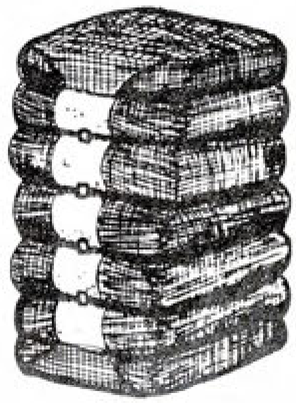
Don Ethridge

SELECTED COTTON MARKETING TOPICS



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U.S. Department of Agriculture

Economics, Statistics, and Cooperatives Service

Commodity Economics Division

PREFACE

This publication is a collection of selected articles dealing with current marketing topics relating to cotton. The purpose of these reprints is to provide, under one cover, a readily available source of marketing information. These special articles originally appeared in various issues of the Cotton and Wool Situation which is published four times a year by the Fibers and Oils Program Area, Commodity Economics Division. The Fibers and Oils Program Area conducts a broad range of research activities covering each segment of the production-marketing system for cotton and oilcrops in addition to providing current situation and outlook intelligence for cotton, wool, mohair, and fats and oils. This material has been assembled and edited by Mildred V. Jones.

Further information or additional copies of this publication can be obtained from Fibers and Oils Program Area, Commodity Economics Division, Economics, Statistics and Cooperatives Service, U.S. Department of Agriculture, 500 12th St., S.W., Washington, D.C. 20250. Telephone 202-447-8776.

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(A list of related publications appear on the inside back cover).

November 1978

EXPORTING U.S. COTTON: TRENDS IN MARKETING COSTS TO FOREIGN OUTLETS

by
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ABSTRACT: Detailed estimates of the major costs involved in exporting U.S. cotton for the 1972/73 through 1976/77 seasons are presented. Costs are developed for shipments from average U.S. location to all foreign outlets combined. Data were obtained from both an actual survey of export firms and various secondary sources of information.

KEYWORDS: Cotton, export costs, marketing.

INTRODUCTION

U.S. cotton exports contribute significantly to farm income and are an important element in aiding our balance of payments. During the past 5 seasons, exports represented 40 percent of the total market for U.S. cotton. For the 1976/77 season, shipments increased 44 percent to 4.8 million bales and the value jumped to a record $1.6 billion as foreign demand for U.S. cotton expanded.

However, as the value of exports has increased recently, so have the costs involved in marketing cotton to foreign outlets. Currently, total exporting costs add approximately 12 cents per pound (on a net weight basis) to the value of U.S. cotton landed in foreign ports. In most cases, these costs are substantially above that of other exporting countries.

Efforts to reduce marketing costs to foreign users of U.S. cotton have resulted in numerous innovations and efficiencies such as universal density compression, containerized shipment, and new sampling and bale packaging techniques. But, in spite of these cost reduction efforts, the total cost to export U.S. cotton has trended upward over the years. In many cases, the larger increases have come in those individual marketing cost items for which cotton exporters have little or no control. These items include such things as financing, insurance, transportation rates, and overhead costs.

Purpose of Study

The purpose of this article is to provide current cost estimates for marketing U.S. cotton in world markets. Cotton exporters and others in the industry can compare their own costs for each cost item shown with the industry averages presented and possibly gain insight into potential areas of cost reduction. The information presented summarizes results of a continuous research effort to compute and monitor cotton marketing costs and practices over time. This information has also been used in establishing cotton loan rates, identifying research priorities, and analyzing various cotton policy alternatives.

Method of Analysis

Costs were estimated for each specific marketing function associated with the purchase, sale, and delivery of U.S. cotton from an average interior location to major foreign ports. The major Texas cotton markets of Lubbock, Houston, and Dallas were used in establishing the "average U.S. location" for export purposes. Weighted averages, based on the number of bales marketed, were computed for each cost item in the 3 markets. To approximate transportation costs to aggregate world markets, a weighted average ocean transportation rate from U.S. Gulf ports to Europe and to the Far East was developed.

Information used in estimating export costs was obtained both from an actual survey of cotton exporters and from various secondary sources. Data for the 1972/73 and 1974/75 seasons are based on 2 published surveys of cotton merchandising costs. Cost data for the other crop years were developed by updating the survey data with various published and unpublished sources of information. Detailed methodology and data sources are available upon request.

EXPORT COSTS

The estimated costs for buying, marketing, and delivering U.S. cotton to foreign markets for the 1972/73 through 1976/77 crop years are shown in table 16.

As calculations were made to reflect costs of an average or typical bale exported, estimates of costs for both individual items and total costs can show year-to-year variation because of the following:

(1) Actual increases or decreases in the cost of services or functions performed.

(2) Variations in the total volume marketed and variations among volumes shipped from alternative destinations, as averages are weighted by volume shipped.

(3) Year-to-year variations in the price of cotton and value of the crop which primarily affects insurance and financing costs.

Total Costs

The average cost to export U.S. cotton has increased from about $34.76 per bale in 1972/73 to an estimated $59.60 per bale for the 1976/77 season. However, in 1975/76, cotton export costs were pushed to over $64.00 per bale as exceptionally strong demand for ocean transportation services by all commodities forced rates for cotton to all-time highs. Currently, ocean transportation charges for cotton have declined to more normal levels, which has helped make American cotton more competitive in world markets.

In calculating total export costs, no attempt was made to estimate an operating margin or profit. Total costs only reflect the usual or typical charges which accrue against a bale of raw cotton as it moves through the marketing system.

Cost Components

Costs or charges made for most individual components of the total export marketing bill have also trended upward. The level of cost for some items, however, has fluctuated from year to year reflecting varying practices and cotton values.

Buying and local delivery: Exporters' costs for buying cotton in local markets and delivering it to warehouses for concentration in even running lots increased steadily during the 1972/73-1976/77 period. Costs of performing this first step in the exporting process averaged 77 cents per bale during 1972/73. By 1976/77, this cost more than doubled to $1.72 per bale.

Warehousing services: Costs associated with storing and handling cotton at public warehouses represent the second largest expense involved in exporting U.S. cotton. Over 16 percent of the total cost is accounted for by charges for insured storage, compression, receiving, sampling, weighing, shipping, and other special services. As shown in

Table 16—Cost of exporting U.S. cotton from average location to World markets[1]

Cost item	Crop year				
	1972/73	1973/74	1974/75	1975/76	1976/77
	Dollars per bale				
Buying and local delivery	0.77	1.04	1.32	1.50	1.72
Warehousing services:					
Storage	1.74	1.40	1.56	1.78	1.76
Compression	2.90	3.21	3.88	4.10	3.97
Receiving, shipping and other services	2.03	2.81	3.60	3.96	4.16
Transportation	19.19	24.80	39.00	40.00	31.67
Cotton insurance	1.74	2.58	1.75	2.20	2.98
Financing	2.30	5.61	4.73	4.75	6.29
Selling	1.47	1.56	1.65	1.75	2.50
Miscellaneous	.24	.30	.35	.40	.45
Operating overhead	2.38	2.95	3.55	3.90	4.10
Total cost	34.76	46.26	61.39	64.34	59.60

[1] These data reflect the estimated costs associated with marketing U.S. cotton from the Southwest Region, through Gulf Ports, to Europe and the Far East combined.

FACTORS AFFECTING DOMESTIC MILL DEMAND FOR COTTON AND APPAREL WOOL

by
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ABSTRACT: This paper analyzes the factors affecting mill demand for cotton and apparel wool. Data from 1955-76 are used in the study. Equations were developed to project total domestic consumption of all fibers and mill consumption of cotton and apparel wool.

KEYWORDS: Domestic consumption, mill consumption, cotton, apparel wool, regression analysis.

The purpose of this paper is to measure the effects of the principal factors determining total fiber consumption and U.S. textile mill use of cotton and apparel wool. To this end, ordinary least squares equations were developed using data from 1955-76. The equations were used to project cotton and apparel wool mill use under alternative total fiber use levels. The equations explained a high percentage of variation in domestic fiber consumption, cotton mill use, and apparel wool mill use.

TOTAL FIBER CONSUMPTION

Total fiber consumption is defined as mill use of fibers plus the fiber content of the import trade balance (imports minus exports) in manufactured and semi-manufactured textile products. In the short run, variations in total fiber consumption stem mainly from changes in general economic activity. Factors influencing longrun per capita total fiber demand include the level of economic activity and prices of fiber products relative to those of competing products. In addition, both short- and long-run fiber demand are influenced by many non-measurable factors of a technological or cultural nature.

Several alternative specifications of the total fiber demand equation were estimated. It was expected that most of the year-to-year variation in total fiber consumption per capita was due to fluctuations in economic activity. The following equation confirms this hypothesis:

$$(1)\quad LDFP = 1.18 - \underset{(14.6)}{0.92}\, \underset{(9.1)}{L(PTX/PCEP)} - \underset{(3.4)}{0.104}\, LT$$

where

L = denotes natural logarithm

DFP = total fiber consumption, pounds per capita (Source: *Textile Organon*)

PTX/PCEP = Wholesale Price Index of textile products and apparel (1967=100) divided by total per capita personal consumption expenditures

T = time, 1955=1

Equation (1) explained 92 percent of the variation in per capita total fiber consumption over the 1955-75 period. The "t-values" in parentheses indicate that the estimated coefficients are highly significant. The coefficient of -0.92 on L(PTX/PCEP) indicates that a 10-percent change in the real price of textile products would lead to a 9.2 percent change in total fiber consumption per capita in the opposite direction. The negative trend of about ¼ pound per capita probably resulted from the substitution of manmade fibers for the natural fibers over time. Due to less processing waste, a pound of manmade fiber yields more yardage of cloth than a pound of cotton or wool.

A check of the historical data shows that over the past decade, per capita total fiber consumption increased on the average by about 1.8 percent annually. Such a growth rate indicates that during the early 1980's total fiber consumption could average about 62 pounds per person and during the late 1980's about 70 pounds per person. In 1976, total fiber consumption was 56.4 pounds per capita and is expected to increase only marginally in 1977.

COTTON MILL DEMAND

Cotton mill demand depends upon the level of total fiber demand, cotton prices relative to manmade fiber prices, and many nonmeasurable factors relating to fiber properties and consumer preferences. Given total fiber demand, mill demand for cotton is primarily determined by relative fiber prices and the trade balance in textile products. No attempt was made to adjust for the trade balance in cotton textiles.

Presented below are three cotton mill demand equations. These equations were chosen from those developed for this study on the basis of the statistical significance of the estimated coefficients and the explanatory power of the equation.

$$(2)\quad LQCMP = \underset{(2.8)}{1.55} + \underset{(2.3)}{0.33}LDFP - \underset{(8.1)}{0.35}L\frac{PCT_{t-1}}{PPOL_{t-1}}$$

$$(3)\quad LQCMP = \underset{(0.7)}{0.70} + \underset{(2.3)}{0.46}LDFP - \underset{(5.9)}{0.32}LPCT_{t-1} + \underset{(5.9)}{0.40}LPPOL_{t-1}$$

$$(4)\quad QCMP = \underset{(2.0)}{10.2} + \underset{(2.1)}{0.17}DFP - \underset{(5.4)}{0.13}PCT_{t-1} + \underset{(5.9)}{0.09}PPOL_{t-1}$$

where

L = denotes natural logarithm

QCMP = mill consumption of cotton, calendar year, pounds per capita

DFP = domestic fiber consumption, pounds per capita

PCT = middling 1-1/16 inch cotton price at Group B mill points, cents per pound

PPOL = reported average price for 1.5 denier polyester staple for cotton blending, cents per pound

The equations are statistically sound and each explains about 90 percent of the variation in per capita cotton mill use over the 1955-76 period. The 3 equations indicate that a 10-percent change in polyester price could change per capita cotton mill use by 3.5 to 4.0 percent and that a 10-percent change in cotton price could change per capita mill use by 2.5 to 3.5 percent in the opposite direction.

Cotton mill demand curves were estimated for 3 levels of total fiber use—50, 60, and 70 pounds per capita. The cotton demand curves are shown in figure 8. As a point of reference, 1976 cotton mill use was about 15.9 pounds per capita, the lagged price ratio was about 1.25, and total fiber use was 56.4 pounds per capita. In 1977, per capita cotton mill consumption is expected to decline to just over 14 pounds corresponding to a higher price ratio of about 1.45 and slightly larger total fiber use.

The cotton to polyester price ratio varied widely over the past few years, ranging from 0.86 in 1971 to 1.65 in 1973. The ratio averaged 1.4 in 1976 and has recently averaged about 1.2. No judgment was made about future levels of the ratio. Future oil prices and average cotton yields may be the important factors in determining average production costs of polyester and cotton and relative fiber prices.

APPAREL WOOL DEMAND

U.S. textile mills used about 107 million pounds of apparel wool in 1976 and are expected to use 95-100 million in 1977. In 1955, 280 million pounds were used by U.S. mills. As the following equation indicates, future demand for apparel wool depends upon the rate of U.S. economic growth and the apparel wool to polyester price ratio:

$$(5)\quad LQWAP = \underset{(1.7)}{455.8} + \underset{(1.6)}{0.81}LDFP - \underset{(4.2)}{0.66}L\frac{PWA_{t-1}}{PPOL_{t-1}} - \underset{(1.7)}{60.5}LYR$$

where the variables not previously defined are

QWAP = consumption of apparel wool by U.S. mills, clean pounds per capita

PWA = price of Australian wool, 64's, 70's, duty paid, at Boston, cents per clean pound

YR = year

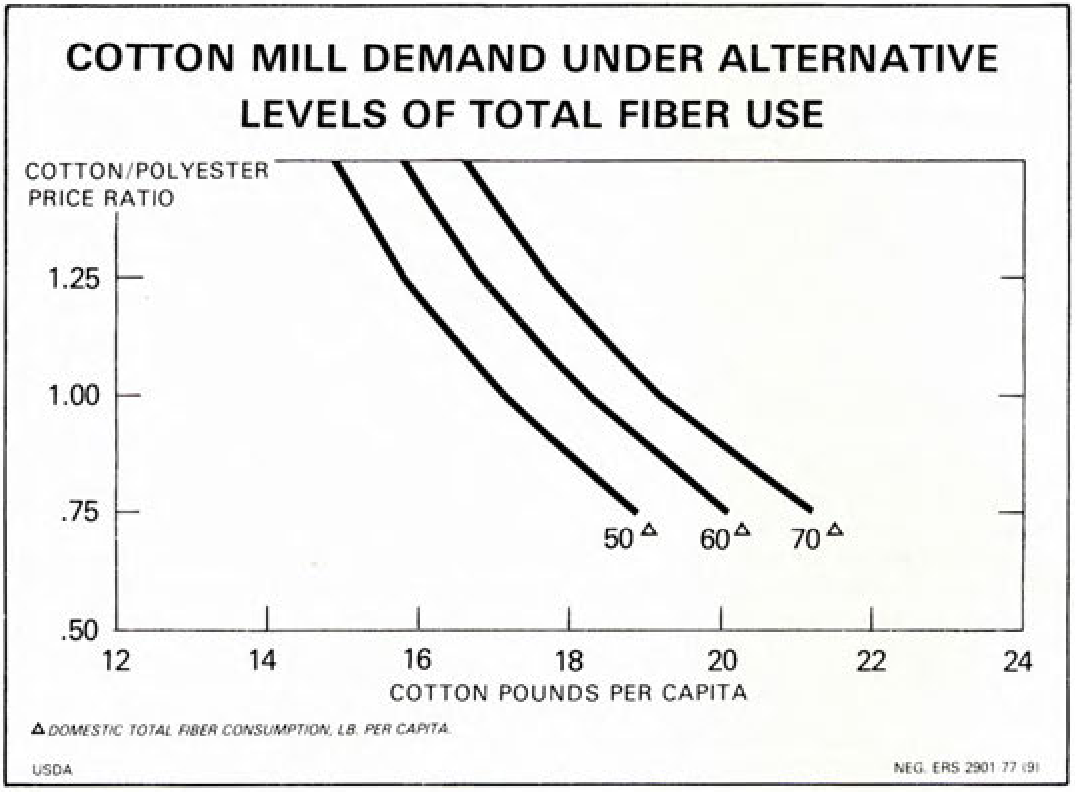


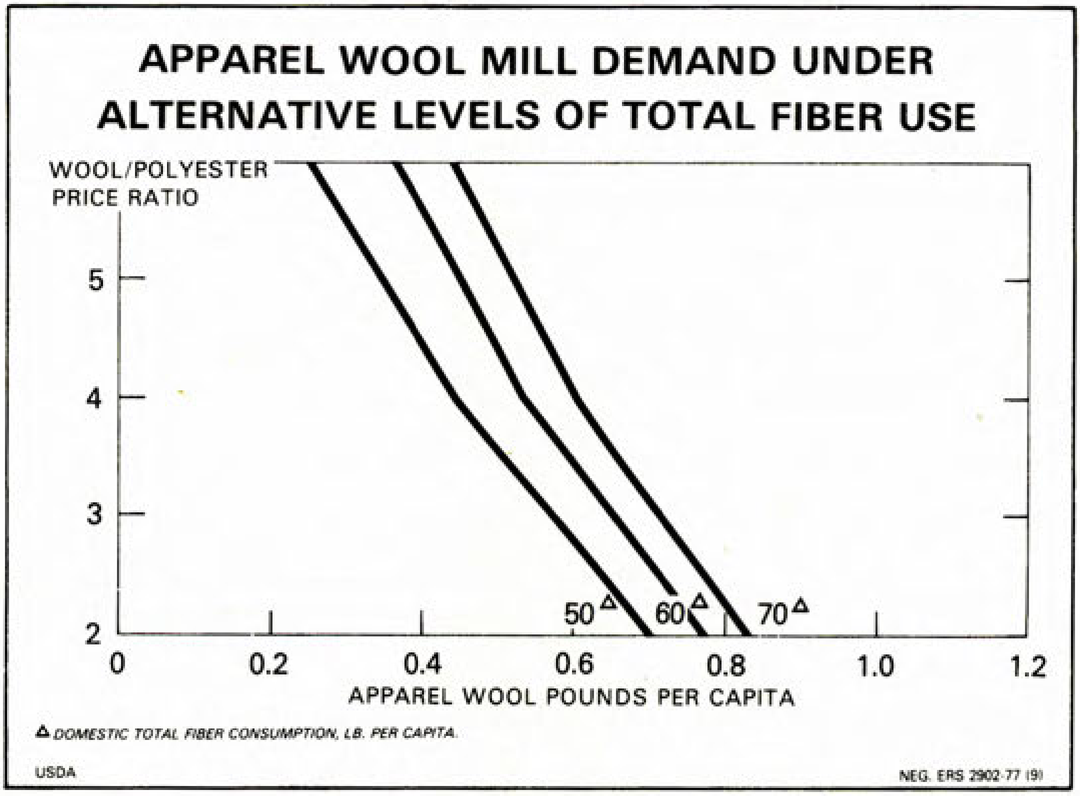
Figure 8

The equation explained about 89 percent of the variation in apparel wool mill consumption over the 1955-76 period. However, the estimated coefficients are not as statistically significant as those in the cotton demand equation. The equation indicates that apparel wool is more sensitive to changes in total fiber demand and in relative fiber prices than is cotton mill demand. A 10-percent change in the wool/polyester price ratio is estimated to lead to a 6.6-percent change in apparel wool mill use in the opposite direction. The demand curves are shown as figure 9.

