

Regional Input-Output Modeling System (RIMS II)

Applications for Tax Incentive Evaluations

Edward P. Seyler, PhD
Economist, Louisiana Legislative Auditor

Pew/NCSL Tax Incentive Evaluators' Conference
November 4, 2022



Overview

- Purpose and development of input-output models
- How to use the RIMS II multipliers
- Applications to tax incentive evaluations in Louisiana

Development of Input-Output (IO) Models

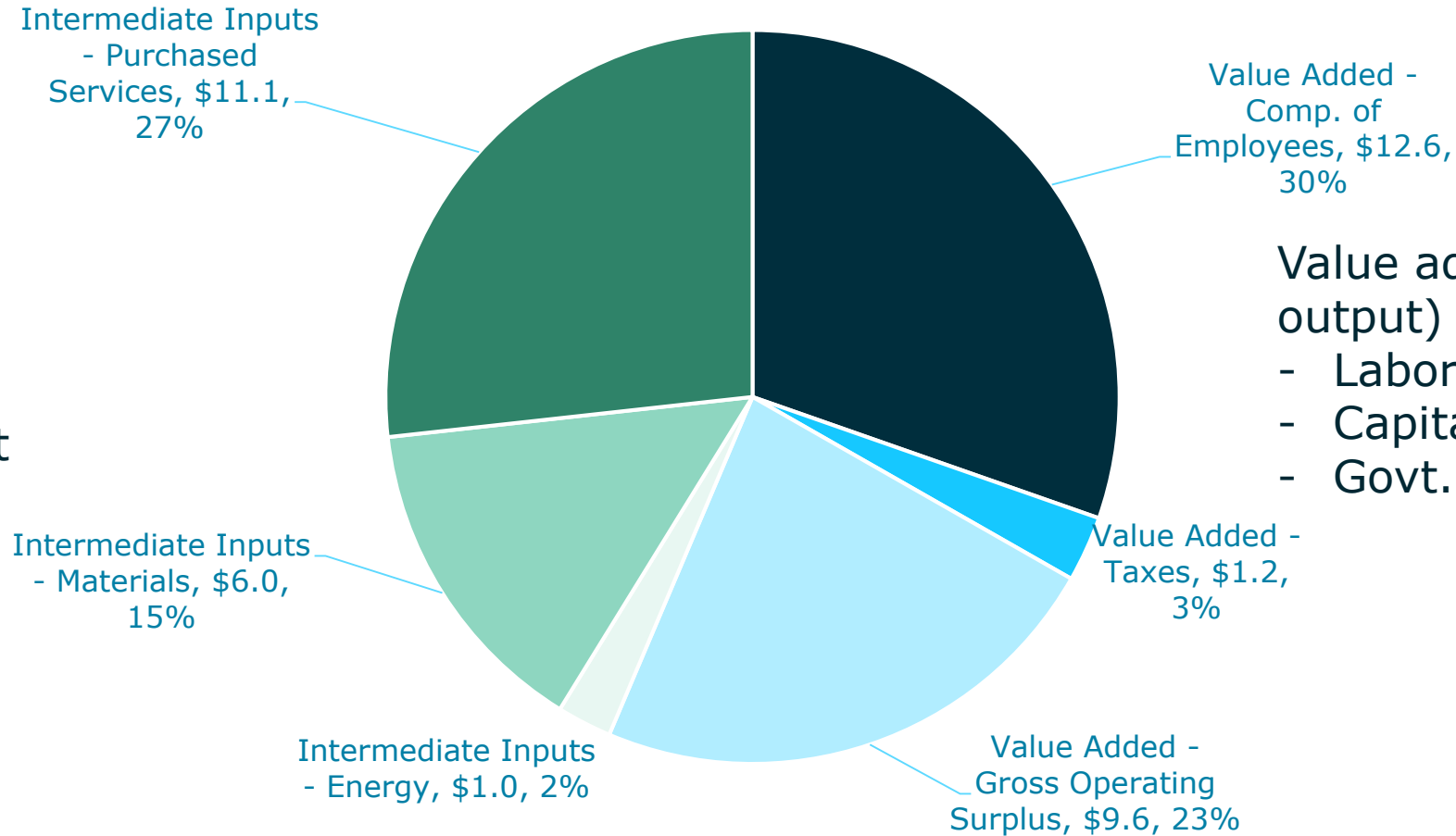
- Goal was to understand the flow of goods and services through the economy in support of final demand.
 - How much does each industry purchase from other industries per unit of output?
 - AKA “interindustry analysis”
- Developed by Wassily Leontief at Harvard in conjunction with BLS beginning in the 1930’s and 40’s.
 - Became controversial in the US in the 1950’s when the USSR used them for central planning, but by 1959 the US resumed using them.
- Input-output relationships are based on estimation.
 - Repeat this process iteratively for all combinations of industries.

