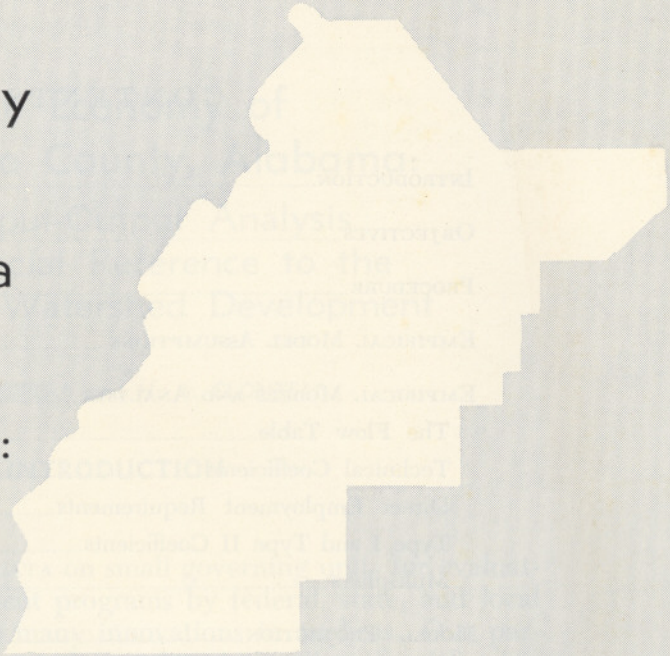
The Economy of Talladega County, Alabama:



An Input-Output Analysis with Special Reference to the Effects of Watershed Development

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FOREWORD

The authors wish to acknowledge the assistance and cooperation of the U.S. Department of Agriculture, Soil Conservation Service. Personnel in both the Alabama State Office and in Talladega County were quite helpful in all aspects of this study.

Gratitude also is expressed to Dr. Wayne C. Curtis, Associate Professor of Economics, Troy State University, formerly of the Department of Agricultural Economics and Rural Sociology, Auburn University. Dr. Curtis served as co-leader of this project while he was at Auburn. A large portion of the theoretical and statistical material in this study was contributed by Dr. Curtis.

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The Economy of Talladega County, Alabama:

An Input-Output Analysis with Special Reference to the Effects of Watershed Development

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INTRODUCTION

The need to obtain data on small governing units for evaluating proposed development programs by federal, state, and local governments has led to many innovations in analysis. One particular technique quite popular at the state and national level is input-output analysis. Input-output analysis provides a quantitative measure of the interdependence of various sectors of the economy. The technique is most favorable for state and national studies because of the large amounts of data collected from smaller governmental units. Generally, there has been a reluctance to apply the technique to small areas, such as a county in a state, because the data disaggregation problem was so great. Also, at local levels, data disclosure problems related to small or individual firm industries in many cases prohibited complete analysis for the area. This lack of available data at larger area levels, e.g., state or regional, was overcome by adjusting national coefficients to represent the production and consumption patterns of the study area. Numerous questions have been raised about the validity of applying this procedure in areas of small size, such as counties. However, the high cost of obtaining primary data and general limits on data available in local areas tend to force the use of adjusted coefficients and secondary data, if such studies are conducted. Few studies have been conducted on this basis.

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This study was an application of input-output analysis using secondary data and adjusted national or state coefficients. The analysis was conducted to measure the relative interdependence of industries and households in Talladega County, Alabama, and to estimate the influence one expenditure program had on the county economy.

The U.S. Department of Agriculture, Soil Conservation Service, worked for many years on problems associated with flooding in small watershed areas throughout the United States. In 1954, new impetus was gained for this work through passage of the Watershed Protection and Flood Prevention Act of 1954, commonly referred to as Public Law 566. This program enabled local communities, with financial and technical help from the State and Federal government, to control and develop small watersheds.

Watershed development originally was initiated to provide flood protection to landowners in drainage areas. Simultaneous with flood protection, conserving practices were to be initiated to increase land productivity and income. Preproject planning for early developments consisted primarily of engineering designs to satisfy the physical requirements of flood control. Economic aspects included nominal estimates of benefits and costs which may occur over the life of the project. Many of the early estimates of benefits and costs were based on somewhat limited data. Thus, several instances occurred where actual benefit-cost ratios did not closely approximate the original estimates.

Many problems, in addition to cost overruns, eventually led to a decision to develop new project evaluation procedures. In order to develop new procedures for project evaluations, the impact of previous development efforts must be considered. This report is based on the results of a study of the impact of Cheaha Creek watershed development on the economy of Talladega County, Alabama. Funds for watershed development were derived primarily from federal government sources. Actual federal expenditures during the development period are shown in Table 1.

Cheaha Creek Watershed was chosen for study for several reasons: (1) The development was begun in 1962-63 just after procedures for project evaluation based on Senate Document 97 ("The Green Book") were published. (2) All structural developments in the watershed were completed by the end of 1971. (3) Cheaha Creek Watershed comprises an area of 72,934 acres of

which approximately 99 per cent lies within Talladega County. Land in this watershed accounts for approximately 15 per cent of the total county land area. Thus, a significant portion of the county is directly influenced by activities within the watershed area.

Table 1. Federal Expenditures for Cheaha Creek Watershed Development by Years, 1965-1972, Talladega County, Alabama[1]

Year	Expenditure
1965	$ 82,899
1966	222,117
1967	204,655
1968	119,179
1969	221,988
1970	299,462
1971	2,863
1972	7,415
Total	$1,160,568

[1] Figures obtained from the State Soil Conservation Service Office.

Talladega County is located in east-central Alabama. The county economy is based largely on textile manufacturing. However, a significant portion of county income is derived from agricultural and forest product sales. The population of Talladega county is a rural-urban mix with the cities of Talladega and Sylacauga having populations in excess of 10,000 persons.

Total population in Talladega County declined slightly between 1960 and 1970. U.S. Census counts showed the population in 1960 to be 65,495. By 1970, the total had dropped 0.3 per cent to 62,280. Urban areas accounted for 54 per cent of the county residents in 1960, but only 53 per cent in 1970. The slight increase in rural residents was not consistent with state trends. However, migration of urban residents to rural subdivisions was believed to account for most of the change. Actual farm population declined during the period, *(49)*.

Talladega County had 1,151 farmers in 1964. This included 590 full-time and 561 part-time farmers. By 1969 there were only 827 farmers, with 376 full-time and 451 part-time operators in the county. Perhaps the more important aspects of these changes were that as farm numbers declined, off-farm employment (part-time farmers) increased approximately six per cent, *(26)*.

Approximately half of the Cheaha watershed lies in the Talladega Mountain portion of the Blue Ridge Mountains and half lies in the Appalachian Valley and Ridge section of the Appalachian Highlands, Figure 1. The mountainous area is underlain by Talla-

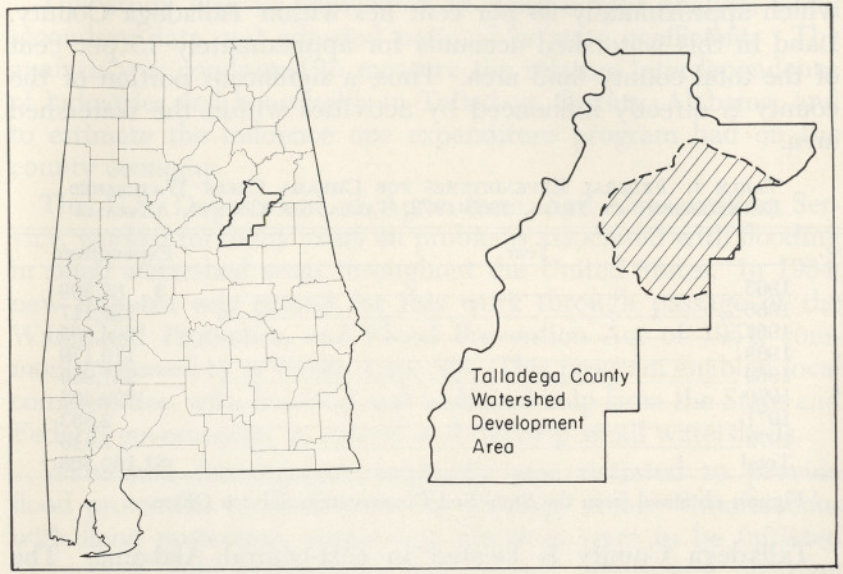

FIG. 1. Shows the location of Talladega County within Alabama and the location of the Talladega County Watershed Development Area within Talladega County.

dega slate, and the soils are derived from that source. There is virtually no agricultural land in this portion of the watershed. Soils in the lower portion of the watershed were developed from dolomitic limestone and shale. Bottomland soils are Lobelville and Lee.

OBJECTIVES

The overall objective of this study was to estimate the impact of watershed development on the economy of Talladega County. Accomplishment of this objective required sub-objectives. They were to: (1) Determine the flow of goods and services among the various sectors of the Talladega County economy. (2) Derive output, income, and employment multipliers for use in estimating the effects of federal expenditures for watershed development. (3) Develop a predictive model for measuring future expenditures in various sectors of the county economy.

PROCEDURE

Two models of the economy were developed, one for 1963 production and the other for 1967. The first year was chosen because Cheaha Creek Watershed was approved for development in that year. Thus, analysis of the economy before development

was possible. The year, 1967, was chosen partially on the basis of data availability and partially on the decision that 1967 represented a mid-point with respect to construction activities. Data for 1971 were desired but were not available at the time of the study.

