

ANALYZING THE ECONOMIC IMPACT
OF TRANSPORTATION PROJECTS
USING RIMS II, IMPLAN AND REMI

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Principal Investigator:
Dr. Tim Lynch, Director
Center for Economic Forecasting
and Analysis

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Florida State University
Institute for Science and Public Affairs
2034 East Paul Dirac Drive
Suite 137, Morgan Building
Innovation Park
Tallahassee, Florida
850-644-7357

Available to the public through the National Technical Information Service (NTIS)
5285 Port Royal Road, Springfield, VA 22181 (703) 487-4650

INTRODUCTION

The early parts of this new century confront public transit managers and planners with unparalleled demands. There are more competing interests for the finite transit dollar, and an increasing need to complete comprehensive transit project economic impact analysis, project accountability studies and alternatives assessments. Elected local, state and federal representative and executive branch policy makers as well as average citizens are increasingly asking, “What is the economic importance of this project? Or “How does this project (or alignment) compare with another competing transportation investment for the limited public transportation dollar?” Ultimately the question is “What ‘bang’ do I get for investment of this buck?”

In order to answer this question, one requires a systematic analysis of the economic impacts of these projects and programs on the affected regions. The most commonly used tool for studying the impact of these projects is the input-output model. These models not only capture the direct effects of the project, but they also capture secondary indirect and induced effects.

There are a wide range of commercially available input-output models that can be used to evaluate differing transit projects. They range from the relatively inexpensive and fairly simple U.S. Department of Commerce, Regional Input-Output Modeling System (RIMS II)¹ to the moderately priced and more complex Minnesota IMPLAN² input-output model. One may also opt for the most sophisticated and expensive integrated input-output-econometric model currently available for analysis of this type developed by Regional Economic Modeling, Inc. know as REMI³. While the choice of models is complex, other use issues are also important to consider.

In addition to selecting the appropriate input-output software, there are a number of technical issues to resolve. Among these are questions of:

- What are the mechanics of applying RIMS, IMPLAN or REMI models?
- What is a proper interpretation of the results of the model?
- What is the difference between direct and indirect economic impact?
- What are final demand multipliers and how do we evaluate and use them and how do they work in estimating economic impacts?
- What do the final demand multipliers for output and earnings mean and how do we evaluate and use them and how do they work in estimating economic impacts?
- How do we compare the outcome of each proposed project with every other competing project?

1 See for example “Regional Multipliers: A user Handbook for the Regional Input-Output Modeling System (RIMSII)”, U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, Second Edition, May, 1992, ISBN 0-16-037944-X

2 “IMPLAN Professional Social Accounting & Impact Analysis Software”, Minnesota IMPLAN Group, Inc., Second Printing, February 1997.

3 “Regional Economic Modeling A Systematic Approach to Economic Forecasting and Policy Analysis”, Treyz, I., George, University of Massachusetts at Amherst, 1993, Kluwer Academic Publishers, Third Printing 1994

- How do we best display and interpret the results for policy makers and what are the most important things for them to understand to evaluate the analysis results?

A number of these questions deal with complex (and often important) technical policy issues that even trained transportation economists grapple each time they undertake a public transit analysis anywhere in the country. Yet many of these key issues such as appropriate discount rate, project length, management of streams of earnings and expenditures render themselves to fairly well accepted standard responses in most applications. These methods are often taught as a standard parts of our graduate level quantitative training in transportation economics, engineering and planning programs across the country.

Yet for others, while an answer is neither particularly simple nor standardized, the approach to securing the answer is formalized into very clear and unambiguous steps. For example gathering the data, and performing the analysis and presenting the conclusions in a lucid fashion involves a well-developed series of steps (even if not always practiced) within the transportation economics discipline.

Unfortunately neither the standardized responses to key issues nor the formalized steps needed to complete a complex analysis are provided in a standard text book in a straightforward manner for transit managers, planners and operators. Each time the public transit system requires an “economic impact” analysis the process begins again as if it were the first time (each time). Even if the managers of the transit properties are contracting the work out to consultants (who will perform the impact analysis) they often do not have a clear idea of answers to the following questions:

1. What models or options exist to perform an economic impact analysis?
2. Which models or options are best suited to differing transit analysis needs and budgets (i.e. “Should we perform city specific or urban-wide regional analysis?” How quickly are the models available and what are their respective costs? .
3. What staffing and data needs and analysis limitations are associated with each method; and
4. How do you best manage and critique the final work product provided by consultants when performing this analysis?

While no document can address each of these issues, the following sections of this report will address a number of them. Specifically, this report will briefly describing each model, explain the theoretical and technical similarities and differences between the models, and provide a general guide for when it is appropriate to use each of the three models identified above. The final sections of this report will compare the results from these models for two hypothetical transit projects: the purchase and operation of a bus fleet and the construction and operation of a light rail transit. This examination of models, and standard analysis and display and discussion of findings and comparison and contrasts of results will provide a single reference to guide transit planners and analysts in future applications.

INTRODUCTION TO THE MODELS

RIMS II⁴

Effective planning for public- and private-sector projects and programs at the national, state, and local levels requires a systematic analysis of the economic impacts of these projects and programs on the affected regions. In turn, systematic analysis of economic impacts must account for the inter-industry relationships within regions because these relationships largely determine how regional economies are likely to respond to project and program changes. Thus, regional input-output (I-O) multipliers, which account for inter-industry relationships within regions, are useful tools for conducting economic impact analysis.

RIMS II is based on an accounting framework called an I-O table. For each industry, an I-O table shows the industrial distribution of inputs purchased and outputs sold. A typical I-O table in RIMS II is derived mainly from two data sources: BEA's national I-O table, which shows the input and output structure of nearly 500 U.S. industries, and the BEA's regional economic accounts, which are used to adjust the national I-O table to show a region's industrial structure and trading patterns.

Using RIMS II for impact analysis has several advantages. RIMS II multipliers can be estimated for any region composed of one or more counties and for any industry, or group of industries, in the national I-O table. The accessibility of the main data sources for RIMS II keeps the cost of estimating regional multipliers relatively low. Empirical tests show that estimates based on relatively expensive surveys and RIMS II-based estimates are similar in magnitude.

RIMS II is widely used in both the public and private sector. In the public sector, for example, the Department of Defense uses RIMS II to estimate the regional impacts of military base closings. State transportation departments use RIMS II to estimate the regional impacts of airport construction and expansion. In the private sector, analysts and consultants use RIMS II to estimate the regional impacts of a variety of projects, such as the development of shopping malls and sports stadiums.

Availability of Multipliers

For any region composed of one or more counties, RIMS II can provide two series of tables of I-O multipliers: Series 1 is for 490 detailed industries, and series 2 is for 38 industry aggregations. Each series consists of four tables: (1) final-demand output multipliers, (2) final-demand earnings multipliers, (3) final-demand employment multipliers, and (4) summary final-demand multipliers for output, earnings, and employment and direct-effect multipliers for earnings and employment.

⁴ This section is taken from "Measuring Gross Economic Impacts Associated with the Amtrak High Speed Rail Corridor Program," prepared by the Center for Urban Transportation Research University of South Florida, March 2000, pp. 4-7.

RIMS II Methodology

RIMS II uses BEA's 1992 national I-O table, which shows the input and output structure for approximately 500 industries. Since a particular region may not contain all the industries found at the national level, some direct input requirements cannot be supplied by that region's industries. Input requirements that are not produced in a study region are identified using BEA's regional economic accounts. Currently, data for 1997 are used.

The RIMS II method for estimating regional I-O multipliers can be viewed as a three-step process. In the first step, the producer portion of the national I-O table is made region-specific by using four-digit SIC location quotients. In the second-step, the household column from the national I-O table is made region-specific. In the last step, the Leontief inversion approach is used to estimate multipliers. This inversion approach produces output, earnings, and employment multipliers, which can be used to trace the impacts of changes in final demand on the directly and indirectly affected industries.

Accuracy of RIMS II

Empirical tests indicate that RIMS II yields multipliers that are not substantially different in magnitude from those generated by regional I-O models based on relatively expensive surveys. For example, a comparison of 224 industry-specific multipliers from survey-based tables for Texas, Washington, and West Virginia indicates that RIMS II average multipliers overstate the average multipliers from the survey-based tables by approximately 5 percent. For the majority of individual industry-specific multipliers, the difference between RIMS II and survey-based multipliers is less than 10 percent. In addition, RIMS II and survey multipliers show statistically similar distributions of affected industries.

Advantages of RIMS II

There are numerous advantages to using RIMS II. First, the accessibility of the main data sources makes it possible to estimate regional multipliers without conducting relatively expensive surveys. Second, the level of industrial detail in RIMS II helps avoid aggregation errors, which often occur when industries are combined. Third, RIMS II multipliers can be compared across areas because they are based on a consistent set of estimating procedures nationwide. Fourth, RIMS II multipliers are updated to reflect the most recent local-area wage-and-salary and personal income data.

Applications of RIMS II

RIMS II multipliers are used in a wide variety of impact studies. For example, the U.S. Nuclear Regulatory Commission has used RIMS II multipliers in environmental impact statements required for licensing electrical-generating facilities. The U.S. Department of Housing and Urban Development has used RIMS II multipliers to estimate the impacts of various types of urban redevelopment expenditures. In addition, BEA has provided

RIMS II multipliers to numerous individuals and groups outside the Federal Government. Among other applications, RIMS II multipliers have been used to estimate the regional impacts of the following: opening or closing military bases, energy conservation, offshore drilling, opening or closing manufacturing plants, shopping malls, new sports stadiums, and new airport facilities.

