

# ECONOMIC IMPACTS OF THE CONTENT INDUSTRY IN NORTHERN MINNESOTA

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**BUREAU OF BUSINESS AND  
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*DISCLAIMER –The Bureau of Business and Economic Research (BBER) at the University of Minnesota Duluth's (UMD) Labovitz School was contacted by the Upper Midwest Film Office (UMFO) as an unbiased research entity. Publication and dissemination of this report, or any of its data, is not an endorsement by the BBER/UMD of UMFO or its projects.*

*The BBER was asked to supply an economic impact analysis only. This analysis does not consider the social or environmental impacts of the project and should not be viewed as a cost benefit analysis or environmental impact assessment.*

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## Executive Summary

For more than 30 years, the Upper Midwest Film Office (UMFO) has been helping attract and integrate film and content production in Northeast Minnesota. Currently, UMFO is working on several issues including increasing the incentives provided to the film and content industry, developing the region's industry-specific workforce, and building the capacity for regional soundstage construction.

For purposes of wanting to educate policy makers and the broader public on the importance of the burgeoning film industry, UMFO contacted the Bureau of Business and Economic Research (BBER) at the University of Minnesota Duluth's Labovitz School of Business and Economics to study the industry's economic impact in St. Louis County.

Currently, there are multiple production incentives within Minnesota for the film industry. In St. Louis County, there is a 25% rebate available to the film industry with a cap of \$1.0 million per year, meaning the industry is limited to spending roughly \$4.0 million before reaching the maximum available incentives. UMFO wanted to explore the potential economic impacts on the county if the rebate limit were increased and film industry spending grew accordingly.

The BBER estimated the economic impacts of the film industry for 2022 as well as three future scenarios that might occur if the rebate limit was increased and St. Louis County saw significant growth in its film industry.

In 2022, the film industry spent just over \$3.0 million in the county. Our small-growth scenario assumed an increase in the rebate limit to roughly \$3.25 million, which could allow for \$13.0 million in spending on the part of the industry in the county. A medium-growth scenario assumed a \$6.25 million rebate limit and \$25.0 million in industry spending, while a large-growth scenario assumed a limit of \$12.5 million and \$50.0 million in local

spending on the part of the film industry.

In addition to the four growth scenarios, a fifth scenario—soundstage construction—assumed a one-time, temporary impact from the construction of a soundstage, something that UMFO has indicated would be necessary to support growth in the industry.

According to the economic impact modeling results, spending on the part of the film industry created 106 jobs in St. Louis County in 2022. Under the second scenario—assuming a rebate of \$3.25 million annually—the BBER estimated that the industry could create about 485 additional jobs in the study area. Under the most ambitious scenario—assuming a rebate of \$12.5 million annually—the industry could add roughly 2,200 jobs to the local economy.

Depending on the growth in the film industry in the county, the area could see between \$2.5 million and \$46.2 million in additional labor income, between \$3.2 and \$57.1 million in additional value-added spending, and between \$6.9 and \$100.5 million in total output.

A multiplier indicates how much additional spending is added to the study area's economy for each dollar in direct spending. The results of modeling show that the film industry in St. Louis County generated an output multiplier of 2.19—meaning that for every one dollar spent by the industry in the county, another \$1.19 is spent in other supporting industries.

Finally, the results of modeling found that if the industry expanded to warrant the construction of a soundstage, that project could create a one-time, temporary impact of 439 jobs, \$27.4 million in wages and benefits, \$33.9 million in value added spending, and \$63.5 million in overall spending.

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# Economic Impacts of the Film and Content Industry in Northern Minnesota

## I. Project Description

For more than 30 years, the Upper Midwest Film Office (UMFO) has been helping attract and integrate film and content production in Northeast Minnesota. Currently, UMFO is working on several issues including increasing the incentives provided to the film and content industry, developing the region's industry-specific workforce, and building the capacity for regional soundstage construction. The organization's goal is to develop Northern Minnesota as a hub for the film industry.

