

HOW DOES CONSUMPTION RESPOND TO NEWS ABOUT INFLATION?

FIELD EVIDENCE FROM A RANDOMIZED CONTROL TRIAL

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A KEY ROLE OF INFLATION EXPECTATIONS FOR POLICY

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- Janet Yellen (2016): “Perhaps **most importantly**, we need to know more about the manner in which inflation expectations are formed and how monetary policy influences them.”

INFLATION EXPECTATIONS AS A POLICY TOOL

Since the onset of the ZLB, there has been growing interest in policies that move expectations, and especially inflation expectations, to affect the real interest rates that households and firms perceive.

- *When inflation expectations go up with zero nominal rates, real rates go down. When real rates go down, investments and the economic activity improves. That's the reasoning [of QE].”* Mario Draghi (2015)

- *“The first element [of QE] was to dispel people's deflationary mindset and raise inflation expectations...”* Haruhiko Kuroda (2014)

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But we have little causal evidence on whether these policies would work.

WHAT WE DO

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- Show that these exogenous treatments have large but transitory effects on expectations of households (“first stage”).
- Use an instrumental variable approach (based on treatment) to study the causal effect of inflation expectations on consumer spending:
 - Higher $E\pi$ lead to a small increase in spending on nondurables.
 - Higher $E\pi$ lead to a large decrease in spending on durables.

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- Try to explain why households in the Netherlands react the way they do.

DNB SURVEY OF HOUSEHOLDS

- CentER Internet panel, which is sponsored by the Dutch National Bank (DNB) and maintained by CentERdata at Tilburg University.
- A large (>2,000), nationally representative panel.
- A flagship household survey in Europe.
- DNB allows “special purpose” surveys.

DNB SURVEY OF HOUSEHOLDS: SPECIAL SURVEY

Elicit expectations (priors) and spending plans

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Information treatment (past inflation)

Control group (no information)

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Elicit expectations (posteriors)

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Elicit expectations (priors) and spending plans



Information treatment (past inflation)

Control group (no information)



Elicit expectations (posteriors)



Measure spending and plans (relative to initial plans)

DNB SURVEY OF HOUSEHOLDS: SPECIAL SURVEY

- Stage I (March 2018):
 - Collect:
 - background information (current demographics, recent spending, liquidity constraints, financial/numeric literacy, etc.)
 - expectations (inflation, income, etc.) [probability distributions]
 - plans for spending on durable and nondurable goods

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How much do you think **consumer prices** in general will change in the **next twelve months** in the Netherlands? Please allocate 100 points in the table below indicating how likely the listed changes are. (Note that the probabilities in the column should sum to 100)

Points	
Consumer prices increase 8% or more
Consumer prices increase 4% or more, but less than 8%
Consumer prices increase 2% or more, but less than 4%
Consumer prices increase 1% or more, but less than 2%
Consumer prices increase or decreases less than 1%
Consumer prices decrease 1% or more, but less than 2%
Consumer prices decrease 2% or more, but less than 4%
Consumer prices decrease 4% or more, but less than 8%
Consumer prices decrease 8% or more
Total (the points should sum to 100)	100

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What do you think your household's spending on purchases of **durable goods** will be per month in the next three months (April, May and June)? Please provide an answer in euros.

April: euros

... I do not have plans to buy durables in this month

... I do not know

May: euros

... I do not have plans to buy durables in this month

... I do not know

June: euros

... I do not have plans to buy durables in this month

... I do not know

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 - **Administer information treatments**

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 - Collect expectations again [point predictions]

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- Stage II (April 2018)
 - Collect expectations and spending (actual for March 2018 & plans for Apr/May 2018)

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- Stage II (April 2018)
 - Collect expectations and spending (actual for March 2018 & plans for Apr/May 2018)
- Stage III (May 2018)
 - Collect expectations and spending (actual for April 2018 & plans for May 2018)
- Stage IV (June 2018)
 - Collect expectations and spending (actual May 2018)

TREATMENTS

- Control group (1/3 sample)

