

The logo for the Survey of Business Uncertainty (SBU), consisting of the letters 'SBU' in a bold, blue, sans-serif font, enclosed within a white rectangular border.

Survey of Business Uncertainty



FEDERAL RESERVE BANK *of* ATLANTA



Stanford
University

David Altig, Jose Maria Barrero, Nicholas Bloom, Mike Bryan, Steven J. Davis, Brent H. Meyer, and Nicholas Parker
July 2019

The Survey of Business Uncertainty (SBU) is fielded by the Federal Reserve Bank of Atlanta. It was designed, tested, and refined in cooperation with Nick Bloom of Stanford University and Steven Davis of the Chicago Booth School of Business and the Hoover Institution. Bloom and Davis received research support from the Sloan Foundation and the U.S. National Science Foundation. Davis also received research support from Chicago Booth.

Structure of the Document

1. Overview
 2. Development of the Survey of Business Uncertainty (SBU)
 3. Recruitment of SBU Panel Members
 4. Assignment of Panel Members to Survey Groups
 5. Panel Composition
 6. SBU Questionnaires
 7. Survey Response Rates
 8. Computing Moments of Firm–Level Subjective Probability Distributions
 9. Data Cleaning
 10. Summary Statistics for Firm–Level Outcomes
 11. Subjective Expectations and Uncertainty Indices
- Appendixes

1. Overview

Our monthly Survey of Business Uncertainty (SBU) goes to about 1,200 panel members (as of November 2018), who occupy senior finance and managerial positions at U.S. firms. We contact panel members each month by email, and they respond via a web-based instrument.

- Survey questions pertain to current, past, and future outcomes at the respondent's firm. Our primary objective is to elicit the respondent's subjective probability distributions over own-firm future sales growth rates, employment levels, and capital investment expenditures.
- Panel members receive a unique link to the web-based survey on the Monday of the second full week in the month. The survey link remains active for two weeks, during which time we send up to three reminder emails.
- Completing the survey takes about five minutes, on average, according to our response time analysis.

2. Development of the Survey of Business Uncertainty

- Initial testing of the SBU question design began in the special question series of the Federal Reserve Bank of Atlanta's Business Inflation Expectations (BIE) Survey in October 2013.
- Cognitive interviews with members of the BIE Survey panel took place during the summer of 2014. Testing in the BIE survey ended in July 2014, when the first SBU was administered to a newly established, national panel.
- For a complete chronology and description of all question testing in the BIE Survey panel and piloting of the new survey instrument with the national SBU Panel, please see Exhibit C.
- Initially, the SBU included profit margin and average price questions. Later, we deleted these questions from our core survey instruments to reduce cognitive burden and keep average survey response time to about five minutes.
- The last revision to the survey instruments was in September 2016.

3. Recruitment of SBU Panel Members

We identify prospective panel members from lists of firms and contacts that we purchased from Dun & Bradstreet, a supplier of business information and research.

- The mix of firms on the D&B list reflects the sectoral composition of U.S. gross domestic product, with random sampling of firms within sectors.
- For a given firm, we select a contact person using a hierarchy of job functions, prioritizing persons in senior finance roles such as CFO or controller. If no such person is available (e.g., for small firms), we contact the CEO or other senior executive.

Approximately 42 percent of potential contacts reached via telephone or email agree to join the panel. Conditional on joining, 62 percent responded at least once. Our average monthly response rate is 43 percent.

Note: The panel membership statistic reflects all recruiting from June 2014 to June 2018. Response rates reflect the period from September 2016 (the last methodological change) to October 2018.

4. Assignment of Panel Members to Sample Groups

As detailed below, the SBU makes use of three questionnaires:

- The Sales questionnaire asks about sales revenue growth.
- The Employment questionnaire asks about number of employees.
- The Capital Expenditure questionnaire asks about capital expenditures (levels).

We randomly assign each new panel member to one of three sample groups:

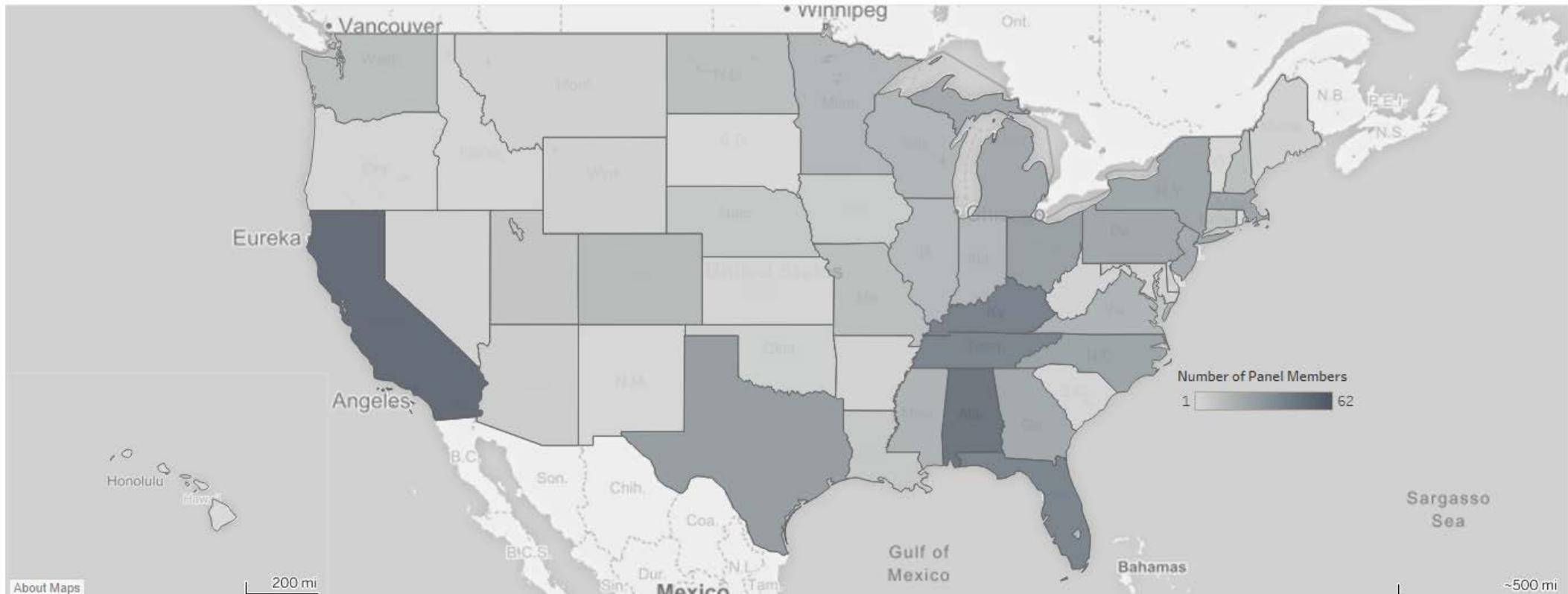
- Members of Group A (B) receive the SE (CC) questionnaire in even-numbered months and the CC (SE) questionnaire in odd-numbered months.
- Thus, about one third of the sample receives sales growth questions each month, one third receives the capital expenditure questions, and one third receives capex questions. In addition, we often add one or more special questions.

In May 2019 we plan to retire the questions on unit costs and reassign panel members to one of three groups. Each group will answer questions about one of employment, sales, or investment in any given month.

5. Panel Composition

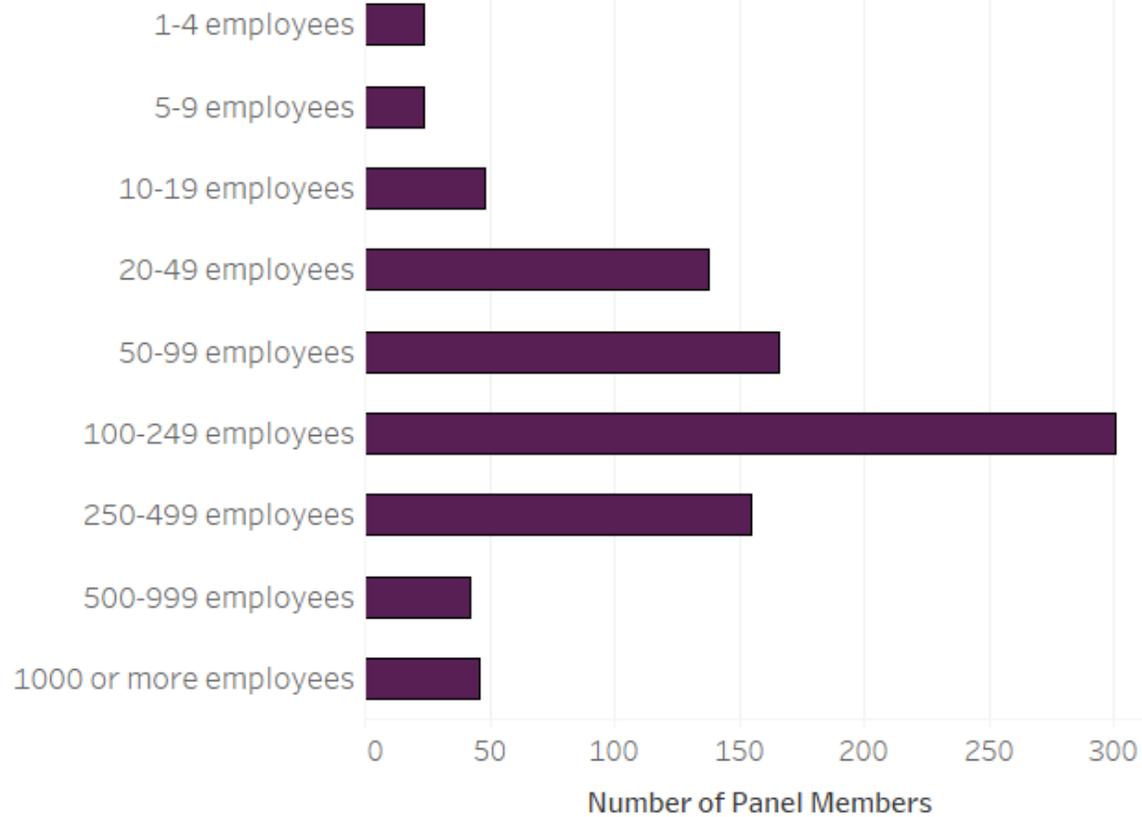
This slide shows the geographic distribution of panel members as of November 2018. The next slide reports the distribution of panel members by industry and firm size (number of employees) as of November 2018.

By Geography

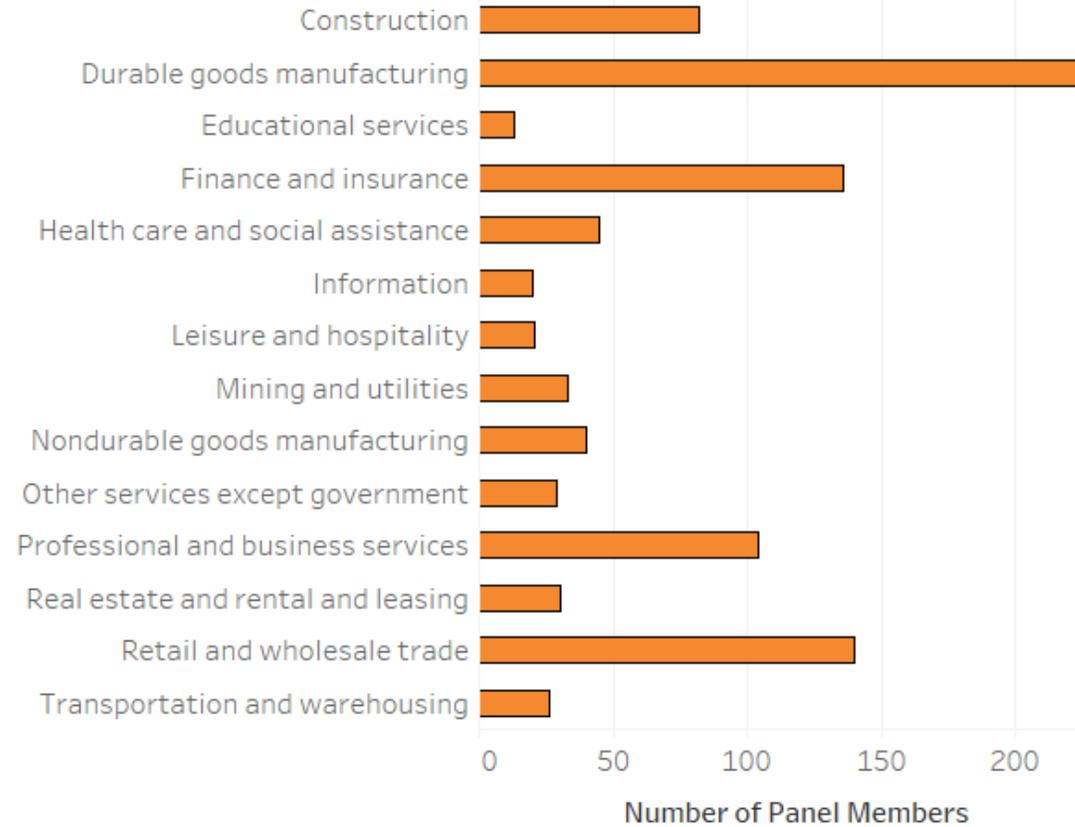


5. Panel Composition (Cont'd)

By Number of Employees



By Sector



6. SBU Questionnaires

- The next 10 slides display screen shots of the SE and CC questionnaires.
- To reduce data entry errors by respondents, we modified the sales–related questions in September 2016, as shown below.

Sales Revenue Questionnaire

SBU

Survey of Business Uncertainty

FEDERAL RESERVE BANK of ATLANTA

CHICAGO BOOTH
The University of Chicago Booth School of Business

Stanford
University

For the current quarter, what would you estimate the total dollar value of your sales revenue will be?

\$ 10,000,000

Looking back, over the last 12 months, what was your approximate percentage sales revenue growth rate?

3 %

Next - 2 of 4

We first ask about the current *level* of sales revenue to obtain a measure of firm size. We then ask about the *growth rate* of sales over the last 12 months.

SBU Survey of Business Uncertainty



Looking ahead, from now to four quarters from now, what approximate percentage sales revenue growth rate would you assign to each of the following scenarios?

The LOWEST percentage sales revenue growth rate would be about:	<input type="text" value="1"/> %
A LOW percentage sales revenue growth rate would be about:	<input type="text" value="2"/> %
A MIDDLE percentage sales revenue growth rate would be about:	<input type="text" value="3"/> %
A HIGH percentage sales revenue growth rate would be about:	<input type="text" value="4"/> %
The HIGHEST percentage sales revenue growth rate would be about:	<input type="text" value="5"/> %

Back - 1 of 4

Next - 3 of 4

SBU Survey of Business Uncertainty



Please assign a percentage likelihood to the sales revenue growth rates you entered. (Values should sum to 100%)

LOWEST: The likelihood of realizing a 1% sales revenue growth rate would be:	<input type="text" value="10"/> %
LOW: The likelihood of realizing a 2% sales revenue growth rate would be:	<input type="text" value="20"/> %
MIDDLE: The likelihood of realizing a 3% sales revenue growth rate would be:	<input type="text" value="40"/> %
HIGH: The likelihood of realizing a 4% sales revenue growth rate would be:	<input type="text" value="20"/> %
HIGHEST: The likelihood of realizing a 5% sales revenue growth rate would be:	<input type="text" value="10"/> %
Total	<input type="text" value="100"/> %

Back - 2 of 4

Next - 4 of 4

These two screens conclude the sales revenue questionnaire. As noted above, we often add one or more special questions at the end of the questionnaire.

Employment Questionnaire

SBU Survey of Business Uncertainty



Currently, what is your **number of employees** (including part-time)?

