GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

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Date: 11/14/78

Project Title: Economic Impact Analysis

Project No: A-2263

Project Director: N. S. Gibson

Sponsor: MARTA

Agreement Period: From 10/4/78 Until 12/3/78

Type Agreement: Ltr. dtd. 10/2/78

Amount: $4,998

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Sponsor Contact Person (s):

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Contractual Matters
(thru OCA)

Defense Priority Rating:

Assigned to: Technology & Development (School/Laboratory)

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:A-3 (3/76)

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GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: April 3, 1979

Project Title: Economic Impact Analysis

Project No: A-2263

Project Director: N. S. Gibson

Sponsor: MARTA

Effective Termination Date: 12/3/78

Clearance of Accounting Charges: all clear

Grant/Contract Closeout Actions Remaining:

X Final Invoice ~~and Closing Documents~~

_ Final Fiscal Report

_ Final Report of Inventions

_ Govt. Property Inventory & Related Certificate

_ Classified Material Certificate

X Other Overrun to be transferred to EES "E" account.

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CA-4 (1/79)

Project A-2263

ECONOMIC IMPACTS OF THE MARTA CONSTRUCTION PROGRAM ON THE ATLANTA REGION AND GEORGIA

by

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BENEFITS TO ATLANTA AND GEORGIA FROM MARTA CONSTRUCTION SPENDING

Millions of dollars have been spent in Atlanta and Georgia on the Marta construction program. This money has paid construction workers, engineers and other workers and has purchased materials and property necessary for the construction of Marta stations, lines, and equipment.

A study done by researchers at the Georgia Institute of Technology indicates that from 1974 through 1978, $540 million was spent in Georgia, of which $490 million was spent in the five-county metropolitan Atlanta area. The completion of the planned Marta system over the 1979 to 1981 period will involve an additional $240 million spending in Georgia, while the construction involved in the completion of the "referendum" system would mean an additional $1.8 billion spending in Georgia over the 1979 to 1989 period.

The greatest part of this spending has been financed by Federal money. Of the $540 million which has already been spent in Georgia, about $425 million came from Federal funds. The completion of the planned Marta system and the construction of the rest of the "referendum" system would also be paid for largely by Federal money, generally at about an 80% Federal to 20% local ratio.

When Federal funds come to a region without an offsetting increase in Federal taxes, there is a great positive stimulus to the local economy. The "new" money spent locally gives income to businesses and employees. When this income is received, a large part of it is in turn spent locally, providing another round of new income to the area. This beneficial "ripple" effect continues and multiplies the original favorable effect of the Federal funds several times.

Economists have a technical method to estimate the total effect on the local economy of this stimulus. This method is called "multiplier" analysis and is the technique used in this study. It estimates the average annual income due both to the initial (externally-financed) spending and to all the spending induced by the "ripple" effect. Because the "ripple" effect takes time to work itself to completion, the total impact of the spending, including all the indirectly generated income, takes place over a longer time period than the spending itself. This study assumes completion of the "ripple" effects three years after the last original spending.

With information about the spending in Atlanta and Georgia financed by Federal funds and with the calculation of the appropriate "multipliers" it is possible to calculate the average annual income impacts. This study has calculated the impacts for the spending which has already occurred and for the spending planned for the completion of the planned Marta system and planned for the completion of the "referendum" system. These income impacts are shown in the table below for the five-county Atlanta metropolitan area, for the fifteen-county Atlanta Standard Metropolitan Statistical Area and for the state of Georgia. The figures measure the yearly benefits of accepting these Federal funds and using them for Marta construction.

INCOME BENEFITS FORM MARTA CONSTRUCTION SPENDING

Millions of Dollars Per Year

	Metro Atlanta	Atlanta SMSA	GEORGIA
Phase A Actual			
Construction already completed, benefitting the economy from 1974 through 1981	$170	$190	$220
Phase A Planned			
Planned construction from 1979 to 1981, benefitting the economy from 1979 through 1984	$100	$110	$130
Beyond Phase A			
Rest of "referendum" system construction 1979 to 1989 benefitting 1979 through 1992	$315	$350	$425

The spending on Marta construction and the additional income created through the positive stimulus of Federal funds means jobs for Atlantans and Georgians. Average annual Marta direct employment, expressed in terms of full-year job equivalents or "man-years" are shown below.

YEARLY MARTA EMPLOYMENT

	Metro Atlanta	Atlanta SMSA	Georgia
Phase A Actual	2200	2400	2500
Phase A Planned	1500	1650	1700
Beyond Phase A	2900	3100	3200

However, just as the actual spending by Marta is not the end of the story for the total income impact, the direct Marta employment is not the only job impact. This study also estimated the total average annual employment caused by the Marta spending and the additional income it generated.

TOTAL YEARLY EMPLOYMENT IMPACT

	Metro Atlanta	Atlanta SMSA	Georgia
Phase A Actual	7900	8700	11700
Phase A Planned	3700	4100	5500
Beyond Phase A	9100	10300	13200

The benefits from the Federally-financed expenditures on Marta construction go even beyond the income and job impact, however. Revenues accrue to the state from the additional corporate and personal income taxes which become payable and from additional sales tax revenues which are generated. The table below shows the average annual increases in income and sales tax receipts which can be anticipated over the impact period.

MILLIONS OF DOLLARS PER YEAR OF INCREASED TAXES

	Corporate and Personal Income Taxes GEORGIA	Metro Atlanta	Sales Taxes Atlanta SMSA	GEORGIA
Phase A Actual	$4.1	$3.5	$3.7	$4.4
Phase A Planned	$2.4	$2.0	$2.2	$2.6
Beyond Phase A	$7.8	$6.5	$7.0	$8.3

Thus, the benefits of Marta construction on income, employment and tax revenues are significant for Atlanta and Georgia. The data, assumptions, methodology and technique supporting the figures shown in the above tables are given in the complete Georgia Tech report.

ESTIMATION OF THE ECONOMIC IMPACT OF MARTA CONSTRUCTION EXPENDITURES METHODOLOGY

INTRODUCTION

This document describes the methodology used to estimate the economic impact of MARTA construction expenditures in three regions: the Atlanta "Metro" area of Fulton, DeKalb, Clayton, Gwinnett, and Cobb counties; the fifteen county Atlanta Standard Metropolitan Statistical Area "SMSA"; and the state of Georgia. Actual Phase A expenditures, planned Phase A expenditures, and expenditures for work beyond Phase A for the remainder of the referendum system are considered. The methodology used in this study, an export-based multiplier analysis, is similar to the previous impact analysis, but differs in empirical data used and assumptions chosen.

THEORETICAL FOUNDATION

Economic theory has established that expenditures in a region, financed by funds obtained outside the region, create income in excess of the level of expenditures. (Expenditures financed by intra-regional funds may have an allocative or distributive effect but are unlikely to result in the creation of income.)

Multiplier analysis is the method used to calculate the total impact of expenditures. The income generated by the infusion of new, externally financed expenditures into a region is received by economic units within that region, for example, the suppliers of materials and labor services on MARTA construction projects. These income recipients

make expenditures on goods and services within the region that generate additional income. The recipients of this income in turn spend part of it on expenditures within the region. The original money spent has a "ripple" effect throughout the economy of the region so that the total impact is a multiple of the original expenditures. Calculation of this "multiplier" requires estimation of the portion of income spent on locally-produced goods and services and the use of a mathematical formula to arrive at the appropriate constant. The total economic impact is the product of externally financed in-region expenditures times the multiplier.

