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Economic Impact of the Transportation Research Center Inc. on Central Ohio and the State Of Ohio

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College of Urban Affairs

Prepared for:

JOBSOHIO

Prepared by:

Research team led by

Dr. Iryna V. Lendel

September 2021

**ECONOMIC
IMPACT OF THE
TRANSPORTATION
RESEARCH CENTER
INC. ON CENTRAL
OHIO AND THE
STATE OF OHIO**

**CENTER FOR
ECONOMIC
DEVELOPMENT**

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About the Study Team

Iryna V. Lendel, Ph.D., is the Director of the Center for Economic Development and a Research Associate Professor at the Maxine Goodman Levin College of Urban Affairs at Cleveland State University. Dr. Lendel was the principal investigator for this project. She is an economist with vast experience in conducting academic and applied research on regional innovation, entrepreneurship, and economic development. Her research portfolio includes projects on industrial analysis (manufacturing, steel, oil and gas, and high-tech industries); energy policy and economics; technology-based economic development; the ecology of entrepreneurship and innovation; the impact of arts on regional economic development; and the role of universities in regional economic development. She leads large multi-institutional research projects, creates methodologies, conducts modeling, and recommends strategies and public policies in a variety of aspects in regional economic development.

Dr. Lendel is currently an associate editor for *Economic Development Quarterly* (since 2009), a member of the Economic Advisory Group for JobsOhio (since 2017), and Vice-chair of the Sustainability Advisory Committee for the International Economic Development Council (since 2017). Dr. Lendel earned her Ph.D. in Economics at the Lviv Regional Institute of Ukrainian Academy of Science. She earned a second Ph.D. in Urban Studies from the Levin College of Urban Affairs at Cleveland State University with a concentration in Economic Development.

Matthew B. Ellerbrock was a Research Associate at the Center for Economic Development at the time when this study was conducted. He was one of the Center's key specialists in input-output economic modeling and analysis, with expertise in the IMPLAN suite of impact planning software, and has contributed to a number of studies involving economic impact analysis as well as economic development, workforce development, and technical assistance to local and regional clients throughout the state of Ohio. Matt received his Master of Arts in Environmental Studies from Cleveland State University's Levin College of Urban Affairs and holds an Urban Geographic Information Systems (GIS) Certificate from the College. He received a Bachelor of Science in Business Administration with a focus in Marketing from the Max M. Fisher College of Business at the Ohio State University.

Scott Corsi was a Graduate Research Assistant for the Center for Economic Development and a Ph.D. student in the Department of Urban Studies in the Maxine Levin College of Urban Affairs at Cleveland State University. His research interests include workforce and economic development. In the past, Scott has worked as an Associate Economist developing labor data and maintaining industrial and occupational databases. He has also led and participated in research projects aimed at improving the workforce in the 16-counties around Detroit, Michigan. He holds a Master's Degree in Economics from the University of Toledo.

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INTRODUCTION

EXECUTIVE SUMMARY

The Transportation Research Center Inc. (TRC) in Ohio has substantially impacted both the six-county regional economy and the overall state economy.¹ The economic impact assessed in this study includes both construction projects and operations of TRC Inc.

TRC Six-County Regional Economic Impact

The capital expenditures analyzed in this study occurred at TRC between 2011 and 2019. During these nine years, a combined total of twenty jobs were created, averaging two jobs per year, paying out \$1.3 million in wages and benefits (Table 1). This labor income was earned directly by construction workers, indirectly by employees in supply chain industries supporting construction projects, or induced by household spending in population-serving industries. The total value added – a proxy for contributions to the gross regional product – was about \$2.5 million, and output (a proxy for the total value of all related economic activities) was \$12.5 million. County and sub-county government institutions

were estimated to receive nearly \$162,000 in tax revenue, while about \$175,000 was paid in state taxes.

The operations conducted by TRC Inc. during 2019 created nearly 600 estimated jobs in the six-county region, with \$31.9 million in wages and benefits (Table 1). The total value added was about \$69 million, with output exceeding \$109 million during the year. These operations are estimated to have provided over \$966,000 to county and sub-county government institutions, \$936,000 to the state government, and \$1.8 million to the federal government.

Table 1: Total Economic Impact of TRC Capital & Operating Expenditures in the Six-County Region²

| Expenditures | Years | Employment (Annual Avg) ³ | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|-----------|--------------------------------------|--------------|-------------|-----------|-------------------------|-----------|-------------|
| Capital | 2011-2019 | 2 | \$1.3 M | \$2.5 M | \$12.5 M | \$161.5 k | \$175.3 k | \$270.5 k |
| Operating | 2019 | 599 | \$31.9 M | \$69.0 M | \$109.2 M | \$966.9 k | \$936.6 k | \$1.8 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

State Economic Impact

The TRC's capital and operating expenditures impacted the state's economy as well. Capital expenditures during these nine years created a

total of 115 jobs, paying out \$7.3 million in wages and benefits (Table 2). Similar to the six-county region, these wages were enjoyed

¹ The six-county region includes Champaign, Delaware, Franklin, Hardin, Logan, and Union Counties.

² All monetary figures are reported in 2021 dollars; due to rounding, some values may not appear to add correctly.

³ The employment numbers are shown as annual averages, as most jobs will be consistent year-over-year and will likely be filled by the same individuals; therefore, they are shown as an average impact over the duration of the capital projects.

directly by construction workers, indirectly in supply chain industries supporting projects, or through the household spending by employees serving these industries. The total value added across the state was nearly \$17 million, with an output greater than \$67 million. Statewide, county and sub-county government institutions were estimated to receive over \$781,000 in tax revenue, and the state earned about \$895,000 in taxes.

The operations conducted by the TRC during 2019 created 674 estimated jobs throughout Ohio, with \$35.7 million in wages and benefits (Table 2). The total value added was about \$78 million, with output exceeding \$127 million during the year. These operations are estimated to have provided over \$1.3 million to county and sub-county government institutions across the state, \$1.3 million to the state government, and another \$2.3 million to the federal government.

Table 2: Total Economic Impact of TRC Capital & Operating Expenditures in Ohio

| Expenditures | Years | Employment (Annual Avg) | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|-----------|-------------------------|--------------|-------------|-----------|-------------------------|-----------|-------------|
| Capital | 2011-2019 | 13 | \$7.3 M | \$16.9 M | \$67.5 M | \$781.0 k | \$894.7 k | \$1.6 M |
| Operating | 2019 | 674 | \$35.7 M | \$77.7 M | \$127.2 M | \$1.3 M | \$1.3 M | \$2.3 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

ABOUT THE TRC

For nearly fifty years, leaders in the transportation industry have been attracted to the Transportation Research Center Inc.'s 4,500-acre campus to test, refine, and validate their vehicles and components in a secure, independent setting that offers a full range of facilities and technical expertise. Located in East Liberty, 35 miles northwest of Columbus, TRC has been a focal point for much of the research and innovation that has transformed transportation in Ohio.

Furthermore, the facility is among the most comprehensive proving grounds for OEMs (Original Equipment Manufacturers), suppliers, systems innovators and government agencies in North America, perhaps worldwide.

As game-changing technologies continue to reshape the automotive industry, TRC is constantly expanding and transforming to meet the current and future needs of transportation science.

TRC is the Automotive Industry's Go-To Source for Testing

As advanced vehicle technologies become more complex, and as safety and performance standards grow more demanding, automotive innovators require a trusted, independent source to evaluate the performance of vehicles and components over many miles of full-range, demanding conditions.

Many leading OEMs and component developers turn to TRC as an unsurpassed resource for testing. Clients at TRC have the assurance that their vehicles and components are tested and rated both in accordance with corporate standards of performance and any required government standards.

TRC offers a world of driving conditions: hot or cold temperatures, rainy or icy roads, even overcast or sunny skies. At its proving ground, TRC conducts programs designed to test for safety, energy, fuel economy, emissions, durability, noise, performance, crash simulation, and more. Also, TRC tests a wide range of vehicle types and equipment, including trucks, buses, motorcycles, recreational vehicles, electric vehicles, passenger cars and components.

How TRC is Helping Innovators Stay Ahead in Transportation Technology

On a massive site two-thirds the size of New York's Central Park, TRC's 540-acre SMARTCenter provides transportation innovators with unrivalled opportunities to securely test their advanced mobility technologies in a safe, confidential, and repeatable real-world environment. SMARTCenter began operations in 2019, and it was the main driver of capital expenditures in the six-county region that year.

The SMARTCenter's high-speed straightaways and cityscape simulations, expressly designed for testing automated and connected vehicle systems, give systems developers the rare experience of evaluating their innovations on a variety of intersection types, roundabouts, access ramps, and other navigational situations. These facilities validate the performance of advanced passenger and commercial vehicles under the rigors of everyday driving before they are taken onto public roadways.