Output vs. Value Added

- Gross output is the value of a firm's goods and services produced, e.g., sales receipts or revenue.
- Merely totaling dollars of output across firms gives an inflated measure of output when supply chains are vertically disintegrated.
 - Each time a good/service moves between firms, its entire output is counted, not just the incremental "value added."
- Value added subtracts out purchased goods and services from other firms.
 - $\text{Gross Output} - \text{Intermediate Goods} = \text{Value Added}$
 - Except for retail and wholesale, where gross output is sales minus cost of goods sold.
- Value added equals the contribution from labor (compensation of employees) and capital (gross operating surplus), plus taxes less subsidies.
- $\text{Gross Domestic Product} = \text{Value Added for All Industries}$

U.S. Gross Output in 2021: \$41.4 trillion

Value added for intermediate inputs (44% of gross output) are included in value added for the industry that produces them.



Value added (56% of gross output) inures to:

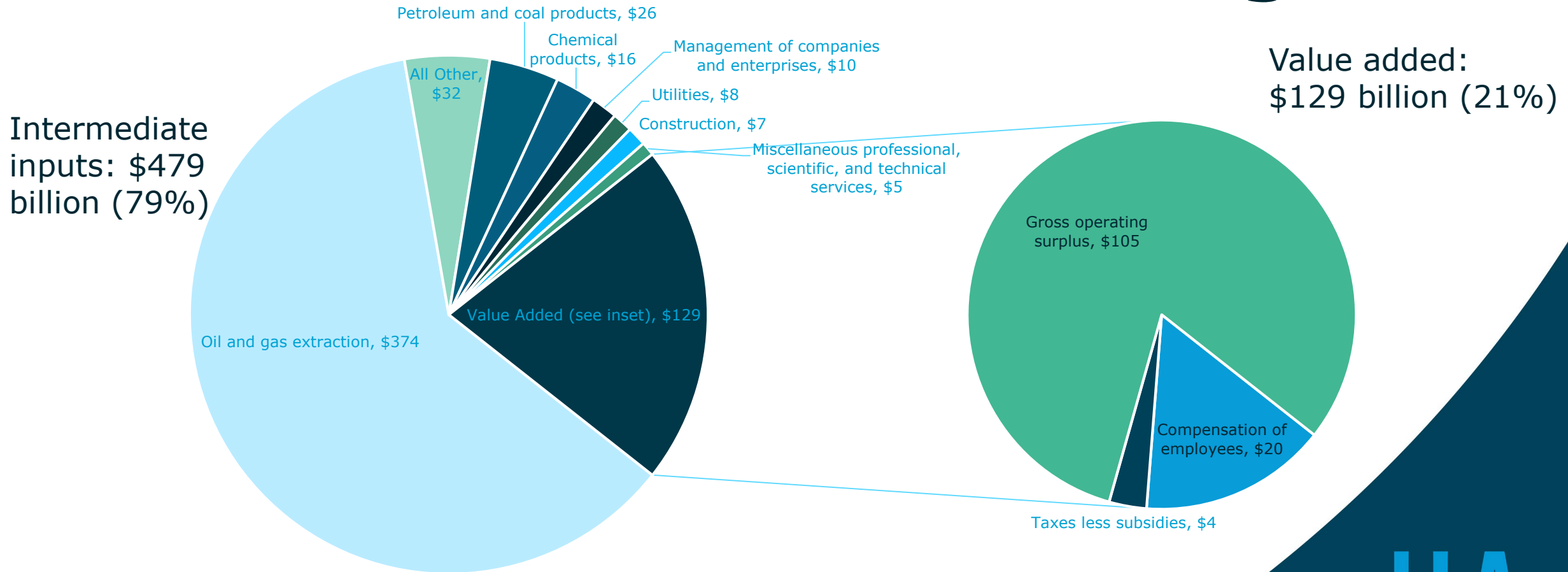
- Labor (wages)
- Capital (profits/"surplus")
- Govt. (taxes)