Data Requirements and Outputs

In order to apply the RIMS II multipliers the spending data for the project or program(s) in question are required. The data have to be classified with respect to each of the following traits:

Industry Category	Spending has to be classified by spending category consistent with the industry classification used by RIMS (see section below on spending categories).
Year of Expenditure	The time of expenditure needs to be specified in order to determine the time period of the economic consequences and in order to adjust the spending to 1997 dollars for use in the estimation of jobs. The RIMS models were calibrated on 1997 dollars and the estimate of jobs requires spending inputs in terms of 1997 dollars.
Location	The spending location also needs to be specified so that the multipliers for the appropriate region can be applied.

The results of the analysis are expressed in terms of three measures of economic activity: Earnings (sometimes expressed as wages and salaries), Output (sometimes referred to as economic activity), and Jobs.

Earnings	Earnings refers to a measure, expressed in millions of dollars, of the change in the value earnings that are received by households from the production of regional goods and services for the time period covered by the cost estimate.
Output	This is a measure of the economic activity created by the spending. It refers to the change in the dollar value of production in all sectors of the economy to satisfy the new demands resulting from spending. Each time a dollar changes hands for products or services it increases the measure of output. By including products as well as labor, the output measure is inclusive of and typically significantly larger than the measure of earnings. Economic output is typically referred to as the Gross National Product (GNP) at the national level. The measure of output is in the same year dollars as the measure of spending used in the calculation.

Jobs	This measure refers to the employment or jobs expressed as full time person years of employment. The measure refers to person years of employment regardless of the term over which spending is aggregated in the input. Jobs are estimated by adjusting the year of spending to 1997 dollars as that is the calibration year for the multiplier used for jobs estimation. The jobs multiplier are expressed in terms of jobs per million dollars of spending.
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IMPLAN MODEL⁵

In contrast to REMI, IMPLAN is exclusively an input-output model. It is nonsurvey based, and its structure typifies that of input-output models found in the regional science literature. Similar to REMI, IMPLAN assumes a uniform national production technology and uses the regional purchase coefficient approach to regionalize the technical coefficients.

The model generates two types of multipliers: Type I multipliers and what IMPLAN refers to as Type III multipliers. The difference between IMPLAN's Type I and Type III multipliers is an induced consumption effect. Their Type III multiplier differs from the standard Type 11 multiplier because the consumption function is nonlinear, that is, the marginal propensity to consume is not constant, decreasing as income in the region rises. 2 Population completely responds to employment changes and drives consumer spending. Multipliers are generated for employment, output, value added, personal income, and total income.

Similar to REMI (which is described next), IMPLAN builds its data from top to bottom. National data serve as control totals for state data. In turn, state data serve as control totals for county data. The primary sources of employment and earnings data are County Business Patterns data and BEA data. Furthermore, IMPLAN's procedure for fining in suppressions in the 1985 model parallels REMI's, except the ES-202 data set is not a primary source of data for counties.

IMPLAN estimates output at the state level by using value added reported by BEA as proxies to allocate U.S. total gross output. Also, IMPLAN allocates state total gross output to counties based on county employment earnings. The use of the BEA Gross State Product series for states, and implicit assumption of uniform value added-to-earnings ratios across counties within a state, parallels REMI's procedure. However, because of REMI's neoclassical production function, differential labor costs cause REMI's labor intensities to differ across states and counties. In addition, REMI adjusts real value added in U.S. dollars reported by BEA for differences in regional unit factor costs.

⁵ This section taken from "A Systematic Comparison of the REMI and Implan Models: The Case of Southern Nevada," Dan S. Rickman and R. Keith Schwer, The Review of Regional Studies, Fall 1993, pp. 148-149.

REMI MODEL⁶

The REMI model, as Bolton (1985) states in his review of econometric models, "is a world apart in complexity, reliance on interindustry linkages, and modeling philosophy" from other econometric models. The REMI model is more than an econometric model, though. It may better be described as an eclectic model that links an input-output model to an econometric model. If the econometric responses are suppressed, the model collapses to an input-output model. The econometric specifications are derived from economic theories that are-generally neoclassical in nature. The notion of regional equilibrium is central to the model's long-term portrait of regional economic growth.

Although a detailed description of the model is impossible within the scope of the present study, an outline of the basic structure facilitates the evaluation of model performance. Conceptually, the model consists of five basic blocks: (1) output, (2) labor and capital demands, (3) population and labor supply, (4) wages, prices, and profits, and (5) market shares.

The output block contains the input-output component of the model. Final demands drive the output block. Production uses factor inputs, labor, capital and fuel, and intermediate inputs. Coefficients of the production functions are based on national input-output tables produced by the Bureau of Labor Statistics. Intermediate inputs are used in fixed proportions. Factor input use is governed by Cobb-Douglas functions in Block 2. Thus, in contrast to input-output models such as IMPLAN, the relative factor intensities respond to changes in relative factor costs (i.e., wage rate changes, cost-of-capital changes, and changes in fuel prices).

Labor supply in Block 3 responds positively to wage rates because of migration. Also, the ratio of residence- adjusted employment to the potential labor force influences migration. Place-of-work income also is adjusted for place of residence to obtain disposable income. The interaction of labor demand calculated in Block 2 and of labor supply calculated in Block 3 determines wage rates in Block 4. Migration induces government spending through additional taxes paid and consumer spending through increased wage and nonwage income. The increase in real disposable income derived from migration also stimulates residential investment. Nonresidential investment is stimulated by increased capital demand by businesses.

Wage rates affect the competitiveness of local firms relative to firms in other regions in Block 5. Regional competitiveness affects the shares of local and export markets (market shares) that local firms capture. The proportion of the local market captured is known as the regional purchase coefficient (RPC), and the proportion of the export market is known as the interregional and international coefficient. Also, the RPC, which is a measure of self-sufficiency, increases as a region grows because of agglomeration effects.

⁶ This section taken from "A Systematic Comparison of the REMI and Implan Models: The Case of Southern Nevada," Dan S. Rickman and R. Keith Schwer, The Review of Regional Studies, Fall 1993, pp. 145-148.

Endogenous consumption, investment, and government expenditures plus exports are the final demands that drive the output block. The endogenous RPC gives the proportions of local expenditures satisfied by imports or local production. Solution values for the endogenous variables in the REMI model must satisfy the equations in all five blocks simultaneously.

By suppressing certain endogenous responses in the REMI model, multipliers comparable to those computed from an input-output model can be obtained. If the responses of labor intensities, labor supply, wage rates, industry RPC's, and endogenous final demands are suppressed, Type I input-output multipliers are obtained. By allowing consumption to be endogenously determined, Type II multipliers are obtained. Complete endogeneity in the REMI model produces what is referred to as Type III multipliers. This Type III multiplier differs from standard Type III input-output multipliers because of the endogeneity of export and propensity to import responses in the REMI model.

The detailed structure of the REMI model requires an extensive amount of data. The input-output component is non-survey based, using national technical coefficients. Of particular importance are data on employment, income, and output. Also, because complete regional accounts consistent with the National Income and Product Accounts are not routinely available, they must be constructed.

REMI uses three sources of employment and wage and salary data: the Bureau of Economic Analysis (BEA) employment, wage, and personal income series, ES-202 establishment employment and wage and salary data, and County Business Patterns (CBP) data published by the Bureau of the Census. The BEA data are annual averages and are reported at the two-digit level for states and at the one-digit level for counties. The ES-202 data, the foundation for the BEA data, are collected monthly in conjunction with the unemployment insurance program at the two-digit level for counties and states, and they are the foundation for the BEA data. CBP data are collected in conjunction with the Social Security program in March of each year.

Confidentiality requirements produce many suppressions in the data. Where suppressions occur, the number of establishments and the ranges of the number of employees for each establishment are supplied by CBP. REMI fills in the suppressions based on the hierarchical structure of the BEA data within regions and within industries. First, all two-digit S.I.C. industries are made consistent within the corresponding one-digit industries for each state simultaneous with all twodigit industries summed to the major region two-digit totals. Second, for counties REMI uses the ES-202 data, if available, and CBP data if ES-202 data is not available. Whichever data set is selected, it is made consistent with BEA one-digit county totals and state two-digit totals.

Output measures are based on regional employment data, the BEA Gross State Product series, and national output-to-employment ratios. REMI begins by applying the national output-to-employee ratio to employment by industry. This application is adjusted by regional differences in labor intensity and total factor productivity. Regional

differences in labor intensity are given by the industry production function and the unit factor costs. Total factor productivity calculations depend on industry value added in production reported in real U.S. dollars by BEA and on adjustments by REMI to the BEA numbers to reflect differences in regional production costs. The ratio of real regional value added per unit of input relative to U.S. value added per unit of input is the REMI relative total factor productivity.

