks of major consumer countries | 0.7203 | 0.1348 | -0.2152 | 0.0204 (-) |
| X ₁₈ Estimated U. S. export price | 0.6542 | 0.7184 | -0.1971 | -0.4683 (+) |
| X ₁₉ Estimated country "i" export price | -0.1137 | 0.0396 | 0.4274 | 0.5446 (+) |
| \bar{R}^2 | 0.7360 | 0.8010 | 0.0943 | 0.0889 |

Table 30. Regression Coefficients by Country for Total Income Terms of Trade, Equation (12). The Total Income Terms of Trade is the Dependent Variable.

| Country | Regression Coefficients | | Elasticity of Adjustment | r^2 |
|----------|-------------------------|---|--------------------------|--------|
| | Constant | b_1 (Cotton Income Terms of Trade) | | |
| U.A.R. | 25.7223 (14.3992) | 0.6471 (0.1216) | 0.743 | 0.8017 |
| Pakistan | 101.8778 (11.6403) | 0.2391 (0.0340) | 0.381 | 0.8320 |
| Brazil | 94.9031 (6.5240) | 0.0183 (0.0172) | 0.059 | 0.1009 |
| Sudan | 35.3118 (18.9588) | 0.6746 (0.1395) | 0.718 | 0.7220 |

Table 31. Value of Cotton Exports as a Percentage of the Value of Total Exports by Country, 1951 to 1962^a

| Year | U.S. | U.A.R. | Mexico | Pakistan | Brazil | Sudan |
|---------|------|--------|--------|----------|--------|-------|
| 1951 | 7.6 | 81.8 | 22.9 | 32.2 | 11.3 | 76.2 |
| 1952 | 5.7 | 88.5 | 24.3 | 49.3 | 2.5 | 70.6 |
| 1953 | 3.3 | 85.7 | 24.0 | 44.9 | 6.6 | 62.3 |
| 1954 | 5.2 | 82.8 | 27.3 | 31.1 | 14.3 | 55.8 |
| 1955 | 3.0 | 78.5 | 29.0 | 26.9 | 9.2 | 62.3 |
| 1956 | 3.8 | 70.2 | 29.9 | 22.5 | 5.8 | 63.9 |
| 1957 | 5.1 | 72.9 | 23.4 | 20.7 | 3.2 | 46.8 |
| 1958 | 3.7 | 67.6 | 25.9 | 17.0 | 2.1 | 56.0 |
| 1959 | 2.5 | 72.0 | 26.5 | 7.9 | 2.9 | 63.1 |
| 1960 | 4.8 | 70.7 | 20.7 | 11.3 | 3.8 | 54.7 |
| 1961 | 4.2 | 65.3 | 19.4 | 5.4 | 7.8 | 52.8 |
| 1962 | 2.5 | 53.0 | 23.5 | 9.9 | 9.2 | 58.1 |
| Average | 4.2 | 74.1 | 24.8 | 25.1 | 7.4 | 60.3 |

^aThe averages are computed from data presented in: United Nations, Statistical Yearbook, ST/STAT/S797Y, selected issues, 1952-1964; and United Nations, Yearbook of International Trade Statistics, ST/STAT/Series G, selected issues, 1952-1963.

zero at the .01 level in all cases examined except for Brazil, where (b_i) is not significantly different from zero at the .05 level of significance. This appears consistent with the data on the relative importance of cotton in each country's export package. The elasticities of adjustment also appear to be at a reasonable level. For example, a 1 percent increase in the U.A.R.'s cotton income terms of trade results in a 0.7 percent increase in the total income terms of trade. But in Pakistan where cotton is a relatively less important export, a 1 percent increase in the cotton income terms of trade increases the total income terms of trade index by only 0.4 percent.

The results of equation (12) are highly reasonable; the results of equations (10) and (11) are less so. Greater refinement in the independent variables plus some statistical modification of the model might provide a more meaningful explanation of the variables affecting the cotton income terms of trade; such an expansion cannot be undertaken in this study. Further study in this area appears to be particularly relevant for the U.A.R. and Sudan.

Recapitulation

The most obvious principle running through the analyses is U. S. "price leadership" in the world cotton market. Clear examples of the U. S. influence appear in the "Trend Analysis" with the initiation of export allocations, and the later initiation of export subsidies. In the regression model, this principle is manifest in the high relative importance of the U. S. export

price in the explanation of price variation of competing exporters, and in the high relative importance of the U. S. export subsidy on the U. S. price and quantity of cotton exports.

Public Law 480 concessional sales have not had a major influence on U. S. cotton prices; therefore, one might expect little influence upon the prices of competing exporters. The "Trend Analysis" indicates that concessional sales did increase the quantity of U. S. exports and decreased the quantity of exports from competitors during the early stages of P.L. 480; by the late 1950's this market disruption had apparently diminished. However, the regression analysis indicates that P.L. 480 concessional sales adversely affected U. S. commercial exports as well as total cotton exports. The adverse effect on U. S. commercial exports is expected (when other variables are taken into consideration, the concessional sales have a retarding effect on the expansion of subsidized commercial exports). The adverse effect of concessional sales on total U. S. cotton exports suggests the possibility that U. S. concessional sales have a greater effect on cotton exports than policy makers have realized, or been willing to accept.

