National Institute of Standards and Technology
U.S. Department of Commerce

MEP • MANUFACTURING EXTENSION PARTNERSHIP

W.E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH

Estimating the Impacts of Business Assistance Programs: The Case of the Manufacturing Extension Partnership and Multi-year Estimates

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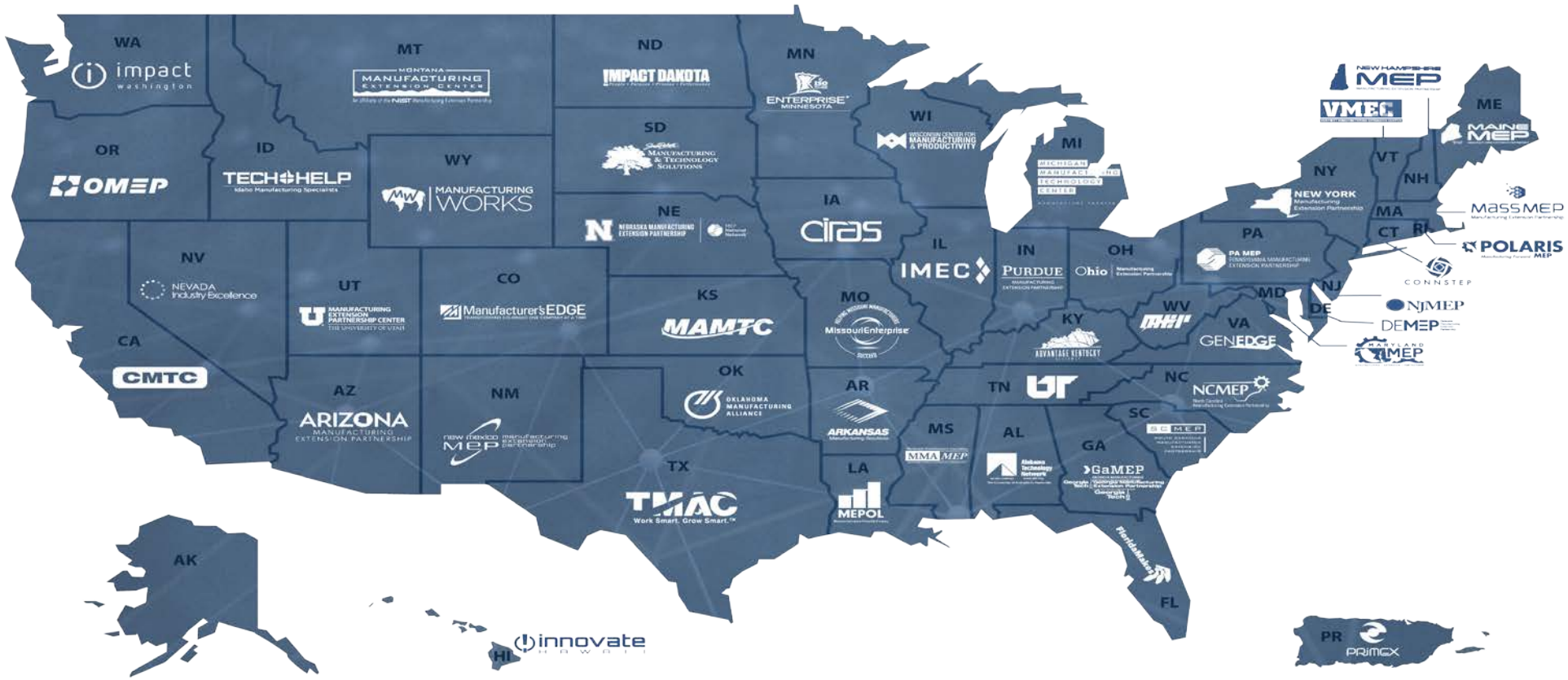
What is the Manufacturing Extension Partnership?

MEP is a public-private partnership that provides small and medium-sized manufacturers (SMMs) technology-based services needed to thrive in today's economy and create well-paying manufacturing jobs. MEP is managed by the National Institute of Standards and Technology (NIST), a U.S. Department of Commerce agency, and implemented through a network of industry-led centers located in all 50 states and Puerto Rico. MEP centers are not-for-profit corporations or state/university-based organizations that employ or partner with industry experts who work with manufacturers.



MISSION

"To enhance the productivity and technological performance of U.S. Manufacturing."

ROLE

MEP's state and regional centers facilitate and accelerate the transfer of manufacturing technology in partnership with industry, universities and educational institutions, state governments, and NIST and other federal and research laboratories and agencies.