TABLE 1⁷: A Comparison of the Different Models

Characteristics	REMI	RIMS II	IMPLAN
I. Type			
	Conjoined input-output and behavior model	Regional input-output	Regional input-output
II. General Model Characteristics			
Base Year	1977	1977	1982
Reference Model	National A matrix	National A matrix	National A matrix
Open/closed	Open	Both	Both
III. Sector Scheme			
Disaggregated	493	531	538
Aggregated	53	39	User choice
IV. Regionalization Technique			
Product Mix	Keep at a disaggregated level	Keep at a disaggregated level	Keep at a disaggregated level
Consumption	BLS regional Consumer Expenditure Surveys	Row adjusted for commuting, column adjusted for savings and state tax leakages	Adjusted using RPC
Trade Patterns	Regional purchase coefficients	Regional purchase coefficients	Regional purchase coefficients
V. Impacts Measured			
Output	Yes	Yes	Yes
Employment	Yes	Yes	Yes
Income	Yes	Yes	Yes
VI. Special Features			
	Occupation impacts Pollution impacts		
VII. Computer Requirement			
	IBM PC or Mainframe accessible via modem	IBM PC	IBM PC or Mainframe accessible via modem
VIII. Costs			
Purchase Model		\$275 per region	\$450 Software State packages (counties + state) for \$475-\$2200
Customized Simulation	Available	Not Available	Not Available
Other Options	Leasing models is available		
IX. Web Site	http://www.remi.com/	http://www.bea.doc.gov/bea/regional/rims/	http://www.mig-inc.com/

7 Adapted from "An Assessment of Input-Output Models", for the U.S. Department of Transportation, Federal Highway Administration, Transportation Studies Division, by DRI/McGraw-Hill (Jan 1994), Contract Number DTFH61-93-C-00055

USING RIMS II, IMPLAN AND REMI FOR ECONOMIC IMPACT ANALYSIS

BUS FLEET ANALYSIS

The following example will provide a basis to estimate the economic impacts that would result from the purchase and operation of a bus fleet using each of the models described above. This project would involve capital costs and operating costs that are shown below:

TABLE 2

BUS FLEET ANNUAL PURCHASE, OPERATION AND MAINTENANCE CASH FLOW ANALYSIS (YEAR 2000\$)							
Year	Bus Capital Costs—Instate	Bus Capital Costs—Out of State	Total Annual Capital Costs	Annual Operation & Maintenance	Driver and other Labor Costs	Total Annual Operating Costs	Total Annual Bus Costs—Capital & Operating Costs
1	\$ 28,440	\$ 540,360	\$ 568,800	\$ 52,800	\$ 472,500	\$ 525,300	\$ 1,094,100
2	\$ 28,440	\$ 540,360	\$ 568,800	\$ 52,800	\$ 472,500	\$ 525,300	\$ 1,094,100
3	\$ 28,440	\$ 540,360	\$ 568,800	\$ 52,800	\$ 472,500	\$ 525,300	\$ 1,094,100
4	\$ 28,440	\$ 540,360	\$ 568,800	\$ 52,800	\$ 472,500	\$ 525,300	\$ 1,094,100
5	\$ 28,440	\$ 540,360	\$ 568,800	\$ 52,800	\$ 472,500	\$ 525,300	\$ 1,094,100
6	\$ -	\$ -		\$ 52,800	\$ 472,500	\$ 525,300	\$ 525,300
7	\$ -	\$ -		\$ 52,800	\$ 472,500	\$ 525,300	\$ 525,300
8	\$ -	\$ -		\$ 52,800	\$ 472,500	\$ 525,300	\$ 525,300
9	\$ -	\$ -		\$ 52,800	\$ 472,500	\$ 525,300	\$ 525,300
10	\$ -	\$ -		\$ 52,800	\$ 472,500	\$ 525,300	\$ 525,300
Total	\$ 142,200	\$ 2,701,800	\$ 2,844,000	\$ 528,000	\$ 4,725,000	\$ 5,253,000	\$ 8,097,000

These costs represent: (1) the capital cost associated with purchasing the bus fleet (divided into the amount that is spent inside the state, which will affect the economy, and the portion spent outside of the state, which will not affect the economy), and (2) the operating expenses associated with running the bus fleet that includes the maintenance expenses and the driver/labor costs. The above costs are expressed in year 2000 dollars, which means these costs are representative of what it would cost to purchase and run the bus fleet right now.

Using RIMS II

RIMS II is a set of regional multipliers maintained by the Bureau of Economic Analysis, Regional Economic Analysis Division. The following multipliers are used in this example:

TABLE 3

EXAMPLES OF 1997 RIMS II MULTIPLIERS FOR THE STATE OF FLORIDA THAT CAN BE USED IN TRANSIT IMPACT ANALYSIS					
COSTS	RIMS II Industries	RIMS II Codes	RIMS II Multipliers		
			Output (per dollar)	Earnings (per dollar)	Jobs (per million \$)
Operating Costs	Transportation	25	1.9520	.7250	37.9
Capital Costs	Motor Vehicles and Equipment	21	1.4801	.3302	15.6

The above multipliers are for the year 1997 so in order to use them, *the costs in Table 2 must be converted to year 1997 dollars*. If regional multipliers are available for a different year, then the costs must be expressed in dollars for whatever year the

multipliers correspond. Since there is inflation every year, a dollar in 2000 is not worth the same as a dollar in 1997 (i.e., one dollar will not buy the same amount of goods in 2000 as it would have in 1997). Inflation is measured by the consumer price index (CPI) and the CPI can be used to inflate or deflate dollars as needed to express them in alternative units. Since the above data is expressed in current year 2000 dollars, we must deflate these dollars and express them in terms of a year that corresponds to the RIMS II multipliers that are available. The below example deflates the above costs and expresses them in equivalent 1997 dollars. This means that the costs will then reflect what it would have cost to purchase and run the bus system in 1997 instead of in 2000.

In order to adjust the costs, we use the consumer price index supplied by the U. S. Bureau of Labor Statistics. The consumer price index series used here is based on an average of prices between 1982-1984. This means that the 1982-1984 is the base year and the CPI is equal to 100. For each year after the 1982-1984 where inflation occurs, the CPI number will be greater than 100. This means that the same products bought in the period 1982-1984 cost more in the current time period than they did in the base period. In order to convert the 2000 dollars to 1997 dollars we must calculate the deflator. The deflator is simply the ratio of the CPI in 1997 to the CPI in 2000. The CPI in 2000 is 171.20 and the CPI in 1997 is 160.52. The third row of the below table shows that the deflator to convert year 2000 dollars to 1997 dollars is:

$$(CPI\ 1997)/(CPI\ 2000) = 160.52/171.20 = .937616822.$$

TABLE 4: CONSUMER PRICE INDEX AND CPI DEFLATORS AND INFLATORS

		DEFLATORS	INFLATORS
CPI 2000	171.20	From 2000\$ to 1999\$ = 166.58/171.2 = 0.9730140	From 1992\$ to 2000\$ = 171.2/140.32 = 1.2200684
CPI 1999	166.58	From 2000\$ to 1998\$ = 163.01/171.2 = 0.9521612	From 1995\$ to 2000\$ = 171.2/152.38 = 1.1235070
CPI 1998	163.01	From 2000\$ to 1997\$ = 160.52/171.2 = 0.937616822	From 1997\$ to 2000\$ = 171.2/160.52 = 1.066534
CPI 1997	160.52		
CPI 1995	152.38		
CPI 1992	140.32		

Once the appropriate deflator has been calculated, the costs in Table 2 are deflated by multiplying each cost in the table by the deflator, .937616822. This is done in the following table:

TABLE 5

BUS FLEET ANNUAL PURCHASE, OPERATION AND MAINTENANCE CASH FLOW ANALYSIS (YEAR 1997\$)							
Year	Bus Capital Costs-- Instate	Bus Capital Costs-- Out of State	Total Annual Capital Costs	Annual Operation & Maintenance	Driver and other Labor Costs	Total Annual Operating Costs	Total Annual Bus Costs--Capital & Operating Costs
1	\$ 26,666	\$ 506,651	\$ 533,316	\$ 49,506	\$ 443,024	\$ 492,530	\$ 1,025,847
2	\$ 26,666	\$ 506,651	\$ 533,316	\$ 49,506	\$ 443,024	\$ 492,530	\$ 1,025,847
3	\$ 26,666	\$ 506,651	\$ 533,316	\$ 49,506	\$ 443,024	\$ 492,530	\$ 1,025,847
4	\$ 26,666	\$ 506,651	\$ 533,316	\$ 49,506	\$ 443,024	\$ 492,530	\$ 1,025,847
5	\$ 26,666	\$ 506,651	\$ 533,316	\$ 49,506	\$ 443,024	\$ 492,530	\$ 1,025,847
6	\$ -	\$ -	\$ -	\$ 49,506	\$ 443,024	\$ 492,530	\$ 492,530
7	\$ -	\$ -	\$ -	\$ 49,506	\$ 443,024	\$ 492,530	\$ 492,530
8	\$ -	\$ -	\$ -	\$ 49,506	\$ 443,024	\$ 492,530	\$ 492,530
9	\$ -	\$ -	\$ -	\$ 49,506	\$ 443,024	\$ 492,530	\$ 492,530
10	\$ -	\$ -	\$ -	\$ 49,506	\$ 443,024	\$ 492,530	\$ 492,530
Total	\$ 133,329	\$ 2,533,253	\$ 2,666,582	\$ 495,062	\$ 4,430,239	\$ 4,925,301	\$ 7,591,883

Once this has been done, the output and earnings multipliers can be directly multiplied to the costs listed in Table 5 since they are the multipliers that occur per each dollar spent. However, in order to use the jobs multiplier, the costs must be expressed in terms of *millions of dollars* so they have to be converted. To convert the costs in Table 5 to units of millions of dollars, divide the costs by \$1,000,000. This will give the following costs:

TABLE 6: ANNUAL BUS PURCHASE AND OPERATING COSTS (IN YEAR 1997\$)

YEAR	BUS CAPITAL COSTS—INSTATE	OPERATING EXPENSES	BUS CAPITAL COSTS—INSTATE (in million \$)	OPERATING EXPENSES (in million \$)
1	\$ 26,666	\$ 492,530	\$0.02666	0.4925
2	\$ 26,666	\$ 492,530	\$0.02666	0.4925
3	\$ 26,666	\$ 492,530	\$0.02666	0.4925
4	\$ 26,666	\$ 492,530	\$0.02666	0.4925
5	\$ 26,666	\$ 492,530	\$0.02666	0.4925
6	\$ -	\$ 492,530	\$ -	0.4925
7	\$ -	\$ 492,530	\$ -	0.4925
8	\$ -	\$ 492,530	\$ -	0.4925
9	\$ -	\$ 492,530	\$ -	0.4925
10	\$ -	\$ 492,530	\$ -	0.4925
Total	\$ 133,329	\$ 4,925,301	\$0.1333	4.925

Once the costs are in the correct form, the RIMS II multipliers in Table 3 can be applied. The multipliers for output and earnings can be directly applied to the costs on the left hand side of the above table. The jobs multiplier must be applied to the costs on the right hand side of the table. This will yield the following economic impacts for output and earnings:

TABLE 7

RIMS II ECONOMIC IMPACTS ON OUTPUT AND EARNINGS (IN 1997\$)				
YEAR	OUTPUT		EARNINGS	
	CAPITAL COSTS	OPERATING EXPENSES	CAPITAL COSTS	OPERATING EXPENSES
1	\$ 39,468	\$ 961,419	\$ 8,805	\$ 357,084
2	\$ 39,468	\$ 961,419	\$ 8,805	\$ 357,084
3	\$ 39,468	\$ 961,419	\$ 8,805	\$ 357,084
4	\$ 39,468	\$ 961,419	\$ 8,805	\$ 357,084
5	\$ 39,468	\$ 961,419	\$ 8,805	\$ 357,084
6	\$ -	\$ 961,419	\$ -	\$ 357,084
7	\$ -	\$ 961,419	\$ -	\$ 357,084
8	\$ -	\$ 961,419	\$ -	\$ 357,084
9	\$ -	\$ 961,419	\$ -	\$ 357,084
10	\$ -	\$ 961,419	\$ -	\$ 357,084
TOTAL	\$ 197,340	\$ 9,614,188	\$ 44,025	\$ 3,570,843

Since the costs were expressed in year 1997 dollars and the multipliers do not inflate or deflate the costs, the results for output and earnings are also expressed in year 1997 dollars. Table 7 shows that the capital expenditures will have almost a \$200,000 impact

on output and the operating expenses will have a \$9.6 million impact. This table also shows the effect on earnings. The capital expenditures will have a \$44,025 impact on earnings (\$8,805 per year for the five years the dollars are expended) and the operating expenses will have a \$3.57 million impact on earnings (\$357,084 per year for the ten years depicted).

Table 8 shows the economic impact on jobs from the bus fleet expenditures. The capital expenditures will result in 2 jobs and the operating expenses will result in almost 1876 jobs.

TABLE 8

RIMS II JOBS ECONOMIC IMPACTS		
YEAR	CAPITAL COSTS	OPERATING EXPENSES
1	0.42	18.67
2	0.42	18.67
3	0.42	18.67
4	0.42	18.67
5	0.42	18.67
6	-	18.67
7	-	18.67
8	-	18.67
9	-	18.67
10	-	18.67
TOTAL	2.08	186.67

Since the multipliers used were for 1997, the results were expressed in terms of 1997 dollars. The jobs result cannot be adjusted since it is not a dollar value. However, the earnings and output results can be inflated to be expressed in current terms of year 2000 dollars. To inflate the results to year 2000 dollars, we will need to calculate the appropriate inflator. This can be found in Table 4. This table shows that the appropriate inflator is the ratio of the CPI 2000 to the CPI 1997. The 2000 CPI is 171.20 and the 1997 CPI is 160.52. The inflator is then:

$$[\text{CPI 2000/CPI 1997}] = 171.2/160.52 = 1.066534.$$

Now that the inflator has been calculated, the earnings and output results can be expressed in year 2000 dollars by multiplying the results in Table 7 by the inflator. This yields the following results for the earnings and output totals:

TABLE 9

RIMS II ECONOMIC IMPACTS ON OUTPUT AND EARNINGS (IN YEAR 2000\$)				
YEAR	OUTPUT		EARNINGS	
	CAPITAL COSTS	OPERATING EXPENSES	CAPITAL COSTS	OPERATING EXPENSES
1	\$ 42,094	\$ 1,025,386	\$ 9,391	\$ 380,843
2	\$ 42,094	\$ 1,025,386	\$ 9,391	\$ 380,843
3	\$ 42,094	\$ 1,025,386	\$ 9,391	\$ 380,843
4	\$ 42,094	\$ 1,025,386	\$ 9,391	\$ 380,843
5	\$ 42,094	\$ 1,025,386	\$ 9,391	\$ 380,843
6	\$ -	\$ 1,025,386	\$ -	\$ 380,843
7	\$ -	\$ 1,025,386	\$ -	\$ 380,843
8	\$ -	\$ 1,025,386	\$ -	\$ 380,843
9	\$ -	\$ 1,025,386	\$ -	\$ 380,843
10	\$ -	\$ 1,025,386	\$ -	\$ 380,843
TOTAL	\$ 210,470	\$ 10,253,856	\$ 46,954	\$ 3,808,425

Tables 9 shows the economic impacts on output and earnings expressed in year 2000 dollars. These results will be compared with the results from the other economic impact models later.

Using IMPLAN

IMPLAN is an input-output model that is similar to RIMS II. However, as the earlier technical discussion detailed, it allows you to use different types of multipliers. The Type II multipliers are the default multipliers and can be used in most circumstances. The Type II multipliers were used in this example.

In Table 2, the costs of purchasing and running the bus fleet were expressed for each year individually in year 2000 dollars. IMPLAN will not allow you to enter the data expressed in year 2000 dollars. Instead, IMPLAN will allow you to enter your data expressed in terms of any year between 1977-1998. Since there is inflation every year, a dollar in 1975 is not worth the same as a dollar in 1998 (i.e., one dollar will not buy the same amount of goods in 1998 as it would have in 1977). Inflation is measured by the consumer price index (CPI) and the CPI can be used to inflate or deflate dollars as needed to express them in alternative units. Since the above data is expressed in current year 2000 dollars, we must deflate these dollars and express them in terms of a year that IMPLAN will accept. The below example deflates the above costs and expresses them in equivalent 1998 dollars. This means that the costs will then reflect what it would have cost to purchase and run the bus system in 1998 instead of in 2000.

In order to adjust the costs, we use the consumer price index supplied by the U. S. Bureau of Labor Statistics. This consumer price index series is based on an average of prices between 1982-1984. This means that the 1982-1984 CPI is equal to 100. For each year after the 1982-1984 where inflation occurs, the CPI number will be greater than 100. This means that the same products bought in the period 1982-1984 cost more than they did in that time period. In order to convert the 2000 dollars to 1998 dollars we must calculate the deflator. The deflator is simply the ratio of the CPI in

1998 to the CPI in 2000. The CPI in 2000 is 171.20 and the CPI in 1998 is 163.01. The second row of Table 4 shows that the deflator to convert year 2000 dollars to 1998 dollars is:

$$(CPI\ 1998)/(CPI\ 2000) = 163.01/171.2 = .9521612.$$

Now that we have calculated the deflator, we use the deflator by multiplying the year 2000 costs by the deflator in order to express the costs in 1998 dollars. The following table shows the costs in Table 2 adjusted to be expressed in 1998 dollars. These costs are the costs expressed in Table 2 multiplied by the deflator, .9521612.

TABLE 10: BUS FLEET ANNUAL PURCHASE, OPERATION AND MAINTENANCE COSTS (IN 1998 \$)

Year	Bus Capital Costs— Instate	Bus Capital Costs--Out of State	Total Annual Capital Costs	Annual Operation & Maintenance	Driver and other Labor Costs	Total Annual Operating Costs	Total Annual Bus Costs--Capital & Operating Costs
1	\$ 27,079	\$ 514,510	\$ 541,589	\$ 50,274	\$ 449,896	\$ 500,170	\$ 1,041,760
2	\$ 27,079	\$ 514,510	\$ 541,589	\$ 50,274	\$ 449,896	\$ 500,170	\$ 1,041,760
3	\$ 27,079	\$ 514,510	\$ 541,589	\$ 50,274	\$ 449,896	\$ 500,170	\$ 1,041,760
4	\$ 27,079	\$ 514,510	\$ 541,589	\$ 50,274	\$ 449,896	\$ 500,170	\$ 1,041,760
5	\$ 27,079	\$ 514,510	\$ 541,589	\$ 50,274	\$ 449,896	\$ 500,170	\$ 1,041,760
6	\$ -	\$ -	\$ -	\$ 50,274	\$ 449,896	\$ 500,170	\$ 500,170
7	\$ -	\$ -	\$ -	\$ 50,274	\$ 449,896	\$ 500,170	\$ 500,170
8	\$ -	\$ -	\$ -	\$ 50,274	\$ 449,896	\$ 500,170	\$ 500,170
9	\$ -	\$ -	\$ -	\$ 50,274	\$ 449,896	\$ 500,170	\$ 500,170
10	\$ -	\$ -	\$ -	\$ 50,274	\$ 449,896	\$ 500,170	\$ 500,170
Total	\$ 135,397	\$ 2,572,549	\$ 2,707,946	\$ 502,741	\$ 4,498,962	\$ 5,001,703	\$ 7,709,649

In addition, IMPLAN will not allow the user to enter the data on a year-by-year basis. Instead, IMPLAN requires that the costs for each category be summed to one total amount. Then, to enter these costs in the IMPLAN program, they must be assigned a code that identifies which sector of the economy they are spent in. The appropriate sector codes for this example are shown in the following table:

TABLE 11: IMPLAN INPUTS FOR BUS FLEET ANALYSIS

CATEGORY OF SPENDING	SECTOR	AMOUNT
Bus capital costs--truck & bus bodies	385	\$ 135,397
Annual operation, maintenance & labor (local government passenger transit)	510	\$ 5,001,703

IMPLAN will provide economic impacts for employment, value added (wages), and output and are shown below for this example.

TABLE 12: IMPLAN ECONOMIC IMPACTS (EXPRESSED IN 1995\$)

	EMPLOYMENT	VALUE ADDED	DEMAND
DIRECT	178.9	\$ 798,619	\$ 4,490,742
INDIRECT	24.5	\$ 1,142,086	\$ 1,979,263
INDUCED	115	\$ 4,996,963	\$ 7,855,670
TOTAL	318.4	\$ 6,937,667	\$ 14,326,675

The IMPLAN results are expressed in 1995 dollars so, to determine what the current year 2000 equivalent dollars are, the dollars must be inflated from 1995 dollars to year 2000 dollars. To calculate the inflator, we will need the 1995 CPI and the 2000 CPI from Table 4. The 1995 CPI is 152.38 and the 2000 CPI is 171.20. The inflator is the ratio of the 2000 CPI to the 1995 CPI:

$$(2000 \text{ CPI}) / (1995 \text{ CPI}) = 171.20 / 152.38 = 1.1235070.$$

Now, to express the above economic impacts in year 2000 dollars, we multiply the value added and demand numbers by the inflator. This yields the following economic impacts expressed in year 2000 dollars.

