The Economic Impact of the
Manufacturing Extension Partnership (MEP) in Alabama:

Estimates for
Alabama Tech Network
in Calendar Year 2018

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Alabama Technology Network

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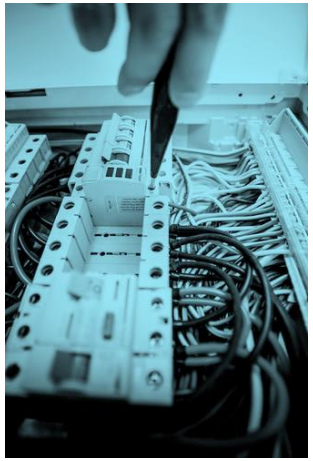
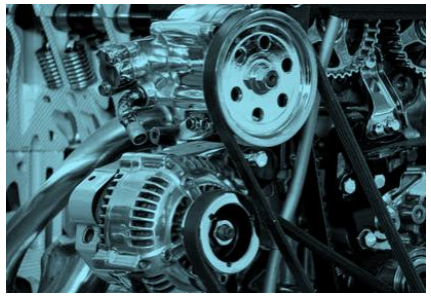
MEP • MANUFACTURING EXTENSION PARTNERSHIP

W.E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH





Alabama Tech Network Economic Impact Analysis

EXECUTIVE SUMMARY

Study Overview

The Alabama Tech Network (ATN) is the state of Alabama's center for the Hollings Manufacturing Extension Partnership (MEP), which is part of the National Institute of Standards and Technology (NIST). ATN engaged the W.E. Upjohn Institute for Employment Research to conduct an analysis of the overall effect of ATN projects on the state of Alabama's economy. MEP centers assist primarily small and medium-size manufacturing businesses to help them improve their productivity. The centers provide services such as assistance with product development, tools and resources for business expansion, and business continuity planning, which contribute to cost savings, new investments, and improved products and processes. These improvements increase the profitability and competitiveness of the client firms, which in turn improves the economy by creating jobs, increasing earnings, and expanding the tax base.

Each year, ATN clients are surveyed using an independent, third-party vendor to obtain a reading of the impact of the services provided. The survey asks clients to report the effects of ATN services on the following possible outcomes:

- Jobs created and retained
- Sales created and retained
- Cost savings
- Investments

The study's purpose is to use the client-reported outcomes to estimate the overall effect of ATN on Alabama's economy. Using the REMI model developed for the Upjohn Institute and configured specifically for the state of Alabama, this study estimates the indirect and induced effects of the reported increase in jobs, sales, cost savings, and investments by ATN clients.

Study Overview - continued

Two scenarios are presented in this study. The first is the unconstrained approach in which it is assumed that an increase in sales of one firm does not effect or reduce the sales of another firm. The use of *industry* variables in REMI assumes that all production is exported out of the study region. In this case, the assumption is that the output from ATN clients would be consumed outside of the state of Alabama. This assumption is not entirely realistic, since it does not take into account competition among firms and the displacement effects that occur from the competition across time. However, the likelihood that a significant portion of firm output would be exported out of the state is reasonable. In two prior Upjohn Institute studies of the aggregate impacts of all MEP centers on the macroeconomy, the use of REMI's industry variables was cautioned, as it was more likely that a much smaller share of domestic production would be exported out of the country than out of a state. This scenario, using a more unconstrained set of variables, is included to serve as an upper bound on the estimates of impacts.

The second scenario provides a set of estimates and potentially a more accurate, yet conservative, assumption that competition among firms reduces the outcomes as a result of competition. In the second scenario, using REMI's *firm* variables, it is not assumed that all output is exported and that some firms with more productive approaches will "crowd out" other less-productive firms. In this case, the impacts, while net positive, are offset by losses in sales and employment in those firms that are crowded out. The results of the analysis are displayed on the following slides.

Estimates of Impacts & ROI

Forecast	Jobs	GDP*	Output*	Personal Income*	Returns to State*
Unconstrained Model Using Industry Variables	8,148	$.893	$2.262	$.437	$.045
Constrained Model Using Firm Variables	6,666	$.729	$1.820	$.358	$.036

*Dollars in billions

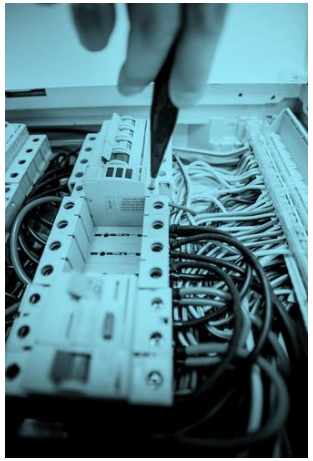
		Constrained Model	Unconstrained Model
Source of ATN Funding	Investment in ATN	Return Per Dollar	Return Per Dollar
State of Alabama	$4,616,000	$7.90	$9.67
NIST/MEP	$1,780,000	$20.48	$25.08
Combined State/MEP	$6,396,000	$5.70	$6.98

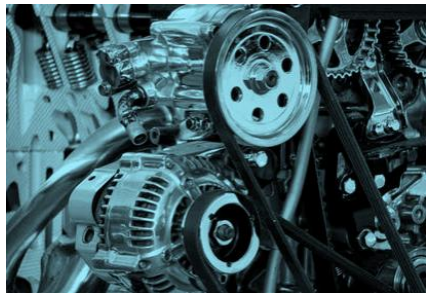
A Summary of Center Activities

Q1 2018 to Q4 2018

Sales:	**+$305.4m**
○ Increased:	$111.6m
○ Retained:	$193.8m
Jobs:	**+2,634**
○ Created:	481
○ Retained:	2,153
Cost Savings:	**+$5.5m**
Investment savings:	**+$11.4m**

Total Investment:	**+$90.0m**
○ Products & Process:	$51.6m
○ Plant & Equipment:	$27.3m
○ Systems & Software:	$0.5m
○ Workforce Practices & Employee Skills:	$8.8m
○ Other Areas of Business:	$1.8m





ATN Economic Impact Analysis

MODELLING THE NET IMPACT OF ATN ACTIVITIES

Modelling the Net Impact

As Upjohn was not able to validate the accuracy of the outcomes given in the client self-reported surveys, we present some caveats when interpreting the results. These caveats are similar to estimating the net impact on the local economy of a company that reports its plans to expand its employment by an anticipated number of workers. In estimating the net impact of such an exogenous shock to a local economy, the company's plans are accepted at face value.

To be consistent with the methodology applied to the MEP/NIST 2017 and 2018 net impact analyses, Upjohn followed a guide created by Mark Ehlen and M. Hayden Brown (2000) entitled, "A Guide for Estimating and Reporting Macroeconomic Impacts of MEP Centers." The guide offered a process to estimate economic impacts on a state, based on the collective outcomes of the surveys administered by centers within the study state. The guide also recommended the use of an economic impact model from Regional Economic Models, Inc. (REMI; www.remi.com) for creating the estimates.

Informed by the guide, Upjohn made several decisions regarding the use of the survey data and assumptions in the REMI model about the dynamics of the state economy.

Decisions Regarding Data Elements

Although the ATN client survey includes both employment and sales, both can, with caveats, be used in the REMI model at the same time without double counting the effects of the outcomes associated with ATN activities. Either employment or sales should be used consistently when aggregating the responses. Contrary to the guide's suggestion, Upjohn chose to use the reported estimates of the number of jobs created or retained, when available, instead of sales. This decision was based on Upjohn's observation and assumption that businesses are better able to estimate the impact of ATN activities on employment rather than on sales.