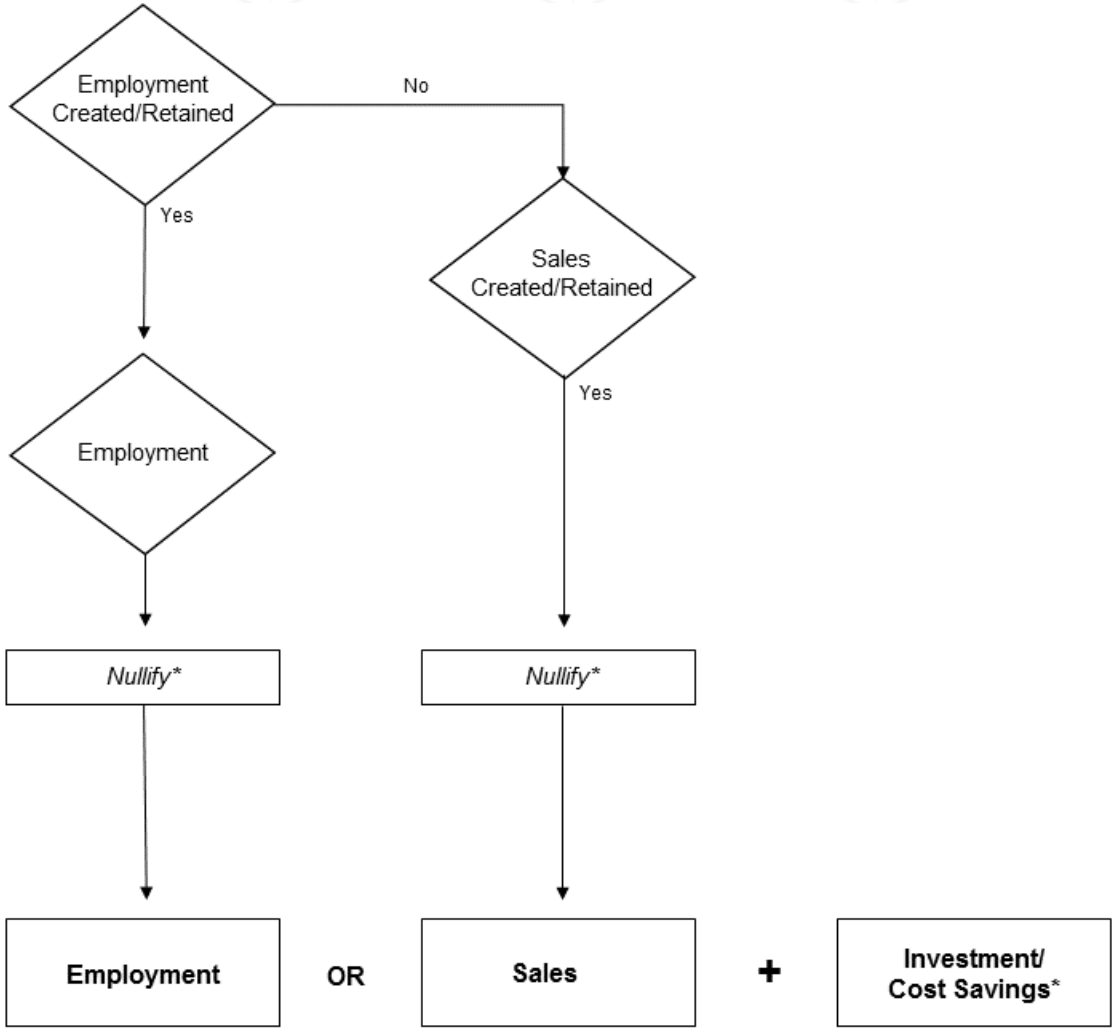
Study Purpose/Background

- The study's goal was to use the client-reported outcomes to estimate the overall effect of MEPs on the U.S. economy. The estimates have been created for the past 3 fiscal years.
- NIST MEP contracted with the W.E. Upjohn Institute for Employment Research.
- Data from the national FY 2018 NIST MEP client survey were provided to Upjohn. This was used to estimate the overall effect of the MEPs on the U.S. economy.
- The study used new and retained jobs, new and retained sales, new investment, and cost savings reported by clients, and then aggregated.
- The study used the survey results in combination with an economic impact model developed by Regional Economic Models Inc. (REMI) to estimate the indirect and induced effects of the reported increase in jobs, sales, cost savings, and investments by MEP clients.

Study Assumptions

- The study takes the reported outcomes of MEP clients at face value. It did not attempt to validate the reported outcomes.
- It considers how the results would vary if only a fraction of the reported outcomes represented the actual effects of MEP activities.
- Recognizing that one use of this study is to determine whether the cost of the MEP program is justified by the benefits it generates, the study estimates the fraction of reported outcomes required for the program to break even, as measured by the projected personal income tax increases covering the annual cost of the program for FY2018 ($140 million).