Currently, there are multiple production incentives within the state of Minnesota for the film industry. Film production projects within the state can opt for either a 25% tax credit or a 25% rebate.<sup>1</sup> In Northeastern Minnesota, there are three different incentives available: In St. Louis County, there is a 25% rebate, the Iron Range (Koochiching, Itasca, Aitkin, Crow Wing, St. Louis, Lake, and Cook Counties with some exceptions) has a 20% rebate, and the city of Duluth has a 25% rebate. All of these incentives are stackable, creating an even larger incentive for film production to occur in Northeastern Minnesota. While the stackable incentives have a broad impact throughout Northern Minnesota, this analysis is focused only on the incentives offered in St. Louis County.

The incentives work in the following manner: First, the production company applies for certification. UMFO then approves or denies production. As the film production occurs, the production company spends money at local businesses and by hiring local workers. The production company must then submit all receipts to UMFO for validation. Once the receipts have been validated, UMFO sends the rebate check to the production company.



*PRODUCTION CREW WORKING ON THE 2021 FILM, "THE HAND THAT FEEDS" (SOURCE: UMFO)*

UMFO contacted the Bureau of Business and Economic Research (BBER) at the University of Minnesota

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<sup>1</sup> For a list of all definitions used in this report, see Appendix A.

Duluth's Labovitz School of Business and Economics to estimate the economic impact of the film industry in St. Louis County for the purpose of educating policy makers and the broader public on the importance of this burgeoning industry.

Currently, the St. Louis County rebate (25%) has a cap of \$1.0 million per year, meaning the industry is limited to spending roughly \$4.0 million before reaching the maximum available incentives. UMFO hopes to increase the incentives in the coming years, with an eventual goal of \$12.5 million in rebates.

The BBER estimated the economic impacts of the film industry for 2022 as well as for three future scenarios that might occur if the rebate limit was increased, and St. Louis County saw significant growth in its film industry.

## II. Inputs

The following section describes the inputs required for modeling the current impact of the rebate incentive, three potential growth scenarios, and the construction of a soundstage. Data were provided by UMFO organization representatives. The research team worked under the assumption that the company provided good-faith estimates for the scenarios. In instances where data was not provided by the client, the research team relied on IMPLAN estimates and secondary data sources as inputs.

Table 1 shows the spending levels anticipated for each of the scenarios, as well as a scenario related to a one-time, temporary impact from the construction of a soundstage, a project that would likely be necessary to support the medium- or large-growth scenarios. Scenarios are independent of one another and are meant to reflect a glimpse into the annual economic impacts of the industry under different levels of growth.

**Table 1. Impact Scenarios Used in Modeling**

<i>Scenario Name</i>	<i>Scenario Details</i>	<i>Film and Content Industry Spending (St. Louis County, in Millions of Dollars)</i>	<i>Share of Spending on Wages</i>
1. Current	Spending based on 2022 data, rebate limit of \$1.0 million	\$3.1	40%
2. Small Growth	Assumes rebate limit of \$3.25 million, year- round production	\$13.0	40%
3. Medium Growth	Assumes rebate limit of \$6.25 million	\$25.0	50%
4. Large Growth	Long-term growth scenario, assumes rebate limit of \$12.5 million	\$50.0	60%
5. Soundstage Construction	One-time, temporary impact from construction of soundstage	\$40.0	

SOURCE: BBER

The current scenario is based on the spending that occurred in 2022, with the existing rebate limit of \$1.0 million. In 2022, the film industry spent just over \$3.0 million in St. Louis County, of which about 40% was spent on wages and benefits for local personnel.

