Getting through:
Communicating complex central bank messages

Michael McMahon\textsuperscript{1,2} Matthew Naylor\textsuperscript{1}

\textsuperscript{1}University of Oxford
\textsuperscript{2}Irish Fiscal Council
\textsuperscript{3}Bank of England

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Disclaimer: Preliminary. The views expressed in this paper are those of the authors and not necessarily of the Bank of England or of the Irish Fiscal Council.
Motivation

▶ “I think our challenge is to speak in plain English as opposed to in a high-tech scientific language which only about half a dozen people understand and even less are interested in” Adrian Orr (2018)
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▶ BUT narrow focus on Flesch-Kincaid (simple avg of word and sentence length).
Research questions

▶ How might complex language influence the formation of inflation expectations?
This paper

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▶ What actually is linguistic complexity and how can we measure it?
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▶ Propose a simple theoretical argument for simplicity
This paper

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▶ How might complex language influence the formation of inflation expectations?
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Approach

▶ Propose a simple theoretical argument for simplicity
▶ Construct novel measures of complexity that capture broader dimensions
This paper

Research questions
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Approach
▶ Propose a simple theoretical argument for simplicity
▶ Construct novel measures of complexity that capture broader dimensions
▶ Test causal impact of complexity on informedness and trust, in an RCT
What we find

1. Complexity reduces attention paid to CB messages, reducing the accuracy of beliefs formed.
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2. Efforts by the BoE to simplify language have focused on *semantic* dimensions of complexity, with more mixed evidence across *conceptual* dimensions.

3. Conceptual complexity matters more than semantic complexity.

4. This result holds among people who have studied economics at university.
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   - For both *informedness* and *trust*
   - Explained exclusively by a novel measure we construct.
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Related Literature

**CB Comms**

1st Revolution (1990s): Financial markets
- CBs have largely been successful in shaping exps Coibion et al., 2019; Swanson 2018

2nd Revolution (2010s): General public
- “It may be time to pay attention to communication with the public” Blinder (2008)
  - HHs and firms form exps in similar ways Coibion & Gorodnichenko, 2015; Nalewaik, 2016
  - HH exps matter for activity and financial choices Reis 2023; Bachmann, Berg & Sims, 2015; Armantier et al., 2015; Malmendier & Nagel, 2016
- “CBs will keep trying but, for the most part, they will fail” Blinder (2018), Binder (2017)
  - Exciting open area of research D’Acunto et al., 2022

**Linguistic Complexity**
- Simplified communication can help achieve this Haldane & McMahon, 2018; Coibion et al., 2020
- But focus to date on Flesch-Kincaid score Mumtaz et al., 2023; Ferrara & Angino 2022; Hernandez-Murillo & Shell 2014; Bulir et al., 2012
A theoretical argument for simplicity
Simple Rational Inattention Model

Summary

Two agents


(ii) Household $h$. Imperfectly informed: rationally inattentive.

Setup

CB transmits a message revealing the true state of the economy.

$h$ chooses how much attention to pay to it based on $u_h$ (informed) and $c_h$ (complexity).

Result

Optimal attention: $\frac{\partial (\text{attention})}{\partial (\text{complexity})} < 0$, and inaccuracy of updated belief: $\frac{\partial (\text{accuracy})}{\partial \text{complexity}} < 0$. 
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Linguistic Complexity of CB Communications
Traditional measures: Semantic Complexity

- Word Count
- Flesch-Kincaid

Flesch Kincaid Score = \(0.39 \frac{n(\text{Words})}{n(\text{Sentences})} + 11.8 \frac{n(\text{Syllables})}{n(\text{Words})} - 15.59\)
Traditional measures: Semantic Complexity

BoE efforts to simplify language have focused on ‘semantic’ dimensions of complexity...
Traditional measures: Semantic Complexity

BoE efforts to simplify language have focused on ‘semantic’ dimensions of complexity...
Novel measures: Conceptual Complexity

▶ Proportion of Jargon

\[
\text{PoJ} = \frac{\sum_{j=1}^{J} w_j}{\sum_{i=1}^{N} w_i} \equiv \frac{W_j}{W_i}
\]