Modelling the Net Impact



Study Overview

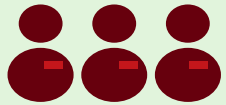
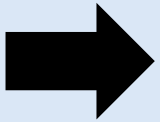
- The study presents three scenarios:
  - Scenario One: The unconstrained approach in which it is assumed that an increase in activity of one firm does not effect or reduce the activity of another firm. This assumption is not entirely realistic, since it does not take into account competition among firms and the displacement effects that occur from the competition across firms. This scenario is included to serve as an upper bound on the results.
  - Scenario Two: A more accurate, yet conservative, scenario assumes that competition among firms reduces the outcomes as a result of competition.
  - Scenario Three: A third model was run to examine how much the overall survey impacts used in the model must be discounted to generate enough federal personal tax revenue to equal federal funding. This is intended to serve as a lower bound on the results.

Study Overview (continued)

Table 1: Differences in Survey Impacts, FY18 vs. FY 16 and FY17.

Category	FY16	FY17	FY18	FY16 to FY17 % Change	FY17 to FY18 % Change
Total Jobs	86,541	100,721	121,412	16.4	20.5
Created	19,653	24,210	26,486	23.2	9.4
Retained	66,888	76,511	94,926	14.4	24.1
Total Sales	$9.33b	$12.6b	$15.9b	35.0	26.2
Increased sales	$2.33b	$3.5b	$3.8b	50.2	8.6
Retained sales	$7.0b	$9.1b	$12.0b	30.0	31.9
Cost Savings	$857m	$1.04b	$976m	21.4	-6.2
Investment Savings	$514m	$703m	$724M	32.8	30
Total Investment	$3.5b	$3.5b	$4.0b	0.0	14.3
Products & Process	$1.07b	$1.07b	$1.08b	0.0	0.9
Plant & Equipment	$1.83b	$1.86b	$2.32b	1.64	24.7
Systems & Software Information	$134m	$178m	$206m	32.8	5.7
Workforce Practices	$210m	$199m	$202m	-5.2	1.5
Other	$227m	$233m	$214m	2.6	-8.2

Study Overview: Estimates of Impacts

Forecast	 Jobs	GDP	 Output	Personal Income	Returns to Treasury	ROI Return on Investment
Unconstrained Model Using Industry Variables	843,889	$103.16*	$203.38*	$54.51*	$7.19*	51.4:1
Constrained Model Using Firm Variables	236,802	$24.9*	$46.6*	$15.0*	$2.02*	14.4:1
6.9% of Reported Impact	16,427	$1.62*	$3.04*	$1.04*	$0.140*	1:1

MEP Economic Impact Analysis:

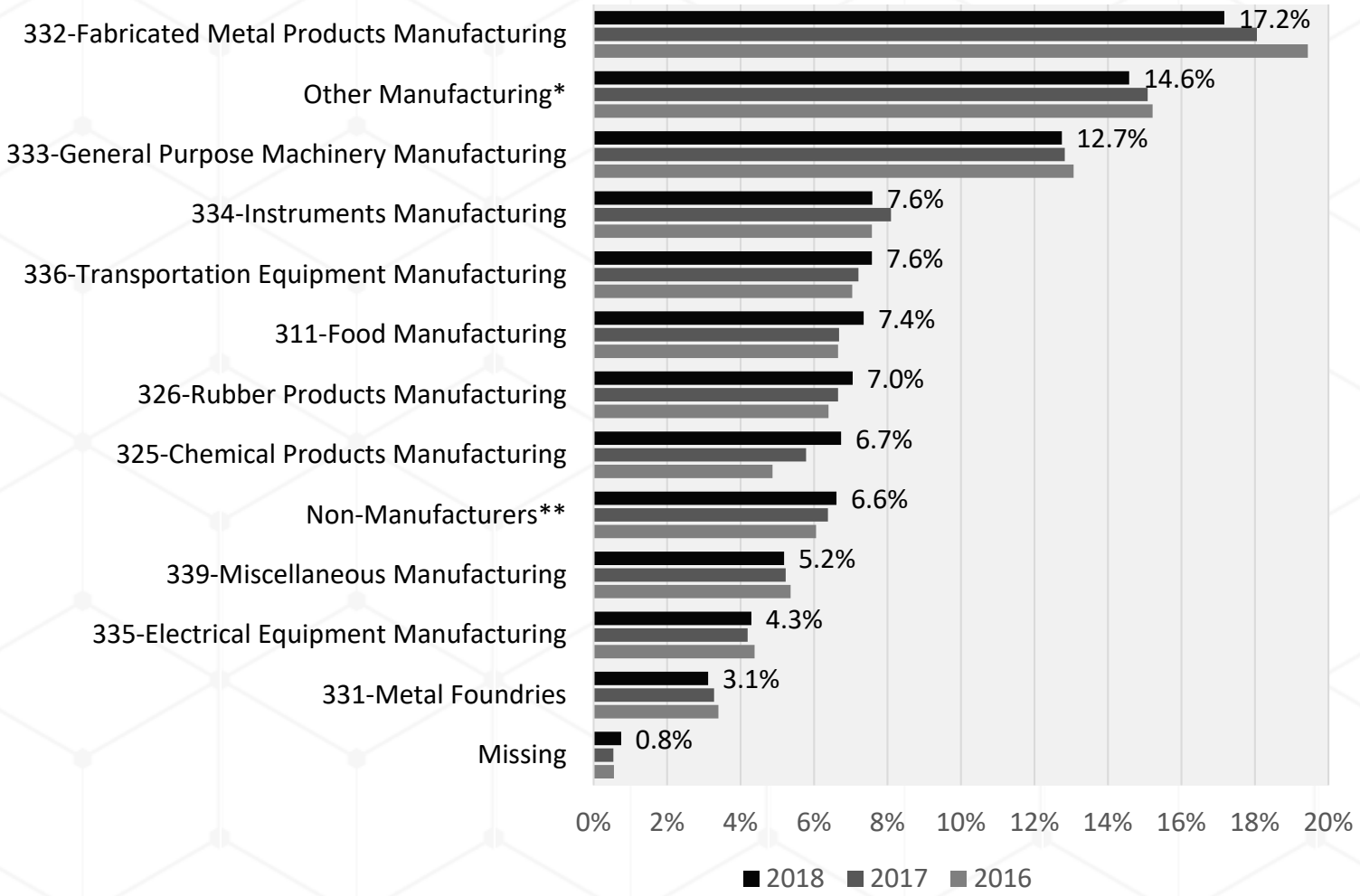
Estimates of Fiscal Year 2018

THE CHANGE FROM 2017 VS 2018

Factors Affecting the Economic Impact

- Clients responding
  - FY 2016: 6,507
  - FY 2017: 7,228
  - FY 2018: 7,986
- Survey response rate
  - FY 2016: 73.1%
  - FY 2017: 80.1%
  - FY 2018: 83..1%
- Ongoing evolution of the REMI model
- Changing baselines for the national and regional forecasts
- Updates to assumptions about factors such as productivity and growth

