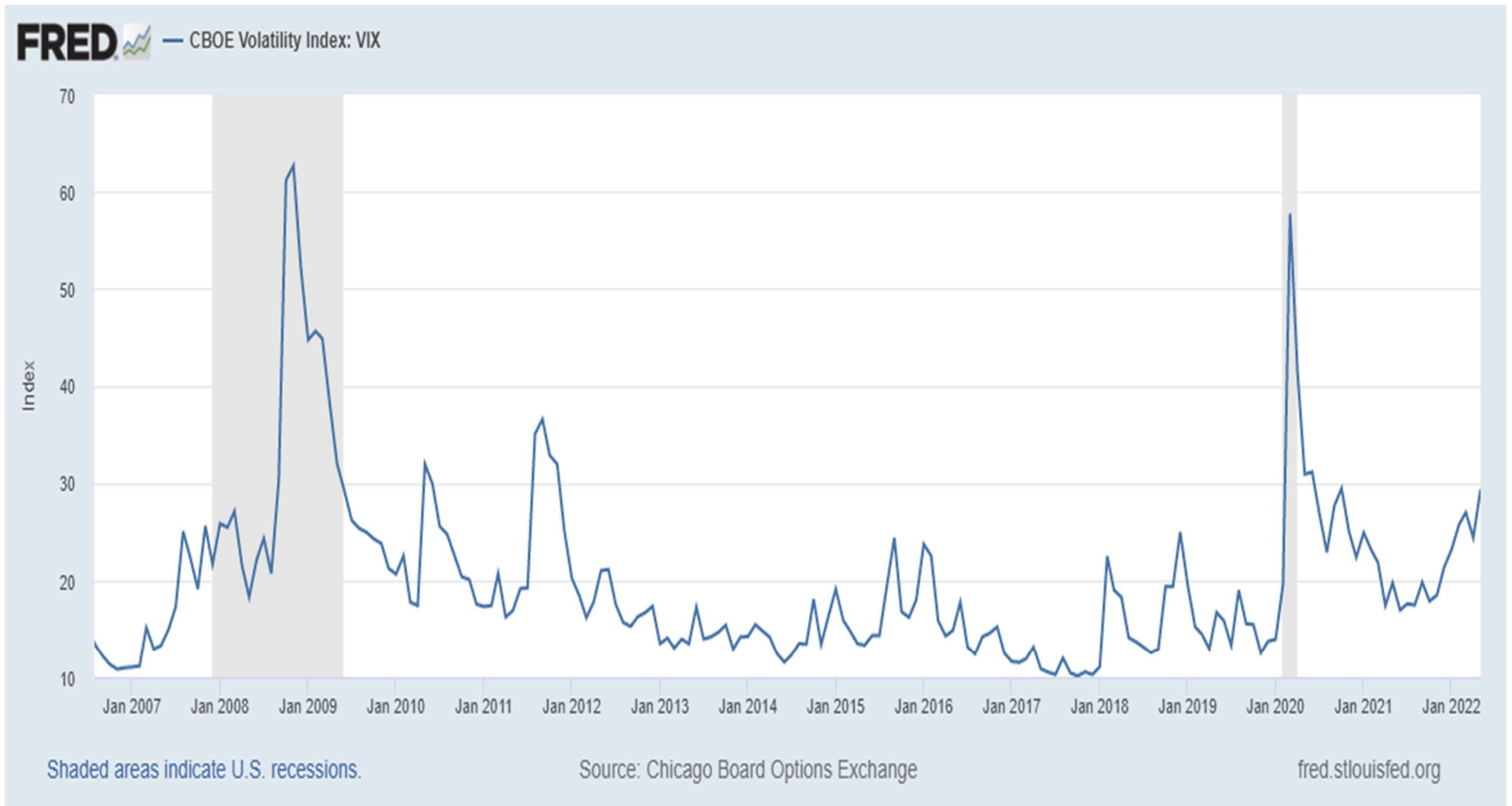# THE EFFECT OF MACROECONOMIC UNCERTAINTY ON HOUSEHOLD AND FIRM DECISIONS

June 23rd, 2022

Deutsche Bundesbank and Banque de France

ECONOMIC UNCERTAINTY IN THE USA

U.S. recessions often coincide with significant spikes in uncertainty.

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High uncertainty induces households to spend less and firms to reduce their investment and employment: intuitive idea/omnipresent in policy discussions esp. during crises:

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François Villeroy de Galhau (2018): *"This type of analysis, in my view, seriously underestimates the possible effects because it ignores the shock to confidence through two channels. Firstly, uncertainty **can** increase risk aversion in financial markets and reduce the supply of credit. Second, a loss of business confidence **can** deter investment. Both uncertainty channels would tend to depress demand."*

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Bloom (2014): the empirical evidence on economic agents' behavior is at best "**suggestive**" and "more empirical work on the effects of uncertainty would be valuable, particularly work which can **identify clear causal relationships**."

MACROECONOMIC UNCERTAINTY AND OUTCOMES

Estimating the effects of uncertainty on outcomes is challenging as it requires separating the effects of expectations about first and second moments: most large uncertainty events are also associated with significant deteriorations in the expected economic outlook.