Looking back, 12 months ago, what was your **number of employees** (including part-time)?

Next 2 of 4

SBU Survey of Business Uncertainty



Looking ahead, 12 months from now, what **number of employees** (including part-time) would you assign to each of the following scenarios?

The LOWEST number of employees would be about:	<input type="text" value="100"/>
A LOW number of employees would be about:	<input type="text" value="105"/>
A MIDDLE number of employees would be about:	<input type="text" value="110"/>
A HIGH number of employees would be about:	<input type="text" value="120"/>
The HIGHEST number of employees would be about:	<input type="text" value="125"/>

Back - 1 of 4

Next - 3 of 4

SBU Survey of Business Uncertainty



Please assign a percentage likelihood to the **number of employees** you entered above. (Values should sum to 100%)

LOWEST CASE: The likelihood of employing about 100 people 12 months from now would be:	<input type="text" value="0"/> %
LOW CASE: The likelihood of employing about 105 people 12 months from now would be:	<input type="text" value="0"/> %
MIDDLE CASE: The likelihood of employing about 110 people 12 months from now would be:	<input type="text" value="0"/> %
HIGH CASE: The likelihood of employing about 120 people 12 months from now would be:	<input type="text" value="0"/> %
HIGHEST CASE: The likelihood of employing about 125 people 12 months from now would be:	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

Back - 2 of 4

Next - 4 of 4

These two screens conclude the employment questionnaire. As noted above, we often add one or more special questions at the end of the questionnaire.

Capital Investment Questionnaire

SBU Survey of Business Uncertainty



Please provide an estimate of the book value of all **property, plant, and equipment** owned by your firm.

\$

For the current quarter, what would you estimate the total dollar value of your **capital investment expenditures** will be?

\$

Looking back, four quarters ago, what was the approximate dollar value of your **capital investment expenditures**?

\$

Next - 2 of 4

SBU Survey of Business Uncertainty



Looking ahead, from now to four quarters from now, what approximate dollar value of **capital investment expenditures** would you assign to each of the following scenarios?

The LOWEST dollar value of capital investment would be about:	\$ <input type="text" value="1,000,000"/>
A LOW dollar value of capital investment would be about:	\$ <input type="text" value="2,000,000"/>
A MIDDLE dollar value of capital investment would be about:	\$ <input type="text" value="3,000,000"/>
A HIGH dollar value of capital investment would be about:	\$ <input type="text" value="4,000,000"/>
The HIGHEST dollar value of capital investment would be about:	\$ <input type="text" value="5,000,000"/>

Back - 1 of 4

Next - 3 of 4

SBU Survey of Business Uncertainty



Please assign a percentage likelihood to the **capital investment expenditures** you entered. (Values should sum to 100%)

LOWEST CASE: The likelihood of about \$1,000,000 in capital investment expenditures would be:	<input type="text" value="0"/> %
LOW CASE: The likelihood of about \$2,000,000 in capital investment expenditures would be:	<input type="text" value="0"/> %
MIDDLE CASE: The likelihood of about \$3,000,000 in capital investment expenditures would be:	<input type="text" value="0"/> %
HIGH CASE: The likelihood of about \$4,000,000 in capital investment expenditures would be:	<input type="text" value="0"/> %
HIGHEST CASE: The likelihood of about \$5,000,000 in capital investment expenditures would be:	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

Back - 2 of 4

Next - 4 of 4

These two screens conclude the Capital Investment questionnaire. As noted above, we often add one or more special questions at the end of the questionnaire.

7. Survey Response Rates

Response Rates*	
Conditional on joining the panel, percentage of panel members who:	
Respond at least once	63%
Respond at least two times*	52%
Respond at least three times*	46%
Respond at least four times*	39%

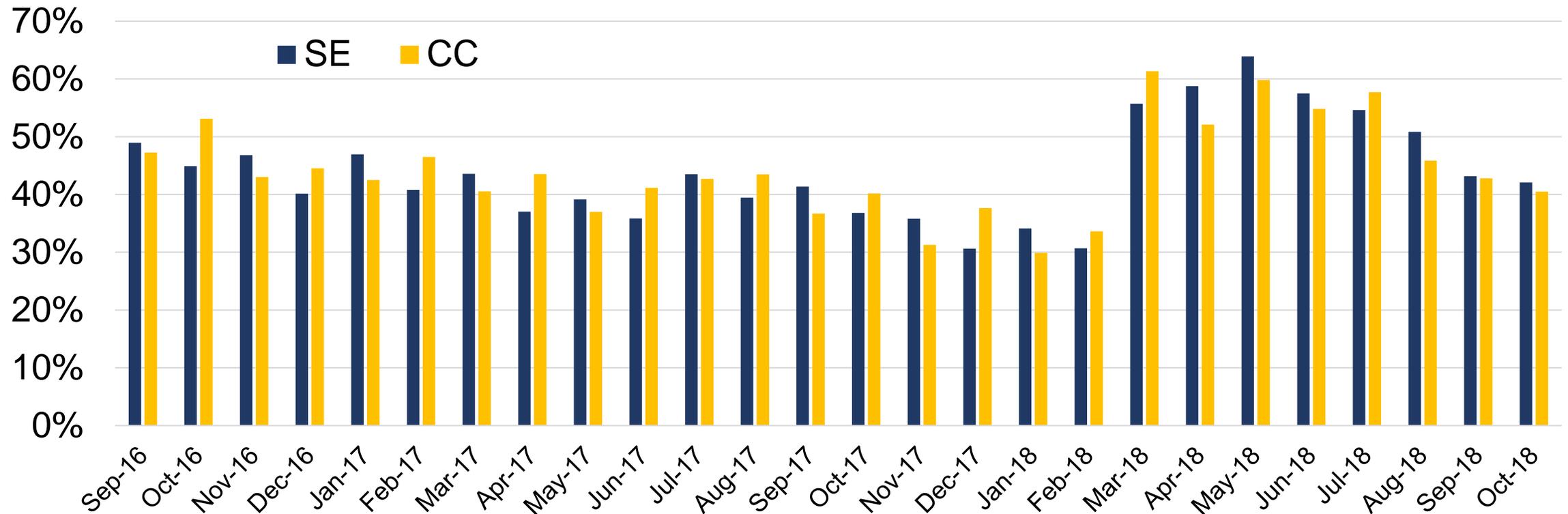
*Calculated from October 2017 to October 2018 using panel members who received at least one questionnaire on or before October 2017.

Average Monthly Response Rates (since September 2016)	
All firms	43%
By Firm Size, Number of employees	
1–4	32%
5–9	52%
10–19	39%
20–49	44%
50–99	50%
100–249	46%
250–499	40%
500–999	35%
1,000 or more	38%

Monthly Unit Response Rates by Questionnaire

Survey of Business Uncertainty

Monthly Response Rates by Questionnaire



*Response rate = (partial and complete responses)/ (surveys sent – noncontact). Noncontact includes bounced or undeliverable email invitations.

Beginning in March 2018, a monthly panel follow-up process was put into place. Panel members who have not responded for 3 consecutive months receive a follow-up call to insure they are receiving the monthly email invitations. Contacts who no longer work for the firm or who no longer wish to participate are removed from the panel. The removal of these inactive panel members increased response rates in March and for several months thereafter.

Responses by Sector

Sector	Surveys Sent	Responses	Nonresponse	Noncontact	Response Rate*
Construction	1,821	724	1034	63	41%
Durable goods manufacturing	4,206	1743	2086	377	46%
Educational services	643	166	444	33	27%
Finance and insurance	2,594	1155	1176	263	50%
Health care and social services	2,564	706	1772	86	28%
Information	505	171	280	54	38%
Leisure and hospitality	731	331	358	42	48%
Mining and utilities	1,897	645	1118	134	37%
Nondurable goods manufacturing	794	369	366	59	50%
Other services	388	133	192	63	41%
Professional and business services	2,271	1212	966	93	56%
Real estate and rental and leasing	786	352	415	19	46%
Retail and wholesale trade	2,685	1113	1433	139	44%
Transportation and warehousing	1,093	415	642	36	39%

Notes: Responses by sector in the Survey of Business Uncertainty, pooling across all firms and months since the last major survey change in September 2016 for which we can construct a subjective probability distribution over the growth rate of at least one of EMPLOYMENT (twelve months hence), SALES REVENUE (four quarters hence), CAPITAL EXPENDITURES (four quarters hence), or AVERAGE UNIT COST (twelve months hence). See slide 23 for a note on how we compute growth rates throughout this document. Also see slides 23–28 for details on constructing these subjective distributions over growth rates.

*Response rate = partial + complete responses/ (surveys sent - noncontact). Includes survey distributions from September 2016 (the last methodological change) to October 2018. Noncontact includes bounced or undeliverable email invitations.

8. Computing Moments of the Firm–Level Subjective Probability Distributions

- The next five slides explain how we use the survey responses to compute moments of subjective probability distributions over own–firm future outcomes.
- We calculate first and second moments of the subjective growth rate distributions of employment, sales and unit costs over the next 12 months or four quarters, as appropriate.
- Following standard practice in the literature on business–level dynamics, we calculate the growth rate of x from $t-1$ to t as $g_t = 2(x_t - x_{t-1}) / (x_t + x_{t-1})$.*
- For capital investment, we calculate first and second moments of the subjective distribution for future investment rate (I/K).

* This definition of the growth rate of sales is convenient for its symmetry around zero and because its support lies on the closed interval $[-2, 2]$, with the endpoints of the interval corresponding to entry and exit. See “Gross Job Creation, Gross Job Destruction, and Employment Reallocation” by Steven J. Davis and John Haltiwanger in the 1992 *Quarterly Journal of Economics* for a more extensive discussion.

Employment

Respondent Data

$CEmp$ = firm's current employment level, as reported by the respondent

$FEmp_i$ = employment 12 months hence, $i = 1, 2, 3, 4, 5$

p_i = the associated probabilities, $i = 1, 2, 3, 4, 5$

Scenario-Specific Growth Rates

$$EGr_i = 2(FEmp_i - CEmp) / (FEmp_i + CEmp), \quad i = 1, 2, 3, 4, 5$$

First and Second Moments of the Subjective Growth Rate Distribution

$$Mean(EGr) = \sum_{i=1}^5 p_i EGr_i$$

$$Var(EGr) = \sum_{i=1}^5 p_i (EmpGr_i - Mean(EGr))^2$$

$$SD(EGr) = \sqrt{Var(EGr)}$$

Capital Investment Rates

Respondent Data

$CCap$ = firm's capital investment expenditures in the current quarter, as reported by the respondent

$FCap_i$ = capital investment expenditures 4 quarters hence, $i = 1, 2, 3, 4, 5$

p_i = the associated probabilities, $i = 1, 2, 3, 4, 5$

K = our measure of the firm's capital stock

Current Investment Rate

$CInvRate = CCap/K$, which we winsorize at the 1st and 99th percentiles

First and Second Moments of the Subjective Distribution for Future Capex:

$$Mean(FCap) = \sum_{i=1}^5 p_i FCap_i$$

$$Var(FCap) = \sum_{i=1}^5 p_i (FCap_i - Mean(FCap))^2$$

$$SD(FCap) = \sqrt{Var(FCap)}$$

Capital Investment Rates (cont.)

First and Second Moments of the Distribution of Future Investment Rates:

$$\text{Mean}(\text{InvRate}) = \text{Mean}(\text{FCap})/K$$

$$\text{SD}(\text{InvRate}) = \text{SD}(\text{FCap})/K$$

We also winsorize these first and second moments at the 1st and 99th percentiles

For constructing indices we focus on expectations about the change in investment rate between now and 4 quarters hence:

$$\text{Mean}(\text{InvRate}) - \text{CInvRate} = \text{Mean}(\text{FCap})/K - \text{CCap}/K \text{ (both normalized by current } K \text{)}$$

Focusing on the change in investment rates between quarters t and $t+4$ makes our investment rate index comparable to our employment and sales indices, which measure expectations about employment and sales growth over the next year.

Sales Revenue (Current SE Questionnaire)

Respondent Data

$CSale$ = firm's sales revenue in the current quarter, as reported by the respondent

$FSaleGr_i$ = respondent's scenario-specific sales growth rate from now to four quarters hence, $i = 1, 2, 3, 4, 5$

p_i = the associated probabilities, $i = 1, 2, 3, 4, 5$

Implied Future Sales Level

$$FSale_i = \left(1 + \frac{FSaleGr_i}{100}\right) CSale, i = 1, 2, 3, 4, 5$$

Scenario-Specific Growth Rates (re-expressing respondent growth rates to our growth rate measure)

$$SaleGr_i = 2(FSale_i - CSale) / (FSale_i + CSale) = 2FSaleGr_i / (FSaleGr_i + 2), i = 1, 2, 3, 4, 5$$

First and Second Moments of the Subjective Growth Rate Distribution

$$Mean(SaleGr) = \sum_{i=1}^5 p_i SaleGr_i$$

$$Var(SaleGr) = \sum_{i=1}^5 p_i (SaleGr_i - Mean(SaleGr))^2$$

$$SD(SaleGr) = \sqrt{Var(SaleGr)}$$

Sales Revenue (Old SE Questionnaire)

Respondent Data

$CSale$ = firm's sales revenue in the current quarter, as reported by the respondent

$FSale_i$ = sales revenue four quarters hence, $i = 1, 2, 3, 4, 5$

p_i = the associated probabilities, $i = 1, 2, 3, 4, 5$

Scenario-Specific Growth Rates

$SaleGr_i = 2(FSale_i - CSale) / (FSale_i + CSale), i = 1, 2, 3, 4, 5$

First and Second Moments of the Subjective Growth Rate Distribution

$$Mean(SaleGr) = \sum_{i=1}^5 p_i SaleGr_i$$

$$Var(SaleGr) = \sum_{i=1}^5 p_i (SaleGr_i - Mean(SaleGr))^2$$

$$SD(SaleGr) = \sqrt{Var(SaleGr)}$$

Average Unit Costs

Respondent Data

$FCostGr_i$ = average unit cost growth between now and 12 months hence, $i = 1, 2, 3, 4, 5$

p_i = the associated probabilities, $i = 1, 2, 3, 4, 5$

Implied Future Cost Level

$$FCost_i = \left(1 + \frac{FCostGr_i}{100}\right) CCost, i = 1, 2, 3, 4, 5$$

Scenario-Specific Growth Rates (re-expressing respondent growth rates to our growth rate measure)

$$CostGr_i = 2(FCost_i - CCost) / (FCost_i + CCost) = 2FCostGr_i / (FCostGr_i + 2), i = 1, 2, 3, 4, 5$$

First and Second Moments of the Subjective Growth Rate Distribution

$$Mean(CostGr) = \sum_{i=1}^5 p_i CostGr_i$$

$$Var(CostGr) = \sum_{i=1}^5 p_i (CostGr_i - Mean(CostGr))^2$$

$$SD(CostGr) = \sqrt{Var(CostGr)}$$

9. Data Cleaning

Automated Cleaning of Data from September 2016 and Later:

- If the respondent's future outcome values are descending rather than ascending, we reverse the order of the outcomes and their associated probabilities.
- If the probabilities sum to a value in [95,105], we rescale them to 100.
- We identify and correct obvious errors that fit certain repeat patterns – for example, an extra or missing zero digit in the response for a future scenario-specific outcome.
- After implementing these corrections, we discard subjective probability distributions that display any of the following:
 - Subjective probabilities do not add up to 100 percent.
 - Future outcome values are not weakly monotonic.
 - One outcome has 100 percent probability.
 - All future outcome values are identical.

