REGIONAL AND FUNCTIONAL DISAGGREGATION OF THE COTTON INDUSTRY IN A NATIONAL INPUT-OUTPUT MODEL

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Various classes of models possess characteristics essential for commodity analysis. One class, input-output (I-O) models, can complement more widely used commodity models, such as econometric and mathematical programming, which are often directed at a few specific production and use markets for the commodity under analysis. I-O models either formally linked with, or used independently of, these other models provide an analytical framework for examining macroeconomic adjustments to commodity market shocks. Further, I-O allows the tracing of resource flows to and from the commodity market and among all secondary markets. These characteristics suggest that a commodity-oriented I-O model ought to be a component of a package of models designed to provide complete coverage of a commodity for economic analysis.

This article examines an I-O model of the U.S. cotton industry. One of several models developed in fiber research at the U.S. Department of Agriculture (USDA), the I-O model serves as a part of a model system used to analyze fiber market developments. This article first covers model construction; then the model is used to describe the inter-industry structure of the cotton sector. Finally, analytical capability is demonstrated by using the model to measure the size of resource shifts because of the movement in the location of cotton production from east to west that occurred during the 1970s.

The structure of the model is distinctive because it is a national model disaggregated by commodity, region, and function. There are many examples in economic literature of regional I-O models used to evaluate regional impacts of economic events (Penson and Fulton; Jones). Also, national I-O models have been disaggregated along commodity lines (Simpson and Adams). The model presented disaggregates a commodity, cotton, from a national model; includes separate sectors for cotton production and marketing functions; and further disaggregates these sectors into four regional subsectors that cover the cotton belt.

The functional areas modeled and used to describe the structure of the cotton industry include cotton production, ginning, warehousing, and merchandising. These sectors essentially exhaust the range of ownership transfers and activities through which cotton passes from planting to the textile mill or export point.

The application of the model to the change in location of cotton production is motivated by current national agricultural policy concerns over farm structure (USDA, November 1979). It is popular to focus on the implications of national policies for individual farm characteristics. However, the implications of changes in national resource allocation due to an evolving structural characteristic are also important. The migration of cotton production from the smaller farms of the Southeast to the larger farms of the Southwest has many resource shift implications. For example, since agricultural policy has generally been held responsible for the production shift of the 1970s, changes in national economic activity as a result of the geographic shift provide policymakers with a measure of resources required to hold production on smaller, higher cost farms. Commodity model I-O analysis of resource flows from production structure changes can provide policymakers with alternative perspectives on the costs, or benefits, or their actions.

EXPANSION OF A NATIONAL I-O MODEL

The U.S. Department of Commerce's I-O tables for 1972, released in 1979, served as the cotton model framework. Two models were published; one identifies 494 industries, while the other uses 83 more aggregated industries (Ritz; U.S. Department of Commerce 1979). Compared with previous models, use of the 1972 models is more complicated because they have been altered to distinguish between industry and commodity sectors. The number of data tables has increased so that various industry/commodity flows may be identified. The distinction between industry and commodity sectors allows for an accounting of production of more than one commodity by an industry. The same names are used for an industry sector and for the commodity sector that represents the industry's primary output. A complete discussion of the model structure (use and make tables) and derivation is in DiPietre, Walker, and Martella.

The cotton industry I-O model is an expansion of the 83-industry 1972 national model. Four of

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the national industries are disaggregated to obtain the cotton sectors. Cotton production is separated from "other agricultural products," ginning from "agricultural, forestry, and fishery services," warehousing from "transportation and warehousing," and cotton merchants from "wholesale and retail trade."

The use table is a primary component of the I-O model. It shows sales of commodities (row sectors) to industries (column sectors). Sales of the i^{th} commodity to the k^{th} national industry, which was disaggregated, X_{ik}, were replaced in the use table by sales of the i^{th} commodity to the m^{th} cotton industry in the r^{th} region of the cotton belt, X^r_{im}. The remaining sales of the i^{th} commodity to the k^{th} sector are viewed as sales to a residual national industry, X_{il}, so that

$$(1)\quad X_{ik} = X_{il} + \sum_r X^r_{im}$$

The total sales from the i^{th} commodity sector to the m^{th} cotton industry, X_{im}, is the sum of the regional cotton industry purchases or

$$(2)\quad X_{im} = \sum_r X^r_{im}$$

If known, X_{im} may be used as a control total to facilitate, or check, construction of the regional transactions. Control totals were available only for cotton production and were obtained from the 494-industry national model.