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Sources: Baker; Bloom; Davis; S&P DJI
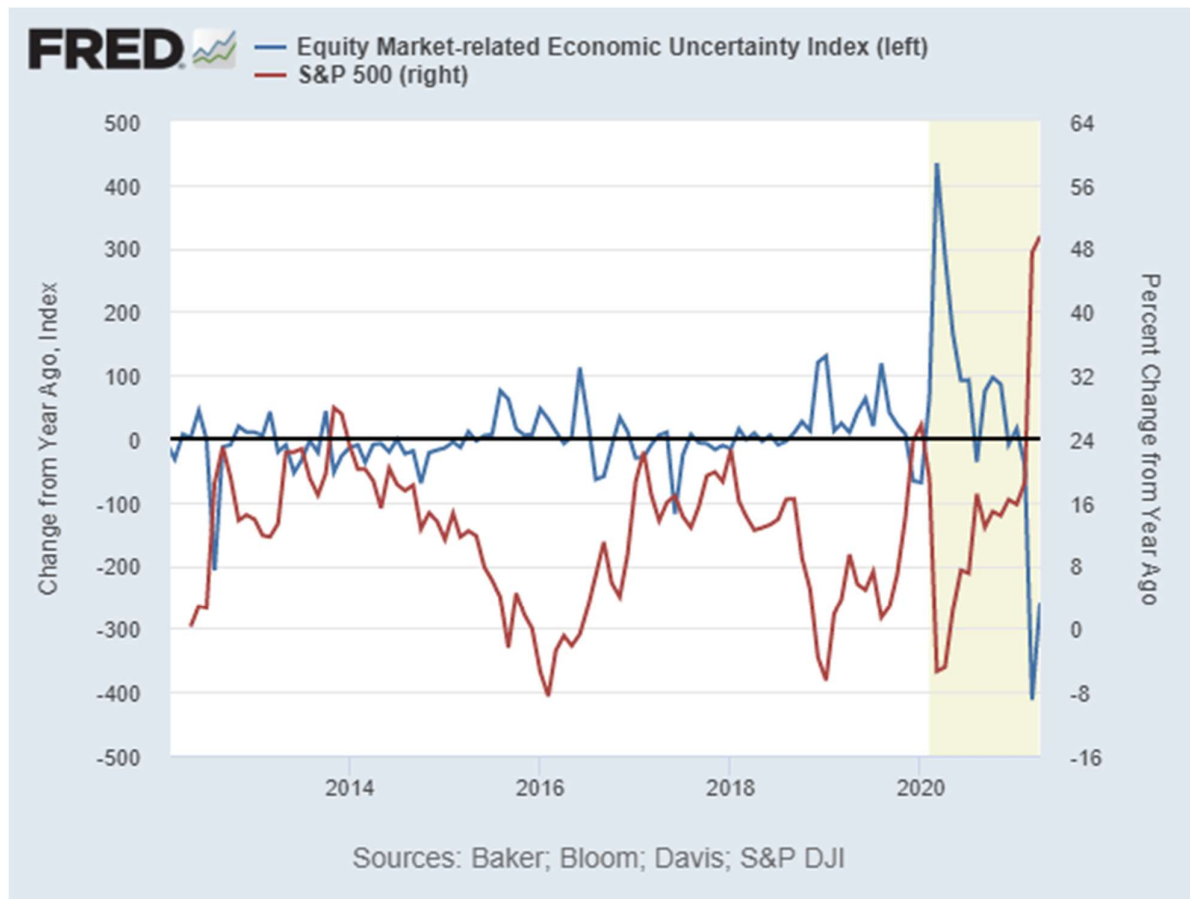
WHAT WE DO

- **Randomized Control Trial**: We use an RCT approach with randomized information treatments to different groups of agents to induce *exogenous* variation in their expectations and uncertainty about future economic growth to study how these beliefs subsequently affect their decisions.

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  - **Households in the Euro Area:**
    - Coibion, Georgarakos, Gorodnichenko, Kenny and Weber 2021

  - **Firms in New Zealand:**
    - Kumar, Gorodnichenko and Coibion 2022

WHAT WE FIND (PREVIEW)

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- Higher uncertainty leads to lower levels of total monthly spending in subsequent months and leads to a lower probability of purchasing large/luxury durable goods.

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For firms:

- Higher uncertainty leads to lower prices, employment and investment. Higher uncertainty firms are less likely to adopt new technologies or open new facilities. They experience lower sales and value information about the aggregate economy more.

Jointly, this provides clear ***causal*** evidence that uncertainty negatively affects household spending and firms' employment and investment decisions.

AN RCT APPROACH TO THE QUESTION

Elicit (1st & 2nd moment) **prior** expectations and planned decisions

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Control group (no information)

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    - *"Now we'd like you to think about what you perceive as the most pessimistic and most optimistic economic outlooks for New Zealand over the next 6 months. What do you think the lowest annualized GDP growth rate might be for this time period and what do you think the highest might be?"*