The small growth scenario assumes an increase in the rebate limit to roughly \$3.25 million, which could allow

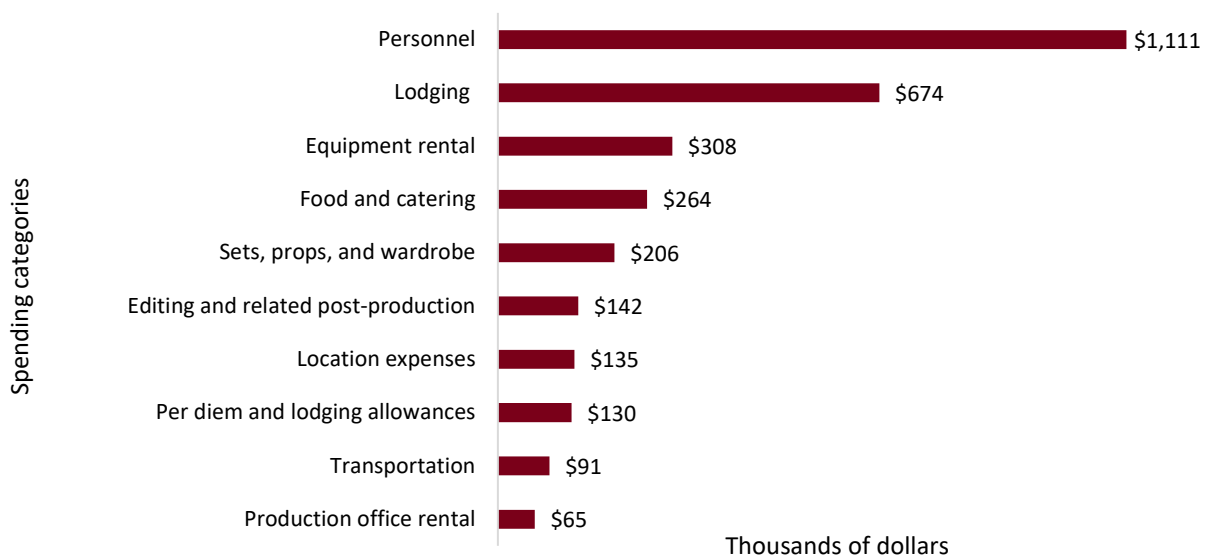
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for \$13.0 million in spending on the part of the film industry in St. Louis County. The medium-growth scenario assumes a \$6.25 million limit and \$25.0 million in industry spending, while the large-growth scenario assumes a limit of \$12.5 million and \$50 in local spending on the part of the industry. These medium- and large-growth scenarios also assume an increase in the share of spending that would go to local personnel, closer in line with the industry average.

In addition to the four growth scenarios, a fifth scenario—soundstage construction—assumes a one-time, temporary impact from the construction of a soundstage, something that UMFO has indicated would be necessary to support growth in the industry.

As noted previously, in 2022, the film industry spent roughly \$3.0 million in St. Louis County. As shown in Figure 1, the largest expense was personnel (\$1.1 million), followed by lodging (\$674,000), equipment rental (\$308,000), and food/catering (\$264,000). All spending was documented by UMFO and must have occurred within the county to receive the incentive, so all spending shown is considered local to the study area.

**Figure 1. Film and Content Industry Spending by Category (2022), in Thousands of Dollars**



*SOURCE: UMFO*

The BBER modeled all impacts with the IMPLAN input-output modeling software using a technique called detailed industry impact analysis.

IMPLAN's detailed industry impact analysis allows the analyst to create a customized industry by entering the analyst's own values for employment, employee compensation, proprietor income, and output with any value left blank being estimated by IMPLAN. This technique also allows the analyst to edit the spending pattern for a specific impact analysis event by changing which commodities are involved and the commodities' share of the spending.

All expenditures provided by UMFO were then re-categorized as IMPLAN commodities using the detailed industry impact analysis method. Appendix B includes a list of all commodities used to create the customized industry.



### III. Findings

The inputs described in the previous section were also used to model the economic impacts<sup>2</sup>—direct, indirect, and induced—of the film and content industry on other supporting local industries.

Economic impact analysis tracks an initial economic shock or activity (like the direct spending of the film industry) through multiple rounds of industry and consumer spending to show the multiplier or ripple effects through a local economy. The initial shock or activity is considered the direct effect, the resulting increase in industry spending is the indirect effect, and the resulting increase in consumer spending is the induced effect. Results are measured in employment, output, labor income, and value added.