Factor: Industry Mix

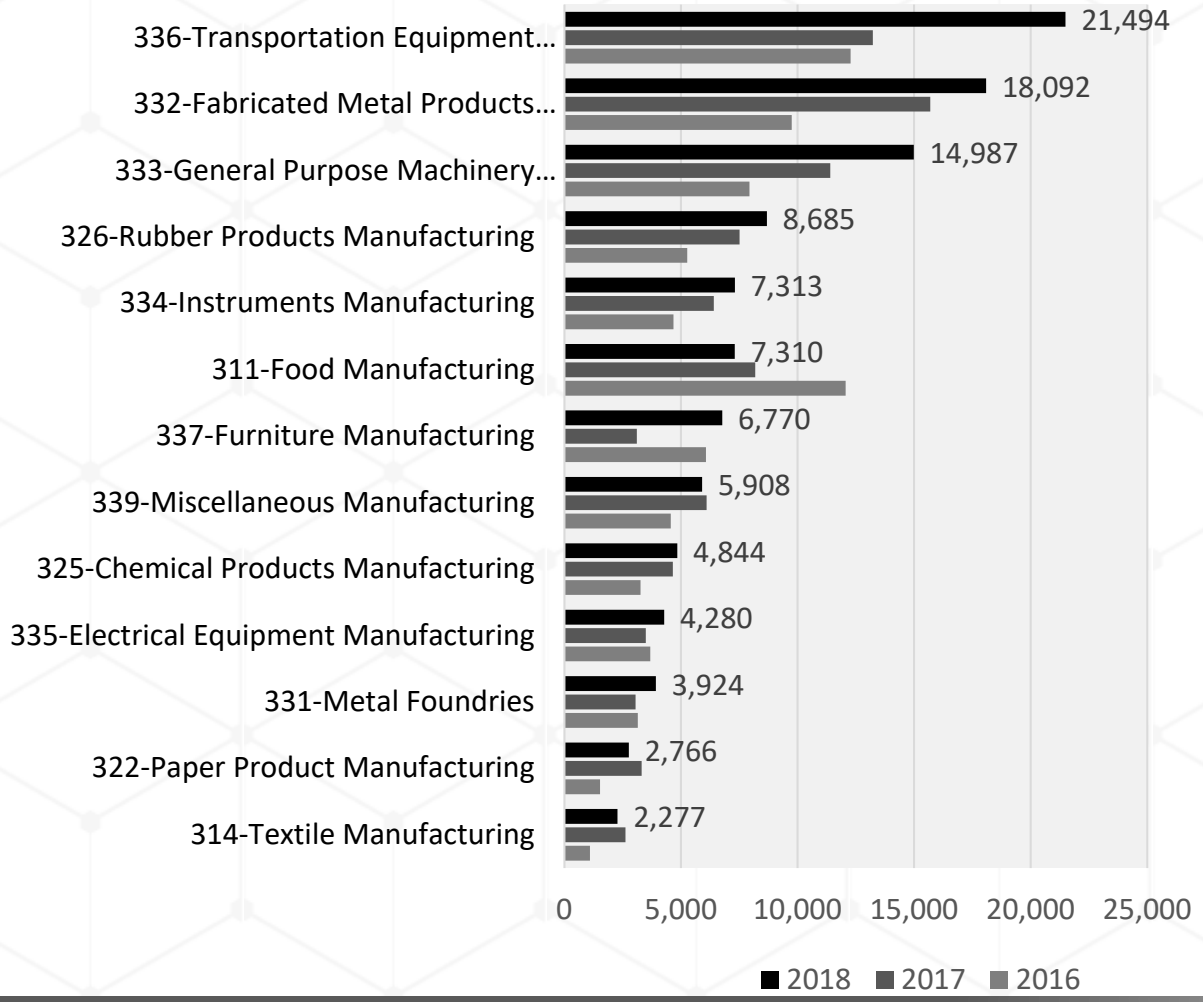


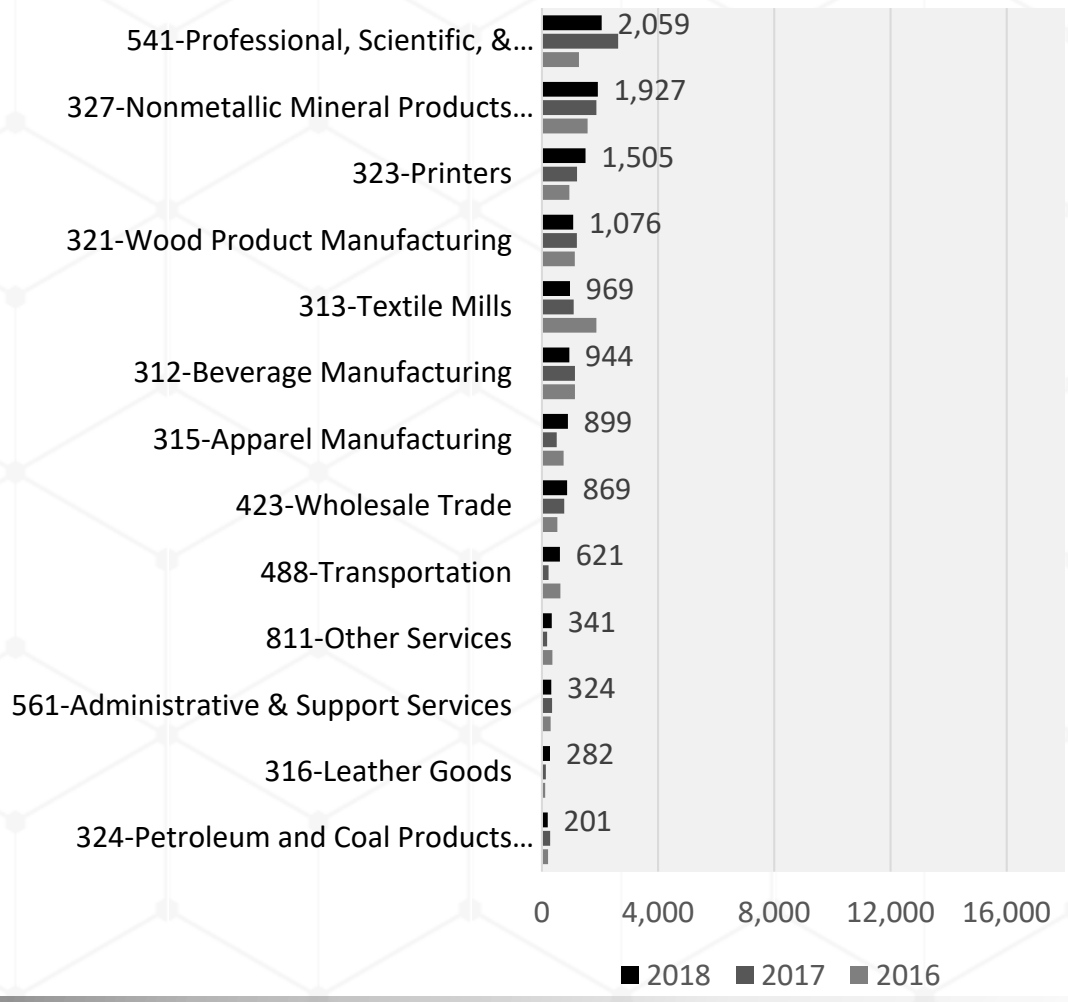
Total Respondents

Industry	2016	2017	2018
332-Fabricated Metal Products Manufacturing	1,265	1,305	1,371
Other Manufacturing*	990	1090	1164
333-General Purpose Machinery Manufacturing	850	927	1,018
334-Instruments Manufacturing	493	585	606
336-Transportation Equipment Manufacturing	458	521	605
311-Food Manufacturing	433	483	587
326-Rubber Products Manufacturing	416	481	563
325-Chemical Products Manufacturing	394	461	528
Non-Manufacturers**	317	418	538
339-Miscellaneous Manufacturing	349	378	414
335-Electrical Equipment Manufacturing	285	303	343
331-Metal Foundries	221	237	249
Missing	36	39	60