- \(w_j\): number of instances jargon term \(j \in \{1, \ldots, J\}\) is mentioned.
- \(w_i\): number of instances any word \(i \in \{1, \ldots, N\}\) is mentioned.
Novel measures: Conceptual Complexity

Wordcloud: Monetary Policy Report
Novel measures: Conceptual Complexity

... but we do not observe the same trend-decline along dimensions of ‘conceptual’ complexity.
Novel measures: Conceptual Complexity

▶ Proportion of Jargon

$$PoJ = \frac{W_j}{W_i}$$
Novel measures: Conceptual Complexity

▶ Proportion of Jargon

\[ \text{PoJ} = \frac{W_j}{W_i} \]

▶ McMahon-Naylor Conceptual Complexity (MNCC) Index

\[ \text{MNCC} = \frac{\sum_{t=1}^{T} W_{j,t}^* \times \Phi}{W_i} \]
Novel measures: Conceptual Complexity

- Proportion of Jargon

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We categorise jargon into 10 topics (MP, inflation, output, etc.) and make two adjustments:
Novel measures: Conceptual Complexity

- **Proportion of Jargon**

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- **McMahon-Naylor Conceptual Complexity (MNCC) Index**

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  We categorise jargon into 10 topics (MP, inflation, output, etc.) and make two adjustments:

  \[ \sum_{t=1}^{T} W_{j,t}^* \equiv \frac{W_{j,t}}{\Psi_t} \]: breadth and dispersion of distinct jargon terms used *within* topic \( t \).
Novel measures: Conceptual Complexity

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We categorise jargon into 10 topics (MP, inflation, output, etc.) and make two adjustments:

i. \( \sum_{t=1}^{T} W_{j,t}^* \equiv \frac{W_{j,t}}{\psi_t} \): breadth and dispersion of distinct jargon terms used within topic \( t \).

ii. \( \Phi \): adjusts for the range of topics, \( T \), discussed.
Novel measures: Conceptual Complexity

The MP Summary uses a broader range of technical terms and concepts.

![Proportion of Jargon (PoJ)](image-url)
Novel measures: Conceptual Complexity

The MP Summary uses a broader range of technical terms and concepts.
Novel measures: Conceptual Complexity

The MP Summary uses a broader range of technical terms and concepts.
Empirical Strategy: RCT
Survey Design

- **Respondents:** 2000 representative members of the public
- **Pre-treatment questions:** Demographics, interests, state of UK economy
- **Treatment:** Read a CB report. Texts vary in complexity across dimensions
- **Post-treatment questions:** Capture levels of informedness and trust
Treatment

Texts vary across different dimensions of complexity

<table>
<thead>
<tr>
<th>Conceptual</th>
<th>Semantic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

- Text 1 = 2018 Q1 VS
- Text 3 = 2019 Q4 VS
- Text 6 = 2018 Q1 MPS
Post-Treatment Questions

i Understanding
  ▶ Perceived
  ▶ Actual

ii Attitude towards CB (such as trust)

iii What matters most?
Results
Results

i Understanding
  ▶ Perceived
  ▶ Actual

ii Attitude towards CB (such as trust)

iii What matters most?
Results: Perceived Understanding

Complexity reduces perceived understanding

Q: To what extent are you able to understand the content and messages of the material you just read?
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Results: Perceived Understanding
High conceptual complexity drives this, explained exclusively by the MNCC index

Q: To what extent are you able to understand the content and messages of the material you just read?
Results

i Understanding
   ▶ Perceived
   ▶ Actual

ii Attitude towards CB (such as trust)

iii What matters most?
Results: Actual Understanding

Conceptual complexity reduces accuracy of beliefs formed

What is the current inflation rate in the economy described?

What is the interest rate in the economy described?