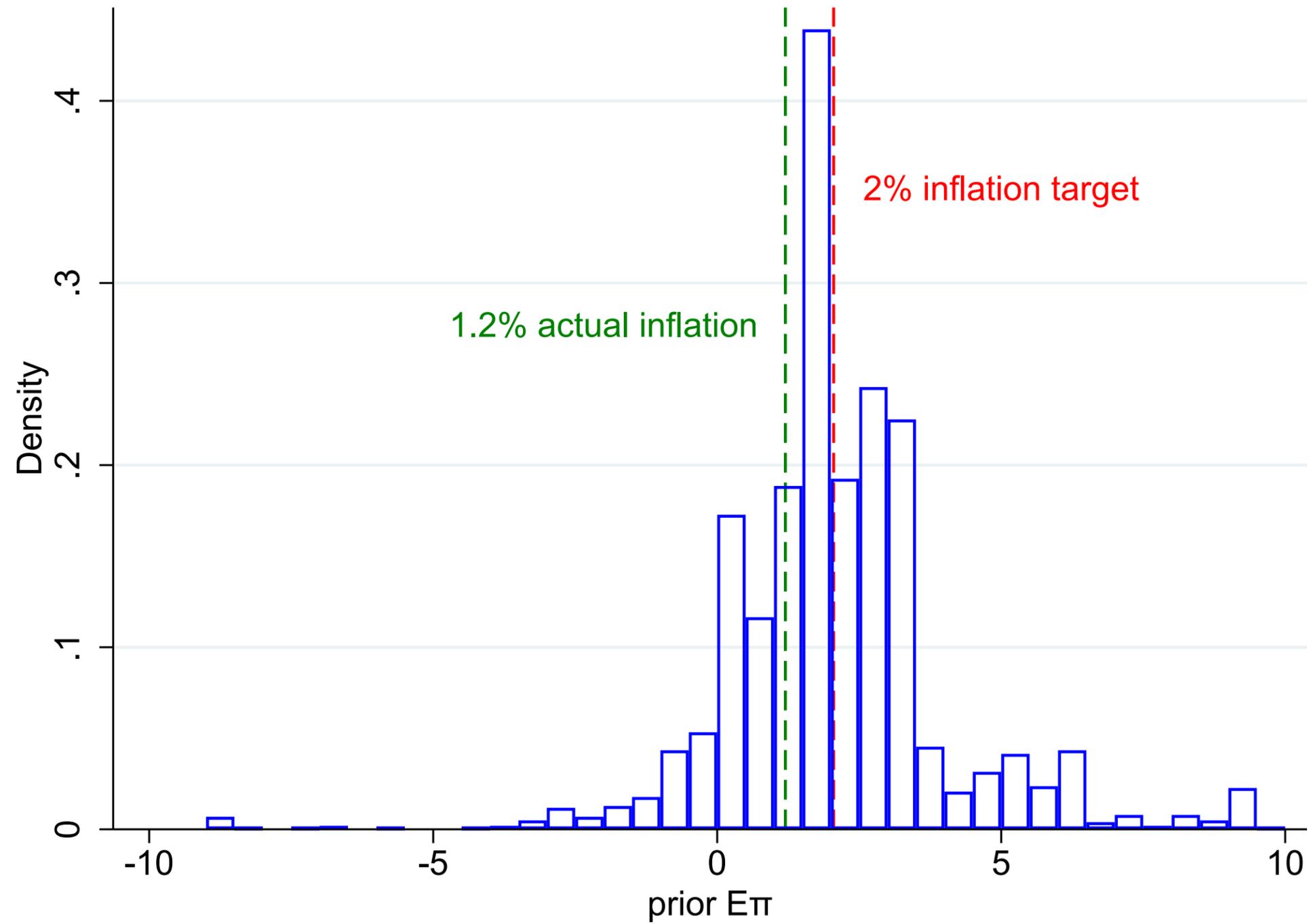
- Treatment A [“public” signal] (1/3 sample)

“Before we proceed, we would like to share the following information with you. In a public release **available to all Dutchmen** at no charge, the Dutch Statistical Office recently reported that the percent increase in consumer prices in February compared to 12 months earlier in the Netherlands was 1.2%”.

