

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

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August 2023

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.

# August 2023 updates and revisions

In August 2023, we engaged in our annual data revision of the Survey of Business Uncertainty (SBU) and refreshed our methodology.

The changes that we implemented are the following:

- We extended the period from which we obtain winsorization thresholds for firm-level expectations and uncertainty up to December 2022 (previously the period ended in December 2021).
- We engaged in our annual cleaning process to account for extremely large forecast errors and units issues.
- The results of our annual data revision can be seen on slides 36-39.

# 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
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9. Data Cleaning
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# 1. Overview

Our monthly Survey of Business Uncertainty (SBU) goes to about 1,600 panel members (as of August 2023), 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 and employment levels.
- 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.
- Historically, the SBU included capital investment, unit costs, profit margin and average price questions. Over time, 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 August 2020.

# 3. Recruitment of SBU Panel Members

We aim for a panel of firms that is broadly representative of the distribution of activity in the U.S. by size and industry. In addition, we aim for broad geographic coverage of the United States. To do so, we identify prospective panel members from lists of firms and contacts that we purchased from Dunn & 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 49 percent of potential contacts reached via telephone or email agree to join the panel. Conditional on joining, 66 percent responded at least once. Our average monthly response rate is 45 percent.

Note: The panel membership statistic reflects all recruiting from June 2014 to August 2020. Response rates reflect the period from September 2016 (the last methodological change) to August 2023.

# 4. Assignment of Panel Members to Sample Groups

As detailed below, the SBU current makes use of two questionnaires:

- The Sales questionnaire asks about sales revenue growth.
- The Employment questionnaire asks about number of employees.

We randomly assign each new panel member to each sample group:

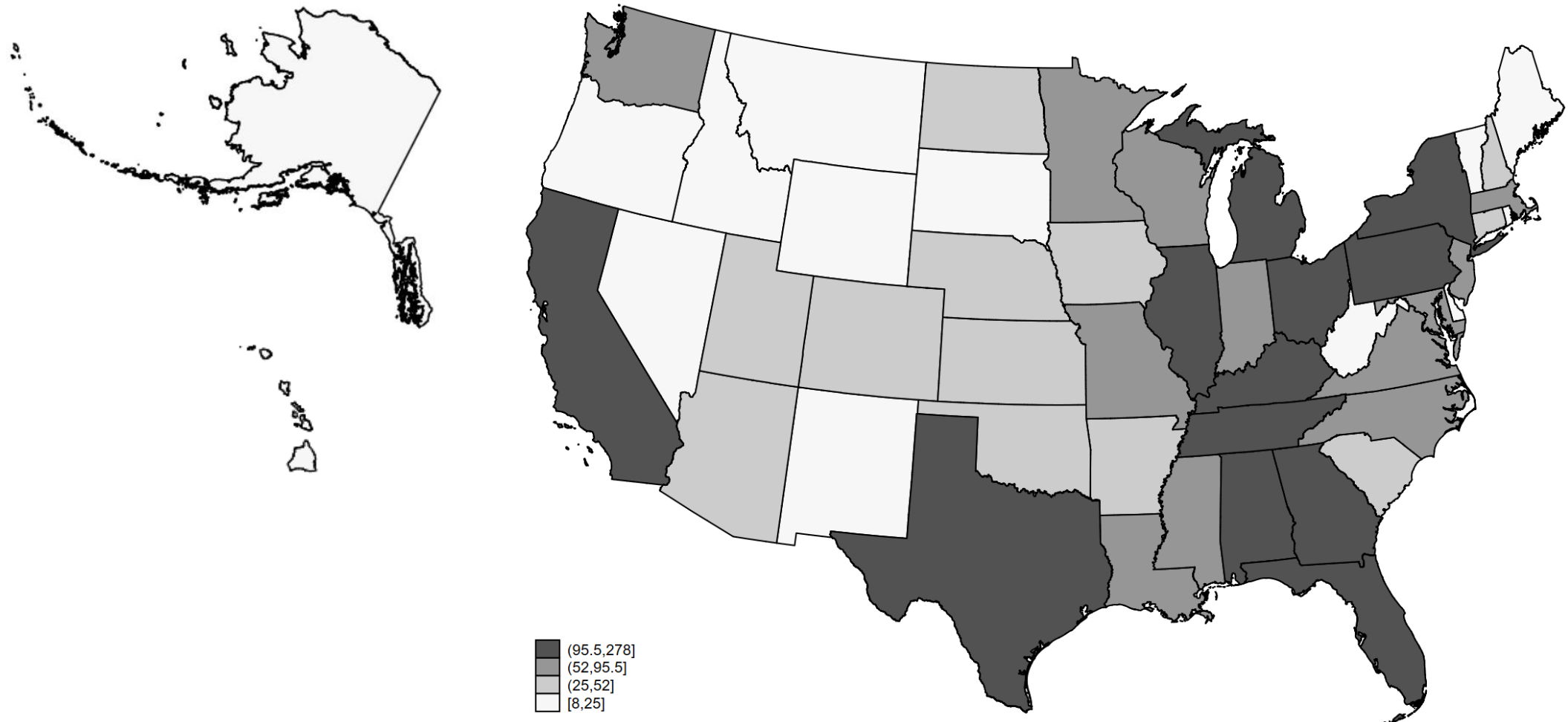
- Members of Group A (B) receive the Sales (Employment) questionnaire in even-numbered months and the Employment (Sales) questionnaire in odd-numbered months.
- In addition to our core question, we often add one or more special questions.

In May 2019, we retired the questions on unit costs and reassigned panel members to one of three groups. Each group answers questions about one of employment, sales, or investment in any given month.

In August 2020, we retired the questions on capital expenditures and reassigned panel members back into two groups.

# 5. Panel Composition

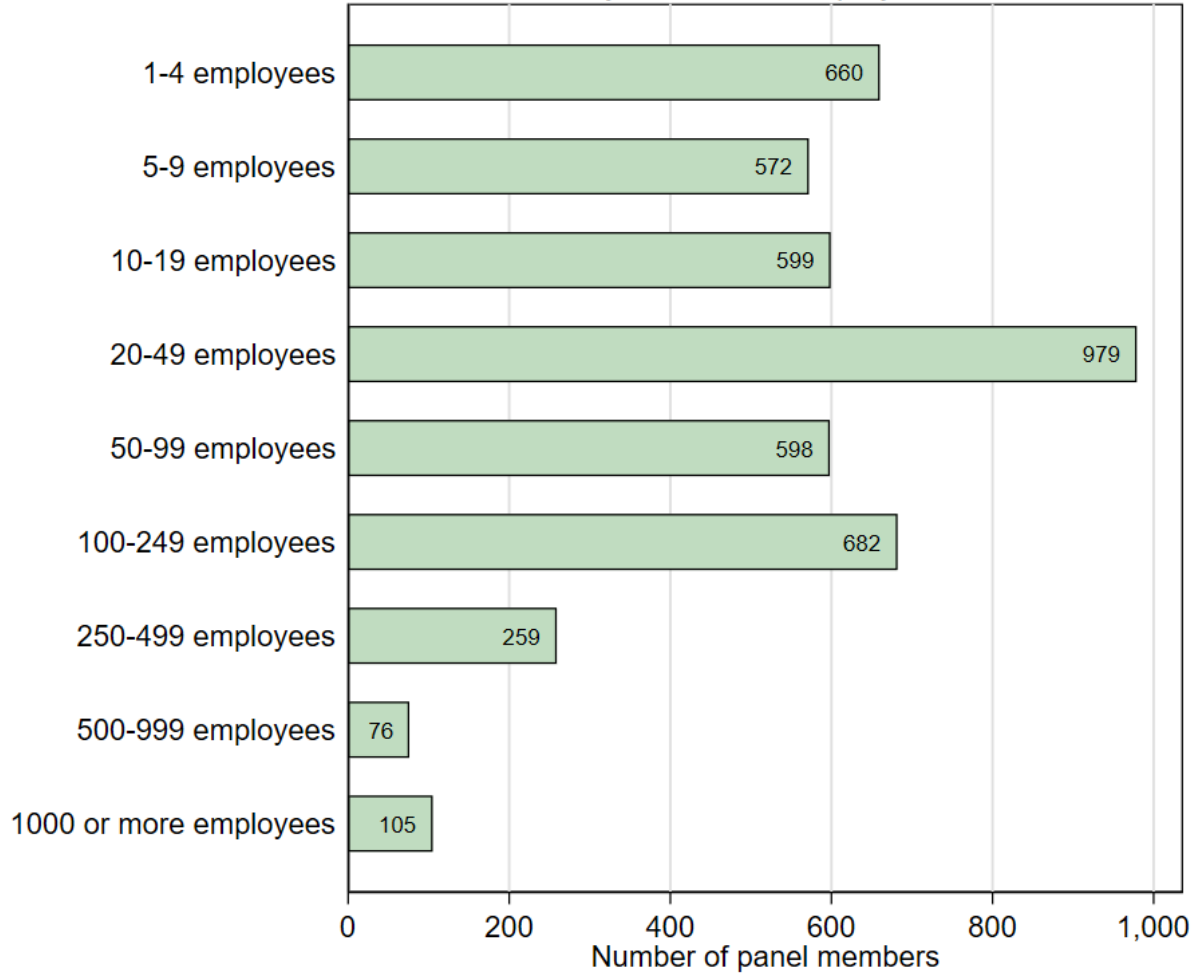
This slide shows the geographic distribution of panel members as of August 2023. The next slide reports the distribution of panel members by industry and firm size (number of employees) as of August 2023.



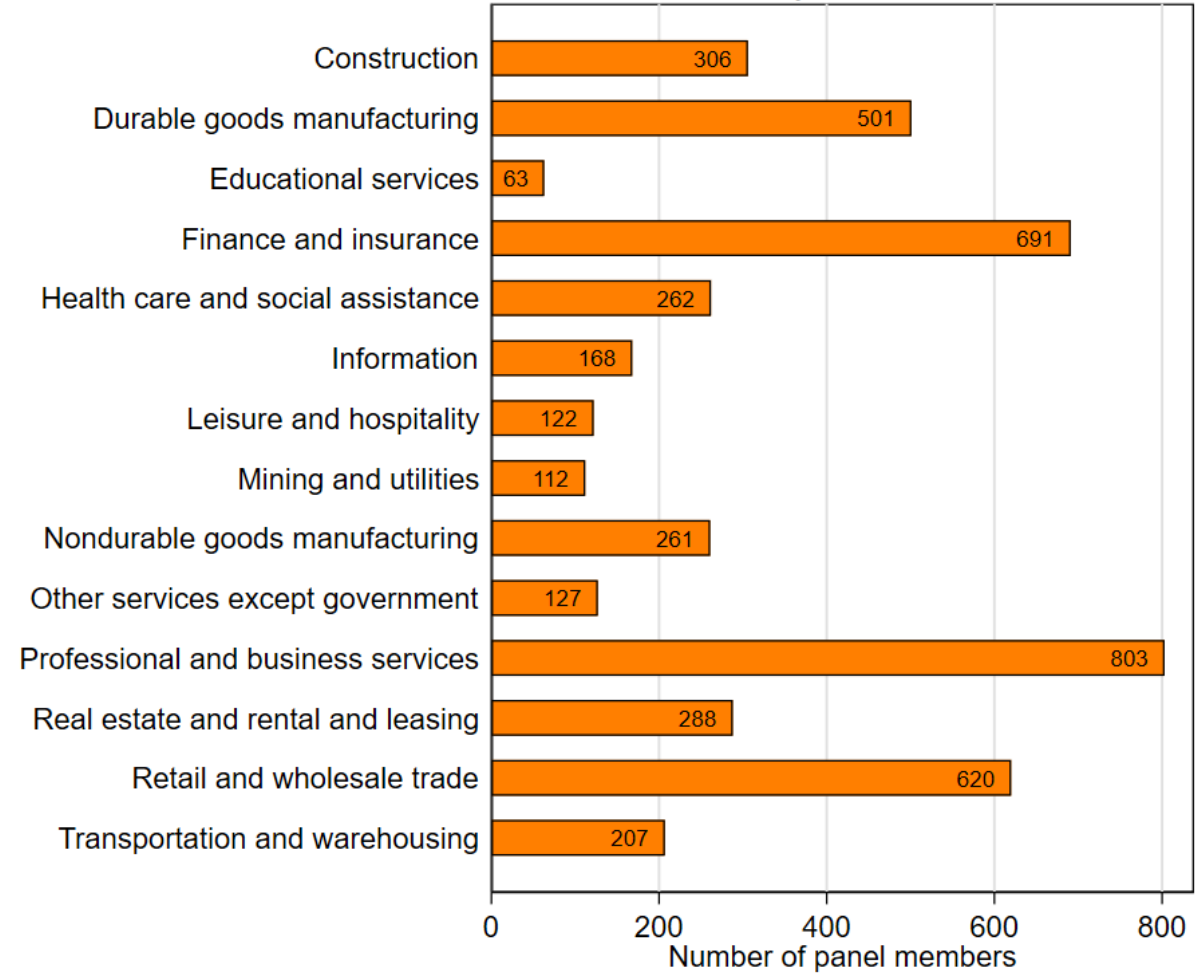


# 5. Panel Composition (Cont'd) As of August 2023

By Number of Employees



By Sector



## 6. SBU Questionnaires

- The next four slides display screen shots of the questionnaires.
- To reduce data entry errors by respondents, we modified the sales-related questions in September 2016, as shown below.
- In April 2019, we retired the unit cost questionnaire.
- In August 2020, we retired the capital expenditures questionnaire (See Appendix D for details).