Although 1967 was a good year for obtaining data on the county economy, it was not a truly representative year for all sectors. Agricultural productivity suffered a major decline that year due to adverse weather conditions. As a result, interactions of the agricultural sector with other sectors were reduced. Hence, caution in interpreting the results of this study with respect to 1967 agricultural activity is encouraged.

Data on the economy of Talladega County were examined to determine the number and size of the various sectors into which the economy could be divided. Secondary data were used throughout the study to insure consistency. Limitations on these data, plus some disclosure problems resulted in several components of the economy being combined into one sector. Final data combinations yielded eleven sectors – nine endogenous, one exogenous, and one treated as both, Appendix.

Endogenous sectors were those sectors whose activity was determined within the county economy. *Agriculture* consisted of livestock and crops production and farm forestry. *Manufacturing* was a combination of agricultural processing, textiles and apparel, lumber and wood products, and other manufacturing. *Transportation, communications, and public utilities* were aggregated into one sector. *Service and mining* were combined into one sector. *Construction; wholesale and retail trade; finance, insurance, and real estate; state and local government;* and *federal government* were designated as separate sectors.

Exogenous sectors were those whose activity was determined outside of the county economy. These sectors were derived and included *households* and *exports-imports*. Most sector data were developed from published secondary data using a modified state input-output model, *(9)*. In some cases, incomplete data were compiled using estimates derived from state-federal and state-county ratios.

EMPIRICAL MODEL ASSUMPTIONS

The empirical model used in this study follows the theoretical model developed by Leontiff *(20)* and more recently reported by Curtis and Waldrop, *(10)*. The approach taken to analyze the

economy of a small economic unit, Talladega County, required several important assumptions as well as a careful development of sector components.

The first assumption in developing the empirical model was that technical coefficients were fixed. This meant that technology was constant, optimum scale of production had been reached, external economies and diseconomies did not exist and price ratios were constant. Therefore, substitution effects were not considered a problem in the analysis.

Second, no errors of aggregation were assumed to occur. As the number of sectors increased, aggregation errors decreased. Hence, model accuracy increased with size.

State and local sectors were assumed to use a constant mix of labor and capital. Such linear assumptions may have caused some inaccuracy in multipliers, but the assumptions were necessary because of time and data constraints.

EMPIRICAL MODELS AND ANALYSIS

Input-output models consist of three basic tables – an interindustry flow table, a technical coefficients table, and a table of interdependence coefficients. The basic flow table is used to derive the latter two data sets. Sectoral output determination is in turn required to develop the flow table. Thus, all input-output analyses require a sequential flow of data with each step being a prerequisite for the subsequent procedure. Final derivation of multipliers for employment, output, and income are the goals of the entire procedure.

The Flow Table

The transaction or interindustry flow table for an economy describes the interaction of the various sectors as they exist. Each sector is developed around relatively homogenous products. The total output of a sector may be used within the endogenous sectors of the economy, or dispersed into the exogenous economy. Usually some of the output will go to each of the areas.

The upper left section of the flow table is comprised of the sectors that are determined by the model, or the endogenous sectors. These are the producing sectors of the economy. Households and exports-imports are the only exogenous sectors or "outside connectors" with the economy.

Mathematically, the flow of transactions between sectors may be expressed by the following equation:

$$(1) \qquad \sum_{j=1}^{n} X_{ij} + Y_i = X_i \quad (i = 1, 2, \ldots, n)$$

where

X_{ij} = amount of output sector i ships to sector j,
Y_i = final demand for output of sector i,
X_i = total output of sector i.

Each column entry in the flow table indicates a purchase by the sector named at the top of each column, from the industry named at the left of the row. For example, in 1963 the construction sector, shown in Table 2, purchased $2,000 from the agricultural sector, $1,000 from itself, $158,000 from the manufacturing sector, and so forth down the column. In 1967, construction, shown in Table 3, purchased $3,000 from agriculture, $2,000 from itself, $256,000 from manufacturing etc.[1]

Each row entry represents a sale of goods by the sector named at the left of the row to the sector identified at the top of the column. The construction sector, in 1963 shown in Table 2, sold $59,000 to the agricultural sector, $1,000 to itself, $199,000 to the manufacturing sector, and so forth across the row. In 1967, Table 3, construction sold $63,000 to agriculture, $2,000 to itself, $244,000 to manufacturing, etc.

The state and local government and federal government sectors were considered endogenously determined. This procedure allowed measurement of the interaction of those sectors with the processing sector. Only continuous type federal government expenditures were handled in this way. These expenditures included wages and salaries and normal purchases for daily operations.

[1] The example using construction effects is followed throughout this report. Construction activities were the primary means whereby federal funds for watershed development were injected into the economy of Talladega County.

TABLE 2. INTERINDUSTRY FLOWS OF GOODS AND SERVICES, TALLADEGA COUNTY, ALABAMA, 1963

Industry producing	Industry purchasing						
	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining
	(Thousand dollars)						
Agriculture	1,041	2	2,997	2	0	16	4
Construction	59	1	199	127	16	91	32
Manufacturing	887	158	16,356	173	117	13	256
Transportation, communications, and public utilities	87	54	1,651	220	58	15	179
Wholesale and retail trade	315	348	4,019	148	143	44	202
Finance, insurance, and real estate	136	16	529	82	169	149	129
Service and mining	38	28	564	111	84	33	74
State and local government	3	3	47	199	48	27	17
Federal government	0	0	11	3	6	3	2
Total endogeneous sectors	2,566	610	26,373	1,065	641	391	895
Imports	323	4,506	89,338	2,742	4,878	2,399	1,093
Households	2,475	1,744	46,372	2,015	8,430	987	2,964
Total outlay	5,364	6,860	162,083	5,822	13,949	3,777	4,952

TABLE 2. INTERINDUSTRY FLOWS OF GOODS AND SERVICES, TALLADEGA COUNTY, ALABAMA, 1963—*(Continued)*

Industry producing	Industry purchasing					
	State and local government	Federal government	Total endogenous sectors	Exports	Households	Total output
			(Thousand dollars)			
Agriculture	0	46	4,108	202	1,054	5,364
Construction	624	2	1,151	0	5,709	6,860
Manufacturing	42	1	18,003	118,057	26,023	162,083
Transportation, communications, and public utilities	112	23	2,399	1	3,422	5,822
Wholesale and retail trade	39	4	5,262	0	8,687	13,949
Finance, insurance, and real estate	37	4	1,251	0	2,526	3,777
Service and mining	37	2	971	2	3,979	4,952
State and local government	8	0	352	986	7,784	9,122
Federal government	0	0	25	0	737	762
Total endogeneous sectors	899	82	33,522	119,248	59,921	212,691
Imports	4,006	20	109,305	0	38,614	147,919
Households	4,217	660	69,864	28,671	0	98,535
Total outlay	9,122	762	212,691	147,919	98,535	459,145

TABLE 3. INTERINDUSTRY FLOWS OF GOODS AND SERVICES, TALLADEGA COUNTY, ALABAMA, 1967

Industry producing	Industry purchasing						
	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining
	(Thousand dollars)						
Agriculture	877	3	2,880	3	0	48	9
Construction	63	2	244	225	18	341	96
Manufacturing	856	256	18,023	276	120	43	699
Transportation, communications, and public utilities	97	101	2,107	407	70	59	566
Wholesale and retail trade	230	425	3,349	178	111	118	416
Finance, insurance, and real estate	242	49	1,077	242	321	928	650
Service and mining	50	61	841	241	117	149	273
State and local government	3	5	52	318	49	92	48
Federal government	0	0	8	3	4	6	3
Total endogeneous sectors	2,418	902	28,581	1,893	810	1,784	2,760
Imports	370	7,356	98,922	4,189	4,853	7,600	2,677
Households	2,389	2,815	51,097	3,220	8,646	3,321	8,105
Total outlay	5,177	11,073	178,600	9,302	14,309	12,705	13,542

TABLE 3. INTERINDUSTRY FLOWS OF GOODS AND SERVICES, TALLADEGA COUNTY ALABAMA, 1967—*(Continued)*

Industry producing	Industry purchasing					
	State and local government	Federal government	Total endogenous sectors	Exports	Households	Total output
			(Thousand dollars)			
Agriculture	0	36	3,856	0	1,321	5,177
Construction	965	2	1,956	1	9,116	11,073
Manufacturing	59	1	20,333	120,892	37,375	178,600
Transportation, communications, and public utilities	180	24	3,611	1	5,690	9,302
Wholesale and retail trade	40	3	4,870	0	9,439	14,309
Finance, insurance, and real estate	94	6	3,609	2,374	6,722	12,705
Service and mining	69	3	1,804	4,011	7,727	13,542
State and local government	12	0	579	925	11,180	12,684
Federal government	0	0	24	0	667	691
Total endogeneous sectors	1,419	75	40,642	128,204	89,237	258,083
Imports	5,401	18	131,386	0	52,280	183,666
Households	5,864	598	86,056	55,461	0	141,517
Total outlay	12,684	691	258,084	183,665	141,517	583,266

Technical Coefficients

Technical or direct coefficients were calculated from the flow tables. Purchases by a sector were divided by total output from that sector for this purpose. This equation took the form:

$$(2) \qquad a_{ij} = \frac{X_{ij}}{X_j}$$

where

a_{ij} = technical coefficient,
X_{ij} = value of shipments from sector i to sector j,
X_j = total output of sector j.

The coefficients thus estimate the input requirements for each dollar of output. This procedure was based on the assumption that the relationship between purchases of a sector and the level of output of that sector was linear. For example, in 1963, for each $10,000 of output produced by the construction industry, the following approximate intersectoral purchases were necessary: $2.90 from agriculture, $1.50 from construction, $230 from manufacturing, etc., Table 4. In 1967, Table 5, construction purchases per $10,000 in output was $2.70 from agriculture, $1.80 from itself, and $231 from manufacturing. In both years, the largest purchases necessary were from imports and households.