Amounts in Trillions

Source: U.S. Bureau of Economic Analysis



Industry Example: Petroleum & Coal Products Manufacturing

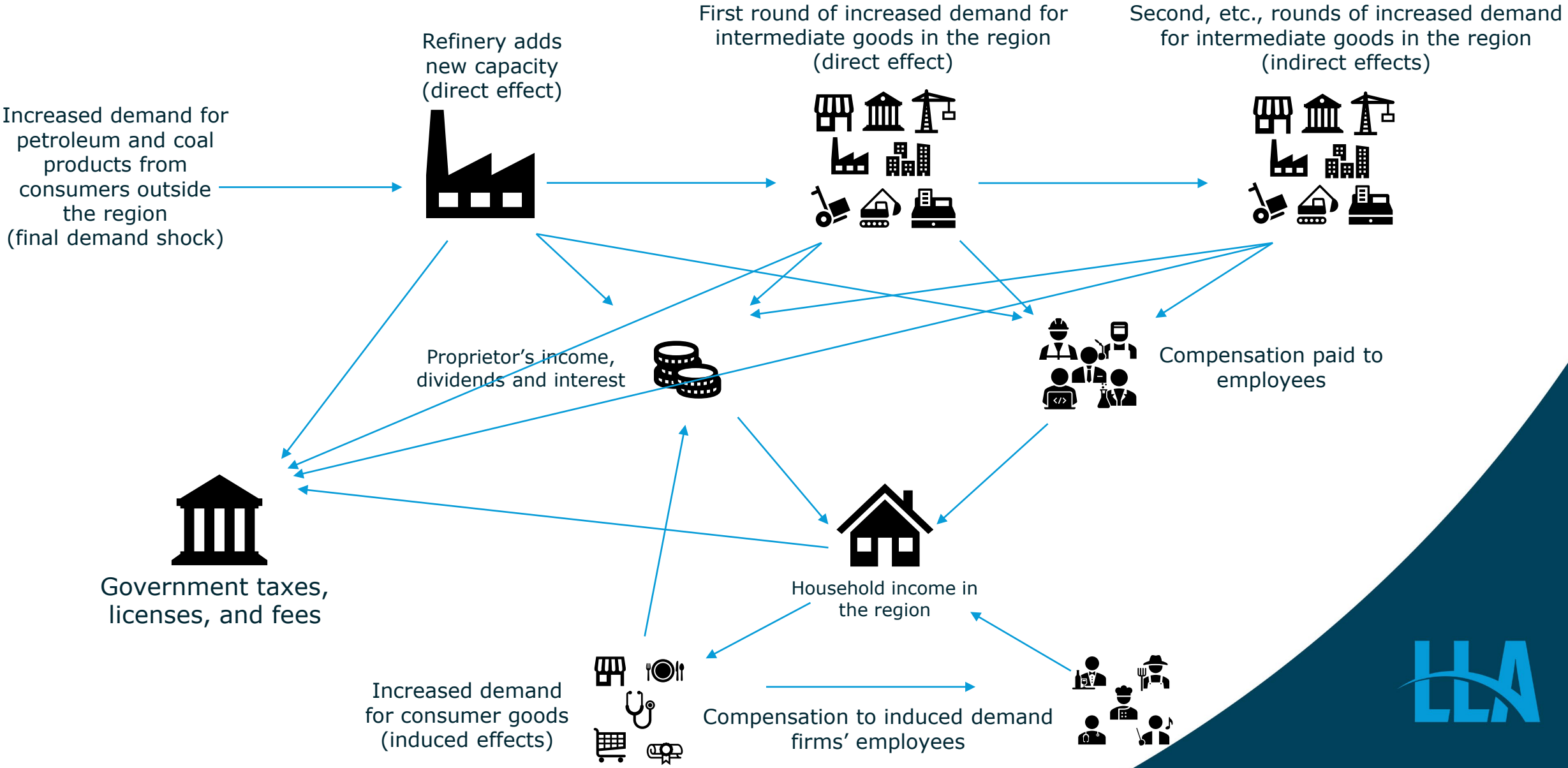


Gross output: \$608 billion = \$479 billion + \$129 billion

Backward Linkages: Output Creates Input

- RIMS II quantifies not just the immediate impact of a final demand shock, but also the “ripple effects.”
- Direct effects – impact of the first round of inputs purchased by the final-demand industry.
- Indirect effects – impact of subsequent rounds of inputs purchased by supporting industries.
 - Direct effect plus indirect effect = interindustry effect.
- Induced effects – impact of increased household spending out of increased earnings.