What do you expect to happen to pay (adjusting for price changes) in the coming years?
Results: Empirical Specification

We test these observations conditioning on demographic factors

\[ Y_i = \beta_1 \text{Conceptual Medium}_i + \beta_2 \text{Conceptual High}_i \]
\[ + \gamma_1 \text{Semantic Medium}_i + \gamma_2 \text{Semantic High}_i \]
\[ + \delta X_i + \epsilon_i \]
## Results: Understanding

And these results hold when we condition on demographic factors

<table>
<thead>
<tr>
<th></th>
<th>Perceived Understanding</th>
<th>Actual Understanding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td><strong>Conceptual</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>$-0.039$</td>
<td>$-0.011$</td>
</tr>
<tr>
<td></td>
<td>$(0.060)$</td>
<td>$(0.031)$</td>
</tr>
<tr>
<td>High</td>
<td>$-0.791^{***}$</td>
<td>$-0.079^*$</td>
</tr>
<tr>
<td></td>
<td>$(0.084)$</td>
<td>$(0.043)$</td>
</tr>
<tr>
<td><strong>Semantic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>$0.029$</td>
<td>$-0.041$</td>
</tr>
<tr>
<td></td>
<td>$(0.061)$</td>
<td>$(0.031)$</td>
</tr>
<tr>
<td>High</td>
<td>$0.005$</td>
<td>$-0.001$</td>
</tr>
<tr>
<td></td>
<td>$(0.108)$</td>
<td>$(0.056)$</td>
</tr>
<tr>
<td><strong>Studied Econ at Uni</strong></td>
<td>$0.450^{***}$</td>
<td>$-0.032$</td>
</tr>
<tr>
<td></td>
<td>$(0.051)$</td>
<td>$(0.026)$</td>
</tr>
<tr>
<td><strong>Demographic Controls</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>1,745</td>
<td>1,745</td>
</tr>
<tr>
<td><strong>$R^2$</strong></td>
<td>0.267</td>
<td>0.063</td>
</tr>
</tbody>
</table>

*Note:* *$p$<0.1; **$p$<0.05; ***$p$<0.01*
Results

i Understanding
  ▶ Perceived
  ▶ Actual

ii Attitude towards CB (such as trust)

iii What matters most?
Results: Attitudes towards CB

Conceptual complexity also drives the degrading of attitudes towards the CB

Q: To what extent do you agree with each of the following statements:

- I now have a better understanding of the role of the Bank of England
- I am now more likely to pay attention to future documents published by the Bank of England
- I now have more trust in the Bank of England as an institution
### Results: Attitudes towards CB

And these results also hold when we condition on demographic factors

<table>
<thead>
<tr>
<th>Conceptual</th>
<th>Trust</th>
<th>Attention</th>
<th>Role of BoE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium Conceptual</td>
<td>−0.009</td>
<td>−0.025</td>
<td>−0.099</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.071)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>High Conceptual</td>
<td>−0.185**</td>
<td>−0.313***</td>
<td>−0.546***</td>
</tr>
<tr>
<td></td>
<td>(0.081)</td>
<td>(0.098)</td>
<td>(0.093)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semantic</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium Semantic</td>
<td>0.057</td>
<td>0.004</td>
<td>0.053</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.071)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>High Semantic</td>
<td>0.009</td>
<td>−0.115</td>
<td>0.043</td>
</tr>
<tr>
<td></td>
<td>(0.104)</td>
<td>(0.127)</td>
<td>(0.120)</td>
</tr>
</tbody>
</table>

| Studied Econ at Uni| 0.118**   | 0.224***  | 0.252***    |
|                    | (0.049)   | (0.059)   | (0.056)     |

Demographic Controls: Yes, Yes, Yes
Observations: 1,742, 1,743, 1,745

$R^2$: 0.047, 0.051, 0.090

**Note:** *p<0.1; **p<0.05; ***p<0.01
Results

i Understanding
   ▶ Perceived
   ▶ Actual

ii Attitude towards CB (such as trust)

iii What matters most?
Results: What would make the text easier?
Respondents identified *conceptual* complexity as the greatest barrier

Which of the following do you think would have made the text easier to understand?

![Bar chart showing the proportion of respondents who believe that reducing technical concepts, technical words, shorter sentences, or shorter words would make the text easier.](chart.png)
Results: Sub-Sample of Economics graduates

Our results hold when we focus on a sub-sample of respondents who studied Economics at university.

