Are Uncertain Firms Riskier?

Fahiz Baba-Yara†  Carter Davis†

Fotis Grigoris‡  Preetesh Kantak†

†Indiana University, ‡University of Iowa

NBER Big Data Session (July 2023)
Big Picture: Economic Uncertainty

- Large literature measuring the economic effects of uncertainty...
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  - Economics: Baker et al. (2016); Bloom et al. (2018), etc.
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  - Distinct from experimental, survey, financial or real-based measures
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- **Novel** and **high-dimensional** data on employee attention to articles

- A broad set of categories are covered...

- Each article mapped to ≈10000 possible "topics"

- Measure firm-level relative attention to uncertainty
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What employees read matters!

- Employee reading about *financial* uncertainty ⇒
  
  (a) Higher exposure to aggregate measures of uncertainty
  (b) Higher costs of equity capital
  (c) Greater hedging and mitigation activity

Identify effects via cross section of firms

▶ i.e., Not driven by COVID-19, elections, ...

What are the real economic implications?

▶ Finding:
  Reading more financial uncertainty news ⇒
  
  (a) Lower future sales,
  (b) Less investment (lower asset, physical capital and inventory growth),
  (c) Hiring fewer (and/or firing more) workers.
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Firm Attention: Motivating Example

Apple Inc.
11/17/2018

Microchip.com
CPU

Generalist

Fin Analyst

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Inflation
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Firm Attention: Motivating Example

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Interaction data

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<th>Date</th>
<th>Domain</th>
<th>Interactions</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>11/17/2018</td>
<td>apple.com</td>
<td>230</td>
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Measuring Relative Attention to Uncertainty

Use *EPU* corpus for uncertainty topics (Baker et al., 2016)
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Measuring Relative Attention to Uncertainty

Firm $B$ reads relatively more uncertainty-related news than Firm $A$.
Firm $B$ reads relatively more uncertainty-related news than Firm $A \Rightarrow \cos(\theta_B) >> \cos(\theta_A)$
Identifying Relevant Topics (2)

- Define topic-frequency for firm $i$ and topic $j$ on date $t$ as
  
  $$ tf_{i,j,t} = \left( \frac{\text{Fraction of Employees at Firm } i \text{ Interacting with Topic } j \text{ at time } t}{} \right) $$

  - Stack topic-frequencies, define raw relative attention as
    
    $$ RRA\{i\}; t = \cos(\theta_{\text{raw}}{i}; t) = \frac{tf_{\text{Unc}; i}; t \cdot tf_{\text{Total}; i}; t}{\|tf_{\text{Unc}; i}; t\| \times \|tf_{\text{Total}; i}; t\|} $$
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Raw Relative Attention to Uncertainty: the Time-series

- Average of relative uncertainty reading shows intuitive dynamics...
  - Reflects both financial and real uncertainty

Ludvigson et al.

Baba-Yara, Davis, Grigoris & Kantak

Are uncertain firms riskier?

July 2023
Average of relative uncertainty reading shows intuitive dynamics...

Reflects both financial and real uncertainty

But which set of topics most differentiate reading by firms?!
To answer question:
(Down)Upweight topics most (un)informative in distinguishing reading in cross-section of firm...

Baba-Yara, Davis, Grigoris & Kantak
Are uncertain firms riskier?
July 2023
Uncertainty
Raw

• To answer question: (Down)Upweight topics most (un)informative in distinguishing reading in cross-section of firm...
Uncertainty

Raw

Weighted

• Analog of a tf-idf score, which we call the *tf-iaf* score

"*Topic Frequency-Inverse Aggregate Frequency*"
Re-weighted uncertainty topics reflect firm management of uncertainty (compliance / hedging / financial risks)
Relative Attention to Uncertainty: the Cross-section

- The adjusted relative attention of firm $i$ at time $t$ is

$$ARA_{i,t} = \cos \left( \theta_{i,t}^{adj} \right) = \frac{tf-iaf_{i,t}^{Unc} \cdot tf-iaf_{i,t}^{Total}}{\| tf-iaf_{i,t}^{Unc} \| \times \| tf-iaf_{i,t}^{Total} \|}$$
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• An empirical question: Is tilt actually informative of exposure to uncertainty? Yes!!
Data

- Link firm-level attention data to CRSP/Compustat universe
  - Focus on the period ranging from 2016 to 2022
  - Exclude financial and utilities firms

90% of CRSP/Compustat firms matched via their domain

95%+ of market capitalization covered
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Are high ARA firms more exposed to economic uncertainty?