Manual Review of Data from September 2016 and Later:

- We manually review the responses of firms with extreme growth rates for past to current and current to expected future outcomes.
- We manually review all responses of firms with >1,000 employees.
- When the above manual reviews reveal potentially anomalous data points, we consult external sources (e.g., the company website) and/or recontact the respondent for confirmation or clarification. If warranted, we manually edit the data point(s) in question.

Manual Review of Data from Prior to September 2016:

- We conducted a human audit on all data from prior to September 2016. We reviewed each individual observation looking for obvious mistakes and patterns.
- Common revisions include correcting for missing or extra “0”, adjusting reports of annual sales to quarterly values, and deleting responses that simply enumerate bins (1, 2, 3, 4, 5).

Manual Review of Forecast Errors (all data):

- We manually review the responses of firms with extremely large forecast errors for sales or employment growth rates. In particular, we review responses when the absolute difference between forecast and realized employment growth rates is greater than unity, i.e. if $|Mean(EGr) - Realized(EGr)| > 1$, and similarly for sales.
- See slides 23–28 for details on how we measure $Mean(EGr)$ and its analog for sales and Appendix D for details on how we measure $Realized(EGr)$.
- We use the firm’s history of responses about current sales and employment to correct obvious mistakes. Common mistakes include missing or added zeros and reporting an annual rather than a quarterly sales figure.
- If we cannot find an obvious mistake, we flag these observations as likely errors and disregard them when analyzing forecast errors.

10. Summary Statistics for Firm–Level Outcomes

Current Levels

Variable	Count	Mean	Standard Deviation	Percentiles				
				10	25	50	75	90
Current Employment	5,058	441	1,049	30	70	155	315	790
Current Quarterly Sales (\$ Millions)	5,083	35.4	97.1	1.0	3.0	8.0	23.3	146
Current Capital Investment Rate (I/K)	4,887	0.097	0.256	0.001	0.007	0.025	0.070	0.201

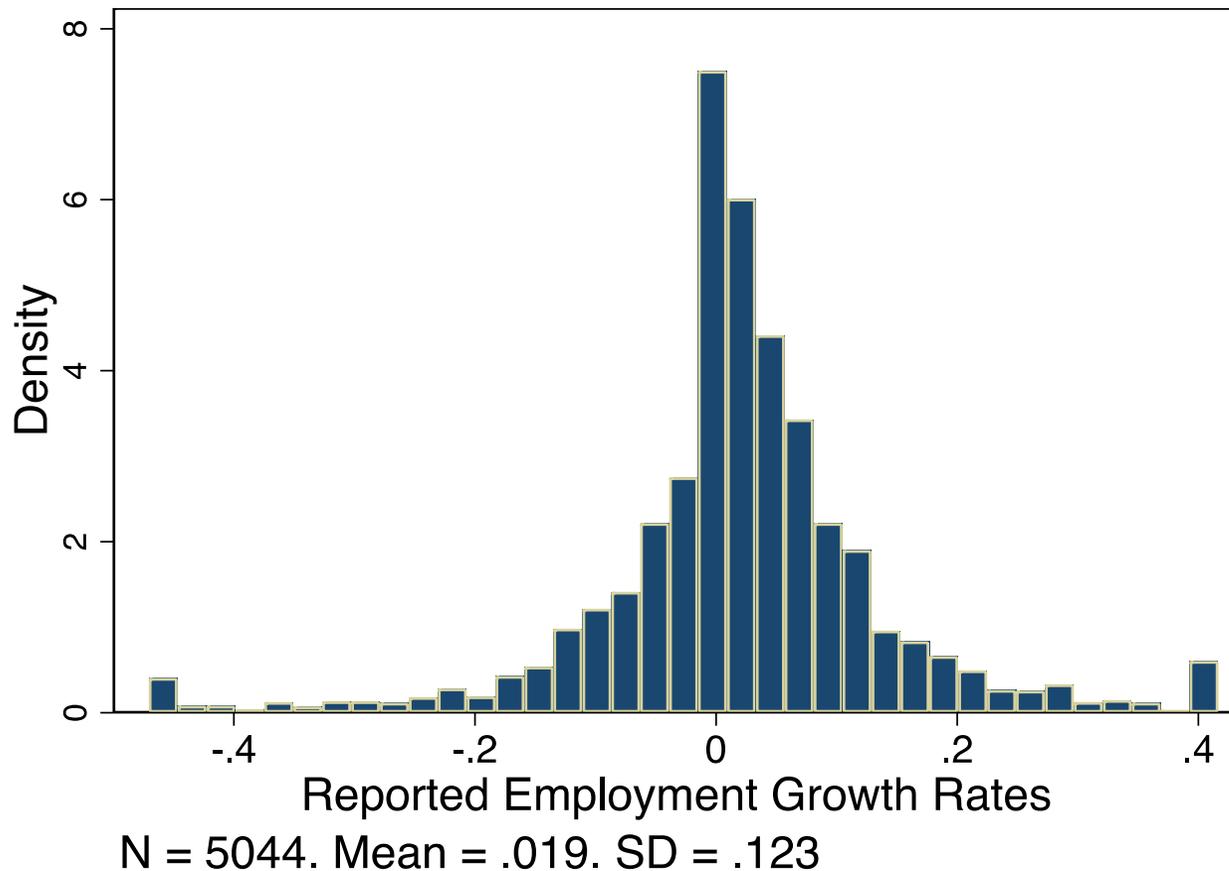
Notes: The sample contains all firm–level responses from October 2014 to August 2018 for which we can construct subjective probability distributions over the growth rates of future employment (12 months hence), sales revenue (four quarters hence), or capital expenditures (four quarters hence).

Past Activity

Variable	Count	Mean	Standard Deviation	Percentiles				
				10	25	50	75	90
Employment Growth, from 12 Months Ago	5,044	0.019	0.123	-0.100	-0.023	0.018	0.069	0.143
Sales Growth, from Four Quarters Ago	5,111	0.038	0.164	-0.105	0.000	0.031	0.095	0.184
Investment Rate (I/K) Four Quarters Ago	4,744	0.043	1.01	-1.384	-0.667	0.000	0.667	1.429
Avg. Unit Cost Growth, from 12 Months Ago	4,889	0.024	0.224	0.001	0.007	0.023	0.068	0.191

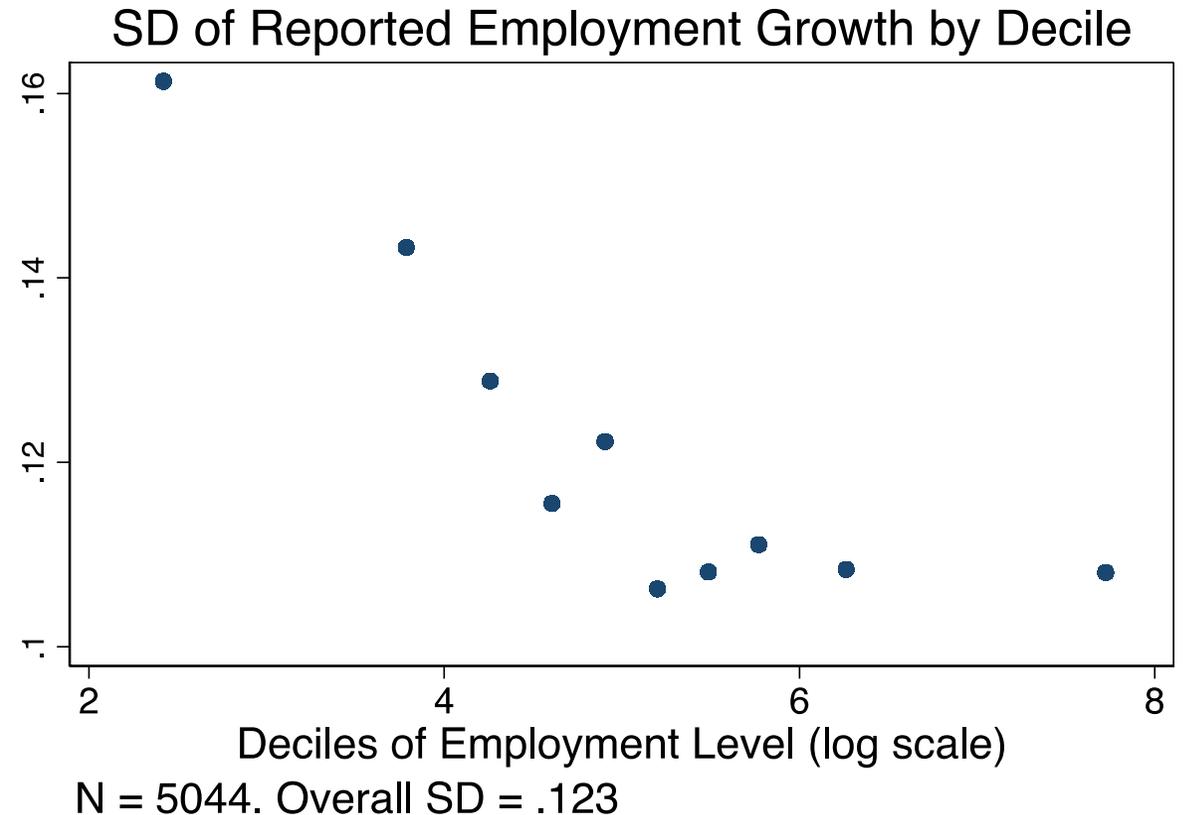
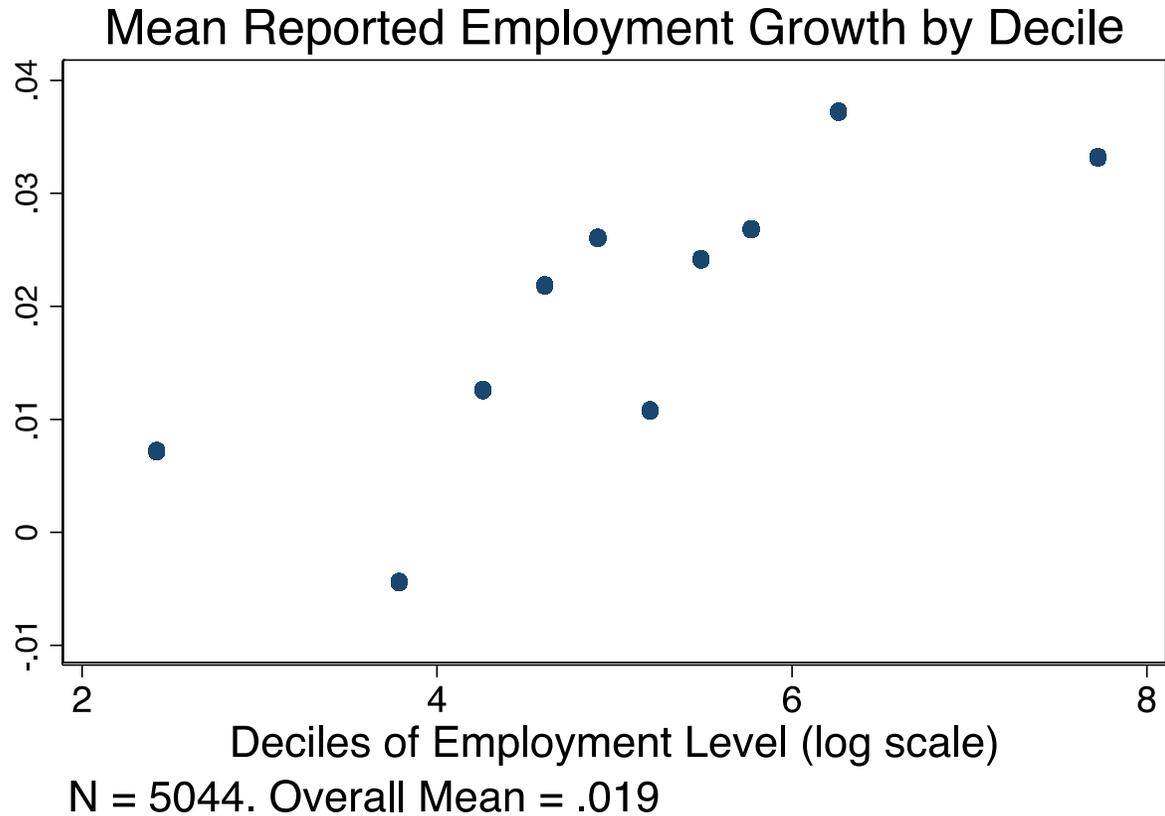
Notes: The sample contains all firm-level responses from October 2014 to August 2018 for which we can construct subjective probability distributions over the growth rates of future employment (12 months hence), sales revenue (four quarters hence), capital expenditures (four quarters hence), or average unit costs (12 months hence).

Distribution of Employment Growth Rates over Past 12 Months



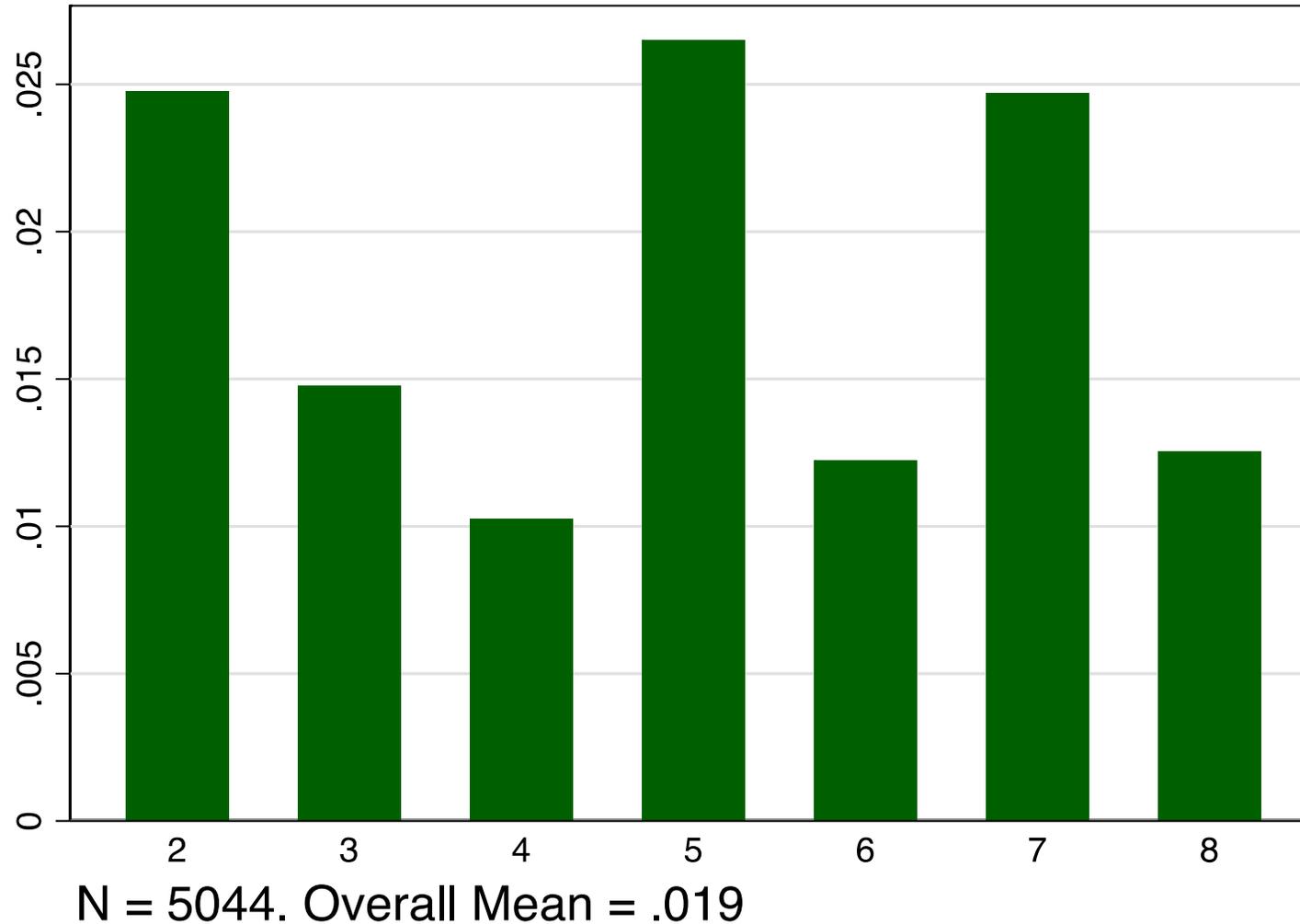
Notes: The histogram shows the empirical distribution of realized employment growth rates in the Survey of Business Uncertainty from October 2014 to August 2018, pooling over all firms for which we can construct subjective distributions over future employment growth rates. We compute the realized employment growth rate in month t using the firm's reported employment in t and its recollection of employment in month $t - 12$. We compute growth rates using the formula in slide 23.