The import trade balance in wool textiles amounted to about a third of a pound per person in 1976, compared with domestic mill use of about one-half pound per person. Over the past several years, imports of wool textiles have become an increasingly important part of domestic wool consumption. However, attempts to incorporate the trade balance into the demand equation failed. The reason is simple—the trade balance is highly and positively correlated with domestic apparel wool mill consumption. Thus, in developing the apparel wool demand equation, a historical trade balance was implicitly assumed.

Mill consumption of apparel wool in 1976 was about ½ clean pound per capita and the wool-/polyester price ratio averaged about 4.0 in the preceding year. The price ratio is still averaging about 4 to 1. If this ratio is maintained or increases, future per capita mill use of apparel wool will at best remain near the current low rate even with no further increases in wool textile imports. On the other hand, higher wool prices are necessary to the rebuilding of the U.S. sheep industry. A partial answer to this dilemma may be the higher wool incentive price now under consideration. The incentive price does not affect wool market prices but could encourage sheep producers to expand their flocks.

Another factor contributing to high wool prices to U.S. mills is the 25.5 cents per pound (clean basis) duty on imported apparel wool. The duty has the effect of increasing the wool/polyester price ratio and decreasing mill demand for apparel wool. In 1976, for example, apparel wool consumption is assumed to have been based on a wool/polyester price ratio of 4 to 1. Without the duty the price ratio would have been about 3.5 to 1, or 12½ percent less. Equation (5) estimates that a 12½-percent reduction in the price ratio would correspond to an 8¼-percent increase in apparel wool mill use; in 1976, about 8¾ million pounds. In 1976, about 36 percent of the apparel wool used by U.S. mills was imported.



APPAREL WOOL MILL DEMAND UNDER
ALTERNATIVE LEVELS OF TOTAL FIBER USE
WOOL/POLYESTER
PRICE RATIO
5
4
3
2
50△
60△
70△
0
0.2
0.4
0.6
0.8
1.0
1.2
APPAREL WOOL POUNDS PER CAPITA
△ DOMESTIC TOTAL FIBER CONSUMPTION, LB. PER CAPITA.
USDA
NEG. ERS 2902-77 (9)

Figure 9

IMPORTS AND EXPORTS OF KNIT APPAREL AND FABRIC

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ABSTRACT: This article describes recent trends in U.S. imports and exports of knit apparel and fabric. Average annual growth rates are presented for cotton, wool, and manmade fiber knit apparel and fabric during 1965-77.

KEYWORDS: Knit, apparel, fabric, textile products.

Introduction

This article discusses the growth of U.S. knit textile imports and exports of apparel and fabric during 1965-77. The composition of these knit textile products (cotton, wool, and manmade fibers) will also be considered. Cotton continues to find large use in such knit textile products as underwear and T-shirts. Knit outerwear apparel is made mostly from manmade fibers. Knit wool textile products are a relatively small quantity because of increasing competition from manade fibers.

Imports

During 1977, this country imported 1,317 million pounds of textile products, 2.3 percent more than in 1976 (table 18). Their average annual rate of growth was 5.4 percent during 1965-77.[2] These imports were at an all-time high in 1977 and more than twice the quantity imported in 1965. Apparel imports in 1977 were 758 million pounds, a record level which was 13 percent above the quantity imported in 1976 and more than four times the quantity imported in 1965. During the 1965-77 period the average annual growth rate was 11.5 percent. In 1977, apparel imports were 46 percent cotton, 48 percent manmade fibers, and 6 percent wool. The average annual growth rate for manmade fiber apparel imports (16.6 percent) was almost twice the growth rate for cotton apparel imports (8.9 percent).

Imported knit apparel in 1977 amounted to 296 million pounds, 8.6 percent more than in 1976 (figure 7 and table 18). The average annual growth rate during 1965-77 was 13.7 percent. Knit apparel in recent years has accounted for 40 percent of total apparel imports. Cotton constitutes about 15 percent of knit apparel imports, manmade fibers about 75 percent, and wool about 10 percent. Cotton and manmade fiber knit apparel imports had average annual growth rates of 11.2 percent and 18.4 percent, respectively. In contrast, wool knit apparel imports had an average annual rate of decline of 4.6 percent. Cotton knit apparel generally has been about 12-15 percent of total cotton apparel imports. Wool apparel imports were about equally divided between knit and woven while manmade fiber knit apparel imports ranged between 60 and 70 percent of manmade fiber apparel imports.

Total fabric imports in 1977 were 362 million pounds and 17 percent below 1976. They had an average annual growth rate of 2.9 percent during 1965-77. In recent years, cotton fabric averaged about 75 percent of all imported fabric, manmade fiber fabric was about 20 percent, and wool was 3-5 percent. Imported cotton fabric had an average annual growth rate of 2.8 percent 1965-77, imported manmade fiber fabric's growth rate was 6.4 percent, and imported wool fabric's rate of decline was 8.0 percent.

[1]Economist and retired statistical assistant, respectively.

[2]Average annual growth rates are based on trend lines of the general form $y=ar^x$. On semilogarithmic charts, it is a straight line and has the equation form, $\log y = \log a + \log r\,(x)$. The slope of this line is $\log r$, which when expressed as $(r\text{-}1.0)100$ is the percentage average annual growth rate of the trend line.

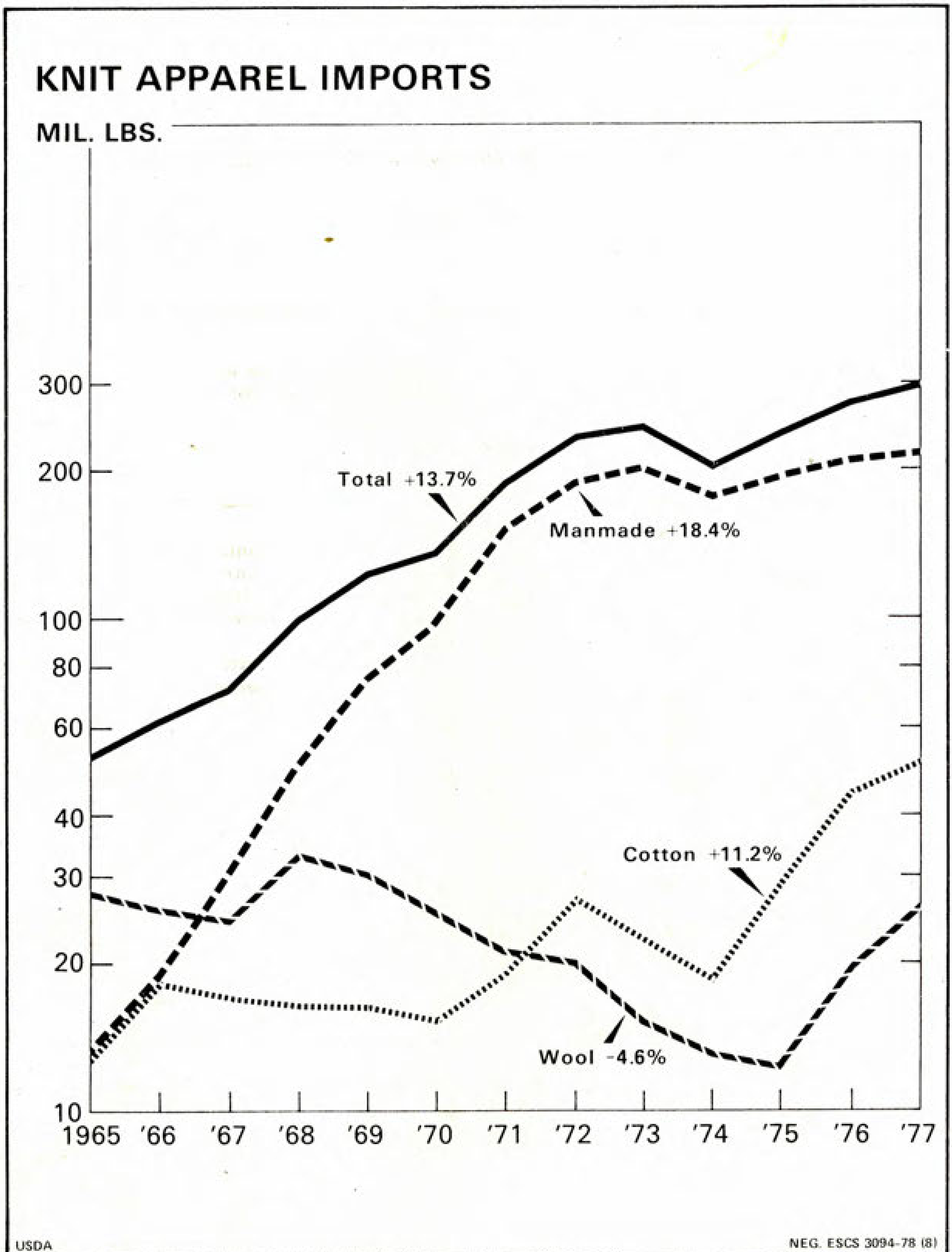
KNIT APPAREL IMPORTS
MIL. LBS.
300
200
100
80
60
40
30
20
10
1965
'66
'67
'68
'69
'70
'71
'72
'73
'74
'75
'76
'77
Total +13.7%
Manmade +18.4%
Cotton +11.2%
Wool -4.6%
USDA
NEG. ESCS 3094-78 (8)

Figure 7

Table 18—U.S. imports of apparel and fabric

Item	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Rate of growth
	(Thousands of pounds)													Percent
Total imports	596,431	777,634	705,637	813,138	875,027	908,995	1,033,583	1,186,533	1,118,782	948,161	970,050	1,286,667	1,316,620	+5.4
Cotton	360,710	510,297	443,385	473,846	487,897	463,177	492,576	610,703	563,501	502,679	501,252	708,601	669,352	+3.7
Wool	156,689	144,272	123,434	145,967	129,670	116,560	89,705	95,377	89,962	74,230	68,422	98,579	116,553	-4.9
Manmade	79,032	123,065	138,818	193,325	257,460	329,258	451,302	480,453	465,319	371,252	400,376	479,487	530,715	+12.1
Total apparel	185,915	199,445	224,749	272,734	327,736	361,181	436,496	492,627	477,012	444,172	534,897	669,552	757,563	+11.5
Cotton	119,891	128,000	133,092	140,047	142,716	135,223	149,404	177,893	162,718	168,310	222,982	293,180	348,269	+8.9
Wool	35,443	33,021	30,771	41,358	41,473	38,124	31,218	31,245	27,420	23,883	22,915	32,973	44,072	-1.1
Manmade	30,581	38,424	60,886	91,329	143,547	187,834	255,874	283,489	286,874	251,979	289,000	343,399	365,222	+16.6
Knit apparel	53,234	62,668	71,785	99,415	123,573	136,816	190,259	237,104	244,531	206,636	235,624	272,665	296,004	+13.7
Cotton	12,785	18,091	16,722	16,260	16,121	15,086	18,936	26,838	24,169	18,561	28,499	43,971	51,515	+11.2
Wool	27,617	25,789	24,371	32,845	30,601	25,207	21,323	19,972	15,026	12,735	12,238	18,902	25,808	-4.6
Manmade	12,832	18,788	30,692	50,310	76,851	96,523	150,000	190,294	205,336	175,340	194,887	209,792	218,681	+18.4
Woven apparel	132,681	136,777	152,964	173,319	204,163	224,365	246,237	255,523	232,481	237,536	299,273	396,887	461,559	+10.1
Cotton	107,106	109,909	116,370	123,787	126,595	120,137	130,468	151,055	138,549	149,749	194,483	249,209	296,754	+8.6
Wool	7,826	7,232	6,400	8,513	10,872	12,917	9,895	11,273	12,394	11,148	10,677	14,071	18,264	+6.5
Manmade	17,749	19,636	30,194	41,019	66,696	91,311	105,874	93,195	81,538	76,639	94,113	133,607	146,541	+13.9
Total fabric	244,337	315,566	291,283	307,044	351,169	358,557	402,772	466,919	441,514	358,485	315,621	434,576	361,860	+2.9
Cotton	188,572	241,939	227,803	229,163	264,597	257,856	264,405	340,403	326,511	278,214	238,783	344,240	262,254	+2.8
Wool	27,063	26,059	26,325	34,626	31,037	26,123	14,410	11,664	14,065	10,159	9,144	13,017	19,268	-8.0
Manmade	28,702	47,568	37,155	43,255	55,535	74,578	123,957	114,852	100,938	70,112	67,694	77,319	80,338	+6.4
Knit fabric	4,258	4,885	6,715	7,403	9,200	21,896	60,345	45,850	34,985	15,482	14,644	14,392	13,588	+6.9
Cotton	263	292	268	304	147	106	267	426	279	169	190	508	334	+2.8
Wool	1,361	1,223	2,006	1,930	1,840	2,180	2,690	2,899	1,682	908	784	807	617	-4.7
Manmade	2,634	3,370	4,441	5,169	7,213	19,610	57,388	42,525	33,024	14,405	13,670	13,077	12,637	+8.2
Woven fabric	240,079	310,681	284,568	299,641	341,969	336,661	342,427	421,069	406,529	343,003	300,977	420,184	348,272	+2.6
Cotton	188,309	241,647	227,535	228,859	264,450	257,750	264,138	339,977	326,232	278,045	238,593	343,732	261,920	+2.8
Wool	25,702	24,836	24,319	32,696	29,197	23,943	11,720	8,765	12,383	9,251	8,360	12,210	18,651	-8.3
Manmade	26,068	44,198	32,714	38,086	48,322	54,968	66,569	72,327	67,914	55,707	54,024	64,242	67,701	+5.8

Compiled from reports of the Bureau of the Census.

Knit fabric imports (13.6 million pounds in 1977) were a relatively small percent, 3-5 percent of total fabric imports (figure 8 and table 18) and had an average annual growth rate of 6.9 percent during 1965-77. More than 90 percent of knit fabric imports was made of manmade fibers which had an average annual growth rate of 8.2 percent. Cotton knit fabric was about 1-3 percent of total knit fabric imports and had an average annual growth rate of 2.8 percent. Wool knit fabric was about 4-6 percent of tótal knit fabric imports and had an average annual rate of decline of 4.7 percent. In recent years, manmade fiber knit fabric imports have been about 15-20 percent of all manmade fiber fabric imports. Less than 0.2 percent of imported cotton fabric and about 6 percent of imported wool fabric were knit. During the years 1971-1973, manmade fiber knit fabric was imported in relatively large amounts because of insufficient domestic knit poduction capacity to meet the rising popularity of knit apparel.

Exports

Exports of textile products in 1977 were 750 million pounds, down 4 percent from 1976 (table 19). The average annual rate of growth from 1965 to 1977 was 10.7 percent. In recent years, exports of textile products have been almost equally divided between cotton and manmade fibers. Cotton textile exports had an average annual growth rate of 8.2 percent and manmade fibers 11.9 percent during the 13-year period. Wool has constituted about 2-3 percent of textile exports and had an average annual growth rate of 7.2 percent. This growth rate was influenced, in part, by the relatively large quantities of tops and advanced wool exported during 1972-75 because of higher foreign prices.

Apparel exports in 1977 were a record-high 108 million pounds, up 19 percent from 1976 (figure 9 and table 19). Their average annual growth rate during the period was 12.0 percent. In contrast to textile imports where the apparel quantity varied in recent years from being equal to being twice the quantity of fabric, apparel exports were one-third to one-fifth fabric exports. In recent years, cotton apparel was about 55-60 percent of total apparel exports; manmade fiber apparel was about 3-5 percent. Knit apparel exports in 1977 were 30.9 million pounds, an all-time high, and had an average annual growth rate during 1965-77 of 16.9 percent. Cotton (14.0 million pounds) and manmade fibers (16.2 million pounds) accounted for almost all the knit apparel exports. Cotton has had an average annual growth rate of 18.0 percent, while it was 17.1 percent for manmade fibers during 1965-77. Wool accounted for about 2 percent (0.6 million pounds) of knit apparel exports in 1977 and had an average annual growth rate of 5.3 percent during 1965-77. About 28 percent of all apparel exports were knit while for the three major fiber groups it was about 20 percent for cotton, about 40 percent for manmade fibers, and about 40 percent for wool.

Fabric exports in 1977 totaled 348 million pounds and had an average annual growth rate of 8.2 percent since 1965 (figure 10 and table 19). Of fabric exports, about 60 percent was cotton and 40 percent manmade fibers. Wool constituted less than 1 percent of fabric exports. Knit fabric exports in 1977 were 16.1 million pounds and were about 5 percent of total fabric exports. Their average annual growth rate was 9.2 percent from 1965 through 1977. Cotton knit fabric exports in 1977 were 4.6 million pounds and had a 12.1 percent average annual growth rate. Manmade fiber knit fabric exports in 1977 were 11.3 million pounds and their average annual growth rate was 8.3 percent during 1965-77. Knit fabric exports were about 25 percent cotton, 75 percent manmade fiber, and about 1 percent wool. With the exception of wool, knit fabric made up a small 5 percent of all fabric exports. About 3 percent of all cotton fabric exports was knit and about 9 percent of the manmade fiber fabric exports. Although the quantity of wool fabric exports was quite small, the percent knit was relatively higher, ranging from 17 to 35 percent in recent years.

