

Construction

The bill-of-goods method can be used to improve the accuracy of an economic impact study's results for specialized construction projects, such as upgrading a seaport or building a new road to improve beach access. This improvement comes from replacing information in RIMS II, which is based on national averages, with information that is specific to an individual project.

The economic impact of construction project on a region can be calculated with the bill-of-goods method in seven steps:

1. Decide whether Type I or Type II multipliers will be used in the analysis.¹ If Type II multipliers will be used, an estimate of the change in earnings of local construction workers is needed. This estimate should include the earnings on the project of both full- and part-time workers.
2. Collect information on the intermediate inputs purchased by the construction company. This information should be grouped by the RIMS II industries that produce the inputs.

All of this information may not be available. Even so, the bill-of-goods method can still significantly improve the results of an impact study with information on only the major purchases made by the final-demand industry.²

Any equipment permanently installed in a new structure, such as an elevator or air conditioning system, should be treated as an intermediate input to maintain consistency with how these purchases are treated in the model.

The construction company may subcontract work to specialists, such as electricians, plumbers, masons, and roofers. In these cases, the costs of labor and materials need to be separately identified before using the multipliers.

The financing of construction projects often causes confusion when conducting an impact study. When construction equipment is financed with an operating lease and used on multiple projects, the amount paid on the lease should be prorated to appropriately measure the leasing services for the project. When a construction company takes out a commercial loan to pay its workers and purchase intermediate inputs, taking about 2.0

¹ Using Type I multipliers will account for only “inter-industry” effects, whereas using Type II multipliers account for both the inter-industry and “household-spending” effects.

² For an assessment of how a bill-of-goods approach can improve the accuracy of results based on RIMS II, see Richard M. Beemiller, “Hybrid Approach to Estimating Economic Impacts Using the Regional Input-Output Modeling System (RIMS II),” *Transportation Research Record*, 1274, pp. 89-96, 1990.

percent of the total loan amount will provide a reasonable estimate of the related purchase of banking services.³

3. For each purchased good, determine which local industries will be involved in its supply.

Reasonable assumptions can be made if some of this information is unavailable—for example, it can be assumed that an intermediate input will only be supplied by a local wholesaler. It is safer to assume that less activity occurs in the region to produce more conservative impact estimates.

4. For each purchased good, calculate producer and distribution cost shares. These shares can be calculated with information from the national use table.

5. For each purchased good, calculate the change in output for each local industry involved in its supply by multiplying the industry's producer or cost share by the purchase price.

6. For each local industry involved in the supply of goods and services to the construction company, multiply the change in the industry's output by the industry's final-demand multiplier.

7. If the total impact is to be expressed as a measure of output, add the final-demand change to the sum of the output impacts calculated in step 6. If the total impact is to be expressed as a measure of earnings or jobs, add the sum of the earnings or job impacts calculated in step 6 to the change in earnings or jobs in the final-demand industry.

If using Type II multipliers, the impact of the spending of local construction workers needs to be added as well. This impact is calculated by multiplying the change in earnings for local construction workers by the final-demand multiplier for households.

To give an example of how the bill-of-goods method can be used for a construction project, consider a proposal to build a new precast concrete bridge in St. Augustine, Florida. The Florida Department of Transportation expects that it will need to pay a construction company \$2.5 million to complete the project. Local construction workers are also expected to earn \$650,000 as a result of working on the project. To help make a final decision on whether the bridge will be built, the Department of Transportation would like to estimate the total earning impact of the project on the region.

³ Two types of services are accounted for in the multipliers for the banking industry—explicit and implicit banking services. For a commercial loan, the explicit services include loan origination fees, which are often amortized and included in loan payments. The implicit services include any costs incurred by the bank to provide borrowing service that are included in the interest rate. Both types of service are typically valued at about 2.0 percent of the total amount of the loan.

To conduct the impact study, the following decisions are made:

- **Final-demand change.** This change consists of the expected amount needed to pay a construction company to build the bridge.
- **Final-demand industry.** Construction is the final-demand industry. However, since a bill-of-goods method will be used in the analysis, the multipliers for each industry expected to supply intermediate inputs to the construction company are needed. The detailed benchmark series is used in the analysis because it most closely matches the industry detail available for the inputs that will need to be purchased by a construction company.
- **Final-demand region.** This region is St. Johns County, Florida. Most workers are expected to come from the local area, so Type II multipliers can reasonably be used in the analysis.⁴

Table 1 shows the intermediate inputs that are expected to be purchased by a construction company. These purchases do not sum to the expected price paid to the construction company for at least three reasons. First, the total (\$1.5 million) does not include any of the overhead costs related to bidding on the contract. Second, the sum represents only major purchases of intermediate inputs. Third, the sum does not include compensation of employees, taxes on production and imports, and a reasonable rate of return to the construction company for committing resources to the project.