The completion of the use table requires distribution of the cotton commodity outputs. Sales of the k^{th} national commodity sector, which was disaggregated into regional cotton commodity sectors, were replaced in the use table. Sales from the k^{th} commodity sector to the j^{th} industry, X_{kj}, were replaced by commodity sales from the m^{th} cotton sector in the r^{th} region to the j^{th} industry, X^r_{mj}. In addition, the remaining commodity sales of sector k are viewed as sales of the residual national commodity sector, X_{lj}, so that

$$(3)\quad X_{kj} = X_{lj} + \sum_r X^r_{mj}$$

Knowledge of total commodity sales of the m^{th} cotton sector to the j^{th} national industry, X_{mj}, provides a control total since

$$(4)\quad X_{mj} = \sum_r X^r_{mj}$$

Again, this total was available only for cotton production.

In a like manner, algebraic statements may be derived for disaggregated entries in the final demand portion of the use table and the remaining table needed for the I-O model, the make table. Final commodity demands were simply separated into final demands for regional cotton commodity sectors and residual final commodity demands. While the use table shows industry purchases of a commodity, the make table shows the amount of each different commodity sold by an industry. For example, cotton producers perform custom services and lease land and buildings; these transactions are output of the cotton production industry sector, but not output of the cotton production commodity sector. The latter output is composed of cotton lint and cottonseed. In the make table, then, commodity outputs of each national industry were separated into commodities produced by each regional cotton industry and by residual national industries. With the use and make tables, the total requirements tables are derived following the procedure in U.S. Department of Commerce, February 1979.[1]

A few statements on construction methods for each cotton sector provide additional insight. Four regions are used for production, ginning, and warehousing, the Southeast, South Central, Southwest, and West.[2] Merchants were not disaggregated by region. Medium-to-large-size cotton merchants merchandise most of the nation's crop. Although often headquartered in a single region, they are national in scope, usually purchasing cotton from each of the four regions. Costs that a merchant incurs for moving a bale of cotton from a production region to a buyer are available, but regional operating costs for a merchant as a business, such as overhead, are not. Therefore, based on scope of operation and data availability, the cotton merchandising sector was disaggregated as a single national sector. The complete cotton industry I-O model, then, is composed of 96 industries.

Commodity purchases by cotton production regions were determined by distributing total cotton production expenditures (known control totals) across the four regions. Cost-of-production data for a number of cotton areas were assigned to I-O sectors, then weighted by acreage planted to obtain input expenditure proportions for the four cotton regions. These proportions were used to distribute the control totals across regions, and the regional data were then expressed in producers' prices.[3] Farm production costs and acreage weights were primarily obtained from Schulter, et al.; Starbird; USDA 1971, 1973; and U.S. Senate Committee on Agriculture and Forestry. Distribution of cotton production was derived from Chandler and Glade.

[1] Industry by commodity and commodity by commodity total requirements tables may be derived. The former shows the total output required of an industry to deliver a dollar of commodity output to final demand. The latter shows output of a commodity sector required to deliver a dollar of commodity output to final demand.

[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] Producers' prices are prices received by the input supplier. Input expenditures by cotton farmers were converted to producers' values by reducing farm expenditures through use of the percentage marketing margin paid on input commodities. The same percentages were used for each cotton region and equaled the margins on total cotton input purchases, which are not published, but are available on the U.S. Department of Commerce computer tapes comprising the 494-sector I-O model.

No control totals were available for ginning, warehousing, and merchandising, therefore regional transactions were constructed from several sources. Primary sources for gin costs were Ghetti; Ghetti, Cleveland, and Bounds; Shaw, Wilmot, and Heron; and Wilmot, Shaw, and Heron. Primary sources for warehouse costs were Chandler and Ghetti. Merchant costs were based on Chandler and Glade and U.S. Department of Commerce, December, 1975. In addition to published sources, cotton specialists provided some estimates; survey schedules, used to prepare some of the references cited, were also used. Gin, warehouse, and merchant costs were adjusted to producers' prices by using the trade margins on inputs purchased by the national sector, from which the respective cotton sectors were disaggregated.