Mean and Standard Deviation (SD) of Employment Growth Rates by Deciles of Firm Size



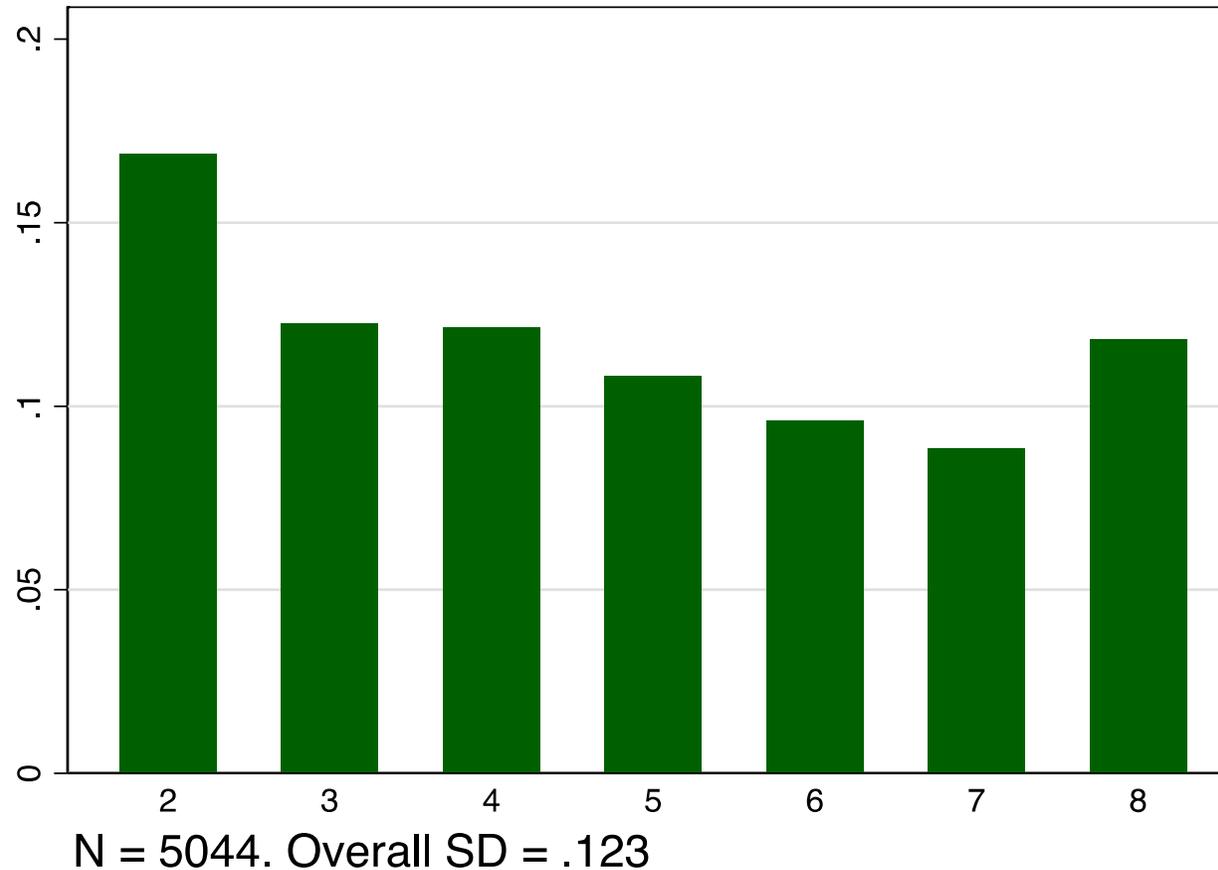
Notes: See the previous slide for a description of the sample.

Mean Realized Employment Growth Rates over Past 12 Months by One-Digit NAICS



Notes: See slide 33 for a description of the sample.

Standard Deviation of Realized Employment Growth Rates Over the Past 12 Months by One-Digit NAICS



Notes: See slide 33 for a description of the sample.

Summary Statistics: Expectations

Variable	Count	Mean	Standard Deviation	Percentiles				
				10	25	50	75	90
Employment Growth, Looking 12 Months Hence	5,058	0.010	0.082	-0.049	-0.011	0.006	0.036	0.079
Sales Growth, Looking Four Quarters Hence	5,124	0.039	0.087	-0.022	0.009	0.034	0.068	0.123
Investment Rate, Looking Four Quarters Hence	4,556	0.123	0.341	0.005	0.013	0.035	0.087	0.250
Avg. Unit Costs Growth, Looking 12 Months Hence	4,979	0.034	0.040	-0.001	0.014	0.027	0.043	0.070

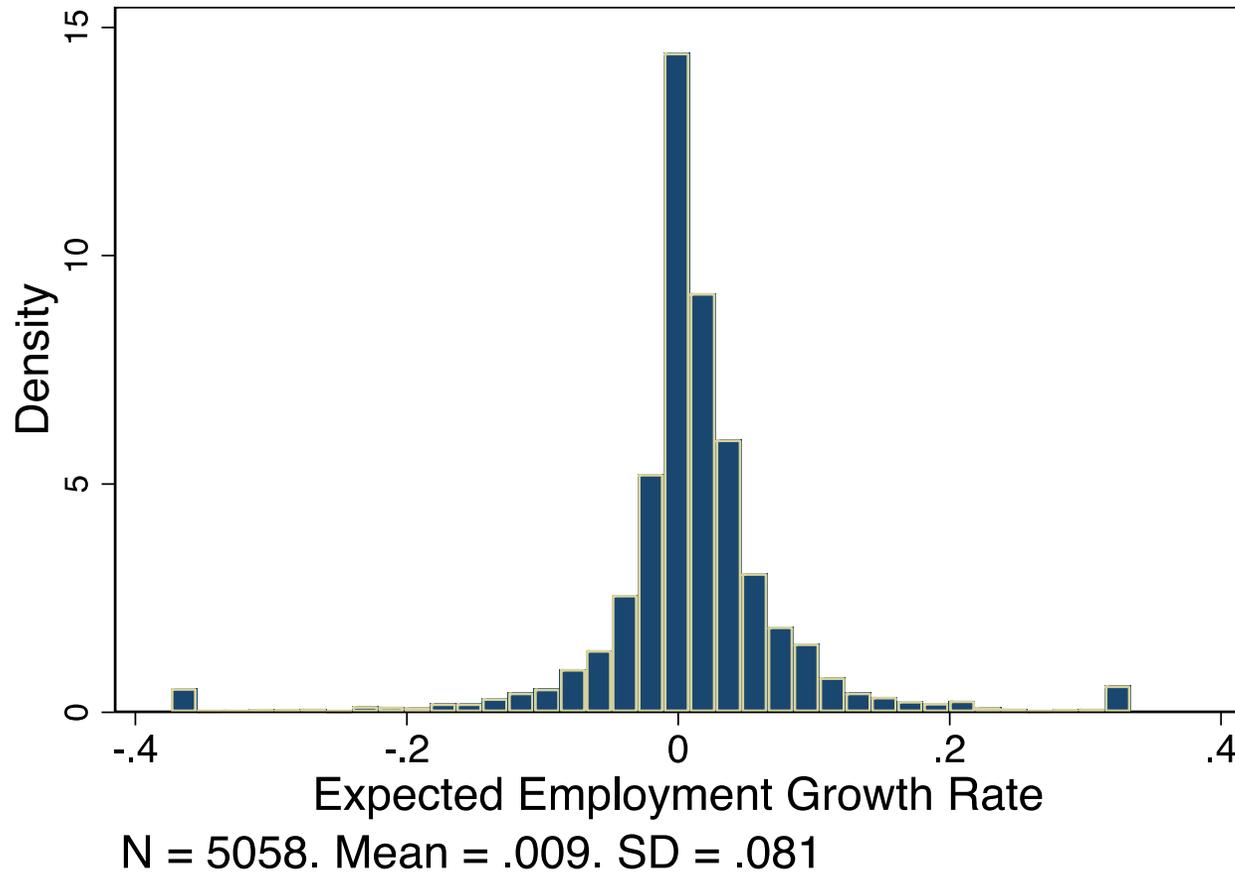
Notes: The sample contains all firm-level responses from October 2014 to August 2018 for which we can construct subjective probability distributions over the future growth rates of employment (12 months hence), sales revenue (four quarters hence), and average unit costs (12 months hence). We also compute expectations for their firm's future investment rate (four quarters hence). See slides 23–28 above for an explanation of how we calculate these expectations.

Summary Statistics: Uncertainty

Variable	Count	Mean	Standard Deviation	Percentiles				
				10	25	50	75	90
Employment Growth, Looking 12 Months Hence	5,059	0.057	0.063	0.014	0.022	0.037	0.065	0.114
Sales Growth, Looking Four Quarters Hence	5,125	0.047	0.052	0.010	0.017	0.030	0.056	0.106
Investment Rate, Looking Four Quarters Hence	4,556	0.042	0.106	0.002	0.005	0.012	0.033	0.087
Avg. Unit Costs Growth, Looking 12 Months Hence	4,979	0.021	0.021	0.006	0.009	0.013	0.023	0.043

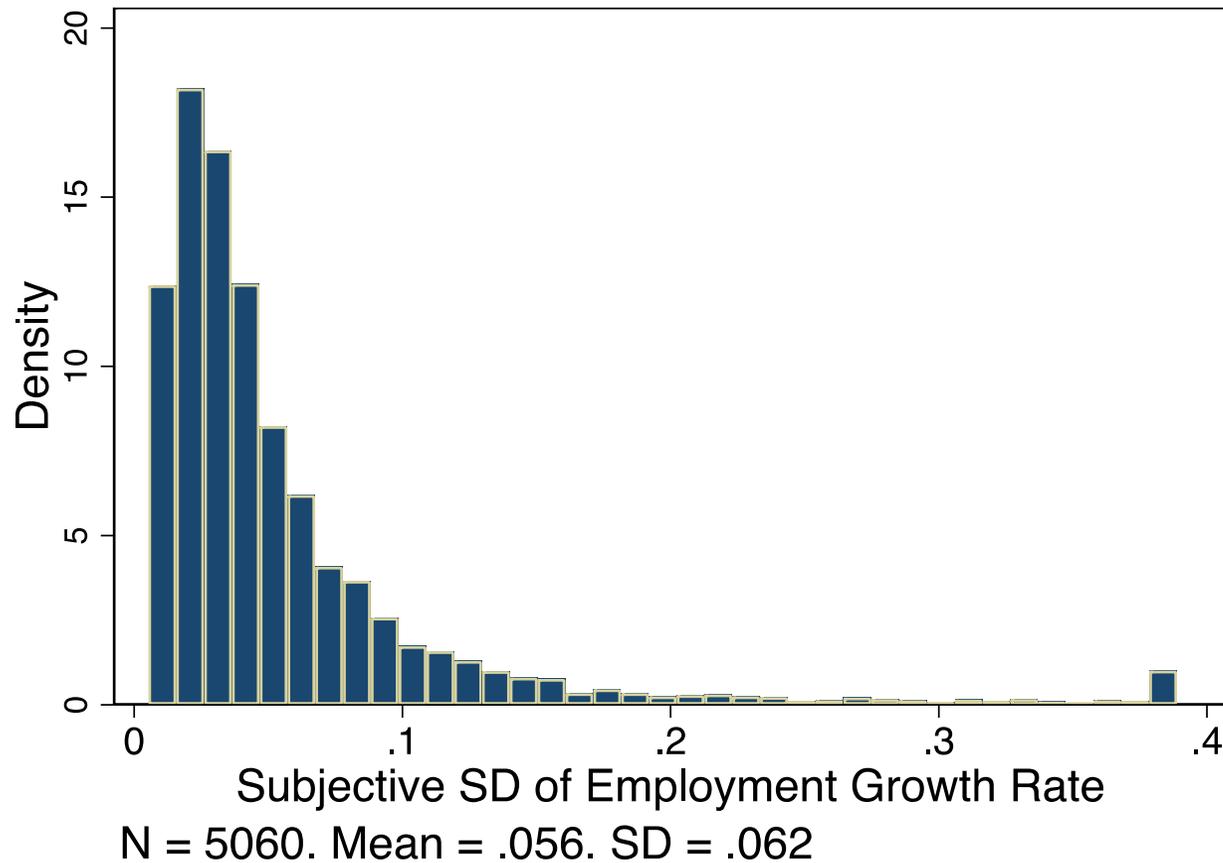
Notes: The sample contains all firm-level responses from October 2014 to August 2018 for which we can construct subjective probability distributions over the future growth rates of employment (12 months hence), sales revenue (four quarters hence), and average unit costs (12 months hence). We also compute uncertainty our respondents have for their firm's future investment rate (four quarters hence). See slides 23–28 above for an explanation of how we calculate these subjective uncertainties.

Distribution of Expected Employment Growth Rates over the Next 12 Months



Notes: The histogram shows the empirical distribution of expected employment growth rates in the Survey of Business Uncertainty from October 2014 to August 2018, pooling over all firms for which we can construct the subjective distributions over future employment growth rates. We compute these subjective mean growth rates as described on slide 24.

Distribution of Subjective Standard Deviations of Employment Growth Rates over the Next 12 Months



Notes: The histogram shows the empirical distribution of the subjective standard deviations over own firm-level growth rates in the Survey of Business Uncertainty from October 2014 to August 2018, pooling over all firms for which we can construct the subjective distributions over future employment growth rates. We compute these subjective standard deviations as described on slide 24.

11. Subjective Expectations and Uncertainty Indices

Business Expectations Indices

Topic–Specific Expectations Indices

We construct a monthly activity-weighted expectations (first-moment) index for employment growth, sales growth, and the investment rate looking one-year ahead.

- In month t , the index for Employment takes a value equal to the activity–weighted average of subjective mean employment growth rates looking 12 months hence ($Mean(EGr)$), averaging across all firms responding that month.
- We compute these subjective mean growth rates as described on slides 23–24, and winsorize them at the first and 99th percentiles before using them to construct the index.
- In month t , we weight firm i 's subjective mean growth rate expectation by its month– t employment ($CEmp_{it}$). If unavailable, we use $CEmp_{it-1}$, $CEmp_{it+1}$, $CEmp_{it-2}$, $CEmp_{it+2}$, $CEmp_{it-3}$, or $CEmp_{it+3}$ in that order. We top–code these weights at 500 to diminish the influence of outliers among very large firms.
- We construct growth indices for sales growth and the investment rate analogously. Our investment index aggregates firms' expectations about the change in their investment rate, looking four quarters ahead, relative to current investment. In all cases, we use top–coded employment values to weight the firm–level expectations.