EMPIRICAL METHOD FOR CALCULATION OF THE MULTIPLIER

Unfortunately, no empirical data on the proportion of income spent (rather than saved) on locally-produced (as opposed to imported) goods and services are available. If, for example, that proportion were know to be .7, the multiplier formula indicates that the total impact, after all ripples have been experienced, would be 1/(1 - .7) or 3.3 times the original impact. Economists have shown, however, that the local impact multiplier can be approximated by the ratio of the region's total production to the region's production for non-local use.* Because production figures are usually not available at a

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*A proof of this is given in Hugh O. Nourse, Regional Economics, McGraw Hill, New York, 1968, p. 161. The proportion of income spent on locally produced goods and services is approximated by the ratio of local production to total production, "p." The multiplier is

$$\frac{1}{1-p} \quad \text{or} \quad \frac{1}{1-\frac{\text{local}}{\text{total}}} \quad \text{or} \quad \frac{\text{total}}{\text{total} - \text{local}} \quad \text{or} \quad \frac{\text{total}}{\text{export}}$$

regional level, production is approximated by employment. Thus, the multiplier used in this study as:

$$\text{Multiplier for Region A} = \frac{\text{Employment in A engaged in Production}}{\text{Employment in A engaged in Production for Use Outside A}}$$

The allocation of employment for any industry in the region between production for local use and production for non-local use is also not usually available. Standard analytical practice makes use of "location quotients" to allocate that employment between employment for local use production and employment for "export." Location quotients are defined for a Region A, and an industry i, with respect to a "benchmark" economy B, as

$$\frac{\text{Employment in Region A in Industry i/Total Employment in Region A}}{\text{Employment in Region B in Industry i/Total Employment in Region B}}$$

When this ratio is greater than 1.0, i.e., when the area's proportion of production activity devoted to that industry is greater than the benchmark area's proportion, that area is assumed to "export" a part of that industry's production. When the ratio is greater than 1.0, the portion of the ratio over 1.0 divided by the total ratio is assumed to represent the proportion of employment devoted to export production.

SUMMARY OF METHODOLOGY

The estimation of the economic impact of MARTA construction expenditures involves: 1) the determination of the amount of externally financed in-region expenditures for each of three regions; 2) the calculation of multipliers for each of these regions; and 3) the calculation of the total impact on income, employment, and tax revenues. Each of these will now be described in detail.

DETERMINATION OF EXTERNALLY FINANCED EXPENDITURES BY REGION

Total MARTA construction expenditures are grouped using two criteria. First, total expenditures are divided among labor, construction materials, right-of-way acquisitions, and overhead, profits, and taxes for each year 1974 through 1989. Second, each of these groupings are divided among the Metro, SMSA, and Georgia regions using data received from MARTA along with a series of assumptions. The result is a matrix showing annual total expenditures for each category by region. The final step is to take the proportion of these total expenditures which are funded by Federal dollars. It is assumed that the Federal grant is equally divided over all expense areas. The final calculation of externally-financed expenditures by region is multiplied by the respective region multipliers to determine the total income impacts.

Total labor expenditures were provided by MARTA broken down by the five-county Metro region, the remaining ten counties of the Atlanta SMSA, the remainder of Georgia, and out-of-state; in addition, labor expenditures for each region were divided between construction and engineering labor. This data is provided for Phase A and for expenditures beyond Phase A. Using this data the total annual labor expenditures were divided between construction and engineering labor and also among the three regions: Metro, SMSA, and Georgia. The regional labor

expenditures were divided by year in equal proportions to the total labor expenditures divisions provided by MARTA for both Phase A and behond. For example, the $216 million to be spent within the Metro region on construction employees comprises 55.959% of the total labor expenditures in Phase A, $386 million. It is assumed, therefore that 55.959% of labor expenditures in each year of Phase A is spent on construction employees within the Metro region. Actual figures shown in Table 1 may vary slightly due to rounding. The percentages used for allocation of labor expenditures by region and type of employee are slightly different for beyond Phase A according to the data received by MARTA. The $386 million of labor expenditures in Phase A (1974-1981) and the $1,063.1 million of labor expenditures beyond Phase A (1979-1989) are allocated according to their respective proportions among the Metro, SMSA, and Georgia regions as well as between construction and engineering labor for each year.

This procedure differs from the technique used to allocate labor expenditures among the three regions in the 1975 study. In that study data were not available on the allocation of labor within the state and estimates were used to approximate the proportions in the Metro, SMSA, and remainder of the state. In the 1975 study, of the labor expenditures within the state, it was assumed that 79% were in the Metro, 12% in the remainder of the SMSA, and 9% were in the remainder of the state. For the current study, the respective figures are approximately 90%, 7.5%, and 2.5%, indicating a greater impact within the Metro region.

Construction materials are the second category of expenditures to be allocated to the Metro, SMSA, and Georgia regions. The data provided by MARTA was disaggregated by only two regions: "In Georgia" and "Out of State" expenditures. Additional information was provided which disaggregated the "In Georgia" expenditures among a number of items: ready-mix concrete, reinforcing steel, other steel (structural steel, H-piling, steel sheet piling, soldier piles, steel deck, bracing, rails and accessories, and third rail), timber, asphalt paving, ballast and sub-ballast, systemwide (transit vehicles, train control system, fare collection, electrification, and trackwork), and "other" expenditures (earthwork, pipework, manhole and catch basins, excavation support systems, signalization and street lighting, electrical and mechanical, railroad work, and miscellaneous). A series of assumptions are made so that each of these items can be categorized by one of the three regions (Metro, SMSA, Georgia) or considered to originate out-of-state. After each item was divided among the above regions, overall ratios for construction materials in Metro, SMSA, Georgia, and out-of-state were calculated. These overall ratios are applied to the yearly construction material expenditures for Phase A and beyond to determine the regional division of material expenditures as well as the total material expenditures for Phase A Actual, Phase A Planned, and beyond Phase A.

We employ the same assumption which was used in the 1975 study and assume that 100% of the ready-mix concrete, asphalt paving,

ballast and sub-ballast, and timber originates within the state. Also, we assume that 100% of the ready-mix concrete originates within the Metro region; this assumption was used in the 1975 study and we feel that it is a reasonable assumption. For allocating material expenditures which originate in Georgia, an assumption was made in the 1975 study that (based on estimates provided at that time by Parsons-Brinekerhoff-Tudor-Bechtel, PBTB) 10% of the expenditures would originate outside the SMSA. A further assumption was made that of the remaining 90%, 10% would fall outside the Metro region and 90% would originate within the Metro region. This leads to an overall general allocation of 81% within the Metro region, 9% in the remaining 10 counties of the SMSA, and 10% in the remainder of Georgia. We feel that there is no additional information to necessitate a change in this assumption, and we employ the above allocations for the remaining items below with some additional adjustments to the totals.