$RRA_p, t = \delta P_t + \beta P_t U_t + \epsilon P_t, t$

Intuition: If higher ARA firms are more exposed to uncertainty, $U_t \in \{VIX, EPU, Ludvigson et al.\} \Rightarrow \beta_{high} > \beta_{low}$

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<tbody>
<tr>
<td>$\beta_{t-stat}$</td>
<td>0.0178 [3.88]</td>
<td>0.0322 [4.81]</td>
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• Represents $\Delta \cos\sim$ similarity from one-standard-deviation higher $U_t$
• Economically/statistically non-sig sorting on $RRA_i, t$
• Placebo: Similar results using five or ten portfolios

Greater Granularity
Are high ARA firms more exposed to economic uncertainty?

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\tilde{RRA}_{p,t} = \delta_p + \beta_p U_t + \epsilon_{p,t}
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Are high ARA firms more exposed to economic uncertainty?

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|------------|-----------|  |-----------|  |-----------|  |-----------|  |
|            | \(\beta\) | \(t\)-stat | \(\beta\) | \(t\)-stat | \(\beta\) | \(t\)-stat | \(\beta\) | \(t\)-stat |
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- Similar results using five or ten portfolios Greater Granularity

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July 2023 12 / 20
Risk Mitigation (1)

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- *tf-iaf* weights upweights topics related to firm-level
  - **Hedging** (Campello et al., 2011):
    \[
    \mathbb{I}(\text{hedging}_{i,k,t} > \text{median}) = \delta_{k,t} + \beta ARA_{i,k,t-1} + \mathbf{X}'_{i,t-1} \gamma + \varepsilon_{i,k,t}
    \]
  - **Compliance** (Kalmenovitz, 2022):
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    \text{Regulatory Burden}_{i,k,t} = \delta_{k,t} + \beta ARA_{i,k,t-1} + \mathbf{X}'_{i,t-1} \gamma + \varepsilon_{i,k,t}
    \]
  - \(\mathbf{X}'_{i,t-1}\) is vector of controls shown to matter... (Leary and Roberts, 2014)
    + Fin Cons; Pol Unc;...
    (Hassan et al., 2019; Whited and Wu, 2006)
  - \(\delta_{k,t}\) are industry and/or date fixed effects
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  - Size; Leverage; ROA; Tangibility;... (Leary and Roberts, 2014)
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- \(X'_{i,t-1}\) is vector of controls shown to matter…
  - Size; Leverage; ROA; Tangibility;… (Leary and Roberts, 2014)
    + Fin Cons; Pol Unc;… (Hassan et al., 2019; Whited and Wu, 2006)
Risk Mitigation (1)

- Do firms more exposed to uncertainty try to manage risk?
- $tf-iaf$ weights upweights topics related to firm-level
  - Hedging (Campello et al., 2011):
    \[
    \mathbb{I}(\text{hedging}_{i,k,t} > \text{median}) = \delta_{k,t} + \beta ARA_{i,k,t-1} + X'_{i,t-1} \gamma + \epsilon_{i,k,t}
    \]
  - Compliance (Kalmenovitz, 2022):
    \[
    \text{Regulatory } \$, \text{Burden}_{i,k,t} = \delta_{k,t} + \beta ARA_{i,k,t-1} + X'_{i,t-1} \gamma + \epsilon_{i,k,t}
    \]
- $X'_{i,t-1}$ is vector of controls shown to matter...
  - Size; Leverage; ROA; Tangibility;... (Leary and Roberts, 2014)
    + Fin Cons; Pol Unc;... (Hassan et al., 2019; Whited and Wu, 2006)
  - $\delta_{k,t}$ are industry and/by date fixed effects
Risk Mitigation (2)