When households were considered exogenous to the economy, construction required over 90 per cent of its inputs from outside the economy. The total endogenous purchases amounted to only $889 in 1963, for each $10,000 in output by the construction sector. The interaction of construction with the remainder of the Talladega County economy was expected to be limited. These data strongly support this hypothesis.

Direct Employment Requirements

Direct employment requirements were calculated by dividing total sectoral output in thousands of dollars into number of people employed in the respective sectors. Employees required in the construction sector in 1963, Table 6, totaled 1.01 people per $10,000 in value of output. By 1967, employment requirements

TABLE 4. TECHNICAL COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1963[1]

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government	Households
Agriculture	.19407	.00029	.01849	.00034	.00000	.00424	.00081	.00000	.06037	.01070
Construction	.01100	.00015	.00123	.02181	.00115	.02409	.00646	.06841	.00262	.05794
Manufacturing	.16536	.02303	.10091	.02971	.00839	.00344	.05170	.00460	.00131	.26410
Transportation, communications, and public utilities	.01622	.00787	.01019	.03779	.00416	.00397	.03615	.01228	.03018	.03473
Wholesale and retail trade	.05872	.05073	.02480	.02542	.01025	.01165	.04079	.00428	.00525	.08816
Finance, insurance, and real estate	.02535	.00233	.00326	.01408	.01212	.03945	.02605	.00406	.00525	.02564
Service and mining	.00708	.00408	.00348	.01907	.00602	.00874	.01494	.00406	.00262	.04038
State and local government	.00056	.00044	.00029	.03418	.00344	.00715	.00343	.00088	.00000	.07900
Federal government	.00000	.00000	.00007	.00052	.00043	.00079	.00040	.00000	.00000	.00748
Total endogenous sectors	.47836	.08892	.16272	.18292	.04596	.10352	.18073	.09857	.10760	.60813
Imports	.06022	.65685	.55119	.47097	.34970	.63516	.22072	.43916	.02625	.39188
Households	.46141	.25423	.28610	.34610	.60434	.26132	.59855	.46229	.86614	.00000
Total	1.00001	1.00000	1.00001	.99999	1.00000	1.00000	1.00000	1.00002	.99999	1.00000

[1] Direct purchases per dollar of output.

TABLE 5. TECHNICAL COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1967[1]

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government	Households
Agriculture	.16940	.00027	.01613	.00032	.00000	.00378	.00066	.00000	.05210	.00933
Construction	.01217	.00018	.00137	.02419	.00126	.02684	.00709	.07608	.00289	.06442
Manufacturing	.16535	.02312	.10091	.02967	.00839	.00338	.05162	.00465	.00145	.26410
Transportation, communications, and public utilities	.01874	.00912	.01180	.04375	.00489	.00464	.04180	.01419	.03473	.04021
Wholesale and retail trade	.04443	.03838	.01875	.01914	.00776	.00929	.03072	.00315	.00434	.06670
Finance, insurance, and real estate	.04675	.00443	.00603	.02602	.02243	.07304	.04800	.00741	.00868	.04750
Service and mining	.00966	.00551	.00471	.02591	.00818	.01173	.02016	.00544	.00434	.05460
State and local government	.00058	.00045	.00029	.03419	.00342	.00724	.00354	.00095	.00000	.07900
Federal government	.00000	.00000	.00004	.00032	.00028	.00047	.00022	.00000	.00000	.00471
Total endogeneous sectors	.46708	.08146	.16003	.20351	.05661	.14041	.20381	.11187	.10853	.63057
Imports	.07147	.66432	.55387	.45033	.33916	.59819	.19768	.42581	.02605	.36943
Households	.46146	.25422	.28610	.34616	.60424	.26139	.59851	.46231	.86541	.00000
Total	1.00001	1.00000	1.00000	1.00000	1.00001	.99999	1.00000	.99999	.99999	1.00000

[1] Direct purchases per dollar of output.

TABLE 6. DIRECT EMPLOYMENT REQUIREMENTS, TALLADEGA COUNTY, ALABAMA, 1963, 1967[1]

Year	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government	Households
1963	.18270	.10058	.05355	.07558	.14983	.07943	.29685	.24775	.18373	.17303
1967	.17385	.16707	.05605	.05483	.15515	.02597	.12184	.14317	.25181	.14458

[1] Employees per $1,000 in sector output.

for construction totaled 1.67 persons per $10,000 in output. Services and manufacturing required the high and low extremes of employees per $10,000 of output in 1963. The requirements were 2.96 and 0.54, respectively. Federal government with 2.52 employees per $10,000 of output; and finance, insurance, and real estate with 0.26 employees per $10,000 were the high and low extremes in 1967.

An increase in employment in the construction sector was expected because of the government expenditures in this sector. The construction sector was growing during this period and federal spending provided additional impetus to the sector.

The reduction in employment requirements per $1,000 in output from agriculture probably resulted from technological advances in this area and the decline in production caused by weather conditions. Finance, insurance, and real estate and service and mining were considered to be developing sectors. Therefore, the reduction in employment requirements was explained partially as a more efficient utilization of manpower and partially on the basis of more specialization. Transportation, communications, and public utilities employment changes were explained on the basis of specialization and some over capacity in earlier periods.

The reduction in employment requirements per $1,000 in output from state and local government seemed inconsistent when new state facilities such as vocational trade schools were considered. No data were available to adequately resolve this question.

Construction, manufacturing, and wholesale and retail trade appeared to have been near the optimum scale of production in 1963. Any additional workers would increase production, but the rate of increase appeared to be declining. The increase in federal government employees per $1,000 in output was attributed to the location of additional federal activity in the county. Average salary of government employees was reduced by the influx of more lower ranked individuals.

The introduction of a revised, minimum wage law in 1966 was important. Also, this law increased wages from $1.25 to $1.65 per hour. The effect of this increase was a reduction in employment requirements per $1,000 in output in several key sectors.

Coefficients and Multipliers: Type I and Type II

Two sets of coefficients and multipliers were developed from the technical coefficients matrix in both 1963 and 1967. The difference between the two sets was in the way the household sector was considered. These two sets of coefficients and multipliers are normally called "Type I" and "Type II."

The difference in consideration of the household sector was the only change between Type 1 and Type II coefficients and multipliers. Households used as an endogenous sector resulted in a larger endogenous matrix for the economy. The matrix of Type II coefficients was a ten by ten model, whereas the Type I matrix was nine by nine.

Type I Coefficients

Type I coefficients considered the household sector as exogenous to the model. That is, household activity was not determined by the model. Rather, any interactions with the household sector was considered an injection into the county economy. However, household activity was assumed to occur outside the county in the Type I model.

Interdependence Coefficients

The interdependence coefficients, or direct and indirect coefficients, estimated the output from other sectors required to sustain an increase in production (demand) of $1.00 for the given sector. These were both the direct and indirect effects of a change in output in a particular sector.

Interdependence coefficients were calculated by subtracting the technical coefficients matrix from an identity matrix of the same magnitude. The resulting matrix was inverted to obtain the interdependence coefficients matrix.

Continuing the example, a $10,000 increase in final demand for the construction sector in 1963 required agriculture to increase output by $10, Table 7. Construction output increased by $10,006, and manufacturing output $269. Final output from a $10,000 increase in demand for construction from all sectors would have been $10,992 in 1963. It should be noted that the interdependence tables indicate the combined direct and indirect effects of a change in final demand. Technical coefficients in Tables 4 and 5 show the direct effect of these changes on a sector. For example, approximately $2 of the extra $6 in construction

TABLE 7. TYPE (I) INTERDEPENDENCE COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1963[1]

	Agriculture	Construction	Manufacturing	Transportation, Communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government
Agriculture	1.24635	.00101	.02570	.00146	.00034	.00571	.00263	.00024	.07536
Construction	.01570	1.00063	.00218	.02581	.00190	.02590	.00864	.06898	.00452
Manufacturing	.23200	.02690	1.11801	.03708	.01015	.00661	.06103	.00777	.01691
Transportation, communications, and public utilities	.02454	.00892	.01263	1.04136	.00486	.00523	.03936	.01367	.03311
Wholesale and retail trade	.08208	.05249	.03023	.03030	1.01129	.01466	.04541	.00868	.01155
Finance, insurance, and real estate	.03543	.00347	.00518	.01660	.01307	1.04187	.02905	.00487	.00827
Service and mining	.01115	.00478	.00462	.02089	.00646	.00964	1.01676	.00480	.00408
State and local government	.00219	.00097	.00093	.03594	.00377	.00773	.00523	1.00146	.00129
Federal government	.00010	.00003	.00010	.00057	.00045	.00084	.00048	.00002	1.00003
Type (I) output multipliers[2]	1.64954	1.09920	1.19957	1.21001	1.05228	1.11819	1.20858	1.11048	1.15513

[1] Direct and indirect changes per dollar change in final demand.

[2] Type (I) output multipliers are the total of Type (I) interdependence coefficients. The average output multiplier for the economy was 1.20033.

output was accounted for by direct purchases from the construction sector, Table 5. The remaining $4 resulted from purchases generated by sectoral interaction.

An identical increase in final demand in 1967, Table 8, for construction would have required an increase in agricultural output of $9, construction output of $10,008, and manufacturing output of $270. Approximately $2 of the additional construction output resulted from direct sectoral purchases. A total increase in output of $10,930 from all sectors was needed to support $10,000 in product values supplied to final demand.