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    - *"You said that the lowest value is X and the highest value is Y. The midpoint of this range is Z=[(X+Y)/2] % per year. What is the probability that the growth rate of the economy exceeds this midpoint at an annualized rate over the next six months?"*
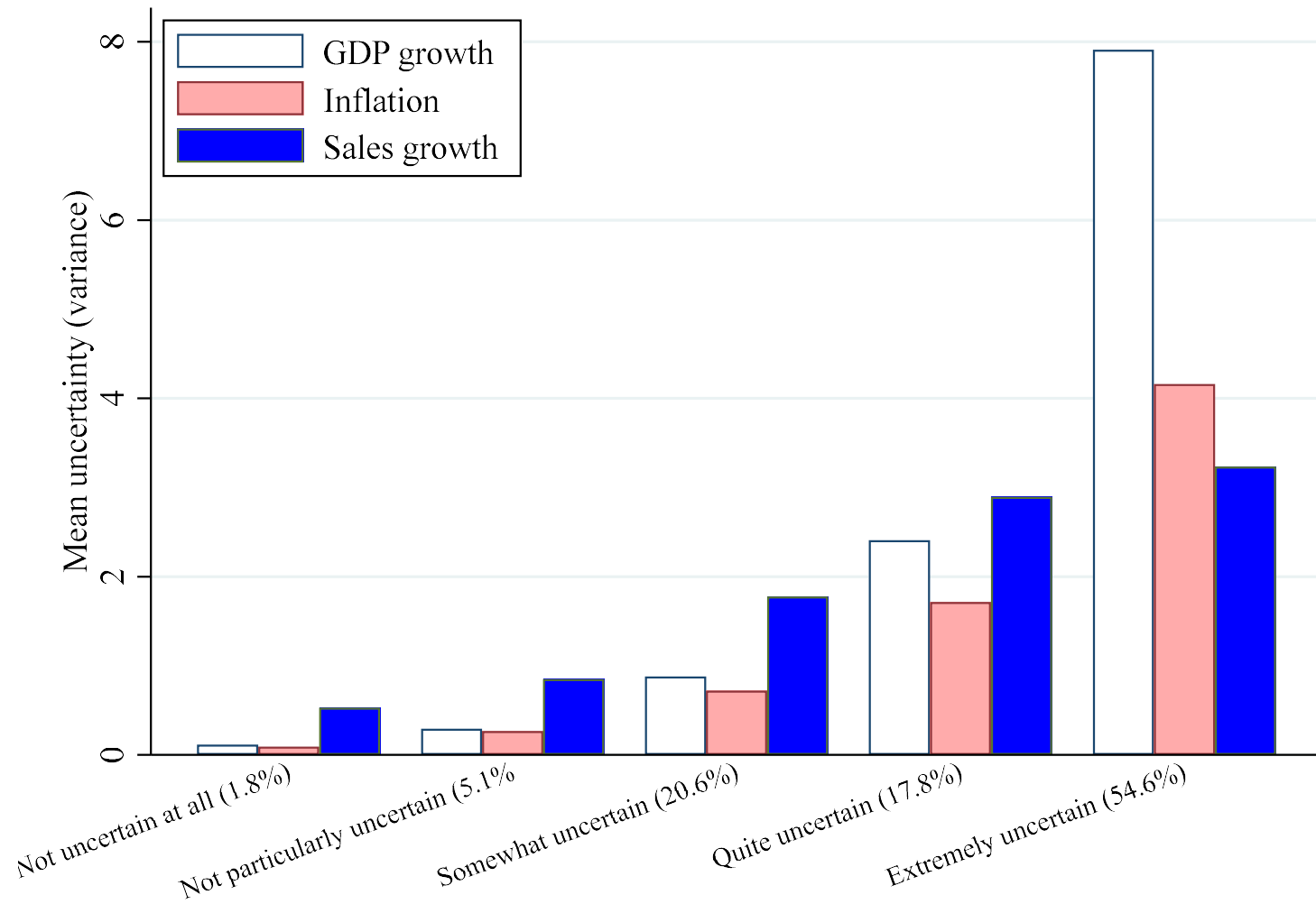
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  - **Measure prior beliefs about uncertainty and mean forecasts:**

    - *"How would you characterize the current macroeconomic outlook over the next 6-12 months in New Zealand? "*
      - *Extremely uncertain*
      - *Quite uncertain*
      - *Somewhat uncertain*
      - *Not particularly uncertain*
      - *Not uncertain at all*

QUALITATIVE AND QUANTITATIVE UNCERTAINTY

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  - Measure prior beliefs about uncertainty and mean forecasts.
  - **Do information treatments.**

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- June-August 2021 survey measured characteristics, plans for next 6 months, and macro expectations.

  - Measure prior beliefs about uncertainty and mean forecasts.

  - Do information treatments.

  - **Measure ex-post beliefs about uncertainty and mean forecasts:**

"What do you think the growth rate of the New Zealand economy will be over the next twelve months in each of the following scenarios:" [Your most pessimistic outlook, your somewhat pessimistic outlook, your middle-of-the-road outlook, your somewhat optimistic outlook, your most optimistic outlook]

"Now, please tell us what probability you would assign to each of the five outlooks."

THE RCT IN PRACTICE

- Broadly representative survey of ~4,000 firms in New Zealand

- June-August 2021 survey measured characteristics, plans for next 6 months, and macro expectations.

- **November 2021-January 2022 follow-up wave (~2,000 firms):**

  - Measure ex-post outcomes for firm

  - Measure ex-post beliefs

TREATMENTS

T1: *"We are going to give you information from a group of leading experts about the economy. The average prediction among professional forecasters is that the New Zealand economy will grow 4% in 2021."*

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T3: *"We are going to give you information from a group of leading experts about the economy. The average prediction among professional forecasters is that the New Zealand economy will grow 4% in 2021. They are quite uncertain about the economic outlook for the New Zealand economy. The average difference between their optimistic forecast and pessimistic forecast is approximately 3.1 percentage points for the 2021 growth rate."*

RESPONSE OF BELIEFS

Theoretical benchmark:

Control group: $Posterior = Prior$

Treatment group: $Posterior = (1 - \textcolor{red}{Gain}) \times Prior + \textcolor{blue}{Gain \times Signal}$