The effect of U. S. policy variables (reflected in the U. S. export price and the quantity of U. S. cotton exported) on the quantity of cotton exported by competitors is in general of relatively minor importance. Apparently U. S. policy actions affect the quantity of competing exports on a short-term basis, but because of price adjustments over the longer run, competing cotton continues to move into the export market in increasing

quantities. Such factors as domestic stock accumulations and yearly variations in production and consumption are found to influence the variation in the export quantity of U. S. competitors much more than are the U. S. policy actions per se. A country "i" variable of particular importance in the explanation of price variation is the rate of the export tax applied to cotton. In this connection it is also interesting to note that there is a high positive relationship between the U. S. export price level and the export tax rates; likewise there is a high negative relationship between U. S. subsidies and the export tax rates. The variation of the tax rate by country "i" may provide flexibility in countering U. S. policy moves.

The expected differential in the effects of U. S. policy actions on the long and short staple cotton exporters is suggested by the results of the "Trend Analysis." The price adjustments of short staple cotton exporters are more closely related to U. S. price variations than are the price adjustments of long staple cotton exporters.

A more complete recapitulation, drawn in conjunction with a summary of recent export trends, an outline of the theoretical basis of the study, and a review of the analyses, is presented in the following chapter.

CHAPTER V

SUMMARY, IMPLICATIONS, AND CONCLUSIONS

Objectives

The consequences of U. S. agricultural legislation since 1930 have not been isolated in the U. S. farm and non-farm economies. This is especially true of cotton policy. Federal government price supports on domestically produced cotton have resulted in U. S. cotton prices which are above world prices, and have encouraged the expansion of domestic production, in spite of acreage controls. By the mid-1950's, after the pressures of war and post-war recovery had been relieved, the inconsistency of high domestic price supports, a general abundance of cotton fiber on the world market, and a continued high level of commercial raw cotton exports, was realized by policy makers. This realization was stimulated by record United States raw cotton stock accumulations in 1955 and 1956.

Because supply control through acreage restrictions had been in effective, and since more effective forms of supply control were politically unacceptable, policy makers turned to the export market in order to dispose of the excess stocks. Two major export policy actions were initiated during the 1950's. In July 1954, Congress passed the Agricultural Trade Development and Assistance Act, with sales for local currency as a major provision. During 1956, export subsidies on commercial cotton exports were initiated;

this action made U. S. commercial cotton exports more competitive on the world market. Such export policy actions might be expected to have adverse effects on U. S. cotton export competitors.

The objectives of this study were (1) to identify the major effects of U. S. export policy actions on five competing exporters (U.A.R. , Mexico, Pakistan, Brazil, Sudan), (2) to explore the changes in the export market share held by the United States and the five competitors , and (3) to examine possible policy implications evolving from the study.

Summary of Major Trends Related to Cotton Exports

Even though world cotton acreage has remained relatively stable over the past three and a half decades , output has more than doubled. This change, impressive as it is, appears more dramatic when one considers the sources of the change. For example, U. S. acreage has decreased by more than half, yet yields have more than doubled; thus production has remained nearly stable. The U.A.R. has remained practically stable both in acreage and production since 1925-1929. Dramatic changes have occurred in Mexico, Brazil, Sudan, and numerous other "emerging nations" of Africa, the Middle East, and Latin America. Acreages have expanded many-fold as a result of irrigation and other technological advances. Yields have also increased, thus compounding the expansion in production.

The end result of these changes is that the United States, the producer of over 50 percent of the world's cotton supply during the 1920's, is becoming less important in the world market, producing approximately 30 percent of the world total during 1960-1962.

A phenomenon similar to that in cotton production has occurred in cotton exports. Total world trade in raw cotton, after being restricted by the depression of the 1930's and World War II, has moved upward over the past 15 years; the current level exceeds the pre-depression level. But, the U. S. share of the world market has declined markedly — from 59 percent during 1925-1929 to 31 percent during 1960-1962. Correspondingly, there has been a substantial shift of the world market share to Mexico, Brazil, and Sudan, and to other African, Middle Eastern, and Latin American countries; in addition, since World War II, the U.S.S.R. has become an important exporter of raw cotton, most of which is exported to Eastern European countries.

Although the declining world market share of U. S. cotton exports was and is of concern to U. S. policy makers, it was the rapid accumulation of excess cotton stocks that motivated the changes in U. S. cotton export policy in the mid-1950's. The United States is, though not by choice, becoming more and more the storehouse for world cotton. The smaller producing countries tend not to have adequate storage facilities for large quantities of cotton, so the inventories of these countries tend to remain very stable over time and at a level considerably lower than that of the United States.

Cotton consumption in the world aggregate has increased substantially during the past 30 years. Most of this increase in consumption is accounted for by the less developed countries. The countries of Western Europe and

Northern North America have had only minimal increases in total cotton consumption; per capita cotton consumption and cotton consumption as a percentage of total fiber consumption are declining steadily. The impact of man-made fibers on cotton consumption in the developed countries is dramatic; cotton consumption has suffered accordingly. Factors appearing to contribute to the substitution of man-made fibers for cotton are: (1) the relatively high price of cotton in the United States and on the world market (United States domestic price supports are a primary cause of the high price), and (2) numerous desirable manufacturing and use advantages inherent in man-made fibers.