Thus, the construction sector did change the source of its inputs slightly between 1963 and 1967, but total effect of the change on the economy appeared insignificant. Construction did not interact to a significant extent with the remainder of the economy. This observation provided one indication that federal expenditures may not greatly affect the county economy.

Indirect Coefficients

Indirect coefficients represent the increase in sector output caused by an increase in consumer demand. This demand increase causes secondary spending which results in further expansion of final output. The intrasector indirect coefficients included the initial increase in final demand as well as the increase caused by secondary spending.

An increase in final demand of $10,000 for construction in 1963, Table 9, would have caused an indirect increase in the value of agricultural output of $7, construction output of $5 and manufacturing output of $39. Construction output would actually increase by $10,005 since $10,000 was needed to satisfy final output demands.[2]

The same increase in final demand in 1967, Table 10, would have indirectly increased agricultural output by $6, construction output by $6, and manufacturing output by $39. Construction would have had to increase its output by $10,000 to satisfy final demand and $6 for indirect interindustry demand for a total of $10,006.

[2] Differences in output requirements reported on basis of direct and indirect coefficients may occur because of numerical rounding; e.g. $10,006 in construction output was required on the basis of interdependence and direct coefficients and $10,005 was required on the basis of indirect coefficients. In the former, $4 of the extra $6 was attributed to indirect effects, whereas the latter statistic shows $5 due to indirect effects.

TABLE 8. TYPE (I) INTERDEPENDENCE COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1967[1]

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government
Agriculture	1.20866	.00089	.02175	.00134	.00034	.00510	.00231	.00024	.06311
Construction	.01783	1.00083	.00256	.02930	.00247	.02997	.01046	.07693	.00516
Manufacturing	.22535	.02702	1.11741	.03779	.01036	.00692	.06152	.00822	.01512
Transportation, communications, and public utilities	.02796	.01043	.01469	1.04862	.00590	.00651	.04617	.01608	.03821
Wholesale and retail trade	.06070	.03973	.02276	.02344	1.00877	.01220	.03478	.00693	.00876
Finance, insurance, and real estate	.06556	.00660	.00968	.03224	.02517	1.08049	.05573	.00940	.01430
Service and mining	.01514	.00646	.00630	.02887	.00897	.01351	1.02316	.00663	.00642
State and local government	.00247	.00102	.00101	.03632	.00388	.00816	.00576	1.00165	.00151
Federal government	.00007	.00002	.00007	.00037	.00030	.00052	.00028	.00001	1.00002
Type (I) output multipliers[2]	1.62374	1.09300	1.19623	1.23830	1.06615	1.16339	1.24017	1.12609	1.15261

[1] Direct and indirect changes per dollar change in final demand.
[2] Type (I) output multipliers are the total of Type (I) interdependence coefficients. The average output multiplier for the economy was 1.21108.

TABLE 9. TYPE (I) INDIRECT COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1963

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government
Agriculture	1.05228	.00072	.00721	.00111	.00034	.00148	.00182	.00024	.01499
Construction	.00470	1.00048	.00096	.00400	.00075	.00181	.00218	.00058	.00190
Manufacturing	.06664	.00386	1.01710	.00736	.00176	.00317	.00933	.00316	.01560
Transportation, communications, and public facilities	.00832	.00105	.00244	1.00357	.00070	.00126	.00321	.00139	.00293
Wholesale and retail trade	.02336	.00176	.00543	.00488	1.00104	.00301	.00462	.00440	.00630
Finance, insurance, and real estate	.01008	.00114	.00191	.00252	.00095	1.00242	.00300	.00081	.00302
Service and mining	.00406	.00070	.00114	.00182	.00043	.00090	1.00182	.00074	.00145
State and local government	.00163	.00054	.00064	.00176	.00033	.00058	.00179	1.00058	.00129
Federal government	.00010	.00003	.00003	.00006	.00002	00005	.00007	.00002	1.00003

TABLE 10. TYPE (I) INDIRECT COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1967

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government
Agriculture	1.03926	.00062	.00563	.00102	.00034	.00133	.00164	.00024	.01101
Construction	.00566	1.00065	.00119	.00511	.00121	.00313	.00337	.00085	.00227
Manufacturing	.06001	.00390	1.01649	.00812	.00197	.00354	.00990	.00356	.01367
Transportation, communications, and public utilities	.00923	.00131	.00290	1.00486	.00101	.00187	.00437	.00189	.00348
Wholesale and retail trade	.01627	.00135	.00401	.00431	1.00101	.00292	.00406	.00378	.00442
Finance, insurance, and real estate	.01882	.00217	.00365	.00622	.00274	1.00745	.00773	.00199	.00562
Service and mining	.00548	.00095	.00159	.00296	.00079	.00178	1.00300	.00119	.00208
State and local government	.00189	.00057	.00072	.00214	.00045	.00092	.00221	1.00070	.00151
Federal government	.00007	.00002	.00002	.00005	.00002	.00005	.00006	.00001	1.00002

The intraeconomy interaction of construction is further shown to be low by the indirect coefficients. Construction had very little effect on the local economy. And, construction was the primary means whereby watershed development funds were injected into the economy.

Type II Coefficients

When households were considered as an endogenous sector of the economy, Type II coefficients could be developed. Activities of households were considered determined by the model. Thus, interaction with the household sector was completely within the economy.

Interdependence Coefficients

Interdependence coefficients were developed using the same procedure as for Type I, the only difference being that in this case households were considered as an endogenous sector of the economy.

The output necessary by each sector to support a $1.00 increase in output for final demand of the respective sector was the basis for these coefficients. These were the total economic interactions within the economy caused by increased sales by each sector.

For construction firms to increase output to consumers they would need support from other sectors in the economy because they are interdependent. Since the interrelations between agriculture and construction were quite low in 1963, only $97 worth of products would be purchased by construction, per $10,000 in consumer sales, in the agricultural sector, Table 11. The total output contractors sold to each other and to other sectors amounted to $10,281. This amount was allocated to final consumers and other endogenous sectors in the economy. A total of $10,000 went to consumers and $281 was purchased by the various interdependent sectors. Agricultural purchases of contractor services amounted to $813, per $10,000 increase in consumer demand for agricultural products.

An increase in agricultural output of $82 would have been necessary in 1967, to support construction sales of $10,000 to consumers, Table 12. These consumer sales by construction required $10,314 worth of construction products. The remaining quantities were sold to other sectors. Examination of the dependence of agriculture upon construction activities revealed that a

TABLE 11. TYPE (II) INTERDEPENDENCE COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1963[1]

	Agriculture	Construction	Manufacturing	Transportation, Communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government	Households
Agriculture	1.26722	.00974	.03611	.01392	.01847	.01452	.02235	.01464	.10231	.02896
Construction	.08128	1.02808	.03491	.06500	.05886	.05358	.07062	.11422	.08922	.09102
Manufacturing	.53365	.15316	1.26853	.27213	.27213	.13392	.34609	.21582	.40648	.41864
Transportation, communications, and public utilities	.06784	.02704	.03423	1.06723	.04246	.02350	.08027	.04353	.08903	.06009
Wholesale and retail trade	.18607	.09602	.08211	.09243	1.10161	.05855	.14368	.08040	.14585	.14431
Finance, insurance, and real estate	.06710	.01673	.02098	.03552	.04057	1.05523	.05897	.02671	.04917	.04395
Service and mining	.05531	.02326	.02666	.04727	.04481	.02827	1.05849	.03525	.06110	.06128
State and local government	.08277	.03470	.04114	.08409	.07375	.04174	.08138	1.05704	.10536	.11183
Federal government	.00763	.00319	.00386	.00507	.00699	.00402	.00759	.00521	1.00976	.01045
Households	.98949	.41416	.49373	.59119	.85939	.41761	.93506	.68244	1.27786	1.37320
Type (II) output multipliers[2]	3.33836	1.80608	2.04226	2.21903	2.51901	1.83095	2.80451	2.27524	3.33613	2.34372

[1] Direct, indirect, and induced changes per dollar change in final demand.
[2] Type (II) output multipliers are the total of Type (II) interdependence coefficients. The average Type (II) output multiplier for the economy was 2.45153.

TABLE 12. TYPE (II) INTERDEPENDENCE COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1967[1]

	Agri-culture	Con-struction	Manu-facturing	Trans-portation, commu-nications, and public utilities	Whole-sale and retail trade	Finance, insur-ance, and real estate	Service and mining	State and local govern-ment	Federal govern-ment	House-holds
Agriculture	1.22592	.00819	.03053	.01216	.01585	.01290	.01927	.01259	.08595	.02464
Construction	.09014	1.03141	.03931	.07460	.06743	.06262	.08150	.12868	.10085	.10323
Manufacturing	.52095	.15203	1.26764	.22298	.27592	.14040	.35191	.21974	.40628	.42197
Transportation, communications, and public utilities	.07793	.03156	.04009	1.07992	.05079	.02907	.09525	.05183	.10433	.07132
Wholesale and retail trade	.13850	.07264	.06231	.07219	1.07866	.04734	.11121	.06261	.11172	.11107
Finance, insurance, and real estate	.12529	.03186	.04003	.06966	.07883	1.10746	.11441	.05214	.09334	.08526
Service and mining	.07419	.03143	.03631	.06586	.06201	.04017	1.08117	.04889	.08456	.08429
State and local government	.08171	.03454	.04129	.08597	.07507	.04394	.08360	1.05836	.10637	.11312
Federal government	.00472	.00199	.00243	.00328	.00448	.00262	.00485	.00334	1.00618	.00664
Households	.96736	.40913	.49166	.60603	.86904	.43682	.95030	.69224	1.28010	1.38092
Type (II) output multipliers[2]	3.30671	1.80478	2.05160	2.29265	2.57808	1.92335	2.89347	2.33041	3.37968	2.40247

[1] Direct, indirect, and induced changes per dollar change in final demand.
[2] Type (II) output multipliers are the total of Type (II) interdependence coefficients. The average Type (II) output multiplier for the economy was 2.49632.