Modelling the Net Impact - continued

The reasoning is that firms typically keep close tabs on head count and are more likely to be able to attribute a change in the number of personnel to ATN activities. Sales, on the other hand, are more volatile and depend on outside market factors, which are beyond a firm's control. When employment is not available from the surveys, however, sales is used instead and the model then calculates the number of additional workers required to generate the observed increase in sales.

Another decision to make is when to use investment data from the survey in the model. The REMI model allows either the model to determine the amount of investment that would be commensurate with employment (or sales) increase, or that feature of the model can be turned off and the amount reported from the survey can be input into the model instead.

There are pros and cons to using one approach or the other. Using the investment estimated by the REMI model may overestimate the amount of capital expenditure induced by ATN activities, and the model would generate additional indirect and induced effects on employment and other outcomes based on the overestimate of the investment expenditures. Using the investment expenditures from the survey assumes that the firms have accurately attributed additional investment expenditures to ATN/MEP activities and that these are consistent with what is needed to accommodate increased sales and additional personnel. Neither approach is completely satisfactory. We view the results from inputting the reported investment expenditures as a more conservative approach, since it is possible that firms that do not report investment expenditures (investment expenditures that are less than needed to accommodate sales or employment increases) may have excess capacity due to prior investments or slack demand.

Modelling the Net Impact - continued

In Upjohn's version of the REMI model, it is possible to "nullify" capital investment for industry variables caused by changes in sales and employment, assuming that new jobs and sales use existing capital stocks. Within the ATN/MEP survey, and as noted above, data on several types of production-related investments were collected and used in place of the assumed changes in capital stock. This change in methodology provides a more realistic view of impacts on the state economy.

As shown in Figure 1, employment is the preferred input for impacts, with sales used when employment isn't available. In the case of investment, it is included whether employment, sales, or neither are available.

Assumptions Regarding Market Dynamics

Since Ehlen and Brown's development of the guide, REMI has added some policy variables that are helpful in estimating impacts at the macro level. Part of the dilemma with this research is in attempting to estimate the effect that helping one company has on others that don't receive help from an MEP center. Ehlen and Brown refer to this as "beggar thy neighbor" and define it as "in the course of improving ones' own condition, making a neighbor worse off" (2000, p. 39). They continue with "(R)elevant to state impacts, the sales increases that MEP clients report may only be displacing the sales of other in-state firms…" (p. 39). While this is true at the state level, it is exacerbated at the national level when the only mitigating factors that don't affect other companies are when there is either import substitution and/or increases in exports for that firm.

Modelling the Net Impact - continued

REMI does offer a solution to that by allowing sales and employment to be placed in a number of policy variables, including ones that assume all new output is exported and ones that assume more productive firms will “crowd out” their less productive competitors.

The “crowding out” or competitive scenario is more realistic and will yield a more conservative estimate of the outcomes than the unconstrained or non-competitive approach.

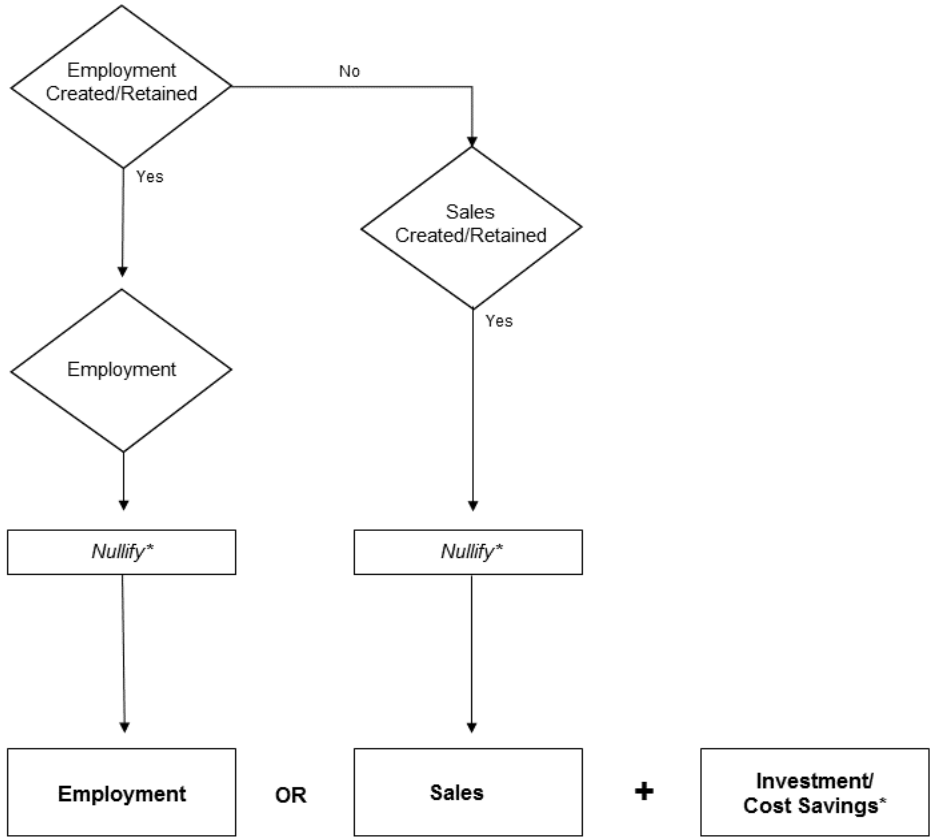
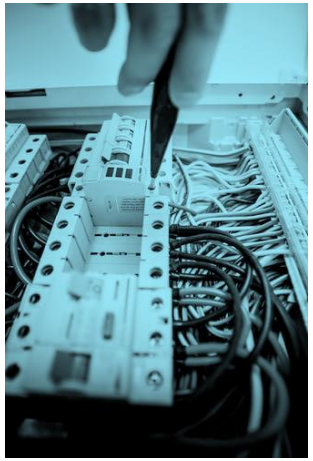
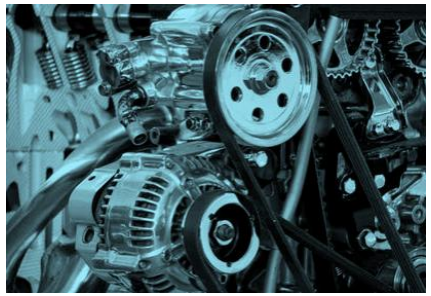


Figure 1: Upjohn’s decision tree for using MEP survey data.