TREATMENT EFFECTS ON FIRMS' MACRO BELIEFS

Panel A: mean
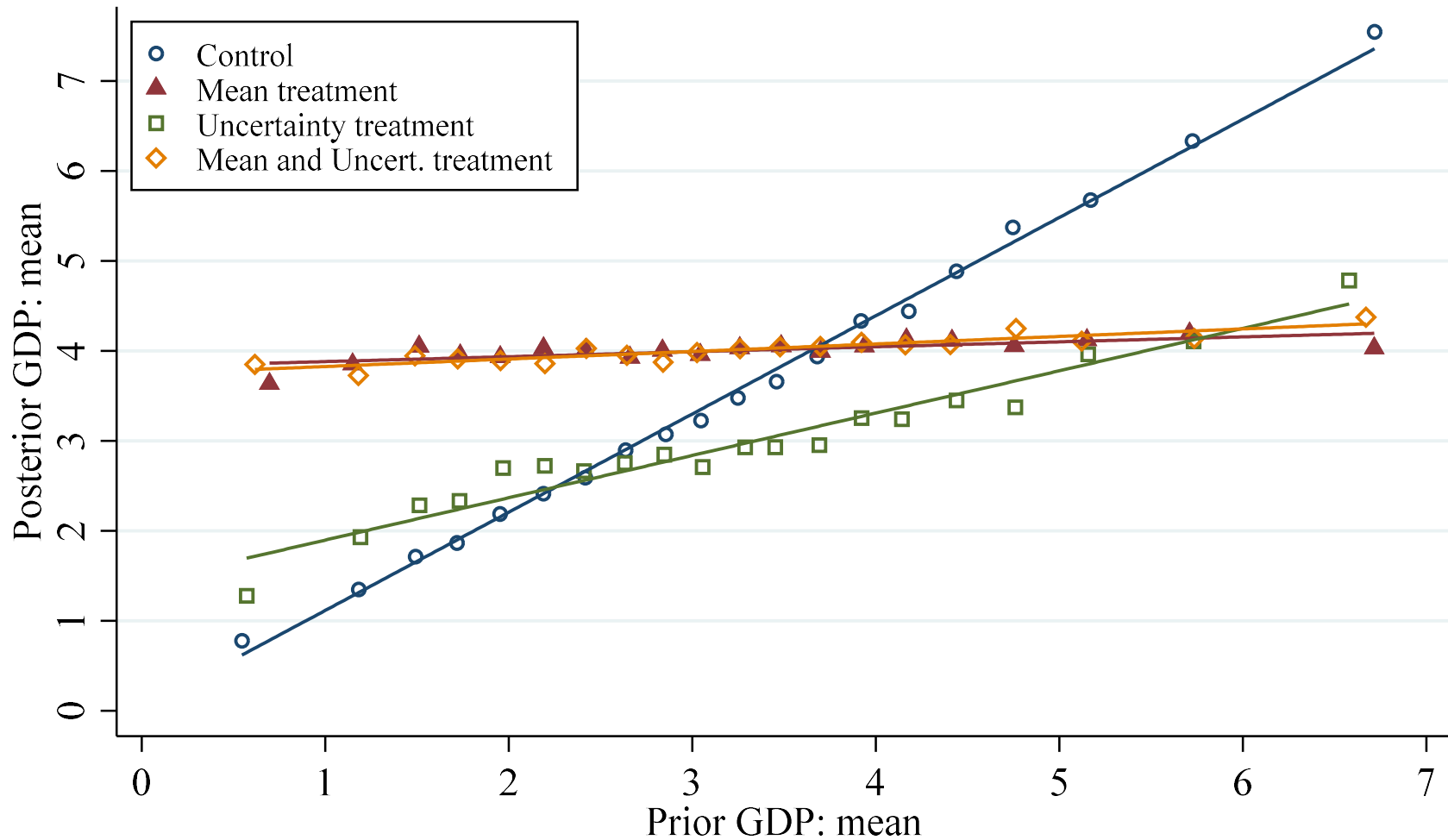
TREATMENT EFFECTS ON FIRMS' MACRO BELIEFS

Panel B: range (uncertainty)