Moreover, SMARTCenter's full range of testing environments offers customizable testing of advanced vehicles and systems in a closed, contained space where innovators can observe

the safety and performance of their designs under almost any driving condition.

This report presents an analysis of the economic impact of building and operating TRC Inc. on a six-county region and the state of Ohio overall. The six-county region is defined as including Champaign, Delaware, Franklin, Hardin, Logan, and Union Counties. The economic impact is assessed for the construction phase of the project (2011 through 2019) and a one-year impact of TRC operations (2019). Five measures are used to estimate its quantitative economic impact: employment (number of jobs), labor

income (household earnings), value added (output less the value of intermediary goods – often used as a proxy for GDP), output (total value of goods and services produced in the region), and taxes. The tax impact calculates the impact of federal, state, and local taxes. Each of these components includes direct, indirect, and induced impacts.

The analysis was conducted by the Center for Economic Development at Cleveland State University's Maxine Goodman Levin College of Urban Affairs (the Center). This study is commissioned by JobsOhio.

METHODOLOGY AND ASSUMPTIONS FOR ESTIMATING PROSPECTIVE ECONOMIC IMPACT

The analysis of the economic impact of the TRC's construction projects and operations on the six surrounding counties and the state of Ohio is based on the initial data received from the TRC and on a number of assumptions created by the research team. The input-output modeling used is constructed for a particular economic area, accounting for a specific number of producing industry sectors trading products and services. This modeling is based on the approach of regional multipliers. The exchange of goods and services between industry sectors starts with the initial change of final demand measured in the value of goods and services, including labor, used in TRC's operations and construction projects.

The economic impact estimates presented in the report were derived using the IMPLAN online application, the most recent economic impact assessment platform and data available from the IMPLAN Group LLC. Only spending occurring in the region of impact was counted as the initial change of final demand. Outside spending, or *leakages*, were not considered in modeling the impacts. This study assesses only effects through the supply chain companies to TRC and does not discuss the additional economic benefits created by consumers.

Multi-Regional Input-Output Analysis (MRIO) was used to assess the economic impact in both the six-county and state levels throughout 546 sectors of the economy. The six-county region includes Champaign, Delaware, Franklin, Hardin, Logan, and Union Counties. The economy in this six-county region is linked to the rest of Ohio through various supply chain companies across the whole state. Spending in this region can trigger indirect and induced effects in the linked region, and spending outside of this region triggers economic impact through suppliers in the six-county region. This MRIO analysis makes it possible to show how spending in this region affects production in all sectors and spending of households throughout Ohio.

The economic impact of the project's construction phase covers capital expenditures between 2011 and 2019, while the impact of operation expenditures focuses on spending during 2019. The main assumption used for this study was that there are no alternative services provided in the study area and that TRC is the only company that customers can receive these specific services from. This economic impact illustrates how much economic activity would have been lost if TRC were to have closed its doors.

An economic impact study analyzes and estimates economic benefits produced in regions affected by projects, programs, or companies. Economic impact modeling ultimately estimates the benefits for a specific region and time period based on industry averages for the given region, in this case, Ohio. These economic benefits are estimated in terms of five different measures:

Employment impact measures the number of jobs created and supported (retained) in the regional economy as a result of TRC Inc.'s construction and operations.

Labor-income impact estimates the household earnings generated in the economy due to TRC Inc.'s construction and operations.

Value-added impact estimates the value of goods and services produced in the economy, less intermediary goods and services, such as materials, utilities, and other goods used in the construction and operation of TRC Inc. Ultimately, value-added impact contributes to gross regional product.

Output impact measures the total value of goods and services produced in the regional economy as a result of TRC Inc.'s construction and operations.

Tax impact includes federal, state and local taxes paid by every component of TRC Inc.'s construction and operations. In addition to

direct expenditure taxes, this includes taxes paid as part of household spending by direct employees, supplier industry employment, and population-serving workers. Like all other measures, they are estimates based on industry averages for Ohio and may not reflect this project's actual tax payments. This study assumes no tax abatements are provided to the project.

Each of these economic impact components is a summation of *direct*, *indirect*, and *induced* impacts.

Direct impact refers to the initial change of final demand measured in the value of goods and services, including labor, used in TRC Inc.'s operations and construction projects (the first-round effect).

Indirect impact refers to the value of labor, capital, and other inputs needed to produce the goods and services required by TRC's operations and construction (the second-round and additional-round effects happening in supply chain companies in the region of study).

Induced impact refers to the change in spending by local households due to increased earnings of employees of TRC Inc. (or their construction contractors), employees of companies in their supply chain, and suppliers in all consecutive economic rounds.

DIRECT IMPACT OF TRC

During 2019, \$27.1 million of operating expenditures were spent on vendors and paid to employees located in this six-county region in Ohio. Over 84% (\$22.8 million) of this spending included wages and benefits received by TRC employees in 2019. Household income, which includes gross payroll and benefits (estimated to be 30%), creates the largest part of the economic impact of TRC on

the six-county region. Among all vendors, the Educational Services sector (mainly The Ohio State University) was the largest beneficiary of TRC's spending, receiving around 8.5% (\$2.3 million). All other sectors accounted for 7.5%, or around \$2 million, of 2019 TRC operating expenditures. Table 3 displays operating expenditures categories by industry sector.

Table 3: Operating Expenditures in the Six-County Region, 2019

| Industry Sector | Total |
|--|-----------------|
| Educational Services | \$2.3 M |
| Retail Trade | \$699.9 k |
| Professional, Scientific, and Technical Services | \$478.1 k |
| Wholesale Trade | \$301.6 k |
| Administrative and Support and Waste Management and Remediation Services | \$106.6 k |
| Arts, Entertainment, and Recreation | \$95.1 k |
| Utilities | \$57.1 k |
| Other Services (except Public Administration) | \$55.3 k |
| Construction | \$47.9 k |
| Manufacturing | \$32.1 k |
| Accommodation and Food Services | \$25.7 k |
| Mining, Quarrying, and Oil and Gas Extraction | \$25.5 k |
| Finance and Insurance | \$23.6 k |
| Real Estate and Rental and Leasing | \$19.8 k |
| Health Care and Social Assistance | \$15.9 k |
| Government Enterprises | \$14.0 k |
| Transportation and Warehousing | \$11.5 k |
| Agriculture, Forestry, Fishing and Hunting | \$4.4 k |
| Household Income | \$22.8 M |
| Total | \$27.1 M |

Sources: Transportation Research Center Inc., CSU Center for Economic Development.

In total, \$33.3 million in operating expenditures was spent on vendors and paid to employees located in the entire state of Ohio during 2019. Wages and benefits received by TRC employees totaled \$24.6 million, representing nearly 74% of all operating expenditures in the state of Ohio during 2019. As in the six-county region, household income creates the largest part of the economic impact of TRC. Among other vendors,

the *Educational Services*; *Manufacturing*; and *Professional, Scientific, and Technical Services* sectors were the largest beneficiaries of TRC spending, cumulatively receiving 16.2%, or \$5.4 million, of TRC's spending. All other sectors accounted for 9.9% of 2019 TRC operating expenditures, totaling about \$3.3 million. Table 4 displays operating expenditures in the state of Ohio during 2019 by industry sector.

Table 4: Operating Expenditures in Ohio, 2019

| Industry Sector | Total |
|--|-----------------|
| Educational Services | \$2.4 M |
| Manufacturing | \$2.0 M |
| Professional, Scientific, and Technical Services | \$1.0 M |
| Retail Trade | \$891.8 k |
| Wholesale Trade | \$817.1 k |
| Administrative and Support and Waste Management and Remediation Services | \$647.1 k |
| Construction | \$330.8 k |
| Finance and Insurance | \$295.3 k |
| Arts, entertainment and recreation | \$95.1 k |
| Government Enterprises | \$77.8 k |
| Utilities | \$57.1 k |
| Other Services (except Public Administration) | \$55.3 k |
| Accommodation and Food Services | \$25.7 k |
| Mining, Quarrying, and Oil and Gas Extraction | \$25.5 k |
| Real Estate and Rental and Leasing | \$19.8 k |
| Health Care and Social Assistance | \$15.9 k |
| Transportation and Warehousing | \$11.5 k |
| Agriculture, Forestry, Fishing and Hunting | \$4.4 k |
| Household Income | \$24.6 M |
| Total | \$33.3 M |

Sources: Transportation Research Center Inc., CSU Center for Economic Development.