# Sales Revenue Questionnaire

SBU

Survey of Business Uncertainty

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University

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

\$

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

%

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"/> % |

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

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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"/> |

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

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

# 7. Survey Response Rates

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## Response Rates\*

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Conditional on joining the panel,  
percentage of panel members who:

|                               |     |
|-------------------------------|-----|
| Respond at least once         | 62% |
| Respond at least two times*   | 44% |
| Respond at least three times* | 37% |
| Respond at least four times*  | 32% |

\*Calculated from September 2016 to July 2023  
using panel members who received at least  
one questionnaire since September 2016.

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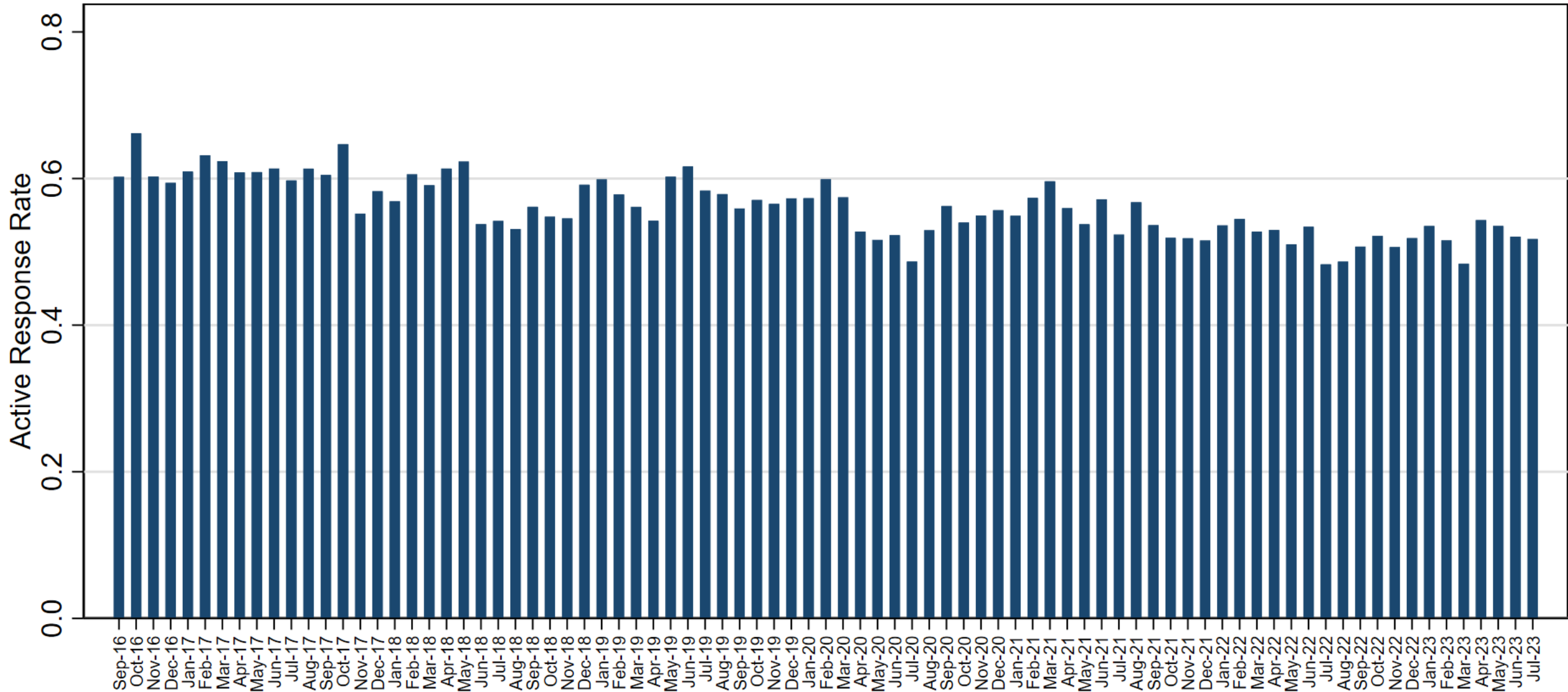
## Average Monthly Response Rates (September 2016 – July 2023)

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|                                      |     |
|--------------------------------------|-----|
| All firms                            | 42% |
| By Firm Size,<br>Number of employees |     |
| 1–4                                  | 31% |
| 5–9                                  | 30% |
| 10–19                                | 35% |
| 20–49                                | 37% |
| 50–99                                | 50% |
| 100–249                              | 51% |
| 250–499                              | 49% |
| 500–999                              | 45% |
| 1,000 or more                        | 44% |

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# 7. Active Monthly Response Rates



Note: Active respondents at time  $t$  are firms that have completed (and provided a valid forecast) any of the standard surveys at least once between  $t-1$  and  $t-6$



# 7. Responses by Sector

| Sector                             | Surveys Sent | Responses | Nonresponse | Response Rate* |
|------------------------------------|--------------|-----------|-------------|----------------|
| Construction                       | 5,501        | 2,298     | 3,203       | 41.8%          |
| Durable goods manufacturing        | 11,589       | 5,487     | 6,102       | 47.3%          |
| Educational services               | 1,371        | 398       | 973         | 29.0%          |
| Finance and insurance              | 11,435       | 5,238     | 6,197       | 45.8%          |
| Health care and social services    | 5,353        | 1,618     | 3,735       | 30.2%          |
| Information                        | 2,388        | 924       | 1,464       | 38.7%          |
| Leisure and hospitality            | 1,978        | 991       | 987         | 50.1%          |
| Mining and utilities               | 3,398        | 1,584     | 1,814       | 46.6%          |
| Nondurable goods manufacturing     | 4,038        | 1,683     | 2,355       | 41.7%          |
| Other services                     | 2,142        | 869       | 1,273       | 40.6%          |
| Professional and business services | 12,875       | 5,417     | 7,458       | 42.1%          |
| Real estate and rental and leasing | 2,912        | 1,140     | 1,772       | 39.1%          |
| Retail and wholesale trade         | 10,495       | 4,269     | 6,226       | 40.7%          |
| Transportation and warehousing     | 3,467        | 1,326     | 2,141       | 38.2%          |

**Notes:** Responses by sector in the Survey of Business Uncertainty, pooling across all firms and months since 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 18 for a note on how we compute growth rates throughout this document. Also see slides 18-21 for details on constructing these subjective distributions over growth rates.

\*Response rate = (partial + complete responses) / surveys sent. Includes survey distributions from September 2016 (the last methodological change) to July 2023. Noncontact includes bounced or undeliverable email invitations.

# 8. Computing Moments of the Firm-Level Subjective Probability Distributions

- The next set of 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 and sales revenue 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  $g_t = 2(x_t - x_{t-1}) / (x_t + x_{t-1})$ .\*

\* 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.

# 8. 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

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

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

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

# 8. Sales Revenue (Current Sales 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

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

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

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

# 8. Sales Revenue (Old 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

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

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

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

# 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 more than 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                    | 16,077 | 323  | 829                | 8           | 30  | 97  | 243  | 555  |
| Current Quarterly Sales (\$ Millions) | 15,568 | 28.0 | 78.5               | 0.3         | 1.4 | 5.2 | 17.0 | 54.5 |

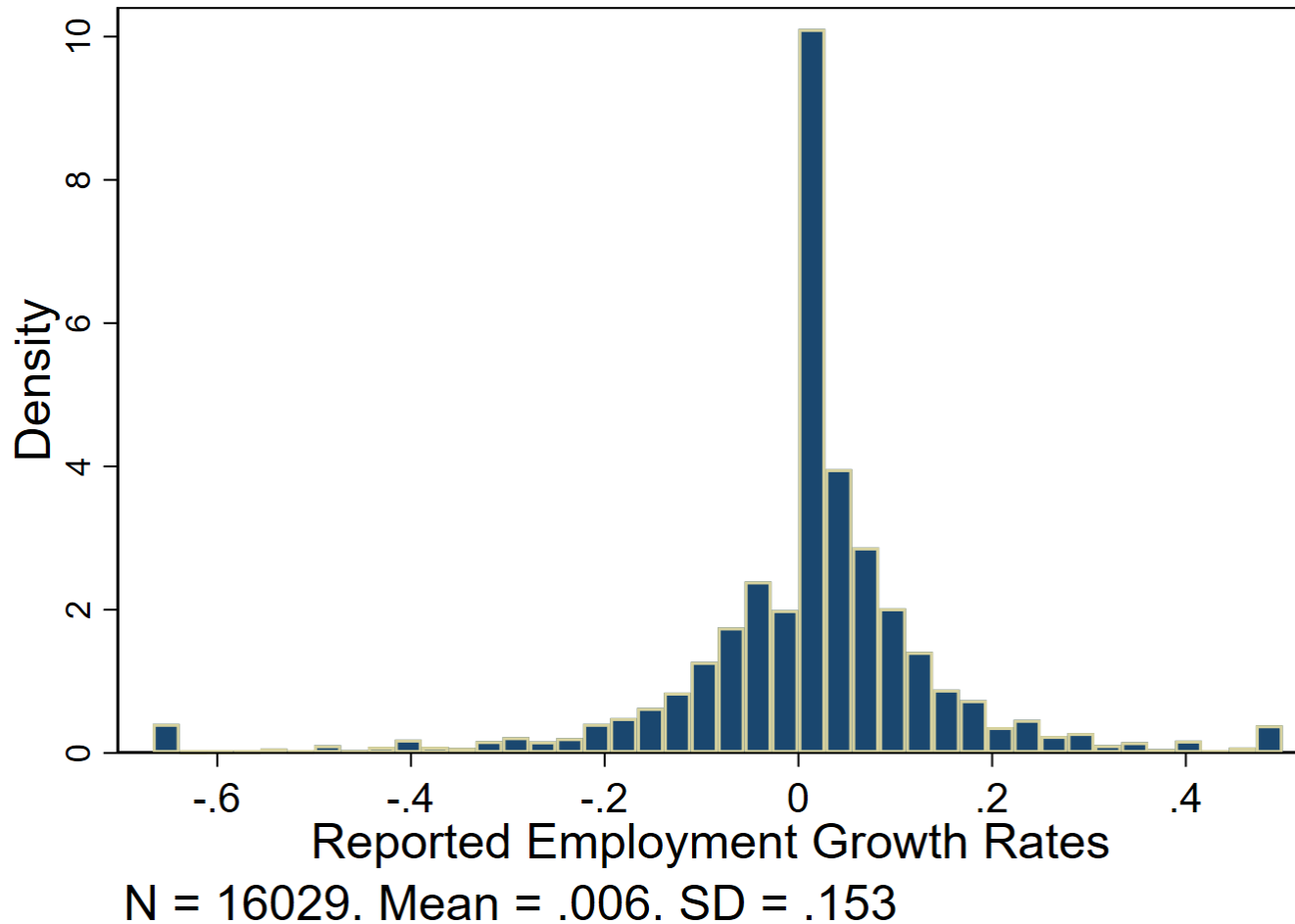
## Past Activity

| Variable                              | Count  | Mean  | Standard Deviation | Percentiles |        |       |       |       |
|---------------------------------------|--------|-------|--------------------|-------------|--------|-------|-------|-------|
|                                       |        |       |                    | 10          | 25     | 50    | 75    | 90    |
| Employment Growth, from 12 Months Ago | 16,029 | 0.006 | 0.154              | −0.133      | −0.036 | 0.000 | 0.067 | 0.149 |
| Sales Growth, from Four Quarters Ago  | 15,665 | 0.035 | 0.233              | −0.140      | 0.000  | 0.037 | 0.010 | 0.214 |