$10,000 increase in agricultural sales would depend on an increase of $819 in construction output.

Indirect Coefficients

Computations to develop indirect coefficients are explained under "Indirect Coefficients (Type I)." Indirect coefficients for construction are shown in Tables 13 and 14. These coefficients indicate that agriculture had to produce $95, construction $10,279, and manufacturing $1,301, in 1963 in additional output for construction to supply $10,000 to satisfy final consumer demand. Agriculture had to produce $79, construction $10,312, and manufacturing $1,289 in additional output to satisfy an increase in final demand of $10,000 from construction in 1967. Obviously, the construction industry was heavily dependent on the manufacturing sector for a large portion of its inputs. However, since most raw product processing was considered as part of the manufacturing sector, this was not unusual.

The effect of the household expenditures of income generated by the construction sector can be seen by comparing "Type I and Type II Indirect Coefficients." The increase suggests that household multiplier effects are highly significant.

Multipliers

Multipliers form the basis for the predictive capacity of an input-output study. Output multipliers show the total interaction that occurs when any sector changes output. Income multipliers reflect the total change in income in the economy when household income changes in any one sector. An employment change in one sector also has repercussions throughout the economy. Total changes in employment resulting from a change in one sector is measured by employment multipliers.

Output Multipliers

Output multipliers indicate the level of output resulting from a change in final demand for the products of any particular sector. These multipliers were calculated directly from the interdependence coefficients, Tables 7, 8, 11, 12. Individual sector column coefficients were added to derive the multipliers.

Type I Multipliers

Output multipliers derived under the assumption that households were exogenous are shown in Tables 7 and 8. The output multipliers for the construction sector were 1.099 and 1.093 in

TABLE 13. TYPE (II) INDIRECT COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1963[1]

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government	Households
Agriculture	1.07315	.00945	.01762	.01358	.01847	.01028	.02154	.01464	.04194	.01827
Construction	.07029	1.02793	.03368	.04318	.05771	.02949	.06416	.04581	.08660	.03308
Manufacturing	.36829	.13013	1.16762	.18759	.26375	.13048	.29440	.21121	.40517	.15454
Transportation, communications, and public utilities	.05162	.01917	.02405	1.02944	.03830	.01953	.04412	.03125	.05884	.02536
Wholesale and retail trade	.12735	.04529	.05732	.06701	1.09135	.04690	.10289	.07612	.14060	.05615
Finance, insurance, and real estate	.04175	.01440	.01772	.02144	.02846	1.01578	.03292	.02265	.04392	.01831
Service and mining	.04822	.01918	.02318	.02820	.03878	.01954	1.04355	.03120	.05848	.02090
State and local government	.08221	.03426	.04085	.04991	.07031	.03459	.07794	1.05616	.10536	.03283
Federal government	.00763	.00319	.00379	.00456	.00656	.00323	.00719	.00521	1.00976	.00297
Households	.52808	.15994	.20763	.24509	.25502	.15629	.33651	.22015	.41172	1.37320

[1] Indirect and induced changes per dollar change in final demand.

TABLE 14. TYPE (II) INDIRECT COEFFICIENTS, TALLADEGA COUNTY, ALABAMA, 1967

	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining	State and local government	Federal government	Households
Agriculture	1.05652	.00792	.01440	.01184	.01585	.00912	.01860	.01259	.03385	.01531
Construction	.07797	1.03123	.03794	.05041	.06617	.03578	.07441	.05260	.09796	.03881
Manufacturing	.35561	.12891	1.16673	.19331	.26753	.13702	.30029	.21509	.40484	.15787
Transportation, communications, and public utilities	.05919	.02244	.02829	1.03617	.04589	.02443	.05346	.03764	.06960	.03112
Wholesale and retail trade	.90407	.03426	.04356	.05305	1.07091	.03805	.08049	.05945	.10738	.04437
Finance, insurance, and real estate	.07854	.02743	.03400	.04364	.05640	1.03442	.06641	.04473	.08466	.03776
Service and mining	.06453	.02592	.03160	.03996	.05384	.02844	1.06101	.04345	.08022	.02969
State and local government	.08113	.03409	.04100	.05178	.07164	.03670	.08006	1.05741	.10637	.03412
Federal government	.00472	.00199	.00239	.00296	.00420	.00215	.00463	.00334	1.00618	.00193
Households	.50589	.15491	.20577	.25987	.26481	.17542	.35179	.22992	.41469	1.38092

1963 and 1967, respectively. This indicates that a one-dollar change in final demand for construction would have caused a change in total output of the economy of $1.10 in 1963. In more realistic terms, a $10,000 change in construction output would have generated a $10,992 change in the total economy in 1963 and $10,930 in 1967. The share of the total output change in each year generated by interaction among firms in the construction industry was $6 and $8, respectively. In other words, the remainder of the economy would have generated less than 10 percent of the total output. The relatively low level of interaction of construction with the remainder of the economy meant that changes in that sector would not cause any major change in the county economy.

Agriculture, on the other hand, would have generated $16,495 in total output for each $10,000 increase in agricultural production in 1963. The impact of agricultural production on the county economy dropped slightly in 1967. A $10,000 shift in agricultural output generated a shift of $16,237 in total output. Most of the output generated by the agricultural sector was accounted for by firms within the sector itself. Of the total $16,495 change, 76 percent was within the agricultural sector.

It was interesting to note the shifts in agricultural sector interaction between 1963 and 1967, particularly with respect to wholesale and retail trade and to finance, insurance, and real estate. The decline in wholesale and retail trade coupled with an increase in the financial sector indicated a possible declining importance of agriculture as a trade sector, but an increasing importance as a credit and land use sector. The latter increase may reflect increased sales of rural land for residential uses. However, the same data also may be a reflection of the fact that 1967 was a poor year for agricultural production. In that case, the decline in trade and increase in finances would reflect less products available for sale and more credit needed to sustain the farm sector. Additional data are needed to draw more definite conclusions.

Federal government interactions with the remainder of the economy indicated the impact of federal expenditures. The multipliers generated by federal funds in both 1963 and 1967 amounted to approximately $1.15 for each $1.00 in sector output (expenditures). This was accounted for on almost a dollar for dollar basis within the federal government sector itself. The

largest effect of federal spending was found in the agricultural sector where $754 in output per $10,000 in government funds was generated. That amount dropped to $631 in output by agriculture in 1967. This change could have resulted from a shift out of agricultural production or an unusually poor agricultural crop in 1967. The data were not conclusive on this point.

Type II Multipliers

If households are considered endogenous to (within) the economy, a different set of multiplier effects may be observed. For example, in both study years, the total economy output would have increased approximately $18,050 if construction output went up $10,000, Tables 11 and 12. The intraeconomy interaction within the construction sector would have increased by $10,281 in 1963 and $10,314 in 1967. Construction-manufacturing interaction accounted for most of the remaining primary sector output. Of course, households generated the greatest sector output other than construction. Household output increased more than $4,000 for every $10,000 increase in construction output both years.

Household expenditures also created other significant production changes in the economy. Agriculture and federal government output multipliers increased significantly when household were considered as part of the economy.

Labor inputs for the entire economy came from households and imports. Thus, when the households sector was endogenous, the multiplier effect was increased. This occurred because the number of rounds of interaction between the sectors was increased or "multiplied."

Income Multipliers

Income multipliers reflect the total income change in the county economy resulting from each dollar change in income in a single sector. The basic assumption of income multipliers is that some amount of income is generated each time output is increased. Income multipliers were computed by multiplying the interdependence coefficients matrix (Type I and II, respectively) times the household row entry in the technical coefficients table. The latter is referred to as the direct income effect, Tables 15 and 16. The column sums of the multiplication represent direct and indirect income effects. Multipliers were determined by dividing the direct income effect into the total effects for each sector.