<table>
<thead>
<tr>
<th>Perceived Understanding</th>
<th>Actual Understanding Inf(t)</th>
<th>Actual Understanding i(t)</th>
<th>Actual Understanding Exp Pay</th>
<th>Sentiments towards CB Trust</th>
<th>Sentiments towards CB Attention</th>
<th>Sentiments towards CB BoE Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Conceptual</td>
<td>−0.784***</td>
<td>−0.053</td>
<td>−0.195**</td>
<td>−0.206**</td>
<td>−0.339**</td>
<td>−0.406**</td>
</tr>
<tr>
<td></td>
<td>(0.189)</td>
<td>(0.092)</td>
<td>(0.089)</td>
<td>(0.089)</td>
<td>(0.150)</td>
<td>(0.179)</td>
</tr>
<tr>
<td>High Semantic</td>
<td>0.225</td>
<td>0.006</td>
<td>−0.052</td>
<td>0.004</td>
<td>0.248</td>
<td>−0.009</td>
</tr>
<tr>
<td></td>
<td>(0.246)</td>
<td>(0.119)</td>
<td>(0.115)</td>
<td>(0.116)</td>
<td>(0.195)</td>
<td>(0.233)</td>
</tr>
</tbody>
</table>

Demographic Controls: Yes, Yes, Yes, Yes, Yes, Yes, Yes, Yes
Sample: Econ, Econ, Econ, Econ, Econ, Econ, Econ, Econ
R\(^2\): 0.129, 0.018, 0.093, 0.051, 0.044, 0.036, 0.038

Note: *p<0.1; **p<0.05; ***p<0.01
Conclusions
Conclusions

1. If agents are rationally inattentive, complexity reduces the accuracy of beliefs formed.

2. Efforts by the BoE to reduce complexity have focused on semantic dimensions, while evidence across conceptual dimensions is more mixed.

3. Conceptual complexity matters more than semantic complexity. It reduces:
   - perceived understanding
   - actual understanding
   - attitudes towards the central bank

4. This remains the case among people who have studied economics at university.
Policy Implications

- Targeting a broader range of dimensions of complexity could enable more effective communications ...
- ... potentially with all economic agents, not just the general public.
Appendix
Motivation

Financial market participants have well anchored 5-year ahead inflation expectations

Source: Beechey & Johansen 2011
Motivation

Household long-run expectations are poorly anchored

Source: Binder 2017 (US Michigan Survey of Consumers)
Motivation

Firms’ are similarly poorly anchored

<table>
<thead>
<tr>
<th></th>
<th>Central bank (1)</th>
<th>Professional forecasters</th>
<th>Households</th>
<th>Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (2)</td>
<td>SD (3)</td>
<td>Mean (4)</td>
<td>SD (5)</td>
</tr>
<tr>
<td><strong>Panel A. 2013:IV</strong> (wave 1, number of observations: 3,144)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>1.3</td>
<td>2.0</td>
<td>2.0</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Panel B. 2014:II</strong> (wave 2, number of observations: 712)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>1.9</td>
<td>2.0</td>
<td>2.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Unemployment</td>
<td>4.9</td>
<td>5.3</td>
<td>5.3</td>
<td>0.3</td>
</tr>
<tr>
<td>GDP growth</td>
<td>3.5</td>
<td>3.4</td>
<td>3.4</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Panel C. 2014:III</strong> (wave 3, number of observations: 1,601)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>1.6</td>
<td>1.9</td>
<td>1.9</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Panel D. 2014:IV</strong> (wave 4, number of observations: 1,257)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>1.1</td>
<td>1.7</td>
<td>1.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Unemployment</td>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
<td>0.3</td>
</tr>
<tr>
<td>GDP growth</td>
<td>3.5</td>
<td>3.0</td>
<td>3.0</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Panel E. 2016:II</strong> (wave 5, number of observations: 2,040)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>1.6</td>
<td>1.3</td>
<td>1.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Unemployment</td>
<td>5.2</td>
<td>5.5</td>
<td>5.5</td>
<td>0.2</td>
</tr>
<tr>
<td>GDP growth</td>
<td>3.4</td>
<td>2.6</td>
<td>2.6</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Panel F. 2016:IV</strong> (wave 6, number of observations: 1,404)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>1.7</td>
<td>1.6</td>
<td>1.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Unemployment</td>
<td>4.7</td>
<td>4.8</td>
<td>4.8</td>
<td>0.3</td>
</tr>
<tr>
<td>GDP growth</td>
<td>3.4</td>
<td>3.0</td>
<td>3.0</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Source: Coibion, Gorodnichenko and Kumar 2018 (New Zealand 5-year ahead expectations)
Motivation