<table>
<thead>
<tr>
<th></th>
<th>Hedging Activity</th>
<th>Compliance Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARA&lt;sub&gt;i,t−1&lt;/sub&gt;</td>
<td>0.3282***</td>
<td>11.1794***</td>
</tr>
<tr>
<td></td>
<td>[4.00]</td>
<td>[4.56]</td>
</tr>
<tr>
<td>Observations</td>
<td>10,437</td>
<td>23,812</td>
</tr>
<tr>
<td>R²</td>
<td>0.0229</td>
<td>0.0069</td>
</tr>
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</table>

**Date FE** + +

**Industry FE** +

**Date × Industry FE** +

**Controls** +

- *t*-statistics computed using firm and date clustered s.e.
## Risk Mitigation (2)

### Hedging Activity

<table>
<thead>
<tr>
<th>$ARA_{i,t-1}$</th>
<th>0.3282***</th>
<th>0.3345***</th>
<th>0.3165***</th>
<th>0.2840***</th>
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<td>[4.47]</td>
<td>[4.14]</td>
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</table>

*Observations: 10,437 10,437 10,362 6,531

* $R^2$: 0.0229 0.1479 0.2040 0.3799

### Compliance Activity

<table>
<thead>
<tr>
<th>$ARA_{i,t-1}$</th>
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<th>9.4435***</th>
<th>7.6329***</th>
<th>2.0122*</th>
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<tr>
<td>[4.56]</td>
<td>[3.66]</td>
<td>[3.74]</td>
<td>[1.82]</td>
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</table>

*Observations: 23,812 23,812 23,696 16,782

* $R^2$: 0.0069 0.1345 0.4266 0.7528

| Date FE | + | + |
| Industry FE | + |
| Date × Industry FE | + |
| Controls | + |

- *t*-statistics computed using firm and date clustered s.e.
- ↑ $P$ (higher than median hedging) as $ARA_{i,t}$ moves 0th to 100th %
## Risk Mitigation (2)

<table>
<thead>
<tr>
<th>Hedging Activity</th>
<th>ARA_{i,t-1}</th>
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<tbody>
<tr>
<td></td>
<td></td>
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<td>0.3165***</td>
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<tr>
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<td>+</td>
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<tr>
<td>Industry FE</td>
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</tr>
<tr>
<td>Date × Industry FE</td>
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<tr>
<td>Controls</td>
<td></td>
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<td></td>
<td>+</td>
</tr>
</tbody>
</table>

- *t*-statistics computed using firm and date clustered s.e.
- ↑ regulatory burden index as ARA_{i,t} moves 0th to 100th %
Cost of Capital (1)

- Are these “priced” risks? Do higher ARA firms have higher $E[R]$?
  - Examine via regression framework:
    \[ ICC_{i,k,t} = \delta_{k,t} + \beta ARA_{i,k,t-1} + X'_{i,t-1} \gamma + \varepsilon_{i,k,t} \]
Cost of Capital (1)

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  \]
  ▶ \( X'_{i,t-1} \) is same vector of controls. . .
  ▶ \( ICC_{i,k,t} \) is the implied cost of capital (Gebhardt et al., 2001)
• Are these “priced” risks? Do higher ARA firms have higher $E [R]$?
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$$\text{ICC}_{i,k,t} = \delta_{k,t} + \beta ARA_{i,k,t-1} + X'_{i,t-1} \gamma + \varepsilon_{i,k,t}$$

▶ $X'_{i,t-1}$ is same vector of controls. . .
▶ $\text{ICC}_{i,k,t}$ is the implied cost of capital (Gebhardt et al., 2001)

• Why do we use ICC rather than realized returns directly?
  ▶ Short time-series: $\sim +6\%$ long-short spread (statistically weak)
Cost of Capital (1)

• Are these “priced” risks? Do higher ARA firms have higher $E[R]$?
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  \[
  ICC_{i,k,t} = \delta_{k,t} + \beta ARA_{i,k,t-1} + X'_{i,t-1} \gamma + \varepsilon_{i,k,t}
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  ▶ $X'_{i,t-1}$ is same vector of controls. . .
  ▶ $ICC_{i,k,t}$ is the implied cost of capital (Gebhardt et al., 2001)

• Why do we use $ICC$ rather than realized returns directly?
  ▶ Short time-series: $\sim +6\%$ long-short spread (statistically weak)

• What characteristics align with ARA portfolios?
  ▶ Strong (weak) association with GP and AG (BM and $\beta_m$)