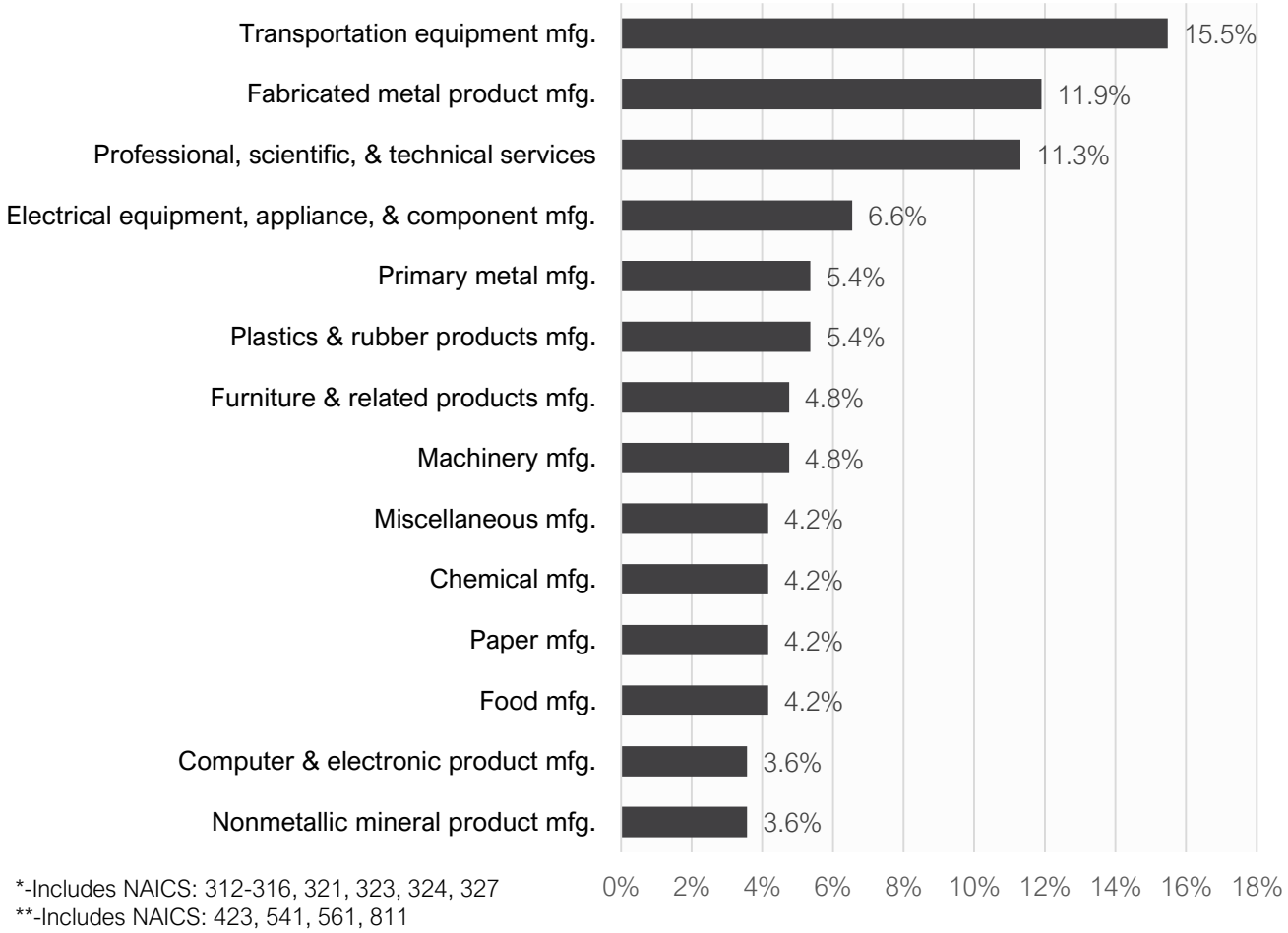




ATN Economic Impact Analysis

SURVEY RESPONSES FROM ATN CLIENTS

Industry Mix



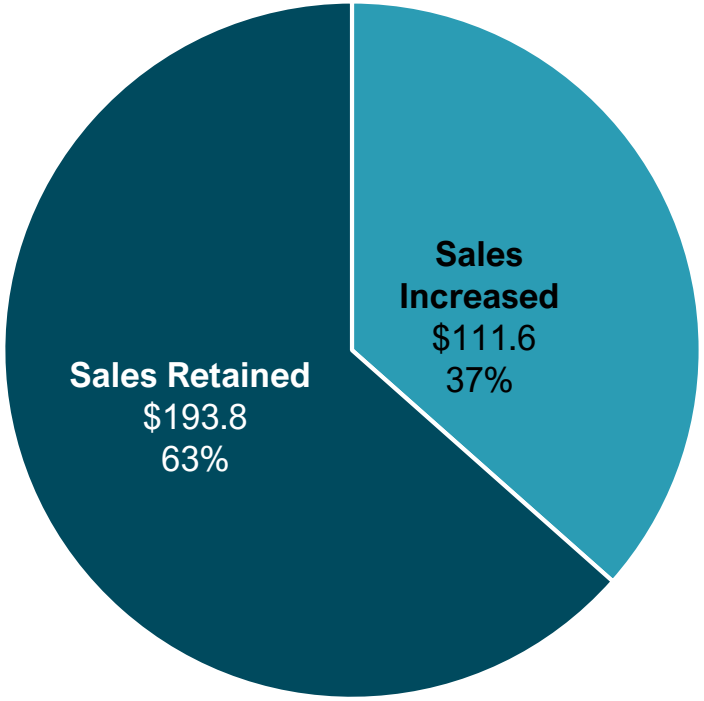
*-Includes NAICS: 312-316, 321, 323, 324, 327
**-Includes NAICS: 423, 541, 561, 811

Total Respondents

Industry	Firms	Percent
Transportation equipment mfg.	26	15.5%
Fabricated metal product mfg.	20	11.9%
Professional, scientific, & technical services	19	11.3%
Electrical equipment, appliance, & component mfg.	11	6.6%
Primary metal mfg.	9	5.4%
Plastics & rubber products mfg.	9	5.4%
Furniture & related products mfg.	8	4.8%
Machinery mfg.	8	4.8%
Miscellaneous mfg.	7	4.2%
Chemical mfg.	7	4.2%
Paper mfg.	7	4.2%
Food mfg.	7	4.2%
Computer & electronic product mfg.	6	3.6%
Nonmetallic mineral products mfg.	6	3.6%

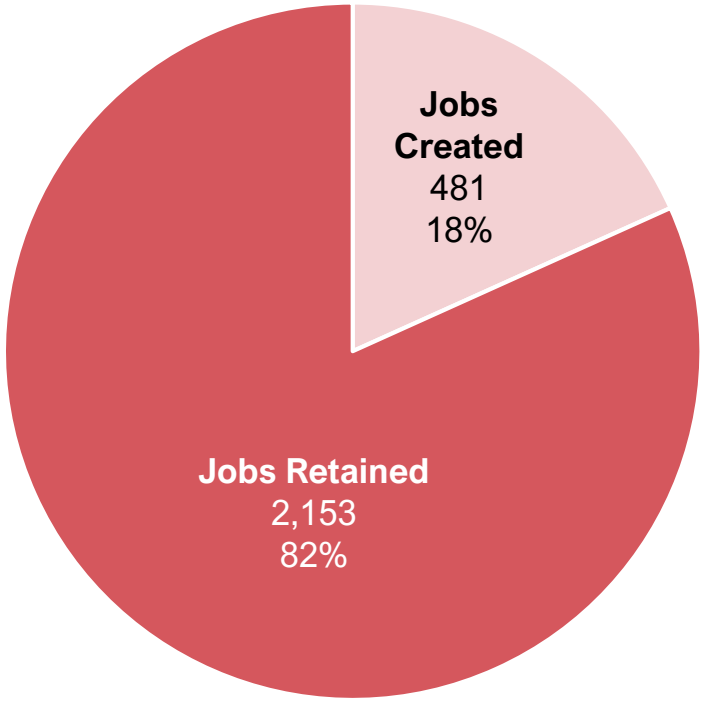
Overview of Total Sales

Total Sales Increased vs. Total Sales Retained
(in millions)