ECONOMIC STRUCTURE OF THE COTTON SYSTEM

The direct input requirements per dollar of output of the cotton production, ginning, warehousing, and merchandising sectors are presented in Tables 1–4. The importance of regional disaggregation is highlighted by many wide variations in the intensity of input use among regions. These differences result from different growing conditions, operating practices, input costs, product quality, and final markets. Therefore, the nationwide economic impact of regional changes in the structure of the cotton system can be significant.

In order to incorporate the regional structure of the cotton system within the I-O format, traditional product flows and ownership transfers are shown somewhat differently than in typical cost or distribution studies. To establish the direct link between farmers and the consuming industries, sales are shown as if moving directly to the users, bypassing the usual cotton marketing facilities and practices. The purchase of cotton by domestic mills and final demand (primarily export customers) are shown coming directly from farmers and not from cotton merchants, ginners, or other merchandisers. Trade margins associated with raw cotton sales are accounted for as a purchase of merchandising services by the consuming industry. Likewise, the sale of cottonseed by producers is made directly to the oil mill industry, bypassing the cottonseed wholesaling function, which is usually performed by ginners.

Direct requirements for cotton farming (Table 1) reveal the comparative disadvantage of cotton farming in the Southeast. Value added is much lower than in other regions; pest control problems and smaller farm sizes, which limit the ability to spread overhead over large acreages, account for some of the disparities. The largest differences among regions occur for farm machinery and for chemicals and chemical products, which include fertilizer and pesticides. Expenditures on transportation and warehousing, and wholesale and retail trade represent margins on purchases of other inputs; consequently, they are higher for the Southeast due to its greater input use. Total output required of all industry sectors to deliver a dollar of regional cotton production to final demand demonstrates the economic impact of differential input intensities. The computed output multipliers are: Southeast, 2.70; South Central, 2.24; Southwest, 2.31 and West, 2.13.

Output of the ginning sector is a purchase of services by cotton farmers. Southwest farmers face the highest ginning charges because their cotton is machine stripped rather than picked, resulting in a higher trash-to-lint ratio. Additional and larger gin-cleaning equipment is required, making maintenance and repair costs, the largest of ginning inputs in Table 2, highest for Southwest ginners. Other significant input categories are miscellaneous textile goods, which include bale bagging costs, and other fabricated metal products, which include metal bale straps. The higher value added in the West is due to newer and higher bale capacity gins than in other regions.

Charges for storing and merchandising cotton, trade margins on raw cotton sales, are shown as purchases by mills or final demand. Regional differences in the structure of the warehouse industry are evidenced by purchases of other fabricated metal products and miscellaneous manufacturing (Table 3). These categories contain warehouse supplies. Warehouses, with compress facilities, compress gin bales to standard or universal densities, which requires supplies such as metal bale straps. The reason for the pattern of warehouse purchases of other fabricated metal products, which contain bale straps, is that virtually all bales in the West are compressed to greater densities, relatively fewer in the South Central and Southwest regions, and only limited quantities in the Southeast. Small warehouses have proportionally higher office costs, thus miscellaneous manufacturing expenditures, which contain office costs, are higher in the Southeast where there are large numbers of old, small-capacity warehouses. The size and age distributions of warehouses are also important factors for determining finance and insurance costs. These costs include warehouse and cotton insurance, license fees, and interest rates on operating funds.

Cotton merchants view transportation and warehousing as their primary operating costs; in I-O, these are margins paid by mills and final demand. Communication, interest on operating funds, and labor costs (value added) dominate the cost of supplying merchandising services (Table 4).

TABLE 1. Regional Cotton Production: Purchases of Inputs per Dollar of Output, 1972.

Commodity Sector	Region			
	South-east	South Central	South-west	West
	Dollars			
Livestock and livestock products	.015	.011	.019	.006
Cotton production, Southeast	.013	--	--	--
Cotton production, South Central	--	.011	--	--
Cotton production, Southwest	--	--	.019	--
Cotton production, West	--	--	--	.005
Agricultural, forestry, and fishery services	.052	.046	.047	.057
Cotton ginning, Southeast	.117	--	--	--
Cotton ginning, South Central	--	.121	--	--
Cotton ginning, Southwest	--	--	.172	--
Cotton ginning, West	--	--	--	.130
Stone and clay mining and quarrying	.008	.002	--	--
Chemical and fertilizer mineral mining	.004	.002	.001	.001
Maintenance and repair construction	.008	.008	.010	.009
Chemicals and selected chemical products	.324	.172	.104	.099
Petroleum refining and related industries	.027	.021	.031	.014
Rubber and miscellaneous plastics products	.006	.006	.007	.006
Other fabricated metal products	.001	.001	.001	.001
Farm and garden machinery	.012	.011	.009	.006
Miscellaneous electrical machinery, equipment, and supplies	.002	.001	.001	a
Transportation and warehousing	.027	.016	.012	.009
Communication, except radio and TV	.005	.002	.004	.001
Electric, gas, water, and sanitary services	a	a	.002	.061
Wholesale and retail trade	.073	.042	.032	.025
Finance and insurance	.027	.022	.016	.018
Real estate and rental	.162	.158	.199	.177
Business services	.014	.014	.016	.013
Automobile repair and services	.006	.005	.004	.003
All other sectors	.005	.002	.007	.002
Total inputs	.908	.674	.713	.643
Value added[b]	.092	.326	.287	.357
Total	1.000	1.000	1.000	1.000