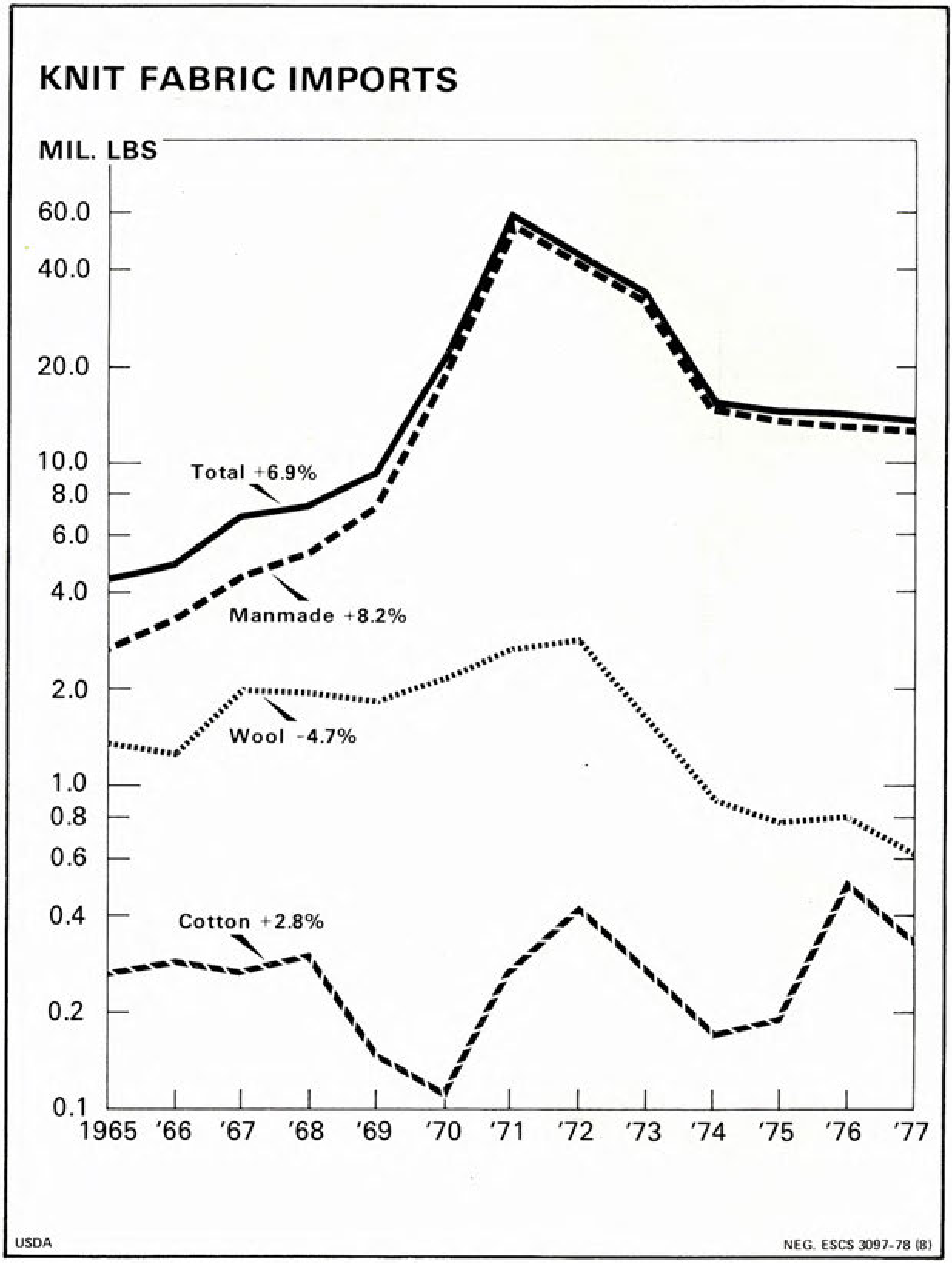
KNIT FABRIC IMPORTS
MIL. LBS
60.0
40.0
20.0
10.0
8.0
6.0
4.0
2.0
1.0
0.8
0.6
0.4
0.2
0.1
Total +6.9%
Manmade +8.2%
Wool -4.7%
Cotton +2.8%
1965 '66 '67 '68 '69 '70 '71 '72 '73 '74 '75 '76 '77
USDA
NEG. ESCS 3097-78 (8)

Figure 8

Table 19—U.S. exports of apparel and fabric

Item	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Rate of growth
	(Thousands of pounds)													Percent
Total exports	315,450	339,621	330,018	326,533	387,186	353,662	385,034	501,360	646,787	809,202	697,437	780,412	750,071	+10.7
Cotton	173,732	189,526	188,399	188,200	232,063	199,186	226,311	290,444	325,197	392,493	353,663	413,154	369,460	+8.2
Wool	12,662	10,119	8,641	9,339	8,892	7,424	12,046	33,332	33,363	25,975	21,386	15,082	13,042	+7.2
Manmade	129,056	139,976	132,978	128,994	146,231	147,052	146,677	177,584	288,227	390,734	322,388	352,176	367,569	+11.9
Total apparel	26,293	28,914	32,145	38,250	49,410	43,762	47,329	56,473	57,027	76,588	76,488	90,802	108,024	+12.0
Cotton	18,035	20,413	23,152	27,475	35,770	29,969	30,237	34,333	29,917	40,089	42,502	54,265	65,314	+9.5
Wool	861	948	1,038	1,045	1,019	993	955	1,351	2,344	3,414	2,143	2,162	2,416	+11.3
Manmade	7,397	7,553	7,955	9,730	12,621	12,800	16,137	20,789	24,766	33,085	31,843	34,375	40,294	+16.8
Knit apparel	6,361	6,662	6,628	7,261	7,550	7,723	8,696	10,949	16,016	22,028	20,935	25,735	30,883	+16.9
Cotton	2,838	2,962	2,694	2,809	2,756	2,769	2,732	3,301	5,166	7,372	7,848	11,090	14,032	+18.0
Wool	349	348	535	472	303	305	306	434	917	944	428	507	586	+5.3
Manmade	3,174	3,352	3,399	3,980	4,491	4,649	5,658	7,214	9,933	13,712	12,659	14,138	16,265	+17.1
Woven apparel	19,932	22,252	25,517	30,989	41,860	36,039	38,633	45,524	41,011	54,560	55,553	65,067	77,141	+10.5
Cotton	15,197	17,451	20,458	24,666	33,014	27,200	27,505	31,032	24,751	32,717	34,654	43,175	51,282	+8.2
Wool	512	600	503	573	716	688	649	917	1,427	2,470	1,715	1,655	1,830	+14.3
Manmade	4,223	4,201	4,556	5,750	8,130	8,151	10,479	13,575	14,833	19,373	19,184	20,237	24,029	+16.7
Total fabric	179,096	195,562	194,901	187,753	197,440	194,571	205,112	260,398	330,252	397,575	374,625	405,573	347,526	+8.2
Cotton	110,301	122,843	119,797	115,202	118,171	113,932	130,841	174,482	199,825	231,099	217,396	248,391	203,981	+7.7
Wool	804	586	550	496	395	403	469	599	1,069	924	1,294	954	878	+6.4
Manmade	67,991	72,133	74,554	72,055	78,874	80,236	73,802	85,317	129,358	165,552	155,935	156,228	142,667	+8.9
Knit fabric	7,856	7,858	8,697	8,635	10,882	13,876	11,400	12,208	15,547	21,085	18,767	23,557	16,136	+9.2
Cotton	2,397	1,987	1,788	1,824	1,684	1,695	2,131	6,024	3,362	5,695	5,453	6,376	4,620	+12.1
Wool	207	117	113	128	60	33	83	95	177	173	249	332	201	+7.7
Manmade	5,252	5,754	6,796	6,683	9,138	12,148	9,186	6,089	12,008	15,217	13,065	16,849	11,315	+8.3
Woven fabric	171,240	187,704	186,204	179,118	186,558	180,695	193,712	248,190	314,705	376,490	355,858	382,016	331,390	+8.1
Cotton	107,904	120,856	118,009	113,378	116,487	112,237	128,710	168,458	196,463	225,404	211,943	242,015	199,361	+7.6
Wool	597	469	437	368	335	370	386	504	892	751	1,045	622	677	+6.1
Manmade	62,739	66,379	67,758	65,372	69,736	68,088	64,616	79,228	117,350	150,335	142,870	139,379	131,352	+8.9

Compiled from reports of the Bureau of the Census.

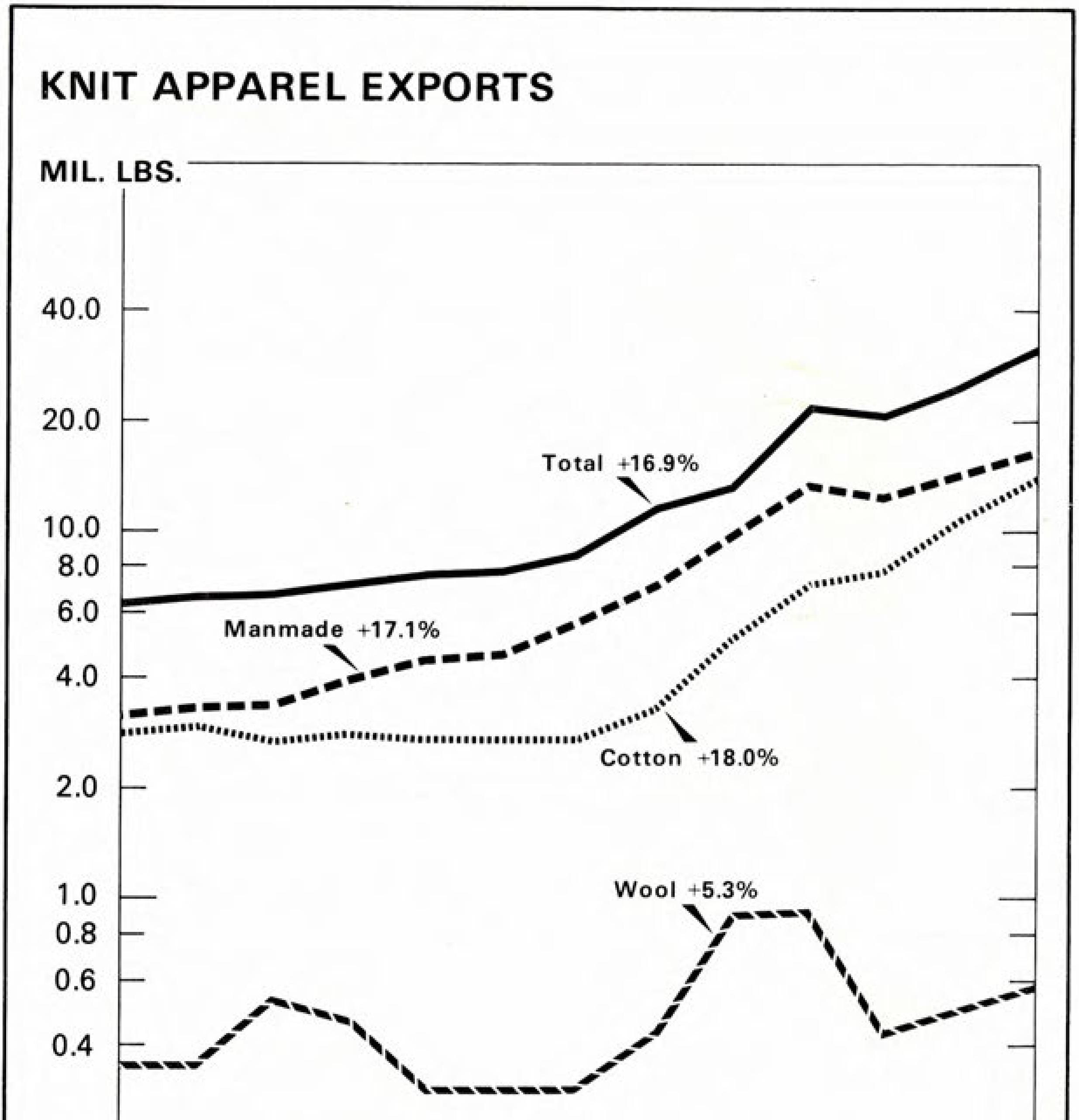
KNIT APPAREL EXPORTS
MIL. LBS.
40.0
20.0
10.0
8.0
6.0
4.0
2.0
1.0
0.8
0.6
0.4
0.2
0.1
Total +16.9%
Manmade +17.1%
Cotton +18.0%
Wool +5.3%
1965 '66 '67 '68 '69 '70 '71 '72 '73 '74 '75 '76 '77
NEG. ESCS 3093-78 (8)

Figure 9

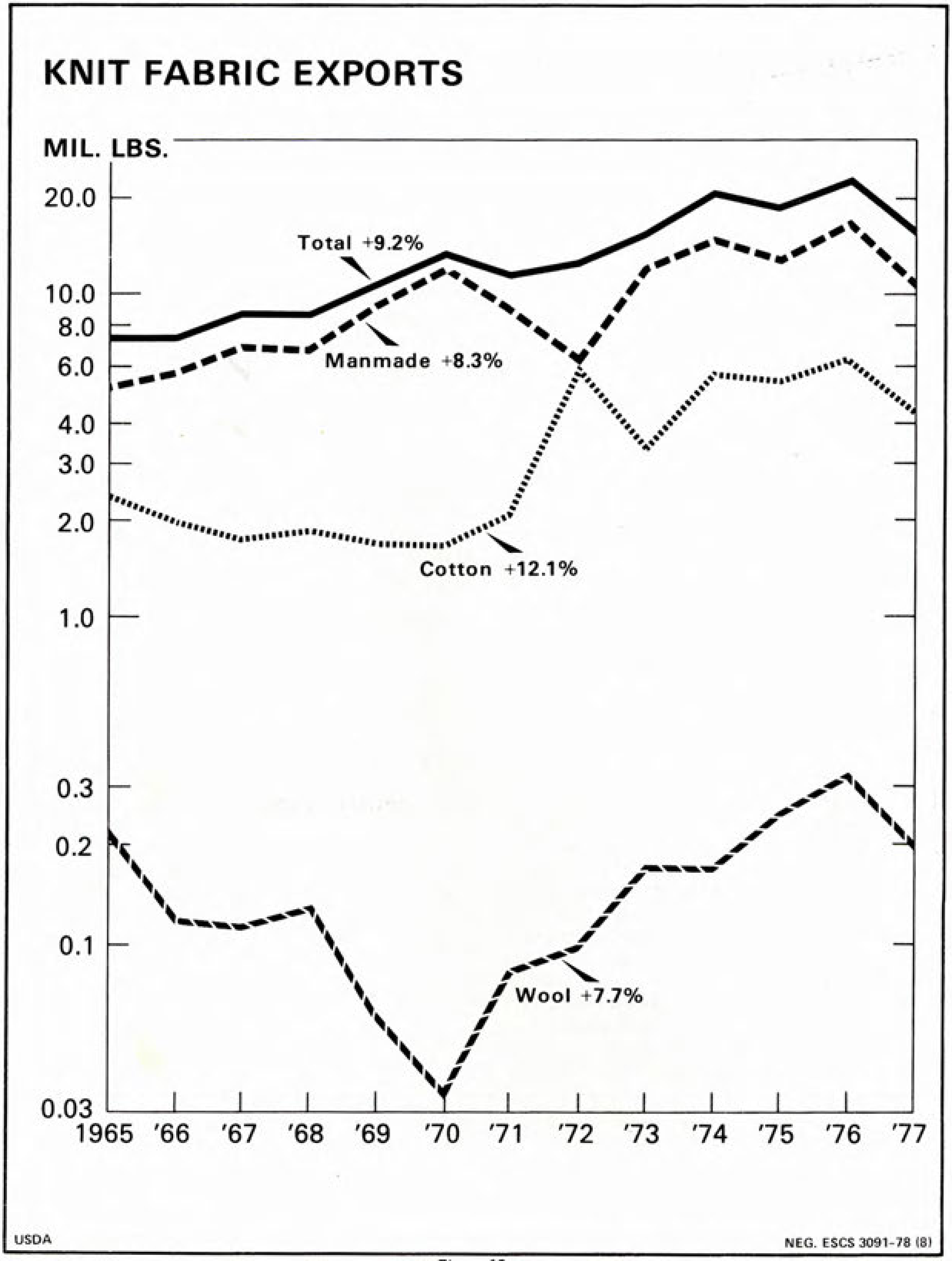
KNIT FABRIC EXPORTS
MIL. LBS.
20.0
10.0
8.0
6.0
4.0
3.0
2.0
1.0
0.3
0.2
0.1
0.03
Total +9.2%
Manmade +8.3%
Cotton +12.1%
Wool +7.7%
1965 '66 '67 '68 '69 '70 '71 '72 '73 '74 '75 '76 '77
USDA
NEG. ESCS 3091-78 (8)

Figure 10

NATIONAL IMPACTS OF REGIONAL COTTON PRODUCTION AND GINNING

by Edward H. Glade, Jr.
and Keith J. Collins[1]

ABSTRACT: An analysis of the relative effects of regional cotton production and ginning on the U.S. economy is presented. A 94-sector interindustry model for 1971 is used to estimate direct production requirements and output impacts for the Southeast, South Central, Southwest, and West regions. Regional output multipliers are also shown.

KEYWORDS: Cotton, cotton ginning, input-output, regional output multipliers.

INTRODUCTION

This article presents information detailing the regional impacts and importance of cotton production and ginning on U.S. economic activity. Input purchases and the total effects of changes in regional output of cotton and cotton ginning services are examined in terms of their ability to generate economic activity throughout all sectors of the economy. For the purpose of the study, U.S. cotton production was divided into 4 standard geographic regions—Southeast, South Central, Southwest, and West.[2]

The basic methodology involved standard interindustry or input-output models to establish the complex network of transactions and to quantify the degree of interdependence among sectors of the economy.[3] The U.S. Department of Commerce Input-Output for 1971 (the most currently available) served as the basis for the study. This table identifies 86 separate, but somewhat aggregated, sectors of the economy. Using various USDA cost of production data for 1972, and published data on regional cotton ginning costs, cotton production and ginning were "broken-out" or disaggregated on a regional basis from the broad groupings where they appeared in the Commerce I-0 table. The resulting table consisted of 94 sectors. Through the use of this information, it is possible to trace the full impact (both direct and indirect) of proposed policies and programs relating to cotton throughout the economy.

[1]Commodity Economics Division, Economics, Statistics, and Cooperatives Service, USDA.

[2]The following States are included in each region: Southeast—Alabama, Georgia, North Carolina, and South Carolina; South Central—Arkansas, Louisiana, Mississippi, Missouri, and Tennessee; Southwest—Texas and Oklahoma; West—Arizona, California, and New Mexico.

[3]For a complete discussion of input-output analysis see: William H. Miernyk, *The Elements of Input-Output Analysis*, Random House Inc., New York, 1965.

REGIONAL SCOPE OF THE COTTON INDUSTRY

Total cash receipts for cotton lint and seed represent only about 3-4 percent of all cash receipts for farm products, but because cotton production and ginning are heavily concentrated in relatively small areas of the country, cotton has an extremely heavy impact on all aspects of economic life in these areas.

Data in table 20 show the importance of the cotton industry on a regional basis during 1972, the year for which disaggregations were made. For example, over 5 million bales of cotton were produced in the South Central region with a combined

Table 20—Regional cotton production and ginning, 1972

Item	Unit	Region			
		South-east	South Central	South-west	West
Bales produced ...	Mil.	1.4	5.1	4.6	2.6
Value of production[1]	Mil. $	211.2	769.3	693.9	392.2
Number of active gins	No.	642	1,314	1,158	403
Average ginning charge per bale ..	Dol.	18.06	19.27	22.96	22.56
Ginning revenue ...	Mil. $	25.3	98.3	105.6	58.7

[1] Includes farm vlaue of cottonseed produced.