TABLE 13: IMPLAN ECONOMIC IMPACTS (EXPRESSED IN 2000\$)

	EMPLOYMENT	VALUE ADDED	DEMAND
DIRECT	178.9	\$ 897,254	\$ 5,045,380
INDIRECT	24.5	\$ 1,283,142	\$ 2,223,716
INDUCED	115	\$ 5,614,123	\$ 8,825,900
TOTAL	318.4	\$ 7,794,517	\$ 16,096,120

Table 13 shows that IMPLAN provides results for direct, indirect, and induced economic impacts. These results are then summed to provide the total economic impact of the project.

Using REMI

REMI will accept data in 1992 or 1999 dollar units. Since the costs for the project are expressed in year 2000 dollars, we must deflate the costs to either year 1992 or year 1999 dollars. In this example we will deflate the costs to year 1999 dollars. From Table 4 we see that the CPI for 2000 is 171.20 and the CPI for 1999 is 166.58. To calculate the deflator to convert the year 2000 costs to year 1999 costs, we find the ratio of the 1999 CPI to the 2000 CPI = $166.58 / 171.20 = .9730140$. To deflate the costs, multiply each value in Table 2 by the deflator just calculated. This yields the following costs expressed in 1999 dollars:

TABLE 14

BUS FLEET ANNUALIZED PURCHASE AND OPERATION AND MAINTENANCE CASH FLOW ANALYSIS (IN 1999\$)							
Year	Bus Capital Costs— Instate	Bus Capital Costs—Out of State	Total Annual Capital Costs	Annual Operation & Maintenance	Driver & other Labor Costs	Total Annual Operating Costs	Total Annual Bus Costs—Capital & Operating Costs
1	\$ 27,673	\$ 525,778	\$ 553,450	\$ 51,375	\$ 459,749	\$ 511,124	\$ 1,064,575
2	\$ 27,673	\$ 525,778	\$ 553,450	\$ 51,375	\$ 459,749	\$ 511,124	\$ 1,064,575
3	\$ 27,673	\$ 525,778	\$ 553,450	\$ 51,375	\$ 459,749	\$ 511,124	\$ 1,064,575
4	\$ 27,673	\$ 525,778	\$ 553,450	\$ 51,375	\$ 459,749	\$ 511,124	\$ 1,064,575
5	\$ 27,673	\$ 525,778	\$ 553,450	\$ 51,375	\$ 459,749	\$ 511,124	\$ 1,064,575
6	\$ -	\$ -	\$ -	\$ 51,375	\$ 459,749	\$ 511,124	\$ 511,124
7	\$ -	\$ -	\$ -	\$ 51,375	\$ 459,749	\$ 511,124	\$ 511,124
8	\$ -	\$ -	\$ -	\$ 51,375	\$ 459,749	\$ 511,124	\$ 511,124
9	\$ -	\$ -	\$ -	\$ 51,375	\$ 459,749	\$ 511,124	\$ 511,124
10	\$ -	\$ -	\$ -	\$ 51,375	\$ 459,749	\$ 511,124	\$ 511,124
Total	\$ 138,363	\$ 2,628,889	\$ 2,767,252	\$ 513,751	\$ 4,597,491	\$ 5,111,243	\$ 7,878,495

In REMI, the corresponding sectors are chosen in a different manner than in IMPLAN. Although the sector descriptions are the same, they are entered in a different way. REMI will ask you to select the policy variable categories that will be used. The corresponding REMI sectors for the costs in this example are the following:

TABLE 15: REMI INPUTS FOR BUS FLEET ANALYSIS

COST	POLICY VARIABLE CATEGORIES	DETAIL SELECTION
Bus Capital Cost (In State)	Output Block→Detailed Industry Output→Durables→Motor Vehicle Sales	Truck & Bus Bodies
Annual Operating Cost	Output Block→Detailed Industry Output→Government Spending→State & Local Services	Local Government Passenger Transit

Once these sectors have been chosen, unlike IMPLAN, REMI will allow you to input the costs on a year-by-year basis. Once the costs have been entered and the analysis has been run, REMI will provide numerous economic impacts including effects on the population as well as the economy. The results that are comparable to IMPLANS' are for the following categories:

TABLE 16: REMI BUS FLEET ECONOMIC IMPACTS (INPUT 1992\$)

Year	Employment (Thous)	GRP (Bil 92\$)	Demand (Bil 92\$)
1	0.02734	0.001068	0.001953
2	0.02637	0.001068	0.001831
3	0.02637	0.0009766	0.001953
4	0.02246	0.000885	0.001709
5	0.02441	0.001007	0.001831
6	0.02051	0.000824	0.001404
7	0.02246	0.0009766	0.001587
8	0.02441	0.001038	0.001953
9	0.02246	0.0009155	0.001648
10	0.02246	0.0009766	0.001709
Total	0.23925	0.0097353	0.017578

These are the economic impacts on employment, gross revenue product and demand. The Employment results are expressed in terms of thousands of jobs and GRP and Demand results are expressed in terms of billions of dollars. This is different from IMPLAN which expresses its output in what ever units the results are in so that \$500,000,000 is expressed as \$500,000,000 instead of as \$.5 billion dollars. Since the above economic impacts are less than a billion dollars, the GRP and demand impacts are expressed as a fraction of a billion dollars instead of in units which may make more sense. To convert the above results, multiply the employment impacts by 1,000 and the GRP and Demand results by \$1,000,000,000. This will yield the following:

TABLE 17: REMI BUS FLEET ECONOMIC IMPACTS (IN 1992\$)

YEAR	EMPLOYMENT	GRP (1992\$)	DEMAND (1992\$)
1	27.34	\$ 1,068,000	\$ 1,953,000
2	26.37	\$ 1,068,000	\$ 1,831,000
3	26.37	\$ 976,600	\$ 1,953,000
4	22.46	\$ 885,000	\$ 1,709,000
5	24.41	\$ 1,007,000	\$ 1,831,000
6	20.51	\$ 824,000	\$ 1,404,000
7	22.46	\$ 976,600	\$ 1,587,000
8	24.41	\$ 1,038,000	\$ 1,953,000
9	22.46	\$ 915,500	\$ 1,648,000
10	22.46	\$ 976,600	\$ 1,709,000
TOTAL	239.25	\$ 9,735,300	\$ 17,578,000

The economic impacts are now expressed in units that are comparable units to the IMPLAN results. However, the results are still expressed in 1992 dollars, so to express them in current year 2000 dollars we must inflate the dollars. To make the conversion, we must calculate the appropriate inflator. From Table 4, we know the 2000 CPI is 171.20 and the 1992 CPI is 140.32. The inflator to convert 1992 dollars to year 2000 dollars is:

$$(CPI\ 2000)/(CPI1992) = 171.20/140.32 = 1.2200684.$$

Now, to convert the dollars, multiply each value in Table 17 by the inflator, and this will yield the following results:

TABLE 18: REMI BUS FLEET ECONOMIC IMPACTS (IN 2000\$)

YEAR	EMPLOYMENT	GRP (2000\$)	DEMAND (2000\$)
1	27.34	\$ 1,303,033	\$ 2,382,794
2	26.37	\$ 1,303,033	\$ 2,233,945
3	26.37	\$ 1,191,519	\$ 2,382,794
4	22.46	\$ 1,079,761	\$ 2,085,097
5	24.41	\$ 1,228,609	\$ 2,233,945
6	20.51	\$ 1,005,336	\$ 1,712,976
7	22.46	\$ 1,191,519	\$ 1,936,249
8	24.41	\$ 1,266,431	\$ 2,382,794
9	22.46	\$ 1,116,973	\$ 2,010,673
10	22.46	\$ 1,191,519	\$ 2,085,097
TOTAL	239.25	\$ 11,877,732	\$ 21,446,362

A Comparison of the Bus Fleet Analyses

TABLE 19: COMPARING THE RESULTS FROM RIMS II, IMPLAN, AND REMI

	RIMS II	IMPLAN	REMI
OUTPUT	\$ 10,253,856	\$16,096,120	\$ 21,446,362
INCOME	\$ 3,808,425	\$ 7,794,517	\$ 11,877,732
JOBS	187	318	239

Rail Transit Analysis

All of the analysis will be done using the following initial information about costs:

TABLE 20: RAIL TRANSIT PROJECT TEN YEAR CONSTRUCTION AND OPERATING EXPENSES (IN YEAR 2000 \$)

Year	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATING EXPENSES		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
1	\$ 1,000,000	\$ 50,000	\$ 15,000	\$ 150,000	\$ 2,850,000	\$ -	\$ -	\$ -	\$ -	\$ 4,065,001
2	\$ 2,000,000	\$ 100,000	\$ 25,000	\$ 300,000	\$ 5,700,000	\$ -	\$ -	\$ -	\$ -	\$ 8,125,002
3	\$ 1,000,000	\$ 50,000	\$ 2,500	\$ 750,000	\$ 14,250,000	\$ 2,850,000	\$ 150,000	\$ -	\$ -	\$ 19,052,503
4	\$ -	\$ -	\$ -	\$ 300,000	\$ 5,700,000	\$ 1,900,000	\$ 100,000	\$ -	\$ 50,000	\$ 8,050,004
5	\$ -	\$ -	\$ -	\$ 300,000	\$ 5,700,000	\$ 1,425,000	\$ 75,000	\$ -	\$ 150,000	\$ 7,650,005
6	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,500,000	\$ 1,500,006
7	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,575,000	\$ 1,575,007
8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,653,750	\$ 1,653,758
9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,736,438	\$ 1,736,447
10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,823,259	\$ 1,823,269
Total	\$ 4,000,000	\$ 200,000	\$ 42,500	\$ 1,800,000	\$ 34,200,000	\$ 6,175,000	\$ 325,000	\$ -	\$ 8,488,447	\$ 55,231,002

These costs represent: (1) the cost associated with purchasing the land where the railway will be built, (2) the cost of legal services to purchase the land, (3) the real estate cost associated with purchasing the land, (4) the cost of constructing the railway, (5) the cost of the railroad equipment or rolling stock, and (5) the operating expenses associated with running the railway. The above costs are expressed in year 2000 dollars, which means these costs are representative of what it would cost to purchase the land, construct, and run the rail line right now.