As mentioned above, asphalt paving, ballast and sub-ballast, and timber are assumed to be produced 100% within the state. We use the "81-9-10" allocation described in the above paragraph to allocate the expenditures to the three regions. The steel expenditures (both reinforcing and "other" steel) which were designated by MARTA as "In-Georgia" expenditures are not assumed to originate wholly within the state. The assumption was made in the 1975 study that not all of the steel purchased by contractors within the State was fabricated within the State. Specifically, it was assumed that

35% of the "In-Georgia" steel was manufactured outside of the state and the remaining 65% was manufactured within the state. Although virtually impossible to identify accurately we feel this is a reasonable assumption and employ the same assumption in this case. Therefore, 65% of the "In-Georgia" steel is assumed to be manufactured in Georgia and that amount is allocated regionally using the "81-9-10" percentage allocations. The "other steel" expenditures which were designated "Out-of-State" by MARTA are considered to be 100% out-of-state.

The next item to be considered is the systemwide material expenditures. MARTA designated some of these expenditures originating within the state and a major proportion originating out of state. There is a large difference in the in-state and out-of-state expenditures allocation for this item by this study compared to the 1975 study. The primary reason for this difference is that the contract for the transit cars was originally thought to be let within the state; as it turned out a French firm won the contract and more of the systemwide expenditures were shifted to out-of-state. The systemwide expenditures designated as outside of Georgia by MARTA are allocated 100% out-of-state. The systemwide expenditures allocated within Georgia, however, are also adjusted. As was done in the 1975 study, we assume that 35% of the systemwide expenditures, although purchased by contractors in Georgia, are actually manufactured outside of Georgia. Therefore, 65% of the systemwide "in-Georgia" expenditures are actually allocated within Georgia using the "81-9-10" percentage allocation.

The final item under construction materials is "other" expenditures. It was assumed in the 1975 study that 100% of this was within Georgia. After examining additional data provided by MARTA concerning the "other" expenditures, we feel that assuming 100% within Georgia is reasonable. It is more difficult, however, to determine the allocation within the state. We therefore assume the "81-9-10" percentage allocation which has been used throughout this category.

After each of these categories is allocated among the three regions, the expenditures within each region are totalled and that percentage of total construction materials is calculated. These three percentages are used for annual allocations of the materials expenditures and are totalled for Phase A Actual, Phase A Planned, and beyond Phase A. These figures are shown in Table 2.

The third category of expenditures is right-of-way acquisitions. These expenditures are divided among four items: acquisition, appraisal, demolition, and relocation. From data supplied by MARTA, the right-of-way expenditures are divided among the four items in the following proportions:

Acquisition	86.1%
Appraisal	1.9%
Demolition	5.3%
Relocation	6.7%

The appraisal, demolition, and relocation were assumed in the 1975 study to fall 100% in the Metro region. We feel that this assumption is valid and use the same assumption with the current data. In addition,

the acquisition includes the purchase of land and buildings. Since the purchase of land is simply an asset transfer, it does not generate any new income. For this reason the proportion of the acquisition expenditures which are for the purchase of land is deducted from the total acquisition item; the balance is for structures, and since it is assumed that an equal valued amount of structures will be purchased within the Metro region, this proportion is considered to be income-generating. The 1975 study assumed that one-third of the acquisition portion was for land and, hence, was an asset transfer, and the remaining two-thirds were income generating. We follow this same assumption. Therefore, 67% of the acquisition expenditures and 100% of the appraisal, demolition, and relocation expenditures are allocated to the Metro region. Table 3 contains the right-of-way expenditures data.

The fourth expenditure category is overhead, profits, and taxes (OPT). OPT paid by contractors and subcontractors outside of the state were separated from the total OPT by MARTA. The OPT expenditures within Georgia were allocated 100% to the Metro region, just as in the 1975 study. These data are contained in Table 4.

CALCULATION OF THE MULTIPLIERS

Multipliers will be calculated for three regions: the Atlanta "Metro" five-county area, the fifteen-county SMSA, and the state of Georgia. As outlined in the previous section, the multiplier for a region is the ratio of employment in that region engaged in production to employment in that region engaged in production for "export." The process described below is complicated but is nothing more than a procedure for determining the allocation of employment between local use and export.

First, a measure of total employment for a region is chosen and the distribution of employment by industry for that region is established. Employment is disaggregated, sometimes to the SIC three-digit level.

Second, for each industry within that region location quotients are calculated. In order to develop information on the widest range of interactions, the Metro and SMSA regions and the State of Georgia are each compared to two benchmark economies: the six-state Southeast (Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee), and the United States.

Third, for each industry within a region, the largest of the two location quotients is used to estimate the amount of employment for export.

Fourth, for each region, employment for export is aggregated across industries. The multiplier for a region is calculated as the ratio of total employment to employment for export.

The Employment Measure

Total employment for the purposes of this study is the sum of three components: the establishment-based County Business Patterns definition of employment as of mid-March 1976 available by state and county and disaggregated by industry; the Department of Labor and Census measure of agricultural employment including hired and family workers as of January 1976; and the Department of Labor measure of state and local government employment as of March 1976.

-INDUSTRY EMPLOYMENT-

Industry data in some counties showed insignificant levels of employment or so few establishments that confidentiality considerations prevented the publication of exact number of employees. Employment by industry for these cases was constructed using a set of rational rules for allocation. The midpoint of the size range of employment was the first-break estimate. State-wide allocations and direct information on manufacturing from the Georgia Manufacturing Directory were also used. All allocations were adjusted to preserve totals.

-AGRICULTURAL EMPLOYMENT-

Employment in agriculture on the hired plus family worker basis was not available below the state level for 1976. Information from the 1974 Census of Agriculture was used to distribute the 79,000 workers in the state into the Metro, SMSA, and rest of the state regions. In 1974, the Census indicated that there were 54,911 farm operators in the state. In that year, 16,756 workers were hired for more than 150 days, 21,728 workers were hired for from 25-150 days, and 85,400 workers were engaged for less than 25 days. To obtain an annual average level of employment measure, the 16,756 hired farm workers were assumed to be

100% active, the 21,728 were assumed to be employed three months or 25% while the 85,400 were assumed to be used 10% of the time. This gave a total farm worker proxy value of 85,639 for the state in 1974, (54,911 + 16,756 + 5,432 + 8,540). The Census data was available for each of the counties within the Metro and SMSA areas. Calculations showed a total farm worker proxy of 1,488 for the Metro area and of 5,653 for the SMSA indicating a 1.738% and 6.601% share respectively. These percentages were used to allocate the state total of 79,000 into 1,373 Metro, 5,215 SMSA, and 73,785 for the rest of the state.

-STATE AND LOCAL GOVERNMENT EMPLOYMENT-

The state and local government measure of employment was not available by county for 1976. The 289,700 employment figure was distributed among the regions using information from the 1972 Census of Governments, the 1975 Occupational Employment Survey, and the Fourth Quarter 1976 Georgia Employment and Wages Survey. According to the 1972 Census of Government, there were 250,119 state and local government employees, 72.7% of whom were local and 27.3% state. This 72.7% was applied to the 1976 figure of 289,700 to obtain a breakdown of 210,612 local government employment and 79,088 state goverment employment.