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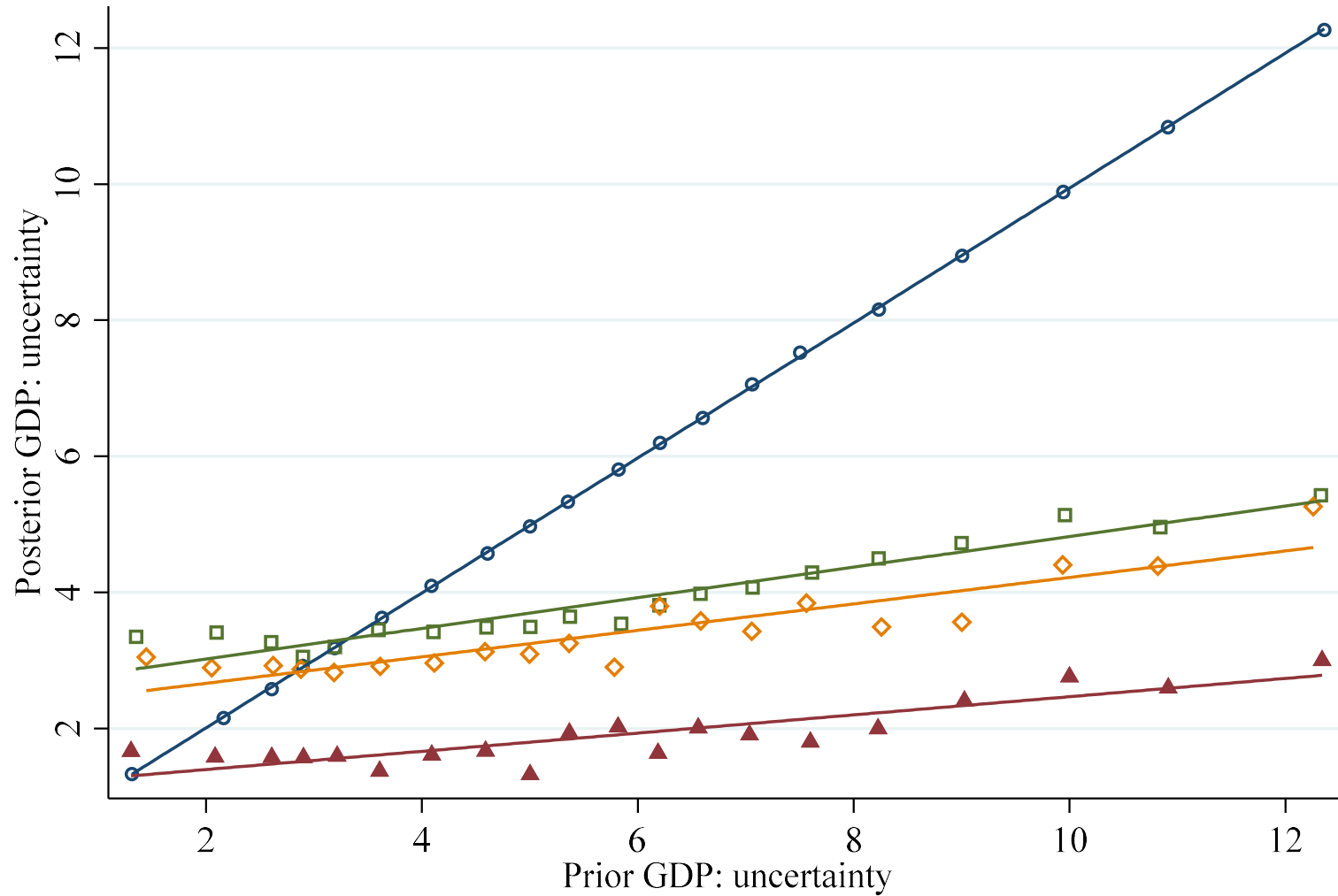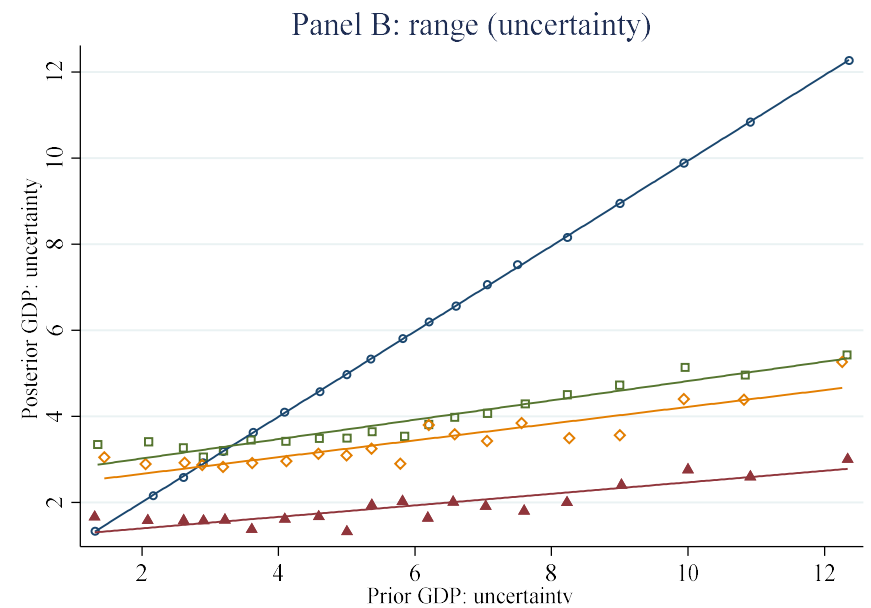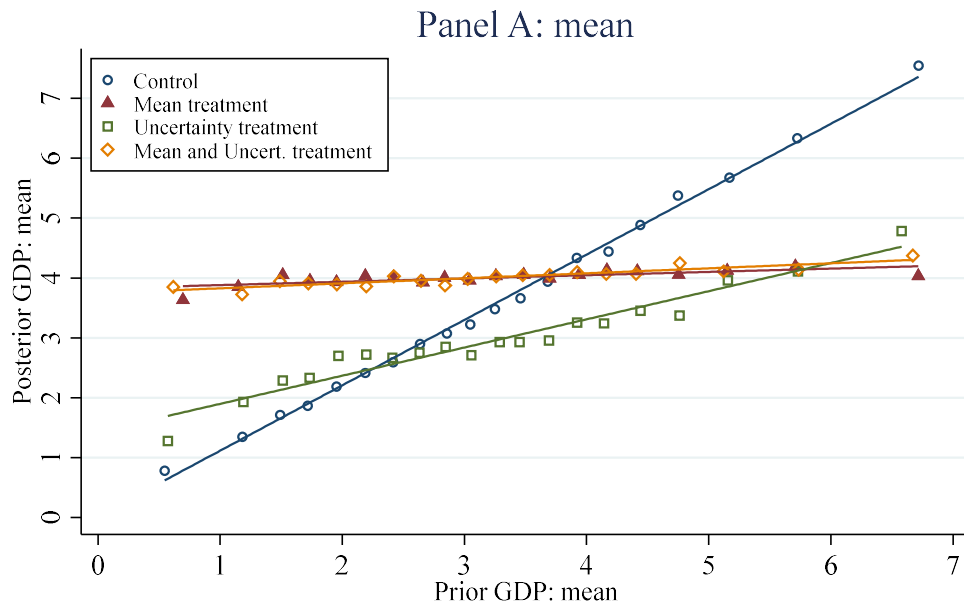
Different treatments induce different relative movements in first and second moments, which will provide us with identification of each effect.

TREATMENT EFFECTS ON FIRMS' BELIEFS: *PERSISTENCE*

Panel A: mean

Panel B: st.dev. (uncertainty)