- Treatment B [“private” signal] (1/3 sample)

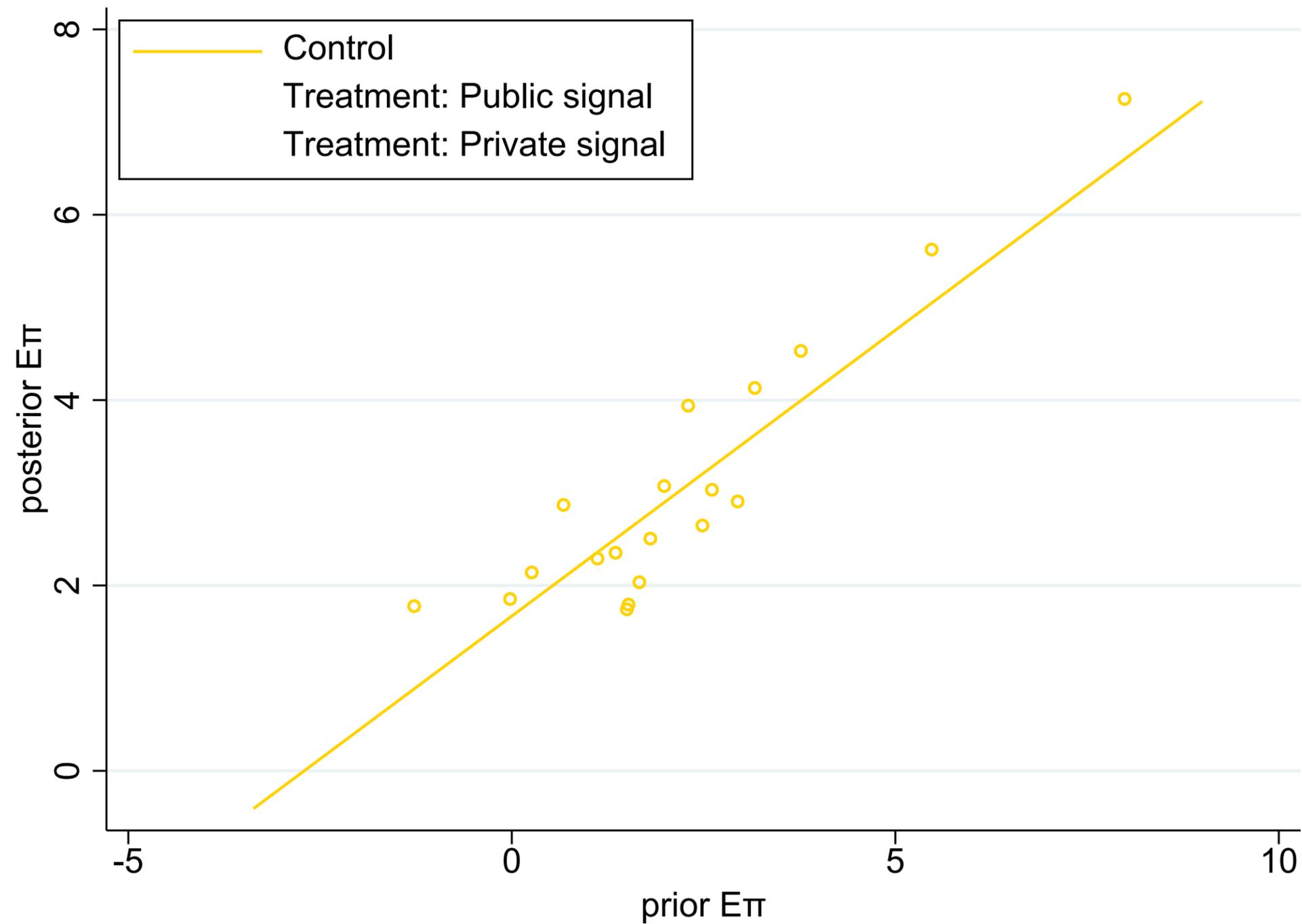
“Before we proceed, we would like to share the following information **only with you** and a few other households. The Dutch Statistical Office recently reported that the percent increase in consumer prices compared in February to 12 months earlier in the Netherlands was 1.2%”.