[Portfolios] [Decomposition]
### Cost of Capital (2)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>ARA(_{i,t-1})</td>
<td>0.0217***</td>
<td>0.0213***</td>
<td>0.0150***</td>
<td>0.0080***</td>
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<tr>
<td></td>
<td>[8.02]</td>
<td>[7.88]</td>
<td>[6.97]</td>
<td>[2.82]</td>
</tr>
<tr>
<td>Date FE</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry FE</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date × Industry FE</td>
<td></td>
<td></td>
<td>+</td>
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</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>36,573</td>
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<td>36,455</td>
<td>26,823</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.0103</td>
<td>0.0172</td>
<td>0.0785</td>
<td>0.2469</td>
</tr>
</tbody>
</table>

- \(t\)-statistics computed using firm and date clustered s.e.
Cost of Capital (2)

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- *t*-statistics computed using firm and date clustered s.e.
- ↑ cost of capital as ARA<sub>i,t</sub> moves 0th to 100th %
Firm-Level Outcomes: Empirical Design

• ↑ Cost of Capital implies ↓ Prospects...

\[ y_{i,t} \equiv \text{real outcome of firm } i \text{ at time } t \] (e.g., investment, sales, hiring)

\[ A_{i,t-1} \] captures adjusted relative attention of firm \( i \) at time \( t - 1 \)

\[ X'_{i,t-1} \] is vector of controls

\[ \delta_k, t \] are industry and/or date fixed effects
Firm-Level Outcomes: Empirical Design

- ↑ Cost of Capital implies ↓ Prospects...
- Test whether any of this actually matters for firm outcomes:

\[ \Delta y_{i,k,t} = \delta_{k,t} + \beta ARA_{i,k,t-1} + X'_{i,t-1}\gamma + \epsilon_{i,k,t} \]

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Firm-Level Outcomes: Empirical Design

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- \( y_{i,t} \equiv \) real outcome of firm \( i \) at time \( t \) (e.g., investment, sales, hiring)
- \( ARA_{i,t-1} \) captures adjusted relative attention of firm \( i \) at time \( t-1 \)
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- \( \delta_{k,t} \) are industry and/by date fixed effects
### Firm-Level Outcomes: Investment and Sales

<table>
<thead>
<tr>
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<th></th>
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<tr>
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<td><strong>ARA(i,t-1)</strong></td>
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<td><strong>ARA(i,t-1)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.0394^{***})</td>
<td>(-0.0391^{***})</td>
<td>(-0.0266^{***})</td>
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<tr>
<td></td>
<td></td>
<td>([-3.34])</td>
<td>([-3.41])</td>
<td>([-3.16])</td>
</tr>
<tr>
<td>Observations</td>
<td>52,794</td>
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<td>33,233</td>
</tr>
<tr>
<td>(R^2)</td>
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<td>0.0149</td>
<td>0.0208</td>
<td>0.1208</td>
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</table>

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>ARA(i,t-1)</strong></td>
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</tr>
<tr>
<td></td>
<td></td>
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<td>(-0.1390^{***})</td>
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<td>(R^2)</td>
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<td>0.0127</td>
<td>0.0367</td>
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- Date FE +
- Industry FE +
- Date × Industry FE +
- Controls +

- Relative attention to uncertainty ↑ ⇒ Invest & Sell less
Firm-Level Outcomes: Investment and Sales

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<th></th>
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<tbody>
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- Date FE +
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- Date × Industry FE +
- Controls +

- Relative attention to uncertainty ↑ ⇒ Invest & Sell less
- Also observe reductions in PPENT Growth and INVT Growth

Baba-Yara, Davis, Grigoris & Kantak 
Are uncertain firms riskier? 
July 2023
Firm-Level Outcomes: Employment

<table>
<thead>
<tr>
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<th>(1)</th>
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<tr>
<td>Industry FE</td>
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<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Date \times Industry FE</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Controls</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
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<td>10,335</td>
<td>10,335</td>
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<td>6,517</td>
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<tr>
<td>$R^2$</td>
<td>0.0074</td>
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<td>0.1243</td>
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</table>

- Attention to uncertainty $\uparrow \Rightarrow$ Hire fewer (fire more?) workers
Conclusion

- Employees within firms pay attention to a lot!
Conclusion

- Employees within firms pay attention to a lot!
- Dissecting attention means understanding distribution of topics...