United States agricultural policy is central to this study. Because the United States is the primary cotton producer and exporter, the imposition of domestic price supports in effect resulted in a support on the world price level. More specifically, the domestic support price put a floor under the price at which U. S. cotton could be sold on the world market. The U. S. price floor resulted in higher prices for the cotton of competing exporters — a price umbrella was maintained as a result of the U. S. domestic price support and because of the importance (size) of the U. S. market share.

As a result of rapidly expanding stock piles of agricultural commodities, especially cotton, wheat, and feed grains, the U. S. Congress passed the surplus disposal Agricultural Trade Development and Assistance Act of 1954 (P.L. 480). The major title of the Act provided for the export of cotton

and other commodities to be paid for in foreign currency; such exports were not to disrupt normal market channels. Through 1957 the intent and implementation of the Act remained surplus disposal, but after 1957 the intent and implementation increasingly emphasized economic aid and development. During 1956 export subsidies were applied to all qualities of U. S. upland cotton. The subsidy made it possible for U. S. cotton to compete more effectively with foreign cotton on a price-quantity basis; the price umbrella for foreign competitors was lowered.

An examination of the effects of these two U. S. export policy actions, plus a consideration of the effect of U. S. cotton export quotas during 1950 on major competing cotton exporters, constitutes the focal point of this thesis.

Theoretical Basis and Hypotheses

The fact that the United States is the largest single exporter of raw cotton indicates that institutional changes made by the United States with respect to the world cotton market should logically affect the cotton exports of competing countries. The theoretical basis for this contention is that the United States is a world cotton "price influencer" by virtue of its importance in the market and the ability and willingness of the federal government to enter into cotton export affecting policies.

Five specific hypotheses are postulated in the study. The basic theme of these hypotheses is: Variations in U. S. cotton export policy during the 1950's (P.L. 480 concessional sales and export subsidies) explain a

significant portion of the variation in the U. S. export price and quantity during the 1950's. Therefore, these policies adversely and measurably affect the prices and/or quantities of raw cotton exported by the five major export competitors studied.

The Analytical Approaches

Two analytical procedures are utilized in the study. The first uses a graphic and tabular presentation of relevant variables related to major price and quantity export trends from 1950 through the 1962 market year. Three specific U. S. policy actions are examined — (1) the restriction of U. S. cotton exports by the imposition of export allocations in September 1950, (2) the initiation of P.L. 480 in July 1954, and (3) the re-inauguration of export subsidies in February 1956. The second procedure supplements the first. A statistical model of the cotton export market is developed, based upon a set of multiple regression equations, and supplemented by the recursive estimation of certain export price and export quantity variables. Twelve equations are developed in the system.

Summary of Results

One characteristic of the world cotton market became increasingly apparent throughout the study, especially in the "Historical Perspective" of Chapter I — namely the gradual shift in the market share of the major raw cotton exporters. Two countries which have historically dominated cotton exports — the United States for short staple and the U.A.R. for long staple cotton — have experienced a gradual decline in their market shares

over the past 20 to 30 years. This is especially true of the United States, whose export market share has dropped to slightly over half of its 1925-1929 market share. Mexico and Brazil over the same period substantially increased their market shares. Sudan and other African and Middle-Eastern countries were insignificant cotton exporters during the 1920's and 1930's; their relative importance in the world market increased significantly (in an economic sense) after the end of World War II.

The effects of U. S. export allocation quotas, as revealed in the "Trend Analysis," were manifest in the price reactions of competing cotton-producing countries. The initiation of export quotas (to protect the short U. S. supply at the outset of the Korean conflict) in conjunction with the speculative building of inventories by consumer countries because of the Korean situation, resulted in sharp price increases on the world market. When the export quotas were cancelled in August 1951, 11 months after their initiation, prices turned sharply downward, with the exception of Brazilian cotton prices. During the period of the U. S. export quotas, Brazil initiated high domestic price supports to encourage domestic production. The fall in world prices in mid-1951 left Brazilian domestic and export prices well above the level of comparable qualities of other exporters. Consequently, during the period of domestic price level and domestic production adjustment, Brazilian exports fell while stocks rose appreciably.

The effects of U. S. concessional sales, specifically P.L. 480, are less obvious than the effects of export quotas. During the early years of

P.L. 480 its primary function was the disposal of U. S. agricultural surpluses. Despite the stated objective that normal commercial export channels were not to be disrupted, the results indicate that concessional sales were substituted for regular commercial imports by cotton importing countries — commercial trade channels were disrupted. The demand for commercial cotton by importers shifted to the left, thus decreasing commercial imports and exerting downward pressure on cotton prices. Because the aggressive implementation of P.L. 480 and the initiation of export subsidies occurred during the same year, 1956, the relative magnitudes of the price effects for the two programs are mixed. However, sufficient data are available to permit an examination of the quantitative effects of P.L. 480. During 1956, P.L. 480 concessional sale imports for several selected importers generally resulted in relative and absolute decreases in imports from non-U. S. exporters.

The predominant effect of the U. S. export subsidy is manifest in declining price levels for U. S. and competing cotton. The price level for short staple cotton producers appears more directly related to the U. S. export price than does the price of long staple cotton producers, and thus was more quickly affected by the initial subsidy and subsequent changes in the subsidy level. Long staple cotton prices are not immune to the U. S. price policy action however; although the two qualities are not perfect substitutes, a sufficiently wide premium between the two qualities will encourage increased usage of short staple cotton. Long staple prices also decreased from 1951 to 1962.