Table 5 details the capital expenditures of TRC Inc. in the Central Ohio six-county region during the period of 2011-2019. Capital expenditures include any expenses made by TRC to acquire, upgrade, or maintain physical assets. TRC spent \$8.6 million on capital expenditures in the region, with over 91% of capital spending supporting the Construction industry sector. Capital expenditures contributing to Retail and Wholesale Trade sectors made up another 8% of the total spent, with the remainder supporting Professional, Scientific, and Technical services.

Capital expenditures across the state of Ohio made by TRC from 2011-2019 totaled \$43.6 million, as illustrated in Table 6. Expenses supporting the Construction industry made up over 87% of TRC's spending on capital, totaling \$38.3 million. Spending in the Professional, Scientific, and Technical services accounted for another 8% of capital expenditures in Ohio, followed by 1% of spending in the Retail and Wholesale Trade sectors.

Table 5: Capital Expenditures, Six-County Region, 2011-2019

| Industry Sector | Total |
|--|----------------|
| Construction | \$7.9 M |
| Retail Trade | \$480.3 k |
| Wholesale Trade | \$195.2 k |
| Professional, Scientific, and Technical Services | \$40.1 k |
| Total | \$8.6 M |

Sources: Transportation Research Center Inc., CSU Center for Economic Development.

Table 6: Capital Expenditures, State of Ohio, 2011-2019

| Industry Sector | Total |
|--|-----------------|
| Construction | \$38.3 M |
| Professional, Scientific, and Technical Services | \$3.6 M |
| Retail Trade | \$569.4 k |
| Information | \$439.1 k |
| Wholesale Trade | \$431.5 k |
| Administrative and Support and Waste Management and Remediation Services | \$92.5 k |
| Other Services (except Public Administration) | \$75.3 k |
| Manufacturing | \$28.1 k |
| Total | \$43.6 M |

Sources: Transportation Research Center Inc., CSU Center for Economic Development.

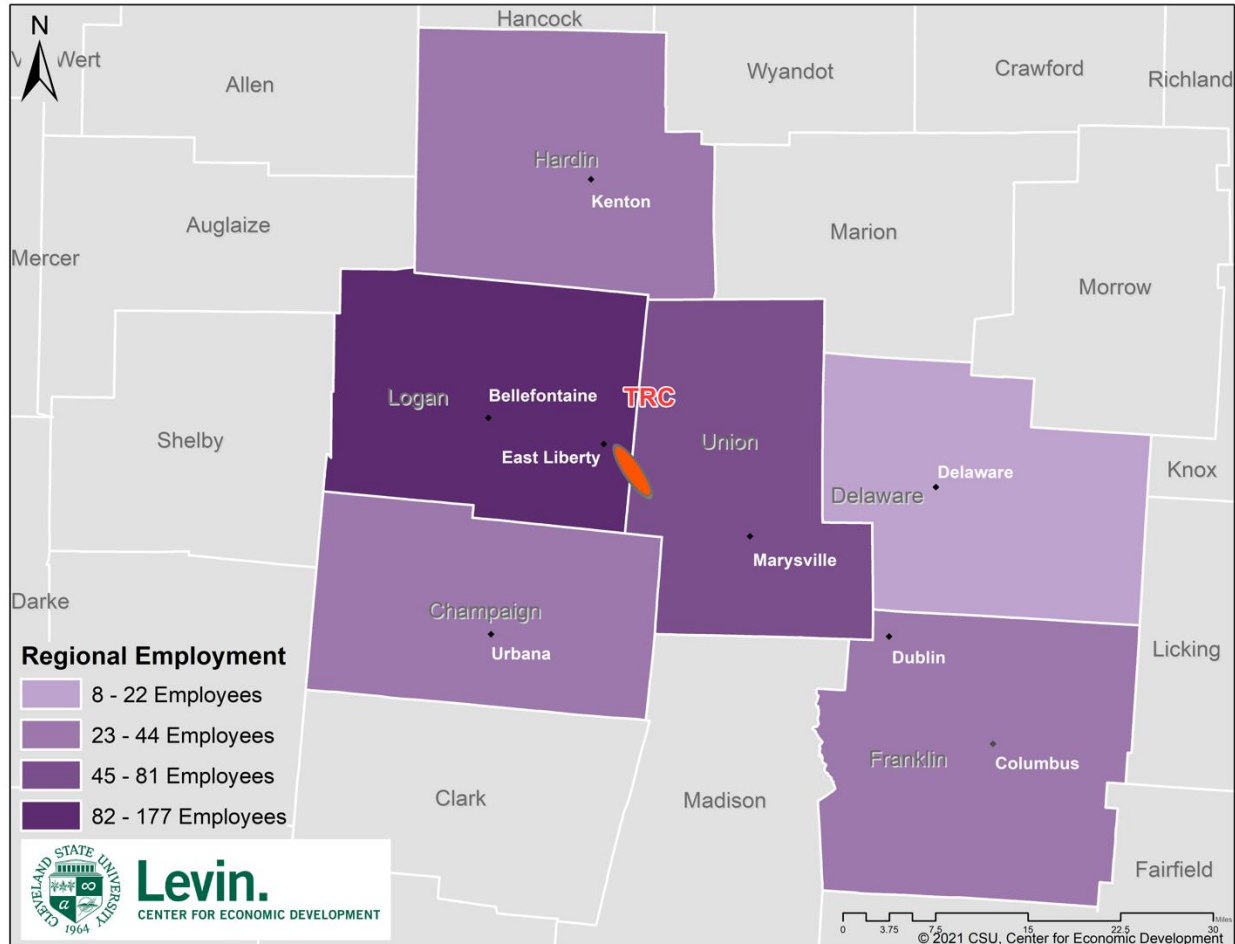
EMPLOYMENT AND PAYROLL MAPS

Six-County Regional Employment

In the Central Ohio six-county region, 419 people were directly employed by TRC. Most of these workers were in the counties that TRC resides in, with 177 workers coming from Logan County and

another 81 coming from Union County. Franklin County accounted for the third-largest population of TRC workers, with 45 residing in the county in 2019.