**Notes:** The sample contains all firm–level responses from October 2014 to July 2023 for which we can construct subjective probability distributions over the growth rates of future employment (12 months hence), sales revenue (four quarters hence),



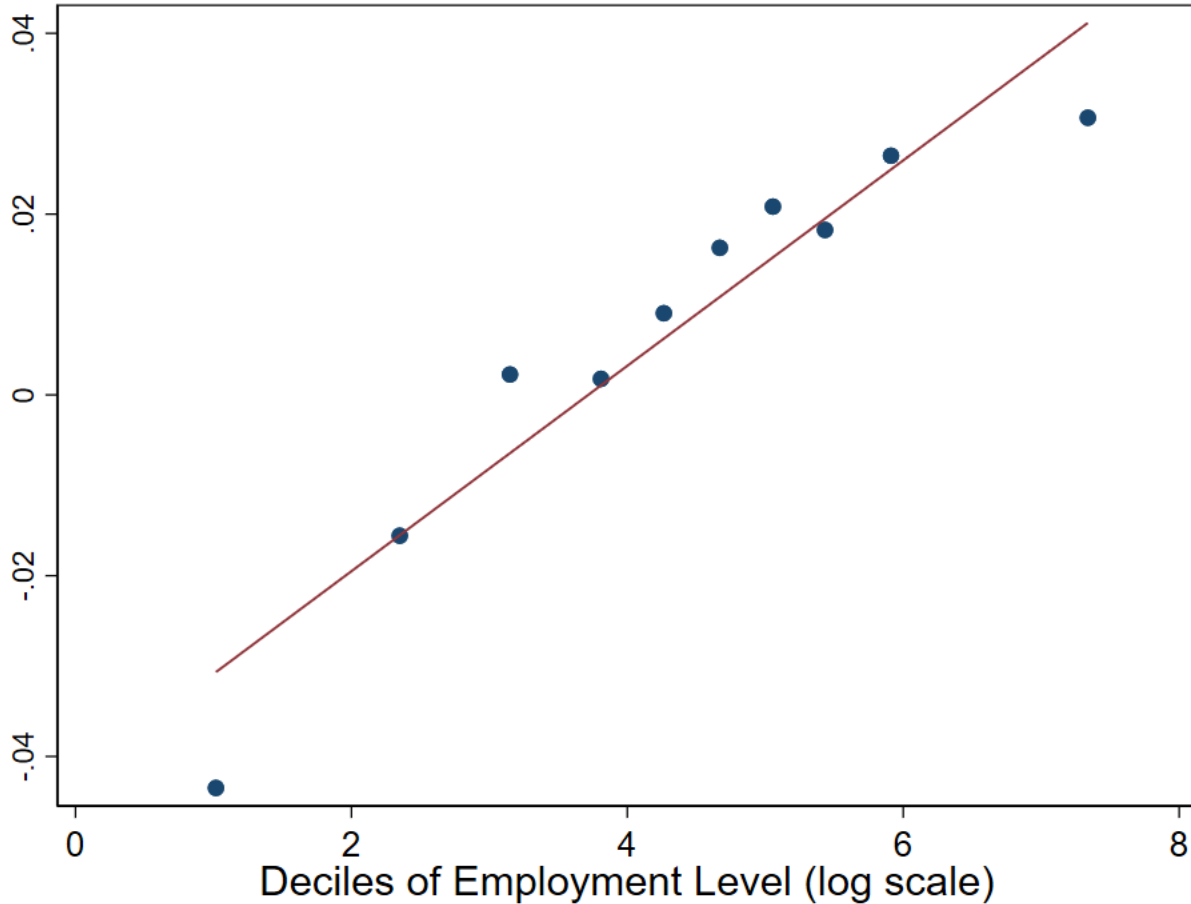
# Distribution of Employment Growth Rates over Past 12 Months



**Notes:** The histogram shows the empirical distribution of realized employment growth rates in the Survey of Business Uncertainty from October 2014 to July 2023, 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 19.

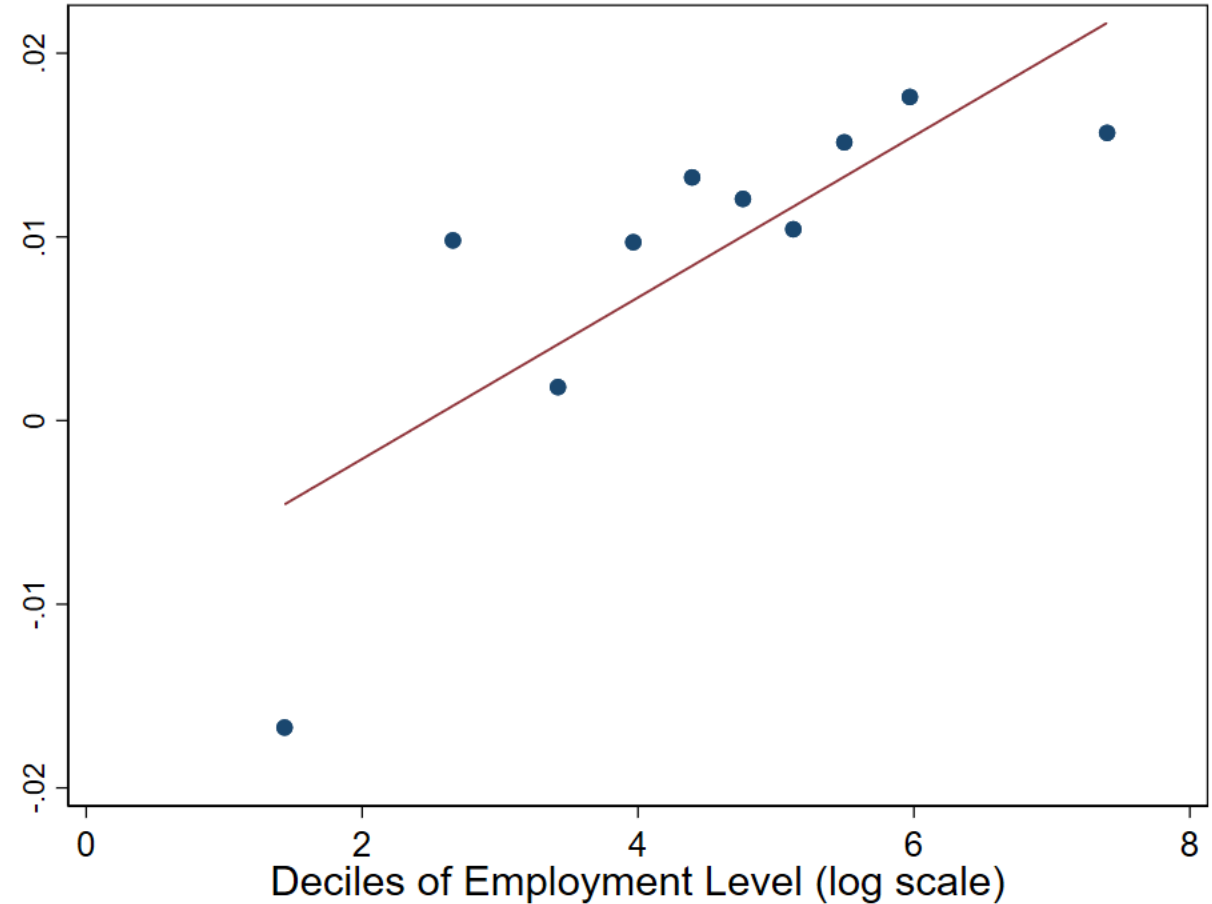
# Mean and Standard Deviation (SD) of Employment Growth Rates by Deciles of Firm Size

## Mean Reported Employment Growth by Decile



N = 16029. Overall Mean = .006

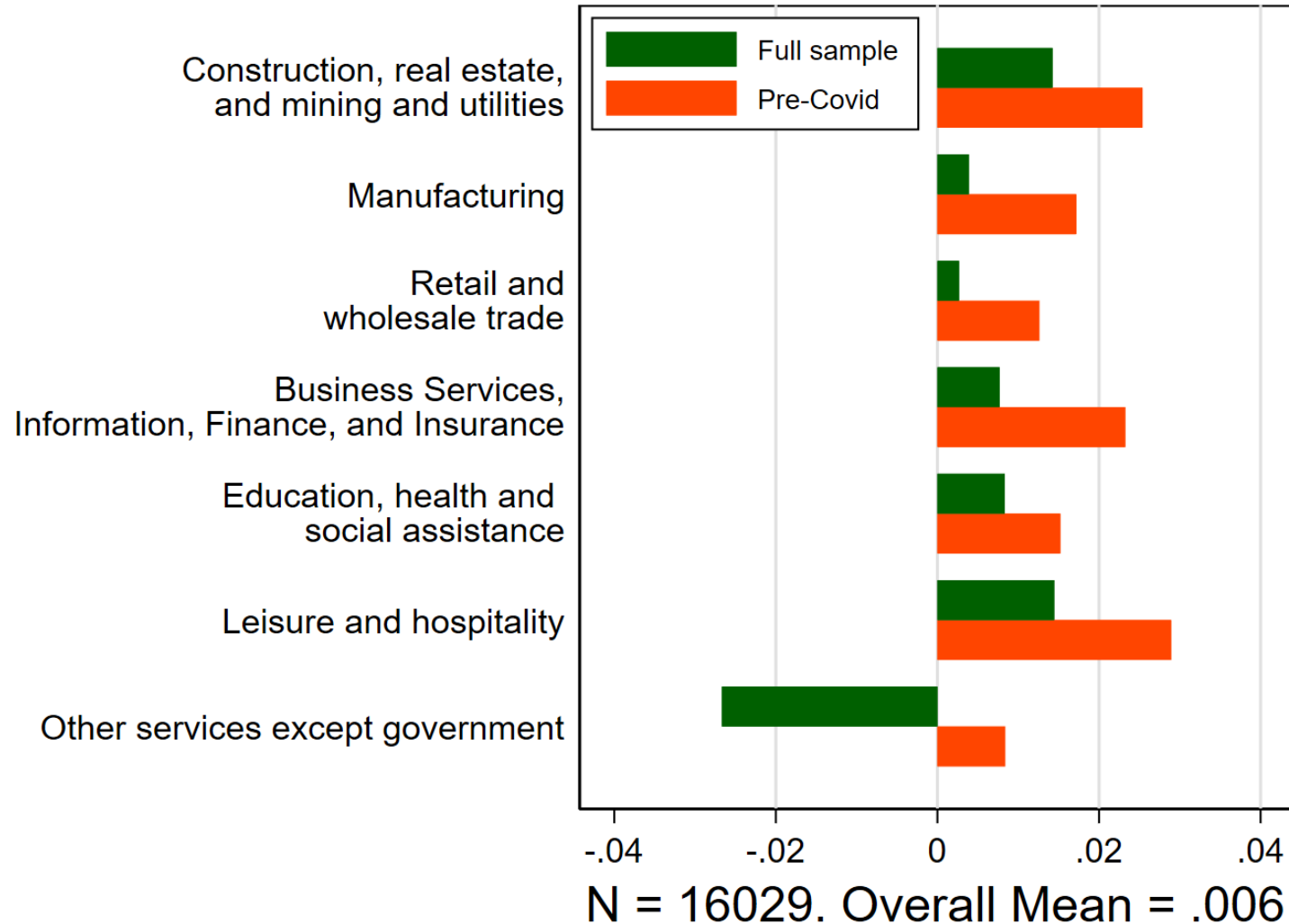
## Mean Expected Employment Growth by Decile