The effects of the export subsidies on the quantity of cotton exported are not entirely clear. United States commercial exports increased as a result of the subsidies. Cotton exports of competing countries generally continued to increase even though U. S. prices were at a more competitive level; the magnitude of the increase by U. S. competing exporters may have been retarded by the more competitive U. S. price. The extent to which that is true cannot be ascertained here. The rapidity with which an exporter competing with the United States can expand its exports is also tied to the elasticity of production for cotton. In most countries, other than the United States, this elasticity seems to be low, with the possible exceptions of Mexico and Brazil.

Early in the development of the multiple regression analysis, a high degree of multicollinearity was discovered among several of the independent variables in the regression equations (especially the price and policy variables). Although two alternative models were considered (a crossectional-time series regression model and a simultaneous equations model), the recursive multiple regression form was used because of insufficient cross-sectional data and because the simultaneous equation model does not adequately account for the effects of multicollinearity.

The results of the statistical analysis, as indicated by the relative levels of the partial correlation coefficients, support the results obtained in the "Trend Analysis." The rate of the U. S. export subsidy and the value of export subsidies were relatively important in the explanation of

the variation in U. S. export price and quantity respectively. The value of P.L. 480 exports exhibited relatively little effect on U. S. price variation, although a relatively greater explanation was provided for U. S. commercial exports.

The variables indicating the greatest relative importance on the price level of competing countries' cotton exports were the export tax rate of the particular country, the U. S. export price, and the countries' domestic production and consumption of cotton. The most important variables in the explanation of the quantity of cotton exported from competing countries were the domestic stocks levels, domestic production and consumption, and world production level. The U. S. price variables generally exhibited a greater influence on the quantity of competing exports than did the quantity of U. S. exports.

The results of the two cotton income terms of trade equations were quite heterogeneous — little can be concluded from them. However, the statistical relationship between the cotton income terms of trade and the total income terms of trade appears quite satisfactory as a reflection of the importance of cotton in a particular country's export package.

Implications and Conclusions

The most significant fact emanating from this study is the verification of the "price influencing" role played by the U. S. government in determining U. S. cotton export prices and the cotton export prices of foreign competitors. Two factors contribute to this "leadership" position. The

first is the traditional importance of the United States in the export market. The second is the willingness with which the U. S. government has entered into domestic programs to support crop prices without effective supply controls, while at the same time accepting the responsibility for maintaining or disposing of excess stocks. This willingness is clearly exhibited by the fact that nearly 75 percent of the value of all cotton exported during 1962-1963 was accounted for by some form of government financing — concessional sales, export subsidies, or P.L. 480 long-term loans.

A continuation of the traditional level of importance for U. S. cotton in the future export market is not assured; the trend has moved steadily downward in recent decades. Although it is unlikely that the United States will be surpassed, at least in the near future, as the major producer and exporter of raw cotton, the trends indicate that foreign competitors are likely to become increasingly important. As the U. S. position becomes relatively less important, we may expect a declining influence of U. S. policy actions on the prices of its competitors. However, changes in the degree of U. S. governmental involvement in the export market are of key importance. If the United States maintains a level of exports equal to three to five million bales of cotton per year, its relative share of the world market will remain substantial enough that government policy actions will not likely remain insulated from the world market. Thus, U. S. cotton will continue to be viewed as the "price leader" in the export market. In this connection, the 1965 Agriculture Bill which substantially lowers

domestic price supports in favor of direct payments to producers suggests that the Congress is becoming less willing to provide a price umbrella for the world market.

The results of this study further indicate that export aid and development exports can be judiciously managed so that the commercial export market is not greatly disrupted. The 1956 experience with P.L. 480 indicates, however, that such a program can be quite disruptive in its effect.

Except for the United States, raw cotton exporting countries tend to fall in a category of "developing nations." Cotton exports are the primary source of foreign exchange earnings for many of these countries. The basic policy implication deriving from this fact and from the results of this study is that U. S. policy makers should constantly keep in perspective the potential consequences, whether adverse or favorable, on competing exporters of any particular cotton export policy action. The position of "price leadership" under such circumstances carries with it the necessity for responsible action.

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APPENDIX

Multiple Regression Equation Results

and

Supplementary Data

Table 1. Regression Equation Results for the U. S. , Equation (1).
The U. S. Cotton Export Price is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | 111.2337 | 27.2889 | |
| X ₃ | -0.0000 | 0.0005 | -0.0102 |
| X ₄ | 0.0002 | 0.0005 | 0.1638 |
| X ₅ | -0.0008 | 0.0004 | -0.7513 |
| X ₁₁ | -0.0022 | 0.0023 | -0.4325 |
| X ₁₂ | -0.8030 | 0.8736 | -0.4176 |
| X ₁₃ | -0.0049 | 0.0229 | -0.1069 |
| X ₂₀ | -0.1251 | 0.0423 | -0.8280 |
| $R^2 = 0.9759, \bar{R}^2 = 0.9336$ | | | |

