

## Construction Bill-of-Goods

For many construction projects, the bill-of-goods method is the best approach for estimating impacts. This approach works best because RIMS II multipliers for the construction industries are based on national averages across a wide variety of construction projects. By using the bill-of-goods method, analysts can replace these averages with information that is specific to their individual construction project.

The bill-of-goods method can provide more accurate estimates when specialized inputs and labor from outside the region are used in a construction project. RIMS II multipliers assume that the inputs for the project that are produced in the region will be used first. However, if the analyst knows that many of these materials and labor come from outside the region, then the bill-of-goods method can be used to improve the impact estimates.

For example, a pipeline construction company may bring in its own employees trained for this highly specialized type of construction instead of using local labor. This method can also be used to appropriately account for highly specialized inputs, such as imported stone or marble, which the model assumes are available from firms within the region but are purchased, in fact, from outside the region.

**Method.** The impact of construction projects can be calculated with the bill-of-goods method in seven steps. These steps are presented with specific guidance for construction projects.

1. **Decide if the impact of additional household spending will be included (Type II multipliers) or excluded (Type I multipliers)** If Type II multipliers will be used, an estimate of local construction workers' earnings from the project is needed. If the construction company uses subcontractors, such as electricians, plumbers, masons, and roofers, subcontractor workers' earnings should be added to the primary contractor workers' earnings.

If Type I multipliers will be used, the impacts of household spending are excluded from the analysis. In this case, the earnings of the construction workers are not needed. Impacts will only be assigned to goods and services purchased for the construction project.

Earnings estimates, if needed, should be based on the definition of RIMS II earnings. RIMS II earnings consist of wages and salaries, proprietors' income, and employer contributions to health insurance, minus employee (and self-employed) withholdings for social security and Medicare.

2. Collect information on the **intermediate inputs** purchased by the construction company or its subcontractors. This information should be grouped by RIMS II industry. For example, shingles purchases are applied to the multiplier for Asphalt shingle and coating

materials manufacturing (324122). Please note that land acquisition costs should not be included in the cost of the construction.

Any equipment permanently installed in a new structure, such as an elevator or air conditioning system, should be treated as an intermediate input rather than as an investment purchase. In the bill-of-goods approach, other durable equipment such as kitchen equipment, installed during construction can also be included with the intermediate inputs.

The financing of construction projects often causes confusion when conducting an economic impact study. If construction equipment is rented or leased and used on multiple projects, the amount paid on the lease should be prorated to appropriately measure the leasing services for the project. If a construction company takes out a commercial loan to pay its workers and purchase intermediate inputs, taking about two percent of the total loan amount will provide a reasonable estimate of the related purchase of banking services. Interest representing payment to the owner of the money, for the use of the money, is not an intermediate expense in RIMS II.

3. For each type of building material or service, **determine which local industries will be involved** in its supply. Please note that some building materials may be sold by local firms, but the materials themselves are produced outside of the region. In these cases, only the wholesale or retail margin (mark-up) may be captured in the region.

Care should be taken to determine the local supply conditions for architectural and banking services. These services can constitute a large share of a construction project's total cost and are easily provided by businesses outside the region. *NB: Improperly treating these as locally purchased services can notably affect the accuracy of an economic impact study's results.*

4. For each type of building material or service, **calculate producer and distribution cost shares**. Producer costs can be thought of as manufacturer's invoice values and distribution costs are mark-ups by retailers, wholesalers, and shipping companies. These shares can be calculated with information from the [national distribution costs tables](#). Services, such as engineering or waste disposal services, are assumed not to have distribution costs.
5. For each type of building material, **calculate the change in manufacturing activity (output) for each local industry involved** in its supply by multiplying the industry's producer cost share by the purchase price.
6. For each manufacturer of building materials and provider of services to the construction company, **multiply the change in the supplier's output by the appropriate final-demand multiplier**.

7. If the total impact is to be expressed as an increase in output or sales, add the total cost of the construction project to the sum of the output impacts calculated in step 6.

If the total impact is to be expressed as an increase in earnings or jobs, add the earnings or job counts from the project's contractors and subcontractors to the sum of the earnings or job impacts calculated in step 6.

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 multipliers for households.

**Example.** To give an example of how the bill-of-goods method can be used for a construction project, consider a local construction company that wins a bid to expand a highway in Greensboro, North Carolina. The company will be paid \$100.0 million upon completion of the project. The state would like to estimate the total impact on output of the project on the region.

To conduct the economic impact study, this example will use the following information:

- **Final-demand change.** This change consists of the amount that will be paid to the construction company to expand the highway. There are no land acquisition costs since the land is already owned by the government.
- **Final-demand industry.** "Highways and streets" (233293) 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 industries are used in the analysis because they more closely match the industry detail available for the inputs purchased by the construction company.
- **Final-demand region.** This region is the metropolitan statistical area of Greensboro, North Carolina. Because it is not clear where many of the construction workers will spend their earnings, Type I multipliers are used in the analysis to provide more conservative impact estimates.

Table 1 shows the construction company's purchases of intermediate inputs. These purchases do not sum to the contract price for at least three reasons. First, the total (\$31.3 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 for committing resources to the project.