Compiled from various reports of the USDA and the Bureau of the Census.

lint and seed value of about $796 million. This volume was processed through 1,314 active gins which received ginning revenues of over $98 million. In the Southwest region, production totaled 4.6 million bales with a value of nearly $694 million, and with ginning revenues of over $105 million. However, in the Southwest, practically all activity is concentrated in one State—Texas—and impacts of actions affecting the cotton production or ginning sectors nationwide result in significant effects on local economies within the State.

DIRECT INPUT REQUIREMENTS

Since the level of production and ginning varies from region to region, so does the level of inputs purchased to support this production. However, among regions, the relative combinations of resources can vary widely, reflecting variations in costs, practices, and growing conditions.

Individual cost items for production and ginning were grouped into categories consistent with the U.S. Department of Commerce input-output delineations. Purchases of inputs such as fertilizer and pesticides by cotton producers were included under "Chemicals and chemical products." Bagging for cotton ginning was included under "Miscellaneous textile goods," and metal bale straps under "Fabricated metal products."

The direct purchases of inputs required by cotton producers and cotton gins for each $1 of output are shown in tables 21 and 22. These data compare the relative proportions of inputs used among the 4 regions for 1972. For example, in order to produce $1 worth of cotton in the Southeast region, approximately 27 cents of agricultural chemicals were required, compared with only about 9 cents in the Southwest where chemical applications were not as extensive. The West had the lowest direct requirements for most input categories and the highest value added among the producing regions. Water charges for irrigation, however, resulted in the West having the highest requirements for "utilities and sanitary services." Wages for the irrigator and all hired labor come out of value added which also includes the return to management.

The cotton ginning industry is not as highly interrelated with the intermediate sectors of the economy as is cotton production. Total purchases of inputs from intermediate markets per dollar of total ouput in cotton ginning range from about 43 cents in the West to 56 cents in the Southwest, while for cotton production, total intermediate purchases ranged from 59 to 86 cents.

Comparisons of individual ginning cost items between regions show little variation except in the western region where intermediate purchases per $1 of output are consistantly lower for most items. As gins in the West are generally larger, process more cotton per gin, and have a longer ginning season, costs per bale are usually lower than in other areas where more overcapacity exists.

While data in these tables are useful for analyzing the regional unit cost structures of cotton production and ginning, they may also be used to evaluate the direct effects or impacts of changes in the output levels of economic activity in the many other sectors of the economy. By applying the unit cost data in a particular column to alternative

Table 21—Regional cotton production direct requirements: Purchases of inputs per $1 of output, 1972

Input sector	Location of production			
	South-east	South Central	South-west	West
	Dollars			
Livestock and livestock products	0.014	0.011	0.018	0.005
Cotton	.014	.011	.019	.005
Ginning	.111	.115	.161	.122
Other agricultural, forestry, and fishery services	.051	.043	.044	.053
Stone and clay mining	.009	.002	—	—
Maintenance and repair construction	.027	.007	.012	.017
Chemicals and chemical products	.267	.142	.085	.086
Petroleum refining and related industries	.025	.019	.029	.024
Rubber and miscellaneous plastics	.006	.005	.004	.003
Other fabricated metal products	.001	.001	.001	.001
Farm machinery	.007	.006	.006	.003
Miscellaneous electrical goods	.001	.001	.001	.001
Transportation and warehousing	.017	.010	.008	.006
Communications except radio and TV	.005	.002	.004	.001
Utilities and sanitary services	(1)	(1)	.001	.031
Wholesale and retail trade	.089	.051	.039	.033
Finance and insurance	.029	.024	.020	.022
Real estate and rental	.154	.150	.187	.167
Business services	.023	.017	.029	.009
Auto repair and services	.005	.005	.004	.002
Business travel, entertainment, and gifts	.001	(1)	.001	(1)
All other sectors	.108	.004	.002	.001
Total inputs	.861	.626	.675	.592
Value added[2]	.139	.374	.325	.408
Total	1.000	1.000	1.000	1.000

[1] Less than .001. [2] Includes labor, depreciation, taxes, and profits.

Table 22—Regional cotton ginning direct requirements: Purchases of inputs per $1 of output, 1972

Input sector	Location of gins			
	South-east	South Central	South-west	West
	Dollars			
Maintenance and repair construction	0.122	0.129	0.151	0.112
Miscellaneous textile goods	.105	.111	.092	.085
Printing and publishing	.003	.002	.004	.003
Other fabricated metal products	.070	.074	.062	.056
Transportation and warehousing	.006	.007	.006	.005
Communications except radio and TV	.004	.004	.009	.005
Utilities and sanitary services	.091	.096	.098	.078
Wholesale and retail trade	.021	.022	.019	.017
Finance and insurance	.060	.064	.042	.031
Real estate and rental	.004	.004	.003	.006
Business services	.015	.016	.030	.010
Auto repair and services	.008	.009	.024	.007
Business travel, entertainment, and gifts	.004	.004	.010	.007
Office supplies	.007	.007	.007	.006
All other sectors	[1]	[1]	[1]	[1]
Total inputs	.520	.549	.557	.428
Value added[2]	.480	.451	.443	.572
Total	1.000	1.000	1.000	1.000

[1] Less than .001. [2] Includes labor, depreciation, taxes, and profits.

regional outputs, the various direct inputs required from each sector to support each output can be determined.

TOTAL REQUIREMENTS

Total requirements for cotton production and ginning are presented in tables 23 and 24. These data indicate the necessary increase in output, for each sector of the national economy, to deliver $1 of cotton production and ginning services to final demand. Total requirements consider both the direct demand for industry outputs to be used as inputs in cotton production and ginning, and the indirect demand created by these input suppliers themselves as they respond to increased cotton production and ginning activity. As in the case of direct input requirements, there is much variability in regional impacts on the national economy. For example, each $1 increase in Southeast cotton production delivered to final demand is ultimately responsible for increasing output in the chemicals industry by $.35, whereas a $1 increase in Southwest production results in only a $.12 increase. A $1 increase in ginning services in the South Central region will stimulate a $.13 increase in the utilities industry (primarily electricity), but the same $1 ginning increase in the West creates about $.11 in utilities output.

By examining total inputs demanded in the direct requirements tables, the extent to which each cotton production and ginning region depends on other producing sectors of the economy may be determined. The more dependent, as indicated by a lower value added, the greater is the effect on total economic activity of a change in regional output. The sum of the total requirements for each region, the output multiplier, in tables 23 and 24, indicates the magnitude of this effect. An alternative aggregation of total requirements of the U.S. economic sectors is presented in table 25. It compares the regional output multipliers for broad industry categories.

The industry output multipliers further illuminate regional differences. Consider, for instance,

Table 23—Regional cotton production total requirements: Total sector output required per dollar of regional production activity

Sector	Location of production			
	South-east	South Central	South-west	West
	Dollars			
Cotton	1.014	1.012	1.020	1.005
Ginning	.113	.116	.165	.123
Other agricultural, forestry, and fishery services	.054	.045	.047	.055
Crude petroleum and natural gas	.036	.024	.027	.025
Stone and clay mining	.013	.004	.002	.001
Maintenance and repair construction	.071	.045	.063	.054
Food and kindred products	.016	.010	.012	.008
Miscellaneous textile goods	.014	.015	.018	.012
Paper and allied products except containers	.014	.009	.009	.007
Printing and publishing	.017	.012	.015	.009
Chemicals and chemical products	.352	.190	.120	.118
Plastics and synthetics	.017	.012	.010	.008
Petroleum refining and related industries	.069	.045	.051	.044
Rubber and miscellaneous plastics	.014	.011	.010	.007
Primary iron and steel	.020	.013	.013	.010
Primary nonferrous metals	.015	.010	.009	.007
Other fabricated metal products	.016	.014	.016	.011
Farm machinery	.008	.007	.007	.004
Transportation and warehousing	.062	.039	.036	.031
Communications except radio and TV	.015	.009	.012	.006
Utilities and sanitary services	.043	.032	.037	.064
Wholesale and retail trade	.132	.081	.071	.058
Finance and insurance	.069	.058	.053	.049
Real estate and rent	.208	.188	.226	.199
Business services	.076	.054	.068	.039
Auto repair and services	.011	.009	.011	.006
Federal government enterprises	.007	.005	.005	.004
State and local government enterprises	.010	.008	.008	.011
Imports	.039	.024	.022	.019
Business travel, entertainment, and gifts	.013	.008	.010	.007
All other sectors	.180	.128	.143	.110
Total	2.738	2.237	2.316	2.111

Table 24—Regional cotton ginning total requirements: Total sector output required per dollar of regional ginning activity

Sector	Location of gins			
	South-east	South Central	South-west	West
	Dollars			
Coal mining	0.006	0.006	0.006	0.005
Crude petroleum and natural gas	.014	.015	.015	.012
Stone and clay mining	.002	.002	.002	.002
Maintenance and repair construction	.137	.144	.167	.125
Fabric, yarn, and thread mills	.034	.036	.030	.027
Miscellaneous textile goods	.115	.121	.100	.093
Lumber and wood products except containers	.005	.006	.006	.005
Paper and allied products except containers	.011	.011	.012	.009
Printing and publishing	.018	.018	.022	.015
Chemicals and chemical products	.022	.023	.021	.018
Plastics and synthetics	.027	.029	.025	.022
Paints	.005	.005	.006	.005
Rubber and miscellaneous plastics	.008	.008	.008	.006
Stone and clay products	.006	.006	.007	.005
Primary iron and steel	.026	.027	.026	.021
Primary nonferrous metals	.014	.015	.014	.012
Heating and metal products	.008	.008	.009	.007
Screw machine products	.003	.003	.004	.003
Other fabricated metal products	.077	.081	.070	.062
Miscellaneous manufacturing	.003	.003	.003	.003
Transportation and warehousing	.033	.035	.037	.030
Communication except radio and TV	.011	.011	.016	.010
Utilities and sanitary services	.125	.133	.135	.107
Wholesale and retail trade	.053	.056	.054	.044
Finance and insurance	.084	.089	.062	.047
Real estate and rent	.027	.028	.027	.024
Lodging and repair except auto	.003	.003	.004	.003
Business services	.044	.047	.060	.033
Auto repair and services	.011	.012	.028	.009
Federal government enterprises	.006	.006	.006	.005
State and local government enterprises	.017	.018	.019	.015
Imports	.026	.028	.026	.022
Business travel, entertainment, and gifts	.011	.012	.019	.013
Office supplies	.008	.009	.009	.007
All other sectors[1]	1.077	1.084	1.089	1.064
Total	2.077	2.138	2.144	1.890

[1] Included is the original $1 of ginning activity.

a change in the pattern of raw cotton exports. From USDA merchandising cost studies, it can be determined that from the 1972 to the 1974 seasons the share of total U.S. export value in the Southeast remained constant at zero, fell in the South Central from 27 to 23 percent, fell in the Southwest from 46 to 23 percent, and rose in the West from 27 to 54 percent. If output multipliers in table 25 are weighted by these proportions, $1 of exports under the 1974 distribution scheme would have been responsible for $2.1873 of total U.S. output, or economic activity, compared with $2.2394 for the 1972 pattern; this is a 5.21-cent decline in aggregate activity. Similarly, a change to the 1974 proportions would have reduced agricultural output by 1.55 cents, manufacturing by 1.93 cents, trade by .68 cent and services by .94 cent. This example underscores the importance of being able to analyze interregional as well as total final demand changes.

CONCLUSIONS

The level of cotton production and ginning is an important determinant of economic activity in many other sectors of the economy. Changes in output of cotton impact heavily on such sectors as chemicals, utilities, and trade. For every $1 of cotton produced in the Southeast, $2.74 of total economic activity is generated in all sectors of the economy. Comparable estimates for other regions were $2.11 in the West, $2.32 in the Southwest, and $2.24 for the South Central region. Output multipliers for cotton ginning were somewhat lower, ranging from $1.89 in the West to slightly over $2.14 in the Southwest. Moreover, while the regional aspects of output changes vary, the significance of this variation increases when national actions and policies are evaluated on a region by region basis.

Table 25—Total U.S. economic sector output multipliers for regional cotton production and ginning

Activity	U.S. economic sector				
	Agriculture	Manufacturing[1]	Trade[2]	Services	Total[3]
	Dollars				
Cotton production:					
Southeast	1.2373	0.8000	0.5321	0.0973	2.7382
South Central	1.2167	0.4946	0.4086	0.0699	2.2374
Southwest	1.2891	0.4517	0.4393	0.0878	2.3159
West	1.2211	0.3865	0.4094	0.0502	2.1111
Cotton ginning:					
Southeast	1.0122	0.5988	0.3351	0.0616	2.0765
South Central	1.0128	0.6335	0.3540	0.0654	2.1385
Southwest	1.0127	0.6226	0.3351	0.0953	2.1436
West	1.0107	0.5074	0.2629	0.0474	1.8898

[1] Manufacturing includes mining and construction. [2] Trade includes transportation, communication, electric, gas, sanitary, real estate, and rental services. [3] Sectors do not add to total because government enterprises, imports, and dummy industries are omitted.

FACTORS AFFECTING THE WHOLESALE PRICE OF COTTON BROADWOVEN FABRICS

by
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ABSTRACT: Equations to explain changes in the wholesale price index of cotton broadwoven goods were estimated for the 1966-75 period. Results show that cost and demand variables explain about 97 percent of the variation in cotton broadwoven fabric wholesale prices.
KEYWORDS: Cotton, broadwoven fabric, wholesale price index of cotton broadwoven fabric, wage rates, cotton price, capacity, imports, and regression analysis.

INTRODUCTION

In the 1971-76 period, the production of all-cotton broadwoven fabrics accounted for more than 60 percent of U.S. mill consumption of cotton. The economic factors affecting the prices of these fabrics are thus highly significant to the entire cotton textile industry. The wholesale prices of unfinished cotton broadwoven fabric provide an important basis for the textile mill's action in determining the price paid for cotton lint and the quantity of raw cotton consumed.

In this paper the factors affecting the prices of cotton broadwoven fabrics are analyzed. Semiannual data for the period, 1966-75 were used. Estimates are made of the impacts of changes in wage rates in cotton weaving mills, in raw cotton prices, and in imports of cotton broadwoven fabric on domestic wholesale prices of these fabrics.

Over the 1966-75 period, production of cotton broadwoven fabrics consistently declined due to increased consumer demand for easy care fabric blends and more stable manmade fiber supplies and prices. The shift to blends has sharply reduced the capacity of domestic textile mills to produce 100-percent cotton fabric in the short run. For example, in 1966 there were about 15 million spindles and more than ¼ million looms consuming 100-percent cotton fiber; at the end of 1975, about 8 million spindles and 130,000 looms were actively consuming 100-percent cotton. As a result of the reduced domestic capacity to produce all-cotton fabric, a surge in demand for these fabrics can only be met in the short-run by increasing machine hours and/or importing the fabric. This situation occurred when consumer demand for all-cotton fabrics picked up in late 1975 and throughout 1976. The capacity of the domestic textile industry to produce all cotton fabric is a significant—but often overlooked—factor in the interactions between production, prices, and imports of these fabrics.

The wholesale price index of 100-percent cotton broadwoven fabrics trended upward over the study period but fluctuated violently, both up and down. On a 1967=100 basis, the index averaged about 102 in 1966 and 175 in 1975. The volatility of the index is well illustrated by its movements from mid-1974 through 1975—averaging 181 in the last half of 1974, 166 in the first half of 1975, and 185 in the second half of 1975.

ANALYSIS

The price equations were formulated in terms of cost and demand/supply factors. The underlying assumption was that broadwoven fabric producers would attempt to pass through costs of production plus a mark-up. Several equations were estimated. In each equation, the cost variables were cotton fiber prices at the mill and average hourly earnings of production workers in cotton broadwoven fabric mills. Alternative demand variables were tried, with the most satisfactory one being the ratio of ending mill stocks of all-cotton broadwoven cloth to current output (or demand, since production responds to orders). This variable measures the rate of excess supply or demand in the market, and its value rises and falls with economic contractions and expansions.

During an economic downturn, inventories accumulate and producers respond by cutting production. Downward pressure is exerted on prices. Prices may be reduced further to work off inventories in an attempt to restore the desired balance between stocks and output.

During an economic expansion, inventories are drawn down, and an upward pressure is exerted on prices. The magnitude of the price increase is highly dependent upon the mill's ability to adjust production to the higher level of demand. The fact that domestic mills have sharply reduced their capacity to make 100 percent cotton cloth is likely to strengthen price increases during periods of rising demand since output adjustments must stem primarily from increases in machinery operating time. Of course, if mills are unable to make the necessary output adjustments, cotton cloth imports are likely to pick up, moderating the price increase.

RESULTS

The price equations presented below explain about 94-97 percent of the variation in the wholesale price index (1967=100) of 100-percent cotton broadwoven fabrics.

$$(1)\quad WPIC_t = \underset{(1.5)}{-16.2} + \underset{(4.9)}{0.91}\ PCT_{t-1} + \underset{(7.1)}{42.2}\ W_{t-1}$$

$$(2)\quad WPIC_t = \underset{(1.5)}{-13.9} + \underset{(2.5)}{0.55}\ PCT_{t-1} + \underset{(2.7)}{24.1}\ W_{t-1} + \underset{(2.5)}{0.47}\ WPIC_{t-1}$$

$$(3)\quad WPIC_t = \underset{(0.2)}{2.1} + \underset{(2.1)}{0.41}\ PCT_{t-1} + \underset{(2.2)}{17.6}\ W_{t-1} + \underset{(3.8)}{0.69}\ WPIC_{t-1} - \underset{(2.7)}{153.4}\ \frac{ES}{Q}$$

Where,

WPIC =average wholesale price index of cotton broadwoven fabric (unfinished), 1967=100.

PCT =average raw cotton price at Group B mill points, middling 1-1/16 inch, cents per pound.

W =average hourly earnings of production workers, cotton broadwoven fabric mills, dollars per hour.

$\frac{ES}{Q}$ =ratio of ending mill stocks of cotton broadwoven cloth to current output.

t,t-1 =current and previous 6-month period, respectively.

The values in parenthesis beneath the coefficients are "t-values" which may be used to test the statistical significance of the variables in an assumed formulation. The equations explained 94, 96, and 97 percent of the variation in the wholesale price index of cotton broadwoven fabrics, respectively. The standard deviations of the residuals (actual minus estimated values) averaged about 5 percent of the average price index.

Equations (1) and (2) do not include the excess demand or supply variable. Yet, they still explain a high percentage of the variation in the price index. At mean values (124.6 for WPIC, \$2.50/hour for W, and 38.6 cents per pound for PCT), equation (1) indicates that a 1-percent increase in wages will lead in the short-run to about a 0.84 percent increase in the price index, and that a 1-percent increase in cotton price will lead to about a 0.3 percent increase in the price index.

Equation (2) indicates that a 1-percent increase in wages or cotton price will, respectively, lead to 0.48 and 0.18 percent increases in WPIC in the short-run. Ultimately, though, the 1-percent increases in the cost variables will lead to increases of 0.90 and 0.30 percent, respectively, in the wholesale price index of cotton broadwoven fabric.