Figure 1: Six-County Region TRC Employment

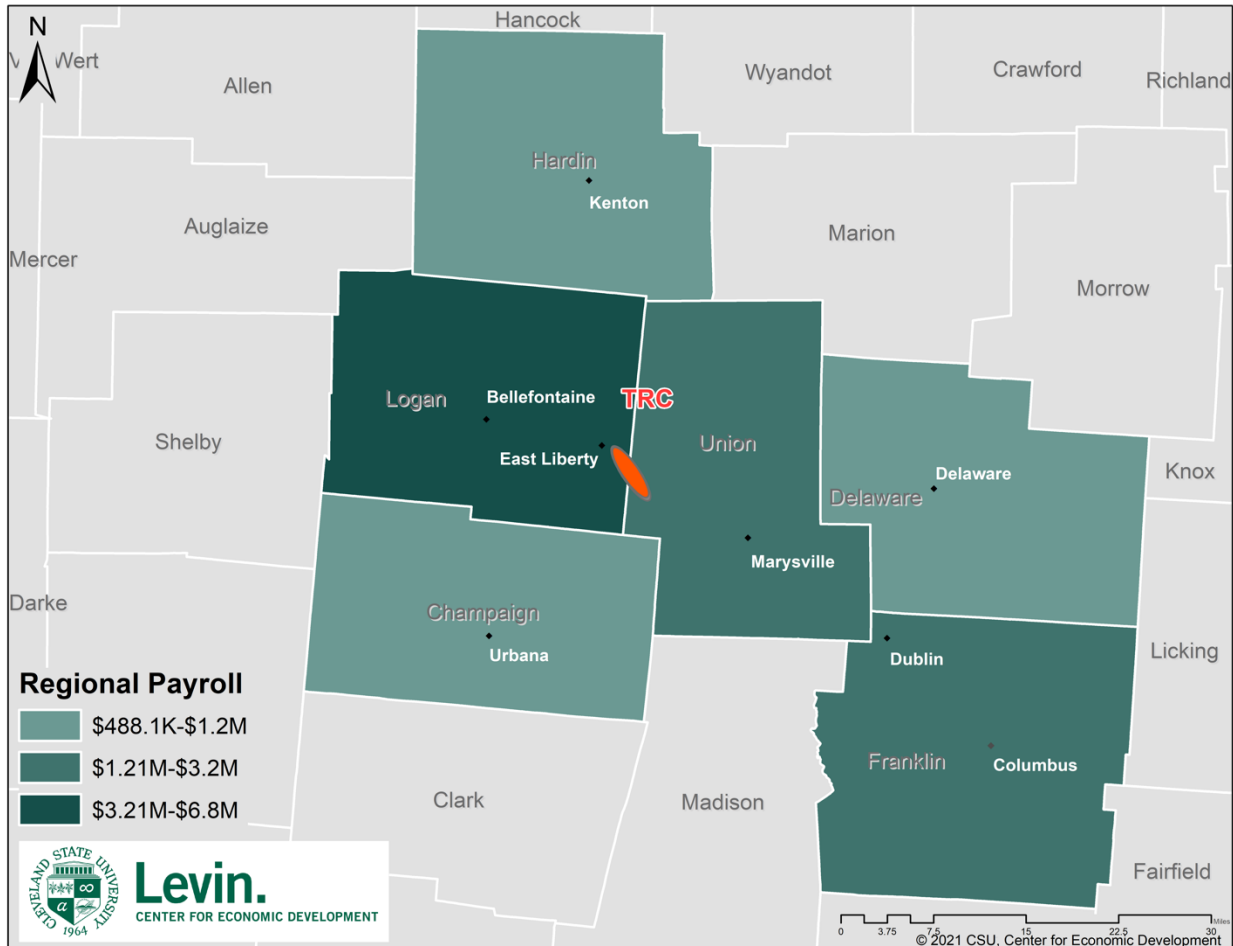


Six-County Regional Payroll

In the six-county region, over \$16 million in payroll, including wages and benefits, was added. The two counties TRC resides in saw the largest payroll increases as a result of TRC's operations, totaling \$9.7 million between the

two counties. As a result of TRC's operating expenditures, Logan County's gross payroll increased by \$6.7 million, Union County's gross payroll grew by \$2.9 million, and Franklin County's payroll increased by \$3.4 million.

Figure 2: Six-County Regional TRC Payroll

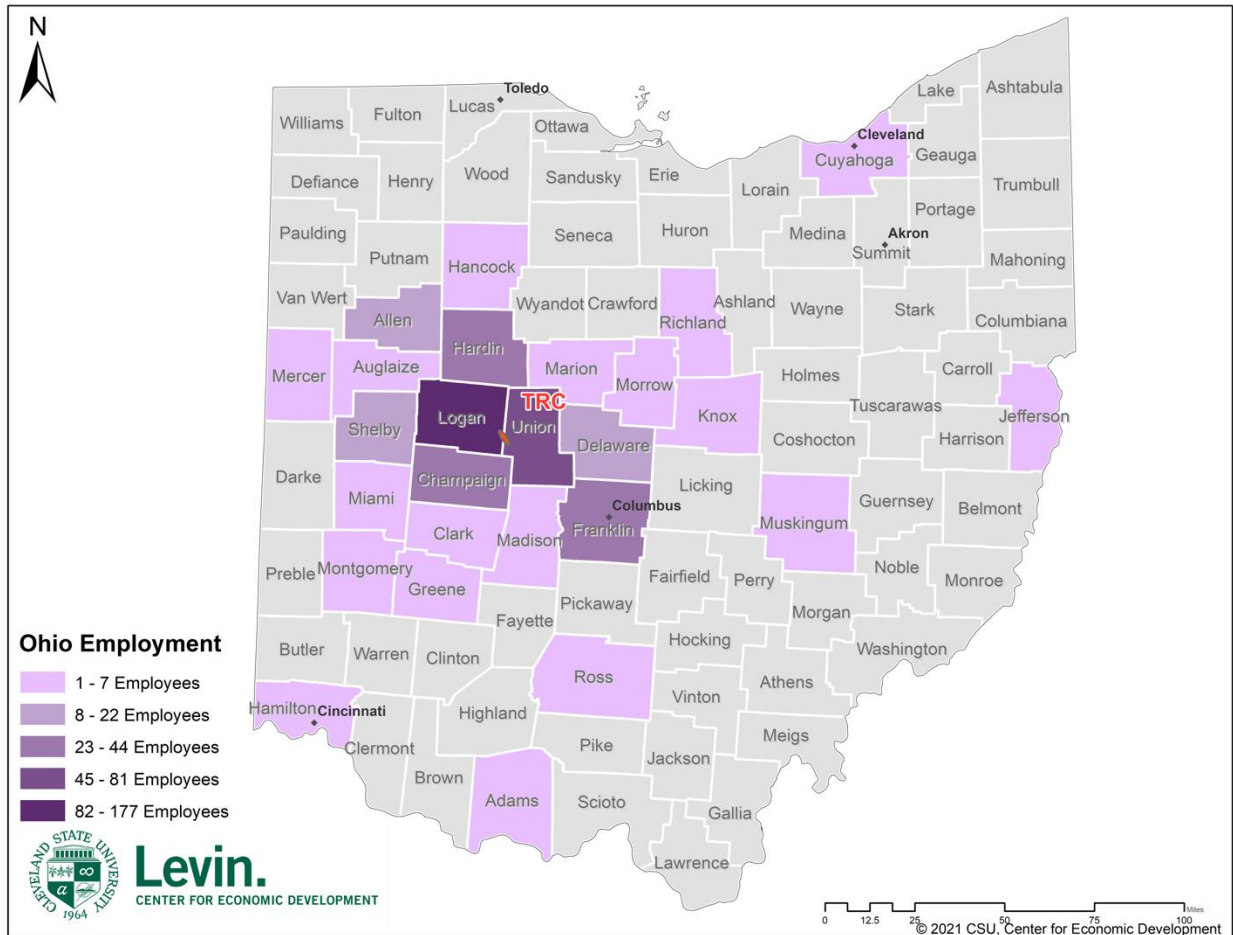


Ohio Employment

TRC operations impacted employment beyond the six-county region, with counties across the state seeing employment increases. TRC operations increased employment in Ohio by 457 workers, with 38 workers residing outside

the six-county region. Allen County employment grew by 22 workers, the largest employment growth outside of the TRC region. However, employment gains were seen as far as Hamilton, Cuyahoga, and Jefferson Counties.