TABLE 15. INCOME MULTIPLIERS FOR THE TALLADEGA COUNTY ECONOMY, 1963

	Direct income effect	Indirect income effect	Direct-indirect income effect	Induced income effect	Direct-indirect-induced income effect	Type I income multiplier	Type II income multiplier
Agriculture	.46141	.29970	.76111	.22836	.98949	1.65	2.14
Construction	.25423	.02523	.27946	.13470	.41416	1.10	1.63
Manufacturing	.28610	.05709	.34319	.15054	.49373	1.20	1.73
Transportation, communications, and public utilities	.34610	.07269	.41879	.17240	.59119	1.21	1.71
Wholesale and retail trade	.60434	.03160	.63594	.22345	.85939	1.05	1.42
Finance, insurance, and real estate	.26132	.03089	.29221	.12540	.41761	1.12	1.60
Service and mining	.59855	.12485	.72340	.21166	.93506	1.21	1.56
State and local government	.46229	.05107	.51336	.16908	.68244	1.11	1.48
Federal government	.86614	.13435	1.00049	.27737	1.27786	1.16	1.48
Economy						1.20	1.64

TABLE 16. INCOME MULTIPLIERS FOR THE TALLADEGA COUNTY ECONOMY, 1967

	Direct income effect	Indirect income effect	Direct-indirect income effect	Induced income effect	Direct-indirect-induced income effect	Type I income multiplier	Type II income multiplier
Agriculture	.46146	.28783	.74929	.21807	.96736	1.62	2.10
Construction	.25422	.02364	.27786	.13127	.40913	1.09	1.61
Manufacturing	.28610	.05613	.34223	.14934	.49166	1.20	1.72
Transportation, communications, and public utilities	.34616	.08247	.42863	.17740	.60603	1.24	1.75
Wholesale and retail trade	.60424	.03998	.64422	.22482	.86904	1.07	1.44
Finance, insurance, and real estate	.26139	.04270	.30409	.13273	.43682	1.16	1.67
Service and mining	.59851	.11074	.70925	.24105	.95030	1.18	1.59
State and local government	.46231	.05829	.52060	.17164	.69224	1.13	1.50
Federal government	.86541	.13209	.99750	.28260	1.28010	1.15	1.50
Economy						1.20	1.65

Type I Multipliers

Analysis of the direct and indirect effects of income changes revealed very little income interaction in the county economy in either study year. Type I income multipliers showed a rather homogeneous effect derived from each sector with the exception of agriculture. However, in all cases the magnitude of the direct income effects greatly outweighed the indirect effects indicating very little interaction among the endogenous sectors. The relatively low magnitude of the wholesale-retail trade multiplier suggested that large amounts of these type purchases occurred outside the county. Both the construction and wholesale and retail trade income effects were lower than the average for the entire economy. Federal government, on the other hand, had a large direct income effect which meant that for every one-dollar of output, federal government spent approximately $.87 for wages and salaries. Other sectors of the economy, including agriculture, were more capital intensive. Hence, they spent less for wages and salaries.

The relatively large income effect of the agricultural sector was difficult to interpret in light of the output multipliers reported earlier. Secondary income generated by agricultural production activities was $65 in 1963 and $62 in 1967 per $100 in agricultural income. A partial explanation may be that the large direct income effect in agriculture resulted from a large labor bill. Also, there was a relatively large amount of intrasector activity.

Type II Multipliers

Analysis of household purchases of locally produced goods and services introduced an additional income effect, induced effect, into the results. This addition completed the circular flow of purchases by assuring that a change in the level of household income generated changes in the level of household spending. Spending changes may cause further endogenous output changes and, consequently, further household receipt changes. Thus, Type II income multipliers reflected changes in household payments "induced" by sectoral adjustments which were "induced" by greater household expenditures.

The analysis showed that in 1963 a dollar increase in household income in the agricultural sector eventually generated $.99 of additional receipts to households; while similar increase in the federal government sector generated $1.28 in additional household income; and construction generated only $.41 in income, Table 15.

Type II multipliers were computed by dividing direct income effects into the total economy effects. Each multiplier indicates the extra income generated throughout the economy with a one-unit (one-dollar) increase in income in a particular sector. Type II multipliers are larger than Type I because of the additional round of spending brought about by including households. As shown, agriculture had the largest Type II multipliers of any sector in 1963 and 1967. For each $100 in agricultural income payments, a total of $214 in wages and salaries was generated in the economy in 1963 and $210 in 1967. All remaining sectors had comparable multiplier effects. Apparently, the economy of Talladega County still depended on agricultural output heavily in 1967, even though the agricultural sector apparently was declining relative to the total economy.

Employment Multipliers

Employment multipliers measured the total effect of a change in employment in a sector on employment in the total economy. Employment multipliers were computed using the same procedure followed for income multipliers. Direct employment effects represent employment per thousand dollars of gross output. They were computed by dividing total sectoral employment by total sectoral output. Direct and indirect effects (Type I) were developed by multiplying the direct employment ratio for each sector, Table 6, times each column entry in the interdependence coefficients matrices, Tables 7 and 8. The column sum for each sector represented the direct and indirect employment requirements per thousand dollar change in final demand. Indirect changes were the residual of total, minus direct requirements. Indirect changes reflected the degree of sector interaction with other sectors.

Type I Multipliers

This multiplier reflected the total employment generated in the economy by a change in employment in a particular sector. Agriculture was the most active sector, Tables 17 and 18. A one-unit (person) change in agricultural employment was expected to initiate changes in the total economy until an additional 1.65 units (people) were hired in 1963 and 1.62 units in 1967. Employment effects of the federal government and construction sectors were 1.16 and 1.10, respectively, in 1963. Multipliers for

TABLE 17. EMPLOYMENT EFFECTS AND MULTIPLIERS FOR THE TALLADEGA COUNTY ECONOMY, 1963[1]

	Direct employment effect	Direct-indirect employment effect	Direct-indirect-induced employment effect	Indirect employment effect	Induced employment effect	Type I employment multiplier	Type II employment multiplier
Agriculture	.18270	.30138	.42893	.11868	.12755	1.65	2.35
Construction	.10058	.11057	.13999	.00999	.02942	1.10	1.39
Manufacturing	.05355	.06426	.08292	.01071	.01866	1.20	1.55
Transportation, communications, and public utilities	.07558	.09145	.12717	.01587	.03572	1.21	1.68
Wholesale and retail trade	.14983	.15766	.24866	.00783	.09100	1.05	1.66
Finance, insurance, and real estate	.07943	.08883	.11228	.00940	.02345	1.12	1.41
Service and mining	.29685	.34064	.55494	.04379	.21430	1.15	1.87
State and local government	.24775	.27513	.39462	.02738	.11949	1.11	1.59
Federal government	.18373	.21224	.37817	.02851	.16593	1.16	2.06
Economy						1.19	1.73

[1] Employment effects represent estimated changes in employment resulting from a $1,000 change in output.

TABLE 18. EMPLOYMENT EFFECTS AND MULTIPLIERS FOR THE TALLADEGA COUNTY ECONOMY, 1967[1]

	Direct employment effect	Direct-indirect employment effect	Direct-indirect-induced employment effect	Indirect employment effect	Induced employment effect	Type I employment multiplier	Type II employment multiplier
Agriculture	.17385	.28229	.40671	.10844	.12442	1.62	2.34
Construction	.16707	.18260	.23317	.01553	.05057	1.09	1.40
Manufacturing	.05605	.06704	.08743	.01099	.02039	1.20	1.56
Transportation, communications, and public utilities	.05483	.06789	.09248	.01306	.02459	1.24	1.69
Wholesale and retail trade	.15515	.16542	.26516	.01027	.09974	1.07	1.71
Finance, insurance, and real estate	.02597	.03021	.03861	.00424	.00840	1.16	1.49
Service and mining	.12184	.15110	.23677	.02926	.08567	1.24	1.94
State and local government	.14317	.15812	.23453	.01495	.07641	1.10	1.64
Federal government	.25181	.29025	.52870	.03844	.23845	1.15	2.10
Economy						1.21	1.76

[1] Employment effects represent estimated changes in employment resulting from a $1,000 change in output.

1967 were slightly lower for these sectors. The agricultural sector exhibited the greatest interaction, yet the indirect effects for all sectors were rather low. This indicated very little endogenous interdependence in Talladega County employment. The close proximity of Anniston and Birmingham outside the county may have resulted in an employment leakage which caused the low interaction rate. Since direct employment requirements were also relatively low, this explanation appeared more reasonable.

Type II Multipliers

Considering households as an integral part of the economy of Talladega County resulted in several significant changes in the multipliers. All sectors showed greater Type II multipliers than Type I. However, the largest changes were observed in agriculture, services and mining, and federal government. Construction exhibited one of the smallest changes. A one-unit change in employment in these four sectors would generate total economy employment changes of 2.35, 1.87, 2.06, and 1.39, respectively, Table 17. Statistics for 1967, Table 18, were quite comparable. Employment effects appeared to be rather well distributed among the direct, indirect, and induced requirements. Thus, the relatively high level of county employment generated by the three sectors enumerated was difficult to explain.

MODEL PROJECTION

An input-output model of an economy is a reflection of the economic activity ongoing in that economy as of a given date in time. Use of such a model to plan new expenditures for investment and employment, both private and public, depends greatly on stability of the input-mix of the economy. The empirical models developed for Talladega County were chosen partially on basis of an objective to test the models for their stability and predictive powers. To accomplish this objective, a comparison was desired of a projected 1967 product mix and the actual 1967 output. To derive a projected 1967 output, the output for 1963, Table 2, was expanded. This was accomplished by adjusting the 1963 flow table for each year up to 1967, by the percentage change in gross national product. Annual changes in each sector were based on changes in the total economy. Using this procedure, total county output for 1967 was estimated to be $607 million, Table 19.