 - Only appropriate when final demand shock excludes spending of workers who already live and work in the region.

Direct, Indirect, and Induced Effects



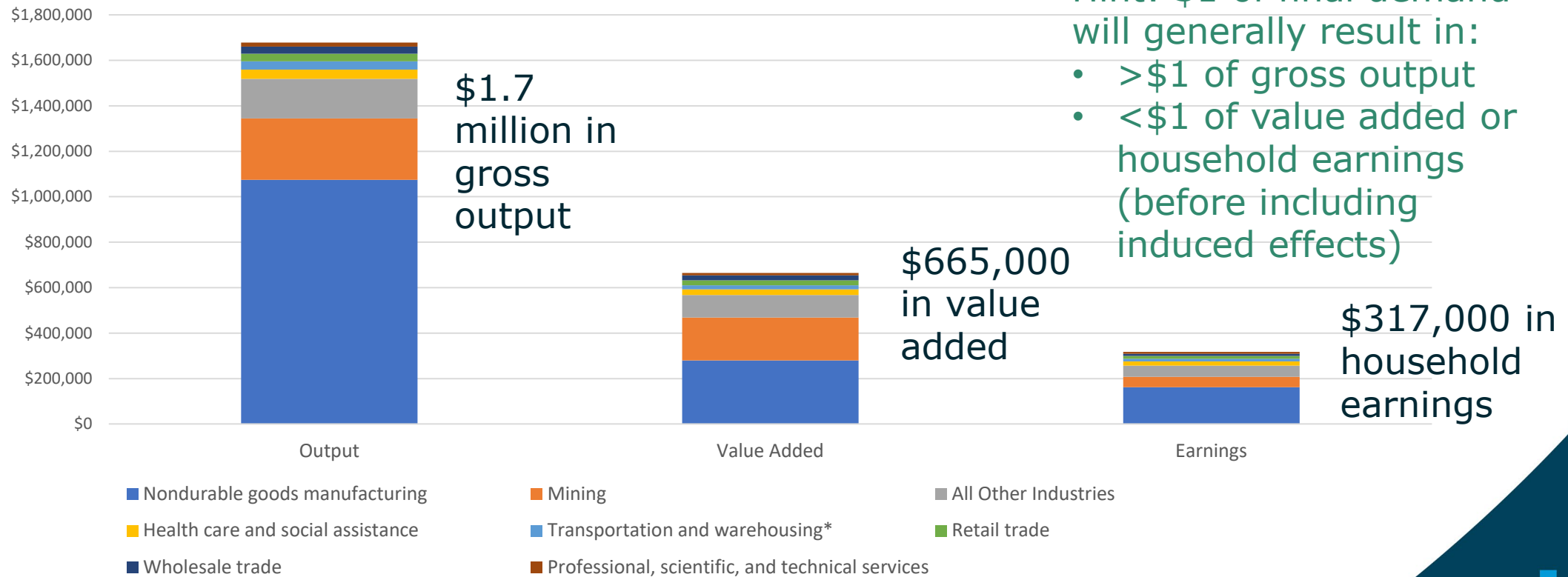
How to Use RIMS II Multipliers

- Produced and sold by U.S. Department of Commerce, Bureau of Economic Analysis
 - Available by industry for all geographies, or by a geography for all industries.
- Useful for fiscal impact studies, or for estimating impact of a particular project/final demand shock.
 - Intermediate goods sold to customers outside the region can be “final demand” for a region because they are not inputs for industries in the region.
- Two types of multipliers:
 - Type I Multipliers: Direct and indirect effects
 - Type II Multipliers: Direct, indirect, and induced effects