The 210,612 local government employees were distributed among the regions by using county information on local government employment from the 1972 Census of Governments. The Census indicated that 31.258% of local government employment was in the Metro area and 35.135% was in the SMSA. Thus, local government employment for the Metro area was estimated to be 65,833 in 1976 and 73,998 for the SMSA, with 136,614 for the rest of the state.

The 79,088 state government employees were distributed into three categories: state education, Capitol-related state government, and other state government. The 1975 Occupational Employment Survey indicated that 42.1% of state government employment was for education (e.g., colleges and universities) while 57.9% was for other purposes. The 1976 Georgia Employment and Wage Survey approximated the distribution for state government education employees giving 22.765% for the Metro and SMSA and 77.235% for elsewhere in the state. Thus, Metro and SMSA state education was 22.765% of 33,300 (42.1% of 79,088), or 7,581 while the rest of the state had 25,719. The remaining 57.9% of state government employment was assumed to be evenly divided between Capitol-related and other, or 22,894 for each. The Capitol-related was assumed to be 100% in the SMSA and 80% in the five-county Metro area. The remaining 22,894 state employees were assumed to be distributed throughout the state in proportion to population, i.e, 30.289% for Metro, 34.813% for the SMSA, and 65.186% for the rest of the state. Thus, non-education state government employment was estimated at 25,249 for the Metro area, 30,864 for the SMSA, and 14,924 for the rest of the state. Total state government employment, including education, was 32,830 for the Metro area, 38,445 for the SMSA, and 40,643 for the rest of the state.

The Disaggregation Levels

Several categories of employment gave unrealistically low estimates of export employment (and hence unrealistically high measures of the multiplier) when the aggregate was used. Thus, a decision was made to disaggregate the agricultural employment estimate as well as the

manufacturing and trade employment figures. The latter was accomplished by moving from the two-digit to the three-digit level. The former involved using farm receipts by crop as a proxy for employment by crop. Fifteen categories of farm product receipts on the national, state, and county level were obtained from the 1974 Census of Agriculture for farms with receipts over $2,500 a year. The location quotient technique was used to allocate receipts between local and export and the resulting ratios were used to allocate employment.

The Location Quotients

As noted in the earlier section, the location quotient is defined for a region A, and an industry i, with respect to a "benchmark" economy B, as

$$\frac{\text{Employment in Region A in Industry i/ Total Employment in Region A}}{\text{Employment in Region B in Industry i/ Total Employment in Region B}}$$

For greater ease in calculation, this was reformulated for each A,B regional pairing as

$$\frac{\text{Employment in Region A in Industry i}}{\text{Employment in Region B in Industry i}} \times \frac{\text{Total Employment in B}}{\text{Total Employment in A}} .$$

When the location quotient is greater than 1.0, the region is assumed to be exporting part of the production. The amount of production exported is assumed to be the proportion of the ratio over 1.0. (See Nourse, p.151.) The largest location quotient was chosen when the two benchmark economies differed. This increased the allocation to export and reduced the upward bias on the multiplier.

Results of the Allocation

	Employment				
	Metro	SMSA	Georgia	Southeast	United States
Agriculture					
Local	435	1,546	44,992	-	-
Export	938	3,669	34,008	-	-
Total	1,373	5,215	79,000	505,000	3,479,800
State and Local Gov't. Total = Local	98,663	112,443	289,700	1,637,400	12,401,000
Total County Business Patterns Employment					
Local	409,278	442,790	1,029,395	-	-
Export	201,151	206,100	393,847	-	-
Total	610,429	648,890	1,423,242	8,323,556	62,647,846
Total Employment Proxy					
Local	508,376	556,779	1,364,087	-	-
Export	202,089	209,769	427,855	-	-
Total	710,465	766,548	1,791,942	10,465,956	78,528,646

The Multipliers

For the five-county Metro area, the calculated multiplier is 3.5156. For the fifteen-county SMSA, it is 3.6542, and for Georgia, it is 4.1882. These numbers are somewhat higher than those of the previous study. There are two explanations for this. First, the data used here are more recent. Second, the technique differs slightly. We have utilized the location quotient and export base multiplier technique explicated in Nourse as our authority.

CALCULATIONS OF IMPACTS

Impact on Income

The calculation of the impact of externally financed MARTA expenditures on income within the regions is straightforward. The externally financed MARTA expenditures by region, shown below, are multiplied by the calculated multipliers, giving the total economic impact of MARTA on income, also shown below.

ACTUAL EXTERNALLY FINANCED MARTA EXPENDITURES

$ Millions

	Phase A Actual	Phase A Planned	Total Phase A	Beyond Phase A
	1974-78	1979-81	1974-81	1979-89
Metro	$386.9	$168.3	$555.2	$1,253.9
SMSA	408.8	179.8	588.6	1,347.5
Georgia	423.9	188.3	612.2	1,413.5

TOTAL ECONOMIC IMPACT OF MARTA ON INCOME

$ Millions

	Phase A Actual	Phase A Planned	Total Phase A	Beyond Phase A
Metro	$1,360.2	$591.7	$1,951.9	$4,408.2
SMSA	1,493.8	657.0	2,150.8	4,924.0
Georgia	1,775.4	788.6	2,564.0	5,920.0

The economic impact of MARTA appears much lower than that shown in the earlier study, even though the multipliers are higher. This is due to a shortfall in expenditures. The earlier study showed, for

example, externally financed expenditures in Georgia at $1,282.7 million over the period from 1974 to 1980. This study shows only $612.2 million over a 1974 to 1981 period.

The impact figures are put in better perspective by determining an average annual amount. We have utilized the same assumption as in the previous study; i.e., that the "ripple" effects should be concluded by three years after the last expenditure. Thus, Phase A, which has expenditures from 1974 through 1981 is presumed to have an impact through 1984. Similarly, expenditures beyond Phase A from 1979 through 1989 will have an impact through 1992. The estimated average annual impacts are shown below by region.

ESTIMATED ANNUAL IMPACT OF
MARTA ON INCOME
$ Millions

	Phase A Actual 1974-81	Phase A Planned 1979-84	Total Phase A 1974-84	Beyond Phase A 1979-92
Metro	$170.0	$ 98.6	$177.4	$314.9
SMSA	186.7	109.5	195.5	351.7
Georgia	221.9	131.4	233.1	422.9

These figures should be interpreted as the upper bounds on the income impact, since the calculated multipliers are subject to some upward bias inherent in the export base technique which remains even after the precaution of choosing the largest location quotient has been taken. However, the impacts are significant, with some perspective given by a comparison to the increases in the regions' personal income between 1975 and 1976.

PERSONAL INCOME BY PLACE OF RESIDENCE

$ Millions

	1976	1975	Increase
Metro	$10,754	$ 9,756	$1,002
SMSA	12,107	10,953	1,124
Georgia	27,580	24,765	2,815

Impact on Employment

The calculation of the impact on employment is not so direct as the income impact. The earlier study assumed personal income was 90% of net area income and assumed wage and salary income was 72% of personal income. After the income impact was adjusted in this manner, it was divided by an average wage and salary income per worker for 1974.

We choose to use a slightly different method so that we can adjust for income escalation, particularly since the time horizon for this study is more distant. We also assume that personal income is approximately 90% of net area (Metro, SMSA, or Georgia) income. We assume that wage and salary incomes are 67.5% of personal income based upon U. S. Department of Commerce data for Georgia in 1976. These figures are used to adjust the income impact figures for each region. The estimated impact of MARTA on wage and salary income are shown below.