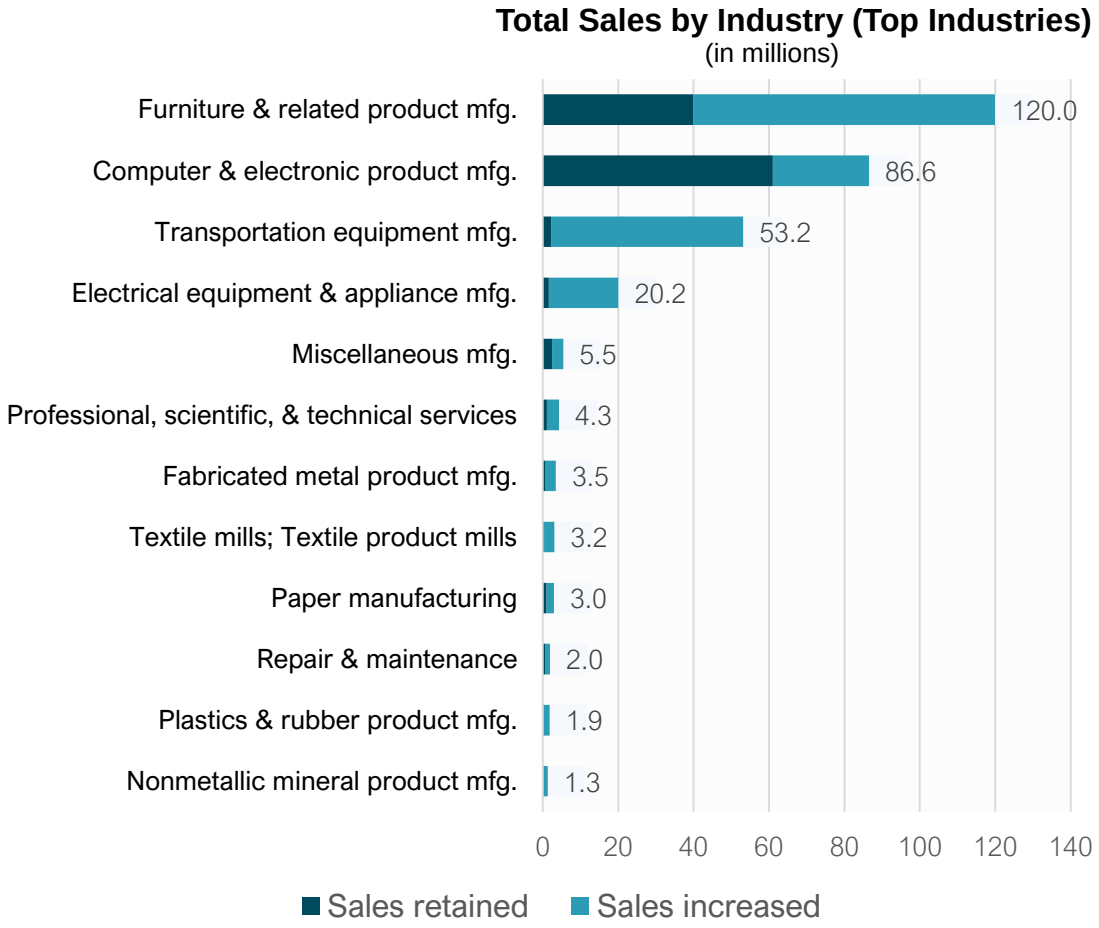


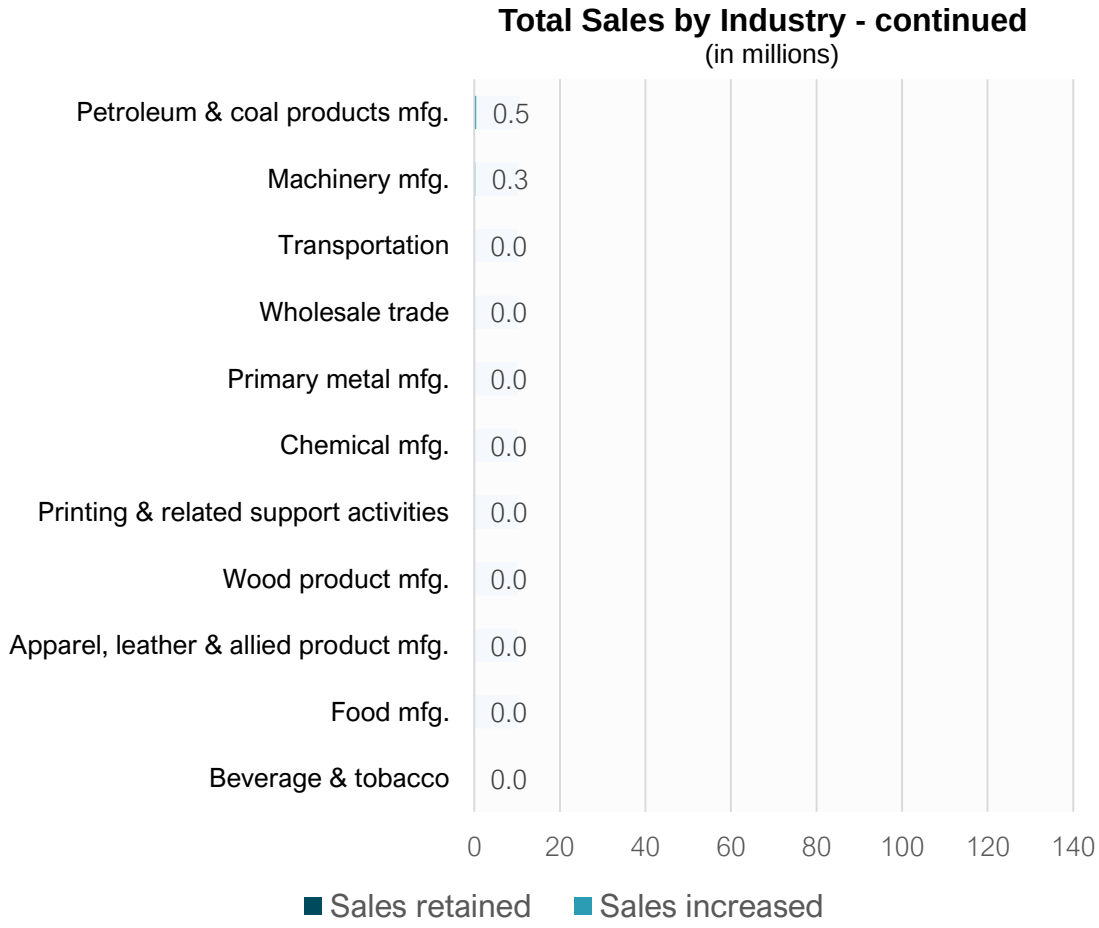
Overview of Total Jobs

Total Jobs Increased vs. Total Jobs Retained

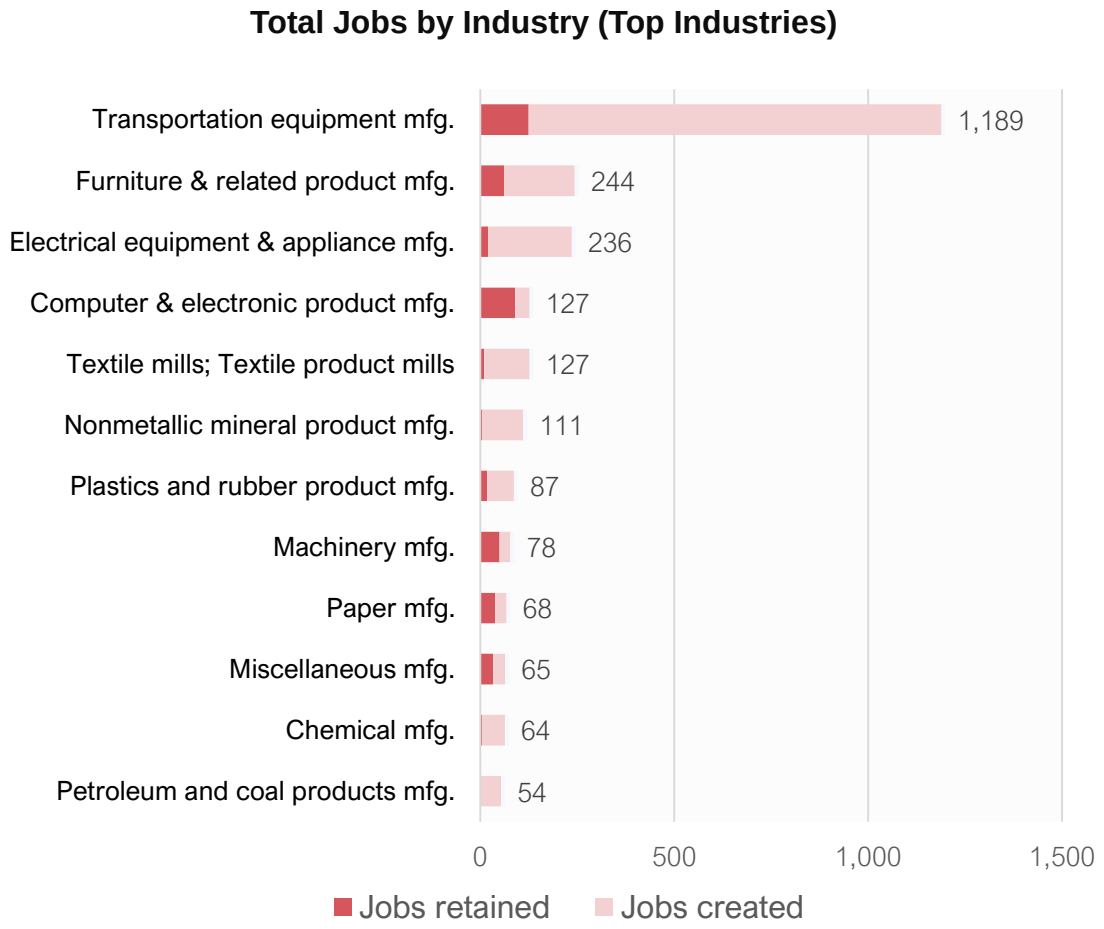


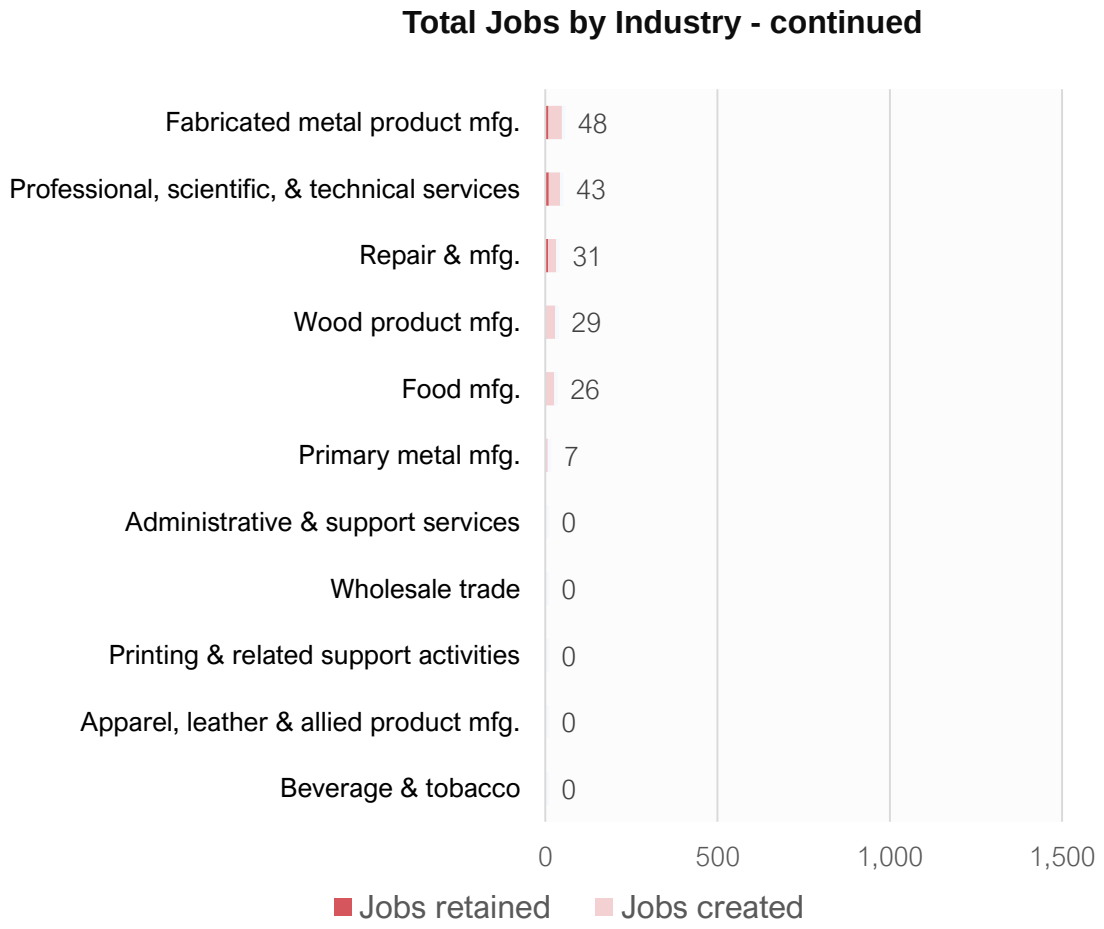
Total Sales by Industry



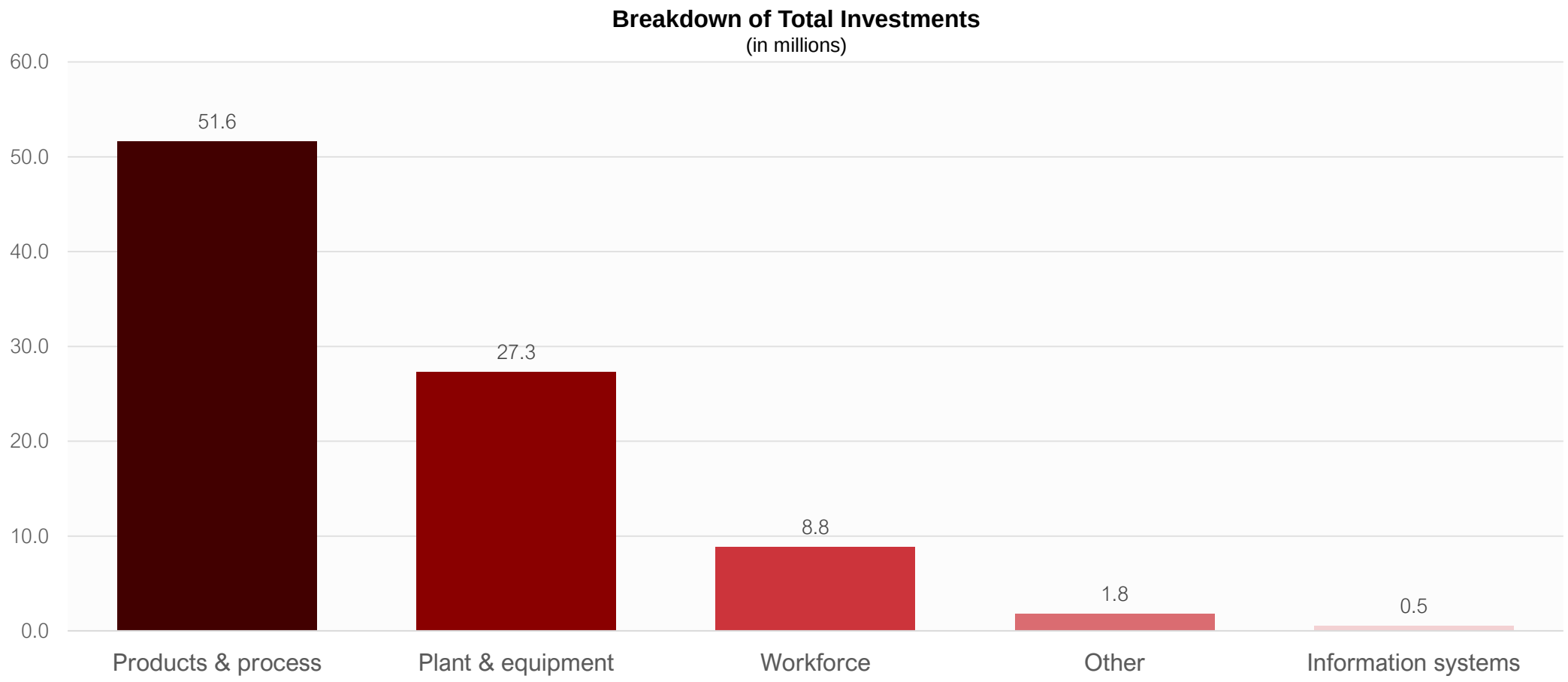


Total Jobs by Industry

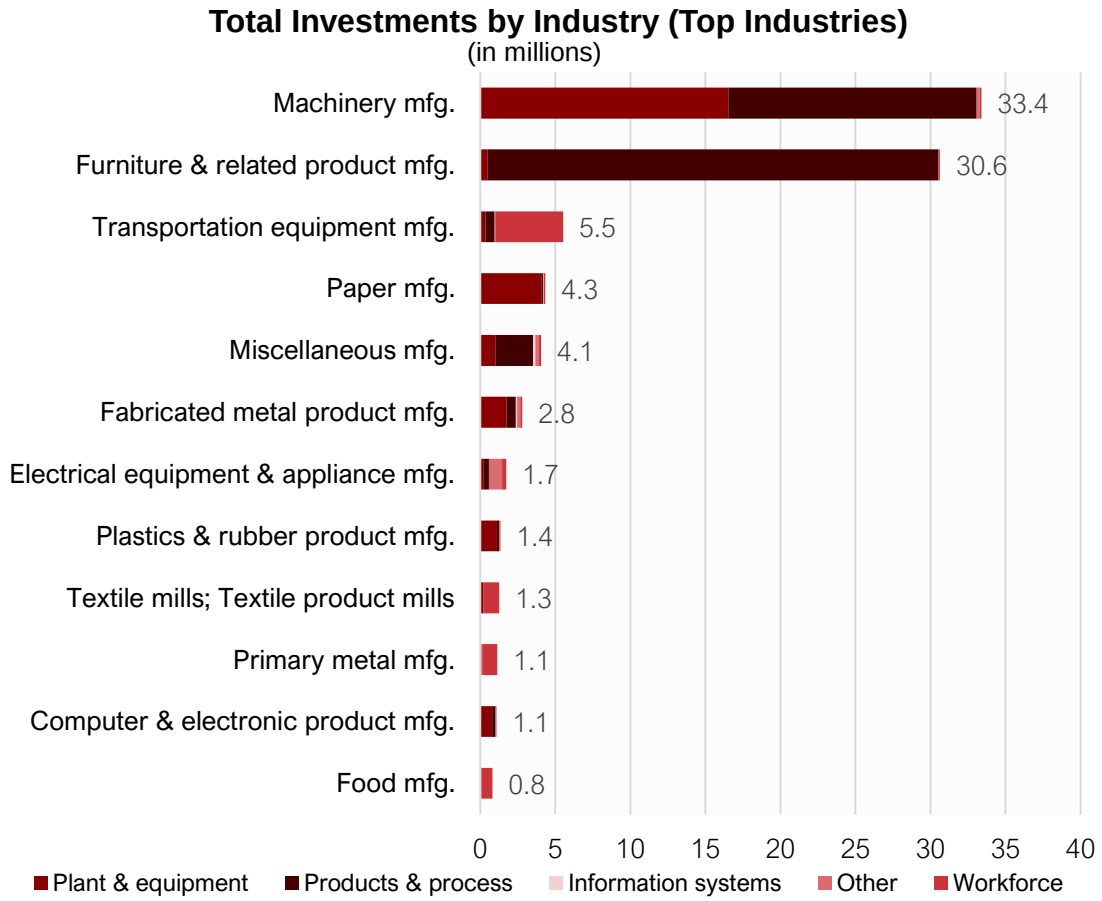


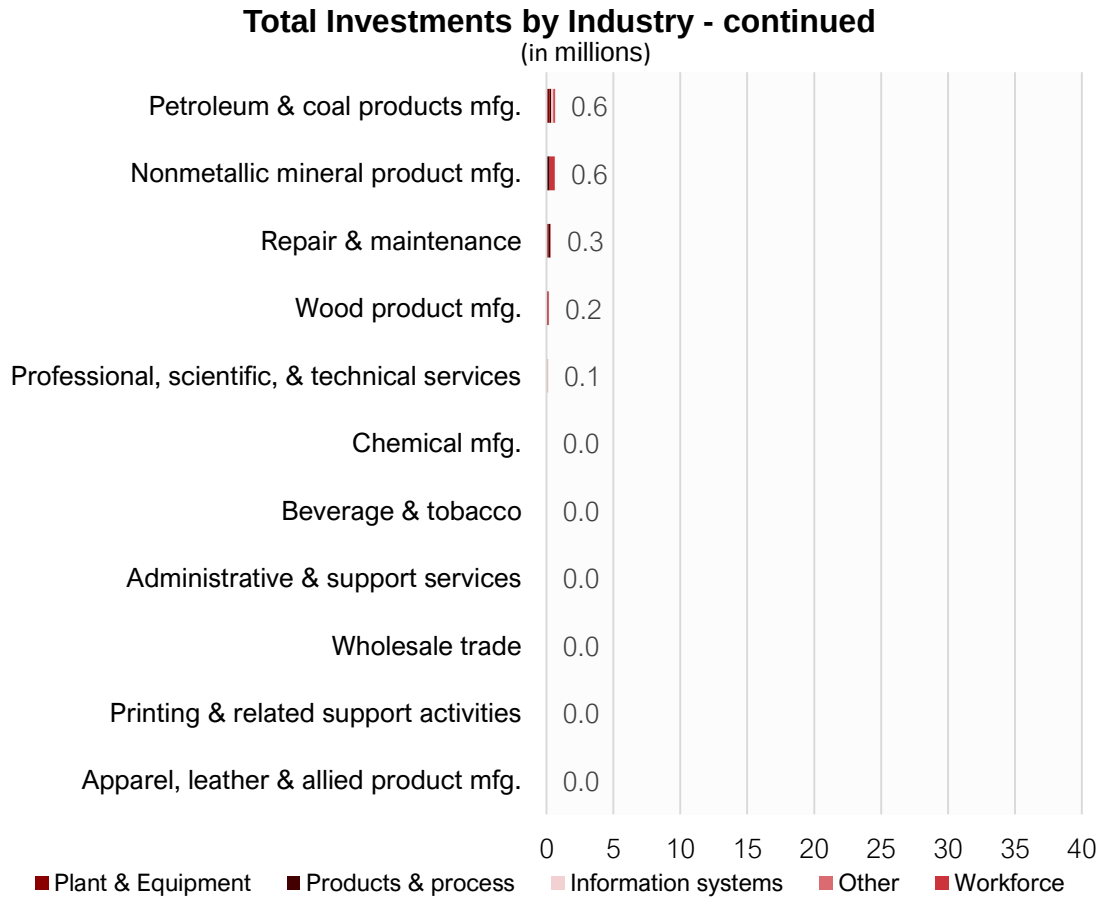


Overview of Total Investments

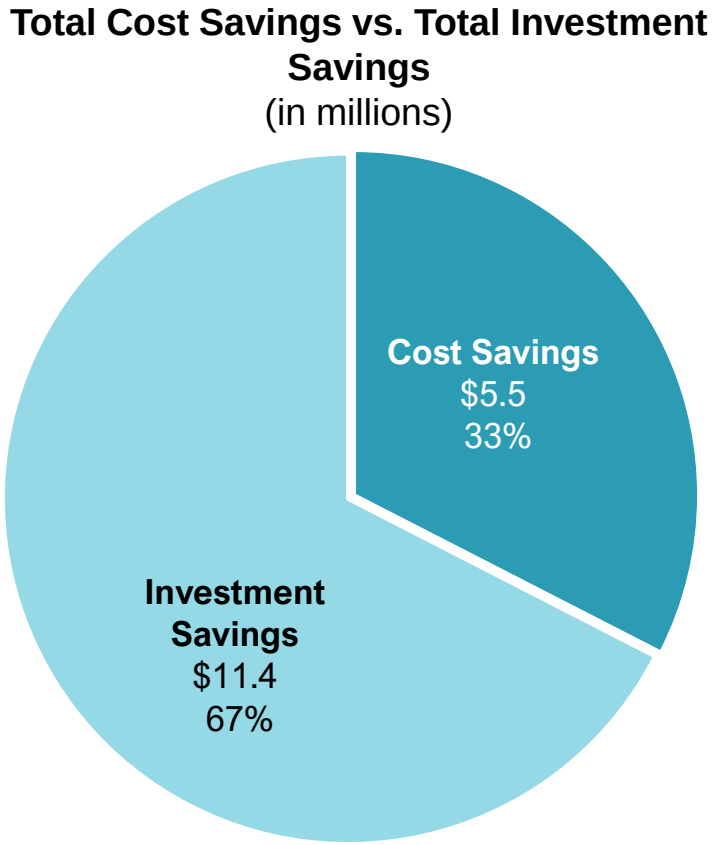


Total Investments by Industry

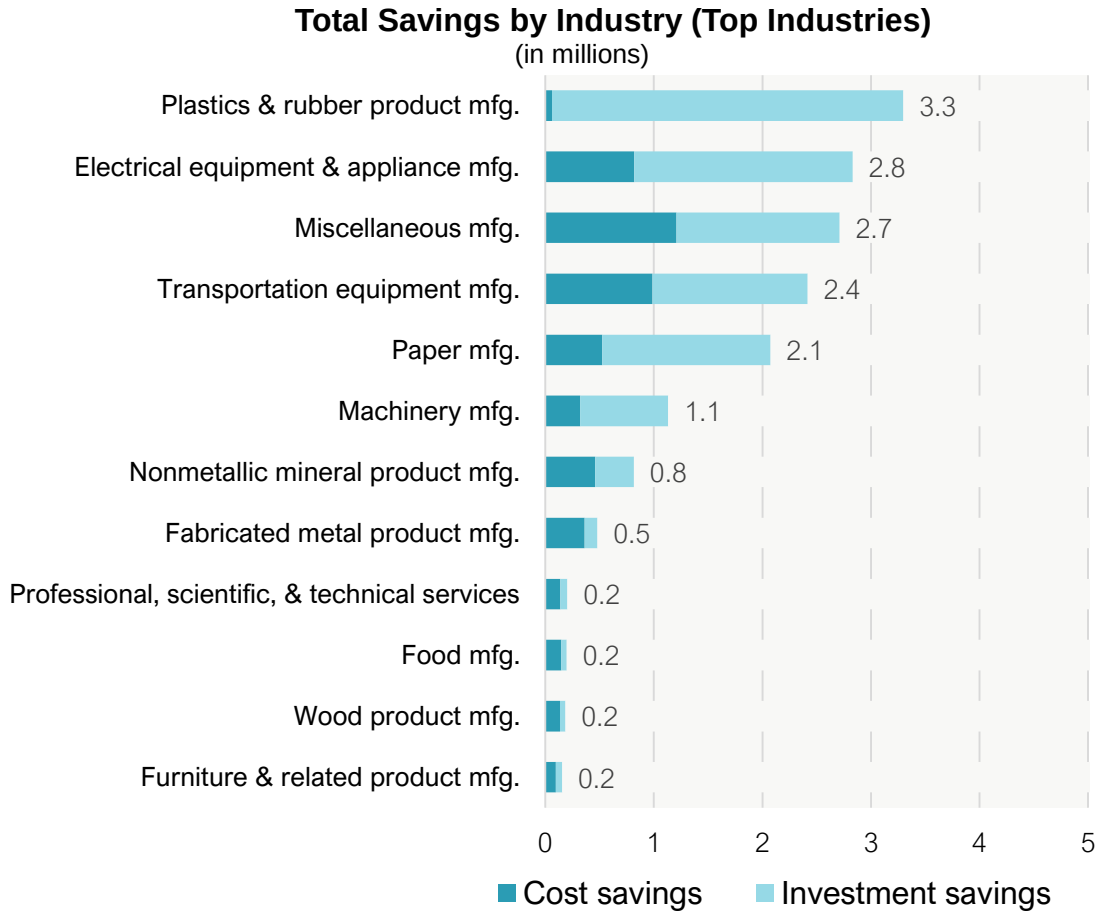


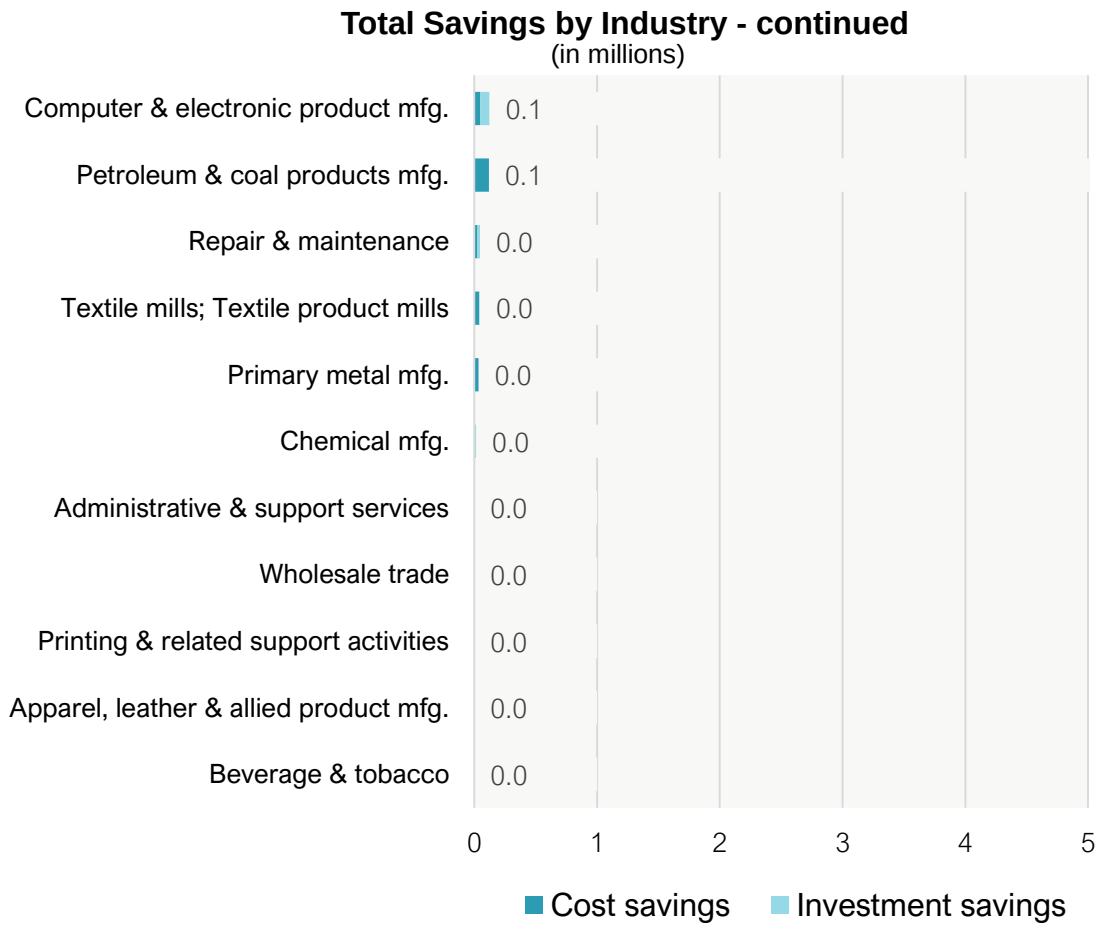


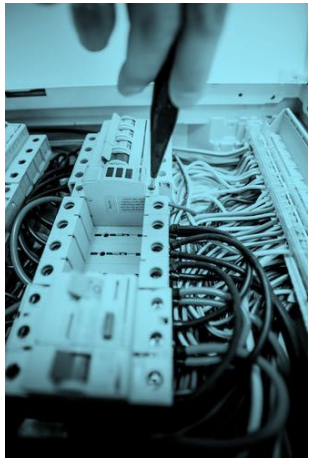
Cost Savings vs. Investment Savings

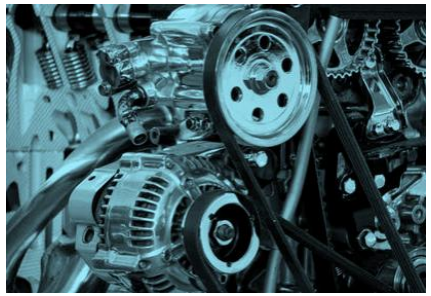


Total Savings by Industry









ATN Economic Impact Analysis

ECONOMIC OUTCOME DEFINITIONS

Economic Outcome Definitions

As with most economic impact studies, this study focuses on four main economic outcome variables and a tax revenue variable:

- Jobs created or retained
- Change in gross domestic product (GDP)
- Change in income
- Change in output