INFLATION EXPECTATIONS



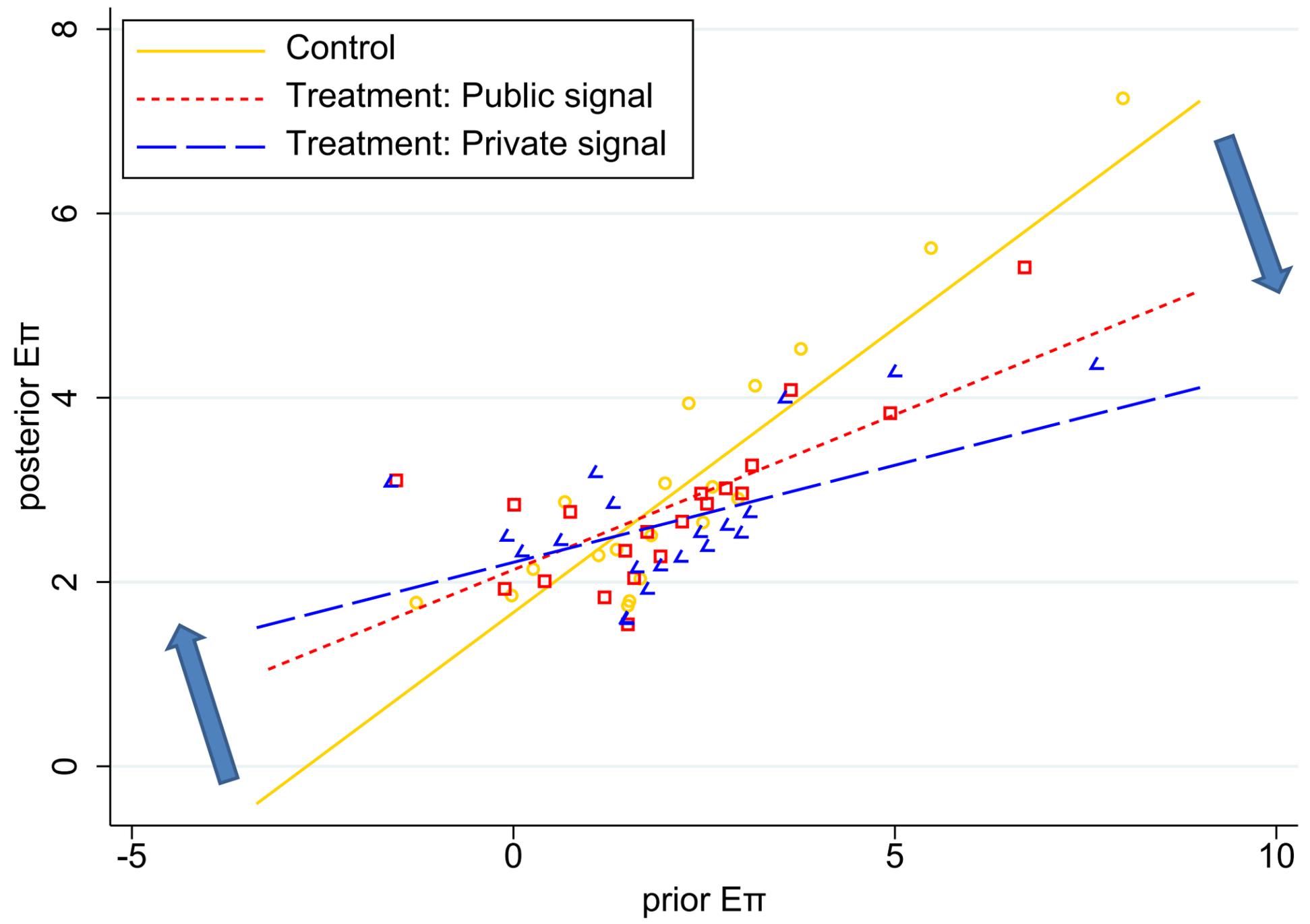
1-year ahead inflation expectations

INFORMATION TREATMENTS AND INFLATION EXPECTATIONS



Binscatter of prior vs posterior 1-year ahead inflation expectations

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Binscatter of prior vs posterior 1-year ahead inflation expectations

PERSISTENCE OF THE EFFECT

	Post-treatment point prediction for inflation in:			
	Wave 1	Wave 2	Wave 3	Wave 4
	(1)	(2)	(3)	(4)
Prior	0.540*** (0.031)			
Prior×Treatment	-0.187*** (0.038)			
Treatment	0.094 (0.086)			
Constant	1.272*** (0.071)			
Observations	1,778			
R-squared	0.339			
F-stat for treatment	26.65			

Prior is from wave 1 pre-treatment. Treatment is “pooled”.