Table 2. Regression Equation Results for the U. S. , Equation (2).
The U. S. Quantity of Cotton Exported is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -49,386.4763 | 26,101.7887 | |
| X ₃ | 0.0980 | 0.1271 | 0.3596 |
| X ₅ | 0.6185 | 0.4026 | 0.6092 |
| X ₁₁ | 3.7568 | 1.3855 | 0.8048 |
| X ₁₃ | -22.7839 | 10.1628 | -0.7462 |
| X ₁₄ | 31.1438 | 5.2416 | 0.9478 |
| X ₁₅ | 32.9285 | 19.5690 | 0.6438 |
| X ₁₈ | 414.6317 | 171.4358 | 0.7706 |
| $R^2 = 0.9431, \bar{R}^2 = 0.8434$ | | | |

Table 3. Regression Equation Results for the U.A.R. , Equation (6).
The U.A.R. Cotton Export Price is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -190.2149 | 198.9331 | |
| X ₃ | -0.0033 | 0.0135 | -0.1223 |
| X ₄ | -0.0114 | 0.0090 | -0.5386 |
| X ₅ | 0.0037 | 0.0032 | 0.5022 |
| X ₁₁ | 0.0012 | 0.0087 | 0.0707 |
| X ₁₅ | 0.1782 | 0.1385 | 0.5410 |
| X ₁₇ | 3.4934 | 1.7282 | 0.7109 |
| X ₁₈ | 1.9305 | 1.3122 | 0.5926 |
| $R^2 = 0.8556, \bar{R}^2 = 0.6030$ | | | |

Table 4. Regression Equation Results for Brazil, Equation (7).
The Brazilian Cotton Export Price is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -23.2427 | 147.1154 | |
| X ₃ | -0.0032 | 0.0045 | -0.3003 |
| X ₄ | 0.0139 | 0.0073 | 0.6467 |
| X ₅ | -0.0003 | 0.0022 | -0.0508 |
| X ₁₁ | 0.0016 | 0.0067 | 0.1048 |
| X ₁₅ | 0.0418 | 0.0991 | 0.1853 |
| X ₁₈ | 1.5674 | 1.0958 | 0.5388 |
| $R^2 = 0.9038, \bar{R}^2 = 0.7883$ | | | |

Table 5. Regression Equation Results for Mexico, Equation (3).
The Mexican Cotton Export Price is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | 31.4434 | 38.4694 | |
| X ₃ | -0.0142 | 0.0088 | -0.6287 |
| X ₄ | -0.0039 | 0.0029 | -0.5586 |
| X ₅ | -0.0001 | 0.0007 | -0.0783 |
| X ₁₁ | 0.0000 | 0.0020 | 0.0118 |
| X ₁₅ | -0.0400 | 0.0260 | -0.6099 |
| X ₁₇ | 1.1292 | 1.6775 | 0.3190 |
| X ₁₈ | 0.3869 | 0.3900 | 0.4444 |
| $R^2 = 0.9843, \bar{R}^2 = 0.9568$ | | | |

Table 6. Regression Equation Results for Pakistan, Equation (3).
The Pakistani Cotton Export Price is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | 20.5898 | 116.7130 | |
| X ₃ | -0.0094 | 0.0185 | -0.2469 |
| X ₄ | 0.0028 | 0.0070 | 0.1985 |
| X ₅ | -0.0001 | 0.0018 | -0.0322 |
| X ₁₁ | 0.0006 | 0.0055 | 0.0518 |
| X ₁₅ | -0.0353 | 0.0734 | -0.2339 |
| X ₁₇ | 1.6728 | 0.9296 | 0.6688 |
| X ₁₈ | 0.3280 | 0.8576 | 0.1878 |
| $R^2 = 0.9275, \bar{R}^2 = 0.8006$ | | | |

Table 7. Regression Equation Results for Sudan, Equation (3)
The Sudanese Cotton Export Price is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -106.0676 | 168.4366 | |
| X ₃ | -0.0145 | 0.0167 | -0.3983 |
| X ₄ | 0.0107 | 0.0139 | 0.3592 |
| X ₅ | 0.0019 | 0.0025 | 0.3592 |
| X ₁₁ | -0.0016 | 0.0078 | -0.1024 |
| X ₁₅ | 0.1159 | 0.1036 | 0.4879 |
| X ₁₇ | 1.7165 | 1.0084 | 0.6481 |
| X ₁₈ | 1.5943 | 1.2757 | 0.5300 |
| $R^2 = 0.8725, \bar{R}^2 = 0.6494$ | | | |

Table 8. Regression Equation Results for the U.A.R., Equation (8).
The Quantity of U.A.R.'s Cotton Exported is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -4,167.3053 | 1,470.7657 | |
| X ₃ | 0.9090 | 0.2021 | 0.9137 |
| X ₄ | 0.4442 | 0.1178 | 0.8834 |
| X ₅ | 0.0814 | 0.0233 | 0.8676 |
| X ₁₀ | 0.0433 | 0.0232 | 0.6821 |
| X ₁₁ | -0.0849 | 0.0836 | -0.4531 |
| X ₁₅ | 32.3327 | 17.2467 | 0.6839 |
| X ₁₉ | -7.2438 | 6.8368 | -0.4681 |
| $R^2 = 0.9671, \bar{R}^2 = 0.9095$ | | | |