[a] Less than .0005.
[b] Includes labor, depreciation, taxes and profits.

TABLE 2. Regional Cotton Ginning: Purchases of Inputs per Dollar of Output, 1972

Commodity Sector	Region			
	South-east	South Central	South-west	West
	Dollars			
Maintenance and repair construction	.122	.129	.151	.112
Miscellaneous textile goods and floor coverings	.105	.111	.092	.085
Printing and publishing	.003	.003	.004	.003
Other fabricated metal products	.069	.074	.062	.056
Miscellaneous manufacturing	.007	.007	.007	.006
Transportation and warehousing	.009	.009	.013	.010
Communication, except radio and TV	.004	.004	.009	.005
Electric, gas, water, 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
Hotels and lodging, personal and repair services (except auto)	.001	.001	.002	.001
Business services	.015	.016	.030	.010
Automobile repair and services	.008	.009	.024	.007
All other sectors	a	a	.001	a
Total Inputs	.519	.549	.558	.427
Value added[b]	.481	.451	.442	.573
Total	1.000	1.000	1.000	1.000

[a] Less than .0005.
[b] Includes labor, depreciation, taxes, and profits.

TABLE 3. Regional Cotton Warehousing: Purchases of Inputs per Dollar of Output, 1972

Commodity Sector	Region			
	South-east	South Central	South-west	West
	Dollars			
Maintenance and repair construction	.022	.035	.018	.018
Other fabricated metal products	.025	.056	.040	.126
Office, computing, and accounting machines	.004	.001	.001	.002
Miscellaneous manufacturing	.036	.007	.007	.021
Transportation and warehousing	.015	.005	.023	.004
Electric, gas, water, and sanitary services	.054	.051	.049	.058
Wholesale and retail trade	.008	.007	.006	.015
Finance and insurance	.119	.055	.039	.038
Real estate and rental	.032	.004	.012	.041
Hotels and lodging, personal and repair services (except auto)	.014	.020	.020	.009
Business services	.004	.026	.012	.010
All other sectors	--	.001	--	.001
Total Inputs	.333	.268	.227	.343
Value added[a]	.667	.732	.773	.657
Total	1.000	1.000	1.000	1.000

[a] Includes labor, depreciation, taxes, and profits.

APPLICATION TO COTTON PRODUCTION LOCATION CHANGES

The change in the geographical distribution of cotton production has been significant during the 1970s (Table 5). Several factors, which relate to relative net returns, contributed to this westward movement. Mechanization of cotton production provided an incentive to increase farm size, and the West, with large, flat land areas, provided an opportunity (McArthur). The soil and climate of the West, enhanced by irrigation, also favored increased cotton production. In the East, growth of soybean demand increased the opportunity cost of planting cotton, and incentive for eastern farmers to reduce cotton plantings.

Government policy also affected net returns and, thus, the location of cotton production. Prior to 1974, program payments tied to production from allotments and bonus payments to small farms helped keep many small and less efficient farms in cotton production. This was particularly true for the Southeast (Blakley and Shafter). The Agricultural and Consumer Protection Act of 1973 eliminated program payments based on allotment production and substituted the target price concept and deficiency payments (Evans). Higher market prices during 1973–77 resulted in no deficiency payments and stimulated production in the lower cost, higher net return areas of the West.