- Returns to the Alabama Treasury (tax revenue)

The REMI model generates these outcomes for the national economy using the MEP client survey responses as inputs. Each of the five variables are described in this section.

Jobs Created or Retained

These are the estimated number of jobs created or retained by MEP activities. These jobs are simply “jobs” as counted by the U.S. Bureau of Economic Analysis (BEA) and can be either full- or part-time positions. Also, these jobs are likely distributed across several industries. In any given industry, a “job” may represent a summation of positions across a number of industries in which each industry has less than one complete position. The impact study may report one “job” but the spending patterns in the study may generate positions in three industries; however, each industry may require only one third of a person. In this case, the three industries that employ one third of a person each to meet demand would sum to one “job” in the REMI model.

Economic Outcome Definitions - continued

Employment is comprised of three elements:

- Direct – Employment created by actual investment, growth, or change
- Indirect – Employment created by the need of the new firm to purchase goods and services, essentially the local supply chain
- Induced – The household that supplies goods and services to the workers in the prior two elements
    - Examples include education, dry cleaners, accountants, gas stations, lawyers, and grocers

Gross Domestic Product

Gross domestic product (GDP) is an economic measure of the value of goods and services produced within the study area of Alabama.

It is the broadest measure of economic activity within a region or country. It consists of compensation of employees, taxes on production and imports (less subsidies), and growth of operating surplus. It does not include intermediate inputs, so it is a measure of the value that labor and capital contribute to production.

Income

Income is the goods and services produced by citizens and residents of the United States (i.e., gross national product) minus the consumption of fixed capital (i.e., depreciation).

Gross Output

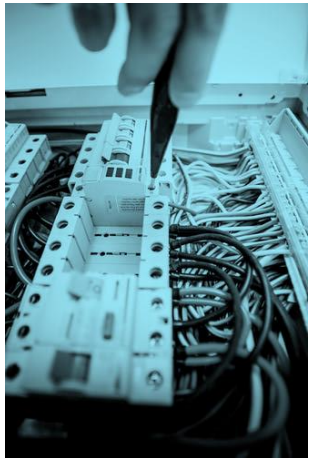