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Prior	0.540*** (0.031)	0.110*** (0.029)		
Prior×Treatment	-0.187*** (0.038)	0.161*** (0.036)		
Treatment	0.094 (0.086)	-0.357*** (0.092)		
Constant	1.272*** (0.071)	2.151*** (0.077)		
Observations	1,778	1,543		
R-squared	0.339	0.112		
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Treatment	0.094 (0.086)	-0.357*** (0.092)	-0.057 (0.091)	
Constant	1.272*** (0.071)	2.151*** (0.077)	1.765*** (0.077)	
Observations	1,778	1,543	1,533	
R-squared	0.339	0.112	0.170	
F-stat for treatment	26.65	10.24	0.411	

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Treatment	0.094 (0.086)	-0.357*** (0.092)	-0.057 (0.091)	-0.010 (0.098)
Constant	1.272*** (0.071)	2.151*** (0.077)	1.765*** (0.077)	1.760*** (0.082)
Observations	1,778	1,543	1,533	1,500
R-squared	0.339	0.112	0.170	0.126
F-stat for treatment	26.65	10.24	0.411	0.265

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Treatment effects on inflation expectations are short-lived (similar to other experiments)

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WHAT IS THE EFFECT ON ACTIONS?

CONSUMPTION RESPONSE

$$S_{i,t+h}^{cat} = \alpha + \beta \times F_{i,t}\pi_{t+12} + \gamma \times F_{i,t-}S_{i,t+h}^{cat} + \delta \times F_{i,t-}\pi_{t+12} + \theta \times \mathbf{X}_{i,t} + e_{i,t+h}$$

i and t index households and time

$S_{i,t+h}^{cat}$ (log) spending in category cat (non-durable/ durable) by household i in month $t+h$ reported in survey at time $t+h$;

$F_{i,t}\pi_{t+12}$ the 12-month ahead inflation forecast of household i at the end of wave 1 (time t) after treatments [“posterior”]

$F_{i,t-}\pi_{t+12}$ forecast prior to the treatment (time $t-$) [“prior”];

$F_{i,t-}S_{i,t+h}^{cat}$ the prediction prior to the treatment of household i in wave 1 (time $t-$) of what the level of (log) spending on goods in category cat would be at time $t+h$;

$\mathbf{X}_{i,t}$ is a vector of household controls.

CONSUMPTION RESPONSE

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CONSUMPTION RESPONSE

Dep. var. is indicated in the title of the panel	Actual spending, horizon, month			
	ln(C_1)	ln(C_2)	ln(C_3)	Pooled
	(1)	(2)	(3)	(4)
Panel A. Spending on non-durable goods, log(spending)×100.				
Posterior $E\pi$	6.91 (8.58)	6.74 (7.78)	26.34* (13.34)	11.33 (7.28)
Observations	945	924	888	2,735
1 st stage F-stat	15.37	14.53	12.06	15.17
p-value (weak IV robust)	0.57	0.45	0.06	0.17

- Statistically weak (but large economically) positive response of spending on non-durables to elevated inflation expectations

CONSUMPTION RESPONSE

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	ln(C_1)	ln(C_2)	ln(C_3)	Pooled
	(1)	(2)	(3)	(4)
Panel B. Spending on durable goods, extensive margin, linear prob. model.				
Posterior $E\pi$	-0.17*	-0.29***	-0.33***	-0.21***
	(0.10)	(0.11)	(0.11)	(0.07)
Observations	1,088	999	940	3,014
1 st stage F-stat	10.62	8.136	10.10	12.07
p-value (weak IV robust)	0.09	<0.01	<0.01	<0.01

- Strong negative (“stagflationary”) response of spending on durables (extensive margin) to elevated inflation expectations, similar to other evidence for households (USA, e.g. Kamdar 2018) and firms (Italy, e.g. Coibion et al. 2018).
- Persistent effect on actions even with a transitory effect on beliefs (similar to other evidence, e.g., Italian firms)

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OLS				
Posterior inflation expectations	-0.01	-0.03**	-0.02*	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)

- OLS estimates are an order of magnitude smaller than IV estimations, which is consistent with weak sensitivity of spending to expected inflation in “correlation-based” studies.