TABLE 19. PROJECTED INTERINDUSTRY FLOWS OF GOODS AND SERVICES, TALLADEGA COUNTY, ALABAMA, 1967[1]

Industry producing	Industry purchasing							
	Agriculture	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Service and mining
Agriculture	1,364	3	3,928	3	0	21	5
Construction	77	1	261	166	21	119	42
Manufacturing	1,162	207	21,434	227	153	17	335
Transportation, communications, and public utilities	114	71	2,164	288	76	20	234
Wholesale and retail trade	413	456	5,268	194	187	58	265
Finance, insurance, and real estate	178	21	692	107	222	195	169
Service and mining	50	37	739	146	110	43	97
State and local government	4	4	62	261	63	35	22
Federal government	0	0	15	4	8	4	3
Total endogeneous sectors	3,362	800	34,563	1,396	840	512	1,172
Imports	423	5,905	117,079	3,594	6,393	3,145	1,432
Households	3,243	2,286	60,771	2,641	11,047	1,294	3,882
Total outlay	7,028	8,991	212,413	7,631	18,280	4,951	6,486

TABLE 19. PROJECTED INTERINDUSTRY FLOWS OF GOODS AND SERVICES, TALLADEGA COUNTY, ALABAMA, 1967[1]—(*Continued*)

Industry producing	Industry purchasing: State and local government	Federal government	Total endogenous sectors	Exports	Households	Total output
Agriculture	0	60	5,384	262	1,382	7,028
Construction	818	3	1,508	0	7,482	8,990
Manufacturing	55	1	23,591	154,717	34,103	212,411
Transportation, communications, and public utilities	147	30	3,144	1	4,485	7,630
Wholesale and retail trade	51	5	6,897	0	11,383	18,280
Finance, insurance, and real estate	49	5	1,638	3	3,311	4,952
Service and mining	49	3	1,274	0	5,213	6,486
State and local government	11	0	462	1,293	10,201	11,956
Federal government	0	0	34	0	965	999
Total endogenous sectors	1,180	107	43,932	161,660	78,528	284,120
Imports	5,251	26	143,248	0	50,603	193,851
Households	5,527	865	91,556	37,572	0	129,128
Total outlay	11,958	998	278,736	199,232	129,131	607,099

[1] These projections based on technical coefficients for 1963 and gross national product increases[2] from 1963 to 1967.
[2] U.S. Treasury Department, Internal Revenue Service, *Statistics of Income, 1964, 65, 66, 67: U.S. Business Tax Returns*, Washington: Government Printing Office, 1965, 66, 67, 68.

The interindustry flow table was developed by assuming that the input-mix had remained constant over time. Thus, the projected interindustry flow of goods and services for 1967 was calculated using the proportional allocation.

MODEL COMPARISON

Projected total output in 1967 exceeded actual output by about $24 million. Endogenous sector interaction was approximately $3 million less than projected. Thus, the projected model was within 4 per cent of the actual output in 1967. Output in five of the sectors exceeded projections, but two of those sectors were expanding rapidly relative to the total economy. The developing sectors expanded production more than the average for the Nation. This explained a part of the discrepancy. If allowance had been made for individual sector expansion, estimates probably would have been more realistic than shown.

Largest actual increases in output over projects occurred in the finance, insurance, and real estate and services-mining sectors. These two sectors were considered to be developing and were expected to show significant increases. Urbanization and the resulting residential and commercial demands were the factors to which growth in these sectors was attributed. The federal government estimate was closest to actual output of all projections.

An unexpected increase in state and local government output was attributed to the construction of a vocational trade school in the county. The decision to locate this facility in Talladega County did not appear to be based on economic conditions. Thus, it could not be predicted with an economic model as used in this study.

No allowances were made to compensate for the change in product or input mixes in the economy. Refinements of the projection technique would have allowed adjustments in the model. Such adjustments undoubtedly would allow more accurate predictions.

SUMMARY

The primary objective of this study was to estimate the impact of watershed development on the economy of Talladega County. Sub-objectives were: (1) Determine the flow of inputs and outputs from the various sectors of the Talladega County economy.

(2) Derive output, income, and employment multipliers for use in estimating the effects of federal expenditures for watershed development. (3) Develop a predictive model for measuring future expenditures in any of the various sectors of the county economy.

Two input-output models were developed, one for 1963 production and the other for 1967. Eleven sectors were developed for the models, nine endogenous and two exogenous. Secondary data were used throughout the study to insure consistency. Limitations on these data plus some disclosure problems resulted in several components of the economy being combined into one sector. The basic assumption that the economy was well developed and viable was made as required by the constraints of input-output analysis.

Three basic tables were developed for each model: an interindustry flow table, a technical coefficients table, and a table of interdependence coefficients. The derivation of multipliers was the final goal of model development.

The flow table delineated the flows of goods and services between industries in the economy. The technical coefficients table, measured inputs per dollar of output. Interdependence coefficients showed not only the primary sector requirements, but all interindustry requirements.

Multipliers form the basis for the predictive capacity of an input-output study. Output multipliers show the sectoral interaction that occurs when any other sector changes its output. Income multipliers measure the total change in the economy when household income changes in one sector.

When households were considered exogenous to the economy, output multipliers for construction with 1.099 and 1.093 in 1963 and 1967, respectively. The larger this multiplier, the greater the effect the sector involved has on the economy. The interdependence of the sector with other sectors increases as the output multiplier increases. The average output multipliers in each period were 1.200 and 1.211, respectively. This indicated that construction had a limited effect on the economy. The same relationship was observed when households were considered endogenous. Considering households as an endogenous sector, the economy yielded the induced effects of household expenditures.

Income multipliers, reflecting the total change in income in the economy resulting from a dollar change in sector income, also

indicated very little interaction within the economy. This was shown by the fact that the magnitude of the direct income effect was greater than that of the indirect effects. When households were considered as endogenous, income multipliers were larger but held relatively the same relationship as in Type I.

Employment multipliers measured the total effect of a change in final product demands in a sector on employment. With the exception of agriculture, services and mining, and federal government, when households were considered endogenously, employment multipliers were relatively small.

Construction had a low multiplier effect when compared with the other sectors of the economy. Therefore, activity in the sector generated the least effect on the county economy.

The 1963 interindustry flow table was expanded by the same percentage that gross national product increased each year through 1967. The projection fell within 4 per cent of actual total output in 1967. This difference was considered extremely small; particularly in view of the small area studied and limited data availability. Actual output exceeded projections in five of the eleven sectors. Two of these sectors were considered to be developing and actual sector growth was expected to be higher than the average of all sectors. Urbanization and its repercussions were believed to be the reason that the service oriented sectors expanded so rapidly. Even though the projections of the 1963 model to 1967 were not completely accurate, the discrepancy would not be of major consequence.

The construction of Cheaha Creek Watershed appeared to have only a limited effect on the economy, through the construction sector alone. An insufficient amount of time had passed by 1967, to measure changes in agricultural production. Thus, only a small effect of the actual construction was shown. However, the total effect may prove to be somewhat greater after sufficient time has elapsed to allow the various multipliers to act. The large multipliers for agriculture would cause significant changes in the county economy, if expected agricultural changes occur. Therefore, later studies may confirm the expectations of greater income, but this is not the case at the present time.

IMPLICATIONS

This study showed that economic benefits of development could be estimated. Indirect and induced benefits could be increased by developing greater interdependence between all sectors of

the economy. Consequently, secondary benefits would be greater when one sector, say agriculture or government, increased output.

The economy of this county was sufficiently developed to project future use of the input-output approach. Future development plans could be based on desired total output and the interrelationships developed in this report. County planners could decide the desired output, income, and/or employment for some future time, and the preferred level of each could be approximated using the requirements and effects shown by this study. Interindustry flows would need to be reevaluated periodically.

The empirical model actually may be more accurate than this study shows. Agricultural output was unusually low in 1967 compared with annual productivity over the years 1960 to 1970. Thus, this sector would be closer to projections developed with the model, if a normal output year were measured.

Use of primary data to supplement secondary data definitely would be a benefit. Also, it was learned that current secondary data were more useful than older data; i.e., 1967 data were more accurate than 1963 data. This fact allowed a reduction in the number of assumptions necessary at the county level with respect to the 1967 model.

There appear to be sufficient grounds to say that success of the approach taken for this research was high. The large amount of estimation required to develop output, income, and employment coefficients compared with the rather accurate predictive potential indicate (1) the county economy followed closely the national economic changes and (2) the estimating procedure was a sound approach. Consequently, new applications for an "old" technique may be forthcoming.

Even though only small changes in the economy resulting from watershed development were measured, the input-output approach appears to have sufficient projection potential to allow its use in the evaluation of proposed watershed projects. Changes in the economy must be incorporated into the model over time to allow its use for long term projections. With reasonable care such projections would yield fairly accurate results that would be of value in project evaluation.

Benefits measured in terms of multiplier effects provide a good estimate of at least a portion of the secondary benefits possible, if a proposed project is funded. If estimates of project costs also are reasonably accurate, then the total benefit-cost analysis will

be more reliable. In this respect, the results of this study represent a significant step in project evaluation procedures.

In conclusion, additional research is needed with the technique to verify the results obtained. Also, further testing of the predictive model with published data for later years should be performed. Only after these tests are completed will the real value of the work be determined.

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APPENDIX

SECTOR COMPOSITION

Sectors in Talladega County were delineated according to the classification of firms by the Bureau of Labor Statistics. The only exceptions were services and mining, which were combined into one sector for easier data handling and to avoid disclosure problems in secondary sources. The extent of rural non-farm population was also considered. This segment of the population supplied a major source of manpower to all sectors in the economy.

Total civilian employment in Talladega County in 1963 and 1967 was derived from *Civilian Work Force Estimates, (12).* Employment for sectors used as reported in secondary data sources were agriculture; construction; transportation, communications, and public utilities; wholesale and retail trade; and finance, insurance, and real estate. Services and mining were combined into one sector. State, local, and federal government employment were reported as government employment. "Federal government employees" for Talladega County in 1965 was reported separately in *City and County Data Book, 1967, (44).* Assuming a constant percentage of government employees were federal employees, federal government employees were computed for Talladega County in 1963 and 1967. After accounting for the federal component, state and local government employment were considered the residual of government employees.

Agriculture

The agricultural sector included those firms involved in the production of livestock, crops, vegetables, and forest products. Farmers in Talladega County were almost equally divided between full-time and part-time farming. This sector produced about $5 million in 1963 and 1967.