Table 9. Regression Equation Results for Mexico, Equation (8).
The Quantity of Mexican Cotton Exported is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -2,525.4875 | 2,173.0275 | |
| X ₃ | 0.7000 | 0.7159 | 0.4392 |
| X ₄ | 0.9560 | 0.2873 | 0.8571 |
| X ₅ | 0.0388 | 0.0304 | 0.5387 |
| X ₁₀ | 0.0166 | 0.0396 | 0.2047 |
| X ₁₁ | -0.1036 | 0.1192 | -0.3984 |
| X ₁₅ | 20.8744 | 52.6308 | 0.1945 |
| X ₁₉ | 3.0852 | 66.9247 | 0.0230 |
| $R^2 = 0.9678, \bar{R}^2 = 0.9113$ | | | |

Table 10. Regression Equation Results for Pakistan, Equation (8).
The Quantity of Pakistani Cotton Exported is the Dependent Variable.

| Independent Variables | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -1,749.3050 | 445.4954 | |
| X ₃ | 0.7517 | 0.1687 | 0.9124 |
| X ₄ | 0.8476 | 0.0526 | 0.9924 |
| X ₅ | 0.0323 | 0.0067 | 0.9230 |
| X ₁₀ | -0.0013 | 0.0074 | -0.0909 |
| X ₁₁ | -0.1183 | 0.0285 | -0.9011 |
| X ₁₅ | 14.0677 | 5.3547 | 0.7957 |
| X ₁₉ | -1.1837 | 3.8505 | -0.1519 |
| $R^2 = 0.9971, \bar{R}^2 = 0.9919$ | | | |

Table 11. Regression Equation Results for Brazil, Equation (8).
The Quantity of Brazilian Cotton Exported is the Dependent Variable.

| Independent Variable | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -689.5042 | 7,257.2776 | |
| X ₃ | 0.4606 | 0.3839 | 0.5145 |
| X ₄ | 0.8320 | 0.8240 | 0.4507 |
| X ₅ | 0.0109 | 0.1221 | 0.0446 |
| X ₁₀ | -0.0129 | 0.0874 | -0.0734 |
| X ₁₁ | -0.1554 | 0.4343 | -0.1762 |
| X ₁₅ | 41.6519 | 88.0096 | 0.2303 |
| X ₁₉ | -35.6348 | 49.8134 | -0.3368 |
| $R^2 = 0.6541, \bar{R}^2 = 0.0488$ | | | |

Table 12. Regression Equation Results for Sudan, Equation (8).
The Quantity of Sudanese Cotton Exported is the Dependent Variable.

| Independent Variable | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -780.5426 | 1,768.3334 | |
| X ₃ | 0.2655 | 0.3209 | 0.3823 |
| X ₄ | 0.0171 | 0.2901 | 0.0295 |
| X ₅ | 0.0327 | 0.0244 | 0.5558 |
| X ₁₀ | -0.0487 | 0.0309 | -0.6185 |
| X ₁₁ | 0.0634 | 0.1027 | 0.2949 |
| X ₁₅ | -17.3494 | 21.4755 | -0.3745 |
| X ₁₉ | 10.4012 | 9.5064 | 0.4799 |
| $R^2 = 0.8818, \bar{R}^2 = 0.6751$ | | | |

Table 13. Regression Equation Results for the U. S. , Equation (9).
The Quantity of U. S. Commercial Cotton Exports is the Dependent Variable.

| Independent Variable | Regression Coefficients | Standard Errors of the Coefficients | Partial Correlation Coefficients |
|------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| Constant | -17,888.7893 | 33,759.7309 | |
| X ₃ | 0.0173 | 0.2848 | 0.0350 |
| X ₄ | 0.1356 | 0.3908 | 0.1965 |
| X ₅ | 0.1331 | 0.3883 | 0.1941 |
| X ₁₁ | 2.1913 | 1.3431 | 0.6857 |
| X ₁₂ | -16.8733 | 498.4700 | -0.0195 |
| X ₁₃ | -15.9612 | 12.8227 | -0.5836 |
| X ₁₄ | 28.8068 | 9.6022 | 0.8660 |
| X ₁₈ | 216.2978 | 272.2717 | 0.4169 |
| $R^2 = 0.9062, \bar{R}^2 = 0.6561$ | | | |

Table 14. Regression Equation Results for the Cotton Income
Terms of Trade, Equation (10). The Cotton Income Terms
of Trade Index is the Dependent Variable for the
U.A.R. , Pakistan, Brazil, and Sudan.

| Independent Variable | Regression Coefficients | | | |
|----------------------|-------------------------|-------------|----------|----------|
| | U.A.R. | Pakistan | Brazil | Sudan |
| Constant | 106.1146 | -1,120.6173 | 735.1848 | 129.0457 |
| Standard error | 59.0069 | 309.9371 | 748.9108 | 81.4312 |
| X ₁₀ | -0.0089 | 0.0072 | -0.0299 | 0.0049 |
| Standard error | 0.0045 | 0.0195 | 0.0403 | 0.0061 |
| Partial correlation | -0.7050 | 0.1383 | -0.2698 | 0.3112 |
| X ₁₁ | 0.0187 | 0.0455 | -0.1296 | -0.0074 |
| Standard error | 0.0194 | 0.1051 | 0.2190 | 0.0269 |
| Partial correlation | 0.4345 | 0.1615 | -0.2183 | -0.1117 |
| X ₁₈ | -4.3413 | 38.3694 | -13.8383 | -5.4989 |
| Standard error | 2.2005 | 11.6497 | 25.7269 | 3.4030 |
| Partial correlation | -0.7023 | 0.7796 | -0.1992 | -0.5507 |
| X ₁₉ | 3.7488 | -4.7663 | 15.5082 | -4.3651 |
| Standard error | 1.2256 | 9.0669 | 16.3084 | 2.2025 |
| Partial correlation | 0.8370 | -0.1949 | 0.3382 | 0.6290 |
| \bar{R}^2 | 0.7326 | 0.7998 | 0.0000 | 0.4379 |