N = 16077. Overall Mean = .009

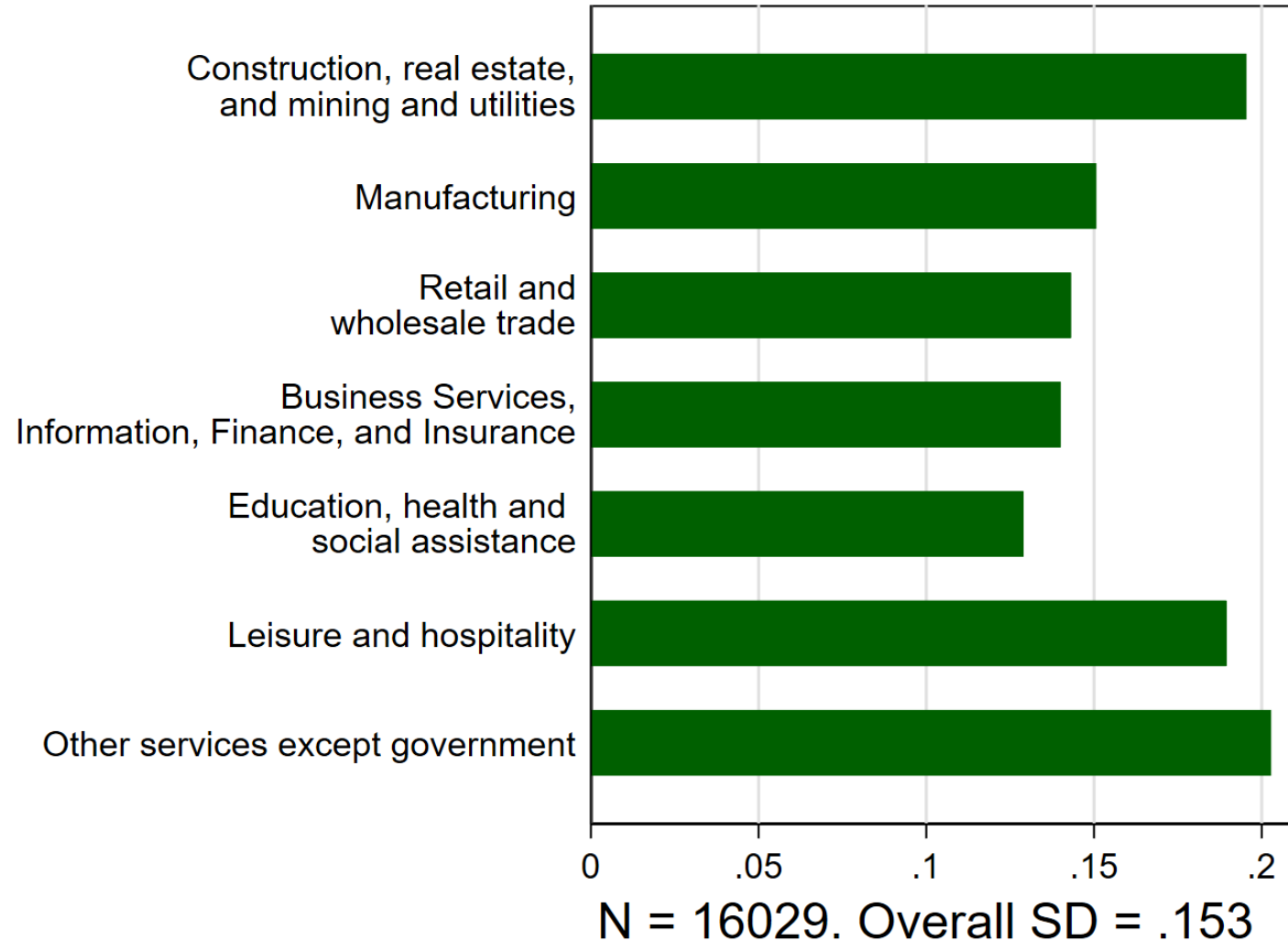
**Notes:** See slide 25 for a description of the sample.

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



**Notes:** See slide 25 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 25 for a description of the sample.

## Summary Statistics: Expectations

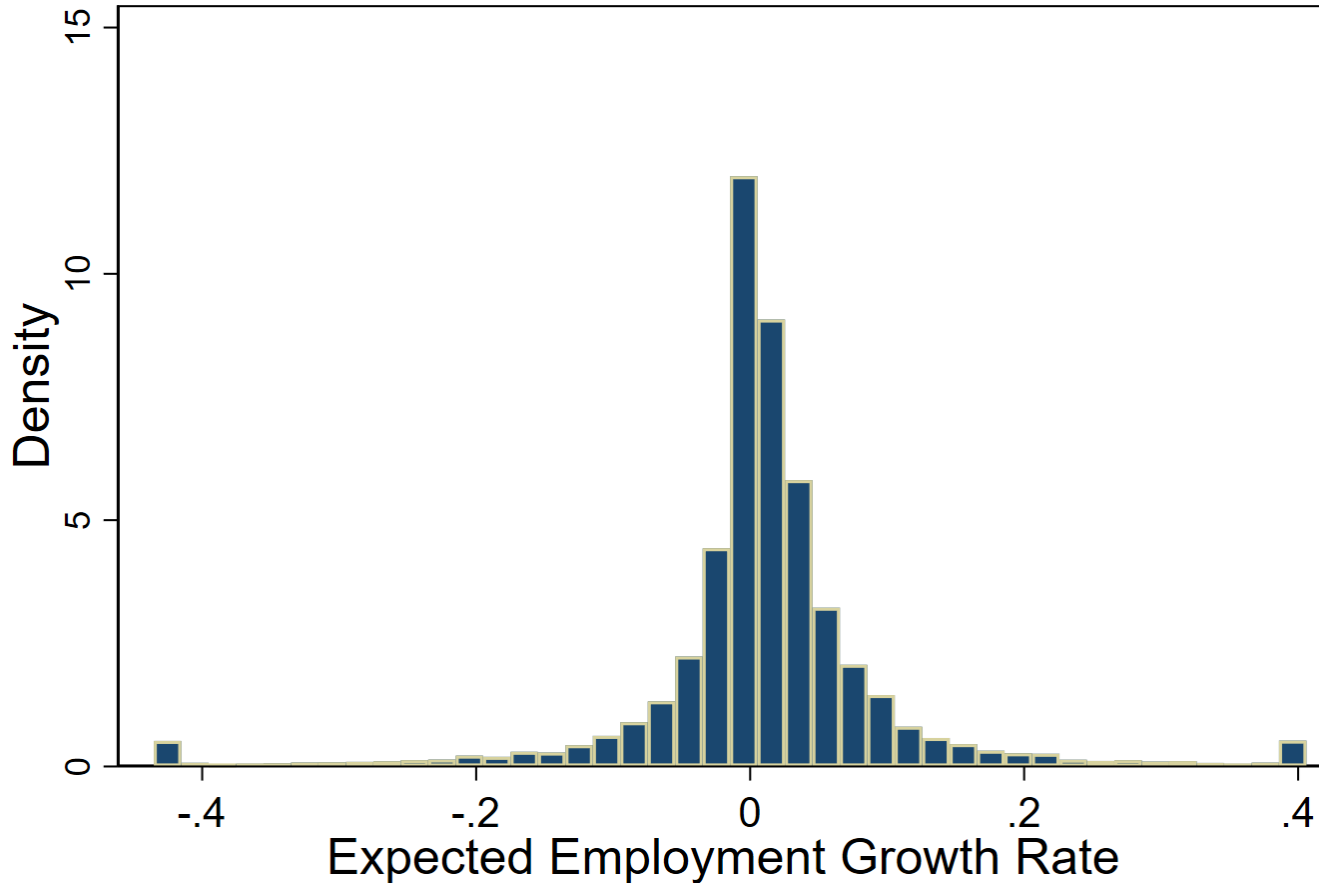
| Variable                                   | Count  | Mean  | Standard Deviation | Percentiles |        |       |       |       |
|--|--------|-------|--------------------|-------------|--------|-------|-------|-------|
|  |        |       |                    | 10          | 25     | 50    | 75    | 90    |
| Employment Growth, Looking 12 Months Hence | 16,077 | 0.010 | 0.100              | -0.064      | -0.014 | 0.007 | 0.038 | 0.091 |
| Sales Growth, Looking Four Quarters Hence  | 15,714 | 0.043 | 0.098              | -0.030      | 0.010  | 0.037 | 0.075 | 0.136 |

## Summary Statistics: Uncertainty

| Variable                                   | Count  | Mean  | Standard Deviation | Percentiles |       |       |       |       |
|--|--------|-------|--------------------|-------------|-------|-------|-------|-------|
|  |        |       |                    | 10          | 25    | 50    | 75    | 90    |
| Employment Growth, Looking 12 Months Hence | 16,081 | 0.075 | 0.088              | 0.016       | 0.026 | 0.046 | 0.084 | 0.163 |
| Sales Growth, Looking Four Quarters Hence  | 15,715 | 0.049 | 0.050              | 0.011       | 0.018 | 0.032 | 0.060 | 0.104 |

**Notes:** The sample contains all firm-level responses from October 2014 to July 2023 for which we can construct subjective probability distributions over the future growth rates of employment (12 months hence) and sales revenue (four quarters hence). See slides 18-21 above for an explanation of how we calculate these expectations.

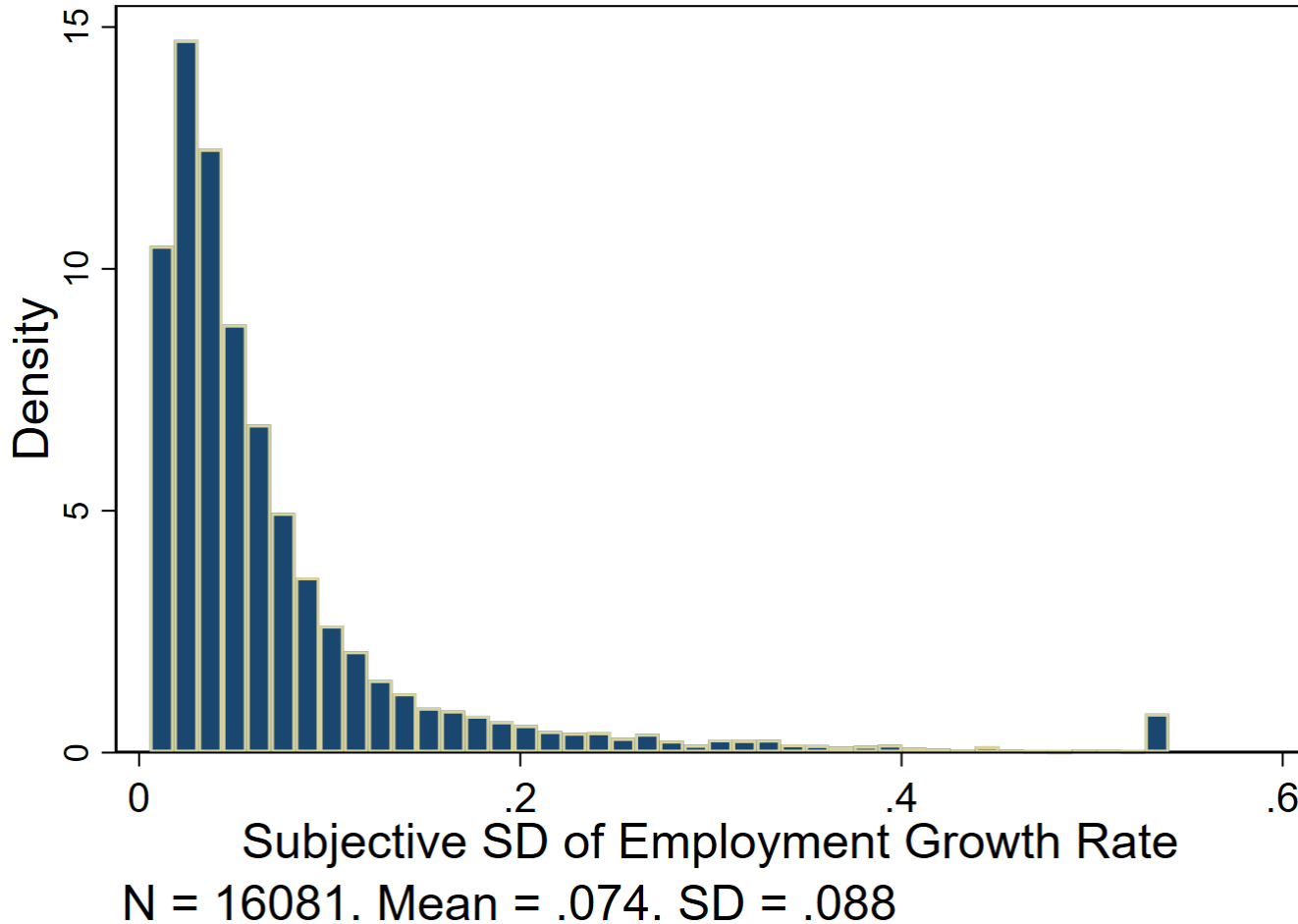
# Distribution of Expected Employment Growth Rates over the Next 12 Months