Equation (3) which includes the excess demand or supply variable, has slightly more explanatory power than the other equations. At mean data values, the equation indicates that a 1-percent increase in the average wage rate will lead eventually to a 1.1 percent increase in the price index; whereas a 1-percent increase in cotton price will lead to just a 0.4-percent increase in the price index. The effect of changes in the wage rate is definitely overstated (and probably is overstated by equations (1) and (2) also) while the effect of changes in cotton prices is possibly understated. Wage rates are highly correlated with the overall inflation rate—a correlation coefficient of 95 percent during the study period. Thus, the wage rate variable could be proxying other cost factors. It is also possible that textile firms key their price increases to wage increases since future wage rates are likely to be known with more certainty than are future cotton prices.

The coefficient on the variable, $\frac{ES}{Q}$ (ratio of stocks to output), in equation (3) indicates that as it changes by 1 percent, the wholesale price index changes by 0.2 percent in the opposite direction. The ratio varies considerably over the course of the business cycle. For example, the value of the ratio averaged about 0.09 in 1973, but climbed to about 0.19 as the recession deepened in late 1974 and early 1975.

The substitution of imports for the domestic production of 100 percent cotton broadwoven fabrics implies an increase in the value of $\frac{ES}{Q}$ and lower broadwoven fabric prices, other things equal. (Ending stocks are defined as beginning stocks plus production and imports minus shipments and exports.) In recent years imports have averaged 10 to 15 percent of domestic production of cotton broadwoven fabric. Using equation (3), it is estimated that for each 1-percent increase in the ratio of net imports to production, WPIC will fall by 0.17 percent in the short-run. A net import balance equal to 5 or 10 percent of domestic output will eventually lead to declines of 2.9 to 5.5 percent in the cotton broadwoven cloth wholesale price index, other things equal.

The above analysis indicates that if the current level of the net import balance in cotton broadwoven fabrics is maintained, the average wholesale price of these fabrics will be lower than they would be if imports equalled exports or if there were no trade in these goods. Consumers theoretically benefit from the lower prices associated with a high level of imports. On the other hand, domestic mills would tend to decrease output of all-cotton fabric in response to the lower product prices. Other research by the author indicates that at approximately current production and price levels, a 1-percent decrease in the wholesale price index (WPIC) would result in a 1.7-percent decrease in cotton broadwoven fabric production. Other things equal, lower cotton farm prices would also result in the short run.

SUMMARY

The results of this study indicate that fiber costs, wage rates, and excess supply or demand factors play signficant roles in determining the levels of cotton broadwoven fabric prices. The results are encouraging in that the equations explained most of the variation in the wholesale price index of all-cotton fabrics. However, one should regard this as a preliminary investigation of the complex factors at work in the textile industry. Additional work of a much broader scope is currently underway in the Fibers and Oils Program Area and will be completed in about a year.

CHANGING PATTERNS IN DOMESTIC SHIPMENTS OF U.S. COTTON

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ABSTRACT: Trucks transported about 47 percent of the 9.7 million bales of cotton shipped during the 1975/76 season. The remaining 53 percent was carried by the Nation's railroads. Truck shipments accounted for 27 percent of all shipments in 1961/62 and 36 percent in 1970/71. Nearly one-half of all shipments in 1975/76 went to the Southeastern mill area. U.S. ports were the next most important destination, with about 36 percent. The most significant change in transportation mode between 1970/71 and 1975/76 occurred in the South Central and Southwestern regions, where the share transported by trucks increased 15 to 17 percentage points, respectively.

KEYWORDS: Cotton, flow, transportation, distribution, trucks, railroads, cotton handling.

INTRODUCTION

The percentage of cotton shipped by trucks from warehouses to domestic mills and ports has steadily increased during recent years. Trucks were used for transporting about 47 percent of the 9.7 million bales of U.S. cotton shipped during the 1975/76 season. Rail transportation was used for the remaining 53 percent. Comparable figures from previous years indicate 27 percent of 1961/62 shipments were made by motor vehicle and about 36 percent in 1970/71 (table 14). Rail shipments accounted for 73 percent of the total in 1961/62 and 64 percent in 1970/71. This change reflects an increase in truck shipments of over 20 percentage points since 1961/62 and about 11 percentage points since 1970/71.

Truck shipments were the predominant mode in all regions except the Southwest, where only 30.3 percent of all shipments went by truck. The most significant change in transportation mode between 1970/71 and 1975/76 occurred in the South Central and Southwestern regions, where the share carried by motor trucks increased 15 and 17 percentage points, respectively. However, the amount of cotton transported in the South Central and Western regions by truck since the 1961/62 season increased by 33 and 38 percentage points, respectively.

These findings are based on a Beltwide survey of shipments from warehouses approved to store government-controlled (CCC) cotton. Data on origins, destinations, number of bales, and mode of transporation were obtained for the 1975/76 season.

REGIONAL ANALYSIS

Southeastern region intrastate shipments accounted for 54 percent of total shipments in 1975/76 while interstate shipments totaled 42 percent (table 15). The remaining 4 percent moved to either port facilities, Canada, or interior concentration points. Intrastate shipments ranged from 33 percent of total shipments in Alabama to 87 percent in North Carolina. Truck shipments within the Southeastern region decreased slightly from 65 percent in 1970/71 to 63 percent in 1975/76. However, truck shipments in 1975/76 were slightly over 8 percentage points greater than in 1961/62.

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Table 14—Shipments of cotton from producing States and regions, and U.S. totals, by mode of transportation, seasons, 1961/62, 1970/71, and 1975/76

Origin	1961/62			1970/71			1975/76		
	Total	Shipped by		Total	Shipped by		Total	Shipped by	
		Rail	Truck		Rail	Truck		Rail	Truck
	1,000 bales	*Percent*	*Percent*	*1,000 bales*	*Percent*	*Percent*	*1,000 bales*	*Percent*	*Percent*
Southeast:									
Alabama	754.1	33.9	66.1	402.7	48.4	51.6	174.5	37.0	63.0
Florida	3.0	.4	99.6	---	---	---	---	---	---
Georgia	444.0	36.5	63.5	332.0	23.5	76.5	179.5	22.7	77.3
N. Carolina	[1] 412.6	46.6	53.4	205.1	18.4	81.6	146.7	25.4	74.6
S. Carolina	640.0	63.0	37.0	303.4	42.1	57.9	327.6	49.7	50.3
Virginia	---	---	---	1.2	---	100.0	---	---	---
Total	2,253.6	45.0	55.0	1,244.3	35.2	64.8	828.1	36.8	63.2
South Central:									
Arkansas	1,347.1	78.1	21.9	1,213.5	63.1	36.9	676.0	54.7	45.3
Louisiana	488.9	85.2	14.8	563.4	70.5	29.5	315.6	46.6	53.4
Mississippi	1,147.4	67.9	32.1	1,419.4	52.5	47.5	1,127.4	38.4	61.6
Missouri	393.7	76.8	23.2	206.0	73.0	27.0	235.7	44.6	55.4
Tennessee	1,340.5	88.1	11.9	635.2	67.1	32.9	454.7	54.9	45.1
Total	4,717.5	79.1	20.9	4,037.5	61.6	38.4	2,809.4	46.4	53.6
Southwest:									
Oklahoma	331.3	82.3	17.7	197.1	91.8	8.2	201.5	73.1	26.9
Texas	4,147.9	77.1	22.9	3,466.7	86.0	14.0	3,214.7	69.5	30.5
Total	4,479.1	77.5	22.5	3,663.8	86.3	13.7	3,416.1	69.7	30.3
West:									
Arizona	763.7	63.3	36.7	608.2	24.7	75.3	820.4	29.2	70.8
California	1,711.7	86.0	14.0	1,176.3	55.2	44.8	1,701.0	45.6	54.4
New Mexico	275.1	92.9	7.1	114.9	75.3	24.7	130.9	72.1	27.9
Total	2,750.5	80.4	19.6	1,899.3	46.7	53.3	2,652.3	41.8	58.2
U.S. total	14,200.7	73.4	26.6	10,844.9	64.3	35.7	9,705.9	52.6	47.4

[1] Includes Virginia.

Truck shipments from the *South Central* region increased from 21 percent in 1961/62 to 54 percent of all shipments in 1975/76. Total shipments from the South Central region to the Southeastern mill area increased to 77 percent, compared with 75 percent in 1970/71 and 70 percent in 1961/62.

Rail shipments from the *Southwestern* region decreased from 86 percent of the total in 1970/71 to 70 percent in 1975/76. In contrast, 1961/62 shipments by this mode accounted for 77 percent of the total. Nearly one-third of the 3.4 million bales originating in the Southwestern region in 1975/76 was shipped to the Southeastern mill area; 47 percent went to Texas ports, and 6 percent to Pacific Coast ports. But no shipments originating in the Southwestern region in 1961/62 went to Pacific Coast ports, and less than 1 percent of total shipments in 1970/71 went to these facilities. Remaining shipments were to interior concentration points (7 percent), other U.S. ports, and Canada.

Shipments from the *Western* region to the Southeastern mill area increased from 38 percent of the total in 1970/71 to 42 percent in 1975/76, but were below the 1961/62 level of 45 percent. Shipments to Pacific ports also declined during the 1975/76 season. Slightly over 45 percent of all shipments from the Western region moved to California ports in 1975/76, compared with 51 percent in 1970/71 and 35 percent in 1961/62. Shipments to Texas ports increased from 2 percent of the total in 1970/71 to 3 percent in 1975/76, but were below the 6 percent shipped in 1961/62.

During the 1975/76 season, 26 percent of total U.S. shipments were to ports, compared with about 29 percent in the previous surveys. Shipments to ports in 1975/76 ranged from 1 percent of the total in the Southeastern region to 58 percent in the Southwestern region.

CONCLUSIONS

The recent change in the modes of transportation used to ship cotton to final destinations has primarily resulted from two factors: (1) more competitive truck rates and (2) the generally shorter delivery time by truck.

Table 15—Primary flow of cotton from producing states, regions, and U.S., 1975/76 season

Origin	Intrastate (excluding ports)		Interior concentration points[1]		Southeastern mill area		Ports	
	1,000 bales	*Percent*	*1,000 bales*	*Percent*	*1,000 bales*	*Percent*	*1,000 bales*	*Percent*
Southeastern region:								
Alabama	57.5	33.0	5.8	3.3	109.2	62.6	0.4	0.2
Georgia	84.8	47.2	.5	.3	84.7	47.2	5.5	3.0
North Carolina	128.2	87.4	---	---	14.7	10.0	---	---
South Carolina	175.6	53.7	5.6	1.7	135.1	41.3	5.1	1.5
Total	446.1	53.9	11.9	1.4	343.7	41.5	11.0	1.3
South Central region:								
Arkansas	34.8	5.1	59.6	8.8	500.4	74.1	39.5	5.9
Louisiana	7.7	2.4	27.2	8.6	247.8	78.6	28.6	9.1
Mississippi	37.8	3.3	66.5	5.9	866.1	76.9	114.9	10.2
Missouri	5.4	2.3	28.5	12.1	187.0	79.4	9.0	3.8
Tennessee	27.4	6.0	8.3	1.8	368.8	81.2	29.3	6.4
Total	113.1	4.0	190.1	6.8	2,170.2	77.2	221.4	7.9
Southwestern region:								
Oklahoma	---	---	8.3	4.1	93.8	46.6	97.3	48.3
Texas	188.1	5.9	33.0	1.0	1,029.2	32.1	1,877.9	58.3
Total	188.1	5.5	41.3	1.2	1,122.9	32.9	1,975.2	57.8
Western region:								
Arizona	---	---	24.3	3.0	258.9	31.5	510.5	62.2
California	10.3	.6	152.7	9.0	776.0	45.6	741.2	43.6
New Mexico	---	---	36.4	27.8	66.7	51.0	23.6	18.0
Total	10.3	.4	213.5	8.0	1,101.6	41.6	1,275.3	48.1
U.S. total	757.5	7.8	456.7	4.7	4,738.3	48.8	3,482.9	35.9

Origin	New England, Eastern and Midwestern States		Canada		Other[2]		Total	
	1,000 bales	*Percent*	*1,000 bales*	*Percent*	*1,000 bales*	*Percent*	*1,000 bales*	*Percent*
Southeastern region:								
Alabama	---	---	---	---	1.5	0.9	174.5	100.0
Georgia	.6	.4	---	---	3.4	1.9	179.5	100.0
North Carolina	---	---	---	---	3.8	2.6	146.7	100.0
South Carolina	2.0	.6	---	---	4.1	1.2	327.6	100.0
Total	2.7	.3	---	---	12.8	1.6	828.1	100.0
South Central region								
Arkansas	.1	([3])	36.1	5.3	5.5	.8	676.0	100.0
Louisiana	.2	.1	3.6	1.1	.4	.1	315.6	100.0
Mississippi	3.8	.3	8.1	.7	30.3	2.7	1,127.4	100.0
Missouri	---	---	1.7	.7	4.0	1.7	235.7	100.0
Tennessee	1.9	.4	14.6	3.2	4.3	1.0	454.7	100.0
Total	6.0	.2	64.1	2.3	44.6	1.6	2,809.4	100.0
Southwestern region:								
Oklahoma	.4	.2	1.6	.8	---	---	201.5	100.0
Texas	18.5	.6	30.6	.9	37.5	1.2	3,214.7	100.0
Total	18.9	.6	32.3	.9	37.5	1.1	3,416.1	100.0
Western region:								
Arizona	.5	.1	8.8	1.1	17.4	2.1	820.4	100.0
California	.1	([3])	11.0	.6	9.7	.6	1,701.0	100.0
New Mexico	---	---	---	---	4.2	3.2	130.9	100.0
Total	.5	([3])	19.9	.7	31.3	1.2	2,652.3	100.0
U.S. total	28.1	.3	116.2	1.2	126.1	1.3	9,705.9	100.0

[1] Nonconsuming establishments from which cotton is reshipped to final destinations. [2] Minor destinations and destinations designated as "other" by shipping warehouse. [3] Less than 0.05 percent.

The present competitive advantage of trucks is readily seen in an examination of transportation rates. For example, consider the following rates for transporting cotton to Eastern Carolina (Group 200 mill areas):

Origin	Truck	Rail
	Dollars per bale	
Memphis.	6.00	7.70
Lubbock	9.00	10.75
California	13.05	17.05

Additionally, a shorter delivery time from warehouse to mill can result in a lower financing cost to the cotton merchant. This has become especially important in recent years as merchants have experienced increasing interest rates. Other factors that have contributed to the decline in rail usage include the shortage of boxcars when needed, the steady deterioration of some rail lines, and the abandonment of rail systems in some areas.

However, the transit privilege of the Nation's railroads is an important element to merchants when they select their transportation mode. This privilege allows merchants to consolidate cotton at intermediate warehouses. Transportation charges for consolidating cotton are based on the most direct route from original origin to final destination. Therefore, this practice offers an important competitive advantage for railroads. Additionally, containerized shipments are increasing and, in fact, have become quite popular in some areas. Rates for such shipments are lower than for conventional rail shipments and offer reductions in the total marketing bill through less damage and pilferage during transit, a lower insurance cost, and a lower handling cost.

Although recent trends have favored truck transportation, the present energy shortage and associated increased operating costs of trucks may result in a somewhat slower shift in this direction. Moreover, this energy problem could result in a reversal of recent trends as motor transportation companies are forced to increase rates to offset rising costs.

REGIONAL U.S. COTTON ACREAGE RESPONSE

by
Sam Evans

ABSTRACT: This paper analyzes the economic and institutional factors affecting the planted acreage of upland cotton. Data over the 1959 to 1976 cotton crop years were used to estimate a U.S. upland cotton acreage response equation. Equations for the four major producing regions were also estimated. The equations were used to analyze the factors responsible for the sharply higher cotton plantings in 1977.

KEYWORDS: Upland cotton, acreage response equation, regions, opportunity and variable costs, prices, policy, and least squares.

INTRODUCTION

U.S. acreage of upland cotton has fluctuated widely since the 1974 crop year. In order, the year-to-year changes have been: -30 percent, +24 percent, and +14 percent. The fluctuations have resulted mainly from economic factors, principally from changes in the costs and returns from cotton production relative to those from competing crops such as soybeans and sorghum. Also, the acreages of cotton and other crops under the Agriculture Consumer and Protection Act of 1973 are not as tightly controlled by Government programs as they once were.

Prior to the 1974 crop year, cotton acreage was heavily influenced by Government programs; in fact, during the 1960's, changes in the programs were primarily responsible for yearly variations in cotton acreage. With the removal of marketing quotas for the 1971 and subsequent crops, cotton producers became more responsive to market prices, although the direct payment provisions of the 1971-73 programs tended to moderate this response. With the adoption of the target price programs in 1974 and with market prices above target prices, cotton producers are now almost wholly responsive to market conditions.

The purpose of this paper is to estimate the effects of changes in the economic and policy variables on upland cotton planted acreage. The acreage response equations are used to explain the reasons for the sharply higher cotton acreage planted in 1977.

Policy Variables

The national acreage response equation and each regional equation contains three policy variables: (1) allotment acreages, (2) a diversion payment variable, and (3) a direct payment variable. Details of the calculations of these variables are available from the author.

The allotment set an upper limit on acreage during the years in which marketing quotas were in effect (1959-70 in this study). However, since 1971, the allotment has served chiefly as a payment base rather than as an upper limit on acreage. Two approaches were tried to extend the allotment variable over the remaining years of the study. These were to (1) assume an upper limit on total cotton acreage of 14 million acres and (2) to use lagged acreages as a proxy for the upper limit. Better results were obtained by using the latter method, and those results are reported in this study.

The direct and diversion payments vary directly with the amount of the payments per pound and the acreage eligible for payments. Other things equal, cotton acreage would be expected to vary inversely with respect to diversion payments and positively with respect to direct payments. The equations were first estimated with direct payments as a separate variable, but due to the closeness of the coefficients on this variable and on the cotton price variable, the equations were reestimated with price and direct payments combined.

Economic Variables

The economic variables considered were: Average farm prices of cotton and competing crops in the first 4 months of the calendar year, expected yields, and expected direct production costs. Equations were estimated assuming farmers expected yields to equal either the average of the previous 3-year or 5-year period. Similar results were obtained except that for the past 3 years, the equation based on the 3-year average yields worked better and is reported in this study.

The farm price of cotton was treated as a separate variable, but the remaining economic factors were lumped together into a variable defined as the sum of the average variable and opportunity costs of producing cotton, denoted as AVOC. This variable was constructed as follows for each region:

$$(1) \quad AVOC = \frac{(P)\ (Y) - VC + VCC}{YC}$$

where

AVOC = Average variable and opportunity costs of producing cotton, dollars per pound

P = expected farm price of a competing crop, dollars per bushel

Y = expected yield of a competing crop, bushels per acre

VC = variable costs of a competing crop, dollars per acre

VCC = variable costs of cotton less ginning costs, dollars per acre

YC = expected yield of cotton, pounds per acre

A national AVOC was computed for each year by weighting each regional measure by the proportion of total upland cotton acreage planted in the region the previous year.