The research team used the IMPLAN input-output modeling data and software for modeling economic impacts. The data used was the most recent IMPLAN data available, which is for the year 2019. All data were modeled in the year 2022. All results are shown in millions of dollars for the year 2022.

Economic impact analysis requires the analyst to select a study area—the boundary of the local economy. For this analysis, the research team estimated the impacts on St. Louis County.

Table 2 on the following page shows the total economic effects for each of the scenarios developed for this study. Total effects represent the sum of the direct, indirect, and induced effects that result from the economic activity related to the film industry in St. Louis County. The column labeled employment shows the total number of jobs that the film industry created in 2022 (for the current scenario) or could create (for scenarios two through five) both



*PRODUCTION CREW WORKING ON THE 2021 FILM, “THE HAND THAT FEEDS” (SOURCE: UMFO)*

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<sup>2</sup> For more details on the assumptions and methodology used in input-output modeling, see Appendix C.



directly and through indirect and induced effects. For example, in 2022, given the level of spending seen in the county, the film industry created 106 jobs in the study area. Under the second scenario, small growth—assuming a rebate of \$3.25 million annually—the industry could create about 485 additional jobs in the study area. The most ambitious scenario—assuming a rebate of \$12.5 annually—could add roughly 2,200 jobs to the local economy.

**Table 2. Overall Economic Impacts by Scenario, in 2022 Dollars (Millions)**

<i>Scenario</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Scenario 1: Current	106	\$2.5	\$3.2	\$6.9
Scenario 2: Small Growth	485	\$10.2	\$13.6	\$28.7
Scenario 3: Medium Growth	973	\$21.4	\$21.1	\$52.4
Scenario 4: Large Growth	2,198	\$46.2	\$57.1	\$100.5
Scenario 5: Construction of Soundstage	439	\$27.4	\$33.9	\$63.5

SOURCE: BBER

The column labeled labor income is the total of all employee compensation. This includes wages, benefits, and payroll taxes for full- and part-time workers. Depending on the growth in the film industry in St. Louis County, the area could see between \$2.5 million and \$46.2 million in additional labor income.

The column labeled value added refers to the contribution to the GDP made by an individual industry or sector. In this case, it's the film industry. Value added includes employee compensation, proprietor income, and other property income and taxes. Depending on the scenario, the film industry in St. Louis County could see between \$3.2 million and \$57.1 million in additional value added to the study area's economy.

Output, the last column in the table, is the value of all local production required to sustain activities. According to the results of modeling, St. Louis County saw roughly \$7.0 million in new spending last year as a result of the film industry. If the industry were to expand to the large growth scenario, output could be just over \$100.0 million.

It is helpful to consider the results of modeling as they relate to the initial rebate. For example, in the case of the current rebate, a \$1 million investment (i.e., the rebate) led to 106 jobs and \$6.9 million output, or a return on investment of \$6.90 for every dollar invested. If UMFO is successful at increasing the incentive, higher rebate values would provide a return on investment of greater than \$8.80 for every one dollar invested.

Finally, the results of our modeling estimate that if the industry expanded enough to warrant the construction of a soundstage, that project could create a one-time, temporary impact of 439 jobs, \$27.4 million in wages and benefits, \$33.9 million in value added spending, and \$63.5 million in overall spending.

## DEFINITIONS

**Employment**—The number of jobs (full- or part-time) created by the industry, either directly or through indirect or induced effects

**Labor Income**—All employee compensation, including wages, benefits, payroll taxes, and proprietor income

**Value Added**—The industry's contribution to GDP. Value added includes employee compensation, proprietor income, and other property income and taxes. Also referred to as gross output minus intermediate inputs

**Output**—The total value of all local production (all spending)

Table 3 shows the detailed economic effects for each of the scenarios included in this study. Here, results are broken out by direct, indirect, induced, and total effects. As noted previously, the initial shock or spending is considered the direct effect, the resulting increase in industry spending (i.e., spending by related businesses) is the indirect effect, and the resulting increase in consumer spending (i.e., spending by households) is the induced effect.