Business Expectations Indices

Index Smoothing

- We smooth the three topic-specific indices, noting that in survey months prior to September 2016 we have about 50 responses per topic per month and since September 2016 about 150 responses per topic per month.
- We smooth as follows:
 - For months since November 2016 we use a three-month lagged moving average.
 - For months up to and including August 2016 we use a nine-month lagged moving average.
 - In September and October 2016 we use a seven-month and five-month lagged moving average.

Overall Business Expectations Index

- We standardize each of the topic-specific expectations indices to have a mean and variance of 100 during the period from January 2015 to December 2018, inclusive.
 - We hold the standardization period fixed to keep historical values constant as we add more months of data.
- We compute the overall Business Expectations Index in month t as the arithmetic average of the three standardized topic-specific indices in month t .
- Finally, we standardize the overall Business Expectations Index to have a mean and variance of 100 during the period from January 2015 to December 2018, inclusive.

Business Uncertainty Indices

Topic-Specific Uncertainty Indices

We construct a monthly activity-weighted uncertainty (second-moment) index for the employment growth, sales growth, and the investment rate, looking one year ahead.

- The month- t index of 12-month-ahead subjective uncertainty for employment growth is the activity-weighted mean of $(SD(EGr))$ values across firms responding in month t .
- We compute these subjective standard deviations over growth rates as described on slides 23–24, and winsorize them at the first and 99th percentiles before inputting them into the index construction formula.
- In month t , we weight firm i 's subjective growth rate uncertainty by the firm's month- t employment ($CEmp_{it}$). If unavailable, we use $CEmp_{it-1}$, $CEmp_{it+1}$, $CEmp_{it-2}$, $CEmp_{it+2}$, $CEmp_{it-3}$, or $CEmp_{it+3}$ in that order. We top-code these weights at 500 to diminish the influence of outliers among very large firms.
- We construct the indices for sales growth and firms' investment rate analogously. In all cases, we use top-coded employment values to weight the firm-level measures.

Business Uncertainty Indices

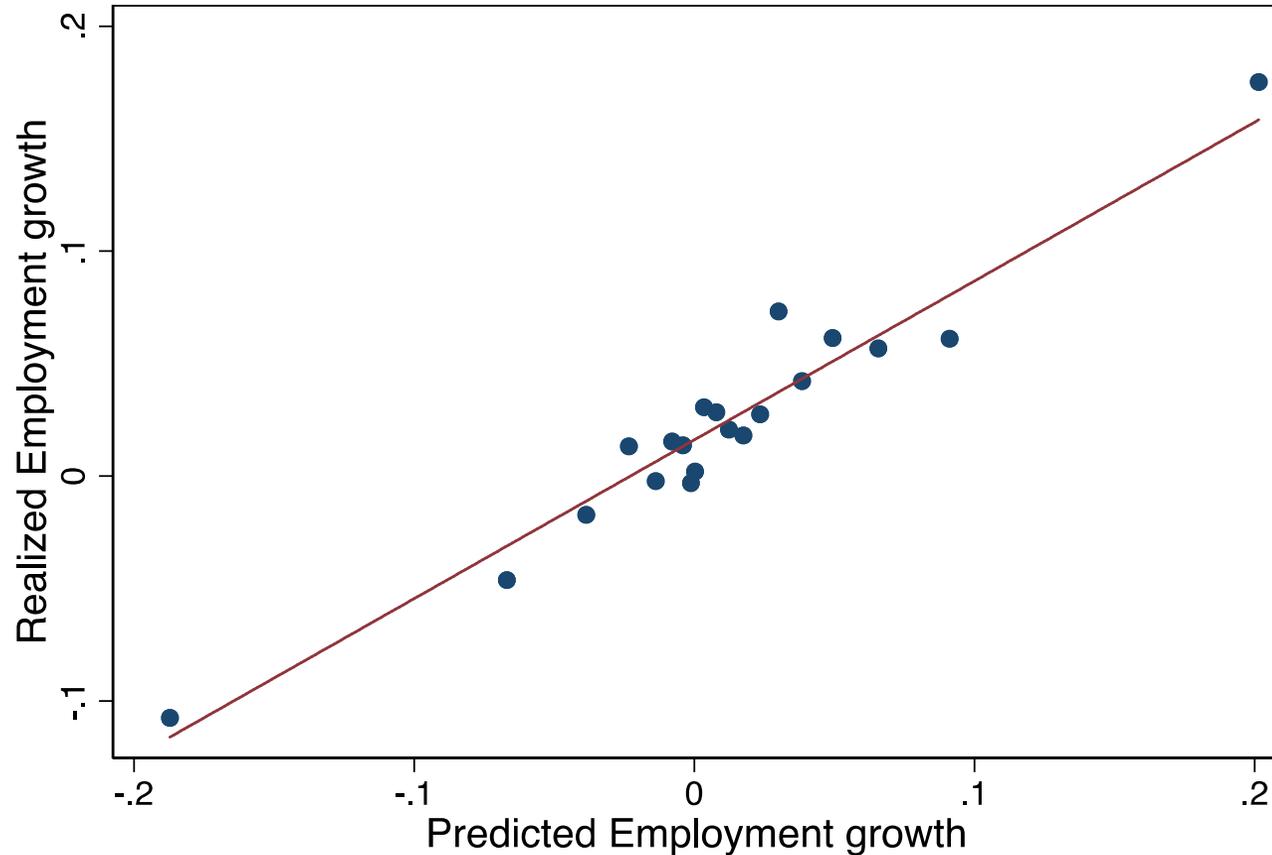
Index Smoothing

- We smooth the three topic-specific indices, noting that in survey months prior to September 2016 we have about 50 responses per topic per month and since September 2016 about 150 responses per topic per month.
- We smooth as follows:
 - For months since November 2016 we use a three-month lagged moving average.
 - For months up to and including August 2016 we use a nine-month lagged moving average.
 - In September and October 2016 we use a seven-month and five-month lagged moving average.

Overall Business Uncertainty Index

- We standardize each of the topic-specific uncertainty indices to have a mean and variance of 100 during the period from January 2015 to December 2018, inclusive.
 - We hold the standardization period fixed to keep historical values constant as we add more months of data.
- We compute the overall index in month t as the equally weighted average of the three standardized topic-specific indices in month t .
- Finally, we standardize to have a mean and variance of 100 during the period from January 2015 to December 2018, inclusive.

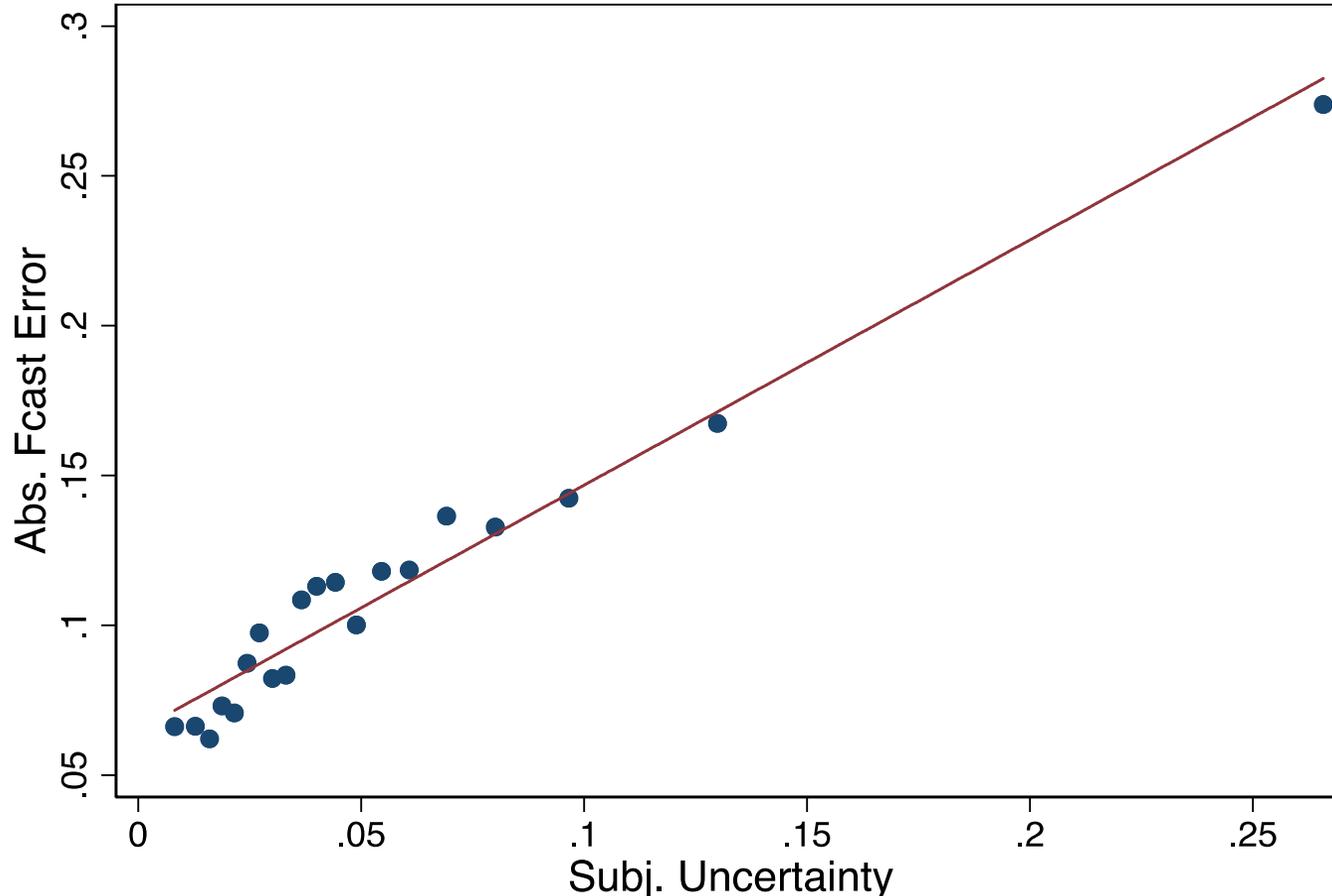
Firms' Subjective Expectations Are Highly Predictive of Realized Outcomes



Population regression: coeff = .706, s.e. = .086, R² = .100, N = 2238

Notes: This bin-scatter plot sorts observations into 20 bins according to their expected employment growth over the next 12 months ($\text{Mean}E(Gr_i)$), shown on the x-axis. We plot the average realized employment growth for the observations in each bin on the y-axis. The sample includes all firm-month observations in the *SBU* between October 2014 and August 2018 for which we observe expected and realized employment growth. We also report the coefficient, standard error, and R-squared from a firm-level regression of realized employment growth against expected employment growth.

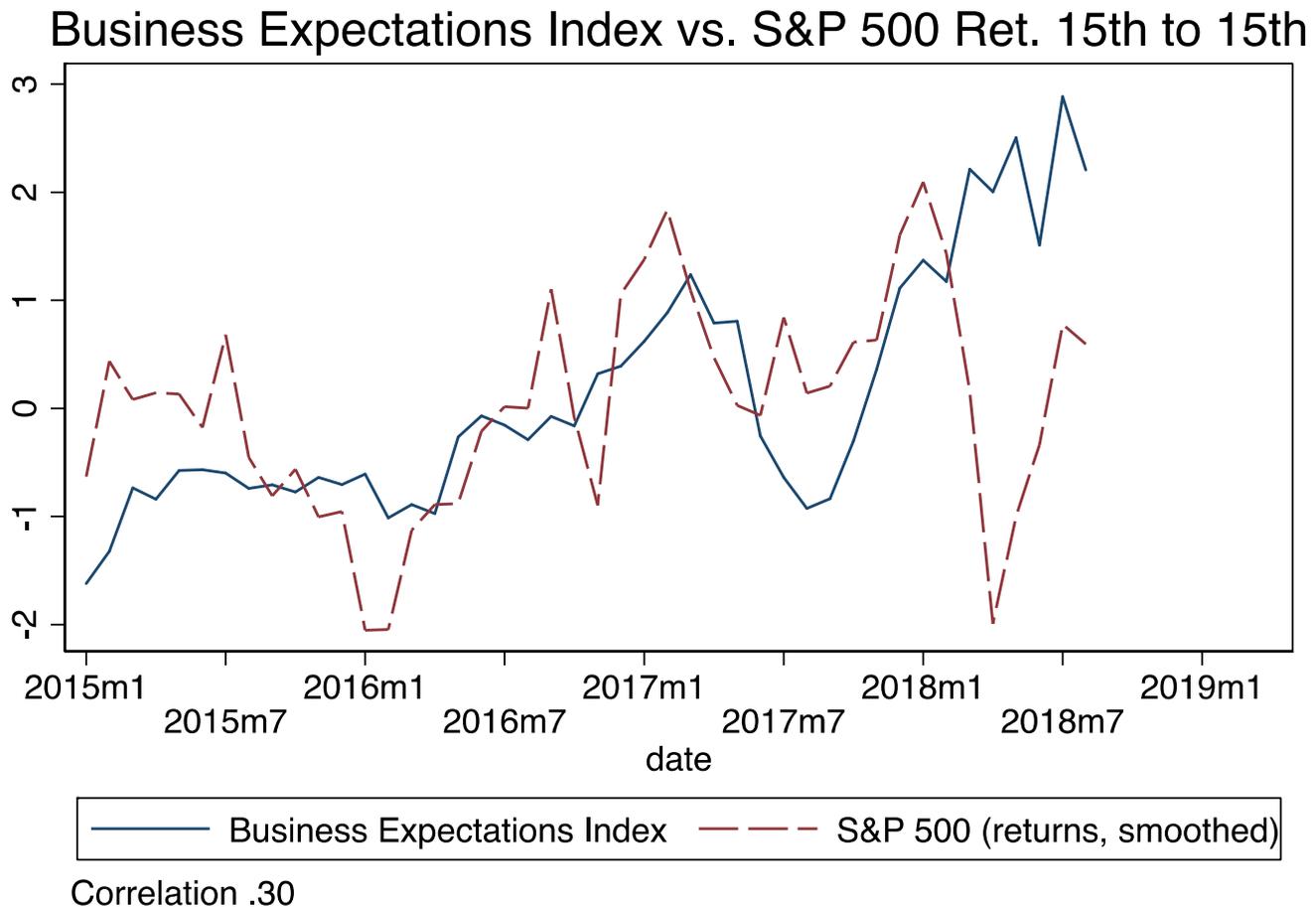
Firms' Subjective Uncertainty Is Highly Predictive of the Magnitude of Ex-Post Forecast Errors



Firm level regression: coeff = .818, s.e. = .070, R² = .136, N = 2238

Notes: This bin-scatter plot sorts observations into 20 bins according to their subjective uncertainty over employment growth in the next 12 months ($SDE(Gr_i)$), shown on the x-axis. We plot the average absolute forecast error for each bin on the y-axis. The absolute forecast error is the absolute value of the difference between expected employment growth ($MeanE(Gr_i)$), looking 12 months hence, and the realized employment growth. The sample includes all firm-month observations in the SBU between October 2014 and August 2018 for which we observe expected and realized employment growth. We also report the coefficient, standard error, and R-squared from a firm-level regression of absolute forecast errors against subjective uncertainty.