Figure 3: State of Ohio TRC Employment

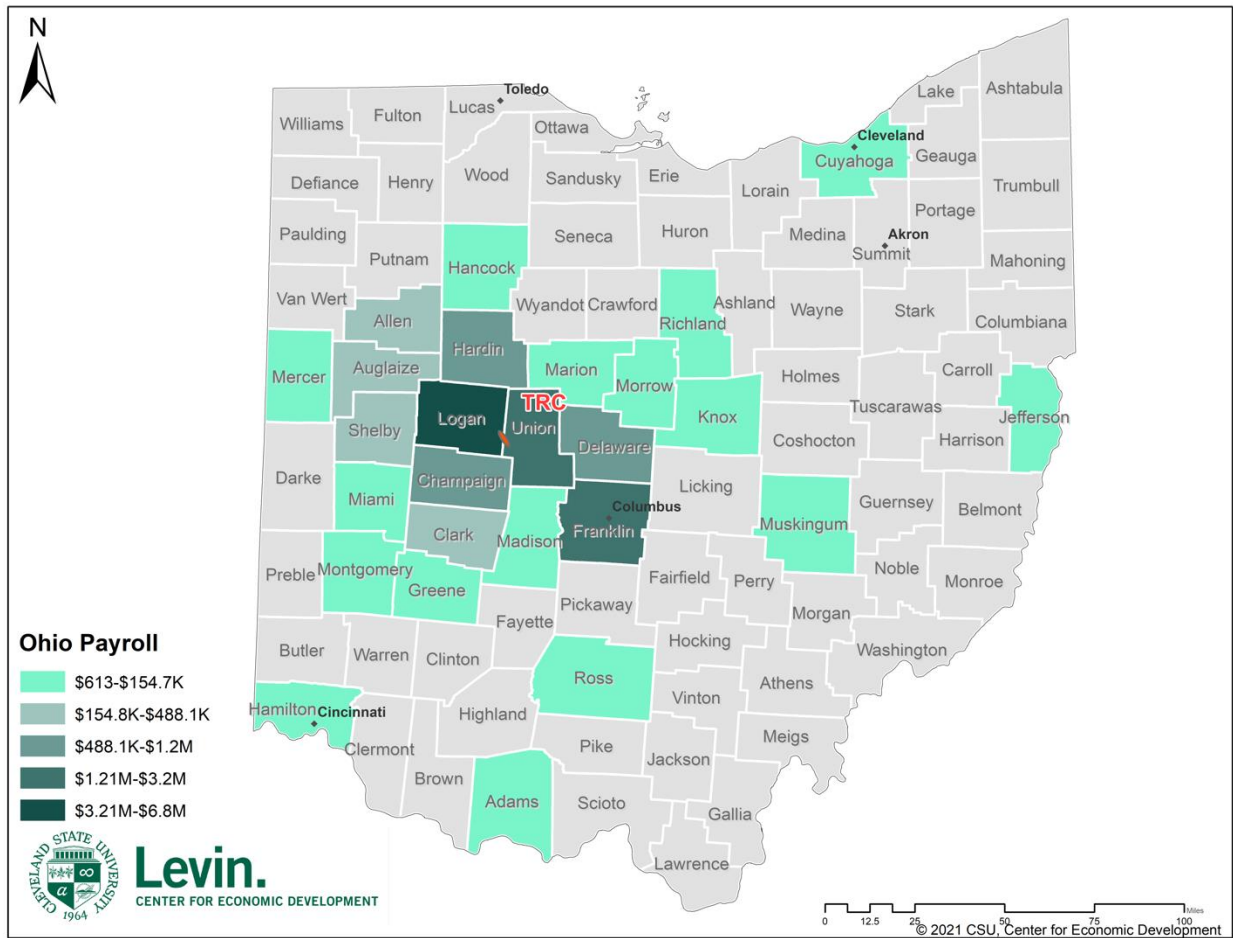


Ohio Payroll

The state of Ohio saw payroll, including benefits and wages, increase by nearly \$19 million through TRC operations. Over \$2.5 million in payroll increases occurred outside of the six-county TRC region. Allen county payroll

increased by nearly \$500,000, accounting for 2.6% of the total payroll gains across the state. Counties that saw payroll increases as a result of TRC operations can be found in Figure 4.

Figure 4: State of Ohio TRC Payroll



TRC'S ECONOMIC IMPACT ON THE SIX-COUNTY REGION

Table 7 shows the total estimated economic impact of the operations of TRC in the six-county region during 2019. The operations are estimated to support nearly 600 workers. The direct impact of operation expenditures supports more than 400 employees directly. Nine jobs were in supply chain industries (indirect impact), while 171 jobs were supported in population-serving industries through the household spending of those directly employed by TRC or in the supply chain. Labor income is estimated to be nearly \$32 million in total, with about \$0.41 being paid to supply chain or service

industries for every dollar paid directly to employees.

The total estimated value added, \$69 million, represents the operation's contribution to the gross regional product. The total economic activity (output) impact was over \$109 million. An estimated \$967,000 in county and sub-county taxes were collected through TRC operation expenditures. An additional \$936,000 in taxes was collected at the state level, and another \$1.8 million was collected at the federal level.

Table 7: Total Economic Impact of TRC Operations on Six-County Region, 2019

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|-----------------|------------|-----------------|-----------------|------------------|-------------------------|------------------|----------------|
| Direct | 419 | \$22.7 M | \$50.7 M | \$75.6 M | \$156.3 k | \$142.4 k | \$39.4 k |
| Indirect | 9 | \$460.1 k | \$1.7 M | \$5.9 M | \$30.5 k | \$30.6 k | \$87.9 k |
| Induced | 171 | \$8.8 M | \$16.6 M | \$27.7 M | \$780.1 k | \$763.6 k | \$1.7 M |
| Total | 599 | \$31.9 M | \$69.0 M | \$109.2 M | \$966.9 k | \$936.6 k | \$1.8 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

TRC Operating Expenditures' Impact by Industry in the Six-County Region

The output impact TRC operations had on the Central Ohio six-county region during 2019 totaled \$109.2 million. Nearly \$76 million of this output was from the direct economic impact of TRC's operating expenditures. The remaining \$33.6 million of output impacted other industries in the region through supply chain activity and workers spending wages in the local economy (Table 8).

Table 8 and Figure 5 further group these top affected industry sectors by broad categories. Employment in the *Mixed Demand* includes industries that serve both the construction

industry and the household sector, like *Securities, Commodities, and Other Financial Investments*. *Personal Services* represent industries that are commonly used by households, such as *Health Care* and *Accommodation and Food Services*. *Professional and Administrative Services* represent industries such as *Professional, Scientific, and Technical Services* and *Management of Companies and Enterprises* that assist in the construction industry. *Industry Suppliers* represent industries that commonly supply the transportation industry.

Over a third (\$11.4 million) of these indirect and induced impacts were in the *Mixed Demand* sector. *Personal Services* industries were the second largest group of impacted industries, followed by *Professional and Administrative Services*, *Education Services* (primarily around

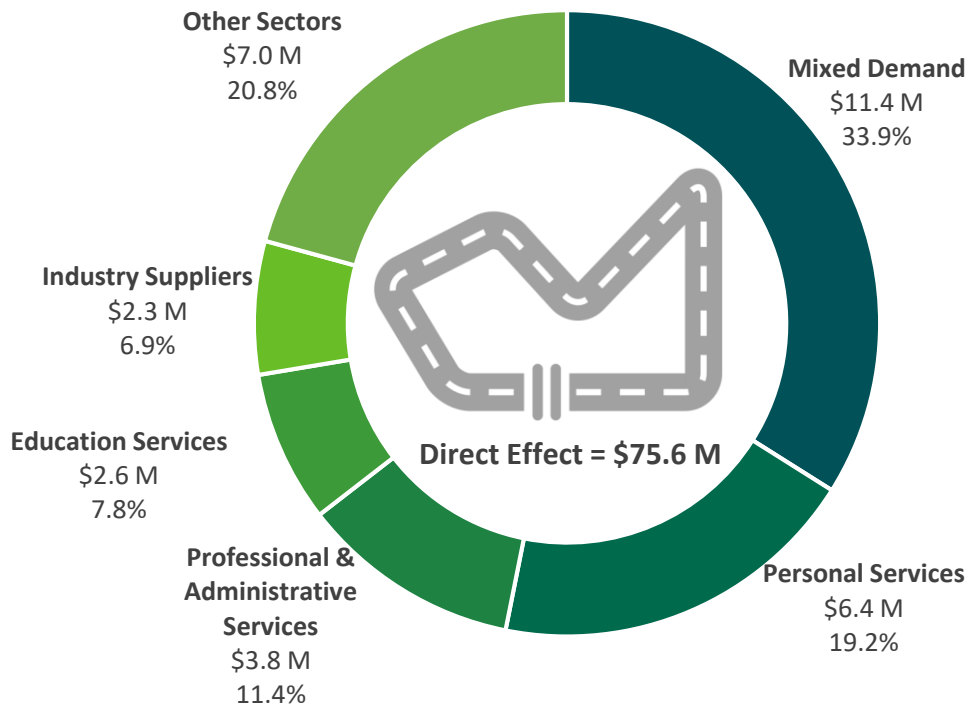
The Ohio State University), and *Industry Suppliers* in the region (Figure 5). These top industry groups totaled nearly 80% of the ripple effect TRC operations had on the regional economy.

Table 8: Six-County Indirect and Induced Output from TRC Operating Expenditures

| Industry Sectors – Combined Categories | Total |
|--|-----------------|
| Mixed Demand | \$11.4 M |
| Personal Services | \$6.4 M |
| Professional & Administrative Services | \$3.8 M |
| Education Services | \$2.6 M |
| Industry Suppliers | \$2.3 M |
| Other Sectors | \$7.0 M |
| Total | \$33.6 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

Figure 5: Six-County Output Impact of Operating Expenditures



Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

Economic Impact of TRC Capital Expenditures in the Six-County Region

Table 9 shows the total estimated economic impact of TRC's construction projects in the six-county region from 2011-2019. The capital expenditures over the nine years are estimated to have supported twenty jobs. Fourteen of these jobs were in supply-chain industries (indirect impact), while six jobs were supported in population-serving industries by household spending in the regional economy. Labor income was estimated to be over \$1 million in total.

The total estimated value added, around \$2.5 million, represents capital expenditure contributions to the gross regional product. The total economic activity (output) impact was nearly \$13 million. An estimated \$161,000 in county and sub-county taxes was collected through TRC capital expenditures. An additional \$175,000 taxes were collected at the state level, and another \$270,000 was collected at the federal level.

Table 9: Economic Impact of TRC Capital Expenditures on Six-County Central Ohio Region, 2011-2019

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|----------------|-----------------|-------------------------|------------------|------------------|
| Indirect | 14 | \$1.0 M | \$2.0 M | \$11.6 M | \$136.8 k | \$147.6 k | \$209.6 k |
| Induced | 6 | \$304.6 k | \$555.6 k | \$928.7 k | \$24.7 k | \$27.8 k | \$60.9 k |
| Total | 20 | \$1.3 M | \$2.5 M | \$12.5 M | \$161.5 k | \$175.3 k | \$270.5 k |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

TRC Capital Expenditures Impact by Industry in the Six-County Region

The output impact TRC construction projects had on the Central Ohio six-county region between 2011 and 2019 totaled \$12.5 million. This impacted other industries in the region through supply chain activity and workers spending wages in the local economy (table 10).