The West's comparative advantage for cotton production suggests a westward production movement, other things being equal, that would release resources from cotton production, which could then be employed in alternative agricultural or non-agricultural uses. Since government direct and small-farm payments and allotments were so important in motivating the production shift, the freed resources could be interpreted as a measure of costs of a government policy designed to keep smaller and higher cost farms in production. To obtain a measure of the resources involved, the "before" geographical distribution

TABLE 4. Cotton Merchandising: Purchases of Inputs per Dollar of Output 1972

Commodity Sector	Merchandising Inputs
	Dollars
Office, computing, and accounting machines	a
Miscellaneous manufacturing	.002
Transportation and warehousing	.004
Communications, except radio and TV	.045
Electric, gas, water, and sanitary services	.015
Finance and insurance	.426
Real estate and rental	.030
Business services	.017
Eating and drinking places	.002
Total inputs	.542
Value added[b]	.458
Total	1.000

[a] Less than .0005.
[b] Includes labor, depreciation, taxes, and profits.

TABLE 5. Average Regional Shares of Total U.S. Cotton Production by Time Period [a]

Period	Southeast		South Central		Southwest		West		Total	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%
1970–74	1.33	11.3	4.20	35.6	3.75	31.8	2.51	21.3	11.78	100.0
1975–79	0.62	5.3	3.04	25.9	4.45	37.3	3.65	31.0	11.75	100.0

[a] Quantity is expressed in million bales.

was taken as the average for 1970–74 and the "after" as the 1975–79 average (Table 5).[4] The resource adjustments are measured by sector output changes, using the cotton industry I-O model. The two distributions are ideal for comparison because average total cotton production was the same for both periods, and government policies and payments were significantly different.[5]

The method of analysis follows. Output, in dollars, in the i^{th} I-O industry, X_i, is

$$(5)\quad X_i = \sum_j TR_{ij} Y_j$$

where TR_{ij} is the total output of industry i required to deliver a dollar of commodity j to final demand, Y_j. The total differential of equation (5) expresses the change in industry output as

$$(6)\quad dX_i = \sum_j (TR_{ij} dY_j + Y_j dTR_{ij})$$

Equation (6) was used to compute the effects of production location changes.

The difference between the two production location distributions for the 1970s entered the I-O model as a change in the pattern of shipments from each production region to foreign and domestic buyers. The changes in regional shipments were computed by applying the regional distribution differences (Table 5) to cotton exports and mill purchases for 1972, a base year that is consistent with the I-O model and representative of the early 1970s. A change in the regional origin of cotton exports constitutes a change in final demand for regional cotton production (dY_j). A change in a regional domestic mill purchase constitutes a change in a textile industry direct requirements coefficient, thus, all total requirements coefficients change (dTR_{ij}).[6]

It should be noted that a change in any direct requirement coefficient will change all total requirements coefficients and that most direct requirements change yearly. However, only total requirement changes due to changes in mill purchases of cotton were considered in equation (6) because the national I-O table (for 1977), possibly representative of the later 1970s, is not yet available. Young and Ritz have examined the stability of total requirements coefficients over time by comparing actual industry output for 1971 with a level derived using the 1967 national I-O model and final demands for 1971. Differences between actual and derived output exceeded 5 percent in only 3 of 79 industries. The cotton production sector has also demonstrated some stability. Cotton farmers, like many other farmers, saw variable costs as a portion of total costs rise during the 1970s. A comparison of 1972 with 1977 costs shows that most cotton input purchases per dollar of output were similar, except for power and equipment, which has risen, and labor, which has declined.[7]

The annual national economic impacts of production migration due to the differences between the "before" and "after" location distributions and aggregated to 8 sectors are presented in Table 6. Decreases in cotton production in the Southeast and South Central regions create negative economic effects (free resources) in each sector of the economy, and production increases in the Southwest and West cause positive impacts (command resources).

Aggregating industry output changes across

TABLE 6. Changes in U.S. Industry Outputs Due to the Geographic Redistribution of Cotton Production

Industry	Southeast	South Central	Southwest	West	All Regions
	Million dollars				
Agriculture, forestry, and fisheries	-145.1	-242.4	154.8	243.8	11.1
Mining	-9.2	-9.3	5.3	8.1	-5.1
Construction	-6.3	-9.5	7.6	10.0	1.8
Manufacturing	-82.1	-88.1	45.3	62.2	-62.7
Transportation, communications, and utilities	-21.1	-26.2	18.4	35.0	6.1
Wholesale and retail trade	-13.2	-14.0	7.3	9.7	-10.2
Finance, insurance, and real estate	-33.8	-50.7	35.1	52.0	2.6
Services	-12.8	-16.3	10.5	15.6	-3.0
Total economy	-323.6	-456.6	284.4	436.4	-59.4

[4] A comparison of period average distributions rather than a year-by-year analysis of actual production changes was conducted for two reasons. First, regional annual output changes are often determined by weather, and averages abstract from weather induced impacts. Second, our interest is in national implications of shifts among farms with different production characteristics. Use of the distributions abstracts from the demand changes of the 1970s—declining U.S. mill consumption and increased exports.