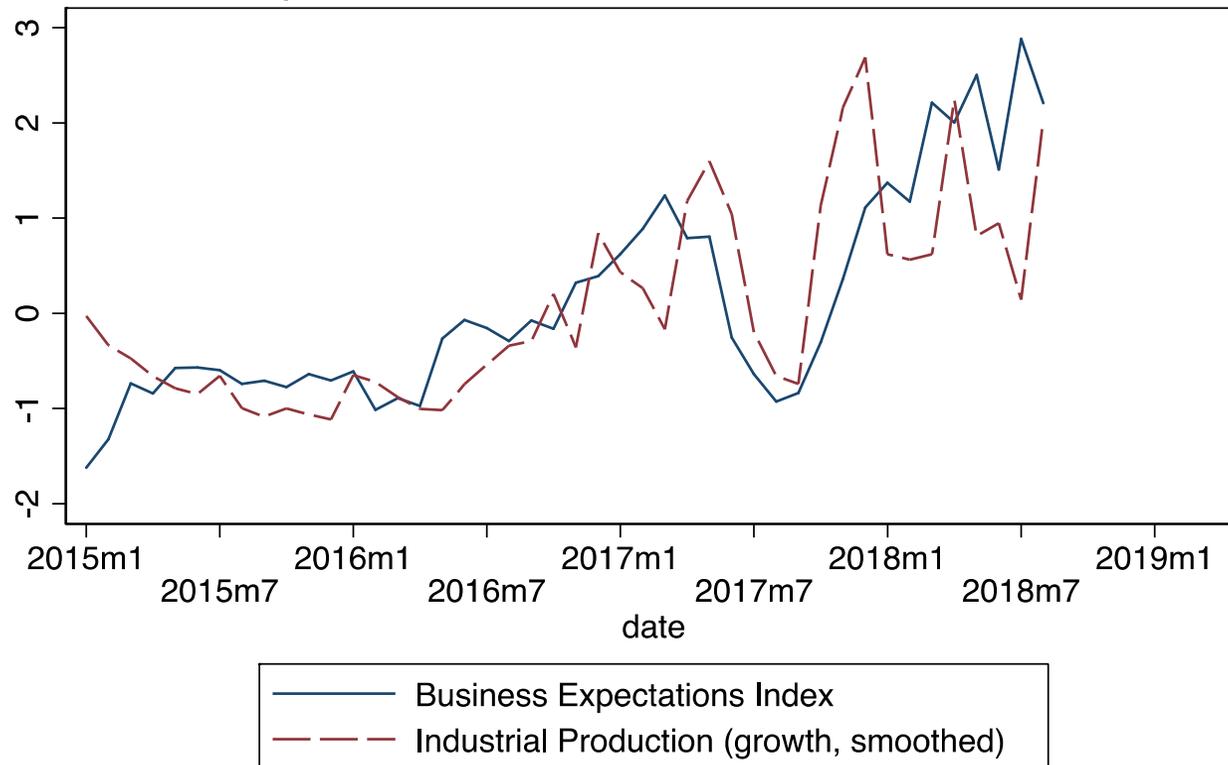
Business Expectations Index Compared To S&P 500 Movements



Notes: This figure shows our overall Business Expectations Index against standardized monthly S&P 500 returns between January 2015 and August 2018. We compute S&P 500 returns in month t as the growth rate of the dividend-adjusted S&P 500 Index (Source: Yahoo! Finance) between the 15th day of month $t-1$ and the 15th day of month t . If the 15th is not a trading day, we try the 16th, 14th, 17th, 13th, 18th, or 12th in that order. Then, we smooth this series of monthly S&P 500 returns using the same procedure as for our Business Expectations Index and standardize the series to have mean zero and unit standard deviation during the 42 months covering January 2015 and June 2018, inclusive.

Business Expectations Index Compared to Growth in the Industrial Production Index

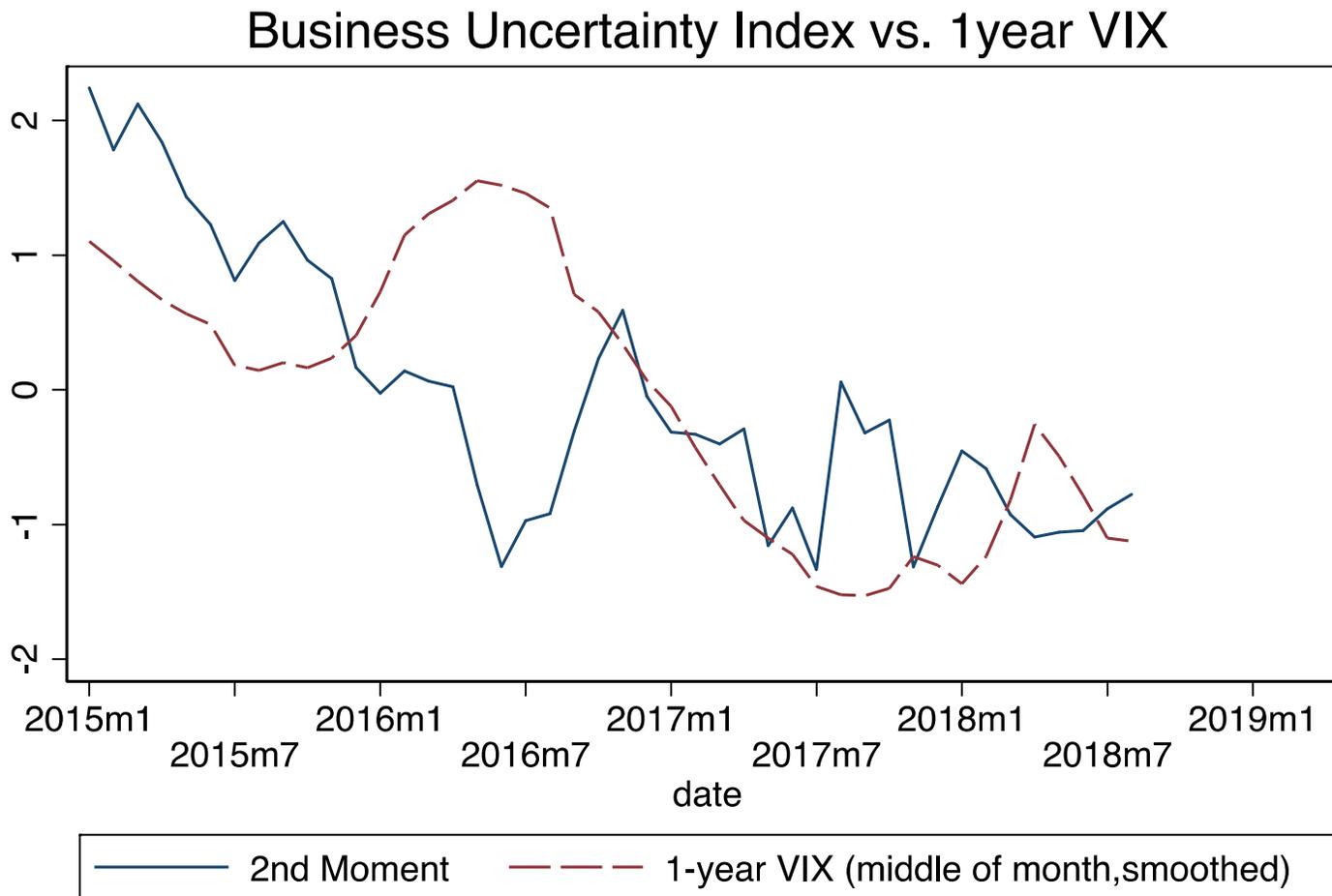
Business Expectations Index vs. Industrial Production Growth



Correlation .66

Notes: This figure shows our overall Business Expectations Index against the standardized monthly growth rate of the Industrial Production (IP) Index between January 2015 and August 2018. In each month we compute the growth rate of seasonally adjusted IP since the previous month and then smooth this series of growth rates using the same procedure as for our Business Expectations Index and standardize the series to have mean zero and unit standard deviation over the 42 months covering January 2015 to June 2018, inclusive.

Business Uncertainty Index Compared to the 1-year VIX



Notes: This figure shows our overall Business Uncertainty Index against the value of the 1-year VIX on the 15th day each month between January 2015 and August 2018 (Source: Yahoo! Finance). If the 15th is not a trading day, we try the 16th, 14th, 17th, 13th, 18th, or 12th in that order. We smooth the monthly VIX series using the same procedure as for our Business Uncertainty Index and standardize the series to have mean zero and unit standard deviation over the 42 month period covering January 2015 to June 2018, inclusive.

Correlation = .42

Appendix A. Screen Shots of Special Questions

July 2019 – 1 of 5

Asked in all versions of the questionnaire:

If a service provider:

Please provide some information about foreign sales and input purchases for your firm.

What percent of revenues from your firm's U.S. operations are due to foreign sales?

%

What percent of inputs used by your firm's U.S. operations are sourced from abroad?

%

If a goods producer:

Please provide some information about foreign production, sales, and input purchases for your firm.

What percent of your firm's production occurs outside the United States?

%

What percent of your firm's global revenues are due to foreign sales?

%

What percent of revenues from your firm's U.S. operations are due to foreign sales?

%

What percent of input supplies for its U.S. operations does your firm source from abroad?

%

July 2019 – 2 of 5

Asked at the end of the capital investment questionnaire:

Did tariff hikes and trade policy tensions cause your firm to cut or postpone capital expenditures in the first half of 2019?

Yes

No

If responded “yes” to prior question:

By roughly what percentage did your firm cut capital expenditures in the first half of 2019 due to tariff hikes and trade policy tensions? Please include any capital expenditures that your firm postponed to the second half of 2019 or later.

%

Did tariff hikes and trade policy tensions cause your firm to increase capital expenditures in the first half of 2019 or to bring capital expenditures forward in time to the first half of 2019?

Yes

No

If responded “yes” to prior question:

By roughly what percentage did your firm increase capital expenditures in the first half of 2019 due to tariff hikes and trade policy tensions? Please include any capital expenditures that your firm brought forward from the second half of 2019 or later.

%

July 2019 – 3 of 5

Asked at the end of the capital investment questionnaire:

Have recent tariff hikes and ongoing trade policy tensions caused your firm to re-assess or alter its capital expenditure plans for the second half of 2019?

Yes

No

How have they caused your firm to re-assess or alter its capital expenditure plans for the second half of 2019? Please check all that apply.

My firm is currently **reviewing** some of its capital expenditure plans.

My firm has **postponed** certain capital expenditures

My firm has **brought** certain capital expenditures **forward in time**

My firm has **dropped** previous plans for certain capital expenditures

My firm has **added** plans for new capital expenditures

What percentage of your planned capital expenditures for the second half of 2019 are under review?

%

What percentage of your previously planned capital expenditures for the second half of 2019 have been postponed?

%

What amount did your firm bring forward to the second half of 2019 as a percentage of its previously planned capital expenditures for the second half of 2019?

%

What percentage of your previously planned capital expenditures for the second half of 2019 did your firm drop?

%

How large are these newly added capital expenditures as a percentage of your previously planned capital expenditures for the second half of 2019?

%

July 2019 – 2 of 4

Asked at the end of the sales questionnaire:

What impact, if any, did recent tariff hikes and trade policy tensions have on your firm's sales revenue in the first half of 2019?

- Sales revenue in the first half of 2019 was **lower**
- Sales revenue in the first half of 2019 was **not impacted**
- Sales revenue in the first half of 2019 was **higher**

If responded “lower” to prior question:

By what percentage was your firm's sales revenue for the first half of 2019 lower due to tariff hikes and trade policy tensions?

 %

What impact, if any, have recent tariff hikes and trade policy tensions had on your firm's anticipated sales revenue for the second half of 2019?

- We anticipate **lower** sales revenue for the second half of 2019
- We anticipate **no impact** on sales revenue for the second half of 2019
- We anticipate **higher** sales revenue for the second half of 2019

If responded “lower” to prior question:

By what percentage do you anticipate your firm's sales revenue for the second half of 2019 will be lower due to recent tariff hikes and trade policy tensions?

 %

A similar follow-up question was asked for those who selected the “higher” response.

July 2019 – 4 of 4

Asked at the end of the employment questionnaire:

What impact, if any, did recent tariff hikes and trade policy tensions have on your firm's number of employees in the first half of 2019?

- My firm's number of employees in the first half of 2019 was **lower**
- My firm's number of employees in the first half of 2019 was **not impacted**
- My firm's number of employees in the first half of 2019 was **higher**

What impact, if any, have recent tariff hikes and trade policy tensions had on your firm's anticipated number of employees for the second half of 2019?

- We anticipate a **lower** number of employees for the second half of 2019
- We anticipate **no impact** on our number of employees for the second half of 2019
- We anticipate a **higher** number of employees for the second half of 2019

If responded “lower” to prior question:

By what percentage was your firm's number of employees for the first half of 2019 lower due to tariff hikes and trade policy tensions?

%

If responded “lower” to prior question:

By what percentage do you anticipate your firm's number of employees for the second half of 2019 will be lower due to recent tariff hikes and trade policy tensions?

%

A similar follow-up question was asked for those who selected the “higher” response.

June 2019

How many unfilled job openings did your firm have as of June 7, 2019?

Please give the number of openings at your firm that meet the following conditions:

- A specific position exists
- Work could start within 30 days
- You are actively seeking employees from outside your firm to fill the position(s)

In the past 30 days, has your firm changed the compensation it offers for open jobs?

We raised compensation for about	<input type="text"/> %
We lowered compensation for about	<input type="text"/> %
We made no compensation changes for about	<input type="text"/> %

In the past 30 days, has your firm changed the qualification requirements of its job openings?

We raised qualification requirements for about	<input type="text"/> %
We lowered qualification requirements for about	<input type="text"/> %
We made no change to qualification requirements for about	<input type="text"/> %

May 2019 – 1 of 2

Employment Questionnaire:

Roughly how many **employees** (including part-time) do you expect your firm to have in May of 2019, 2020, and 2021, respectively?

2019 number of employees

2020 number of employees

2021 number of employees

How would you describe the current level of uncertainty facing your firm?

Above average

Average

Below average

Sales Revenue Questionnaire:

Roughly what **sales revenue growth (percentage)** do you expect for your firm in calendar years 2019, 2020, and 2021?

2019 percentage sales revenue growth

 %

2020 percentage sales revenue growth

 %

2021 percentage sales revenue growth

 %

How would you describe the current level of uncertainty facing your firm?

Above average

Average

Below average

May 2019 – 2 of 2

Capital Investment Questionnaire:

Roughly what total dollar value of **capital investment expenditures** do you expect for your firm in calendar years 2019, 2020, and 2021?

2019 level of capital investment expenditures

\$

2020 level of capital investment expenditures

\$

2021 level of capital investment expenditures

\$

How would you describe the current level of uncertainty facing your firm?

Above average

Average

Below average

April 2019

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

March 2019 – 1 of 2

Asked at the end of the Capital Investment/Unit Cost Questionnaire:

Please provide an estimate of the book value of all property, plant, and equipment owned by your firm.

\$

Asked at the end of the Sales Revenue /Employment Questionnaire:

Are your firm's ownership shares traded on a stock exchange or in over-the-counter markets?

Yes

No

Who owns the largest share of your business? (Please choose one)

The current CEO

The family of the current CEO

A private equity or venture capital firm

Another firm headquartered in the United States

A foreign multinational

Outside investors who are unrelated to the current CEO (e.g., the company founder)

Other (please describe)

March 2019 – 2 of 2

Asked at the end of the Sales Revenue/Employment Questionnaire (Cont'd):

In which country is your parent firm headquartered?

Does your business operate under any trademarks or brand names authorized by a franchisor?

Yes, we are a franchisee-owned business

Yes, we are a franchisor-owned business

No

February 2019 – 1 of 2

Asked at the end of the Capital Investment/Unit Cost Questionnaire:

Please provide an estimate of the book value of all property, plant, and equipment owned by your firm.

\$

Asked at the end of the Sales Revenue/Employment Questionnaire:

Are your firm's ownership shares traded on a stock exchange or in over-the-counter markets?

Yes

No

Who owns the largest share of your business? (Please choose one)

The current CEO

The family of the current CEO

A private equity or venture capital firm

Another firm headquartered in the United States

A foreign multinational

Outside investors who are unrelated to the current CEO (e.g., the company founder)

Other (please describe)

February 2019 – 2 of 2

Asked at the end of the Sales Revenue/Employment Questionnaire (Cont'd):

In which country is your parent firm headquartered?