*-Includes NAICS: 312-316, 321-324, 327 & 337
**-Includes NAICS: 423, 488, 541, 561, & 811

Factor: Total Inputs Such as Jobs per Industry





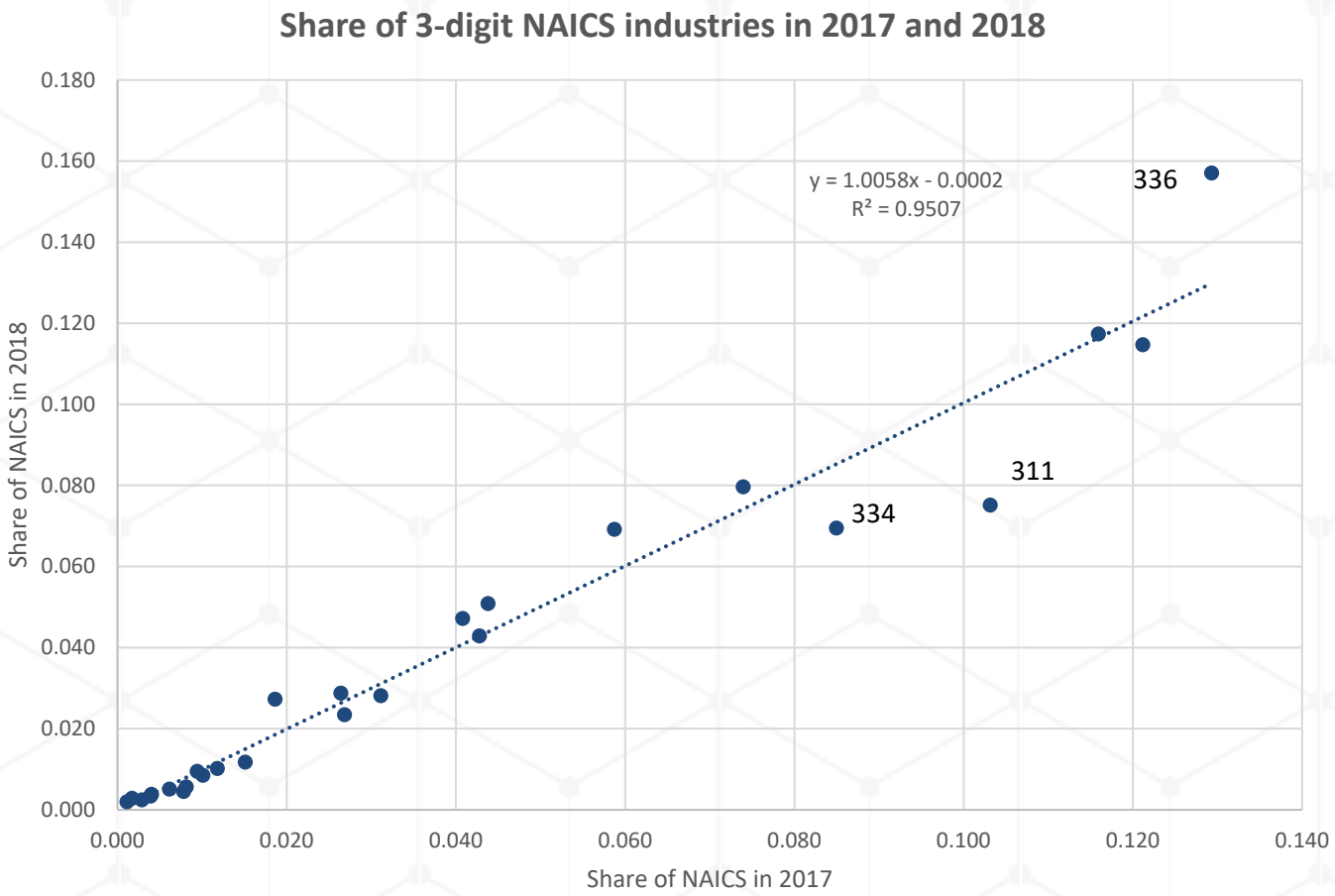
Manufacturing Extension Partnership

DEEPER DIVE INTO JOBS CREATION RESPONSE

Comparing REMI Estimates from 2017 to 2018

- Used REMI to estimate various impacts of MEP
  - REMI estimates based on annual surveys of MEP clients
- We look at two factors that could explain the difference in estimates
  - Differences in industry composition from one year to the next
  - Differences in response rates from the surveys each year
- We look at the jobs creation variable in the survey, but the deeper dive is extended to all relevant variables in the computation