The financing of the construction project is reflected in the purchases of intermediate inputs in the following manner: The construction company is expected to spend \$50,000 to lease equipment for the project. The company is also expected to take out a \$2.5 million commercial loan from a local bank to pay its workers and purchase intermediate inputs until the company gets paid by the State. The banking services for this loan are estimated to be \$25,000.

Architectural services will not need to be purchased by the construction company because the plans for the bridge were developed by engineers at the Florida Department of Transportation.

Table 2 shows that only three of the intermediate inputs are expected to be produced in the region. These inputs include banking services, leasing services, and ready-mix concrete. The special fuel needed from the construction equipment is expected to be provided by a local wholesaler. The precast parts are also expected to be delivered by a local trucking company.

Table 3 shows the expected changes in local output for each industry involved in the supply of fuel, concrete, and bridge parts to the construction company. The output for each industry equals the cost share times the price paid for the intermediate input. These cost shares are based on information from the national use table.

Table 4 shows the total impact on earnings in St. Augustine, Florida. For each industry, the earnings impact (column 3) is calculated by multiplying the industry's output (column 1) by the

⁴ If many workers are expected to live outside the region, more conservative impact estimates could be calculated using Type I multipliers.

industry's final-demand earnings multiplier (column 2). The total impact on earnings is \$815,000. This value is equal to the impact of construction workers' spending (\$110,000), plus the impact of purchases of intermediate inputs (\$56,000), plus the initial change in the construction workers' earnings (\$650,000).

The estimate of the total impact on earnings is small is because the construction company's largest cost is the purchase of precast concrete parts. The labor costs paid by the construction company are also expected to be lower than average because of the type of bridge being built.

This example highlights how the accuracy of an impact study's results for a construction project can be improved by using a bill-of-goods approach. If the final-demand change (\$2.5 million) is multiplied by the final-demand earnings multiplier for the construction industry (0.3783), earnings expected to increase by a much larger amount (\$946,000).

Further examples and tips on how to use RIMS II multipliers in an economic impact study are available in the [RIMS II Handbook](#). Additional information is available on the [RIMS II website](#).

Table 1. Purchases of Intermediate Inputs by the Construction Company

Industry	Purchases (thousands of dollars)
Petroleum refineries	30
Ready-mix concrete manufacturing	60
Prefabricated bridge span (other concrete product manufacturing)	1,325
Monetary authorities and depository credit intermediation	50
Commercial and industrial machinery and equipment rental and leasing	25
Total	1,490

Table 2. Local Supply Conditions of Intermediate Inputs, St. Johns County, FL

Industry	Production	Truck transportation	Wholesale trade	Retail trade
Petroleum refineries	No	No	Yes	No
Ready-mix concrete manufacturing	Yes	No	No	No
Prefabricated bridge span (other concrete product manufacturing)	No	Yes	No	No
Monetary authorities and depository credit intermediation	Yes
Commercial and industrial machinery and equipment rental and leasing	Yes

Table 3. Changes in Local Output, St. Johns County, FL

Category	Petroleum refineries			Ready-mix concrete manufacturing			Other concrete product manufacturing		
	U.S. purchases		Local output (thousands of dollars)	U.S. purchases		Local output (thousands of dollars)	U.S. purchases		Local output (thousands of dollars)
	Cost (millions of dollars)	Share		Cost (millions of dollars)	Share		Cost (millions of dollars)	Share	
Producer value	12,526	0.92	...	15,773	0.77	46	4,918	0.79	...
Truck transportation	236	0.02	...	79	0.00	...	382	0.06	82
Other transportation	237	0.02	...	31	0.00	...	11	0.00	...
Wholesale margin	665	0.05	1	168	0.01	...	527	0.08	...
Retail margin	0	0.00	...	4,426	0.22	...	368	0.06	...
Purchaser value	13,664	1.00	...	20,478	1.00	...	6,204	1.00	...

Table 4. Type II Earnings Impact of Bridge Construction, St. Johns County, FL

Industry ¹	Increase in local purchases (thousands of dollars)	Final-demand earnings multiplier	Earnings impact (thousands of dollars)
Household earnings	650	0.1691	110
Ready-mix concrete manufacturing	46	0.2759	13
Monetary authorities and depository credit intermediation	50	0.2861	14
Commercial and industrial machinery and equipment rental and leasing	25	0.2819	7
Truck transportation margin for prefabricated bridge span	82	0.2565	21
Wholesale margin for petroleum products	1	0.3731	1
Subtotal	854	...	165
Plus: Initial change in household earnings	650
Total	854	...	815

1. Detailed industries from benchmark series