Does your business operate under any trademarks or brand names authorized by a franchisor?

Yes, we are a franchisee-owned business

Yes, we are a franchisor-owned business

No

January 2019 - 1 of 3

If a service provider:

Please provide some information about foreign sales and input purchases for your firm.

What percent of revenues from your firm's U.S. operations are due to foreign sales?

 %

What percent of inputs used by your firm's U.S. operations are sourced from abroad?

 %

If a goods producer:

Please provide some information about foreign production, sales, and input purchases for your firm.

What percent of your firm's production occurs outside the United States?

 %

What percent of your firm's global revenues are due to foreign sales?

 %

What percent of revenues from your firm's U.S. operations are due to foreign sales?

 %

What percent of input supplies for its U.S. operations does your firm source from abroad?

 %

Did tariff hikes and trade policy tensions cause your firm to cut or postpone capital expenditures in 2018?

 Yes No

By roughly what percentage did your firm cut capital expenditures in 2018 due to tariff hikes and trade policy tensions? Please include any capital expenditures that your firm postponed to 2019 or later.

 %

Did tariff hikes and trade policy tensions cause your firm to increase capital expenditures in 2018 or to bring capital expenditures forward in time?

 Yes No

By roughly what percentage did your firm increase capital expenditures in 2018 due to tariff hikes and trade policy tensions? Please include any capital expenditures that your firm brought forward from 2019 or later.

 %

January 2019 - 2 of 3

Did tariff hikes and trade policy tensions cause your firm to increase capital expenditures in 2018 or to bring capital expenditures forward in time?

Yes

No

By roughly what percentage did your firm increase capital expenditures in 2018 due to tariff hikes and trade policy tensions? Please include any capital expenditures that your firm brought forward from 2019 or later.

%

Have the tariff hikes in 2018 and ongoing trade policy tensions caused your firm to re-assess its capital expenditure plans for 2019?

Yes

No

January 2019 - 3 of 3

How have they caused your firm to re-assess its capital expenditure plans for 2019? Please check all that apply.

My firm is currently **reviewing** some of its capital expenditure plans.

My firm has **postponed** certain capital expenditures

My firm has **accelerated** certain capital expenditures

My firm has **dropped** previous plans for certain capital expenditures

My firm has **added** plans for new capital expenditures

What percentage of your planned capital expenditures in 2019 are under review?

Percentage of my 2019 capital expenditures under review is about %

What percentage of your planned capital expenditures in 2019 have been postponed?

Percentage of my 2019 capital expenditures that have been postponed is about %

What percentage of your planned capital expenditures in 2019 have been accelerated?

Percentage of my 2019 capital expenditures that have been accelerated is about %

What percentage of your planned capital expenditures in 2019 have been dropped?

Percentage of my 2019 capital expenditures that have been dropped is about %

How large are these newly added capital expenditures relative to your previous plans for 2019?

My newly added capital expenditures as a percentage of our previously planned capital expenditures for 2019 are about %

November/December 2018

When did your firm conclude its most recent fiscal year?

Month

Year

Did your firm retain a Certified Public Accountant to help prepare financial reports for the fiscal year that ended in February 2018?

Yes

No

Did your firm retain a Certified Public Accountant to audit its financial statements for the fiscal year that ended in February 2018?

Yes

No

Please tell us why your firm retained a Certified Public Accountant to audit its financial statements. Please check all that apply:

We are required by law

To help us develop higher quality information for internal use

Our creditors (e.g., our bank) require it

Our shareholders require it

Our suppliers require it

Our customers require it

October 2018

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

September 2018

Roughly what percentage of your firm's employees are paid on an hourly basis?

 %

Is the average hourly wage rate at your firm up, down or unchanged over the past 12 months?

up

down

unchanged

Do you expect the average hourly wage rate at your firm to be up, down or unchanged over the next 12 months?

up

down

unchanged

Respondents received a similar follow-up question if “down” was selected in the prior question:

By what percentage do you expect your firm's average hourly wage rate to rise over the next 12 months?

 %

August 2018 – 1 of 2

Presented only to firms in retail and wholesale trade:

Does your firm have a formal planning or forecasting process in place for the following?		
	Yes	No
Sales	<input type="radio"/>	<input type="radio"/>
Inventories	<input type="radio"/>	<input type="radio"/>
Employment	<input type="radio"/>	<input type="radio"/>
Pricing	<input type="radio"/>	<input type="radio"/>
Profit margins	<input type="radio"/>	<input type="radio"/>

Presented only to firms in manufacturing:

Does your firm have a formal planning or forecasting process in place for the following?		
	Yes	No
Sales	<input type="radio"/>	<input type="radio"/>
Production	<input type="radio"/>	<input type="radio"/>
Employment	<input type="radio"/>	<input type="radio"/>
Capital investment	<input type="radio"/>	<input type="radio"/>
Input costs	<input type="radio"/>	<input type="radio"/>

Presented only to firms not in retail and wholesale trade or manufacturing:

Does your firm have a formal planning or forecasting process in place for the following?		
	Yes	No
Sales	<input type="radio"/>	<input type="radio"/>
Employment	<input type="radio"/>	<input type="radio"/>
Pricing	<input type="radio"/>	<input type="radio"/>
Capital investment	<input type="radio"/>	<input type="radio"/>

August 2018 – 2 of 2

Response categories were only presented if respondent selected “yes” in the prior question. The retail and wholesale trade version is pictured below. A manufacturing and non–manufacturing/non–retail and wholesale trade version were also presented as appropriate:

How frequently does your firm update its plans or forecasts for the following?

	Daily	Weekly	Monthly	Quarterly	Semiannually	Annually	Less often than annually	Unsure
Sales	<input type="radio"/>	<input type="radio"/>						
Inventories	<input type="radio"/>	<input type="radio"/>						
Employment	<input type="radio"/>	<input type="radio"/>						
Pricing	<input type="radio"/>	<input type="radio"/>						
Profit margins	<input type="radio"/>	<input type="radio"/>						

Which planning or forecasting horizon(s) does your firm use for the following? (Please check all that apply)

	Less than one month ahead	1 month ahead	3 months ahead	6 months ahead	12 months ahead	More than 12 months ahead	Fiscal year	Unsure
Sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inventories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pricing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Profit margins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

July 2018 – 1 of 2

Presented to service providing firms:

Please provide some information about foreign sales and input purchases for your firm.

What percent of revenues from your firm's U.S. operations are due to foreign sales?

%

What percent of inputs used by your firm's U.S. operations are sourced from abroad?

%

Presented to goods producing firms:

Please provide some information about foreign production, sales, and input purchases for your firm.

What percent of your firm's production occurs outside the United States?

%

What percent of your firm's global revenues are due to foreign sales?

%

What percent of revenues from your firm's U.S. operations are due to foreign sales?

%

What percent of input supplies for its U.S. operations does your firm source from abroad?

%

Have recently announced tariff hikes or concerns about retaliation caused your firm to re-assess its capital expenditure plans?

No

Yes

July 2018 – 2 of 2

Presented if responded “yes” to tariff question on prior page:

How have recent tariff hikes or concerns about retaliation caused your firm to re-assess its capital expenditure plans? Please check all that apply.

My firm is currently **reviewing** some of its capital expenditure plans.

My firm has **postponed** certain capital expenditures

My firm has **accelerated** certain capital expenditures

My firm has **dropped** previous plans for certain capital expenditures

My firm has **added** plans for new capital expenditures



Presented follow-up questions based on response to prior question:

What percentage of your planned capital expenditures in 2018 and 2019 are under review?

Percentage of my 2018/2019 capital expenditures under review is about %

What percentage of your planned capital expenditures in 2018 and 2019 have been postponed?

Percentage of my 2018/2019 capital expenditures that have been postponed is about %

What percentage of your planned capital expenditures in 2018 and 2019 have been accelerated?

Percentage of my 2018/2019 capital expenditures that have been accelerated is about %

What percentage of your planned capital expenditures in 2018 and 2019 have been dropped?

Percentage of my 2018/2019 capital expenditures that have been dropped is about %

How large are these newly added capital expenditures relative to your previous plans for 2018 and 2019?

My newly added capital expenditures as a percentage of our previously planned capital expenditures for 2018/2019 are about %

June 2018

Respondents were randomly presented one of the two questions below:

During the next twelve months, by how much do you think prices will change for your competitors? Please provide a precise and quantitative answer in percentage terms.

percentage change

During the next twelve months, by how much do you think prices will change in your industry? Please provide a precise and quantitative answer in percentage terms.

percentage change

April 2018

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

March 2018 – 1 of 3

All firms received this question:

For tax purposes, what is your firm's legal form of organization?

Sole proprietorship

Partnership

Limited Liability Company

S-Corp

C-Corp

Other

Unsure

March 2018 – 2 of 3

Respondents were randomly presented with one of the two questions listed on this and the next slide.

Which of the following best describes the expected change in your firm's tax bill as a result of the recently enacted Tax Cuts and Jobs Act?

Increase of more than 10%

Increase of less than 10%

No change

Reduction of less than 10%

Reduction of more than 10%

Unsure

March 2018 – 3 of 3

Respondents were randomly presented with one of the two questions listed on this and the prior slide.

Those who selected the “not change” option in the first question below did not receive the subsequent question:

How do you expect your firm's tax bill will change as a result of the recently passed Tax Cuts and Jobs Act?

Tax bill will increase

Tax bill will not change

Tax bill will decrease

Unsure

What's your best estimate of the percentage by which the recently enacted Tax Cuts and Jobs Act will increase your firm's tax bill in 2018?

% increase in my firm's tax bill

How do you expect your firm's tax bill will change as a result of the recently passed Tax Cuts and Jobs Act?

Tax bill will increase

Tax bill will not change

Tax bill will decrease

Unsure

What's your best estimate of the percentage by which the recently enacted Tax Cuts and Jobs Act will decrease your firm's tax bill in 2018?

% decrease in my firm's tax bill

February 2018

How has the recently enacted Tax Cuts and Jobs Act led you to revise your plans for capital expenditures in 2018?

decrease capital expenditures by 10% or more

decrease capital expenditures by less than 10%

no material change to capital expenditures

increase capital expenditures by less than 10%

increase capital expenditures by more than 10%

How has the recently enacted Tax Cuts and Jobs Act led you to revise your plans for capital expenditures in 2019?

decrease capital expenditures by 10% or more

decrease capital expenditures by less than 10%

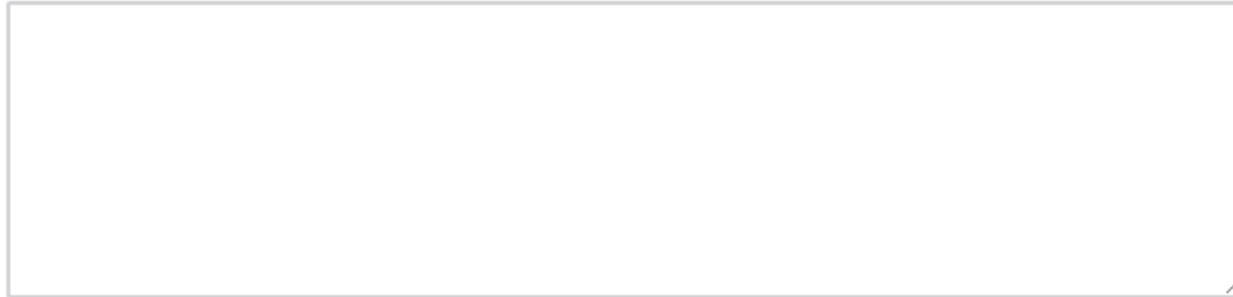
no material change to capital expenditures

increase capital expenditures by less than 10%

increase capital expenditures by more than 10%

January 2018

We would like you to think more generally about your firm. Looking ahead into 2018, what are the biggest areas of concern? (detailed descriptions are helpful)

A large, empty rectangular box with a thin grey border, intended for the user to provide detailed descriptions of their biggest areas of concern for 2018. The box is currently blank.

December 2017

Please rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Please rate your optimism about the U.S. economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

November 2017

If passed in its current form, how would the Tax Cuts and Jobs Act affect your capital expenditures in 2018?

decrease capital expenditures by 10% or more

decrease capital expenditures by less than 10%

no material change to capital expenditures

increase capital expenditures by less than 10%

increase capital expenditures by 10% or more

October 2017

SE Version

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

CC Version

Please provide an estimate of the book value of all property, plant, and equipment owned by your firm.

\$

September 2017

SE Version

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

CC Version

Please provide an estimate of the book value of all property, plant, and equipment owned by your firm.

\$

March 2017

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

February 2017

Please indicate the level of influence each of the following might have on your capital expenditure and/or employment decisions over the next 12 months:

	little/no influence	some influence	significant influence
regulatory changes, including healthcare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
wage and salary growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
interest rate changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
global economic growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
trade policy changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
demand for my product or service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
strength of the dollar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
tax policy changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

January 2017

In what year did your firm hire its first paid employee? If you do not know the precise year, please give your best estimate.

December 2016

How did the recent U.S. Presidential and Congressional election outcomes affect your firm's capital expenditure plans for the next twelve months?

They prompted my firm to raise its planned capital expenditures by more than 10%.

They prompted my firm to raise its planned capital expenditures by less than 10%.

They did not prompt my firm to materially change its planned capital expenditures.

They prompted my firm to lower its planned capital expenditures by less than 10%.

They prompted my firm to lower its planned capital expenditures by more than 10%.