Using the economic and policy variables discussed above, a U.S. and four regional acreage response equations were estimated by ordinary least squares.

RESULTS

U.S. Equation

The U.S. upland cotton acreage response equation was estimated to be:

$$(2) \quad \text{A-US} = \underset{(2.3)}{4{,}565} + \underset{(8.0)}{0.608}\,(\text{AL-US}) + \underset{(5.4)}{225}\,(\text{PCT-US}) - \underset{(5.5)}{236}\,(\text{AVOC-US}) - \underset{(8.7)}{1950}\,(\text{DIV-US})$$

where:

A-US = planted acres of upland cotton, thousands of acres

AL-US = national allotment of upland cotton for 1959-70; lagged acreage, thereafter, in thousands

PC-US = expected farm price of upland cotton, cents per pound (weighted direct payments added in 1966-1973 crop years)

AVOC-US = average variable and opportunity costs of producing cotton, cents per pound

DIV-US = weighted diversion payment, 1964-1968 crop years, cents per pound

The estimated coefficients were highly significant as indicated by the "t-values" in parentheses under the coefficients, and all the signs were correct. The equation explained about 93 percent of the variation in planted acreage during the 1959-76 period. It is also interesting to note that the coefficients on PC and AVOC are nearly equal and have opposite signs, as theoretically expected.

The equation indicates that a 10-cent-per-pound change in the expected farm price of cotton will prompt a 2¼ million change in planted acreage. This implies a price elasticity of about 1.0 at 1976 price and acreage levels. The equation can be also used to evaluate the effects of direct payments, diversion payments, deficiency payments under the target price program, and the effects of changes in any component of the variable, AVOC. These detailed effects will not be reported in this article, however.

Regional Equations

The variables in the regional equations are defined as those in the U.S. equation and similar interpretations can be made of the results. These equations are:

DELTA:

$$(3)\ A\text{-}D = \underset{(1.3)}{1{,}251} + \underset{(4.0)}{0.565}\,(AL\text{-}D) + \underset{(4.6)}{112}\,(PC\text{-}D) - \underset{(5.0)}{116}\,(AVOC\text{-}D) - \underset{(6.1)}{719}\,(DIV\text{-}D)$$

where:

AVOC is based on soybean prices

and $R^2 = 0.80$.

SOUTHEAST:

$$(4)\ A\text{-}SE = \underset{(0.7)}{483} + \underset{(7.6)}{0.716}\,(AL\text{-}SE) + \underset{(3.0)}{34}\,(PC\text{-}SE) - \underset{(2.8)}{35}\,(AVOC\text{-}SE) - \underset{(5.6)}{366}\,(DIV\text{-}SE)$$

where AVOC is based on soybean and corn prices,

and $R^2 = 0.93$.

SOUTHWEST:

$$(5)\ A\text{-}SW = \underset{(3.3)}{2{,}632} + \underset{(7.9)}{0.562}\,(AL\text{-}SW) + \underset{(2.6)}{42}\,(PC\text{-}SW) - \underset{(3.4)}{45}\,(AVOC\text{-}SW) - \underset{(9.6)}{857}\,(DIV\text{-}SW)$$

where AVOC is based on sorghum prices

and $R^2 = 0.94$.

WEST:

$$(6)\ A\text{-}W = \underset{(5.0)}{577} + \underset{(7.1)}{0.525}\,(AL\text{-}W) + \underset{(7.6)}{24}\,(PC\text{-}W) - \underset{(5.2)}{29}\,(AVOC\text{-}W) - \underset{(6.7)}{146}\,(DIV\text{-}W)$$

where AVOC is based on barley prices

and $R^2 = 0.94$.

Figure 6 shows the actual versus estimated values for each of the equations.

Analysis of 1977 Cotton Acreage

Figure 7 shows the estimated cotton acreage response function under 1976 and 1977 economic conditions. The bend in the response curve results from the fact that under the target price program, farmers are more responsive to price changes at prices above the target price. The curve shifted leftward in 1977 due to the sharp increase in soybean farm prices and low cotton yields again in 1976. However, cotton prices are nearly 15 cents per pound higher, averaging about 66 cents during January-April. This price intersects the curve at about 13.3 million acres. The June acreage survey indicated that about 13.3 million acres were planted this spring.

Values of AVOC and average cotton farm prices for 1976 and 1977 are as follows:

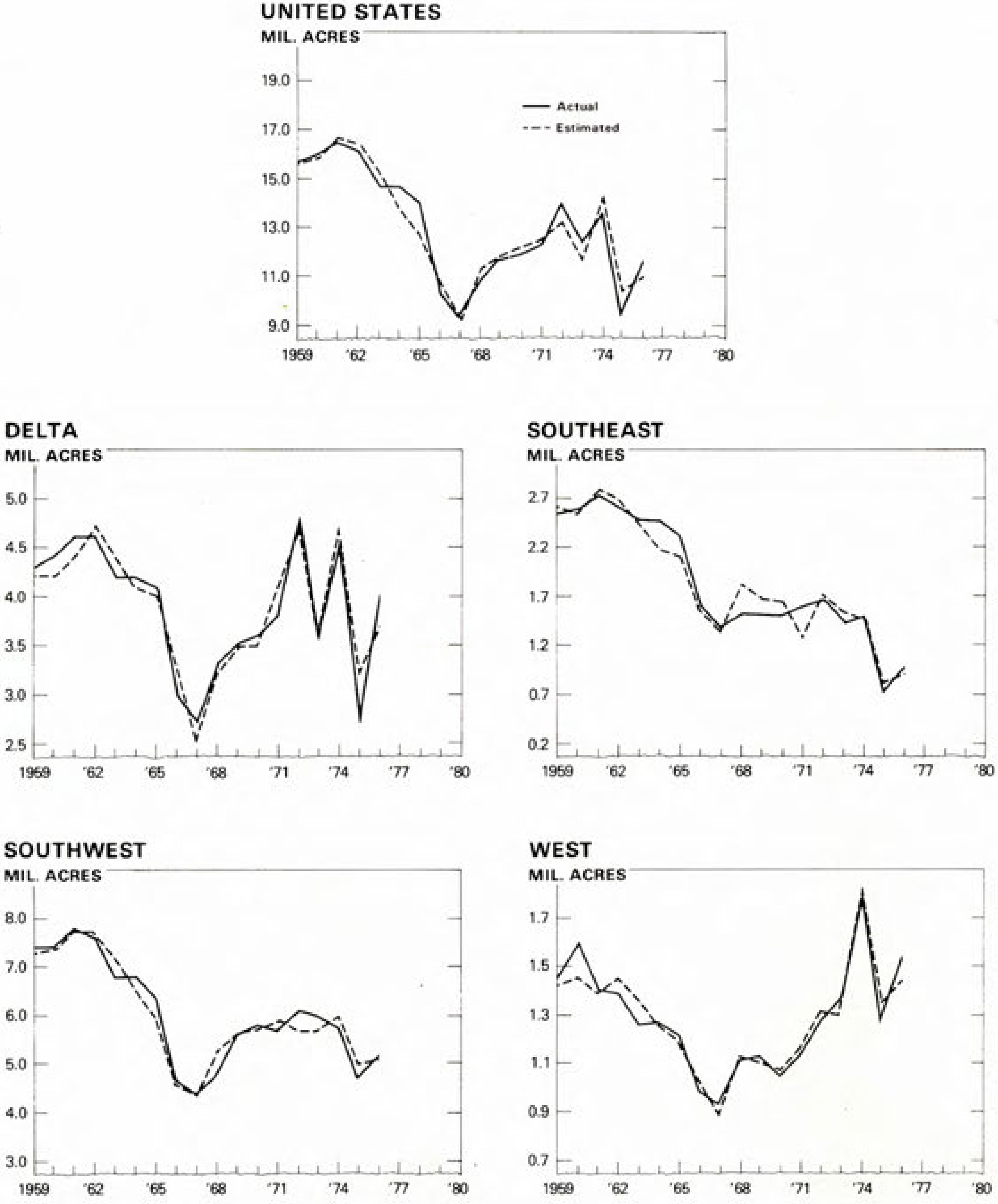
Region	AVOC, cents per pound		Cotton price, cents per pound	
	1976	1977	1976	1977
Delta	46.5	71.9	53.6	67.7
Southeast	58.2	70.7	55.6	67.9
Southwest	46.7	46.2	45.2	63.9
West	38.6	34.7	55.7	70.0
United States	46.4	55.5	51.0	65.7

The data suggest that, compared with 1976, cotton has become much more profitable in the West and Southwest, that cotton has become much less profitable in the Delta, and that cotton's relative profitability in the Southeast was unchanged. The June 30 acreage report confirms these findings. The equation estimates compared with the June survey are as follows:

Equation	Equation estimate	June survey
Region	*1,000 acres*	*1,000 acres*
Delta	2,743	3,686
Southeast	1,024	975
Southwest	6,148	6,690
West	2,067	1,931
United States	13,325	13,282

The U.S. equation estimate slightly exceeded the June acreages report (estimate by equation (2) not the sum of the regional estimates). But the Delta and Southwest regional equations estimated on the low side, although the Southwest equation does estimate a sharp increase in 1977. All in all, the analysis pinpoints the reasons for the sharp rise in cotton planted acreage as (1) a nearly 15-cent-per pound increase in cotton farm prices which gave cotton a big advantage outside the soybean growing area of the Cotton Belt and which nearly offset the sharp increase in average soybean farm prices of more than \$3.00 per bushel, and (2) a drop in average sorghum farm prices in the Southwest of about 30 cents per bushel from 1976. In fact, the June survey showed a decrease in sorghum plantings in Texas of 1.2 million acres which nearly matched a 1.4 million increase in cotton acreage.

COTTON: ACREAGE, ACTUAL AND ESTIMATED



USDA NEG. ERS 2818-77 (6)

Figure 6

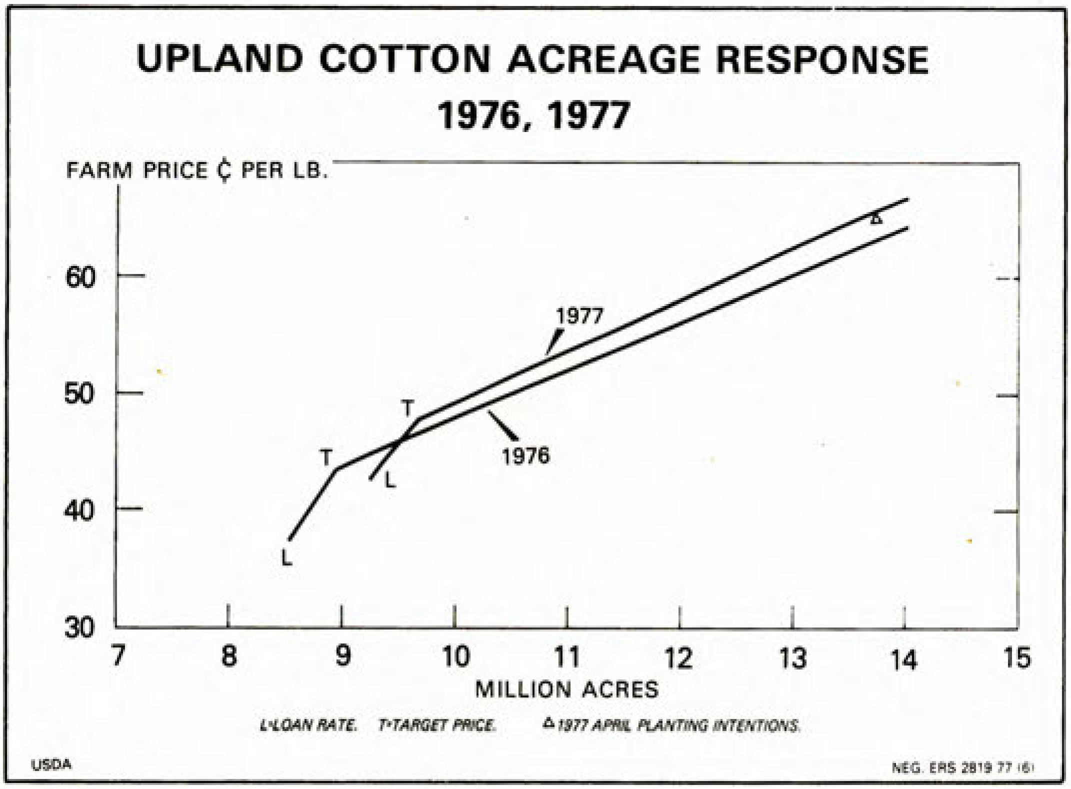

UPLAND COTTON ACREAGE RESPONSE
1976, 1977
FARM PRICE ¢ PER LB.
60
50
40
30
7
8
9
10
11
12
13
14
15
MILLION ACRES
1977
1976
T
T
L
L
L=LOAN RATE. T=TARGET PRICE. Δ 1977 APRIL PLANTING INTENTIONS.
USDA
NEG. ERS 2819 77 (6)

Figure 7

CHANGES IN THE U.S. COTTON GINNING INDUSTRY

by
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ABSTRACT: An analysis of changes in the number and size of cotton gins during 1973-75 is presented. Data for the ginning industry have been specially aggregated for 37 cotton production areas across the Belt. Total hourly capacities and potential seasonal volumes are also shown.

KEYWORDS: Cotton, ginning, location, capacities.

INTRODUCTION

With the declining trend in cotton production over the past 3 decades, the number of active U.S. cotton gins has also fallen and is currently less than one-half the number of gins operating in 1946. Both remodeling and new gin construction have been greatly curtailed as well. However, the remaining gins processed nearly as much cotton in 1975 as in 1964, largely due to the development in the middle 1950's of the high-capacity gin stand. Until then, gin stands could only gin from 1 to 2 bales per hour depending on equipment size. But, with the development of the high-capacity gin stand, ginning rates increased 300 to 500 percent or more.

NUMBER, LOCATION, AND SIZE OF GINS

For this study, the Cotton Belt was divided into 37 production areas, reflecting variations in U.S. cotton production practices and resource availabilities (figure 12). These areas cut across traditional regional and state boundries and, in some instances, county lines. The information presented in this article on the number and capacities of cotton gins is the first time such data have been summarized and reported for detailed production areas.

There were a total of 3,533 active gins reported in 1973 (table 14). By 1974 the number had declined to 3,388, and the decline continued into 1975, when there were only 3,320 active gins.

The number of gins with a 6-bale or less per hour capacity show the sharpest decline. These gins tend to be older facilities with low annual volumes. From 1973 to 1975 the total number of active gins in this capacity group declined over 16 percent from 475 to 398. Gins with hourly capacities of from 6.1 to 8 bales decreased nearly 10 percent over the same period, declining from 1,103 to 998. Gins with capacities of from 8.1 to 15 bales per hour declined by about 3 percent. However, those with hourly capacities of from 15.1 to 20 bales per hour, and those with 20.1 and over, actually increased moderately. This increase indicates, in part, that as gin numbers declined in some areas, larger, more efficient, and high capacity gins have been erected which are capable of processing the combined volume of several older gins.

Data for specific production areas in 1975 show that most of these larger gins are concentrated in the Far West. Over 99 percent of all gins in the San Joaquin 1 area have rated capacities of 8.1 bales per hour or higher. Slightly over 84 percent are rated from 8.1 to 15 bales per hour, 4.4 percent from 15.5 to 20 bales per hour, and about 10 percent 20.1 or more bales per hour.

Nearly 28 percent of all U.S. gins in 1975 were concentrated in only 5 areas. About 7 percent are located in the East Delta area, 5.5 percent in the North Delta, 5 percent in the Tennessee Brown Loam area, about 5 percent in the San Joaquin 1 area, and about 5 percent located in the Blackland area. The distribution of gins among the remaining 32 areas was fairly uniform, ranging from about 2.0 to 4.0 percent of the total.

Figure 12

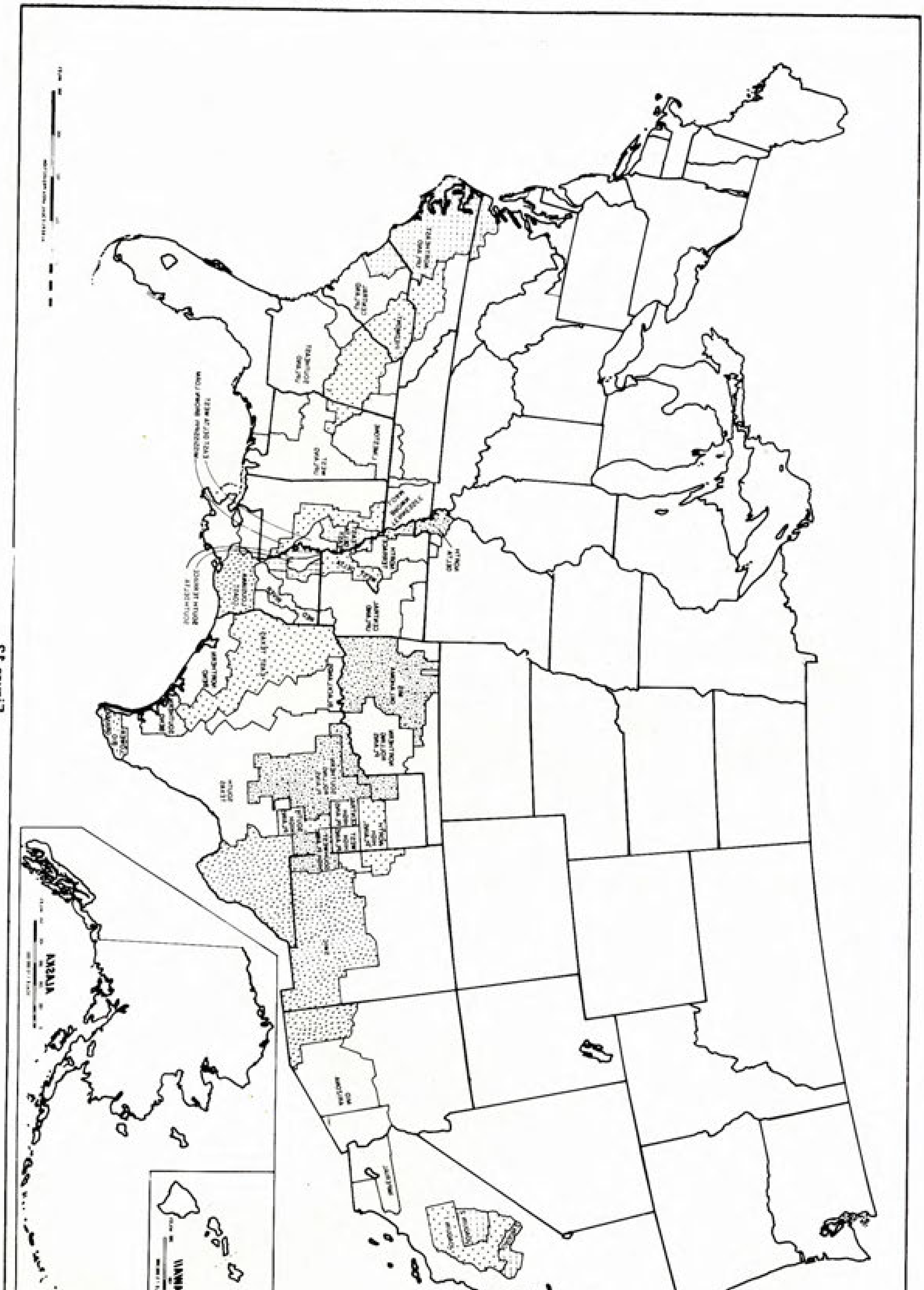

Table 14—Number and percent of gins by hourly ginning capacity of gins in operation, by area and United States, 1973, 1974, 1975