TOTAL WAGE AND SALARY INCOME IMPACT OF MARTA

$ Millions

	Phase A Actual	Phase A Planned	Total Phase A	Beyond Phase A
Metro	826.3	359.5	$1,185.8	$2,678.0
SMSA	907.5	399.1	1,306.6	2,991.3
Georgia	1,078.5	479.1	1,557.6	3,596.4

To calculate the average wage and salary income per worker in the Metro, SMSA, and Georgia regions, we used data from Employment and Wages Insured by the Georgia Employment Security Law, Georgia Department of Labor. From these data we estimate that the 1976 wage and salary incomes per worker for the Metro, SMSA, and Georgia regions are $11,133, $11,031, and $9,701, respectively. To adjust for changes in these figures over time because of inflation and cost of living increases, we inflated and deflated the above figures at a 6% rate per year. In addition, we received from MARTA the average annual wage and salary incomes of construction and engineering personnel. Both of these annual figures were inflated and deflated at 6% per year over the relevant years.

The employment impact is divided between direct and indirect impacts. The direct impact is that amount of employment (man-years) generated by the direct labor expenditures for MARTA construction. The indirect employment impact is that generated by the additional expenditures on construction materials, right-of-way, and overhead, plus the additional "ripple" effect in the regional economies generated through the multiplier process.

The direct employment impact is calculated in the following manner for both construction and engineering employees. Each year's labor expenditures (provided by MARTA) are divided by each year's annual wage and salary income, which has been adjusted for inflation as mentioned above. This equals each year's direct employment. The sum of each year's direct employment for both construction and engineering personnel equals the total direct employment impact.

The calculation of the indirect employment impact begins by subtracting the total direct wage and salary income from the calculated total wage and salary income impact. This equals the total indirect wage and salary income impact; when divided by the appropriate number of years, it equals the average annual indirect wage and salary income impact. The next step requires the sum over the appropriate number of years of the inflated and deflated annual wage for the area (discussed above). This sum is divided by the same number of years and provides the average annual wage for the area. The average annual indirect employment is calculated by dividing the average annual indirect wage and salary income by the average annual impact multiplier by the appropriate number of years.

The sum of the direct employment impact and the indirect employment impact is the total employment impact. These figures are shown below for Phase A and beyond.

TOTAL EMPLOYMENT IMPACT
(man-years)

	Phase A Actual 1974-81	Phase A Planned 1979-84	Total Phase A 1974-84	Beyond Phase A 1979-92
Metro	63,067	22,049	85,116	127,539
SMSA	69,782	24,667	94,449	143,654
Georgia	93,566	33,290	126,856	184,559

DIRECT EMPLOYMENT IMPACT

(man-years)

	Phase A Actual 1974-1978	Phase A Planned 1979-1981	Total Phase A 1974-1981	Beyond Phase A 1979-1989
Metro	11,051	4,535	15,586	31,457
SMSA	12,030	4,945	16,975	34,258
Georgia	12,310	5,060	17,370	35,053

Again, the employment impact of MARTA is lower for Phase A than in the 1975 study. There are several reasons for this. First, the employment figures are generated from the total income impact figures; as noted above the income impact figures are lower primarily because the actual expenditures in Phase A are below the projected expenditures in the earlier study. This has a domino effect through the calculations and results in lower employment impact figures. Second, we use an escalation factor of 6% in the average wage and salary income figures for each of the three regions; there was no escalation figure in the earlier study.

The employment impact of expenditures beyond Phase A is substantially larger than the employment impact of Phase A because the planned level of externally financed expenditures is substantially higher. Because of the distant time horizon inherent beyond Phase A, the escalation rate of wage and salary incomes plays a more dominant role, and the actual employment impact will vary inversely with the actual escalation rate.

Impact on Tax Revenues

The increased levels of income and employment caused by the impact of MARTA construction expenditures bring another benefit through an increase in tax revenues. We utilize historical and projected relationships to estimate these revenue impacts on the corporate and personal income tax and on sales tax receipts.

Personal and corporate income tax receipts have a fairly stable relationship to adjusted personal income (defined as personal income adjusted to a "taxable" or "net" basis by excluding transfer payments and re-adding in employee payments for social insurance). In the last three years, corporate and personal income tax has been approximately 2.21% of this income measure. The average annual personal income impact for the state is $209.8 million (90% of $233.1 million) over the 1974-84 impact period for Phase A. The adjusted annual personal income impact is expected to be approximately $193.9 million (or 92.4% of personal income). Thus, the average annual increase in corporate and personal income tax receipts due to the impact of MARTA construction expenditures is $4,285,200 over the 1974-84 impact period for Phase A. Other calculated impacts on corporate and personal income tax revenues are shown in the table.

CORPORATE AND PERSONAL INCOME TAXES

Georgia (Annual $ millions)

	Phase A Actual 1974-1981	Phase A Planned 1979-1984	Total Phase A 1974-1984	Beyond Phase A 1979-1992
Georgia Income Impact	$ 221.9	$ 131.4	$ 233.1	$ 422.9
Personal Income Impact	199.7	118.3	209.8	380.6
Adjusted Personal Income Impact	184.5	109.3	193.9	351.7
Average Increase in Receipts Due to MARTA	4.078	2.416	4.285	7.773

Sales tax receipts are related to unadjusted personal income with the yield differing by region for the Metro, SMSA, and state. The table below indicates how the $4,620,000 average annual sales tax receipt impact of Phase A Total for the 1974-84 period is calculated.

	Average Annual Personal Income Impact $ million	Sales Tax Receipt Yield, %	Average Annual Sales Tax Receipts Impact $ Million
Metro (5 County)	$159.7	2.30%	$3.673
Non-Metro SMSA (10 County)	16.3	1.48%	.241
Rest of the State	33.8	2.09%	.706
Georgia	$209.8		$4.620

Other calculated impacts are shown below.

AVERAGE ANNUAL SALES TAX RECEIPTS

Impact in $ Millions

	Phase A Actual 1974-81	Phase A Planned 1979-84	Total Phase A 1974-84	Beyond Phase A 1979-92
Metro (5 County)	$3.519	$2.040	$3.673	$6.518
Non-Metro SMSA (10 County)	.222	.147	.241	.490
Rest of the State	.663	.412	.706	1.340
Georgia	$4.404	$2.599	$4.620	$8.348