Using RIMS II

The RIMS II multipliers were explained in the previous example. Since the above example was studying the economic impact of purchasing and operating a bus fleet, the same multipliers cannot be used in this example. In order to study the economic impact of the rapid rail project, the appropriate multipliers must be used. A few of the multipliers that could be used are described in the following table:

TABLE 21: EXAMPLES OF 1997 RIMS II MULTIPLIERS FOR FLORIDA THAT CAN BE USED IN THIS ANALYSIS

COST COMPONENTS	RIMS II Industries (bold italics indicates multipliers used in this analysis)	RIMS II CODES	RIMS II MULTIPLIERS		
			OUTPUT (per dollar)	EARNINGS (per dollar)	JOBS (per million \$)
Operating Costs	<i>Railroads and related services</i>	<i>65.01</i>	<i>2.23</i>	<i>0.69</i>	<i>25.67</i>
Financing Fees	Security and commodity brokers	70.03	2.10	0.68	26.28
ROW Fees	<i>Real estate agents, managers, operators, and lessors.</i>	<i>71.0201</i>	<i>2.13</i>	<i>0.70</i>	<i>27.12</i>
Capital Costs	<i>Legal, engineering, accounting and related services</i>	<i>73.0302</i>	<i>2.18</i>	<i>0.73</i>	<i>27.52</i>
	<i>Other new construction</i>	<i>11.09</i>	<i>2.06</i>	<i>0.71</i>	<i>28.22</i>
	New building construction, office, industrial and commercial	11.08	1.65	0.42	14.90
	Maintenance and repair construction, other	12.03	1.91	0.64	18.76
	New construction, highways and streets	11.04	2.12	0.82	19.52
	Maintenance and repair of highways and streets	12.0214	1.59	0.26	12.49
Rolling Stock	<i>Railroad equipment</i>	<i>61.03</i>	<i>2.20</i>	<i>0.86</i>	<i>30.60</i>

The following multipliers were taken from the above table and were used in this analysis. Since the analysis is only interested in the economic impact of the project on the Florida economy, the multipliers will not be applied to the out-of-state expenditures. Table 22 below shows the multipliers used for each expenditure category in this example:

TABLE 22: FINAL DEMAND MULTIPLIERS FROM RIMS II

TYPES	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATIONAL EXPENSES	
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State
JOBS	-	27.521	27.119	-	28.218	-	30.602	-	25.672
EARNINGS	-	0.731	0.703	-	0.708	-	0.860	-	0.694
OUTPUT	-	2.181	2.135	-	2.062	-	2.198	-	2.233

As explained in the previous bus fleet analysis, the costs must be expressed in dollars for whatever year the multipliers correspond. The above multipliers are for the year 1997 so in order to use them, *the costs in Table 20 must be converted to year 1997 dollars*. Since the above data is expressed in current year 2000 dollars, we must deflate these dollars and express them in terms of a year that corresponds to our RIMS II multipliers. The below example deflates the above costs and expresses them in equivalent 1997 dollars. This means that the costs will then reflect what it would have cost to construct and run the rail system in 1997 instead of in 2000.

In order to adjust the costs, we use the consumer price index supplied by the U. S. Bureau of Labor Statistics. This consumer price index series is based on an average of prices between 1982-1984. This means that the 1982-1984 CPI is equal to 100. For each year after the 1982-1984 where inflation occurs, the CPI number will be greater than 100. This means that the same products bought in the period 1982-1984 cost more in the current time period than they did in the base period. In order to convert the 2000 dollars to 1997 dollars we must calculate the deflator. The deflator is simply the ratio of the CPI in 1997 to the CPI in 2000. The CPI in 2000 is 171.20 and the CPI in 1997 is 160.52. The third row of table 4 shows that the deflator to convert year 2000 dollars to 1997 dollars is:

$$(CPI\ 1997)/(CPI\ 2000) = 160.52/171.2 = .937616822.$$

Once the deflator has been calculated, the costs in Table 20 are deflated by multiplying each value by the deflator. Once this has been done, this will yield the following costs of running the rail system expressed in year 1997 dollars:

TABLE 23 : RAIL TRANSIT PROJECT TEN YEAR CONSTRUCTION AND OPERATING EXPENSES (IN 1997\$)

YEAR	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATING EXPENSES		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
1	\$ 937,617	\$ 46,881	\$ 14,064	\$ 140,643	\$ 2,672,208	\$ -	\$ -	\$ -	\$ -	\$ 3,811,413
2	\$ 1,875,234	\$ 93,762	\$ 23,440	\$ 281,285	\$ 5,344,416	\$ -	\$ -	\$ -	\$ -	\$ 7,618,139
3	\$ 937,617	\$ 46,881	\$ 2,344	\$ 703,213	\$ 13,361,040	\$ 2,672,208	\$ 140,643	\$ -	\$ -	\$ 17,863,947
4	\$ -	\$ -	\$ -	\$ 281,285	\$ 5,344,416	\$ 1,781,472	\$ 93,762	\$ -	\$ 46,881	\$ 7,547,819
5	\$ -	\$ -	\$ -	\$ 281,285	\$ 5,344,416	\$ 1,336,104	\$ 70,321	\$ -	\$ 140,643	\$ 7,172,773
6	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,406,425	\$ 1,406,431
7	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,476,746	\$ 1,476,753
8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,550,584	\$ 1,550,591
9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,628,113	\$ 1,628,121
10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,709,519	\$ 1,709,528
Total	\$ 3,750,467	\$ 187,523	\$ 39,849	\$ 1,687,710	\$ 32,066,495	\$ 5,789,784	\$ 304,725	\$ -	\$ 7,958,911	\$ 51,785,516

In order to apply the jobs multiplier, the costs must be converted to millions of dollars as in the previous bus fleet example. This is done by dividing each value by \$1,000,000. Once the conversion has been done and the multiplier has been applied to each year's costs, the following impacts result:

TABLE 24: FULL DIRECT AND INDIRECT ECONOMIC IMPACTS ON JOBS

YEAR	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATIONAL EXPENSES		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
1		1.29	0.38		75.40		0.00		0.00	77.08
2		2.58	0.64		150.81		0.00		0.00	154.03
3		1.29	0.06		377.02		4.30		0.00	382.68
4		0.00	0.00		150.81		2.87		1.20	154.88
5		0.00	0.00		150.81		2.15		3.61	156.57
6		0.00	0.00		0.00		0.00		36.11	36.11
7		0.00	0.00		0.00		0.00		37.91	37.91
8		0.00	0.00		0.00		0.00		39.81	39.81
9		0.00	0.00		0.00		0.00		41.80	41.80
10		0.00	0.00		0.00		0.00		43.89	43.89
TOTAL		5.16	1.08		904.86		9.33		204.32	1124.74

Table 24 shows that over 1,000 jobs will result from the project including over 900 resulting from the construction expenditure and over 200 from the annual operating expenses. Table 25 below shows the effects of the project on earnings.

TABLE 25: FULL DIRECT AND INDIRECT TRANSIT ECONOMIC IMPACTS ON EARNINGS

Year	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATIONAL EXPENSES		TOTALS					
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State						
1	\$	34,256	\$	9,891	\$	-	\$	1,891,389	\$	-	\$	-	\$	1,935,536	
2	\$	68,512	\$	16,486	\$	-	\$	3,782,778	\$	-	\$	-	\$	3,867,775	
3	\$	34,256	\$	1,649	\$	-	\$	9,456,944	\$	-	\$	120,910	\$	9,613,759	
4	\$	-	\$	-	\$	-	\$	3,782,778	\$	-	\$	80,607	\$	3,895,901	
5	\$	-	\$	-	\$	-	\$	3,782,778	\$	-	\$	60,455	\$	3,940,782	
6	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	975,497	
7	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	1,024,271	
8	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	1,075,485	
9	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	1,129,259	
10	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	1,185,722	
Total	\$	137,023	\$	28,026	\$	-	\$	22,696,665	\$	-	\$	261,972	\$	5,520,300	
														\$	28,643,987

The above table shows there will be a \$28.6 million dollar impact on income as a result of this project. Over \$22 million will result from the construction of the rapid rail and almost \$5.5 million will result from the annual operating expenses. Table 26 below shows the economic impact on output as a result of the project.

TABLE 26: FULL DIRECT AND INDIRECT TRANSIT ECONOMIC IMPACTS ON OUTPUT

YEAR	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATIONAL EXPENSES		TOTALS							
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State								
1	\$	-	\$	102,242	\$	30,023	\$	-	\$	5,508,757	\$	-	\$	-	\$	5,641,022	
2	\$	-	\$	204,485	\$	50,038	\$	-	\$	11,017,513	\$	-	\$	-	\$	11,272,036	
3	\$	-	\$	102,242	\$	5,004	\$	-	\$	27,543,783	\$	-	\$	309,146	\$	27,960,176	
4	\$	-	\$	-	\$	-	\$	-	\$	11,017,513	\$	-	\$	206,098	\$	11,328,305	
5	\$	-	\$	-	\$	-	\$	-	\$	11,017,513	\$	-	\$	154,573	\$	11,486,169	
6	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	3,140,829	
7	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	3,297,870	
8	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	3,462,764	
9	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	3,635,902	
10	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	3,817,697	
TOTAL	\$	-	\$	408,970	\$	85,065	\$	-	\$	66,105,080	\$	-	\$	669,817	\$	17,773,839	
																\$	85,042,771

This table shows that there will be a \$85 million dollar impact on output resulting from this project. Construction will be responsible for \$66 million of this impact and the annual operating expenses will create an impact of almost \$18 million.