Industry Mix

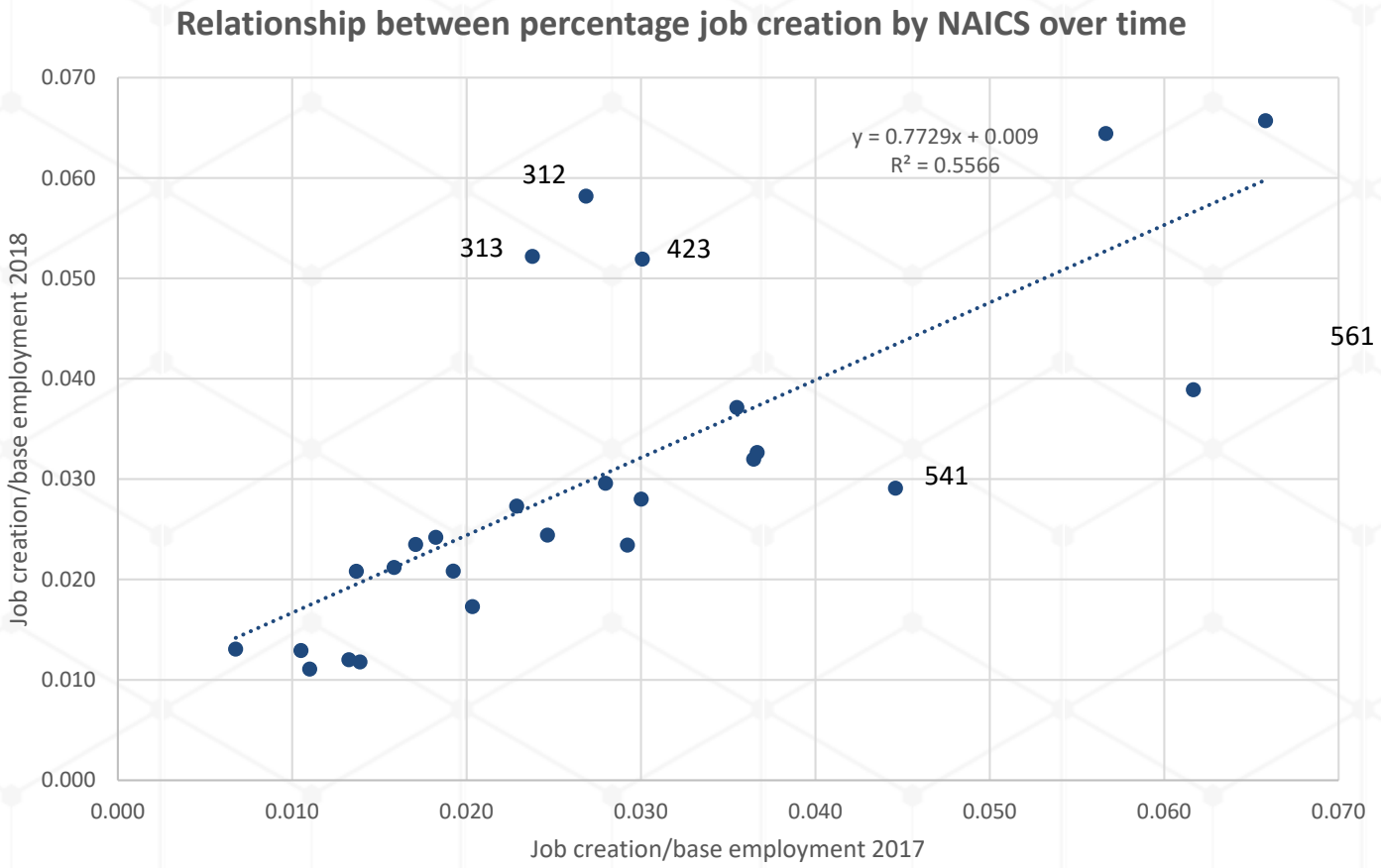


Industry mix is roughly the same in each year (all fall along the dotted line), except for three industries:
311—Food manufacturing
334—Electronic equipment mfg.
336—Transportation mfg.

A good measure of the consistency in industry over time is how close the dots are to the trend line and the *R*-square. In this case the *R*-square is 0.95.

The data are based on the reported employment size of the establishment/client.

Share of Jobs Created



This graph shows the power of each NAICS industry to generate jobs as a result of the MEP services, as reported by the clients. The share of jobs created average from slightly over 1% of reported employment base to 6.5%.