Example: \$1 million final demand shock to petroleum and coal products in Louisiana

Hint: \$1 of final demand will generally result in:

- >\$1 of gross output
- <\$1 of value added or household earnings (before including induced effects)



Source: BEA RIMS Type II multipliers.



Types of multipliers

- Input

- Gross Output
- Earnings
- Jobs

- Output

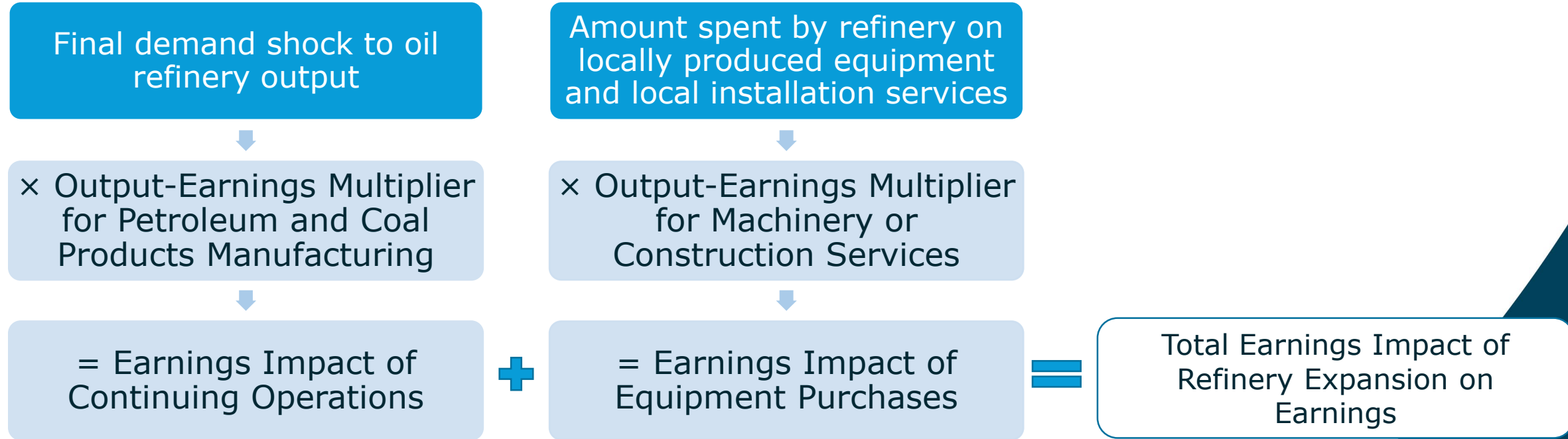
- Gross Output
- Value added
- Earnings
- Jobs

- E.g., an earnings per gross output multiplier shows the dollars of earnings per \$1 of final demand for a certain industry.
 - Earnings includes wages, salaries, employer health contributions, and proprietors' income.
- Gross output is generally sales receipts or revenue.
 - For wholesale and retail, sales less of cost of goods sold.
- BEA provides six types of multipliers. The others can be derived arithmetically.
 - E.g., value added per job created: $\text{jobs/jobs} \div \text{jobs/output} * \text{value-added/output}$