Table 15. Regression Equation Results for the Value of Cotton Exports, Equation (11). The Value of Cotton Exports is the Dependent Variable for the U.A.R., Mexico, Pakistan, Brazil, and Sudan.

| Independent Variable | Regression Coefficients | | | | |
|----------------------|-------------------------|----------|-----------|----------|---------|
| | U.A.R. | Mexico | Pakistan | Brazil | Sudan |
| Constant | -164.8239 | 407.8747 | -410.6049 | 165.7254 | 99.3454 |
| Standard error | 92.5764 | 61.1971 | 120.6577 | 227.2864 | 61.8841 |
| X_{10} | | | | | |
| Standard error | 0.0121 | 0.0026 | 0.0028 | -0.0082 | 0.0001 |
| Partial correlation | 0.0074 | 0.0044 | 0.0076 | 0.0122 | 0.0055 |
| | 0.5263 | 0.2140 | 0.1370 | -0.2442 | 0.0039 |
| X_{11} | | | | | |
| Standard error | 0.0879 | -0.1036 | 0.0172 | -0.0388 | 0.0013 |
| Partial correlation | 0.0320 | 0.0220 | 0.0409 | 0.0665 | 0.0249 |
| | 0.7203 | -0.8717 | 0.1348 | -0.2152 | 0.0204 |
| X_{18} | | | | | |
| Standard error | 7.8181 | 4.1270 | 12.3930 | -4.1526 | -4.4674 |
| Partial correlation | 3.4160 | 6.9060 | 4.5352 | 7.8078 | 3.1857 |
| | 0.6542 | 0.2203 | 0.7184 | -0.1971 | -0.4683 |
| X_{19} | | | | | |
| Standard error | -0.6485 | -4.2799 | 0.3699 | 6.1911 | 3.5647 |
| Partial correlation | 2.1429 | 7.3311 | 3.5297 | 4.9494 | 2.0751 |
| | -0.1137 | -0.2155 | 0.0396 | 0.4274 | 0.5446 |
| \bar{R}^2 | 0.7360 | 0.7041 | 0.8010 | 0.0943 | 0.0889 |

Table 16. Estimated Yearly Average Cotton Prices for the U. S., Equation (1); the U.A.R., Equation (4); Mexico, Pakistan, and Sudan, Equation (3); and Brazil, Equation (5). Estimates are in U. S. Cents Per Pound. In Addition, Estimated Yearly Average Cotton Exports by the U. S., Equation (2). Estimates are in Thousands of Bales.

| Aug. 1- July 31 | Estimated Average Yearly Price in Cents Per Pound | | | | | Estimated U. S. Exports in Thousands of Bales | |
|--------------------------------------|---|--------|--------|----------|--------|--|----------|
| | U.S. | U.A.R. | Mexico | Pakistan | Brazil | | Sudan |
| 1951-52 | 47.04 | 69.26 | 44.55 | 59.77 | 58.82 | 62.76 | 4,602 |
| 1952-53 | 45.57 | 52.77 | 42.66 | 44.92 | 48.48 | 52.67 | 4,030 |
| 1953-54 | 43.56 | 50.01 | 42.51 | 40.39 | 39.52 | 50.36 | 3,882 |
| 1954-55 | 43.08 | 47.94 | 41.48 | 41.62 | 41.87 | 48.39 | 3,173 |
| 1955-56 | 41.04 | 44.61 | 37.14 | 40.50 | 36.95 | 51.04 | 2,327 |
| 1956-57 | 34.37 | 48.34 | 32.78 | 33.06 | 30.78 | 54.37 | 7,515 |
| 1957-58 | 36.30 | 46.29 | 34.66 | 35.93 | 27.01 | 41.52 | 6,029 |
| 1958-59 | 32.84 | 33.59 | 29.56 | 32.96 | 27.43 | 40.16 | 2,648 |
| 1959-60 | 30.20 | 40.22 | 28.95 | 30.54 | 23.03 | 38.11 | 7,117 |
| 1960-61 | 32.24 | 37.04 | 30.02 | 32.49 | 27.33 | 39.03 | 6,569 |
| 1961-62 | 29.56 | 37.25 | 29.97 | 31.88 | 30.05 | 35.87 | 5,091 |
| 1962-63 | 29.63 | 42.20 | 28.30 | 27.38 | 24.26 | 34.52 | 3,187 |
| \bar{R}^2 | 0.9336 | 0.6823 | 0.9568 | 0.8006 | 0.8561 | 0.6494 | 0.8434 |
| Standard error of the estimate | 1.7118 | 5.7301 | 1.2927 | 4.0407 | 4.2362 | 5.5526 | 724.4607 |