**Table 3. Detailed Economic Impacts of Growth Scenarios**

<i>Scenario (rebate)</i>	<i>Employment</i>	<i>Labor Income (million \$)</i>	<i>Value Added (million \$)</i>	<i>Output (million \$)</i>	<i>Output Multiplier</i>
<b>1. Current (\$1 million)</b>					
Direct	75	\$1.2	\$1.2	\$3.2	
Indirect	23	\$0.8	\$1.2	\$2.4	
Induced	8	\$0.4	\$0.8	\$1.3	
Total	106	\$2.5	\$3.2	\$6.9	2.19
<b>2. Small Growth (\$3 million)</b>					
Direct	346	\$5.2	\$5.2	\$13.0	
Indirect	100	\$3.2	\$5.1	\$9.8	
Induced	39	\$1.8	\$3.3	\$5.9	
Total	485	\$10.2	\$13.6	\$28.7	2.21
<b>3. Medium Growth (\$6 million)</b>					
Direct	750	\$12.5	\$12.5	\$25.0	
Indirect	151	\$5.3	\$8.0	\$15.7	
Induced	72	\$3.6	\$6.6	\$11.8	
Total	973	\$21.4	\$21.1	\$52.4	2.10
<b>4. Large Growth (\$12.5 million)</b>					
Direct	1,801	\$30.0	\$30.0	\$50.0	
Indirect	242	\$8.4	\$12.8	\$25.1	
Induced	155	\$7.8	\$14.3	\$25.4	
Total	2,198	\$46.2	\$57.1	\$100.5	2.01
<b>5. Soundstage Construction</b>					
Direct	310	\$20.3	\$21.5	\$40.0	
Indirect	36	\$2.5	\$3.9	\$8.3	
Induced	93	\$4.7	\$8.6	\$15.2	
Total	439	\$27.4	\$33.9	\$63.5	1.59

SOURCE: IMPLAN, BBER

Under the current scenario, the film industry spent roughly \$3.2 million in St. Louis County in 2022, employed 75 workers, and paid \$1.2 million in labor income (wages and benefits) to its employees. As a result of that initial spending, other industries in St. Louis County added 31 new jobs, \$1.2 million in wages and benefits, \$2.0 million in value added spending, and \$3.8 million in output—the sum of indirect and induced effects.

Assuming a rebate of \$12.5 million—as shown in the large growth scenario—our modeling estimates that

direct spending by the industry could increase to \$50.0 annually, supporting more than 1,800 jobs and \$30 million in wages and benefits. In addition to the direct effects, the county could see nearly 400 new jobs, \$16.2 million in new wages and benefits, \$27.1 million in value added spending, and roughly \$50 million in new output for the county—the sum of indirect and induced effects.

The last column in Table 3 shows the output multipliers associated with each effect. A multiplier indicates how much additional spending is added to the study area's economy for each dollar in direct spending. For example, an output multiplier of 2.19 indicates that for every one dollar spent by the film industry in the county, another \$1.19 is spent in other supporting industries.

According to IMPLAN, at the county level multipliers typically range between 1.0 and 2.0.<sup>3</sup> As shown in the table, the multipliers generated by the film industry appear to be slightly higher than that range, meaning the spending is having a stronger ripple effect than in many other industries.

There are a couple possible explanations for these higher-than-average multipliers. First, with the rebate incentive, all the film industry's spending must happen within St. Louis County. Because of this, the spending is more likely to cycle throughout the economy rather than leaking outside of the region.

Another possible reason for the higher-than-average multipliers could be due to the nature of the spending itself. According to UMFO, the largest share of the film industry's spending in 2022 (40%) was on personnel. Spending on personnel rather than on inputs can help increase the size of an industry's multiplier because people (i.e., households) tend to be more likely to spend their money locally than businesses. UMFO also expects that, if the industry were to expand locally, a larger share of the annual spending would likely go to personnel costs—more in line with the national industry average of 60%.