N = 16077. Mean = .009. SD = .100

**Notes:** The histogram shows the empirical distribution of expected employment growth rates in the Survey of Business Uncertainty from October 2014 to July 2023, 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 19.

# 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 July 2023, 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 19.

# 11. Subjective Expectations and Uncertainty Indices

## Topic-Specific Expectations Indices

We construct a monthly activity-weighted expectations (first-moment) index for employment growth and sales growth 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 18-21, and winsorize them at the first and 99th percentiles before using them to construct the index.
- For employment in month  $t$ , we weight firm  $i$ 's subjective mean growth rate expectation by the average of its month- $t$  employment ( $CEmp_{it}$ ) and its expected employment level ( $EEmp_{it}$ ). We top-code these weights at 500 to diminish the influence of outliers among very large firms.
- For sales revenue in month  $t$ , we weight firms  $i$ 's subjective mean growth rate expectation by the average of its month- $t$  sales revenue ( $CSale_{it}$ ) and its expected sales level ( $ESale_{it}$ ). We winsorize these activity-weights at the 1<sup>st</sup> and 80<sup>th</sup> percentile.



# 11. Expectations Indices

## Index Smoothing

- We smooth our 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. From August 2020 onward, we gather in excess of 200 responses per topic per month.
- We smooth as follows:
  - Starting in August 2020-present we employ a two-month lagged moving average to reflect our split panel approach.
  - For months since June 2019-August 2020 we use a three-month lagged moving average.
  - For months since December 2016-May 2019 we use a two-month lagged moving average.
  - In September and October 2016 we use a seven-month and five-month lagged moving average.
  - For months up to and including August 2016 we use a nine-month lagged moving average.

# 11. Uncertainty Indices

## Topic-Specific Uncertainty Indices

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

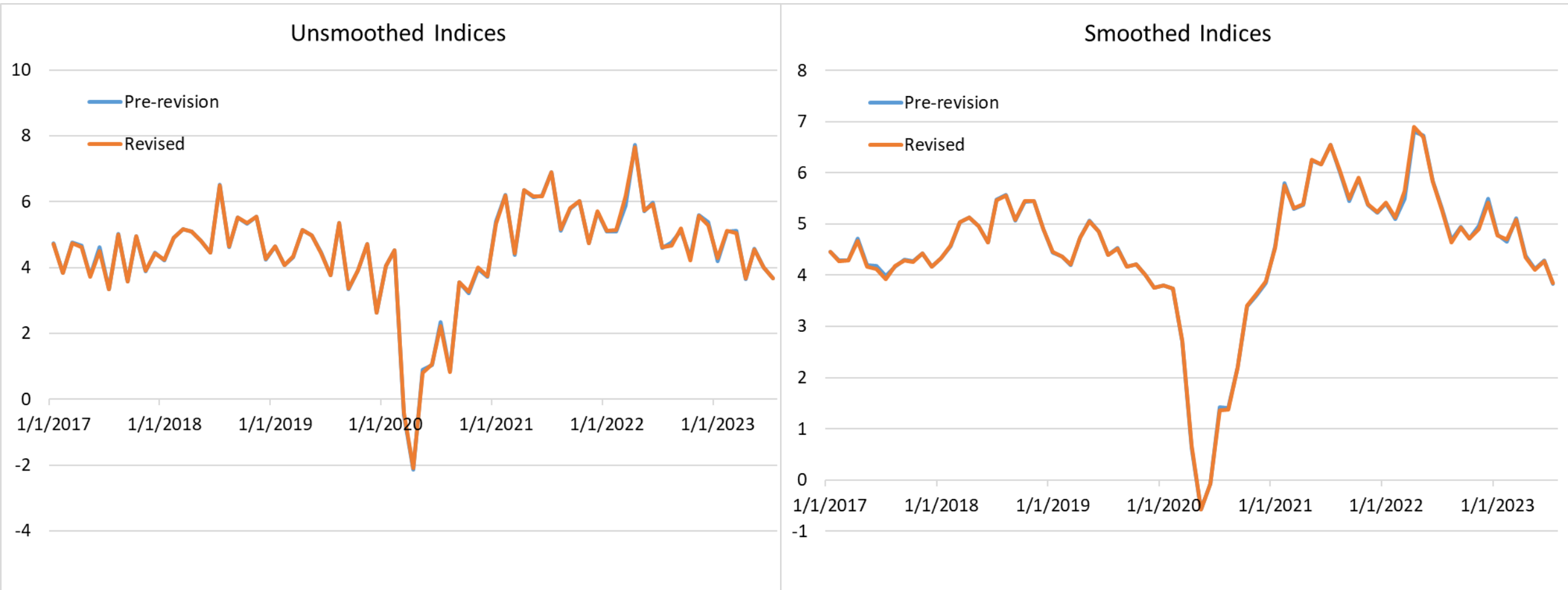
- The month- $t$  index of 12-month-ahead subjective uncertainty for employment growth is the activity-weighted mean of  $(SD(EGr))$  values across firms responding in month  $t$ .
- We compute these subjective standard deviations over growth rates as described on slides 18-21, and winsorize them at the first and 99th percentiles before inputting them into the index construction formula.
- For employment in month  $t$ , we weight firm  $i$ 's subjective mean growth rate expectation by the average of its month- $t$  employment ( $CEmp_{it}$ ) and its expected employment level ( $EEmp_{it}$ ). We top-code these weights at 500 to diminish the influence of outliers among very large firms.
- For sales revenue in month  $t$ , we weight firms  $i$ 's subjective mean growth rate expectation by the average of its month- $t$  sales revenue ( $CSale_{it}$ ) and its expected sales level ( $ESale_{it}$ ). We winsorize these activity-weights at the 1<sup>st</sup> and 80<sup>th</sup> percentile.

# 11. Uncertainty Indices

## Index Smoothing

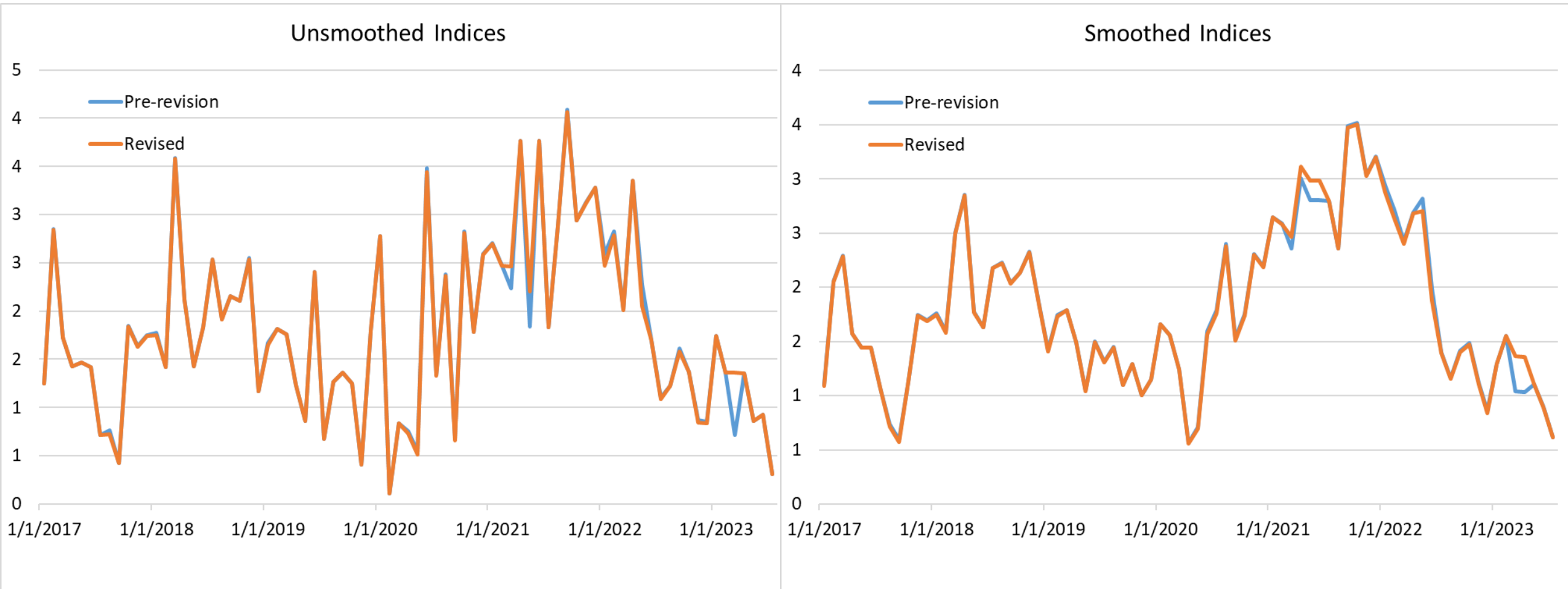
- We smooth our topic-specific indices, noting that in survey months prior to September 2016 we have about 50 responses per topic per month and since September 2016 about 150 responses per topic per month. From August 2020 onward, we gather in excess of 200 responses per topic per month.
- We smooth as follows:
- Starting in September 2020-present we employ a two-month lagged moving average to reflect our split panel approach.
- For months since June 2019-August 2020 we use a three-month lagged moving average.
- For months since December 2016-May 2019 we use a two-month lagged moving average.
- In September, October, and November 2016, respectively, we use a seven-month, five-month, and 3-month lagged moving average.
- For months up to and including August 2016 we use a nine-month lagged moving average.