FK score of FOMC statements has increased significantly since 1990s

Source: Hernandez-Murillo and Shell 2014
Motivated by study conducted by Bholat et al., 2018 in collaboration with Behavioural Insights Team

<table>
<thead>
<tr>
<th>Jargon</th>
<th>Relatable</th>
</tr>
</thead>
<tbody>
<tr>
<td>inflation</td>
<td>prices</td>
</tr>
<tr>
<td>wages</td>
<td>pay</td>
</tr>
<tr>
<td>unemployment</td>
<td>jobs</td>
</tr>
<tr>
<td>firms</td>
<td>companies</td>
</tr>
<tr>
<td>agents</td>
<td>people</td>
</tr>
<tr>
<td>percentages</td>
<td>GBP values</td>
</tr>
</tbody>
</table>
Topics discussed in BoE publications

(i) Topic 3

(ii) Topic 4

(iii) Topic 7

(iv) Topic 9

(v) Topic 15

(vi) Topic 20
Treatment

Texts vary across different dimensions of complexity

<table>
<thead>
<tr>
<th>Degree of Complexity</th>
<th>Semantic</th>
<th>Conceptual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FK</td>
<td>PoJ MNCC</td>
</tr>
<tr>
<td>Low</td>
<td>6.0</td>
<td>5 10</td>
</tr>
<tr>
<td>Medium</td>
<td>10.5</td>
<td>10 15</td>
</tr>
<tr>
<td>High</td>
<td>14.5</td>
<td>10 30</td>
</tr>
</tbody>
</table>
Results: Understanding (alternative)

And these results hold when we condition on demographic factors

<table>
<thead>
<tr>
<th>Baseline</th>
<th>SC low (1)</th>
<th>SC low (2)</th>
<th>SC med (3)</th>
<th>CC low (4)</th>
<th>CC low (5)</th>
<th>CC low (6)</th>
<th>CC med (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC med</td>
<td>−0.050 (0.085)</td>
<td>0.084 (0.088)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC high</td>
<td></td>
<td></td>
<td>−0.028 (0.088)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC med</td>
<td></td>
<td></td>
<td></td>
<td>−0.076 (0.081)</td>
<td>0.037 (0.090)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC high</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−0.748*** (0.087)</td>
<td>−0.787*** (0.093)</td>
</tr>
</tbody>
</table>

Sample: CC low 482, CC med 432, CC high 505, SC low 470, SC med 447, SC med 439, SC med 410