## DEFINITIONS

**Direct Effects** —Employment and spending that is directly attributable to the film and TV production industry

**Indirect Effects** —New employment and spending that occurs in related industries as a result of film and TV production spending (e.g., a local hotel hiring additional workers or purchasing additional supplies to meet increased demand)

**Induced Effects** —New employment and spending stemming from increased wages (e.g., local households spending more on groceries, healthcare, and retail thanks to higher wages or more jobs)

**Total Effects** —The sum of direct, indirect, and induced effects

**Multiplier** —A ratio of total effects to direct effects. The additional amount that is spent throughout the economy for every one dollar spent by the film and TV production industry

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<sup>3</sup> <https://support.implan.com/hc/en-us/articles/1260803916589-More-on-Multipliers#:~:text=AVERAGE%20OUTPUT%20MULTIPLIER%20RANGE,expected%20range%20is%20%2D7>

Many businesses benefit from the spending done by the film industry in St. Louis County. Figure 2 shows the top 25 industries that benefitted the most from spending by the industry in 2022, as measured by employee compensation (or labor income). Industries shown in the figure include several related to tourism, retail, and healthcare.

**Figure 2. Top 25 Industries Impacted by the Film and Content Industry, by Increased Employee Compensation (Thousands of Dollars)**



SOURCE: IMPLAN

## IV. Conclusions

In St. Louis County, there is a 25% rebate that exists to attract film and content production activities. That rebate currently has a maximum value of \$1.0 million per year.

In 2022, the film and content industry spent roughly \$3.0 million in St. Louis County to take advantage of the \$1.0 million rebate. According to data provided by UMFO, the largest expenses were on personnel (\$1.1 million), lodging (\$674,000), equipment rental (\$308,000), and food/catering (\$264,000).

Using the IMPLAN input-output modeling software, the BBER research team modeled the economic impacts of the film industry using a technique called detailed industry impact analysis. Under the current scenario—with a \$1.0 million rebate and \$3.2 million in spending—we estimated that the film industry supported 106 jobs, provided labor income of \$2.5 million, contributed over \$3.0 million to the study area's GDP, and produced nearly \$7.0 million in new spending.

UMFO hopes to increase the incentives in the coming years, and wanted to explore the potential economic impacts on the county if the rebate limit were increased. Therefore, we also examined three different growth scenarios with larger rebate limits. These included a small growth scenario assuming a rebate limit of \$3.25 million producing \$13.0 million in spending, a medium growth scenario with a limit of \$6.25 million producing \$25.0 million in spending, and a large growth scenario with a limit of \$12.5 million producing \$50.0 million in spending. The team also modeled the construction of a soundstage, something UMFO deems necessary to support the medium- or large-growth scenarios.

In the small growth scenario, it is estimated that the spending under the new rebate limit of \$3.25 million could support 485 jobs, provide over \$10.0 million in labor income, contribute \$13.6 million to the study area's GDP (value added), and produce nearly \$28.0 million in spending (output). Our analysis estimates that the medium growth scenario with a rebate limit of \$6.25 million could support 973 jobs, provide over \$21.0 million in labor income, contribute over \$21.0 million to the study area's GDP, and produce over \$52.0 million in spending. The large growth scenario with a rebate limit of \$12.5 million could support nearly 2,200 jobs, provide over \$46.0 million in labor income, contribute over \$57.0 million to the study area's GDP, and produce over \$100.0 million in spending.

It is helpful to consider the results of modeling as they relate to the initial rebate. For example, in the case of the current rebate, a \$1 million investment (i.e., the rebate) led to 106 jobs and \$6.9 million output, or a return on investment of \$6.90 for every dollar invested. If UMFO is successful at increasing the incentive, higher rebate values would provide a return on investment of nearly \$9.00 for every one dollar invested.