TABLE 1

Labor Expenditures by Region
$ Millions
Phase A

	1974	1975	1976	1977	1978	Phase A Actual	1979	1980	1981	Phase A Planned	Total Phase A
Total	10	26	43	86	97	262	94	24	6	124	386
Metro	7.2	18.7	31.0	61.9	69.9	188.7	67.7	17.3	4.3	89.3	235.9
Construction	5.6	14.5	24.1	48.1	54.3	146.6	52.6	13.4	3.4	69.4	216.0
Engineering	1.6	4.2	6.9	13.8	15.6	42.1	15.1	3.9	0.9	19.9	19.9
SMSA	7.8	20.4	33.8	67.5	76.1	205.6	73.9	18.9	4.6	97.4	303.0
Construction	6.0	15.6	25.9	51.7	58.2	157.4	56.6	14.4	3.6	74.6	232.0
Engineering	1.8	4.8	7.9	15.8	17.9	48.2	17.3	4.5	1.0	22.8	71.0
Georgia	8.0	20.8	34.6	69.1	77.9	210.4	75.6	19.3	4.7	99.6	310.0
Construction	6.1	15.9	26.5	52.8	59.5	160.8	57.8	14.7	3.7	76.2	237.0
Engineering	1.9	4.9	8.1	16.3	18.4	49.6	17.8	4.6	1.0	23.4	73.0
Out of State	2.0	5.1	8.5	16.9	19.1	51.6	18.4	4.8	1.2	24.4	76.0
Construction	1.1	2.9	4.8	9.6	10.8	29.2	10.4	2.7	0.7	13.8	43.0
Engineering	0.9	2.2	3.7	7.3	8.3	22.4	8.0	2.1	0.5	10.6	33.0

Beyond Phase A

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total Beyond Phase A
Total	46.5	124.0	151.1	151.6	139.0	140.9	116.5	93.2	46.6	35.0	18.7	1063.1
Metro	33.5	89.3	108.8	109.2	100.1	101.4	83.9	67.2	33.6	25.2	13.5	765.7
Construction	26.0	69.4	84.5	84.8	77.8	78.8	65.2	52.2	26.1	19.6	10.5	594.9
Engineering	7.5	19.9	24.3	24.4	22.3	22.6	18.7	15.0	7.5	5.6	3.0	170.8
SMSA	36.5	97.3	118.6	119.1	109.1	110.5	91.4	73.3	36.6	27.5	14.7	834.6
Construction	27.9	74.5	90.8	91.1	83.6	84.6	70.0	56.1	28.0	21.1	11.3	639.0
Engineering	8.6	22.8	27.8	28.0	25.5	25.9	21.4	17.2	8.6	6.4	3.4	195.6
Georgia	37.3	99.6	121.4	121.9	111.6	113.0	93.5	75.0	37.4	28.2	15.0	853.9
Construction	28.5	76.1	92.8	93.1	85.4	86.4	71.5	57.3	28.6	21.6	11.5	652.8
Engineering	8.8	23.5	28.6	28.8	26.2	26.6	22.0	17.7	8.8	6.6	3.5	201.1
Out of State	9.2	24.3	29.7	29.8	27.4	27.7	22.9	18.4	9.2	6.9	3.7	209.2
Construction	5.2	13.7	16.8	16.9	15.5	15.7	13.0	10.4	5.2	3.9	2.1	118.4
Engineering	4.0	10.6	12.9	12.9	11.9	12.0	9.9	8.0	4.0	3.0	1.6	90.8

TABLE 2

Construction Materials Expenditures--Totals and by Region Allocations

$ Million
Phase A

	1974	1975	1976	1977	1878	Phase A Actual	1979	1980	1981	Phase A Planned	Total Phase A
Total	0	2	24	74	94	194	90	22	4	116	310
In Georgia	0	1.6	19.4	59.7	75.8	156.5	72.6	17.7	3.2	93.5	250.0
Ready Mix Concrete	-	0.3	3.0	9.3	11.8	24.4	11.3	2.8	0.5	14.6	39.0
Reinforcing Steel	-	0.1	1.0	3.1	3.9	8.1	3.8	0.9	0.2	4.9	13.0
Other Steel	-	0.1	1.2	3.8	4.9	10.0	4.7	1.1	0.2	6.0	16.0
Tumber	-	0.1	0.6	1.9	2.4	5.0	2.3	0.6	0.1	3.0	8.0
Asphalt Paving	-	-	0.4	1.2	1.5	3.1	1.4	0.4	0.1	1.9	5.0
Ballast & Sub-Ballast	-	-	0.4	1.2	1.5	3.1	1.4	0.4	0.1	1.9	5.0
Systemwide	-	0.1	0.9	2.6	3.3	6.9	3.2	0.8	0.1	4.1	11.0
Other	-	0.9	11.8	36.5	46.4	95.7	44.4	10.9	2.0	57.3	153.0
Out of State	0	0.4	4.6	14.3	18.2	37.5	17.4	4.3	0.8	22.5	60.0
Other Steel	-	0.1	0.6	1.9	2.4	5.0	2.3	0.6	0.1	3.0	8.0
Systemwide	-	0.3	4.0	12.4	15.8	32.5	15.1	3.7	0.7	19.5	52.0
Allocation											
Metro	0	1.3	15.1	46.6	59.3	122.3	56.7	13.9	2.5	73.1	195.4
SMSA	0	1.4	16.5	50.8	64.5	133.2	61.8	15.1	2.7	79.6	212.8
Georgia	0	1.5	18.3	56.3	71.5	147.6	68.5	16.7	3.0	88.2	235.8
Out Of State	0	0.5	5.7	17.7	22.5	46.4	21.5	5.3	1.0	27.8	74.2

TABLE 2 (Continued)

Construction Materials Expenditures--Totals and by Region Allocations

$ Million
Beyond Phase A

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total Beyond Phase A
Total	37.3	99.4	121.2	121.5	111.5	113.0	93.4	74.7	37.4	28.0	14.9	852.3
In Georgia	30.1	80.2	97.7	98.0	89.9	91.1	75.3	60.2	30.2	22.6	12.0	687.3
Ready Mix Concrete	4.7	12.5	15.3	15.3	14.1	14.2	11.8	9.4	4.7	3.5	1.9	107.4
Reinforcing Steel	1.6	4.2	5.1	5.1	4.7	4.7	3.9	3.1	1.6	1.2	0.6	35.7
Other Steel	1.9	5.1	6.3	6.3	5.8	5.8	4.8	3.9	1.9	1.4	0.8	44.0
Timber	1.0	2.6	3.1	3.1	2.9	2.9	2.4	1.9	1.0	0.7	0.4	22.0
Asphalt Paving	0.6	1.6	1.9	2.0	1.8	1.8	1.5	1.2	0.6	0.4	0.2	13.7
Ballast & Sub-ballast	0.6	1.6	1.9	2.0	1.8	1.8	1.5	1.2	0.6	0.4	0.2	13.7
Systemwide	1.3	3.5	4.3	4.3	4.0	4.0	3.3	2.7	1.3	1.0	0.5	30.2
Other	18.4	49.1	59.8	60.0	55.0	55.7	46.1	36.9	18.4	13.8	7.4	420.6
Out of State	7.2	19.2	23.5	23.5	21.6	21.9	18.1	14.5	7.2	5.4	2.9	165.0
Other Steel	1.0	2.6	3.1	3.1	2.9	2.9	2.4	1.9	1.0	0.7	0.4	22.0
Systemwide	6.2	16.6	20.4	20.4	18.7	19.0	15.7	12.6	6.2	4.7	2.5	143.0
Allocation												
Metro	23.5	62.7	76.4	76.5	70.3	71.2	58.9	47.1	23.6	17.6	9.4	537.2
SMSA	25.6	68.3	83.3	83.4	76.6	77.6	64.1	51.3	25.7	19.2	10.2	585.3
Georgia	28.4	75.6	92.2	92.5	84.8	86.0	71.1	56.8	28.5	21.3	11.3	648.5
Out of State	8.9	23.8	29.0	29.0	26.7	27.0	22.3	17.9	8.9	6.7	3.6	203.8