Gross output includes both GDP and expenditures on intermediate inputs. In that way, it is considered double counting but is an essential statistical tool to understand the interrelationships between industries. Gross output is principally a measure of an industry's sales or receipts, thus it is similar to the sales reported by the individual MEP clients. For the purposes of the model, the sales and receipts are aggregated at the national level.

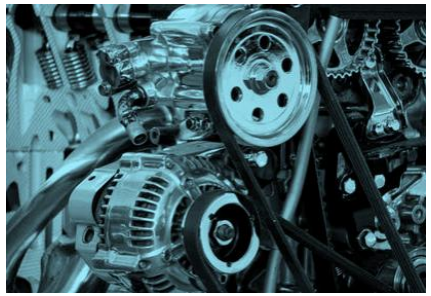
Economic Outcome Definitions - continued

Returns to the Alabama Treasury

Returns to the Alabama Treasury are estimated using personal income for all additional workers (direct, indirect, and induced) who were employed as a result of ATN client activities.

The Alabama Department of Revenue provides fiscal estimates on state tax rates across several measures. Alabama has a graduated tax on personal income which currently ranges from 2% to 5%. Lacking an effective tax rate that accounts for deductions and exemptions, the estimates for returns on investment (ROI) uses the rate of 5%. This rate is applied to estimates of personal income from the REMI model to estimate state benefits. While it is acknowledged that there are other measures of state revenue that could be included in the ROI, only personal income was used as a means to provide comparability to the national MEP study and its findings.





ATN Economic Impact Analysis

APPENDIX

NAICS Codes

Code	Industry
311	Food mfg.
312	Beverage & tobacco
313-314	Textile mills
315-316	Apparel mfg.; Leather & allied product mfg.
321	Wood product mfg.
322	Paper mfg.
323	Printing & related support activities
324	Petroleum & coal products mfg.
325	Chemical mfg.
326	Plastics & rubber products mfg.
327	Nonmetallic mineral product mfg.
331	Primary metal mfg.

Code	Industry
332	Fabricated metal product mfg.
333	Machinery mfg.
334	Computer & electronic product mfg.
335	Electrical equipment, appliance, & component mfg.
336	Transportation equipment mfg.
337	Furniture & related product mfg.
339	Miscellaneous mfg.
42	Wholesale trade
488	Support activities for transportation
54	Professional, scientific, & technical services
56	Administrative & support services
81	Repair & maintenance