Table 17. Value of Cotton Exports by Country and Year, 1950-1963
(figures in millions of dollars)^a

| Year | U. S. | U. A. R. | Mexico | Pakistan | Brazil | Sudan |
|------|-------|----------|--------|----------|--------|-------|
| 1950 | 1,017 | 437 | 90 | 215 | 105 | 68 |
| 1951 | 1,138 | 477 | 131 | 246 | 200 | 137 |
| 1952 | 862 | 369 | 141 | 262 | 35 | 87 |
| 1953 | 517 | 351 | 140 | 197 | 102 | 80 |
| 1954 | 780 | 342 | 179 | 112 | 223 | 65 |
| 1955 | 469 | 329 | 234 | 108 | 131 | 90 |
| 1956 | 718 | 287 | 263 | 77 | 86 | 123 |
| 1957 | 1,048 | 359 | 170 | 74 | 44 | 69 |
| 1958 | 656 | 323 | 190 | 51 | 26 | 70 |
| 1959 | 445 | 332 | 199 | 25 | 37 | 121 |
| 1960 | 980 | 402 | 158 | 44 | 48 | 100 |
| 1961 | 875 | 317 | 161 | 22 | 110 | 95 |
| 1962 | 528 | 212 | 218 | 39 | 112 | 131 |
| 1963 | 576 | 278 | 194 | 69 | 114 | 134 |

^aThese data are compiled from the United Nations trade statistics as found in the Statistical Yearbook, ST/STAT/S797Y and the Yearbook of International Trade Statistics, ST/STAT/Ser.G. The data are not strictly comparable to U. S. Department of Agriculture data.

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Table 18. Total Income and Cotton Income Terms of Trade Indexes by Country, 1951-1962 (base year = 1958 = 100)^a

| Year | U.S. | | U.A.R. | | Pakistan | | Brazil | | Sudan | |
|------|-------|-------|--------|-------|----------|-------|--------|-------|-------|-------|
| | t_i | c_i | t_i | c_i | t_i | c_i | t_i | c_i | t_i | c_i |
| 1951 | 79 | 162 | 143 | 174 | 301 | 569 | 93 | 513 | 119 | 162 |
| 1952 | 87 | 134 | 89 | 116 | 246 | 716 | 75 | 90 | 80 | 102 |
| 1953 | 95 | 85 | 92 | 117 | 208 | 552 | 95 | 305 | 123 | 115 |
| 1954 | 88 | 125 | 97 | 118 | 173 | 318 | 111 | 766 | 102 | 101 |
| 1955 | 91 | 75 | 95 | 110 | 181 | 285 | 110 | 498 | 125 | 139 |
| 1956 | 107 | 109 | 88 | 92 | 139 | 185 | 112 | 315 | 160 | 182 |
| 1957 | 112 | 154 | 97 | 105 | 129 | 156 | 103 | 158 | 106 | 89 |
| 1958 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1959 | 98 | 69 | 108 | 115 | 108 | 52 | 111 | 155 | 165 | 185 |
| 1960 | 114 | 148 | ... | ... | 129 | 86 | 104 | 192 | 139 | 136 |
| 1961 | 118 | 134 | ... | ... | 129 | 41 | 110 | 417 | 149 | 141 |
| 1962 | 124 | 82 | ... | ... | 129 | 75 | 86 | 387 | ... | ... |

^aIndexes are calculated from the U. N. "Unit Value" index of prices for imports (denominator) and a computed index of total value of exports (t_i) and total value of cotton exports (c_i), base 1958 (numerator).

Table 19. Export Tax Rate by Country
in U. S. Cents Per Pound, 1951-1962

| Year | U.S. | U.A.R. ^a | Mexico ^b | Pakistan ^c | Brazil ^d | Sudan ^e |
|------|------|---------------------|---------------------|-----------------------|---------------------|--------------------|
| 1951 | 0.00 | 10.68 | 5.94 | 15.01 | 1.51 | 14.37 |
| 1952 | 0.00 | 5.88 | 4.58 | 7.80 | 1.37 | 6.07 |
| 1953 | 0.00 | 5.88 | 4.30 | 6.93 | 0.00 | 5.74 |
| 1954 | 0.00 | 5.88 | 4.53 | 6.93 | 0.00 | 5.74 |
| 1955 | 0.00 | 1.66 | 5.34 | 7.10 | 0.00 | 5.74 |
| 1956 | 0.00 | 1.27 | 3.75 | 6.21 | 0.00 | 5.74 |
| 1957 | 0.00 | 3.22 | 3.75 | 6.16 | 0.00 | 7.67 |
| 1958 | 0.00 | 2.40 | 3.75 | 6.12 | 0.00 | 3.17 |
| 1959 | 0.00 | 2.40 | 1.67 | 4.02 | ... | 2.87 |
| 1960 | 0.00 | 2.40 | 1.67 | 4.02 | ... | 2.87 |
| 1961 | 0.00 | 2.25 | 1.67 | 4.02 | ... | 2.87 |
| 1962 | 0.00 | 2.12 | 1.67 | 2.19 | ... | 2.87 |

^aApplies to Ashmouni F.G. up to 1961 — Dendara F.G. 1961 and 1962.

^bFrom 1951 to 1955 applies to Middling 15/16" at Torreon, 1956 to 1962 applies to Middling 1-1/32" at Matamoros.

^cApplies to 289F Punjab S.G.

^dApplies to Sao Paulo, Type 5. Not available beginning in 1959.

^eApplies to G3L and G5L.

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