# 11. Expectations Indices (Sales Growth)



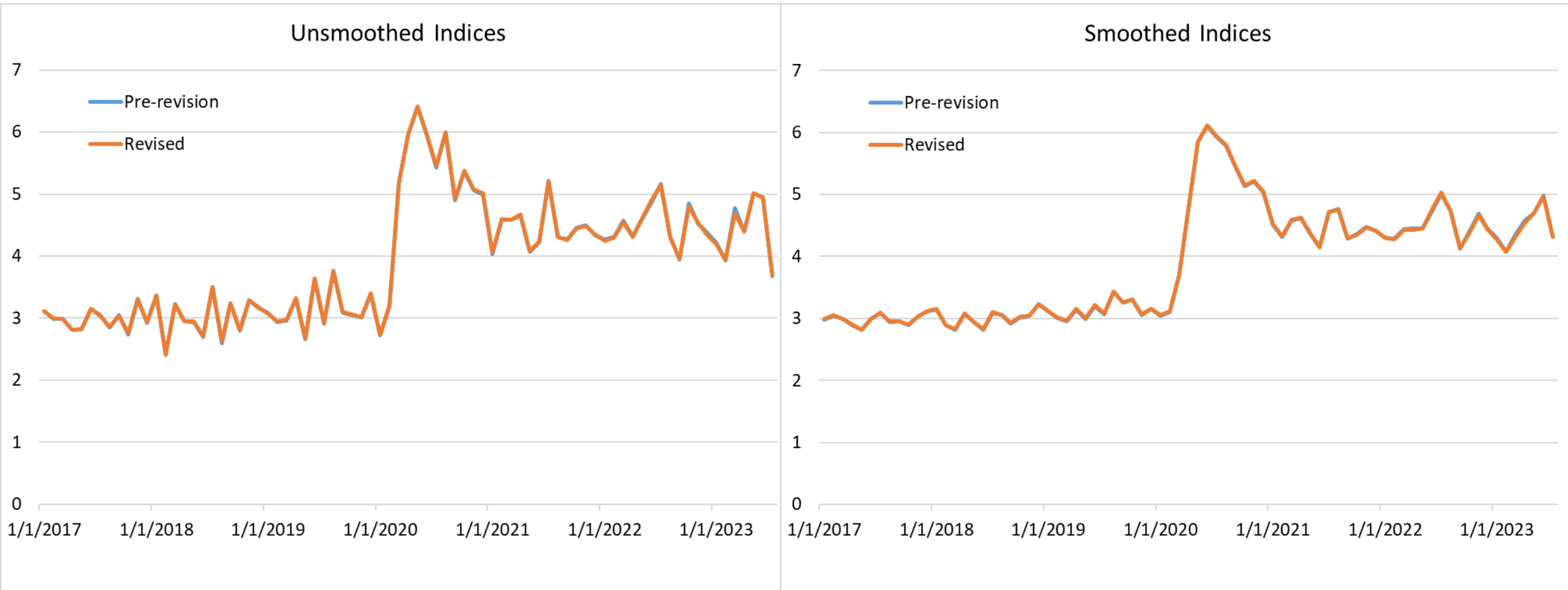
Notes: The slight changes in our pre-revision vs revised series are due to updating the winsorization period and annual cleaning process to account for extremely large forecast errors and units issues.

# 11. Expectations Indices (Employment Growth)



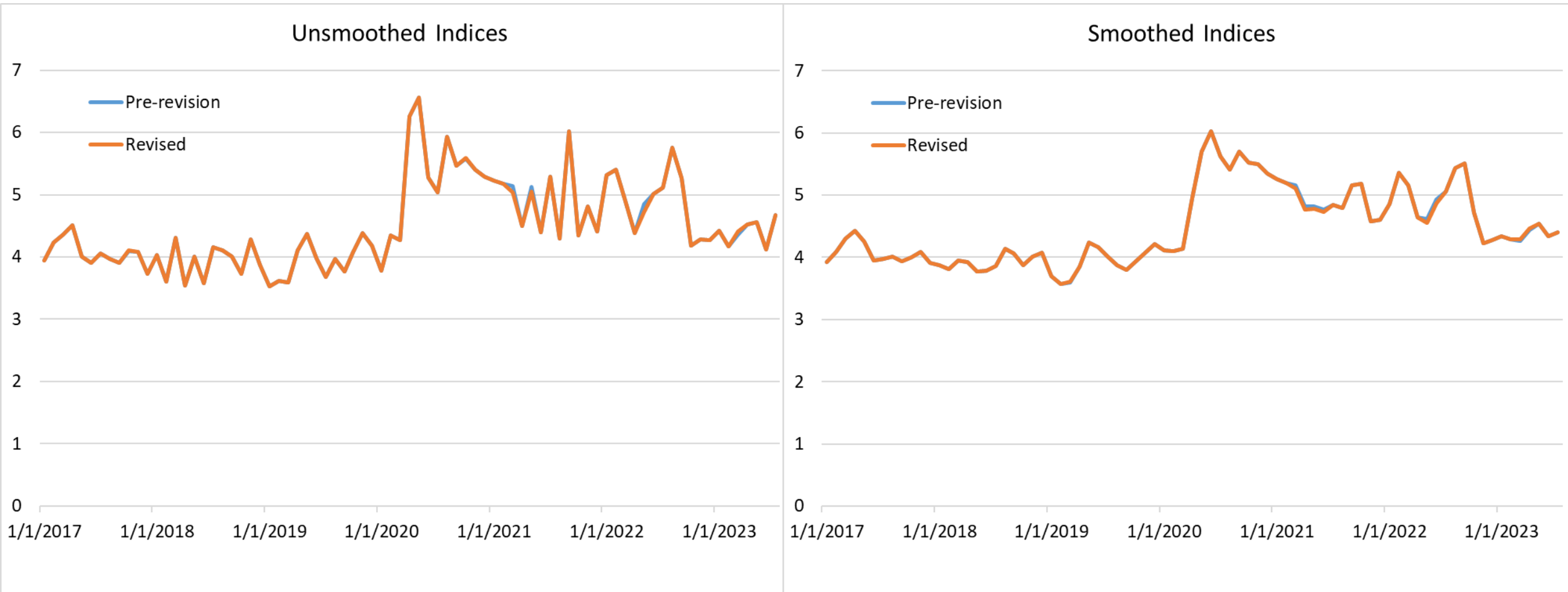
Notes: The slight changes in our pre-revision vs revised series are due to updating the winsorization period and annual cleaning process to account for extremely large forecast errors and units issues.

# 11. Uncertainty Indices (Sales Growth)



Notes: The slight changes in our pre-revision vs revised series are due to updating the winsorization period and annual cleaning process to account for extremely large forecast errors and units issues.

# 11. Uncertainty Indices (Employment Growth)



Notes: The slight changes in our pre-revision vs revised series are due to updating the winsorization period and annual cleaning process to account for extremely large forecast errors and units issues.

# 12. Expected Excess Reallocation Rates

## Topic-specific Expected Reallocation Indices

We construct forward-looking indices of excess job and sales revenue reallocation. These series measure the volume of cross-firm reallocation in economic activity above the reallocation required to support aggregate growth. For ease of exposition, we often refer to these as simply “reallocation rates”:

- First, in each month  $t$ , we compute the activity-weighted average of own-firm expected gross job creation and destruction rates, which boils down to the activity-weighted average of the absolute value of subjective mean growth rates  $|\text{Mean}(EGr)_t|$ .
- Then, in each month  $t$ , we compute the absolute value of the activity weighted average of own-firm expected employment growth  $\text{Mean}(EGr)_t$ . This is effectively the absolute value of the employment growth expectations index in month  $t$ .
- We then obtain the expected job reallocation rate index value for month  $t$  by subtracting the outcome of the second bullet from the first. Letting  $w_{it}$  be firm  $i$ 's activity weight in month  $t$ ,

$$\text{Expected Job Reallocation Rate}_t = \sum_i w_{it} \cdot |\text{Mean}(EGr)_t| - \left| \sum_i w_{it} \cdot \text{Mean}(EGr)_t \right|$$



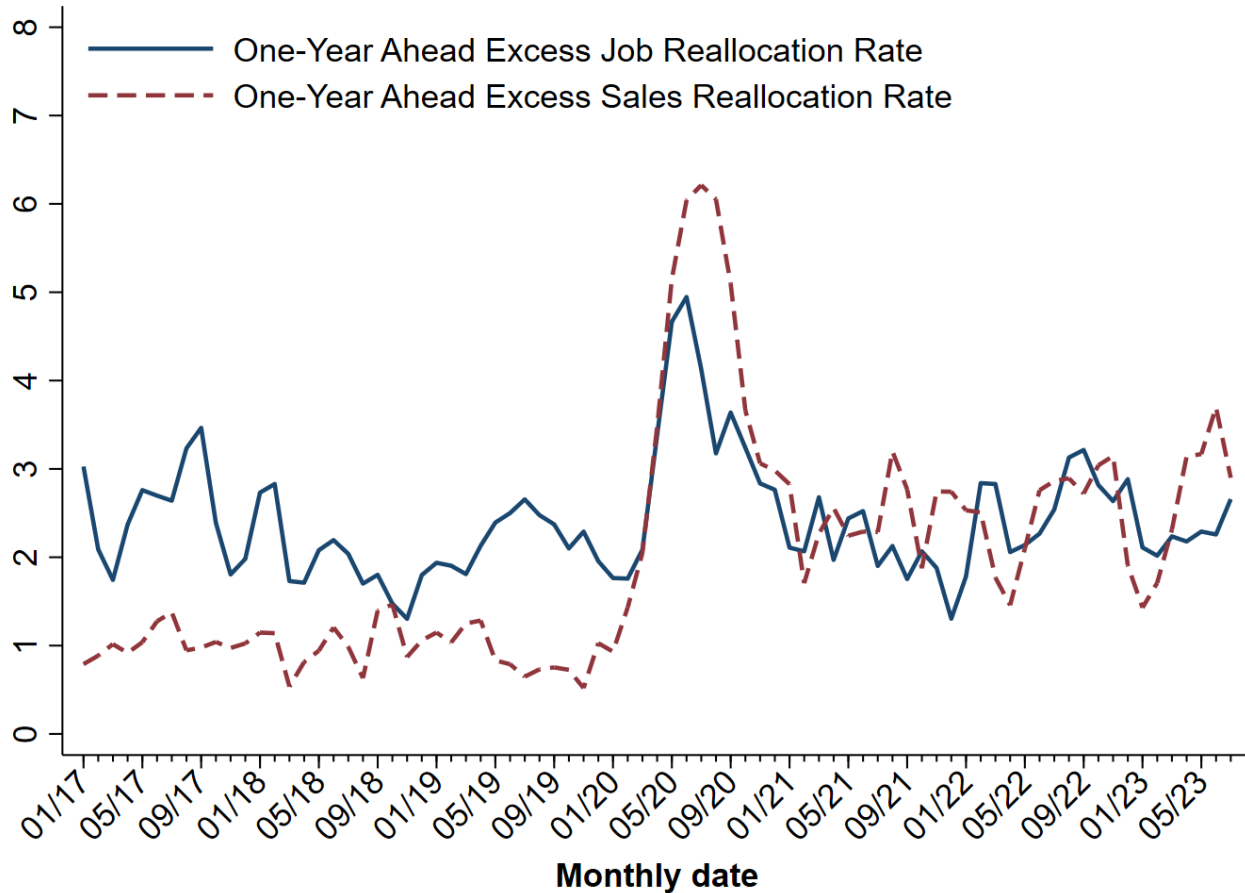
# 12. Expected Excess Reallocation Rates

- Analogously, the expected sales revenue reallocation rate index in month  $t$  is the difference between the activity-weighted average of absolute expected sales growth rates, minus the absolute value of the average activity-weighted growth rate:

$$\text{Expected Reallocation Rate For Sales Revenue}_t = \sum_i w_t \cdot |Mean(SaleGr)| - \left| \sum_i w_t \cdot Mean(SaleGr) \right|$$