Legend:
- Control
- Mean treatment
- Uncertainty treatment
- Mean and Uncert. treatment
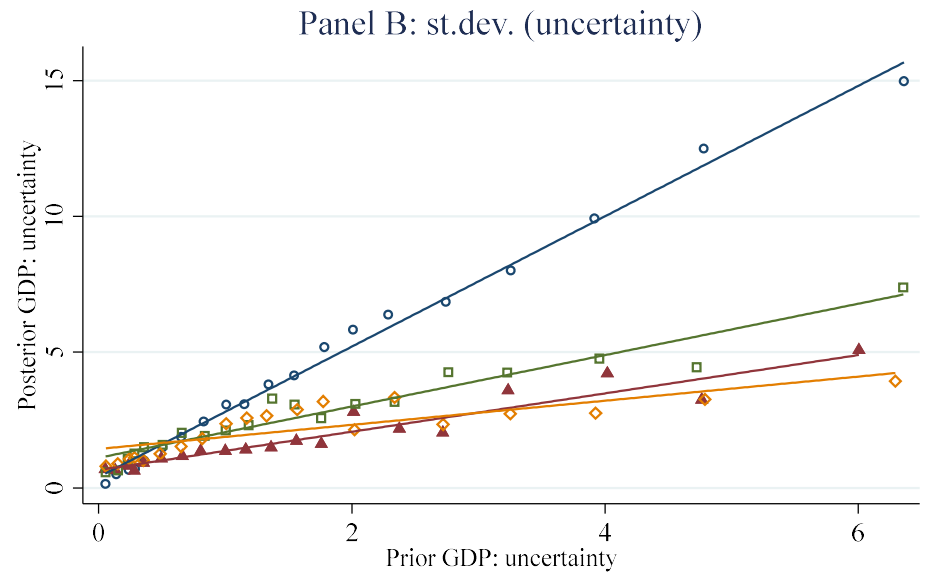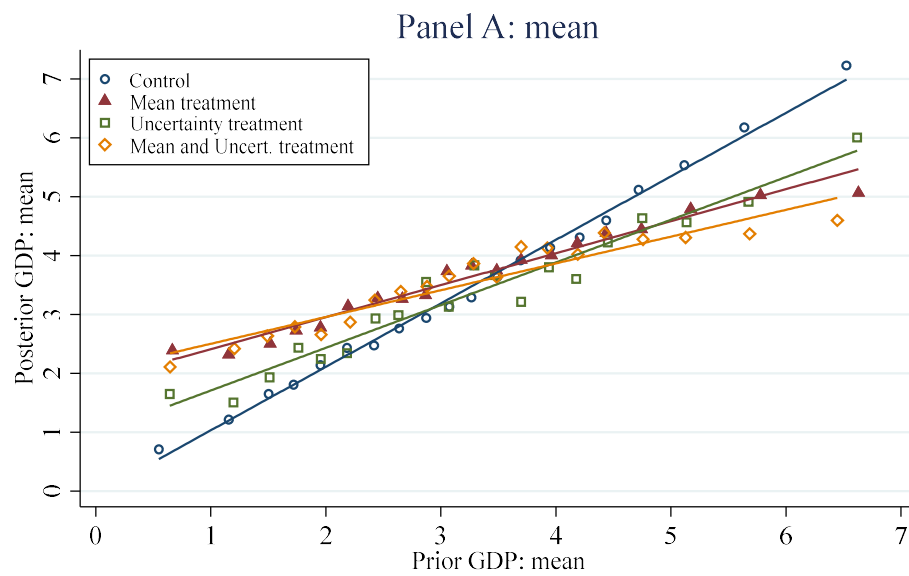
Six months later, both first and second moments (but especially second moments) are still affected by the treatments.

POST-TREATMENT BEHAVIOR

We measure ex-post decisions of firms six months later:

- "Over the last 6 months, by how much (in % changes relative to current levels) did you change:
a)   The price of your main product: ………………. %
b)   Total employment at your firm: ………………. %
c)   Capital stock at your firm: ………………. %
d)   Average wages at your firm: ………………. %

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  d)   Average wages at your firm: ………………. %

- Did you invest in advertising over the previous 6 months? If so, by how much did you change your monthly advertising budget?

- Did you engage in research and development over the previous 6 months? If so, by how much did you change your monthly research and development budget?

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- Did you invest in advertising over the previous 6 months? If so, by how much did you change your monthly advertising budget?

- Did you engage in research and development over the previous 6 months? If so, by how much did you change your monthly research and development budget?

- Now think of your percentage operating margin… By how many percentage points do you think this margin changed?"

EX-ANTE PLANS VS EX-POST DECISIONS: CONTROL GROUP
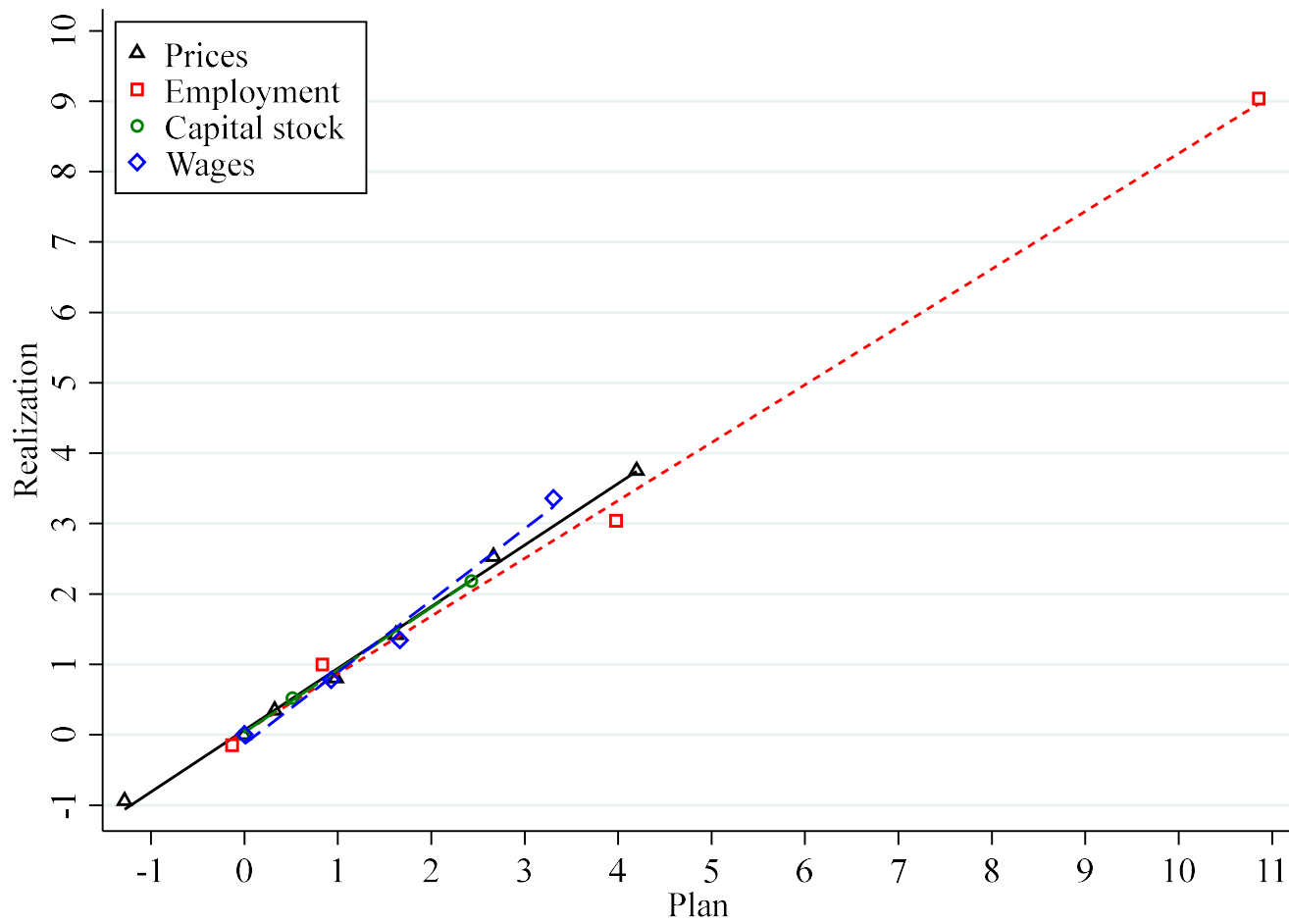
POST-TREATMENT BEHAVIOR: ESTIMATION