Higher attention to financial uncertainty topics
1. More exposure to aggregate measures of uncertainty,
2. Greater effort mitigating risk,
3. Higher cost-of-capital!

Higher attention to uncertainty ⇒ lower investment & prospects
Effects incremental to relationship with other measures of exposure!!
Conclusion

• Employees within firms pay attention to a lot!

• Dissecting attention means understanding distribution of *topics* . . .
  ▶ Higher attention to *financial* uncertainty topics ⇒
    1. More exposure to aggregate measures of uncertainty,
    2. Greater effort mitigating risk,
    3. Higher cost-of-capital!
Conclusion

- Employees within firms pay attention to a lot!
- Dissecting attention means understanding distribution of topics...
  - Higher attention to financial uncertainty topics ⇒
    1. More exposure to aggregate measures of uncertainty,
    2. Greater effort mitigating risk,
    3. Higher cost-of-capital!
  - Higher attention to uncertainty ⇒ lower investment & prospects
    - Effects incremental to relationship with other measures of exposure!!


### Exposure to Uncertainty Placebo

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>VIX</th>
<th>EPU</th>
<th>Financial</th>
<th>Macro</th>
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<tbody>
<tr>
<td>Low ARA</td>
<td>0.0355 [5.14]</td>
<td>0.0397 [5.13]</td>
<td>0.0443 [4.19]</td>
<td>0.0378 [2.36]</td>
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<tr>
<td>2</td>
<td>0.0359 [4.89]</td>
<td>0.0401 [4.72]</td>
<td>0.0473 [3.59]</td>
<td>0.0461 [2.66]</td>
</tr>
<tr>
<td>High ARA</td>
<td>0.0321 [4.64]</td>
<td>0.0366 [4.98]</td>
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</tr>
<tr>
<td>High-Low</td>
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<td>-0.0031 [-0.62]</td>
<td>0.0064 [0.61]</td>
<td>0.0105 [1.01]</td>
</tr>
</tbody>
</table>

- *ARA* stands for Alternating Representation Algorithm.
- The values in square brackets represent the t-statistics.
## Exposure to Uncertainty 5 Portfolios

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<th>Portfolio</th>
<th>VIX</th>
<th>EPU</th>
<th>Financial</th>
<th>Macro</th>
</tr>
</thead>
<tbody>
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<td>$\beta$</td>
<td>$t$-stat</td>
<td>$\beta$</td>
<td>$t$-stat</td>
</tr>
<tr>
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<td>0.0098</td>
<td>[3.44]</td>
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<td>[4.47]</td>
</tr>
<tr>
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<tr>
<td>High ARA</td>
<td>0.0290</td>
<td>[3.89]</td>
<td>0.0321</td>
<td>[4.80]</td>
</tr>
<tr>
<td>High-Low</td>
<td>0.0154</td>
<td>[3.30]</td>
<td>0.0223</td>
<td>[5.23]</td>
</tr>
</tbody>
</table>
### 3 ARA Portfolio Characteristics

<table>
<thead>
<tr>
<th>ARA Type</th>
<th>Beta</th>
<th>Market Cap</th>
<th>Book to Market</th>
<th>Gross Profit</th>
<th>Asset Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low ARA</td>
<td>1.0186</td>
<td>3439</td>
<td>0.5110</td>
<td>0.1742</td>
<td>0.3022</td>
</tr>
<tr>
<td>2</td>
<td>1.0557</td>
<td>5356</td>
<td>0.5291</td>
<td>0.2425</td>
<td>0.2150</td>
</tr>
<tr>
<td>High ARA</td>
<td>1.0628</td>
<td>11978</td>
<td>0.5313</td>
<td>0.2604</td>
<td>0.1453</td>
</tr>
<tr>
<td>High-Low</td>
<td>0.0443</td>
<td>8538</td>
<td>0.0203</td>
<td>0.0862</td>
<td>-0.1568</td>
</tr>
</tbody>
</table>