CONSUMPTION RESPONSE

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	$\ln(C_1)$	$\ln(C_2)$	$\ln(C_3)$	Pooled
	(1)	(2)	(3)	(4)
Panel C. Spending on durable goods, intensive margin, $\log(\text{spending}) \times 100$.				
Posterior $E\pi$				-60.31 (35.81)
Observations				329
1 st stage F-stat				12.05
p-value (weak IV robust)				0.14

- Negative response of spending on durables (intensive margin) to elevated inflation expectations.

CONSUMPTION RESPONSE

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	ln(C_1)	ln(C_2)	ln(C_3)	Pooled
	(1)	(2)	(3)	(4)
Panel D. Spending on durable goods, IV Tobit, log(spending).				
Posterior $E\pi$	-3.90** (2.02)	-5.77*** (2.36)	-8.26*** (2.23)	-4.90*** (1.43)
Observations	945	924	888	2,735
1 st stage F-stat	21.74	15.50	24.15	26.92
p-value (weak IV robust)	0.04	0.01	<0.01	<0.01

- Negative response of spending on durables to elevated inflation expectations.

CONSUMPTION RESPONSE

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	ln(C_1)	ln(C_2)	ln(C_3)	Pooled
	(1)	(2)	(3)	(4)
Panel E. Total spending, log(spending)×100.				
Posterior $E\pi$	-13.41 (11.12)	-7.14 (11.89)	-20.53* (17.82)	-13.95** (9.15)
Observations	809	762	702	2,262
1 st stage F-stat	13.67	10.70	8.474	13.18
p-value (weak IV robust)	0.13	0.44	0.06	0.04

- The negative response of spending on durable goods dominates the positive response of spending on non-durable goods so that the net effect for total spending is negative.

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- The negative response of spending on durable goods dominates the positive response of spending on non-durable goods so that the net effect for total spending is negative.

WHY? HOW?

RESPONSE OF OTHER EXPECTATIONS RIGHT AFTER TREATMENT

$$E_i^{post} X_{t+1} = b_0 + b_1 E_i^{post} \pi_{t+1} + b_2 E_i^{prior} \pi_{t+1} + b_3 E_i^{prior} X_{t+1} + controls_i + e_i$$

where

$E_i^{post} X_{t+1}$ is the post-treatment expectation for the variable of interest X ,

$E_i^{prior} X_{t+1}$ is the pre-treatment expectation for X .

RESPONSE OF OTHER EXPECTATIONS RIGHT AFTER TREATMENT

Household
net income

$E_{it}^{post} \pi_{t+1}$ 0.11
(1.10)

Observations 1,175

1st stage F-stat 17.40

p-val (weak IV) 0.97

$$E_i^{post} X_{t+1} = b_0 + b_1 E_i^{post} \pi_{t+1} + b_2 E_i^{prior} \pi_{t+1} + b_3 E_i^{prior} X_{t+1} + controls_i + e_i$$

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RESPONSE OF OTHER EXPECTATIONS RIGHT AFTER TREATMENT

	Household net income	Household spending on non-durable goods
$E_{it}^{post} \pi_{t+1}$	0.11 (1.10)	-2.93** (1.29)
Observations	1,175	1,157
1 st stage F-stat	17.40	18.63
p-val (weak IV)	0.97	0.02

$$E_i^{post} X_{t+1} = b_0 + b_1 E_i^{post} \pi_{t+1} + b_2 E_i^{prior} \pi_{t+1} + b_3 E_i^{prior} X_{t+1} + controls_i + e_i$$

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RESPONSE OF OTHER EXPECTATIONS RIGHT AFTER TREATMENT

	Household net income	Household spending on non-durable goods	Economy- level spending on non-durable goods
$E_{it}^{post} \pi_{t+1}$	0.11 (1.10)	-2.93** (1.29)	-3.12** (1.52)
Observations	1,175	1,157	1,093
1 st stage F-stat	17.40	18.63	14.35
p-val (weak IV)	0.97	0.02	0.03

$$E_i^{post} X_{t+1} = b_0 + b_1 E_i^{post} \pi_{t+1} + b_2 E_i^{prior} \pi_{t+1} + b_3 E_i^{prior} X_{t+1} + controls_i + e_i$$