$$actual_i - planned_i = \alpha_1 Post_i^{mean} + \beta_1 Post_i^{uncert}$$

$$+\alpha_0 Prior_i^{mean} + \beta_0 Prior_i^{uncert} + Controls + error_i$$

$$Post_i^{mean} = a_0 + \sum_{j=1}^{3} a_j \times I\{i \in Treat\ j\}$$

$$+\sum_{j=1}^{3} b_j \times I\{i \in Treat\ j\} \times Prior_i^{mean}$$

$$+\sum_{j=1}^{3} c_j \times I\{i \in Treat\ j\} \times Prior_i^{uncert} + Controls + error_i$$

$$Post_i^{uncert} = \tilde{a}_0 + \sum_{j=1}^{3} \tilde{a}_j \times I\{i \in Treat\ j\}$$

$$+\sum_{j=1}^{3} \tilde{b}_j \times I\{i \in Treat\ j\} \times Prior_i^{mean}$$

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EFFECTS OF EXPECTATIONS ON FIRM DECISIONS

	Price	Employment	Capital stock	Wages	Advert. budget	R&D budget	Profit margin
			Change relative to plan				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mean							
Uncertainty							
Observations							
R-squared							
1st stage F: mean	433	435.2	436.6	431			
1st stage F: var	439.9	438.7	435	431.7			

Our information treatments provide powerful instruments for expectations.

EFFECTS OF EXPECTATIONS ON FIRM DECISIONS

| | Change relative to plan | | | | | | |
	Price	Employ ment	Capital stock	Wages	Advert. budget	R&D budget	Profit margin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mean	-0.06***	-0.11	-0.03**	-0.00			
	(0.02)	(0.10)	(0.01)	(0.00)			
Uncertainty	-0.10***	-0.59***	-0.07***	0.00			
	(0.01)	(0.04)	(0.01)	(0.00)			
Observations	2,016	2,018	2,017	2,008			
R-squared	0.38	0.24	0.27	0.00			
1st stage F: mean	433	435.2	436.6	431			
1st stage F: var	439.9	438.7	435	431.7			

Higher aggregate uncertainty leads to lower prices, employment and investment but no change in wages.

EFFECTS OF EXPECTATIONS ON FIRM DECISIONS

| | Change relative to plan | | | | | | |
	Price	Employment	Capital stock	Wages	Advert. budget	R&D budget	Profit margin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mean	-0.06***	-0.11	-0.03**	-0.00	0.04*	0.01*	-0.06***
	(0.02)	(0.10)	(0.01)	(0.00)	(0.02)	(0.01)	(0.02)
Uncertainty	-0.10***	-0.59***	-0.07***	0.00	0.11***	-0.00	0.01**
	(0.01)	(0.04)	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)
Observations	2,016	2,018	2,017	2,008	2,018	2,016	2,020
R-squared	0.38	0.24	0.27	0.00	0.14	0.00	0.01
1st stage F: mean	433	435.2	436.6	431	436.9	435.6	437.8
1st stage F: var	439.9	438.7	435	431.7	435.4	435.2	438.2

Higher aggregate uncertainty leads to more advertising, no change in R&D, and a small increase in profit margins.

EFFECTS OF EXPECTATIONS ON *EXTENSIVE* FIRM DECISIONS

	New product	New technology	New facility
	(1)	(2)	(3)
Posterior mean			
Posterior uncertainty (var)			
Plan			
Observations			
R-squared			
1st stage F stat: post. mean			
1st stage F stat: post. std			

Higher uncertainty makes firms less likely to adopt new technologies or create new facilities.

EFFECTS OF EXPECTATIONS ON *EXTENSIVE* FIRM DECISIONS

	New product	New technology	New facility
	(1)	(2)	(3)
Posterior mean	-0.26	-1.72**	-4.25***
	(0.68)	(0.76)	(0.79)
Posterior uncertainty (var)	-0.09	-2.46***	-2.14***
	(0.13)	(0.25)	(0.25)
Plan	0.47***	0.53***	0.52***
	(0.03)	(0.03)	(0.03)
Observations	2,020	2,020	2,020
R-squared	0.43	0.34	0.35
1st stage F stat: post. mean	440.8	438	438.6
1st stage F stat: post. std	436.1	438.8	439

Higher uncertainty makes firms less likely to adopt new technologies or create new facilities.