[5] From 1970–73, government payments averaged 46 percent of the value of production. In 1974, payments fell to a 5.4 percent, but the high cotton prices of 1973 acted as a strong inducement for farmers to remain in cotton for the 1974 season. During 1975–79, government payments were only 3.7 percent of production value (USDA, April 1980).

[6] A similar approach was used to alter direct requirements for and final purchases of regional cotton warehousing services. Such changes were not necessary for ginners (their total output is purchased by cotton producers in their region) and merchants (no regional disaggregation).

[7] Although cotton cost-of-production data are available, we chose not to alter the consistency of our 1972 model by attempting to impose a later 1970s structure of cotton production alongside the 1972 structure of all other industries. The rising share of power and equipment expenditures for cotton farmers suggests that a change in regional cotton shipments, using the 1972 structure of production, would primarily understate changes in output in industries supplying (1) power and equipment and (2) inputs to power and equipment suppliers. The bias introduced may be offset by changes in the structure of production in other industries during the 1970s, and is mitigated somewhat by examining production changes among cotton regions rather than overall production increases due to demand expansion.

cotton regions reveals an increase in resource demands on some industries (such as agriculture, forestry, and fisheries) and a decline in others (such as mining and manufacturing). More intensive use of lime and agricultural chemicals in the East accounts for the decline in demand for mining and manufacturing output. Larger transportation and water costs in the West account for the increase in economic activity in the transportation, communications, and utilities industries. Economy-wide, the cotton production redistribution results in declining output sales totaling $60 million.

This is a first step in an adjustment process. These released resources may be used for increasing non-agricultural production, production of other crops on land formerly in cotton, production of cotton on land formerly in other crops, or they may be idled. Although specific knowledge of all such adjustments is necessary to compute all eventual output changes for a "final" equilibrium, some primary crop adjustments have become apparent. Cotton acreage in the Southeast has gone into corn and soybeans, and in the South Central region into rice and soybeans. Cotton has displaced sorghum in the Southwest and also a variety of grain and vegetable crops and non-crop uses in the West.

Besides providing policymakers with a different perspective on impacts of policy-induced crop adjustments, such as a small-farms policy, implications may be drawn from commodity I-O models for industries particularly affected by regional dislocations. Problems with sales, production capacity, and employment (using employment multipliers) may be identified at national and local levels. National output changes will often occur primarily in the region where the dislocation occurs. For example, private sector firms in the Southeast involved in areas such as cotton custom harvesting, scouting, and pesticide sales could use the disaggregated I-O industry impacts to project consequences for their firms.

CONCLUSIONS

The production of cotton is strongly interrelated with the U.S. economic system. Changes in regional cotton output levels result in significant, but varying levels of output and resource use in many other sectors, such as chemicals, agricultural services, finance and insurance, transportation, and trade. The economic importance of these impacts is further illuminated when national policies and actions are evaluated on a regional basis. Development and use of national I-O models, with regional commodity detail, can provide an effective method for measuring the distributional effects of both national and regional adjustments.

From a methodology perspective, disaggregation of a national I-O model can be a lengthy accounting exercise. Data availability is also a constraint on sector detail and accuracy. Regional commodity disaggregation in a national model, for many types of analyses, requires generation of before and after total requirements tables. Thus, model use becomes slightly more complex than the often sufficient technique of changing final demand and measuring the resulting impacts.

This article employs a commodity I-O model to estimate effects of regional cotton production shifts since 1970. The workings of regional comparative advantage, permitted to operate for a variety of reasons, including government policy, are examined by measurement of changes in resource use. The results show the extent of freed resources due not only to the mobility of cotton production, but also due to an exhaustive network of industrial dependencies with the cotton system. The diversity and comprehensiveness of these results and their implications for policymakers and private sector firms suggest that disaggregated I-O models are a useful tool for commodity analysis.

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