TABLE 3

Right-of-way Expenditures--Totals and by Region Allocation

$ Million
Phase A

	1974	1975	1976	1977	1978	Phase A Actual	1979	1980	1981	Phase A Planned	Total Phase A
Total	22	25	21	20	7	95	8	0	0	8	103
Acquisition	18.9	21.5	18.1	17.2	6.0	81.7	6.9	-	-	6.9	88.6
Income Generating	12.6	14.4	12.1	11.5	4.0	54.6	4.6	-	-	4.6	59.2
Asset Transfer	6.3	7.1	6.0	5.7	2.0	27.1	2.3	-	-	2.3	29.4
Appraisal	0.4	0.5	0.4	0.4	0.1	1.8	0.2	-	-	0.2	2.0
Demolition	1.2	1.3	1.1	1.1	0.4	5.1	0.4	-	-	0.4	5.5
Relocation	1.5	1.7	1.4	1.3	0.5	6.4	0.5	-	-	0.5	6.9
Total Income Generating	15.7	17.9	15.0	14.3	5.0	67.9	5.7	-	-	5.7	73.6
Allocation											
Metro-100%	15.7	17.9	15.0	14.3	5.0	67.9	5.7	-	-	5.7	73.6

TABLE 3 (Continued)

Right-of-way Expenditures--Totals and by Region Allocation

$ Million
Beyond Phase A

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total Beyond Phase A
Total	6.2	16.5	20.1	20.1	18.5	18.7	15.5	12.4	6.2	4.6	2.3	141.1
Aquisition	5.4	14.2	17.3	17.3	15.9	16.0	13.4	10.7	5.4	4.0	2.0	121.6
Income Generating	3.6	9.5	11.6	11.6	10.7	10.7	8.9	7.1	3.6	2.7	1.3	81.3
Asset Transfer	1.8	4.7	5.7	5.7	5.2	5.3	4.5	3.6	1.8	1.3	0.7	40.3
Appraisal	0.1	0.3	0.4	0.4	0.4	0.4	0.3	0.2	0.1	0.1	-	2.7
Demolition	0.3	0.9	1.1	1.1	1.0	1.0	0.8	0.7	0.3	0.2	0.1	7.5
Relocation	0.4	1.1	1.3	1.3	1.2	1.3	1.0	0.8	0.4	0.3	0.2	9.3
Total Income Generating	4.4	11.8	14.4	14.4	13.3	13.4	11.0	8.8	4.4	3.3	1.6	100.8
Allocation												
Metro-100%	4.4	11.8	14.4	14.4	13.3	13.4	11.0	8.8	4.4	3.3	1.6	100.8

TABLE 4

Overhead and Profits Taxes Expenditures--Totals and by Region Allocation
$ Million
Phase A

	1974	1975	1976	1977	Phase A 1978	Phase A Actual	1979	1980	1981	Phase A Planned	Total Phase A
Total	11	20	29	48	47	155	47	11	5	63	218
In State	8.0	14.6	21.1	35.0	34.3	133.0	34.3	8.0	3.6	45.9	158.9
Out of State	3.0	5.4	7.9	13.0	12.7	42.0	12.7	3.0	1.4	17.1	59.1
Allocation											
Metro-100%	8.0	14.6	21.1	35.0	34.3	113.0	34.3	8.0	3.6	45.9	158.9

Beyond Phase A

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total Beyond Phase A
Total	9.7	26.2	31.9	32.2	29.3	29.8	24.6	19.7	9.8	7.4	3.9	224.5
In State	7.1	19.1	23.3	23.5	21.4	21.7	17.9	14.4	7.1	5.4	2.8	163.7
Out of State	2.6	7.1	8.6	8.7	7.9	8.1	6.7	5.3	2.7	2.0	1.1	60.8
Allocation												
Metro-100%	7.1	19.1	23.3	23.5	21.4	21.7	17.9	14.4	7.1	5.4	2.8	163.7

TABLE 5

Allocation by Region of Total Expenditures

$ Million
Phase A

	1974	1975	1976	1977	Phase A 1978	Phase A Actual	1979	1980	1981	Phase A Planned	Total Phase A
Metro	30.9	52.5	82.2	157.8	168.5	491.9	164.4	39.2	10.4	214.0	705.9
SMSA	31.5	54.3	86.4	167.6	179.9	519.7	175.7	42.0	10.9	228.6	748.3
Georgia	31.7	55.3	89.0	174.7	188.7	538.9	184.1	44.0	11.3	239.4	778.3
Asset Transfer	6.3	7.1	6.0	5.7	2.0	27.1	2.3	-	-	2.3	29.4
Out of State	5.0	11.0	22.1	47.6	54.3	140.0	52.6	13.1	3.6	69.3	209.3
Total	43	73	117	228	245	706	239	57	15	311	1017
Externally-Financed Allocation of Expenditures											
Metro	24.3	41.3	64.7	124.1	132.5	386.9	129.3	30.8	8.2	168.3	555.3
SMSA	24.8	42.7	68.0	131.8	141.5	408.8	138.2	33.0	8.6	179.8	588.6
Georgia	24.9	43.5	70.0	137.4	148.4	423.9	144.8	34.6	8.9	188.3	612.2

TABLE 5 (Continued)

Allocation by Region of Total Expenditures
$ Million
Beyond Phase A

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total Beyond Phase A
Metro	68.5	182.9	222.9	223.6	205.1	207.7	171.7	137.5	68.7	51.5	27.3	1567.4
SMSA	73.6	196.5	239.6	240.4	220.4	223.2	184.4	147.8	73.8	55.4	29.3	1684.4
Georgia	77.2	206.1	251.3	252.3	231.1	234.1	193.5	155.0	77.4	58.2	30.7	1766.9
Asset Transfer	1.8	4.7	5.7	5.7	5.2	5.3	4.5	3.6	1.8	1.3	0.7	40.3
Out of State	20.7	55.2	67.3	67.5	62.0	62.8	51.9	41.6	20.8	15.6	8.4	473.8
Total	99.7	266.1	324.3	325.4	298.3	302.4	250.0	200.0	100.0	75.0	39.8	2281.0
Externally-Financed Allocation of Expenditures												
Metro	54.8	146.3	178.3	178.9	164.1	166.2	137.4	110.0	55.0	41.2	21.8	1253.9
SMSA	58.9	157.2	191.7	192.3	176.3	178.6	147.5	118.2	59.0	44.3	23.4	1347.5
Georgia	61.8	164.9	201.0	201.8	184.9	187.3	154.8	124.0	61.9	46.6	24.6	1413.5

SUMMARY OF TECHNIQUE AND RESULTS

The Metropolitan Atlanta Rapid Transit Authority authorized an economic impact study in 1975 to determine the effects of MARTA construction on the Atlanta and surrounding areas. The study was performed by faculty members of the Department of Economics at Georgia State University and estimated projected increases in income, employment, and tax revenues generated by the construction expenditures.