EFFECTS OF EXPECTATIONS OF FIRM OUTCOMES

	Dependent variable: Change relative to initial level	
	Employ ment	Sales
	(1)	(2)
Posterior mean	0.00	3.70***
	(0.13)	(0.60)
Posterior uncertainty (var)	-0.60***	-0.89***
	(0.04)	(0.18)
Observations	2,019	1,179
R-squared	0.18	0.02
1st stage F stat: post. mean	438.1	215.2
1st stage F stat: post. var	436.7	220.2

Higher aggregate uncertainty leads firms to experience lower sales.

EFFECTS OF EXPECTATIONS OF FIRM OUTCOMES

	Dependent variable: Change relative to initial level				
				Value of information	
	Employ ment	Sales	Macro forecast	Info from customers, suppliers, peers, etc.	Dollars allocated to info. about own industry
	(1)	(2)	(3)	(4)	(5)
Posterior mean	0.00	3.70***	-2.39	-1.44	0.50
	(0.13)	(0.60)	(3.36)	(0.97)	(0.37)
Posterior uncertainty (var)	-0.60***	-0.89***	4.31***	4.11***	-0.38***
	(0.04)	(0.18)	(0.91)	(0.30)	(0.11)
Observations	2,019	1,179	2,020	2,020	2,020
R-squared	0.18	0.02	0.02	0.14	0.01
1st stage F stat: post. mean	438.1	215.2	438.2	438.2	438.2
1st stage F stat: post. var	436.7	220.2	437.8	437.8	437.8

Higher aggregate uncertainty leads to a higher value of macro information, both in absolute value as well as relative to industry information.

SUMMARY

We find that in response to higher uncertainty, firms:

- *lower prices*
- *reduce investment and employment*
- *experience lower sales*
- *do not change wages*
- *experience slightly higher profits*
- *value macroeconomic information more*
- *invest more heavily in advertising*
- *become less likely to adopt new technologies or create new facilities.*

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Using a new (repeated) survey of households in the Euro area and the same identification strategy, CGGKW (2021) show that in response to higher uncertainty, households:

- *significantly reduce their total monthly spending for at least four months*
- *have a lower probability of purchasing large/luxury durable goods*
- *would like to reduce their exposure to risky financial assets (mutual funds, crypto)*

ADDITIONAL FINDINGS

- How big are these results?

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- How big are these results? **Big**

    Average treatment effect from uncertainty:
    - On average, treated firms raise prices by 0.4% more relative to plans than untreated firms over six months due to lower uncertainty.
    - On average, treated firms increased employment by 2.5% more relative to plans than untreated firms over six months due to lower uncertainty.

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Compared to Alfaro, Bloom and Lin (2021):

- o They find that a 2 standard deviation increase in uncertainty leads to a 0.18 standard deviation drop in investment across all firms and a 0.09 standard deviation drop in employment.
- o We find a two standard deviation increase in uncertainty according to our estimates yields a 0.61 standard deviation increase in investment and a 0.77 standard deviation increase in employment.

ADDITIONAL FINDINGS

- How big are these results?   Big

- How plausible are these responses?

    o We asked firms how they would respond to a hypothetical increase/decrease in uncertainty about the economic outlook.

ADDITIONAL FINDINGS

- How big are these results?   Big

- How plausible are these responses?   **Quite**

  o We asked firms how they would respond to a hypothetical increase/decrease in uncertainty about the economic outlook.

  o Firms reported that higher uncertainty would make them:

    - Reduce prices, employment and investment, experience lower sales, reduce their probability of opening new facilities, and increase their advertising;

    - Lower wages and R&D investment and reduce their probability of introducing new products;

    - Lower their margins;

    - Less likely to apply for new loans but more likely to increase cash reserves, less likely to open new export markets, and less likely to make long-term (10-year) plans.

ADDITIONAL FINDINGS

- How big are these results?   Big

- How plausible are these responses?   Quite

- Does macro uncertainty matter above and beyond micro uncertainty?

ADDITIONAL FINDINGS

- How big are these results?   Big

- How plausible are these responses?   Quite

- Does macro uncertainty matter above and beyond micro uncertainty?   **Yes**

  - When we control for ex-post mean and uncertainty of future sales growth as well as inflation, our results are completely unchanged.

  - The effects of macro uncertainty go above and beyond what is captured by microeconomic uncertainty, which has implications for growing number of surveys of firm-level uncertainty.

ADDITIONAL FINDINGS

- How big are these results?   Big

- How plausible are these responses?   Quite

- Does macro uncertainty matter above and beyond micro uncertainty?   Yes

- Do all firms respond in the same way?

ADDITIONAL FINDINGS

- How big are these results?   Big

- How plausible are these responses?   Quite

- Does macro uncertainty matter above and beyond micro uncertainty?   Yes

- Do all firms respond in the same way?   **Mostly**

    o Along most margins and observable characteristics, there are few noticeable
      differences in how firms respond to uncertainty.

    o One exception is employment and firm size: smaller firms respond significantly more
      than larger firms.

DOES THIS MATTER FOR POLICY?

- *We can safely remove the caveats:*

    o Changes in uncertainty unambiguously have causal effects on firms and households.

    o Two of the key channels through which uncertainty shocks are thought to affect economic outcomes (household and firm decisions) are present and economically significant.

    o This means changes in uncertainty should loom large in what policymakers pay attention to.

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    o This means changes in uncertainty should loom large in what policymakers pay attention to.

- *Communication by policymakers can serve to reduce uncertainty!*

    o We increased employment of some NZ firms by 2.5% just by telling them how little professional forecasters disagreed about the macroeconomic outlook. Imagine what policy statements could do.

    o "Whatever it takes"