Since the multipliers used were for 1997, the results were expressed in terms of 1997 dollars. The jobs result cannot be adjusted since it is not a dollar value. However, the earnings and output results can be inflated to be expressed in current terms of year 2000 dollars. To inflate the results to year 2000 dollars, we will need to calculate the appropriate inflator. This can be found in Table 4. This table shows that the

appropriate inflator is the ratio of the CPI 2000 to the CPI 1997. The 2000 CPI is 171.20 and the 1997 CPI is 160.52. The inflator is then:

$$[\text{CPI 2000/CPI 1997}] = 171.2/160.52 = 1.066534.$$

Now that the inflator has been calculated, the earnings and output results can be expressed in year 2000 dollars by multiplying the results in Table 25 and Table 26 by the inflator. This yields the following results for the earnings and output totals:

TABLE 27: RIMS II ECONOMIC IMPACTS ON EARNINGS (IN YEAR 2000\$)

	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATIONAL EXPENSE		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
TOTAL	\$ -	\$ 146,140	\$ 29,890	\$ -	\$ 24,206,760	\$ -	\$ 279,403	\$ -	\$ 5,887,587	\$ 30,549,780

TABLE 28: RIMS II ECONOMIC IMPACTS ON OUTPUT (IN YEAR 2000\$)

	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATIONAL EXPENSE		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
TOTAL	\$ -	\$ 436,180	\$ 90,725	\$ -	\$ 70,503,300	\$ -	\$ 714,383	\$ -	\$ 18,956,400	\$ 90,700,987

Tables 27 and 28 show the economic impacts on earnings and output expressed in current year 2000 dollars.

Using IMPLAN

As stated previously, IMPLAN is an input-output model that is similar to RIMS II. However, as the earlier discussion detailed, it allows you to use different types of multipliers. The Type II multipliers are the default multipliers and can be used in most circumstances. The Type II multipliers were used in this example.

As explained in the bus fleet analysis, the costs must be deflated before they can be entered into IMPLAN. Since the above data is expressed in current year 2000 dollars, we must deflate these dollars and express them in terms of a year that IMPLAN will accept. The below example deflates the above costs and expresses them in equivalent 1998 dollars. This means that the costs will then reflect what it would have cost to construct and run the high speed rail system in 1998 instead of in 2000.

In order to adjust the costs, we use the consumer price index supplied by the U. S. Bureau of Labor Statistics. This consumer price index series is based on an average of prices between 1982-1984. This means that the 1982-1984 CPI is equal to 100. For

each year after the 1982-1984 where inflation occurs, the CPI number will be greater than 100. This means that the same products bought in the period 1982-1984 cost more than they did in that time period. In order to convert the 2000 dollars to 1998 dollars we must calculate the deflator. The deflator is simply the ratio of the CPI in 1998 to the CPI in 2000. The CPI in 2000 is 171.20 and the CPI in 1998 is 163.01. The second row of table 4 shows that the deflator to convert year 2000 dollars to 1998 dollars is:

$$(CPI\ 1998)/(CPI\ 2000) = 163.01/171.2 = .9521612.$$

Now that we have calculated the deflator, we use the deflator by multiplying the year 2000 costs by the deflator in order to express the costs in 1998 dollars. The following table shows the costs in Table 20 adjusted to be expressed in 1998 dollars. These costs are the costs expressed in Table 20 multiplied by the deflator, .9521612.

TABLE 29: RAIL TRANSIT PROJECT TEN YEAR CONSTRUCTION AND OPERATING EXPENSES (IN 1998 \$)

Year	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATING EXPENSES		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
1	\$ 952,161	\$ 47,608	\$ 14,282	\$ 142,824	\$ 2,713,659	\$ -	\$ -	\$ -	\$ -	\$ 3,870,536
2	\$ 1,904,322	\$ 95,216	\$ 23,804	\$ 285,648	\$ 5,427,319	\$ -	\$ -	\$ -	\$ -	\$ 7,736,312
3	\$ 952,161	\$ 47,608	\$ 2,380	\$ 714,121	\$ 13,568,297	\$ 2,713,659	\$ 142,824	\$ -	\$ -	\$ 18,141,054
4	\$ -	\$ -	\$ -	\$ 285,648	\$ 5,427,319	\$ 1,809,106	\$ 95,216	\$ -	\$ 47,608	\$ 7,664,902
5	\$ -	\$ -	\$ -	\$ 285,648	\$ 5,427,319	\$ 1,356,830	\$ 71,412	\$ -	\$ 142,824	\$ 7,284,038
6	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,428,242	\$ 1,428,248
7	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,499,654	\$ 1,499,661
8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,574,637	\$ 1,574,644
9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,653,368	\$ 1,653,377
10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,736,037	\$ 1,736,046
Total	\$ 3,808,645	\$ 190,432	\$ 40,467	\$ 1,713,890	\$ 32,563,914	\$ 5,879,596	\$ 309,452	\$ -	\$ 8,082,370	\$ 52,588,818

Once the costs have been deflated, the total expenditure in each category must be used since IMPLAN will not allow the costs to be entered on a year-by-year basis. Then, to enter these costs in the IMPLAN program, a code must be assigned that identifies which sector of the economy they are spent in. The appropriate sector codes for this example are shown in the following table:

TABLE 30: RAIL TRANSIT INPUTS

CATEGORY OF SPENDING	SECTOR	AMOUNT
Legal & Other Services	494	\$ 190,432
Real Estate	462	\$ 40,467
Construction--New Highways & Streets	51	\$ 32,563,914
Rolling Stock--Railroad Equipment	394	\$ 309,452
Operational Expenses--Railroad & Related Services	433	\$ 8,082,370

IMPLAN does not have a specific sector code for construction of railroad track. Therefore, the IMPLAN staff advised that the sector code for construction of new highways and streets be used since it is the best substitute.

IMPLAN will provide economic impacts for employment, value added (wages), and output (expressed in 1995 dollars) and are shown below for this example.

TABLE 31: IMPLAN ECONOMIC IMPACTS (EXPRESSED IN 1995\$)

	EMPLOYMENT	VALUE ADDED	DEMAND
DIRECT	338.2	\$ 16,069,480	\$ 39,315,768
INDIRECT	164.4	\$ 7,870,395	\$ 14,318,607
INDUCED	250.3	\$ 10,876,946	\$ 17,099,528
TOTAL	752.9	\$ 34,816,821	\$ 70,733,905

To determine what the current year 2000 equivalent dollars are, the dollars must be inflated from 1995 dollars to year 2000 dollars. To calculate the inflator, we will need the 1995 CPI and the 2000 CPI. The 1995 CPI is 152.38 and the 2000 CPI is 171.20. The inflator is the ratio of the 2000 CPI to the 1995 CPI:

$$(2000 \text{ CPI}) / (1995 \text{ CPI}) = 171.20 / 152.38 = 1.1235070.$$

Now, to express the above economic impacts in year 2000 dollars, we multiply the value added and demand numbers by the inflator. This yields the following economic impacts expressed in year 2000 dollars.

TABLE 32: IMPLAN ECONOMIC IMPACTS (EXPRESSED IN 2000\$)

	EMPLOYMENT	VALUE ADDED	DEMAND
DIRECT	338.2	\$ 18,054,173	\$ 44,171,541
INDIRECT	164.4	\$ 8,842,444	\$ 16,087,055
INDUCED	250.3	\$ 12,220,325	\$ 19,211,439
TOTAL	752.9	\$ 39,116,942	\$ 79,470,037

Using REMI

REMI will accept data in 1992 or 1999 dollar units. Since the costs for the project are expressed in year 2000 dollars, we must deflate the costs to either year 1992 or year 1999 dollars. In this example we will deflate the costs to year 1999 dollars. From Table 4, we see that the CPI for 2000 is 171.20 and the CPI for 1999 is 166.58. To calculate the deflator to convert the year 2000 costs to year 1999 costs, we find the ratio of the 1999 CPI to the 2000 CPI:

$$(CPI \ 1999) / (CPI \ 2000) = 166.58 / 171.20 = .9730140.$$

To deflate the costs, multiply each value in Table 20 by the deflator just calculated. This yields the following costs expressed in 1999 dollars:

TABLE 33: RAIL TRANSIT PROJECT TEN YEAR CONSTRUCTION AND OPERATING EXPENSES (IN 1999\$)

Year	RIGHT OF WAY			CONSTRUCTION		ROLLING STOCK		OPERATING EXPENSES		TOTALS
	Land Costs	Legal & Other Services	Real Estate	Outside State	Inside State	Outside State	Inside State	Outside State	Inside State	
1	\$ 973,014	\$ 48,651	\$ 14,595	\$ 145,952	\$ 2,773,090	\$ -	\$ -	\$ -	\$ -	\$ 3,955,303
2	\$ 1,946,028	\$ 97,301	\$ 24,325	\$ 291,904	\$ 5,546,180	\$ -	\$ -	\$ -	\$ -	\$ 7,905,741
3	\$ 973,014	\$ 48,651	\$ 2,433	\$ 729,761	\$ 13,865,450	\$ 2,773,090	\$ 145,952	\$ -	\$ -	\$ 18,538,353
4	\$ -	\$ -	\$ -	\$ 291,904	\$ 5,546,180	\$ 1,848,727	\$ 97,301	\$ -	\$ 48,651	\$ 7,832,767
5	\$ -	\$ -	\$ -	\$ 291,904	\$ 5,546,180	\$ 1,386,545	\$ 72,976	\$ -	\$ 145,952	\$ 7,443,562
6	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,459,521	\$ 1,459,527
7	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,532,497	\$ 1,532,504
8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,609,122	\$ 1,609,130
9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,689,578	\$ 1,689,587
10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,774,057	\$ 1,774,067
Total	\$ 3,892,056	\$ 194,603	\$ 1,353	\$ 1,751,425	\$ 33,277,079	\$ 6,008,362	\$ 316,230	\$ -	\$ 8,259,378	\$ 53,740,539