November 2016

CC Version

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

+6 percent or more	<input type="text" value="0"/> %
+5.0 to +5.9 percent	<input type="text" value="0"/> %
+4.0 to +4.9 percent	<input type="text" value="0"/> %
+3.0 to +3.9 percent	<input type="text" value="0"/> %
+2.0 to +2.9 percent	<input type="text" value="0"/> %
+1.0 to +1.9 percent	<input type="text" value="0"/> %
+0.0 to +0.9 percent	<input type="text" value="0"/> %
-1.0 to -0.1 percent	<input type="text" value="0"/> %
-2.0 to -1.1 percent	<input type="text" value="0"/> %
-3.0 to -2.1 percent	<input type="text" value="0"/> %
Decline more than 3 percent	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

SE Version

Please indicate what probabilities you would attach to the various possible year-ahead percentage changes in U.S. economic output (Real Gross Domestic Product). (Results should sum to 100%)

4 percent or more	<input type="text" value="0"/> %
3 percent	<input type="text" value="0"/> %
2 percent	<input type="text" value="0"/> %
1 percent	<input type="text" value="0"/> %
0 percent	<input type="text" value="0"/> %
-1 percent	<input type="text" value="0"/> %
-2 percent or less	<input type="text" value="0"/> %
Total	<input type="text" value="0"/> %

October 2016

Looking ahead, from now to 12 months from now, what do you think will happen to overall US economic growth?

grow at a faster pace than it is currently

continue growing at the same pace

grow at a slower pace than it is currently

unsure

Looking ahead, from now to 12 months from now, what do you think will happen to your industry's growth?

grow at a faster pace than it is currently

continue growing at the same pace

grow at a slower pace than it is currently

unsure

September 2016

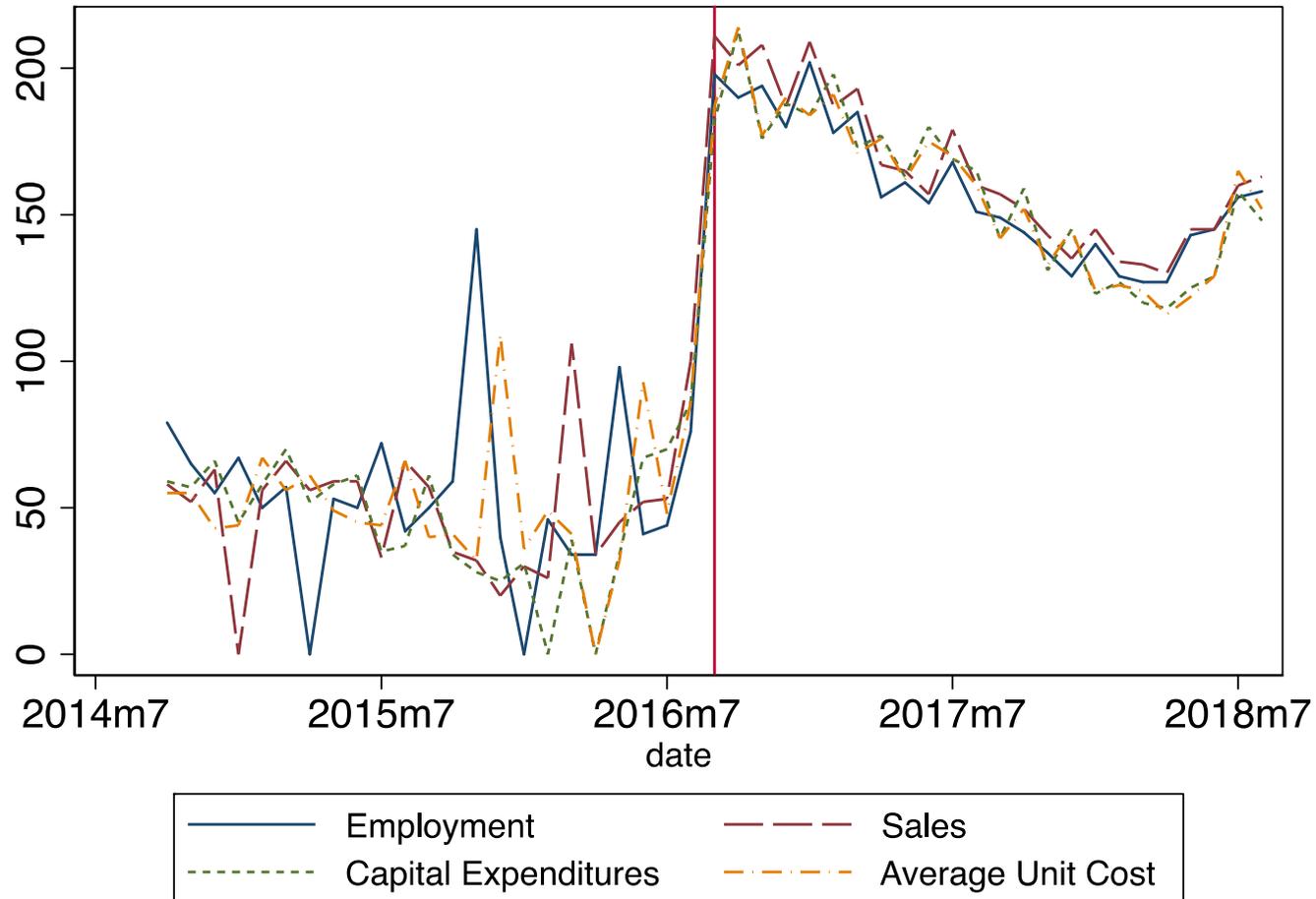
Is uncertainty related to the upcoming presidential election materially affecting your current business decisions?

Yes

No

In what way(s) is uncertainty related to the upcoming presidential election affecting your current business decisions? (specific examples are helpful)

Appendix B Survey Responses by Topic and Month



Notes: The chart at left shows the number of usable responses in the *Survey of Business Uncertainty by topic and month*. We include all survey responses for which we can construct a subjective probability distribution over the growth rate of EMPLOYMENT (12 months hence), SALES REVENUE (four quarters hence), CAPITAL EXPENDITURES (four quarters hence), or AVERAGE UNIT COST (12 months hence). See slides 23–28 for details on constructing these subjective distributions over growth rates. The vertical line corresponds to September 2016 when we last changed our survey methodology and expanded the sample.

Appendix B. Nonresponse Rate by Item, Conditional on Survey Response

I. Employment

Current Level	Past Level	Employment Level Estimate 12 months hence					Probability				
		Bin 1	Bin 2	Bin 3	Bin 4	Bin 5	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5
0.012	0.001	0.006	0.008	0.006	0.009	0.007	0.007	0.006	0.0006	0.006	0.006

II. Capital Expenditures

Current Level	Past Level	CapEx Level Estimate four quarters hence					Probability				
		Bin 1	Bin 2	Bin 3	Bin 4	Bin 5	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5
0.003	0.003	0.012	0.013	0.010	0.014	0.012	0.010	0.010	0.010	0.010	0.010

Notes: Fraction of missing responses by item, conditional on responding to the survey, in the Survey of B business uncertainty for the period between September 2016 and October 2018.

III. Sales

Current Level	Growth Rate, Past 4 Quarters	Sales Growth Rate Estimate over next four quarters					Probability				
		Bin 1	Bin 2	Bin 3	Bin 4	Bin 5	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5
0.012	0.004	0.012	0.012	0.012	0.012	0.012	0.015	0.015	0.015	0.015	0.015

IV. Average Unit Cost

Growth Rate, Past 4 Quarters	Average Unit Cost Growth Rate Estimate over next four quarters					Probability				
	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5
0.005	0.027	0.027	0.027	0.027	0.027	0.029	0.029	0.029	0.029	0.029

Notes: Fraction of missing responses by item, conditional on responding to the survey, in the Survey of Business Uncertainty for the period between September 2016 and January 2018.

Appendix C Field Testing Details

Panel	Date	Variable(s)	Abbreviated description	Description
BIE Survey Panel – Special Question Series	Oct-13	sales levels	A/B test. three-estimate and five-binned range versions.	Participants were randomly assigned to one of two panels. Panel 1 received a question eliciting the "best," "most likely," and "worst" case change in sales levels over the next 12 months. A drop-down box was provided with estimates ranging from -15% to 30%. Panel 2 received a question asking respondents to assign a likelihood to five potential percentage sales level change ranges (from "less than -1%" to "more than 5%") over the next 12 months.
	Nov-13	sales levels	A/B test.	Participants were randomly assigned to one of two panels. Panel 1 received a question eliciting the "best," "most likely," and "worst" case change in sales levels over the next twelve months. For each estimate a drop-down box was provided with options ranging from -15% to 30%. A note indicating "best" and "worst" case scenarios should be associated with a 10% chance of occurrence was included. Panel 2 received a question asking respondents to assign a likelihood to five potential percentage sales level change ranges (ranging from "less than -5%" to "more than 25%") over the next 12 months.
	Dec-13	unit costs	A/B test	Participants were randomly assigned to one of two panels. Panel 1 received a question eliciting the "best," "middle," and "worst" case percentage change in unit costs over the next 12 months. Panel 2 received a question asking respondents to assign a likelihood to five potential percentage unit cost change ranges (from "less than -1%" to "more than 5%") over the next 12 months.
	Jan-14	sales levels	three estimates	Participants received a two-part question. Part one elicited the expected "low," "middle," and "high" case changes in sales levels over the next twelve months. Part two asked respondents to assign a likelihood of occurrence for each of the three scenarios.
	Feb-14	number of employees	three estimates	Participants received a two-part question. Part one elicited the expected "low," "middle," and "high" case number of employees twelve months ahead. Part two asked respondents to assign a likelihood of occurrence for each of the three scenarios.
	Mar-14	sales levels	three estimates	Repeat of the January 2014 question.
	Apr-14	sales levels	five estimates	The same question as in January and March 2014 with the addition of a "worst case" and "best case" scenario for a total of five response categories.
	May-14	number of employees	five estimates	The same question as in February 2014 with the addition of a "worst case" and "best case" scenario for a total of five response categories.
	Jun-14	sales levels	three estimates with a best case/worst case follow-up	Repeat of the January 2014 question with a follow-up question asking for the "best case" and "worst case" scenarios without a likelihood assignment.

Appendix C Field Testing Details

Panel	Date	No. of Panels	Variable(s)	Notes	Description
Survey of Business Uncertainty Panel	Jul-14	2	number of employees, average price, sales revenue	A/B Test – 5 estimate and 3 estimate versions with drop down boxes for estimates and open text boxes for likelihoods	Participants were randomly assigned to one of two panels. In each panel, respondents received a two-part question for each variable. Panel 1: Part one elicited the "high," "medium," and "low" case change in each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios. Panel 2: Same format as Panel 1 with two additional scenarios eliciting the "lowest case" and "highest case."
	Aug-14	2	sales revenue, average price, number of employees, unit cost, capital investment, profit margin	five estimates with drop down box for estimates and open text box for likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "medium," "low," and "lowest" case change in each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.
	Sep-14	2	sales revenue, average prices, unit cost, capital investment	five estimates with open text boxes for estimates and likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "medium," "low," and "lowest" case change in each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.
	Oct-14 to Jan-15	3	sales revenue, average price, number of employees, unit cost, capital investment, profit margin	five estimates with open text boxes for estimates and likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "medium," "low," and "lowest" case change in each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.
	Feb-15 to Oct-15	3	sales revenue, average price, number of employees, unit cost, capital investment, profit margin	five estimates with open text boxes for estimates and likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "medium," "low," and "lowest" case change in each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.
	Nov-15 to Jan-16	6	sales revenue, average price, number of employees, unit cost, capital investment, profit margin	five estimates with open text boxes for estimates and likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "middle," "low," and "lowest" case change in each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.
	Feb-16 to Aug-16	6	sales revenue, average price, number of employees, unit cost, capital investment, profit margin	five estimates with open text boxes for estimates and likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "middle," "low," and "lowest" value for each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.
	Sep-16 to Present	2	sales revenue, average unit cost, capital expenditures, number of employees	five estimates with open text boxes for estimates and likelihoods	Participants received a two-part question for each variable. Part one elicited the "highest," "high," "middle," "low," and "lowest" value for each variable over the next 12 months. Part two asked respondents to assign a likelihood to each of these scenarios.

Appendix D Obtaining Realizations and Forecast Errors

- Consider a firm's subjective mean employment growth in month t , looking 12 months ahead ($Mean(EGr)$).
- We measure the firm's realized employment growth $Realized(EGr)$ as follows:
 - We record its realized employment level in month $t+12$, $CEmp_{t+12}$.
 - We record $Realized(EGr) = 2 * (CEmp_{t+12} - CEmp_t) / (CEmp_{t+12} + CEmp_t)$.
 - If $CEmp_{t+12}$ is missing, we use $CEmp_{t+11}$ and define $Realized(EGr) = 2 * (CEmp_{t+11} - CEmp_t) / (CEmp_{t+11} + CEmp_t) * 12/11$.
 - If $CEmp_{t+11}$ is also missing, we use $CEmp_{t+13}$ and record $Realized(EGr) = 2 * (CEmp_{t+11} - CEmp_t) / (CEmp_{t+11} + CEmp_t) * 12/13$.
 - If $CEmp_{t+13}$ is also missing, we use the same formula with $CEmp_{t+10}$, or with $CEmp_{t+14}$ as a last resort.
- We record the firm's forecast error for employment growth looking 12 months ahead = $Mean(EGr) - Realized(EGr)$.

- Consider a firm's subjective mean Sales growth in month t of quarter q , looking 4 quarters ahead ($Mean(SaleGr)$).
- We measure the firm's realized sales growth, $Realized(SaleGr)$, as follows:
 - We record its current quarterly sales level reported in month $t+12$, $CSale_{t+12}$.
 - We record $Realized(SaleGr) = 2 * (CSale_{t+12} - CSale_t) / (CSale_{t+12} + CSale_t)$.
 - If $CSale_{t+12}$ is missing, we proceed differently depending on whether t is the first, second, or third month of the quarter.
 - If t is the first month of the quarter, we then try $CSale_{t+13}$ and $CSale_{t+14}$ in that order.
 - If t is the second month of the quarter, we then try $CSale_{t+11}$ and $CSale_{t+13}$ in that order.
 - If t is the third month of the quarter, we then try $CSale_{t+11}$ and $CSale_{t+10}$ in that order.
 - This procedure ensures that we use the level of quarterly sales reported in quarter $q+4$, though not necessarily in month $t+12$.
- We record the firm's forecast error for sales growth looking four quarters ahead = $Mean(SaleGr) - Realized(SaleGr)$

- Consider a firm's subjective mean investment rate looking four quarters ahead, as recorded in month t of quarter q ($Mean(InvRate)$).
- We measure the firm's realized investment rate in quarter $q+4$ $Realized(InvRate)$ as follows:
 - We record their current quarterly capital expenditures level reported in month $t+12$, $CCap_{t+12}$.
 - We record $Realized(InvRate) = CCap_{t+12}/K_t$. Here we use K_t rather than K_{t+12} to focus on changes in investment rather than changes in (potentially mis-measured) capital stocks. This is symmetrical with how we construct expectations of future investment $Mean(InvRate)$ in Appendix A.
 - If $CCap_{t+12}$ is missing, we proceed differently depending on whether t is the first, second, and third month of the quarter.
 - If t is the first month of the quarter, we then try $CCap_{t+13}$ and $CCap_{t+14}$ in that order.
 - If t is the second month of the quarter, we then try $CCap_{t+11}$ and $CCap_{t+13}$ in that order.
 - If t is the third month of the quarter, we then try $CCap_{t+11}$ and $CCap_{t+10}$ in that order.
 - This procedure ensures that we use the level of quarterly capital expenditures reported in quarter $q+4$, though possibly not in month $t+12$.
- We record the firm's forecast error for capEx growth looking four quarters ahead = $Mean(InvRate) - Realized(InvRate)$.

Appendix E. Measuring Capital Stocks

- In September and October 2017 as well as February and March 2019 we included the following special question with the CC (Capex/Unit Costs) questionnaire:

Please provide an estimate of the book value of all property, plant, and equipment owned by your firm.

\$

- We thus have data on our respondents' capital stock (PPENT) during at most two survey waves.
- Our goal is to approximate firm's actual investment rates $\left(\frac{I}{K}\right)_t$ in quarter t , as well as their expectations and uncertainty for future investment from the standpoint of quarter t : $E_t \left[\left(\frac{I}{K}\right)_{t+4} \right]$, $SD_t \left[\left(\frac{I}{K}\right)_{t+4} \right]$ in all survey waves.

- We impute the firm's capital stock based on the responses to the special questions from September/October 2017 and February/March 2019 as follows:
 - Case 1. We observe a firm's reported capital stock once:
In this case we impute the capital stock $K_t = K$, the reported capital stock for all survey waves t the firm participates in.
 - Case 2. We observe a firm's reported capital stock twice, once in 2017 and once in 2019:
 - In months prior to the first observation, we impute $K_t = K_1$, the first reported capital stock.
 - In months between the two observations, we impute $K_t = w_t * K_1 + (1 - w) * K_2$ where $w_t = (D_2 - t) / (D_2 - D_1)$, $D_i, i = 1, 2$ is an integer representing the month in which we observe a reported capital stock, and $D_1 < t < D_2$.
 - Case 3. We do not observe the firm's reported capital stock in any survey wave:
 - We impute K_t based on a regression $\log K_{ft} = \alpha_s + \alpha_t + \beta \log E_{ft} + \varepsilon_{ft}$ where f indexes firms, s indexes sectors, and t indexes dates and E = employment. Our estimate for $\hat{\beta} = 1.009(0.013)$ and the R-squared of the regression is 0.432.
- After these imputations we have a (rough) measure of K for most survey responses.
- We winsorize our measure of K at the 1st and 99th percentile before running the procedure in case 3.