Table 10 and Figure 6 group the industry sectors most impacted by TRC into broad categories. Over two-thirds (\$8.8 million) of these industries

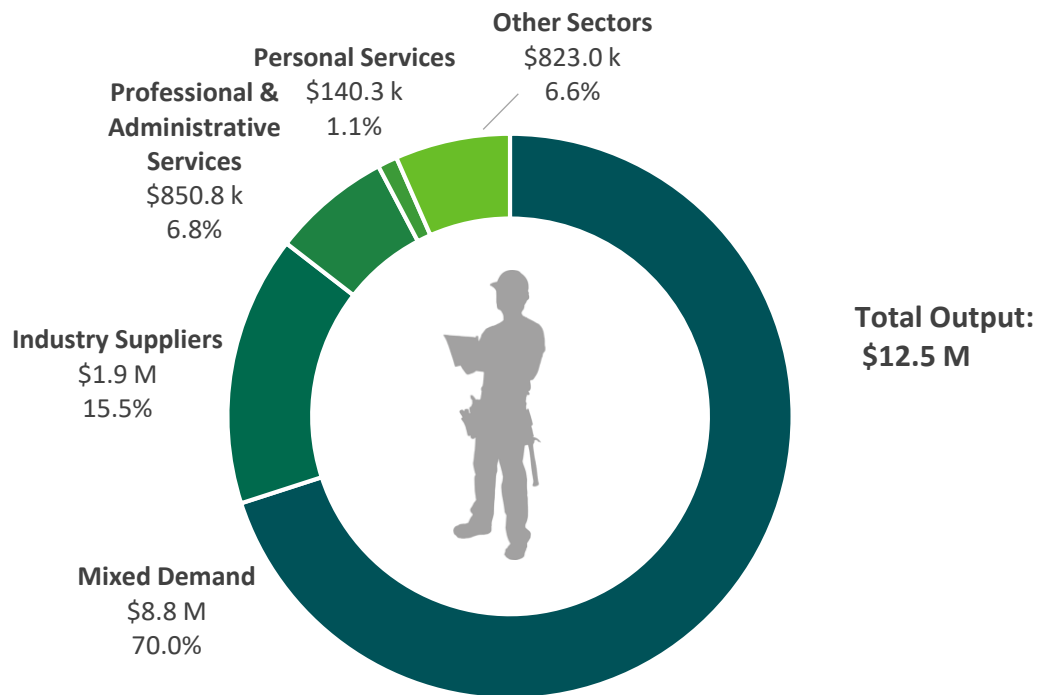
impacted were in the *Mixed Demand* sector, including both the construction industry and the demand of individual households. Other top industry groups included *Industry Suppliers*, *Professional and Administrative Services*, and *Personal Services* in the region (Figure 6). These top industry groups totaled nearly 95% of the ripple effect TRC capital expenditures had on the regional economy.

Table 10: Output Impact of TRC Capital Expenditures on Six-County Central Ohio Region, 2011-2019

| Industry Sectors - Combined Categories | Total |
|--|-----------------|
| Mixed Demand | \$8.8 M |
| Industry Suppliers | \$1.9 M |
| Professional & Administrative Services | \$850.8 k |
| Personal Services | \$140.3 k |
| Other Sectors | \$823.0 k |
| Total | \$12.5 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

Figure 6: Output Impact of TRC Capital Expenditures on Six-County Central Ohio Region, 2011-2019



Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

ECONOMIC IMPACT OF TRC OPERATIONS ON THE STATE OF OHIO

Table 11 shows the total estimated economic impact of TRC's operations in Ohio during 2019. TRC's operations are estimated to support 674 workers statewide. The direct impact of operation expenditures supports 457 employees directly, thirty-eight of whom are employed outside of the six-county region TRC operates in. Seventeen jobs were in supply chain industries, while nearly 200 jobs were supported in population-serving industries through TRC employee spending or in supply chain industries.

Labor income is estimated to be nearly \$36 million in total.

The statewide gross regional product increased by \$77.7 million as a result of the operation expenditures by TRC. The total economic activity impact was over \$127 million. An estimated \$1.3 million in county and sub-county taxes was collected throughout the state from these operation expenditures. Another \$1.3 million in taxes was collected at the state level, and \$2.3 million was collected by the federal authorities.

Table 11: Total Economic Impact of TRC Operations on the State of Ohio, 2019

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|-----------------|------------|-----------------|-----------------|------------------|-------------------------|----------------|----------------|
| Direct | 457 | \$24.6 M | \$55.1 M | \$82.8 M | \$367.4 k | \$360.7 k | \$85.5 k |
| Indirect | 17 | \$989.4 k | \$3.4 M | \$12.1 M | \$64.3 k | \$70.9 k | \$197.5 k |
| Induced | 199 | \$10.2 M | \$19.2 M | \$32.4 M | \$908.5 k | \$910.3 k | \$2.0 M |
| Total | 674 | \$35.7 M | \$77.7 M | \$127.2 M | \$1.3 M | \$1.3 M | \$2.3 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

TRC Operating Expenditures Impact by Industry in the State of Ohio

The output impact TRC operations had on the state of Ohio during 2019 totaled \$127.2 million. Nearly \$83 million of this output was from the direct economic impact of operating expenditures from TRC. The other \$44.5 million of output impacted other industries in the region through supply chain activity and workers spending wages in the local economy (Table 12). Over a third (\$14.9 million) of these indirect and

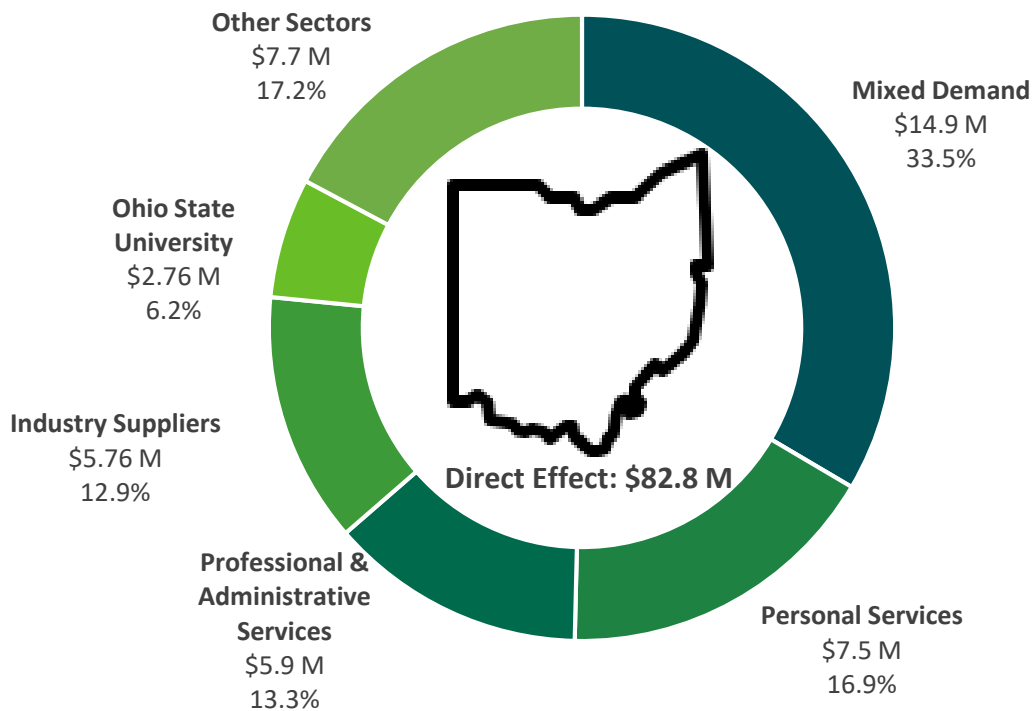
induced impacts were in the *Mixed Demand* sector. Other top industry groups include *Personal Services*, *Professional and Administrative Services*, *Education Services* (primarily around The Ohio State University), and *Industry Suppliers* in the region (Figure 7). These top industry groups totaled nearly 80% of the ripple effect TRC operations had on the regional economy.