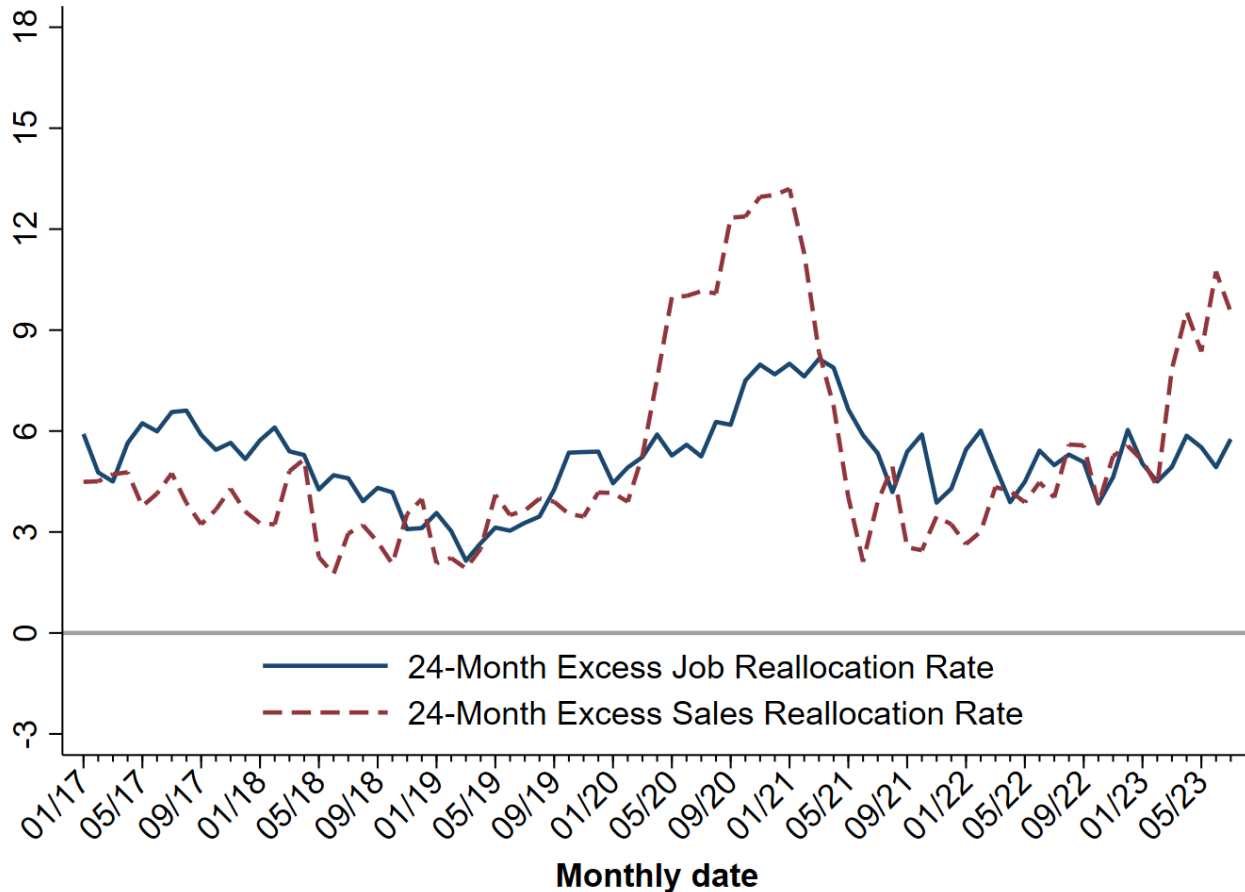
- We compute the subjective mean growth rates  $Mean(EGr)$  and  $Mean(SaleGr)$  as described on slides 18-21, and winsorize them at the 1st and 99th percentiles before using them to construct the index.
- Firm  $i$ 's activity weight  $w_{it}$  is the average of its month- $t$  employment or sales level ( $Cemp_{it}$  or  $CSale_{it}$ ) and its expected employment or sales level twelve months hence ( $FEmp_{it}$  or  $FSale_{it}$ ). We top-code these weights at 500 for employment and at the 80<sup>th</sup> percentile for sales to diminish the influence of outliers among very large firms.

# 12. Expected Excess Reallocation Rates



NOTE: Calculated using monthly data through July 2023. Excess employment and sales reallocation rates quantify the volume of cross-firm job (or sales) reallocation in excess of what is required by the aggregate change. They quantify the simultaneous creation and destruction of realized and expected employment (sales). Indexes are smoothed as described in slide 33.

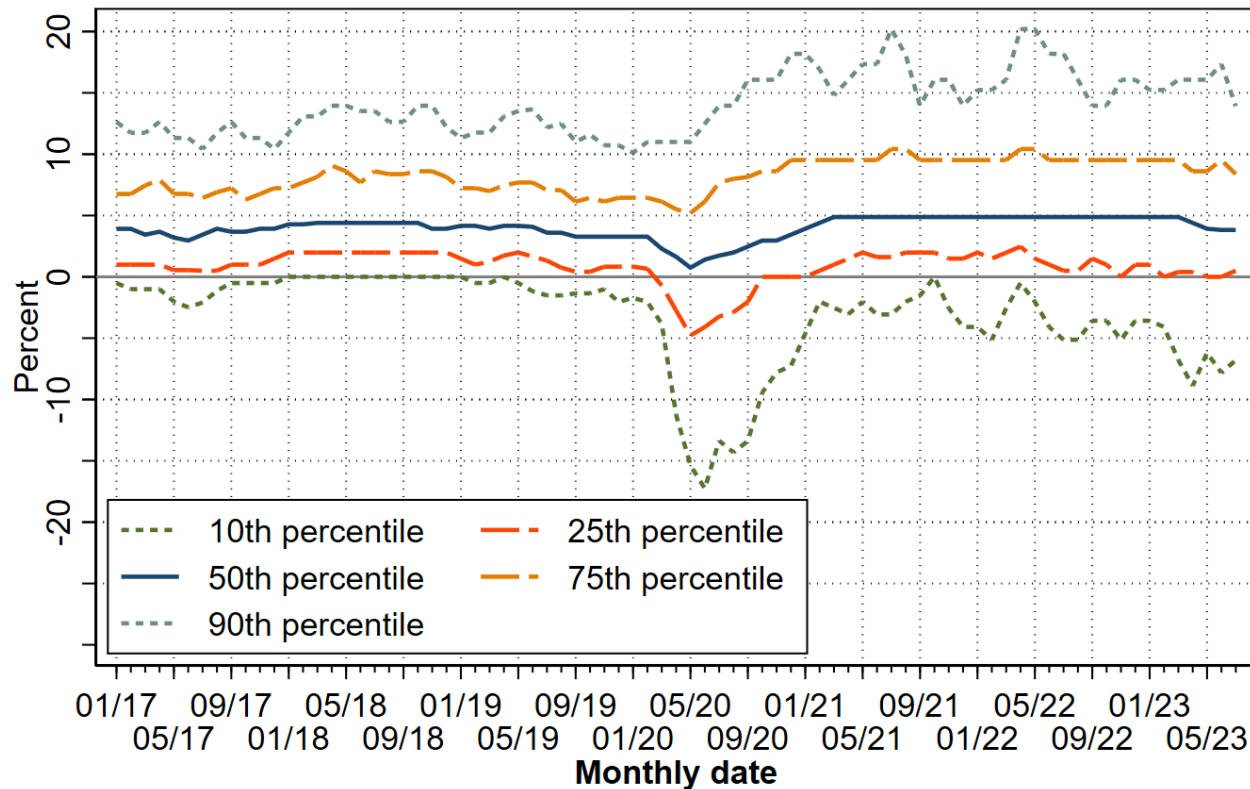
# 13. 24-Month Reallocation Rates



NOTE: Calculated using monthly data through July 2023. Excess employment and sales reallocation rates quantify the volume of cross-firm job (or sales) reallocation in excess of what is required by the aggregate change. They quantify the simultaneous creation and destruction of realized and expected employment (sales). The 24-month excess reallocation rates are computed combining individual firm realized (one-year look-back) and future (one-year look-ahead) sales growth rates. Indexes are smoothed as described in slide 33.

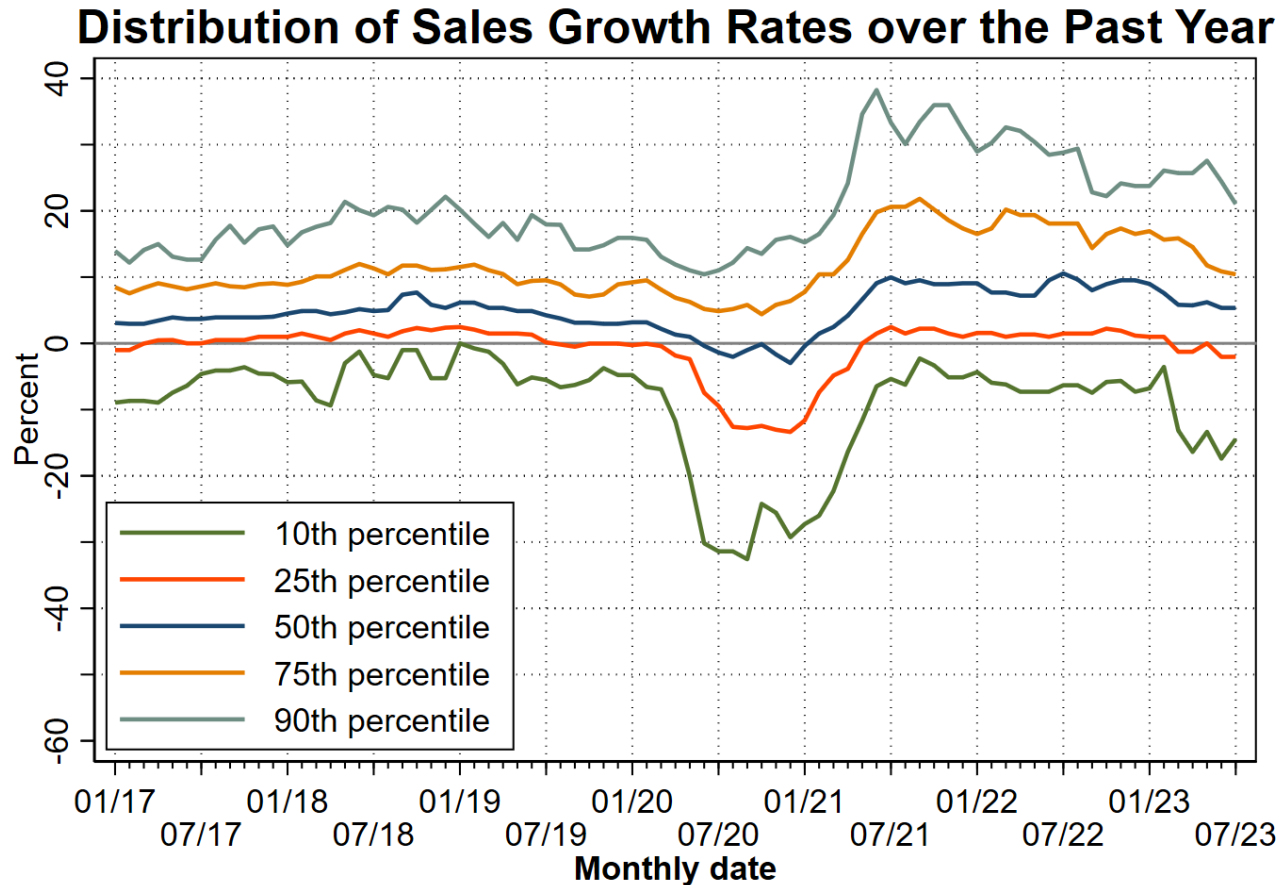
# 14. Subjective Distribution of Future Sales Growth Rates at a One-Year Horizon

**Subjective Distribution of Future Sales Growth Rates at a One-Year Horizon**



NOTE: Calculated using monthly data through July 2023. This is a plot of the subjective distribution for the representative firm’s future sales growth rates over a 4-quarter look-ahead horizon. To calculate this distribution, we pool over all firm-level subjective forecast distributions in the indicated month and weight each firm by its activity level. Then we use the probabilities assigned to each possible future sales growth rate to obtain activity-weighted quantiles of the future sales growth rate distribution.

# 15. Distribution of Sales Growth Rates over the Past Year, Monthly



NOTE: Calculated using monthly data through July 2023. Solid lines show percentiles of the activity-weighted distribution of firm-level sales growth rates over the past year. Dashed lines show – for the most recent month – the mean expected sales growth rate over the next four quarters for firms within +/- five percentiles of the indicated realized growth rate percentile.

# Appendix A. Nonresponse Rate by Item, Conditional on Survey Response

## I. Employment

| Current Level | Past Level | Employment Level Estimate<br>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<br>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 B. 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 B. 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 C. 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 =  $Mean(SaleGr) - Realized(SaleGr)$

# Appendix D. Capital Investment

## Capital Investment Questionnaire (discontinued)

### SBU Survey of Business Uncertainty

FEDERAL RESERVE BANK of ATLANTA

CHICAGO BOOTH  
The University of Chicago Booth School of Business

Stanford  
University

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

\$ 50,000,000

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

\$ 2,000,000

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

\$ 1,000,000

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# 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"/> |

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

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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.