Start-Up vs. Continuing Operations

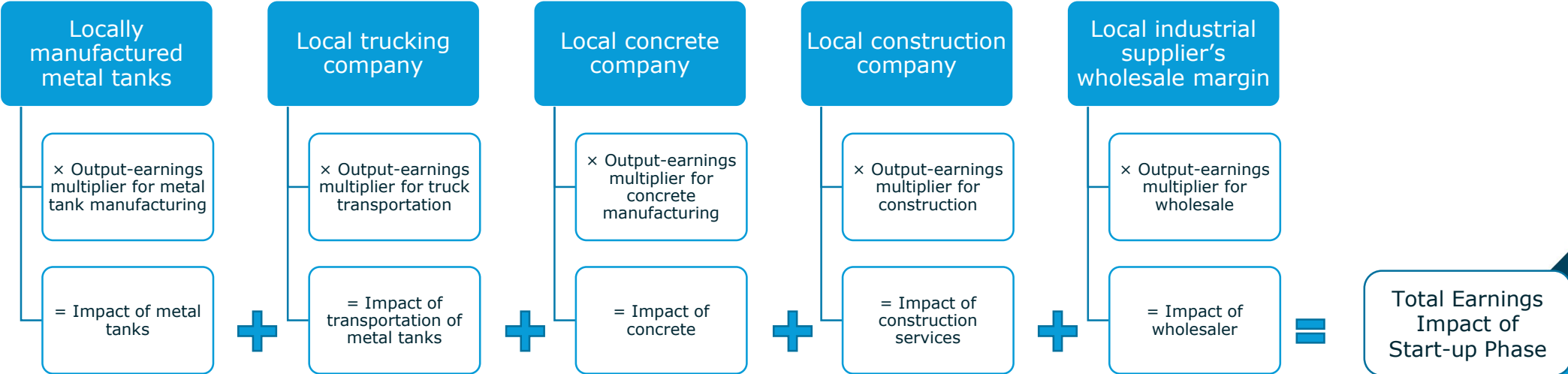
- RIMS multipliers are based on continuing operations and include capital and maintenance spending needed to maintain existing levels of output.
 - Includes purchases of goods that will be used ≤ 1 year.
- Initial capital expenditures and construction services should be accounted for separately.
 - E.g., construction services, building materials, goods that will be used > 1 year, etc.
- Important to consider regional purchasing coefficients on start-up purchases.

Oil Refinery Expansion with Equipment Purchases



Bill of Goods Approach

- Instead of using final-demand change for the expanding industry, use the specific amount spent by the expanding industry on specific categories of locally-sourced goods.

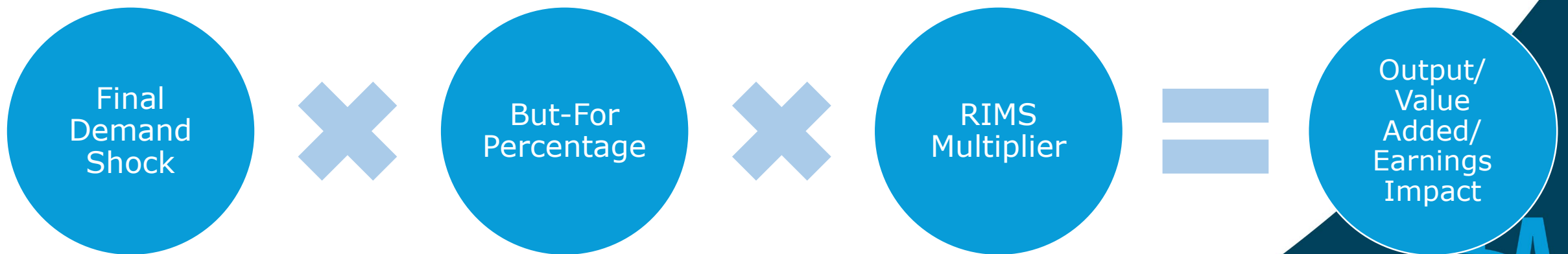


What RIMS Multipliers Do NOT Capture

- Forward linkages, e.g., air, water, and ground transportation grow in response to the greater availability of fuel.
 - RIMS assumes backward linkages, i.e., increased final demand triggers growth in “upstream” industries.
- Economic impact outside the region.
 - BEA generates multipliers to order for a specific region, which must include at least one U.S. county.
 - Important to consider possibility of “leakages” when capital and labor are sourced from outside of a given region.

But-for Analysis

- “But for” and regional purchasing percentages have to be determined outside of RIMS II and applied by the evaluator.
 - How much final demand shock would not have occurred “but for” the incentive?