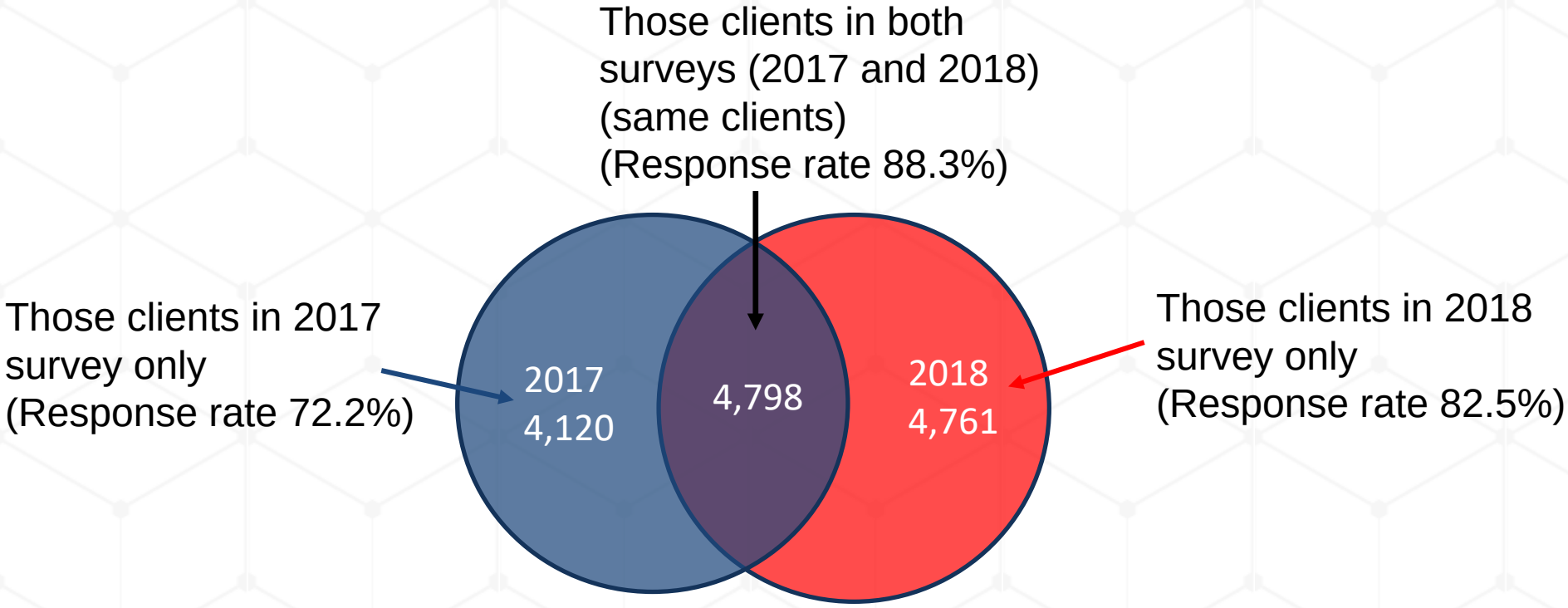
Of the 26 industries represented by MEP clients, most fall along the trend line but 5 deviate substantially from it.

Response Rates for the Jobs Creation Question

- Response rates are somewhat uneven across surveys and industries
- More clients responded to the 2018 survey (8,023/9,559) than the 2017 survey (7,228/8,924)
  - 83.1% in 2018 and 81.0% in 2017
- Of those clients who responded to any question on the survey, more responded to the question about job creation in 2018 than in 2017
  - 42.2% in 2018 versus 38.9% in 2017

Form Three Groups

- Dividing the 2 years into three groups helps to understand the differences in response rates



Effect of Response Rates on Jobs Creation

- Jobs created increased by 9.5% from 2017 to 2018
  - With a response rate increase of 11.0%
- How much did the increase in the response rate affect the increase in job creation?
- To address this question, we used the response rates and job creation rates of firms that were in both surveys and using the 2017 response rate
  - Controlling for comparable response rates reduced the impact estimates by about 7% to 220,231

Adjusting REMI Estimates for Response Rates

- Used the lower response rate in 2017 for the merged sample to derive a set of conservative estimates from REMI
- Controlling for comparable response rates reduces all estimates by around 7%
  - Job created from 236,802 to 220,231
  - GDP from $25.0 billion to $23 billion
  - Output from $46.6 billion to $43.3 billion
  - Personal income from $15.0 billion to $14.0 billion
- Returns to Treasury from $2.01 billion to $1.88 billion
- Return on investment of $140 million was 13.4 to 1

FY18 Study Findings, Controlling for Change in Response Rates

Forecast	Jobs	GDP	Output	Personal Income	Returns to Treasury	ROI Return on Investment
FY17 Findings Using Firm Variables	219,148	$22.01*	$40.34*	$13.76*	$1.86*	14.5:1
FY18 All Responses Using Firm Variables	236,802	$24.9*	$46.6*	$15.04*	$2.01*	14.4:1
FY18 with FY17 Response Rates Using Firm Variables	220,231	$23.17*	$43.35*	$13.99*	$1.88*	13.4:1

The Study Team

The team contributing to this report are:

- Upjohn:
  - Jim Robey, Ph.D.
  - Randall Eberts, Ph.D.
  - Brian Pittelko
  - Claudette Robey
- Ken Voytek, NIST/MEP
- Chris Judson, REMI

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