# Appendix D. Capital Investment: 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 1<sup>st</sup> and 99<sup>th</sup> percentiles before running the procedure in case 3.

# Appendix D. Capital Investment: Calculating 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 four 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 1<sup>st</sup> and 99<sup>th</sup> percentiles

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

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

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

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

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

$$Mean(InvRate) = Mean(FCap)/K$$

$$SD(InvRate) = SD(FCap)/K$$

We also winsorize these first and second moments at the 1<sup>st</sup> and 99<sup>th</sup> percentiles



# Appendix D. Capital Investment: Calculating Capital Investment Rates

- 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 F: Subjective Moments about Average Unit Costs (Retired May 2019)

## 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

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

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

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

## Appendix E. Overall Indices (Discontinued)

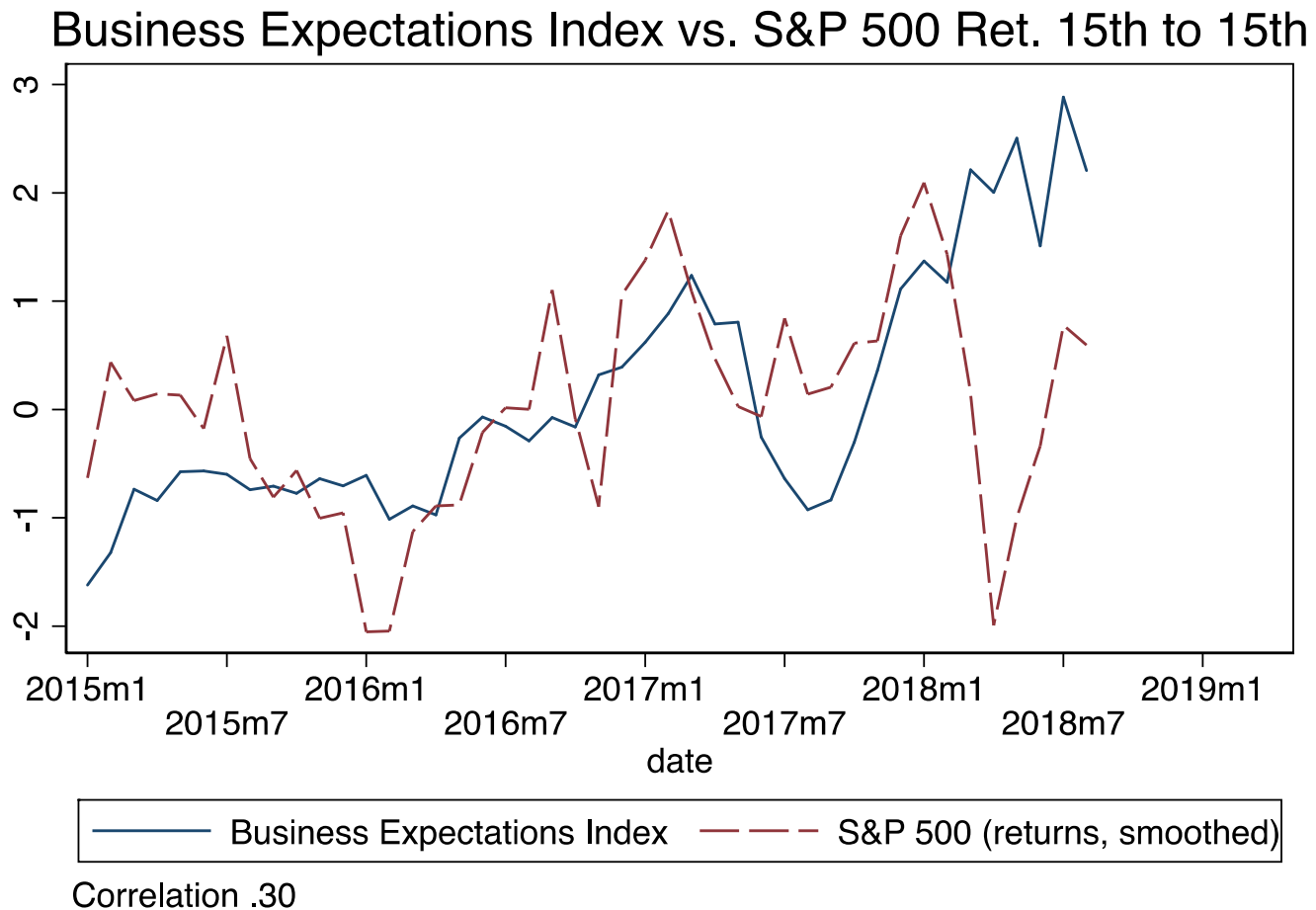
We standardize each of the topic-specific uncertainty indices to have a mean and variance of 100 during the period from January 2015 to December 2018, inclusive.

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.

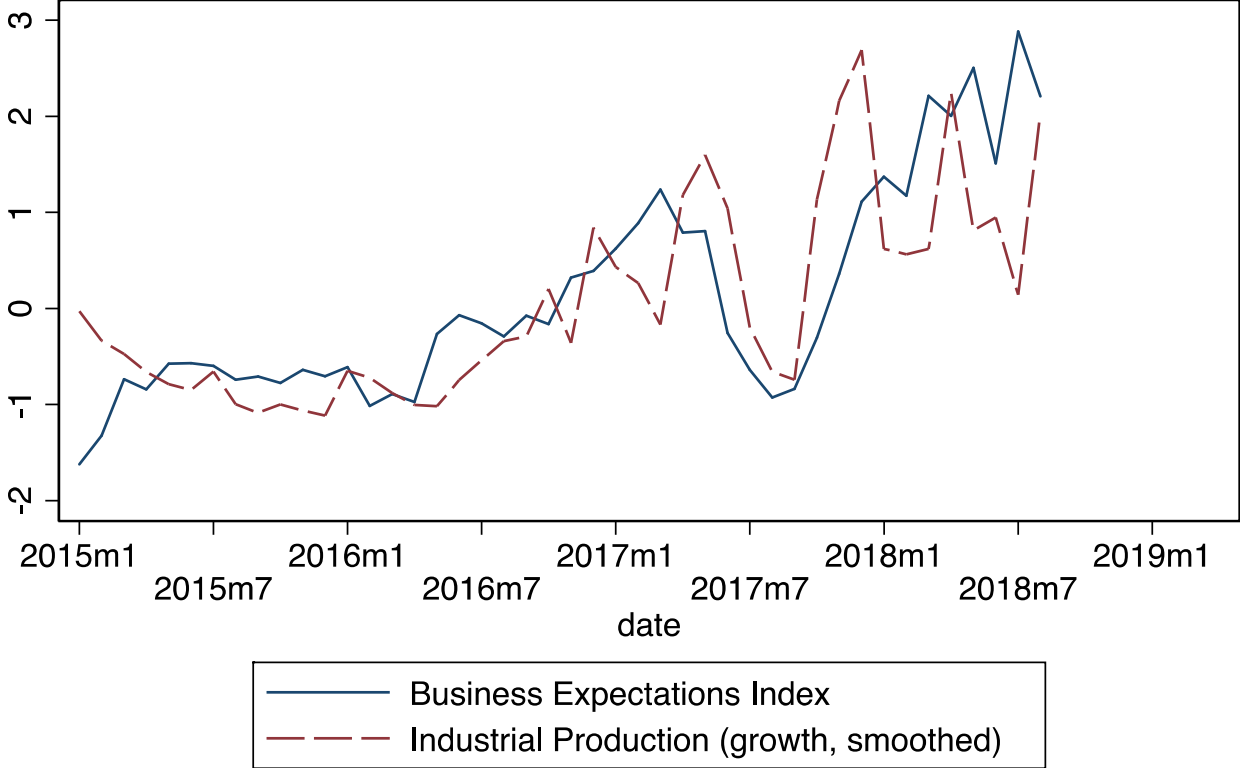
# Business Expectations Index Compared To S&P 500 Movements



**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 12<sup>th</sup> 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

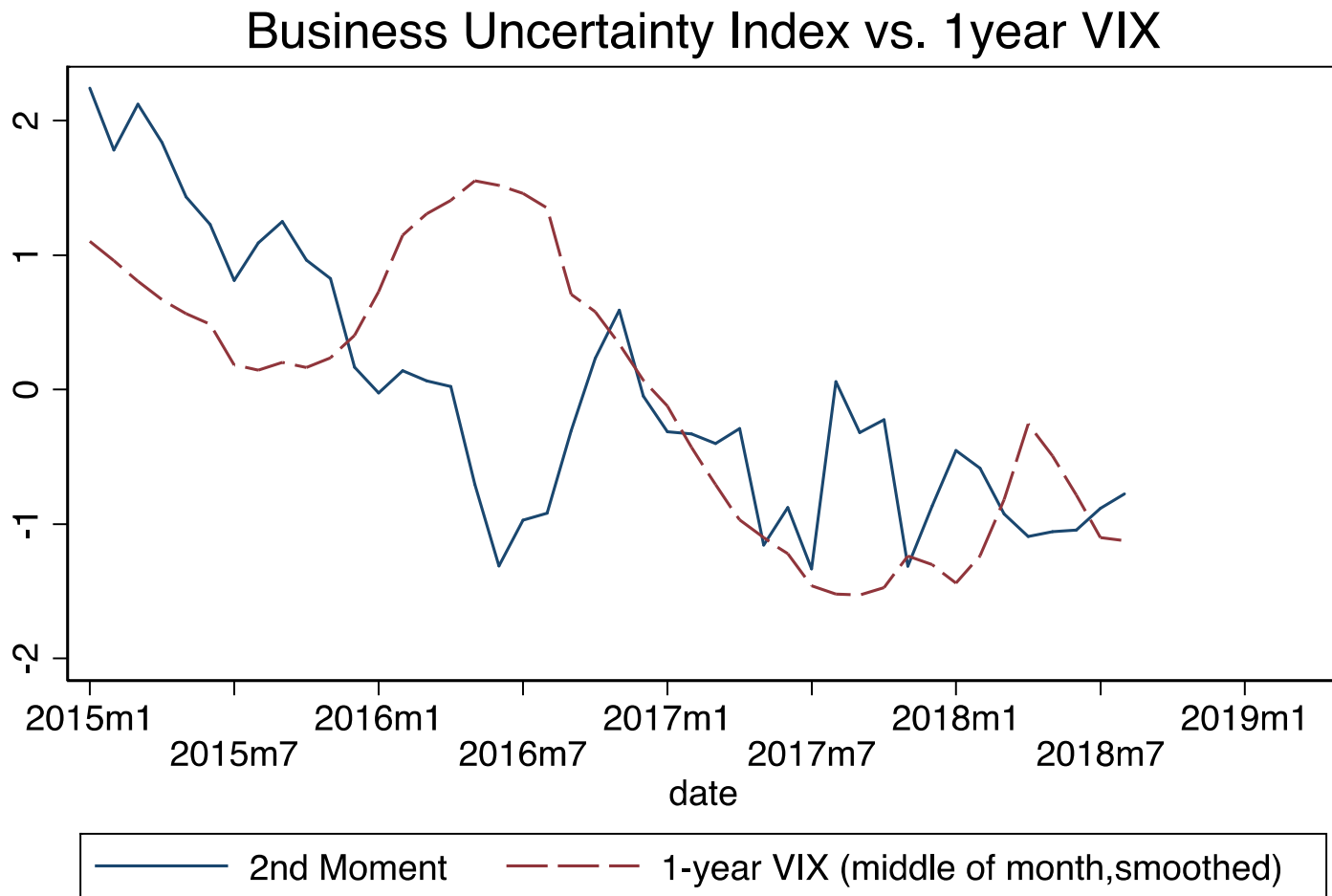
Business Expectations Index vs. Industrial Production Growth



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



Correlation = .42

**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.