The results of our modeling also estimate that if the industry expanded enough to warrant the construction of a soundstage, that project could create a one-time, temporary impact of 439 jobs, \$27.4 million in wages and benefits, \$33.9 million in value added spending, and \$63.5 million in overall spending.

According to IMPLAN, an output multiplier at the county level generally ranges between 1.0 and 2.0. According to our analysis, the output multipliers generated by the film industry in St. Louis County range from 2.01 to 2.21, depending on the scenario. All of these multipliers are above what is expected, meaning the spending is having a stronger ripple effect than in many other industries.

The supporting industries that benefit the most from the incentive program in St. Louis country are hotels and other accommodations, followed by hospitals and restaurants, respectively. These industries benefit through indirect and induced impacts, caused by the direct spending.

## Appendix A. Definitions Used in this Report

**Direct effect:** Initial new spending in the study area resulting from the project

**Economic impact:** The effect of an event on the economy in a specified area, ranging from a single neighborhood to the entire globe. It usually measures changes in business revenue, business profits, personal wages, and/or jobs.

**Employment:** Estimates (from U.S. Department of Commerce secondary data) are in terms of jobs, not in terms of full-time equivalent employees. Therefore, these jobs may be temporary, part-time, or short-term.

**Expenditure:** The amount of money spent

**Gross Domestic Product (GDP):** The market value of all goods and services produced in a region in a certain time frame (typically a year)

**IMPLAN:** A software system that uses a backward-linkage model which allows a user to develop models that can estimate the economic impact of different varieties such as when a new firm enters a study area, recreation and tourism, development, and more

**Indirect effect:** The additional inter-industry spending from the direct impact. For example, increased sales in linen supply firms resulting from more motel sales would be an indirect effect of visitor spending.

**Induced effect:** The impact of additional household expenditures resulting from the direct and indirect impact. For example, motel employees spend the income they earn from increased tourism on housing, utilities, groceries and other consumer goods.

**Industry:** A group of businesses based on their related primary business activities

**Input:** Information or data that can be operated on by any process or system

**Labor income:** All forms of employment income, including employee compensation (wages and benefits) and proprietor income

**Leakages:** Any payments made to imports or value added sectors that do not in turn re-spend the dollars within the region

**Multipliers:** Total production requirements within the study area for every unit of production sold to final demand. Total production will vary depending on whether induced effects are included and the method of inclusion. Multipliers may be constructed for output, employment, and every component of value added.

**Output:** The value of local production required to sustain activities

**Rebate:** A form of buying discount in which part of the money spend is later refunded

**Soundstage:** Typically a large, soundproof building, or room, with large doors and high ceilings used primarily for shooting productions

**Spending pattern:** A set of data describing a particular set of goods and services an individual is likely to buy

**Value added:** A measure of the impacting industry's contribution to the local community; it includes wages, rents, interest, and profits



## Appendix B. IMPLAN Sectors

**Table 4. IMPLAN Sectors Used in Modeling**

<i>Description</i>
Hotels and motels, including casinos
Other accommodations
Motion picture and video industries
Automotive equipment rental and leasing
General and consumer good rentals except video tapes and discs
Full service restaurants
Limited service restaurants
All other food and drinking places
Commercial and industrial machinery and equipment rental and leasing
Other real estate
Retail – building material and garden equipment and supplies stores
Retail – sporting goods, hobby, musical instruments, and bookstores
Retail – furniture and home furnishing stores
Personal care services
Retail – food and beverage
Retail – gasoline stores
Transit and ground passenger transportation
Retail – nonstore retailers
Services to buildings
Retail – health and personal care stores
Retail – general merchandise stores
Grantmaking, giving, and social advocacy groups
Internet publishing and broadcasting and web search portals
Retail – electronics and appliance stores
Accounting, tax preparation, bookkeeping, and payroll services

*SOURCE: IMPLAN*

## Appendix C. Input-Output Modeling

### *Data Sources*

This study uses the IMPLAN Group's input-output modeling data and software. The IMPLAN database contains county, state, zip code, and federal economic statistics, which are specialized by region, not estimated from national averages. Using classic input-output analysis in combination with region-specific Social Accounting Matrices and Multiplier Models, IMPLAN provides a highly accurate and adaptable model for its users. IMPLAN data files use the following federal government data sources:

- U.S. Bureau of Economic Analysis Benchmark Input-Output Accounts of the U.S.
- U.S. Bureau of Economic Analysis Output Estimates
- U.S. Bureau of Economic Analysis Regional Economic Information Systems (REIS) Program
- U.S. Bureau of Labor Statistics Covered Employment and Wages (CEW) Program
- U.S. Bureau of Labor Statistics Consumer Expenditure Survey
- U.S. Census Bureau County Business Patterns
- U.S. Census Bureau Decennial Census and Population Surveys
- U.S. Census Bureau Economic Censuses and Surveys
- U.S. Department of Agriculture Census

IMPLAN data files consist of the following components: employment, industry output, value added, institutional demands, national structural matrices, and inter-institutional transfers. Economic impacts are made up of direct, indirect, and induced impacts. The data used was the most recent IMPLAN data available, which is for the year 2019. All data are reported in 2022 dollars.

Economic impacts are made up of direct, indirect, and induced impacts. The following are suggested assumptions for accepting the impact model: IMPLAN input/output is a production-based model, and employment numbers (from U.S. Department of Commerce secondary data) treat both full- and part-time individuals as being employed.

Regional data for the impact models for value added, employment, and output are supplied by IMPLAN for this impact. Employment assumptions were provided to the model to enable construction of the impact model. From these data, social accounts, production, absorption, and byproducts information were generated from the national level data and was incorporated into the model. All region study definitions and impact model assumptions were agreed on before work with the models began.

## ***Modeling Assumptions***

The following are suggested assumptions for accepting the impact model:<sup>4</sup>

**Backward-Linkages:** IMPLAN is a backward-linkage model, meaning that it measures the increased demand on industries that produce intermediate inputs as a result of increases in production. However, if an industry increases production, there will also be an increased supply of output for other industries to use in their production. Models that measure this type of relationship are called forward-linkage models. To highlight this concept, consider the example of a new sawmill beginning its operations in a state. The increased production as a result of the sawmill's operations will increase the demand for lumber, creating an increase in activity in the logging industry, as well as other supporting industries such as electric transmission and distribution. IMPLAN's results will include those impacts but will exclude effects on any wood product manufacturers located nearby that might be impacted by the newly available supply of lumber.

**Employment:** IMPLAN input-output is a production-based model, and employment numbers (from U.S. Department of Commerce secondary data) treat both full- and part-time individuals as being employed.

**Fixed prices and no supply constraints:** IMPLAN is a fixed-price model. This means that the modeling software assumes no price adjustment in response to supply constraints or other factors. In other words, the model assumes that firms can increase their production as needed and are not limited by availability of labor or inputs and that firms in the local economy are not operating at full capacity.

**Fixed production patterns:** Input-output (I-O) models assume inputs are used in fixed proportion, without any substitution of inputs, across a wide range of production levels. This assumption presumes that an industry must double its inputs (including both purchases and employment) to double its output. In many instances, an industry will increase output by offering overtime, improving productivity, or improvements in technology.

**Industry homogeneity:** I-O models typically assume that all firms within an industry have similar production processes. Any industries that fall outside the typical spending pattern for an industry should be adjusted using IMPLAN's Analysis-by-Parts technique.

**Leakages:** A small area can have a high level of leakage. Leakages are any payments made to imports or value added sectors, which do not in turn re-spend the dollars within the region. What's more, a study area that is actually part of a larger functional economic region will likely miss some important linkages. For example, workers who live and spend outside the study area may actually hold local jobs.

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<sup>4</sup> Bureau of Economic Analysis [https://www.bea.gov/papers/pdf/WP\\_IOMIA\\_RIMSII\\_020612.pdf](https://www.bea.gov/papers/pdf/WP_IOMIA_RIMSII_020612.pdf)