Table 12: State Indirect and Induced Output from TRC Operating Expenditures

| Industry Sectors - Combined Categories | Total |
|--|-----------------|
| Mixed Demand | \$14.9 M |
| Professional & Administrative Services | \$5.9 M |
| Personal Services | \$7.5 M |
| Education Services | \$2.7 M |
| Industry Suppliers | \$5.7 M |
| Other Sectors | \$7.7 M |
| Total | \$44.5 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

Figure 7: State of Ohio Output Impact of Operating Expenditures



Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

Economic Impact of TRC Capital Expenditures in the State of Ohio

Table 13 shows the total estimated economic impact of TRC's construction projects in Ohio from 2011-2019. The capital expenditures over this nine-year period are estimated to have supported 115 jobs throughout the state. Eighty of these jobs were in supply chain industries (indirect impact), while another thirty-five jobs were supported in population-serving industries by household spending in the regional economy. Labor income from these capital expenditures is estimated to be over \$7 million.

The total estimated value added from these projects, nearly \$17 million, represent capital expenditure contributions to the gross regional product. The total economic activity (output) impact was over \$67 million. An estimated \$781,000 in county and sub-county taxes was collected through TRC construction projects. An additional \$894,000 in taxes was collected at the state level, and another \$1.6 million was collected at the federal level.

Table 13: Economic Impact of Capital Expenditures on State of Ohio, 2011-2019

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|-----------------|-----------------|-------------------------|------------------|----------------|
| Indirect | 80 | \$5.6 M | \$13.8 M | \$62.0 M | \$636.8 k | \$723.5 k | \$1.3 M |
| Induced | 35 | \$1.7 M | \$3.1 M | \$5.5 M | \$144.2 k | \$171.2 k | \$367.1 k |
| Total | 115 | \$7.3 M | \$16.9 M | \$67.5 M | \$781.0 k | \$894.7 k | \$1.6 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

TRC Capital Expenditures Impact by Industry in the State of Ohio

The output impact TRC construction projects had on Ohio from 2011-2019 totaled \$67.5 million. This impacted other industries in the region through supply-chain activity and workers spending wages in the local economy (Table 14).

Table 14 and Figure 8 group these top industry sectors into broad categories. Nearly two-thirds (\$42.6 million) of the industries impacted were

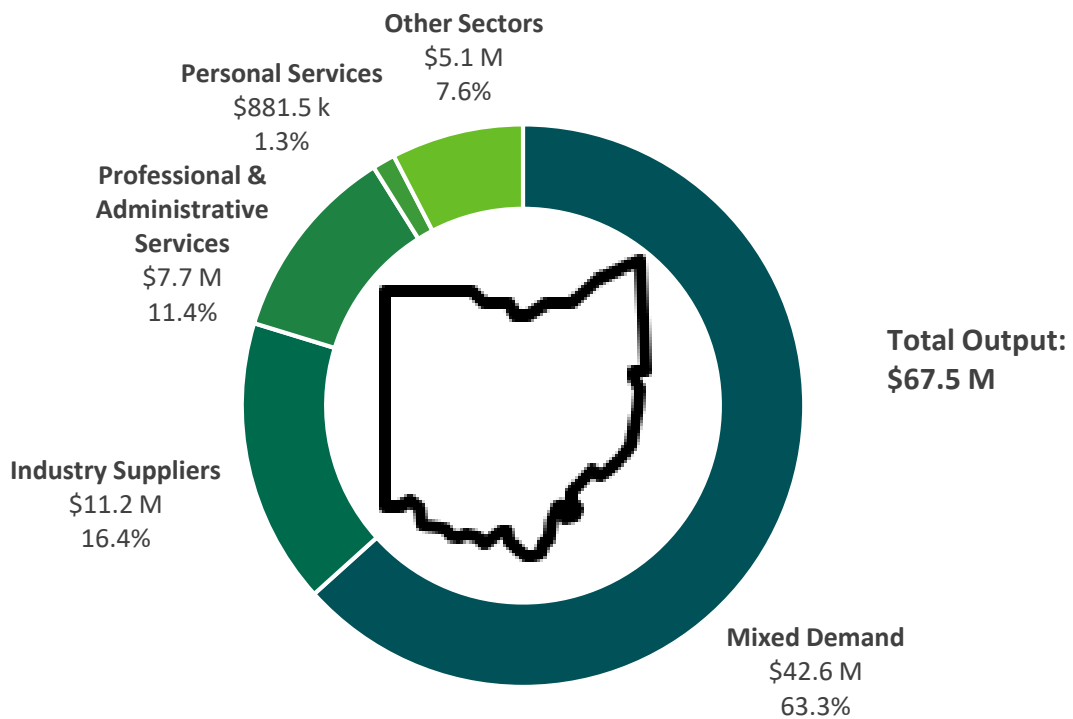
in the *Mixed Demand* sector. The *Industry Suppliers* sector was the second-biggest industry group, with over \$11 million in output impact from TRC capital expenditures. The *Professional Services* sector benefited by almost \$8 million from the capital expenditures made in the state. These top industry groups totaled over 90% of the ripple effect TRC construction projects had on the regional economy.

Table 14: Output Impact of TRC Capital Expenditures on State of Ohio, 2011-2019

| Industry Sectors - Combined Categories | Total |
|--|-----------------|
| Mixed Demand | \$42.6 M |
| Industry Suppliers | \$11.2 M |
| Professional & Administrative Services | \$7.7 M |
| Personal Services | \$881.5 k |
| Other Sectors | \$5.1 M |
| Total | \$67.5 M |

Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

Figure 8: Output Impact of TRC Capital Expenditures on State of Ohio, 2011-2019



Sources: IMPLAN trade flows and data files, data provided by TRC Inc., CSU Center for Economic Development.

CONCLUSION

The construction of the TRC campus and its operations greatly impacted both the economy of the six-county region around the campus and the state of Ohio overall. The capital expenditures between 2011 and 2019 in the local six-county area created \$12.5 million in economic activities, while operations at the campus in 2019 created over \$109 million in output. The capital expenditures from 2011 to 2019 had a much larger effect throughout the state of Ohio, creating an estimated \$67.5 million in output. Operations during 2019 created \$127.2 million in output across the state, with \$18 million being created outside of the six-county Central Ohio region.

From 2011 through 2019, capital expenditures of the Transportation Research Center Inc. created an estimated twenty jobs, paying out over \$1 million in wages and benefits in the local six-county area. The operations conducted by TRC in 2019 supported another 599 estimated jobs, providing nearly \$32 million in wages and benefits in the six-county region around the facility. Throughout Ohio, 115 jobs were created from TRC's capital expenditures between 2011 and 2019, and a total of 674 jobs were supported from operations in 2019. Capital projects created over \$7 million in wages and benefits to workers throughout the state, and TRC operations created nearly \$36 million in labor income. The TRC campus had a significant impact on workers and income both in its own region and throughout the state of Ohio.

In the six-county region, the *Mixed Demand* sector received nearly \$9 million in output from construction projects over the 9-year period and over \$11 million from operating expenditures. In Ohio, industries in this sector enjoyed nearly \$43 million in output from TRC construction projects between 2011 and 2019 and nearly \$15 million output from TRC's operations. *Industry Suppliers* also benefited from TRC's capital and operating expenditures, with over \$11 million in output resulting from 2011-2019 capital expenditures and nearly \$6 million from 2019 operating expenditures throughout Ohio. Other industry sectors to benefit from the construction and operation of TRC's facility included *Professional, Administrative, and Personal Services*.

APPENDIX

Table A1: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2011

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|----------------|-----------------|-------------------------|----------------|----------------|
| Indirect | 0 | \$2.2 k | \$8.7 k | \$25.6 k | \$1.8 k | \$1.6 k | \$0.7 k |
| Induced | 0 | \$0.5 k | \$1.0 k | \$1.7 k | \$47 | \$46 | \$0.1 k |
| Total | 0 | \$2.7 k | \$9.7 k | \$27.3 k | \$1.8 k | \$1.7 k | \$0.8 k |

Table A2: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2012

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|-----------------|-----------------|-------------------------|----------------|----------------|
| Indirect | 0 | \$6.6 k | \$25.7 k | \$75.0 k | \$5.1 k | \$4.7 k | \$2.1 k |
| Induced | 0 | \$1.7 k | \$3.2 k | \$5.3 k | \$0.1 k | \$0.1 k | \$0.3 k |
| Total | 0 | \$8.3 k | \$28.8 k | \$80.3 k | \$5.3 k | \$4.8 k | \$2.4 k |

Table A3: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2013*

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|----------------|----------------|-------------------------|-------------|-------------|
| Indirect | 0 | \$0.2 k | \$0.4 k | \$0.7 k | \$14 | \$15 | \$46 |
| Induced | 0 | \$0.2 k | \$0.4 k | \$0.7 k | \$19 | \$18 | \$43 |
| Total | 0 | \$0.5 k | \$0.8 k | \$1.4 k | \$33 | \$33 | \$89 |

* There were no capital expenditures in the six-county region in 2013; results shown are from MRIO impact only.