Demographic Controls: Yes, Yes, Yes, Yes, Yes, Yes, Yes, Yes

Observations: 482, 470, 432, 505, 447, 439, 410

R²: 0.180, 0.188, 0.169, 0.254, 0.139, 0.233, 0.251

Note: *p<0.1; **p<0.05; ***p<0.01
## Results: Understanding

And these results hold when we condition on demographic factors

<table>
<thead>
<tr>
<th>Conceptual</th>
<th>Perceived Understanding</th>
<th>GDP(t)</th>
<th>Inflation(t)</th>
<th>Interest Rate(t)</th>
<th>Pay</th>
<th>Interest Rate Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Conceptual</td>
<td>-0.791***</td>
<td>-0.004</td>
<td>-0.079*</td>
<td>-0.186***</td>
<td>-0.130***</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td>(0.084)</td>
<td>(0.028)</td>
<td>(0.043)</td>
<td>(0.043)</td>
<td>(0.042)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>age</td>
<td>0.004**</td>
<td>0.005</td>
<td>-0.001</td>
<td>0.003***</td>
<td>-0.001</td>
<td>0.003***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>UK country of birth</td>
<td>0.044</td>
<td>0.012</td>
<td>-0.001</td>
<td>-0.009</td>
<td>-0.013</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>(0.059)</td>
<td>(0.020)</td>
<td>(0.030)</td>
<td>(0.030)</td>
<td>(0.030)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>income</td>
<td>0.168***</td>
<td>0.010</td>
<td>0.012</td>
<td>0.026**</td>
<td>0.017</td>
<td>0.021**</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.007)</td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>econ at uni</td>
<td>0.450***</td>
<td>-0.033*</td>
<td>-0.032</td>
<td>0.022</td>
<td>-0.048*</td>
<td>-0.039*</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.017)</td>
<td>(0.026)</td>
<td>(0.026)</td>
<td>(0.026)</td>
<td>(0.024)</td>
</tr>
<tr>
<td>pre-anchored exps</td>
<td>0.518***</td>
<td>0.077***</td>
<td>0.233***</td>
<td>0.174***</td>
<td>0.093***</td>
<td>0.093***</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.016)</td>
<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.022)</td>
</tr>
</tbody>
</table>

Demographic Controls | Yes | Yes | Yes | Yes | Yes | Yes
Observations | 1,745 | 1,745 | 1,745 | 1,745 | 1,745 | 1,745
R² | 0.067 | 0.031 | 0.062 | 0.099 | 0.095 | 0.024

Note: ∗p < 0.1; ∗∗p < 0.05; ∗∗∗p < 0.01
More results

Rational borrowing and savings preferences

How would your borrowing and savings preferences change under various interest rates?
### Results: Attitudes towards CB

And these results also hold when we condition on demographic factors

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conceptual</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Conceptual</td>
<td>-0.185** (0.081)</td>
<td>-0.313*** (0.098)</td>
<td>-0.546*** (0.093)</td>
</tr>
<tr>
<td><strong>age</strong></td>
<td>0.007*** (0.002)</td>
<td>0.003 (0.002)</td>
<td>0.0003 (0.002)</td>
</tr>
<tr>
<td><strong>UK country of birth</strong></td>
<td>-0.106* (0.056)</td>
<td>-0.236*** (0.069)</td>
<td>-0.038 (0.065)</td>
</tr>
<tr>
<td><strong>income</strong></td>
<td>0.056*** (0.021)</td>
<td>0.032 (0.026)</td>
<td>0.072*** (0.025)</td>
</tr>
<tr>
<td><strong>econ at uni</strong></td>
<td>0.118** (0.049)</td>
<td>0.224*** (0.059)</td>
<td>0.252*** (0.056)</td>
</tr>
<tr>
<td><strong>pre-anchored exps</strong></td>
<td>0.146*** (0.045)</td>
<td>0.122** (0.055)</td>
<td>0.322*** (0.052)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>1.418*** (0.094)</td>
<td>2.148*** (0.115)</td>
<td>1.750*** (0.109)</td>
</tr>
</tbody>
</table>

Demographic Controls | Yes | Yes | Yes
Observations | 1,742 | 1,743 | 1,745
R² | 0.047 | 0.051 | 0.090

Note: *p<0.1; **p<0.05; ***p<0.01
Two agents:


(ii) Household \( h \). Imperfectly informed: rationally inattentive.

Stage 1. Household \( h \) has a prior belief \( \bar{x}_h \) about the state of the economy.

Stage 2. CB transmits a message, \( x \sim N(0, \sigma^2_x) \), revealing true state of the economy.

Stage 3. Households receive the CB's message as a noisy signal:
\[
\tilde{x}_h = x + \epsilon_h
\]
noise

Stage 4. Update beliefs:
\[
\tilde{x}_h = E[x | s_h] = (1 - \xi_h)\bar{x}_h + \xi_hs_h
\]

Choosing \( \xi_h \) based on utility from being informed, \( u_h(x, \tilde{x}_h) \), and cost of attention, \( c_h(\mu) \).