**Table 1. Purchases of Intermediate Inputs by the Construction Company**

Industry	Purchases (thousands of dollars)
Stone mining and quarrying	7,000
Petroleum refineries	10,000
Asphalt paving mixture and block manufacturing	7,500
Ready-mix concrete manufacturing	750
Monetary authorities and depository credit intermediation	2,000
Commercial and industrial machinery and equipment repair and maintenance	4,000
<b>Total</b>	<b>31,250</b>

The financing of the construction project is reflected in the purchases of intermediate inputs in the following manner. The construction company owns all of the equipment that will be used on the project. Because the company owns the equipment, there is no intermediate interest expenses related to the equipment nor are there any leasing expenses. However, the company will need to take out a \$100.0 million commercial loan from a local bank to pay its workers and purchase intermediate inputs until the company gets paid by the state upon the completion of the project. The banking services for this loan are estimated to be two million.

Architectural services are not purchased by the construction company because the plans for the road were developed by engineers at the state's Department of Transportation in Raleigh, North Carolina.

Table 2 shows that most of the intermediate inputs will be produced locally and purchased directly from the manufacturer. In fact, an asphalt plant will even be transported to the site. Only the special fuel needed for the construction equipment will not be produced locally, but this fuel will be purchased from a local wholesaler. The construction company will also need to pay a large amount for the delivery of gravel by truck from a local quarry.

**Table 2. Local Suppliers of Intermediate Inputs, Greensboro, NC MSA**

Industry	Production	Transportation cost	Wholesale trade	Retail trade
Stone mining and quarrying	Yes	Yes	--	--
Petroleum refineries	--	--	Yes	--
Asphalt paving mixture and block manufacturing	Yes	--	--	--
Ready-mix concrete manufacturing	Yes	--	--	--
Monetary authorities and depository credit intermediation	Yes	--	--	--
Commercial and industrial machinery and equipment repair and maintenance	Yes	--	--	--

Table 3 shows the break-out of intermediate input expenses to the construction company where transportation or wholesale costs needed to be calculated and measured separately. The local transportation and wholesale costs for each industry equals the U.S. cost share times the price

paid for the intermediate input by the construction company. These cost shares are based on information from the national use table.

**Table 3. Changes in Local Output, Greensboro, NC MSA**

Category	Stone mining and quarrying (212310)			Petroleum refineries (324110)		
	U.S. purchases		Local output (thousands of dollars)	U.S. purchases		Local output (thousands of dollars)
	Cost	Share		Cost	Share	
	(millions of dollars)			(millions of dollars)		
Producer value	2,323	0.75	5,256	3,535	0.85	8,498
Transportation costs	533	0.17	1,206	70	0.02	168
Wholesale margin	239	0.08	541	555	0.13	1,334
Retail margin	0	0	0	0	0	0
Purchaser value	3,094	1.00	7,000	4,160	1.00	10,000

Table 4 shows the total impact on output in Greensboro, North Carolina. For each industry, the output impact (column 3) is calculated by multiplying its output (column 1) by its final-demand output multiplier (column 2). The total output impact is \$128.3 million. This value is equal to the impact of the purchase of intermediate inputs (\$28.3 million) plus the initial change in output for the construction company (\$100.0 million).

**Table 4. Type I Output Impact of Road Construction, Greensboro, NC MSA**

Industry	Increase in local purchases (thousands of dollars)	Final-demand output multiplier (Type I)	Output impact (thousands of dollars)
Stone mining and quarrying	5,256	1.2668	6,658
Asphalt paving mixture and block manufacturing	7,500	1.2623	9,467
Ready-mix concrete manufacturing	750	1.4363	1,077
Monetary authorities and depository credit intermediation	2,000	1.3366	2,673
Commercial and industrial machinery and equipment repair and maintenance	4,000	1.2130	4,852
Truck transportation, total	1,206	1.4792	1,784
Stone mining and quarrying	1,206	n.a.	n.a.
Wholesale trade, total	1,334	1.3539	1,806
Petroleum refineries	1,334	n.a.	n.a.
<b>Subtotal (intermediate inputs)</b>	<b>22,046</b>	<b>n.a.</b>	<b>28,318</b>
Plus: Total project cost (Initial change in output)	n.a.	n.a.	100,000
<b>Total</b>	<b>22,046</b>	<b>n.a.</b>	<b>128,318</b>
n.a. Not applicable			

The estimate of the total impact on output is small because the construction company's largest cost is the earnings paid to workers. Since Type I multipliers are used in the analysis, the impact of increased spending by construction workers are not included in this estimate.

This estimate is also limited to the impact of the construction of the highway. It does not reflect any changes that may result from new homes being built or new businesses locating near the new highway. RIMS II accounts for the impact of only the supply of inputs to the construction company and does not account for any increases in economic activity that may result from the use of the highway.

This example highlights how the accuracy of an economic impact study's results for a construction project can be improved by using a bill-of-goods method. If the final-demand change (\$100.0 million) is multiplied by the final-demand output multiplier for the construction industry (1.4279), output is expected to increase by a much larger amount (\$142.8 million), illustrating the need to thoughtfully consider which approach should be followed for estimating the economic impact for construction endeavors.

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