Area	Bale capacity per hour																	
	6 or less			6.1-8			8.1-15			15.1-20			20.1 and greater			Total gins-all capacities		
	1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975
	Number of gins																	
Blacklands	12	9	8	84	83	80	69	69	65	1	1	1	0	0	0	166	162	154
Central High Plains	0	0	0	17	16	16	91	89	88	14	14	14	15	15	15	137	134	133
Central Upland	34	31	23	51	49	46	45	45	44	4	4	4	1	1	1	135	130	118
Central Upland-M	3	3	3	4	4	4	0	0	0	0	0	0	0	0	0	7	7	7
East Delta East	34	33	30	65	63	60	63	63	63	41	41	41	22	23	24	225	223	218
East Delta West	8	8	8	17	16	17	63	63	63	41	41	41	22	23	24	151	151	153
East Texas	1	0	0	9	5	5	17	16	14	1	1	1	1	1	1	29	23	21
Imperial	0	0	0	4	4	4	12	13	16	4	6	6	3	3	3	23	26	29
San Joaquin 1	1	1	1	0	0	0	135	135	137	7	7	7	15	15	17	158	158	162
San Joaquin 2	0	0	0	1	1	1	47	47	46	5	5	6	8	8	8	61	61	61
Louisiana Coast	0	0	0	14	13	10	0	0	0	0	0	0	0	0	0	14	13	10
Limestone	16	16	16	77	66	62	43	42	42	6	6	6	2	2	2	144	132	128
Mississippi Brown Loam	11	11	11	44	38	39	26	23	25	6	6	6	2	2	2	89	80	83
Mid. Arizona	13	13	12	9	9	9	63	62	66	4	4	4	3	3	4	92	91	95
Mis. Okla.	6	6	6	6	6	6	1	1	0	0	0	0	0	0	0	13	13	12
North High Plains	1	1	1	9	9	9	29	28	26	4	4	4	3	3	3	46	45	43
Northern Rolling Plains	8	8	8	44	44	45	59	59	59	12	12	12	7	7	7	130	130	131
North Terrace	46	38	36	77	71	69	53	50	51	2	2	2	7	7	7	185	168	165
Northern Upland	33	26	26	29	26	22	18	18	18	1	1	1	1	1	1	82	72	68
Northern Bend	3	1	1	29	28	21	25	23	13	1	1	0	2	2	2	60	55	37
North Delta	24	21	21	86	71	77	74	72	73	9	9	9	2	2	2	195	175	182
Piedmont	46	38	30	41	35	34	7	7	7	1	1	1	0	0	0	95	81	72
Red River	8	7	7	18	15	15	20	19	20	3	3	3	0	0	0	49	44	45
Lower Rio Grande	0	0	0	4	4	4	63	60	59	1	1	1	8	10	10	76	75	74
South High Plains	1	1	1	9	9	7	49	50	42	17	17	16	8	8	7	84	85	73
Southern Rolling Plains	0	0	0	35	35	33	86	87	84	10	10	10	5	5	5	136	137	132
South Terrace	1	1	1	16	16	16	11	11	11	8	8	8	2	2	2	38	38	38
Southeast Upland	10	9	10	42	37	38	36	35	35	2	2	2	4	4	4	94	87	89
Southern Bend	3	3	3	7	6	7	17	17	18	8	8	9	8	8	8	43	42	45
South Delta	1	1	1	4	3	3	29	27	28	3	3	3	2	2	2	39	36	37
South Texas	0	0	0	6	3	3	8	7	8	0	0	0	1	1	1	15	11	12
Southwest High Plains	0	0	0	9	9	9	40	40	39	7	8	9	4	5	6	60	62	63
SWIC	17	16	18	18	20	20	45	45	43	2	2	2	3	3	3	85	86	86
Tenn. Brown Loam	58	55	50	75	72	71	37	36	37	4	3	4	3	3	3	177	169	165
West High Plains	1	1	1	25	25	23	67	66	63	10	10	10	6	7	7	109	109	104
West Delta	32	28	28	44	42	42	35	35	35	5	5	5	6	6	6	122	116	116
West Upland	43	38	37	74	71	71	48	48	47	4	4	4	0	0	0	169	161	159
Total (Number)	475	424	398	1,103	1,024	998	1,531	1,508	1,485	248	250	252	176	182	187	3,533	3,388	3,320
Percent in each size class	13.5	12.5	12.0	31.2	30.2	30.1	43.3	44.5	44.7	7.0	7.4	7.6	5.0	5.4	5.6	100.0	100.0	100.0

Compiled from data obtained by the Cotton Division, Agricultural Marketing Service.

HOURLY GINNING CAPACITY AND POTENTIAL GINNING VOLUME

Hourly ginning capacity and potential ginning volume by area are shown in table 15 for 1973, 1974, and 1975. Hourly ginning capacity and potential volume have trended slightly downward since 1973. Total hourly capacity of all gins combined ranged from 44.9 bales per hour in the Central Upland area to 2,653.4 bales in the East Delta area during 1973. Comparable figures for the same two areas were 40.0 and 2,625.1 in 1974, and 44.9 and 2,626.4 in 1975. As shown in table 15, 15 areas had hourly ginning capacities of over 1,000 bales in 1973 and 1974, and 13 in 1975.

It is generally accepted in the industry that operating at 85 percent of the manufacturers' rated capacity is a realistic maximum as time is required for cleanup and preventive maintenance measures. Also, actual operation of about 906 hours per year, per gin, constitutes about the normal time required for seasonal operation. The last three columns in table 15 show the potential volume of cotton which could be processed when operating at this rate.

Total potential volumes were fairly constant at 24.9, 24.3, and 24.0 million bales in 1973, 1974, and 1975, respectively. However, these potential volumes were more than double the actual number of bales which were ginned during these three crop years.

While there does not appear to be any large amount of excess capacity in those areas located in the western part of the Cotton Belt, the excessive capacity existing in many other areas has resulted in poor use of all gin plants. For example, gins in the East Delta processed only 42.5 percent of their potential volumes in 1974 and those gins in the South Delta and East Delta West regions 54.4 and 51.7 percent, respectively.

SOME FUTURE TRENDS IN THE COTTON GINNING INDUSTRY

The high cost of constructing and operating today's cotton gins requires a continuing and reasonable volume of cotton to enable gins to most economically provide the services demanded of them. As evidenced by the vast amount of unused ginning capacity in most areas, these volume criteria are not being met. Moreover, the decreasing trend in gin numbers may continue as increasing costs and declining volumes restrict ginning revenues.

The trend toward central ginning will doubtlessly further decrease the number of firms in the ginning industry in some areas. Regional shifts in production will also have a significant impact on the size, efficiency, and importance of the ginning industry in some areas as it already has in those areas located in the southeastern part of the Cotton Belt.

Moreover, many small, low volume, marginal gins faced with excessive capital expenditures required to meet current and proposed Federal-State dust and safety regulations may not be able to remain profitable. Unquestionably this situation will have a significant effect on the U.S. ginning industry.

Table 15—Total hourly ginning capacity and potential ginning volume of gins in operation by area and United States, 1973, 1974, 1975

Area	Total hourly ginning capacity[1]			Potential ginning volume at 85% of hourly capacity[2]		
	1973	1974	1975	1973	1974	1975
	Bales					
Blacklands	1,366.0	1,351.5	1,298.0	1,051,956	1,040,813	999,590
Central High Plains	1,642.1	1,625.1	1,616.6	1,264,595	1,251,458	1,244,935
Central Upland	1,160.0	1,093.1	1,042.8	893,316	841,765	803,078
Central Upland-M	44.9	40.0	44.9	34,609	30,804	34,609
East Delta East	2,653.4	2,625.1	2,626.4	2,043,392	2,021,558	2,022,554
East Delta West	776.4	709.1	800.5	597,869	546,046	616,442
East Texas	296.3	260.9	242.4	228,221	200,950	186,636
Imperial	390.2	433.5	460.9	300,520	333,861	354,970
San Joaquin 1	1,674.5	1,700.0	1,738.9	1,289,510	1,309,170	1,339,159
San Joaquin 2	739.4	739.4	746.0	569,421	569,421	574,946
Louisiana Coast	126.2	119.1	89.7	97,213	91,687	69,037
Limestone	1,230.9	1,150.8	1,112.7	947,948	886,249	856,894
Mississippi Brown Loam	797.4	733.9	763.1	614,086	565,163	587,632
Mid. Ariz.	900.2	891.7	947.5	693,271	686,657	729,692
Mis. Okla.	81.8	81.8	73.2	62,967	62,967	56,353
North High Plains	485.1	476.6	456.7	373,544	367,020	351,709
Northern Rolling Plains	1,315.6	1,315.6	1,322.3	1,013,089	1,013,089	1,018,344
North Terrace	1,554.6	1,492.5	1,486.3	1,197,188	1,149,352	1,144,640
Northern Upland	535.2	461.8	522.4	412,139	355,605	402,264
Northern Bend	542.6	496.9	355.7	417,847	382,694	273,884
North Delta	1,760.9	1,623.5	1,688.6	1,356,100	1,250,280	1,300,382
Piedmont	554.8	537.7	419.7	472,270	414,042	323,170
Red River	428.7	392.8	401.5	330,146	302,513	309,218
Lower Rio Grande	860.2	872.6	881.9	662,467	671,980	679,138
South High Plains	1,032.8	1,042.3	904.2	795,377	802,716	696,352
Southern Rolling Plains	1,016.9	1,019.6	979.0	783,146	785,230	753,973
South Terrace	336.5	336.5	336.5	259,116	259,116	259,116
Southeast Upland	907.8	866.0	869.0	699,070	666,907	669,262
Southern Bend	438.5	407.5	421.4	337,666	313,838	324,529
South Delta	599.2	592.4	627.2	461,426	456,171	482,989
South Texas	131.5	101.2	109.6	101,290	77,916	84,439
Southwest High Plains	696.7	737.0	760.9	536,533	567,609	586,000
SWIC	577.5	598.0	570.8	417,265	460,520	439,591
Tenn. Brown Loam	1,382.3	1,333.3	1,318.0	1,064,550	1,026,951	1,014,992
West High Plains	1,040.0	1,053.8	1,008.7	800,904	811,504	776,804
West Delta	1,135.3	1,106.4	1,099.6	874,290	852,002	846,838
West Upland	1,128.9	1,089.9	1,069.7	869,397	839,318	823,735
Total all areas	32,341.3	31,508.9	31,213.3	24,906,031	24,265,035	24,037,358
Average	874.1	851.6	843.6	673,158	655,853	649,693

[1] Rated capacity of all gins actually operating during each year. [2] Gins operating at 85% of rated capacity for 906 hours per season.

Compiled from data obtained by the Cotton Division, Agricultural Marketing Service.

COMPETITION BETWEEN COTTON AND OTHER CROPS IN MAJOR PRODUCING REGIONS

by R. Samuel Evans, Jr
and Preston E. LaFerney[1]

ABSTRACT: A technique is presented to calculate the prices of cotton required to equal returns above-variable costs from competing crops in the 4 major producing regions. The breakeven prices are compared to expected cotton prices to determine the direction and approximate magnitude of cotton acreage adjustments in the regions.

KEYWORDS: Break-even prices, variable costs, acreage response, region.

INTRODUCTION

Each spring, farmers across the Cotton Belt must decide the acreage to be seeded to cotton and other crops such as soybeans, corn, and sorghum. These decisions are based on the individual's expected prices, costs, and yields of cotton and the alternative crops. Those producers who are able to adjust to changing economic conditions (and are aware of the needed adjustments) will increase net returns per acre.

"Rules of thumb" are often applied by farmers making production decisions. It is commonly stated that the break-even price ratio between soybeans and corn is 2.5 to 1, and that for soybeans and cotton is about 10 to 1. These statements mean that if soybean prices are more than 2½ times corn prices and more than 10 times cotton prices, soybeans are viewed as more profitable than both corn and cotton. Producers often rely on these ratios in making acreage planting decisions, and economists rely on the same ratios to predict aggregate adjustments in crop acreages.

A rule of thumb such as the break-even price ratio is a very useful decisionmaking tool. However, as prices, costs, and yields change, break-even prices change, and the break-even price ratio, itself, changes. In other words, the soybean/cotton break-even ratio of 10 to 1 only applies to a given set of prices, costs, and yields. In 1977, for example, at high price levels for soybeans and cotton, the soybean/cotton break-even price ratio was 12 to 1. This year at lower price levels, the break-even price ratio will be just over 9 to 1.

[1]Commodity Economics Division, Economics, Statistics, and Cooperatives Service, USDA.

CALCULATION OF BREAK-EVEN PRICES

To show the competitive position of cotton relative to soybeans, corn, sorghum, and barley, net returns per acre over a range of prices for each crop are calculated as follows, using soybeans as an example:

(1) $NRcot = Pcot \times Ycot + Vseed - VCcot$

(2) $NRsB = Psb \times Ysb - VCsb$

Where:

NRcot, Pcot, Ycot, Vseed, VCcot = Net returns, price, yield, seed value, and variable costs for cotton.

NRsb, Psb, Ysb, VCsb = Net returns, price, yield, and variable costs for soybeans.

The break-even price of cotton with respect to soybeans is calculated as follows:

(3) Set $NRcot = NRsb$

Writing the equation out gives:

(4) $Pcot \times Ycot + Vseed - VCcot = Psb \times Ysb - VCsb$

Solve for Pcot:

(5) $$Pcot = \frac{Psb \times Ysb - VCsb + VCcot - Vseed}{Ycot}$$

Costs, yields, and prices used in the analysis represent regional averages with the costs not including the fixed portion (since in this study we are only interested in short-run adjustments in acreage). Therefore, the costs may not be consistent with those of a particular producer. Producers or others who use or will use the technique presented here should substitute into the formulas their own anticipated prices, costs, and yields.

Variable Production Costs

Production costs have increased significantly in recent years, changing the competitive position of the different crops and the relative prices needed to give equal returns. Regional crop production costs per acre for 1975-77 and projections for 1978 are shown in table 19. The costs include a ginning charge for cotton and machinery ownership costs for all crops.

Table 19—Direct production costs per planted acre for cotton and competing crops

Region	Variable plus machinery ownership costs per acre			
	1975	1976	1977[1]	1978[2]
	Dollars			
Delta:				
Cotton	216	221	243	257
Soybeans	78	79	88	91
Southeast:				
Cotton	241	246	249	274
Soybeans	82	83	91	94
Corn	134	129	133	141
Southwest:				
Cotton	128	146	155	165
Sorghum	88	90	99	108
West:				
Cotton	354	385	426	455
Barley	98	99	100	106

[1] Preliminary. [2] Projected.

The rise in production costs in recent years has adversely affected cotton's competitive position. Cotton production costs have increased more than competing crop costs in all regions. For example, the projected $14-per-acre increase in cotton production costs and the $3 increase in soybean costs in the Delta would add $11 to the righthand side of formula (5), the formula for cotton's break-even price. Dividing $11 by 465 pounds, which is the average cotton yield for the last 5 years in the Delta, gives a 2.4-cent-per-pound increase in cotton's break-even price from 1977.

REGIONAL ANALYSIS

Cotton break-even prices were calculated for each region using production cost data in table 19 and certain price and yield assumptions. Average yields of cotton and competing crops for the last 5 years were used. Average farm prices of competing crops over the January-March period were used to calculate cotton's break-even price.

Figure 10 presents for each region a plot of acreage against the difference between *expected* cotton price (farm prices in the January-March planning period) and cotton's break-even price for the 1975-1977 crop years. These lines show a strong relationship between changes in cotton acreage and cotton's relative profitability.

Delta

As figure 10 indicates, cotton was at a disadvantage in 1975 and only 2.7 million acres were planted in the Delta. However, cotton had a wide advantage over soybeans in 1976. As a result, cotton acreage increased nearly 50 percent to 4 million acres. Cotton's advantage was shaved by one-half in 1977 and as a result acreage declined to 3.5 million acres.

Based on cotton's target price of 52 cents per pound and December futures of 58 to 60 cents, cotton may lose some or all of its advantage in the Delta, since cotton prices of 53 to 56 cents are needed to break even with soybeans of $5.00 to $5.50 per bushel. The Delta line in figure 10 indicates a drop in acreage of nearly half a million if current prices are maintained. In the January Prospective Plantings report, Delta producers revealed plans to seed 3.1 million acres to cotton, an indicated cut of 450,000 acres.

Southeast

The corn target price of $2.10 per bushel requires a cotton price of 56 cents per pound, and soybean prices of $5.25 per bushel would require 64 cents per pound for cotton to break even. At the 52-cents-per-pound target price, cotton is at a clear disadvantage, as this only requires a corn price of $1.85 per bushel and soybeans of $3.20 per bushel to break even.

The Southeast line in figure 10 indicates that Southeastern producers could cut acreage by 10 to 15 percent or about 120,000 acres in 1978. In January, Southeast producers indicated plans to seed 770,000 acres, down 179,000 acres from last year's 949,000.