Other Limitations

- Different from Keynesian macroeconomic multipliers, which account for marginal propensities to consume, labor supply/consumption/saving adjustments, supply constraints, etc.
- Possible for disasters and major shocks to impact industry purchasing patterns.
- Supply constraints/inability of all upstream industries to grow proportional to the demand shock may impact multipliers.
 - More concerning for extremely large projects relative to their suppliers, or if supply is inelastic.
- Based on historical data – purchasing patterns may change over time.
- No balanced budget requirement.

Example: LLA Performance Audit on Quality Jobs Incentive Program

- Provides payroll rebates of up to 6% on newly created payrolls for companies that create at least 15 new jobs (5 for companies with 50 or fewer employees)
- Companies that meet job creation requirements can receive either:
 - Rebate of state sales and use taxes, currently 4.45% (and local, if locals approve, averaging ~5%)
 - Project facility expense rebate (i.e., investment tax credit) of 1.5% of qualified capital expenditures.
- Cost the state an estimated \$99.9 million in FY 2018.



LLA Methodology for QJ Audit

- Impact of continuing operations: Earnings-earnings multiplier based on newly created payrolls for that industry.
- Impact of start-up:
 - Earnings-earnings multiplier for construction and engineering.
 - Output-earnings multiplier for industrial machinery manufacturing, times in-state purchasing percentage based on statistical sample of invoices submitted by participating companies.
- Continuing operations and start-up demand shocks were multiplied by but-for percentages.

Impact of Regional Purchasing

- Increased in-state investment would have increased the effect of the program on household income and the overall net gain of the program.

Exhibit 9 Effect of Out of State Sales on QJ Program Performance		
In-state percentage of investment spending	Effect on Household Income	Overall Net Gain of Program
33.5%	\$176,487,179	(\$63,334,264)
34.5%	\$176,986,823	(\$62,796,514)
100.0%	\$216,717,897	(\$20,035,370)

Source: Prepared by legislative auditor's staff using information from LED, LDR, LWC, BLS, and BEA.

Impact of Capping SUTR/PFER

Table B.5 Effects of the QJ Program, with and without SUTR/PFER/ITC Amounts in Dollars (Except Jobs)			
Sector	Current Program	Capping SUTR/PFER	Change from removing SUTR/PFER
Direct Effect of Payrolls on Household Earnings	\$82,736,623	65,397,393	(17,339,230)
Indirect Effects of Subsequent Spending on Household Earnings	\$93,750,556	76,202,268	(17,548,288)
Total Effect on Household Income	\$176,487,179	141,599,661	(34,887,518)
Gross Cost to the State	\$253,281,148	165,809,018	(87,472,130)
State Tax Revenue	\$13,459,705	10,799,026	(2,660,679)
Net Cost to the State Treasury (Gross Cost less Taxes)	\$239,821,443	155,009,992	(84,811,451)
Overall Net Gain (Loss)	\$(63,334,264)	(13,410,331)	49,923,933
Fiscal Return on Investment*	\$0.05	0.07	0.01
Benefit-Cost Ratio**	\$0.74	0.91	0.18
Permanent Jobs Supported Per Year	97.3	95.0	(2.3)
Construction Jobs Supported	182.3	112.5	(69.9)

*Fiscal return on investment is the state tax revenue generated by the program, divided by the gross cost to the state.
 **Benefit-cost ratio is the dollars of household income generated by the program, divided by the net cost to the state.
Note: Rebate, tax, and household income amounts discounted to the first year of the QJ contract using a discount rate of 2.3%.
Source: Prepared by legislative auditor's staff using information from LED, LDR, LWC, and the U.S. Bureau of Economic Analysis.

- Capping the SUTR/PFER rebates at 21% of gross payrolls would improve the overall net gain of the program.

Conclusion

- RIMS multipliers allow for estimation of direct, indirect, and induced effects of a final demand shock.
- Applications to economic development/tax incentives.
- Requires careful methodology to account for but-for percentages, regional purchasing, etc.
- Edward Seyler
 - eseyle@lla.la.gov
 - (225) 336-8061