Construction

Construction consisted of firms engaged in construction of buildings, and special services construction (plumbing, electrical, and carpentry work), and general contracting. Construction was defined as the annual net increase in real estate value. This sector contributed approximately $7 million and $11 million to the county economy in 1963 and 1967, respectively.

Manufacturing

Firms which produced textiles and apparel, lumber and wood products, printed and published materials, stone, clay, glass, and concrete products were part of the manufacturing sector. Agricultural processing was considered as manufacturing since non-farm employees were the major labor force. Manufacturing was expected to be the dominant sector of the economy because of a large textile and apparel industry in the county. This sector contributed about $162 million to the economy in 1963, and almost $179 million in 1967, or 35 percent and 31 percent of total output, respectively.

Transportation, Communications, and Public Utilities

The transportation, communications, and public utilities sector consisted of those firms involved in trucking, warehousing, electrical, telephone, gas, radio, water, and sanitary services. These firms provided an output of approximately $6 million and $9 million in 1963 and 1967, respectively.

Wholesale and Retail Trade

All firms engaged in wholesaling and/or retailing were combined to develop the wholesale and retail trade sector. Total output in both 1963 and 1967 was approximately $14 million.

Finance, Insurance, and Real Estate

The finance, insurance, and real estate sector consisted of commercial banks, credit agencies, insurance, and real estate agencies. There were 50 such firms in 1963 and 56 in 1967; however, output increased from about $4 million to almost $13 million in the time interval.

Services and Mining

Firms engaged in personal services, repair, amusement, medical, legal, engineering, and other services were combined with mining and quarrying to develop the service and mining sector. This sector contributed approximately $5 million and $14 million in 1963 and 1967, respectively.

State, Local, and Federal Government

This sector included municipal, school district, and county and state government economic activity. The state and local govern-

ment sector spent $9 million in 1963 and almost $13 million in 1967.

Federal government consisted of all endogenously determined federal government economic activity, such as exchange of federal money for goods and services on a continuing basis. Federal government expenditures amounted to $762,000 in 1963 and $691,000 in 1967.

Household

All sales by, or to, households were included in the household sector. This sector was considered to be completely exogenous to the Talladega County economy in Type (I) computations. However, Type (II) computations considered households as completely endogenous. Reality would be somewhere between the two. Households contributed approximately $99 million and $142 million to the economy in 1963 and 1967, respectively.

Exports

Exports represented net sales to the outside economy. Prior knowledge of the county suggested that a large proportion of exports would be intermediate goods. The proximity to both Birmingham and Anniston, Alabama, suggested significant labor sales by households to these markets. Exports in 1963 were almost $148 million, and in 1967 were nearly $184 million. Households contributed nearly $29 million in 1963, and over $55 million in 1967 to the Talladega County economy. Manufacturing was the largest exporter in both years, exporting about $118 million in 1963 and about $121 million in 1967.

SECTORAL OUTPUT

Sectoral output, or value of shipments, was developed for each sector using the most reliable sources available. In some cases, slightly different procedures were used in 1963 and 1967. However, final data were comparable.

Agriculture

State and county farming income was reported for 1964 in the *Census of Agriculture, (26).* State cash receipts from farm marketings for 1963 were found in *Alabama Agricultural Statistics, (3).* State business receipts from agriculture for 1967 were developed from *Statistics of Income, 1967, (51).*

Agricultural income for Talladega County for 1963 and 1967 was estimated by assuming a linear relationship between 1963, 1964, and 1967. The same percentage of state farm income was estimated to have been produced in the county in 1963, 1964, and 1967.

Construction

The value of construction output for 1963 and 1967 was developed from the Annual Report of the State of Alabama for 1962, 1963, 1966, and 1967, and information obtained from the State Advisor to the Tax Equalization Board of Talladega County. The sums of gross real estate tax assessments plus homestead exemptions for 1962, 1963, 1966, and 1967 were determined to obtain gross increases in real estate assessments. The net increase in tax assessments resulting from revaluation was deducted to obtain the net increase in real estate assessments for 1963 and 1967.

The average tax assessment in Talladega County during the study years was found to be approximately ten per cent of the appraised value of the real estate. Thus, net increases in tax assessments were multiplied by a factor of 10 to obtain the value of output from construction in Talladega County in 1963 and 1967.

Manufacturing

The cost of materials for manufacturers in 1963 and 1967 and value of shipments for 1967 were reported in *Census of Manufacturers, Area Statistics, (41).* Output was developed for 1963 by assuming a linear relationship between cost of materials and value of shipments in 1963 and 1967. Cost of materials in 1963 was multiplied by the ratio of value of shipments to cost of materials in 1967 to estimate value of 1963 shipments from the manufacturing sector.

Transportation, Communications, and Public Utilities

National value of output for transportation, communications, and public utilities for 1963 and 1967 were obtained from *Statistics of Income 1963 and 1967 (50,51).* State output was reported for 1967 only. Therefore, value of output for Alabama in 1963 was estimated as the same percentage of national output as 1967.

Assuming a linear relationship between employees and value of output at state and county levels, estimates were made of

county output in 1963 and 1967. Value of output per employee was determined for the State in each year. County employment for each year was multiplied by this amount to estimate the county value of output for each year.

Wholesale and Retail Trade

Value of sales from wholesale and retail trade for 1963 in Talladega County was determined by adding retail sales and wholesale sales reported in the *County and City Data Book for 1963, (44).* Receipts from those trades in 1967 were recorded in the *Census of Business (31,32).* Coefficients for cost of goods sold and sector output were determined by the same procedure in both years. One exception was corporate receipts, which were not reported in 1963. Hence, different data sources were required for the two periods. Corporate receipts were estimated for 1963 by assuming that proprietor and partnership sales for the year were the same percentage of total receipts as they were in 1967.

Cost of goods sold in the county was determined by assuming that local costs were linearly related to state costs. The ratio of state costs to receipts was assumed to apply at the local level as well. Total state receipts from wholesale and retail trade were divided by total cost of goods sold to obtain a cost of goods sold coefficient. This coefficient was multiplied by receipts for the wholesale and retail trade sector in Talladega County to estimate cost of goods sold in the sector. Receipts for wholesale and retail trade, minus estimated cost of goods sold, provided an estimate of sectoral output for each year.

Finance, Insurance, and Real Estate

Output from finance, insurance, and real estate was developed by assuming a linear relationship between national and state expenditures for 1963 and 1967. National output was reported for both 1963 and 1967; however, state output was reported only for 1967. National output for 1963 was multiplied by the ratio of 1967 state output to national output to derive an estimate of state output in 1963.

State output for both 1963 and 1967 was divided by state employees in the respective years to determine output per employee. Output per employee was multiplied by county employment in each respective year to estimate output from finance, insurance, and real estate for Talladega County in 1963 and 1967.

Services and Mining

Services and mining and quarrying were combined into one sector for easier data handling and to avoid disclosure problems in secondary sources. Mining receipts for Alabama were obtained from *Census of Mineral Industries* and *Statistics of Income.* Total receipts from services for the state were reported in *Census of Business, (30).* Estimates of services and mining were added in each year to determine sector totals.

Output for Talladega County in each study year was estimated by assuming linearity between employment and output at the state and county levels. State employment in each year was divided into state output in each year to obtain output per employee. Output per employee was multiplied by county employment to estimate output from services and mining in 1963 and 1967.

State, Local, and Federal Government

Output for state and local government in 1963 and 1967 was developed from *Census of Government, (34).* The state output was reported as intergovernmental revenue from the State. This figure was added to local revenue to determine state and local government output.

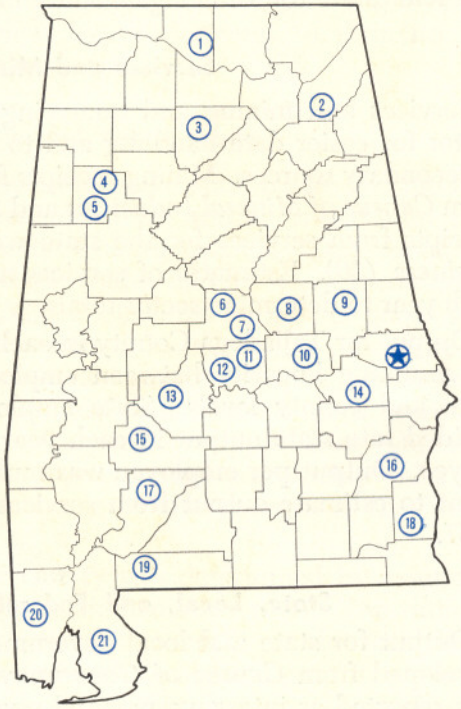
Federal government output for 1963 and 1967 also was determined from *Census of Government.* Federal government was combined with state government and reported as intergovernmental revenue less intergovernmental revenue from the state.

Household

Output by households in 1963 and 1967 for Talladega County was obtained from *Alabama Business, (53).* "Estimated Personal Income in Alabama Counties, Major Types 1963 and 1967" was considered as household output. Output was the total of wage and salary disbursements; other labor income; proprietor's income (farm and non-farm); property income; and transfer payments, minus personal contributions for social insurance.

AGRICULTURAL EXPERIMENT STATION SYSTEM OF ALABAMA'S LAND-GRANT UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Thorsby Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
10. Plant Breeding Unit, Tallassee.
11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. Tuskegee Experiment Field, Tuskegee.
15. Lower Coastal Plain Substation, Camden.
16. Forestry Unit, Barbour County.
17. Monroeville Experiment Field, Monroeville.
18. Wiregrass Substation, Headland.
19. Brewton Experiment Field, Brewton.
20. Ornamental Horticulture Field Station, Spring Hill.
21. Gulf Coast Substation, Fairhope.