| t-stat   | [1.48]| [13.22]| [2.32]| [3.49]| [-3.49]|

- Baba-Yara, Davis, Grigoris & Kantak
- Are uncertain firms riskier?
- July 2023
## 5 ARA Portfolio Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Beta</th>
<th>Market Cap</th>
<th>Book to Market</th>
<th>Gross Profit</th>
<th>Asset Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low ARA</td>
<td>1.0103</td>
<td>3157</td>
<td>0.5146</td>
<td>0.1588</td>
<td>0.3480</td>
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<tr>
<td>2</td>
<td>1.0336</td>
<td>3960</td>
<td>0.5052</td>
<td>0.2052</td>
<td>0.2380</td>
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<tr>
<td>3</td>
<td>1.0573</td>
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<td>0.5279</td>
<td>0.2434</td>
<td>0.2139</td>
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<tr>
<td>4</td>
<td>1.0747</td>
<td>7472</td>
<td>0.5419</td>
<td>0.2702</td>
<td>0.1575</td>
</tr>
<tr>
<td>High ARA</td>
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<td>14584</td>
<td>0.5293</td>
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<td>0.1472</td>
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<tr>
<td>High-Low</td>
<td>0.0422</td>
<td>11427</td>
<td>0.0147</td>
<td>0.0921</td>
<td>-0.2007</td>
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<tr>
<td>t-stat</td>
<td>[1.25]</td>
<td>[9.51]</td>
<td>[1.23]</td>
<td>[3.20]</td>
<td>[-3.64]</td>
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<td></td>
<td>2-digit NAICS</td>
<td>3-digit NAICS</td>
<td>No Fixed Effect</td>
<td></td>
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</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>---------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sector FE</td>
<td>3.78%</td>
<td>6.82%</td>
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<tr>
<td>Sector × Date FE</td>
<td>1.32%</td>
<td>2.93%</td>
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<tr>
<td>Firm-specific</td>
<td>94.89%</td>
<td>90.25%</td>
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</tr>
<tr>
<td>Permanent difference across firms, within sector-date</td>
<td>34.01%</td>
<td>30.88%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Across firm-time residual</td>
<td>60.88%</td>
<td>59.37%</td>
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</tr>
</tbody>
</table>

**Characteristics:**

- Beta                   | 0.22%         | 0.22%         | 0.19%           |
- Size                    | 0.01%         | 0.01%         | 8.91%           |
- Book-to-Market          | 0.04%         | 0.04%         | 1.27%           |
- Gross Profitability     | 0.10%         | 0.10%         | 0.29%           |
- Asset Growth            | 0.01%         | 0.01%         | 1.13%           |
- Characteristic Total    | 0.36%         | 0.38%         | 11.78%          |

**Number of Sectors**

- 19
- 72
### Firm-Level Outcomes: Investment (PPENT growth)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARA$_{i,t-1}$</td>
<td>$-0.0979^{***}$</td>
<td>$-0.0982^{***}$</td>
<td>$-0.0692^{***}$</td>
<td>$-0.0459^*$</td>
</tr>
<tr>
<td></td>
<td>$[-2.72]$</td>
<td>$[-2.94]$</td>
<td>$[-3.14]$</td>
<td>$[-1.89]$</td>
</tr>
<tr>
<td>Date FE</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Industry FE</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Date $\times$ Industry FE</td>
<td></td>
<td></td>
<td>+</td>
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<tr>
<td>Controls</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Observations</td>
<td>51,976</td>
<td>51,976</td>
<td>51,634</td>
<td>33,115</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.0029</td>
<td>0.0877</td>
<td>0.0948</td>
<td>0.2316</td>
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</tbody>
</table>
## Firm-Level Outcomes: Investment (Inventory Growth)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARA$_{i,t-1}$</td>
<td>$-0.0457^{***}$</td>
<td>$-0.0453^{***}$</td>
<td>$-0.0394^{***}$</td>
<td>$-0.0202^{***}$</td>
</tr>
<tr>
<td></td>
<td>[−6.16]</td>
<td>[−6.18]</td>
<td>[−5.60]</td>
<td>[−2.93]</td>
</tr>
<tr>
<td>Date FE</td>
<td></td>
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<tr>
<td>Industry FE</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date × Industry FE</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Controls</td>
<td></td>
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<tr>
<td>Observations</td>
<td>36,841</td>
<td>36,841</td>
<td>36,718</td>
<td>25,871</td>
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<tr>
<td>$R^2$</td>
<td>0.0025</td>
<td>0.0161</td>
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