Table A4: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2014

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|-----------------|------------------|-------------------------|-----------------|----------------|
| Indirect | 0 | \$14.6 k | \$57.3 k | \$168.0 k | \$11.0 k | \$10.2 k | \$4.5 k |
| Induced | 0 | \$3.7 k | \$6.8 k | \$11.4 k | \$0.3 k | \$0.3 k | \$0.7 k |
| Total | 0 | \$18.3 k | \$64.1 k | \$179.3 k | \$11.4 k | \$10.5 k | \$5.3 k |

Table A5: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2015

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|-----------------|------------------|-------------------------|-----------------|----------------|
| Indirect | 0 | \$17.0 k | \$67.4 k | \$197.5 k | \$13.4 k | \$12.3 k | \$5.4 k |
| Induced | 0 | \$4.4 k | \$8.1 k | \$13.6 k | \$0.4 k | \$0.4 k | \$0.9 k |
| Total | 0 | \$21.4 k | \$75.6 k | \$211.1 k | \$13.8 k | \$12.7 k | \$6.2 k |

Table A6: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2016

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|------------------|------------------|-------------------------|----------------|-----------------|
| Indirect | 1 | \$43.0 k | \$118.2 k | \$366.5 k | \$6.9 k | \$6.6 k | \$9.8 k |
| Induced | 0 | \$11.8 k | \$21.8 k | \$36.5 k | \$1.0 k | \$1.0 k | \$2.3 k |
| Total | 1 | \$54.8 k | \$140.0 k | \$403.0 k | \$7.9 k | \$7.6 k | \$12.1 k |

Table A7: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2017

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|------------------|----------------|----------------|-------------------------|-----------------|------------------|
| Indirect | 10 | \$663.1 k | \$1.2 M | \$9.0 M | \$68.5 k | \$82.2 k | \$134.7 k |
| Induced | 3 | \$170.4 k | \$311.2 k | \$518.0 k | \$13.8 k | \$16.6 k | \$35.1 k |
| Total | 13 | \$833.4 k | \$1.5 M | \$9.5 M | \$82.3 k | \$98.8 k | \$169.8 k |

Table A8: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2018

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|------------------|------------------|----------------|-------------------------|-----------------|-----------------|
| Indirect | 2 | \$118.5 k | \$236.4 k | \$1.1 M | \$9.4 k | \$10.2 k | \$22.9 k |
| Induced | 1 | \$41.9 k | \$75.5 k | \$126.8 k | \$3.3 k | \$3.6 k | \$7.9 k |
| Total | 3 | \$160.5 k | \$311.9 k | \$1.2 M | \$12.7 k | \$13.9 k | \$30.8 k |

Table A9: Economic Impact of TRC Capital Expenditures on the Six-County Central Ohio Region, 2019

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|------------------|------------------|------------------|-------------------------|-----------------|-----------------|
| Indirect | 2 | \$149.7 k | \$272.5 k | \$701.1 k | \$20.7 k | \$19.7 k | \$29.4 k |
| Induced | 1 | \$70.0 k | \$127.6 k | \$214.7 k | \$5.7 k | \$5.6 k | \$13.6 k |
| Total | 3 | \$219.8 k | \$400.1 k | \$915.8 k | \$26.4 k | \$25.4 k | \$43.0 k |

Table A10: Economic Impact of TRC Capital Expenditures on Ohio, 2011

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|-----------------|-----------------|-------------------------|----------------|----------------|
| Indirect | 0 | \$2.2 k | \$8.7 k | \$25.6 k | \$1.8 k | \$1.6 k | \$0.7 k |
| Induced | 0 | \$1.0 k | \$1.8 k | \$3.1 k | \$86 | \$90 | \$0.2 k |
| Total | 0 | \$3.2 k | \$10.5 k | \$28.7 k | \$1.8 k | \$1.6 k | \$0.9 k |

Table A11: Economic Impact of TRC Capital Expenditures on Ohio, 2012

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|-----------------|------------------|-------------------------|----------------|----------------|
| Indirect | 0 | \$10.9 k | \$34.7 k | \$116.8 k | \$5.4 k | \$5.0 k | \$3.0 k |
| Induced | 0 | \$4.1 k | \$7.6 k | \$13.1 k | \$0.4 k | \$0.4 k | \$0.9 k |
| Total | 0 | \$15.0 k | \$42.3 k | \$129.9 k | \$5.8 k | \$5.4 k | \$3.9 k |

Table A12: Economic Impact of TRC Capital Expenditures on Ohio, 2013

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|-----------------|------------------|-------------------------|----------------|----------------|
| Indirect | 0 | \$16.0 k | \$48.0 k | \$195.4 k | \$7.5 k | \$7.9 k | \$4.6 k |
| Induced | 0 | \$4.5 k | \$8.2 k | \$14.2 k | \$0.4 k | \$0.4 k | \$1.0 k |
| Total | 0 | \$20.5 k | \$56.2 k | \$209.6 k | \$7.9 k | \$8.3 k | \$5.6 k |

Table A13: Economic Impact of TRC Capital Expenditures on Ohio, 2014

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|-----------------|------------------|-------------------------|-----------------|----------------|
| Indirect | 0 | \$16.9 k | \$64.3 k | \$188.2 k | \$11.5 k | \$10.6 k | \$5.1 k |
| Induced | 0 | \$7.1 k | \$13.2 k | \$22.5 k | \$0.6 k | \$0.7 k | \$1.5 k |
| Total | 0 | \$24.0 k | \$77.5 k | \$210.7 k | \$12.1 k | \$11.3 k | \$6.6 k |

Table A14: Economic Impact of TRC Capital Expenditures on Ohio, 2015

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|-----------------|------------------|------------------|-------------------------|-----------------|-----------------|
| Indirect | 1 | \$50.6 k | \$186.7 k | \$576.1 k | \$19.8 k | \$19.1 k | \$10.0 k |
| Induced | 0 | \$16.6 k | \$30.6 k | \$52.3 k | \$1.1 k | \$1.1 k | \$2.5 k |
| Total | 1 | \$67.2 k | \$217.3 k | \$628.4 k | \$20.8 k | \$20.2 k | \$12.6 k |

Table A15: Economic Impact of TRC Capital Expenditures on Ohio, 2016

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|------------------|------------------|-----------------|-------------------------|-----------------|-----------------|
| Indirect | 3 | \$167.1 k | \$471.0 k | \$1.51 M | \$28.1 k | \$29.6 k | \$41.5 k |
| Induced | 1 | \$50.9 k | \$93.5 k | \$161.5 k | \$4.4 k | \$4.9 k | \$10.7 k |
| Total | 4 | \$218.0 k | \$564.5 k | \$1.67 M | \$32.5 k | \$34.5 k | \$52.3 k |

Table A16: Economic Impact of TRC Capital Expenditures on Ohio, 2017

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|----------------|-----------------|-------------------------|------------------|------------------|
| Indirect | 22 | \$1.5 M | \$2.9 M | \$15.9 M | \$138.0 k | \$169.4 k | \$326.2 k |
| Induced | 11 | \$534.1 k | \$970.8 k | \$1.7 M | \$44.6 k | \$55.6 k | \$117.7 k |
| Total | 33 | \$2.0 M | \$3.9 M | \$17.6 M | \$182.6 k | \$225.0 k | \$443.9 k |

Table A17: Economic Impact of TRC Capital Expenditures on Ohio, 2018

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|----------------|-----------------|-------------------------|------------------|------------------|
| Indirect | 18 | \$1.3 M | \$3.5 M | \$13.9 M | \$122.9 k | \$148.1 k | \$289.5 k |
| Induced | 8 | \$371.4 k | \$672.0 k | \$1.2 M | \$30.6 k | \$37.6 k | \$77.4 k |
| Total | 26 | \$1.6 M | \$4.2 M | \$15.1 M | \$153.5 k | \$185.7 k | \$366.8 k |

Table A18: Economic Impact of TRC Capital Expenditures on Ohio, 2019

| Impact | Employment | Labor Income | Value Added | Output | County & Sub-County Tax | State Tax | Federal Tax |
|--------------|------------|----------------|----------------|-----------------|-------------------------|------------------|------------------|
| Indirect | 36 | \$2.5 M | \$6.6 M | \$29.7 M | \$301.9 k | \$332.1 k | \$602.1 k |
| Induced | 15 | \$725.7 k | \$1.3 M | \$2.3 M | \$62.1 k | \$70.5 k | \$155.2 k |
| Total | 51 | \$3.3 M | \$7.9 M | \$32.0 M | \$364.0 k | \$402.6 k | \$757.4 k |