Construction of the MARTA system had just begun at that time, however, and from that point until the end of 1978, substantial changes occurred in the timing and level of expenditures. Because of these changes in expenditures, some of the basic assumptions in the 1975 study, although correct at the time, are no longer valid. In addition, the ultimate effects on employment, income, and tax revenues are different because of the different levels of actual expenditures made through 1978 and those projected beyond 1978.

To adjust for the changes which have occurred in the last three years as well as those projected changes in the future, MARTA commissioned the Economic Development Division of the Engineering Experiment Station at the Georgia Institute of Technology to calculate the economic impacts of MARTA construction, both past and future. Specifically, Georgia Tech researchers were to review the 1975 study and update and revise the impact calculation model; then, after recalculating the multipliers, new expenditure data provided by MARTA were used to re-estimate the economic impacts on income, employment, and tax revenues for the five-county Atlanta Metro region, the fifteen-county Standard Metropolitan Statistical Area (SMSA), and the State. The calculations were to be made for the 1974-1978 period (Phase A Actual), 1979-1981 (Phase

A Planned), and the balance of the "referendum system", 1979-1989 (Beyond Phase A).

Introduction

Economic theory has established that expenditures in a region, financed by funds obtained outside the region, create income in excess of the level of expenditures. The income generated by the infusion of new externally-financed expenditures into a region is received by

ion that generate additional income.

in turn spend part of it on expenditures

a "ripple" effect throughout the economy

al impact is a multiple of the original

this multiplier requires estimation of

locally-produced goods and services and

ula to arrive at the appropriate constant.

the product of externally-financed in-

region expenditures times the multiplier. Employment and tax revenue impacts are calculated based upon these income impact estimates.

An export-based multiplier analysis is used in this study just as in the 1975 study. Since no empirical data on the proportion of income spent on locally-produced goods and services are available, economists have shown that the local impact multiplier can be approximated by the ratio of the region's total production to the region's production for non-local use. Again, assumptions must be made to approximate regional production levels so that multipliers can be estimated.

The estimation of the economic impact of MARTA construction expenditures involves three main processes: (1) the determination of the amount of externally-financed in-region expenditures for each of

three regions; (2) the calculation of multipliers for each of the regions; and (3) the calculation of the total impact on income, employment, and tax revenues.

These are identical with the processes involved in the 1975 study. The first process is a function of data provided by MARTA and assumptions made regarding distribution of expenditures. The second process involves a number of assumptions and approximations made to determine levels of regional employment employed in local or non-local production. The third process basically involves assumptions and calculations on regional wage and salary incomes and taxes.

In every case where there was either no new data or the assumption/proxy used in the 1975 study was considered very reasonable, similar data and assumptions were used in this study. In cases where the assumption was reasonable but new data (more current) were available, the new data were used. In cases where a better approximation could be made using different data or techniques, those data and techniques were used. In the allocation between export and local use employment, judgements yielding the most conservative multiplier were always made The specific differences and similarities between this and the 1975 study are noted in each case throughout the body of the report.

Summary

Having made the necessary assumptions and calculations, the multipliers for the three regions are as follows: Metro (five-county)--3.52 SMSA (fifteen-county)--3.65; Georgia--4.19. These numbers are somewhat higher than those of the 1975 study because of the use of more recent data and a slightly different technique as is noted in the body of the study.

The total economic impact of MARTA on income is shown in Table A. The economic impact appears much lower than that shown in the 1975 study, even though the multipliers are higher, because of a shortfall in expenditures. The 1975 study showed, for example, externally-financed expenditures in Georgia at $1,282.7 million over the 1974-1980 period, while this study shows only $612.2 million over the 1974-1981 Phase A period. During the Phase A period the average annual impact on Metro, SMSA, and State incomes is estimated to be $177.4 million, $195.5 million, and $233.1 million, respectively. Of the $233.1 million State income impact, $55 million, or approximately 24 percent of the total impact is realized outside of the five-county Metro area. The equivalent percentage is 25% for the Beyond Phase A projected income impact.

The total employment impacts for each phase of construction and for each of the three regions is shown in Table A, as well as the levels of direct employment impact. The total impact for Phase A in the State is 126,856 man-years; approximately 68% of these man-years will impact within the five-county Metro region and 32% outside of the Metro region. For the Beyond Phase A phase, approximately 69% are in the Metro region and 31% outside the Metro region. The reason that the 24% of the income impact falling outside the Metro region accounts for almost 32% of the employment impact is that the average annual wage outside the Metro and SMSA regions is slightly lower than the average annual wage within those regions.

The employment impact of MARTA is lower for Phase A than in the 1975 study. There are several reasons for this. First, the employment figures are generated from the total income impact figures; as noted

above, the income impact figures are lower primarily because the actual expenditures in Phase A are below the projected expenditures in the earlier study. This has a domino effect through the calculations and results in lower employment impact figures. Second, we use an escalation factor of 6% in the average wage and salary income figures for each of the three regions; there was no escalation figure in the earlier study. The employment impact of expenditures beyond Phase A is substantially larger than the employment impact of Phase A because the planned level of externally-financed expenditures is substantially higher.

The increased levels of income and employment caused by the impact of MARTA construction expenditures bring another benefit through an increase in tax revenues. The total and average annual tax revenues generated are shown in Table A for each phase and region. The income tax revenue impacts include both corporate and personal income taxes. The total Phase A income tax revenue impact is $47.1 million and Beyond Phase A is $108.8 million. The sales tax revenue impacts are $50.8 and $117.3 million, respectively, with overall average annual impacts of $8.9 and $16.2 million. Again, the primary reason that Beyond Phase A is so much higher than Phase A is that the level of externally-financed expenditures is much higher.

TABLE A

SUMMARY OF IMPACTS
($ millions)

	Phase A Actual	Phase A Planned	Total Phase A	Beyond Phase A
Construction Period	1974-1978	1979-1981	1974-1981	1979-1989
No. of Years of Impact	8	6	11	14
External Funding				
Metro	$ 386.9	$ 168.3	$ 555.2	$ 1,253.9
SMSA	408.8	179.8	588.6	1,347.5
State	423.9	188.3	612.2	1,413.5
Total Impact on Income				
Metro	1,360.2	591.7	1,951.9	4,408.2
SMSA	1,493.8	657.0	2,150.8	4,924.0
State	1,775.4	788.6	2,564.0	5,920.0
Average Annual Impact				
Metro	170.0	98.6	177.4	314.9
SMSA	186.7	109.5	195.5	351.7
State	221.9	131.4	233.1	422.9
Total Employment Impact*				
Metro	63,067	22,049	85,116	127,539
SMSA	69,782	24,667	94,449	143,654
State	93,566	33,290	126,856	184,559
Average Annual Impact*				
Metro	7,883	3,675	7,738	9,110
SMSA	8,723	4,111	8,586	10,261
State	11,696	5,548	11,532	13,183
Direct Employment Impact*				
Metro	11,051	4,535	15,586	31,457
SMSA	12,030	4,945	16,975	34,258
State	12,310	5,060	17,370	35,053
Tax Revenue Impacts				
Income Tax Impact	32.6	14.5	47.1	108.8
Sales Tax Impact	35.2	15.6	50.8	117.3
Total Tax Impact	67.8	30.1	97.9	226.1
Average Annual Impact	8.5	5.0	8.9	16.2

*in man-years