Southwest

Cotton producers in the Southwest are very responsive to changing cotton and sorghum prices and costs. The Southwest line in figure 10 shows gains in cotton acreage in 1976 and again in 1977 as cotton's competitive position improved. Cotton was priced at the break even level with sorghum in the spring of 1976. In 1977 cotton farm prices averaged about 64 cents per pound when just 38 cents were needed to breakeven. As a result, acreage was increased by nearly 2 million. Cotton will probably

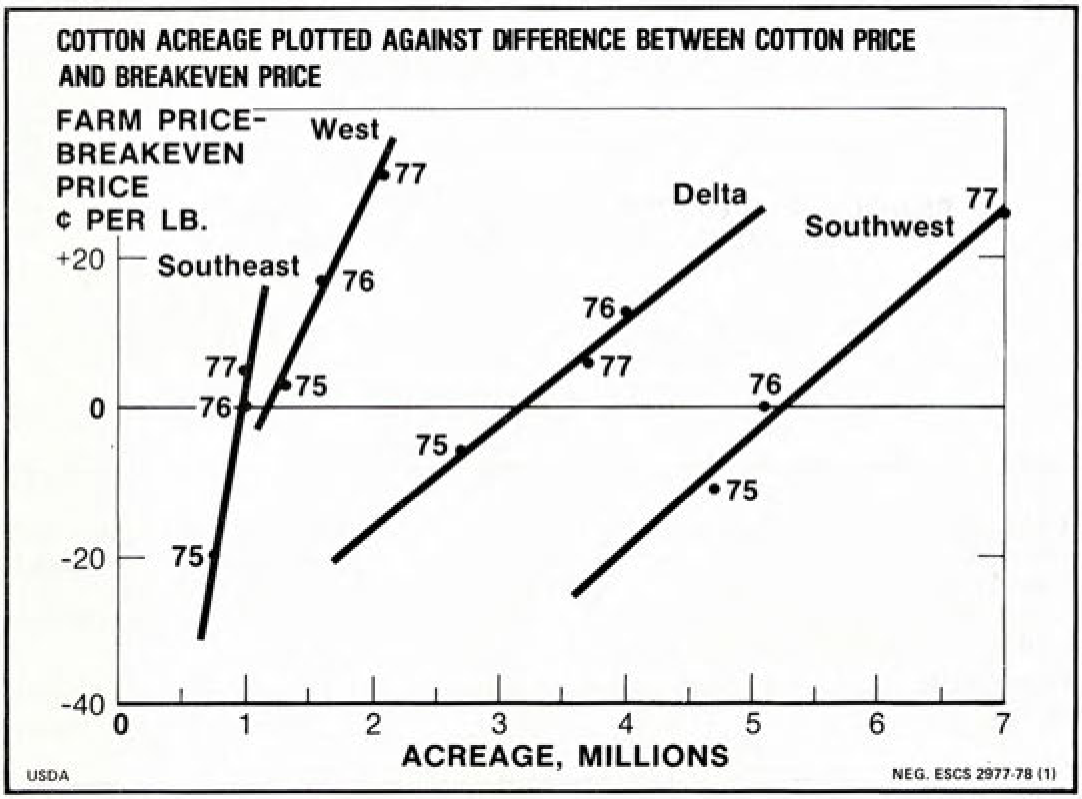

Figure 10

retain a slight advantage in the Southwest even if producers expect sorghum prices to be near last year's target price of $2.28 per bushel. This would require a cotton price of 42 cents per pound. However, cotton's relative advantage in the Southwest has sharply declined. For example, even if producers base their acreage decisions on the sorghum loan rate of $1.90 per bushel, the analysis indicates a cut in cotton acreage of about a half million compared with the 200,000-acre reduction indicated last month.

We did not adjust the analysis for potential effects of the 10-percent feed-grain set-aside (corn, sorghum, and barley). Producer reaction to the set-aside program may be as important in the Southwest as price and weather developments over the next 2 to 3 months as far as cotton acreage is concerned.

West

Cotton has many competitors in the West, but we use barley as representative of the competing crops. As figure 10 indicates, cotton acreage increased in 1976 and in 1977 as cotton's relative advantage increased. Cotton's relative advantage in the spring of 1977 was about 31 cents per pound, but may decline this year to under 15 cents. Barley farm prices of $2.00 to $2.25 per bushel require prices of 39 to 41 cents per pound to break even, compared to cotton's 52-cent target price, which translates into an average farm price of 55 to 56 cents in the West. The West line in figure 10 indicates a cut in cotton acreage of less than half a million. In January, Western cotton producers indicated plans to seed about 1.9 million acres to cotton, compared to 2.1 million in 1977

PRODUCTION OF COTTON AND ALTERNATIVE CROPS: RELATIVE IMPACTS ON THE U.S. ECONOMY

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ABSTRACT: An analysis of the relative effects on the general economy of the production and distribution of cotton, feed grains, and oil crops is presented. An 86-sector inter-industry model of the U.S. economy for 1967 is used to compare direct production requirements and indirect outputs generated. Industry output multipliers are used to examine total economic activity generated within the economy by each sector.

KEYWORDS: Cotton, feed grains, oil crops, input-output, direct requirements, output multipliers.

INTRODUCTION

This article compares the relative effects of the production of cotton, feed grains, and oilseeds on U.S. economic activity. These effects are measured in terms of the level and diversity of purchases of production inputs and by analyzing the impacts that final consumption of these products has in generating industrial output throughout the economy.

For cotton, the level of production and consumption is determined by many interdependent factors. The most important of these are competition from other crops for land and other production resources and competition in the marketplace from alternative fibers. The extent of competition is usually determined by relative market prices in relation to costs of production. Moreover, the identification and analysis of the relative resource or input requirements per unit of production, aids in a sharper understanding of the effects of changes in demand on input industries and in assessing the total effects of alternative policies and programs.

Methodology

This article is based on information developed from the latest inter-industry relations (input-output) study published by the U.S. Department of Commerce[1] Three tables form the basis for the input-output system—the transactions table, direct requirements table, and table of total requirements.

The transactions table traces the complex flow (in dollars) of products and services among all industries or sectors of the U.S. economy. The economy is divided into any number of meaningful sectors and arranged in matrix format. That is, rows represent sales of an industry to intermediate markets and also direct to final users such as persons, governments, and exports (final demand). Columns show each industry's purchases of inputs from all other industries and payments or allowances made for labor, depreciation, taxes and profits (value added). Total inputs to the system equal total outputs produced as each industry is shown both as a producer (row) and as a consumer (column).[2] For the purpose of this study, the transactions table consisting of 484 sectors was aggregated to 86 sectors emphasising the agricultural and agriculture related industries

[1]U.S. Department of Commerce, Office of Business Economics, *The Inter-industry Relations Study for 1967*, February 1974.

[2]For a complete discussion of the concepts and theory of input-output analysis see: Miernyk, William H., *The Elements of Input-Output Analysis*, New York, Random House, Inc., 1965.

The table of direct requirements is derived from the transactions table. For every industry or sector, each column entry (purchases) is divided by total sales or output of that industry to yield the value of the various inputs required by a sector to produce $1 of output.

The direct requirements do not, however, represent the total economic activity a sector generates in the production process. For any increase in output, indirect activity results as input industries make additional purchases to support their new level of demand. These indirect effects are captured in the total requirements table. Data on total requirements combines the direct plus multiple indirect effects to show the total expansion of output in all sectors of the economy as a result of the delivery of $1 of ouput to final demand by each sector.

Assumptions and Limitations

The construction of the interindustry framework for a particular year requires certain assumptions about the nature of production and consumption. These assumptions are primarily of an accounting nature and do not seriously affect the interpretation of the data if restricted to the year for which the table was constructed. However, the use of the direct and total requirements data for periods *beyond* the base year do involve certain strict assumptions. These assumptions are that the physical structure of the economy does not change, ruling out the substitution of one input for another as a result of changes in technology and/or relative prices; and, that for any level of production, an industry's mix of inputs remains constant such that a doubling of the inputs in a producing industry will double the output of that industry.

Table 16—Direct input requirements of the cotton, feed grains, and oil crops sectors per $1 of output, 1967

Sector	Cotton	Feed grains	Oil crops
	Dollars	*Dollars*	*Dollars*
Cotton	.013	---	---
Feed grains	---	.014	---
Oil crops	---	---	.055
Livestock and livestock products	.019	.074	.045
Other agricultural products	---	.007	---
Agricultural services, forestry, and fisheries	.151	.022	.022
Mining	.003	.006	.001
Maintenance and repair	.013	.014	.012
Cordage and twine	(1)	.002	(1)
Industrial chemicals	.023	.042	.005
Fertilizer and fertilizer mixing	.026	.053	.013
Agricultural chemicals	.077	.015	.021
Petroleum refining and products	.037	.046	.018
Rubber and misc. plastic products	.006	.007	.007
Fabricated metal products	.001	.003	.001
Farm machinery	.012	.014	.014
Electrical and electronic equipment	.002	.002	.002
Railroads and related services	.005	.008	.002
Motor freight transportation and warehousing	.005	.009	.011
Other transporation and services	.004	.003	.001
Communications	.003	.002	.002
Electric utilities	.006	.001	.003
Water and sanitary services	.005	.006	---
Wholesale trade	.038	.040	.018
Retail trade	.022	.026	.011
Finance and insurance	.011	.011	.009
Real estate and rental	.122	.082	.078
Personal and business services, and lodging	.053	.059	.059
Gross imports	.022	.001	(1)
Business travel, entertainment, and gifts	.002	.001	(1)
All other sectors	.004	.004	.004
Total inputs	.685	.574	.414
Value added	.315	.426	.586
Total	1.000	1.000	1.000

[1] Less than $0.001.

DIRECT PRODUCTION INPUTS

The direct purchases of production inputs per $1 of cotton, feed grains, and oil crops output during 1967 are shown in table 16. That is, the table shows the direct unit cost structure of these sectors necessary to support their level of output.

For example, for the cotton sector to produce $1 of output it requires purchases of 1.3 cents of its own production, 1.9 cents from livestock and livestock products, 15.1 cents from agricultural services, forestry, and fisheries, and other purchases as shown. The total direct inputs required from intermediate markets by cotton producers for $1 of output is 68.5 cents which indicates a high degree of interdependence with other sectors of the economy. Payments to the factors of production, as shown by the value-added row, account for 31.5 cents of every $1 of output.

While feed grain producers are not as highly interrelated with other sectors of the economy as cotton producers, over 57 percent of the value of feed grain production is used to purchase intermediate inputs. For each $1 of production, the feed grains sector requires 1.4 cents of its own output, 4.2 cents for industrial chemicals, 5.3 cents for fertilizer and fertilizer mining, and so forth. Almost 43 cents is available for the factors of production.

The oil crops sector is not as highly interrelated with the intermediate sectors of the U.S. economy as the cotton or feed grains sectors. As a result, value added accounts for a greater portion of production costs than do the other two sectors. For each $1 of production, 58.6 cents is available for distribution to employees wages and salaries, profits, interest and depreciation, and taxes. However, since intermediate input purchases are less than for the cotton or feed grains sectors, economic activity directly attributable to changes in final demand for oil crops is generally less than for the other sectors.

The data shown in table 16 are also useful for estimating the direct effects of changes in the output level for cotton, feedgrains, and oilseeds on the production levels in many other sectors of the economy. These data permit the tracing of the interconnections between various industries and final demand in a systematic way.

For example, assume that the cotton industry increases production by $1 million as a result of an increase in export demand. The table shows that the cotton industry would require $13,000 ($1,000,000 × .013) from itself making total production of $1,013,000. Moreover, the increased output would require additional output of $152,963 ($1,013,000 × .151) from agricultural services, forestry, and fisheries, $78,001 ($1,013,000 × .077) from agricultural chemicals, $12,156 ($1,013,000 × .012) from farm machinery, and so forth down the column. A total of $693,905 ($1,013,000 × .685) would be required directly for the $1 million increase in cotton production. Similar calculations and comparisons can be made for the feed grains and oilseeds sectors.

It is obvious from the above example that those sectors supplying the cotton sector require additional inputs to support this increased production. They, in turn, put additional requirements on yet other sectors and this ripple effect is felt throughout the economy. The analysis of these indirect effects on economic output is one of the major uses of input-output and is discussed in the next section.

TOTAL OUTPUT REQUIREMENTS

The direct, indirect, and total output effects on each sector of the economy per $1 delivery to final demand by the cotton, feed grains, and oil crops sectors are shown in table 17. The direct inputs required were presented in table 16. The total outputs required were obtained from the total requirements matrix. The indirect outputs generated are total outputs required minus direct inputs required. Each column shows the amounts of output required

Table 17—Direct, indirect, and total effects per dollar delivery to final demand by the cotton, feed grains, and oil crops sectors, 1967

Sector	Cotton			Feed grains			Oil crops		
	Direct input re-quired	Indirect output gener-ated	Total output re-quired	Direct input re-quired	Indirect output gener-ated	Total output re-quired	Direct input re-quired	Indirect output gener-ated	Total output re-quired
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Cotton	.013	1.003	1.016	---	.001	.001	---	.001	.001
Feed grains	---	.024	.024	.014	1.033	1.047	---	.021	.021
Oil crops	---	.004	.004	---	.002	.002	.055	1.000	1.055
Livestock and livestock products	.019	.024	.043	.074	.028	.102	.045	.020	.065
Other agricultural products	---	.014	.014	.007	.004	.011	---	.003	.003
Agr. services, forestry, and fisheries	.151	.006	.157	.022	.005	.027	.022	.004	.026
Mining	.003	.006	.009	.006	.007	.013	.001	.004	.005
Maintenance and repairs	.013	.021	.034	.014	.019	.033	.012	.013	.025
Cordage and twine	([1])	([1])	([1])	.002	---	.002	([1])	([1])	([1])
Industrial chemicals	.023	.060	.083	.042	.045	.087	.005	.022	.027
Fertilizer and fertilizer mixing	.026	.008	.034	.053	.009	.062	.013	.004	.017
Agricultural chemicals	.077	.003	.080	.015	.001	.016	.021	.002	.023
Petroleum refining and products	.037	.023	.060	.046	.024	.070	.018	.012	.030
Rubber and misc. plastic products	.006	.006	.012	.007	.006	.013	.007	.004	.011
Fabricated metal products	.001	.015	.016	.003	.013	.016	.001	.009	.010
Farm machinery	.012	.002	.014	.014	.001	.015	.014	.002	.016
Electrical and electronic equipment	.002	.006	.008	.002	.006	.008	.002	.005	.007
Railroads and related services	.005	.009	.014	.008	.009	.017	.002	.005	.007
Motor freight transportation and warehousing	.005	.011	.016	.009	.011	.020	.011	.009	.020
Other transporation and services	.004	.011	.015	.003	.012	.015	.001	.006	.007
Communications	.003	.008	.011	.002	.009	.011	.002	.006	.008
Electric utilities	.006	.009	.015	.001	.009	.010	.003	.005	.008
Water and sanitary services	.005	.002	.007	.006	.002	.008	---	.001	.001
Wholesale trade	.038	.021	.059	.040	.022	.062	.018	.014	.032
Retail trade	.022	.010	.032	.026	.011	.037	.011	.008	.019
Finance and insurance	.011	.018	.029	.011	.016	.027	.009	.013	.022
Real estate and rental	.122	.043	.165	.082	.038	.120	.078	.028	.106
Personal and business services, and lodging	.053	.046	.099	.059	.046	.105	.059	.034	.093
Gross imports	.022	.024	.046	.001	.022	.023	([1])	.011	.011
Business travel, entertainment, and gifts	.002	.008	.010	.001	.008	.009	([1])	.006	.006
All other sectors	.004	.194	.198	.004	.185	.189	.004	.110	.114
Total	.685	1.639	2,324	.574	1.604	2.178	.414	1.382	1.796

[1] Less than $0.001

directly, indirectly, and totally from the sectors named at the beginning of each row to support $1 of delivery to final demand by the industry named at the head of the column.

For example, the total economic activity generated by the cotton sector includes a total output of 4.3 cents from livestock and livestock products, 8.3 cents from industrial chemicals, 15.7 cents from agricultural services, forestry, and fisheries, and nearly $1.02 of its own production. This $1.02 represents the $1 production delivered to final demand and the total intra-sector requirements needed to support this delivery. The last entry in the total output required column represents the total expansion in economic activty generated by a $1 delivery to final demand by the industry named at the head of the column.

For cotton this total is more than $2.32, for feed grains almost $2.18, and for oil crops about $1.80. This indicates that the cotton sector generates more total economic activity per $1 of delivery to final demand than the other two sectors. The cotton sector also generates more indirect output due, in part, to its greater purchases of direct inputs. The feed grains sector, however, is the only sector that creates more indirect output than direct input it requires.

The indirect output generated in a sector is often of greater magnitude than the direct input required. The feed grains sector provides 2.4 cents to industries supplying inputs to the cotton sector, but nothing in direct requirements to cotton. The industrial chemicals industry provides over two times as much output to sectors supplying inputs to cotton as it provides directly to that sector. Similar comparisons can be made for the feed grains and oil crops sectors.

INDUSTRY OUTPUT MULTIPLIERS

The sum of the total output required from all sectors of the economy to support a $1 delivery of output to final demand by any one sector is known as that sector's output multiplier. As mentioned previously, the output multiplier for cotton, feed grains, and oil crops for 1967 was $2.32, $2.18, and $1.80, respectively. The value of the multiplier reflects the degree of interdependence of each sector in the economy and its importance in stimulating economic activity. Generally, the higher the value of intermediate inputs the higher the value of the multiplier. For the 86 sectors delineated for this study, values of output multipliers varied from a high of $3.23 to a low of $1.40.

Table 18 gives a comparison of the output multipliers for cotton, feed grains, and oil seeds by major groupings of the economy. For example, in 1967 for each $1 delivery to final demand for cotton, $1.26 in total economic activity was generated in the agriculture sector, compared with $1.19 for feed grains and $1.17 for oilseeds. Likewise, a $1 delivery to final demand by the feed grains sector created over 41 cents of economic activity in those industries included in the manufacturing sector while cotton required 44 cents and the oilseed sector only 22 cents. Industries comprising the nonmanufacturing sector produced over 35 cents in total economic activity to support $1 of output of the oil crops sector. These output multipliers are useful analytical tools and can play an important role in measuring the impact of proposed public and private sector policy decisions.

CONCLUSIONS

The production of cotton, feed grains, and oilseeds are each strongly interrelated within the U.S. economic system. Changes in output result in significant but varying levels of output and resource use in many other sectors such as chemicals, agricultural services, transportation, and utilities. The cotton and feed grains sectors are highly correlated with those intermediate markets while the oil crop sector is much more dependent on activity in final demand markets.

While the relationships developed in this study are based on 1967 economic structures as detailed in the latest U.S. Department of Commerce input-output table, the information can provide useful insights into the relative economic effects of the production of cotton and these alternative crops. Moreover, estimates of both the relative magnitude and direction of possible output adjustments can be determined.

Table 18—Output multipliers: Output adjustments required in U.S. economy per $1 change in final demand for specified products, 1967

Sector of U.S. economy	Product		
	Cotton	Feed grains	Oil crops
	Dollars	*Dollars*	*Dollars*
Agriculture	1.263	1.193	1.173
Mining	.044	.055	.022
New construction, maintenance, and repairs	.034	.033	.025
Manufacturing:			
Paper and allied products	.025	.014	.010
Industrial chemicals	.083	.087	.027
Agricultural chemicals	.080	.016	.023
All others	.255	.294	.163
Non-manufacturing:			
Transportation	.044	.051	.034
Wholesale and retail trade	.092	.099	.052
Finance and insurance	.029	.027	.022
All others	.375	.309	.245
Total output	2.324	2.178	1.796

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