Result: Optimal attention:
\[
\frac{\partial \xi_h}{\partial \mu} < 0, \quad \text{and inaccuracy of updated belief:} \quad \frac{\partial (x - \tilde{x}_h)}{\partial \mu} > 0.
\]
Simple Rational Inattention Model

Summary

Two agents:
Simple Rational Inattention Model

Summary

Two agents:
(ii) Household $h$. Imperfectly informed: rationally inattentive.
Simple Rational Inattention Model

Summary

Two agents:
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Stage 1. Household $h$ has a prior belief $\bar{x}_h$ about the state of the economy.
Two agents:
(ii) Household $h$. Imperfectly informed: rationally inattentive.

Stage 1. Household $h$ has a prior belief $\bar{x}_h$ about the state of the economy.
Stage 2. CB transmits a message, $x \sim \mathcal{N}(0, \sigma_x^2)$, revealing true state of the economy.
Simple Rational Inattention Model

Summary

**Two agents:**
(ii) Household $h$. Imperfectly informed: rationally inattentive.

**Stage 1.** Household $h$ has a prior belief $\bar{x}_h$ about the state of the economy.

**Stage 2.** CB transmits a message, $x \sim \mathcal{N}(0, \sigma^2_x)$, revealing true state of the economy.

**Stage 3.** Households receive the CB’s message as a noisy signal: $s_h = x + \epsilon_h$

Choosing $\xi_h$ based on utility from being informed, $u_h(x, \hat{x}_h)$, and cost of attention, $c_h(\mu)$.

Result: Optimal attention: $\frac{\partial \xi_h}{\partial \mu} < 0$, and inaccuracy of updated belief: $\frac{\partial (x - \hat{x}_h)}{\partial \mu} > 0$. 
Simple Rational Inattention Model

Summary

Two agents:
(ii) Household $h$. Imperfectly informed: rationally inattentive.

Stage 1. Household $h$ has a prior belief $\bar{x}_h$ about the state of the economy.

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Stage 4. Update beliefs: $	ilde{x}_h = E[x|s_h] = (1 - \xi_h)\bar{x}_h + \xi hs_h$
Two agents:
(ii) Household \( h \). Imperfectly informed: rationally inattentive.

Stage 1. Household \( h \) has a prior belief \( \bar{x}_h \) about the state of the economy.

Stage 2. CB transmits a message, \( x \sim \mathcal{N}(0, \sigma^2_x) \), revealing true state of the economy.

Stage 3. Households receive the CB’s message as a noisy signal: \( s_h = x + \epsilon_h \)

Stage 4. Update beliefs: \( \tilde{x}_h = E[x|s_h] = (1 - \xi_h)\bar{x}_h + \xi_h s_h \)

Choosing \( \xi_h \) based on utility from being informed, \( u_h(x, \tilde{x}_h) \), and cost of attention, \( c_h(\mu) \)
Simple Rational Inattention Model

Summary

**Two agents:**
(ii) Household $h$. Imperfectly informed: rationally inattentive.

**Stage 1.** Household $h$ has a prior belief $\bar{x}_h$ about the state of the economy.

**Stage 2.** CB transmits a message, $x \sim \mathcal{N}(0, \sigma_x^2)$, revealing true state of the economy.

**Stage 3.** Households receive the CB’s message as a noisy signal: $s_h = x + \epsilon_h$

**Stage 4.** Update beliefs: $\tilde{x}_h = E[x|s_h] = (1 - \xi_h)\bar{x}_h + \xi_hs_h$

Choosing $\xi_h$ based on utility from being informed, $u_h(x, \tilde{x}_h)$, and cost of attention, $c_h(\mu)$

**Result:** Optimal attention: $\frac{\partial \xi^*_h}{\partial \mu} < 0$, and inaccuracy of updated belief: $\frac{\partial (x - \tilde{x}_h)}{\partial \mu} > 0$. 
Journalists receive a clean signal from the central bank: \( \tilde{x}_m^B = x \) but in seeking to simplify it, generates ‘unintentional bias’:

\[
s_p^B = (1 - \mu \sigma_x^2)x + \epsilon_p \tag{1}
\]

The public optimally allocates attention to this simplified, but now biased signal, generating posterior belief:

\[
x - \tilde{x}_p^B = \mu \sigma_x^2 x + \frac{\tau x}{2b_p \sigma_x^2} (1 - \mu \sigma_x^2) - \eta_p \tag{2}
\]