Unlike IMPLAN, REMI does not have a sector coding that corresponds specifically to “Railroads and related services,” the code we used for the operational expenses in IMPLAN. The REMI staff advised that the “Local government passenger transit” code be used instead. However, like IMPLAN, REMI does not have a specific sector code for construction of rail line so the REMI staff advised that the “New Highways” sector code be used instead since it would be the best substitute. In REMI, the corresponding sectors are chosen in a different manner than in IMPLAN. Although the sector descriptions are the same, they are entered in a different way. REMI will ask you to select the policy variable categories that will be used. The “Policy Variable Sorting” should be by “Variable Type”, and then the corresponding REMI sectors for the costs are the following:

TABLE 34: REMI SECTOR CODES FOR RAIL EXPENDITURES

Cost	Policy Variable Categories	Detail Selection
Legal Services	Output Block → Detailed Industry Output → Services → Miscellaneous Professional Services Sales	Legal Services
Real Estate	Output Block → Detailed Industry Output → Finance, Insurance & Real Estate → Real Estate Sales	Real Estate
Construction	Output Block → Detailed Industry Output → Non-Durables → Construction Sales	New Roads
Rolling Stock	Output Block → Detailed Industry Output → Durables → Rest of Transportation Equipment Sales	Railroad Equipment
Operating Expenses	Output Block → Detailed Industry Output → Government → State and Local Services	Local Government Passenger Transit

There is an alternative method that can be used when entering the high speed rail data into REMI. In the above example, we identified the “Policy Variable Sorting” as “Variable Type” and located the appropriate sector by the block it fell under. Alternatively, you can identify the “Policy Variable Sorting” as “Study Type.” Under “Study Type” several options are listed: Energy & Natural Resources, Economic Development, Labor Legislation, Environmental Policies, Welfare, Transportation, and Taxation & Budget. In this example, the high speed rail is a transportation project so that is the study you would select. Once that option has been selected, REMI will then provide an option for you to choose between a new highway project or a high speed rail project. In this example, you would choose the high speed rail project. REMI then will break down the project into ten parts: Construction of the rail line, other related construction/land purchase, manufacturing of rolling stock, program implementation, operation of high speed rail, highway user savings, high speed rail user savings, direct effects to air transportation, consumer cost savings, and funding of high speed rail system. There is another option listed for “other options.” The packaged program offers a bit of a guide to find the appropriate sector for the cost components of the project and may offer guidance concerning what variables should be included in the economic impact analysis. However, use of the “Study Type” option is limited since there are only certain packaged studies included. As can be seen in this example, the only transportation projects that could be analyzed in this format are for the construction of new highways or a new high speed rail system.

Once these sectors have been chosen, unlike IMPLAN, REMI will allow you to input the costs on a year-by-year basis. Once the costs have been entered and the analysis has been run, REMI will provide numerous economic impacts including effects on the population as well as the economy. The results that are comparable to IMPLAN’S are for the following categories:

TABLE 35: REMI RAIL TRANSIT ECONOMIC IMPACTS (IN 1992\$)

YEAR	Employment (Thous)	GRP (Bil 92\$)	Demand (Bil 92\$)
1	0.06934	0.002838	0.005188
2	0.1338	0.005585	0.01007
3	0.3301	0.0137	0.02521
4	0.1162	0.004913	0.008728
5	0.1143	0.004913	0.008301
6	0.04395	0.00177	0.002502
7	0.05078	0.001892	0.002991
8	0.05957	0.00238	0.004089
9	0.06445	0.002533	0.004272
10	0.07324	0.003021	0.005249
TOTAL	1.05573	0.043545	0.0766

These are the economic impacts on Employment, Gross Revenue Product (GRP) and Demand. The Employment results are expressed in terms of thousands of jobs and GRP and Demand results are expressed in terms of billions of dollars. This is different from IMPLAN which expresses its output in what ever units the results are in so that

\$500,000,000 is expressed as \$500,000,000 instead of as \$.5 billion dollars. Since the above economic impacts are less than a billion dollars, the GRP and demand impacts are expressed as a fraction of a billion dollars instead of in thousand or million dollar units which may make more sense. To convert the above results, multiply the employment impacts by 1,000 and the GRP and Demand results by \$1,000,000,000. This will yield the following calculations:

TABLE 36: REMI RAIL TRANSIT ECONOMIC IMPACTS (IN 1992 DOLLARS)

YEAR	EMPLOYMENT	GRP (1992\$)	DEMAND (1992\$)
1	69.34	\$ 2,838,000	\$ 5,188,000
2	133.8	\$ 5,585,000	\$ 10,070,000
3	330.1	\$ 13,700,000	\$ 25,210,000
4	116.2	\$ 4,913,000	\$ 8,728,000
5	114.3	\$ 4,913,000	\$ 8,301,000
6	43.95	\$ 1,770,000	\$ 2,502,000
7	50.78	\$ 1,892,000	\$ 2,991,000
8	59.57	\$ 2,380,000	\$ 4,089,000
9	64.45	\$ 2,533,000	\$ 4,272,000
10	73.24	\$ 3,021,000	\$ 5,249,000
TOTAL	1055.73	\$ 43,545,000	\$ 76,600,000

The economic impacts are now expressed in units that are comparable to the IMPLAN results. However, the results are still expressed in 1992 dollars, so to express them in current year 2000 dollars we must inflate the dollars. To make the conversion, we must calculate the appropriate inflator. From Table 4, we know the 2000 CPI is 171.20 and the 1992 CPI is 140.32. The inflator to convert 1992 dollars to year 2000 dollars is:

$$(CPI\ 2000)/(CPI1992) = 171.20/140.32 = 1.2200684.$$

Now, to convert the dollars, multiply each value in Table 36 by the inflator, and this will yield the following results:

TABLE 37: REMI RAIL TRANSIT ECONOMIC IMPACTS (IN 2000 DOLLARS)

YEAR	EMPLOYMENT	GRP (2000\$)	DEMAND (2000\$)
1	69.34	\$ 3,462,554	\$ 6,329,715
2	133.8	\$ 6,814,082	\$ 12,286,089
3	330.1	\$ 16,714,937	\$ 30,757,924
4	116.2	\$ 5,994,196	\$ 10,648,757
5	114.3	\$ 5,994,196	\$ 10,127,788
6	43.95	\$ 2,159,521	\$ 3,052,611
7	50.78	\$ 2,308,369	\$ 3,649,225
8	59.57	\$ 2,903,763	\$ 4,988,860
9	64.45	\$ 3,090,433	\$ 5,212,132
10	73.24	\$ 3,685,827	\$ 6,404,139
TOTAL	1055.73	\$ 53,127,878	\$ 93,457,239

A COMPARISON OF THE RAIL TRANSIT ANALYSES

TABLE 38

	RIMS II	IMPLAN	REMI
OUTPUT	\$90,700,987	\$79,470,037	\$93,457,239
INCOME	\$30,549,780	\$39,116,942	\$53,127,878
JOBS	1,125	753	1056

Advantages and Disadvantages of Using the Different Models

One advantage of using either IMPLAN or REMI instead of RIMS II is that since they are computer software packages, you can modify your model specification easily if you want to include or omit variables. Changing the model is simply a matter of clicking a button (so to speak). Since RIMS II is simply a spreadsheet analysis where the user is responsible for actually setting up the multiplier worksheet, every time a new variable is added, the worksheet must physically be changed. Additionally, IMPLAN is a more user-friendly software package. Although both packages are fairly easy to use, IMPLAN seems to make entering the required data easier. An additional benefit of using IMPLAN is that it explicitly breaks the impacts into direct, indirect and induced effects.

The benefit of using RIMS II is that you may not have to inflate or deflate any of your data. If you are using current year data and you want your results expressed in current year dollars, then you simply apply the multipliers to the costs and you are done. As the discussion indicated earlier, this is not the case with IMPLAN and REMI. The software packages limit the user to entering the expenditure data in term of certain years. This means that if the data is expressed in current year dollars, then it must be deflated before being entered into the program. Also, since the programs express the results in either 1995 or 1992 dollars, the results must be inflated to be expressed in current year dollars.

References

- “An Assessment of Input-Output Models”, for the U.S. Department of Transportation, Federal Highway Administration, Transportation Studies Division, by DRI/McGraw-Hill (Jan 1994), Contract Number DTFH61-93-C-00055
- Bolton, Roger. “Regional Econometric Models.” *Journal of Regional Science* 25 (1985): 495-520.
- “IMPLAN Professional Social Accounting & Impact Analysis Software”, Minnesota IMPLAN Group, Inc., Second Printing, February 1997.
- “Measuring Gross Economic Impacts Associated with the Amtrak High Speed Rail Corridor Program,” the Center for Urban Transportation Research University of South Florida, March 2000.
- “Regional Multipliers: A user Handbook for the Regional Input-Output Modeling System (RIMSII)”, U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, Second Edition, May, 1992, ISBN 0-16-037944-X
- “Regional Economic Modeling A Systematic Approach to Economic Forecasting and Policy Analysis”, Treyz, I., George, University of Massachusetts at Amherst, 1993, Kluwer Academic Publishers, Third Printing 1994
- Rickman, Dan S. and Schwer, R. Keith. “A Systematic Comparison of the REMI and Implan Models: The Case of Southern Nevada.” *The Review of Regional Studies* 23, (Fall 1993): 143-161.