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RESPONSE OF OTHER EXPECTATIONS RIGHT AFTER TREATMENT

	Household net income	Household spending on non-durable goods	Economy- level spending on non-durable goods	Higher-order expectations: Economy-level spending on non- durable goods
$E_{it}^{post} \pi_{t+1}$	0.11 (1.10)	-2.93** (1.29)	-3.12** (1.52)	-3.46** (1.63)
Observations	1,175	1,157	1,093	1,018
1 st stage F-stat	17.40	18.63	14.35	18.14
p-val (weak IV)	0.97	0.02	0.03	0.02

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HETEROGENEITY

Reactions of beliefs and actions may be heterogenous along:

- Level of thinking
- Liquidity constraints
- Financial literacy
- Income
- Education
- etc...

HETEROGENEITY

Reactions of beliefs and actions may be heterogenous along:

- Level of thinking [beauty contest game]
- Liquidity constraints [measure liquidity just before a reg. paycheck arrives]
- Financial literacy [“big three” questions]
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- etc...

Summary of results:

- the reaction of beliefs varies along some dimensions (but not with level of thinking, liquidity constraints, or financial literacy)
- the reaction of consumer spending is statistically similar across groups

HETEROGENEITY

- Financial constraint:

“How much money did you have in your checking and savings accounts and in cash on the day before your last regular paycheck arrived? Please do not include fixed term deposits, stocks, bonds, mutual funds, or retirement accounts, etc.”

HETEROGENEITY OF THE INFLATION EXPECTATIONS RESPONSE

Dependent variable: Posterior $E\pi$	Money in liquid accounts enough to cover 3 months on non-dur. consumption
Prior $E\pi$	0.604*** (0.047)
Prior $E\pi \times$ Treatment	-0.220*** (0.062)
<i>Liquidity</i> \times Treatment	0.096 (0.185)
Prior $E\pi \times$ <i>Liquidity</i> \times Treatment	0.062 (0.082)
Treatment	0.044 (0.141)
Prior $E\pi \times$ <i>Liquidity</i>	-0.046 (0.064)
<i>Liquidity</i>	-0.029 (0.149)
Observations	1,323
R-squared	0.392

HETEROGENEITY OF THE CONSUMPTION RESPONSE

Dependent variable is indicated in the title of the panel	Sample split by:	
	Money in liquid accounts enough to cover 3 months on non-durable consumption	
	No	Yes
Panel B. Spending on dur. goods, extensive margin, linear prob. model.		
Posterior $E\pi$	-0.19 (0.09)	-0.30*** (0.09)
Observations	986	1,544
p-value equality	0.36	
1 st stage F-stat	3.95	8.08
p-value (weak IV)	0.197	<0.01

$$S_{i,t+h}^{cat} = \alpha + \beta \times F_{i,t}\pi_{t+12} + \gamma \times F_{i,t} - S_{i,t+h}^{cat} + \delta \times F_{i,t} - \pi_{t+12} + \theta \times \mathbf{X}_{i,t} + e_{i,t+h}$$

$F_{i,t}\pi_{t+12}$ is Posterior $E\pi$

CONCLUSION AND IMPLICATIONS

- We use a novel randomized control trial (RCT) design to generate exogenous variation in expectations and actions of households

CONCLUSION AND IMPLICATIONS

- We use a novel randomized control trial (RCT) design to generate exogenous variation in expectations and actions of households
- We find that our information treatments:
 - Significant, but transitory effects on expectations
 - A strong negative effect for spending on durable goods
 - Less clear effect for spending on non-durable goods

CONCLUSION AND IMPLICATIONS

- Implications:
 - The way in which households interpret the information may be more complex than in the usual thought experiment.
 - Changing inflation expectations, for example, can induce agents to also change their other economic expectations and, importantly, revise their consumption plans so that the ultimate effects on actions may differ from those intended.

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CONCLUSION AND IMPLICATIONS

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 - The way in which households interpret the information may be more complex than in the usual thought experiment.
 - Changing inflation expectations, for example, can induce agents to also change their other economic expectations and, importantly, revise their consumption plans so that the ultimate effects on actions may differ from those intended.
 - The policy of “raising inflation expectations” can backfire.
 - Communication of policies aimed to move inflation expectations should be more nuanced.

HETEROGENEITY

- Level of thinking:

“Please choose a number from zero to 100.

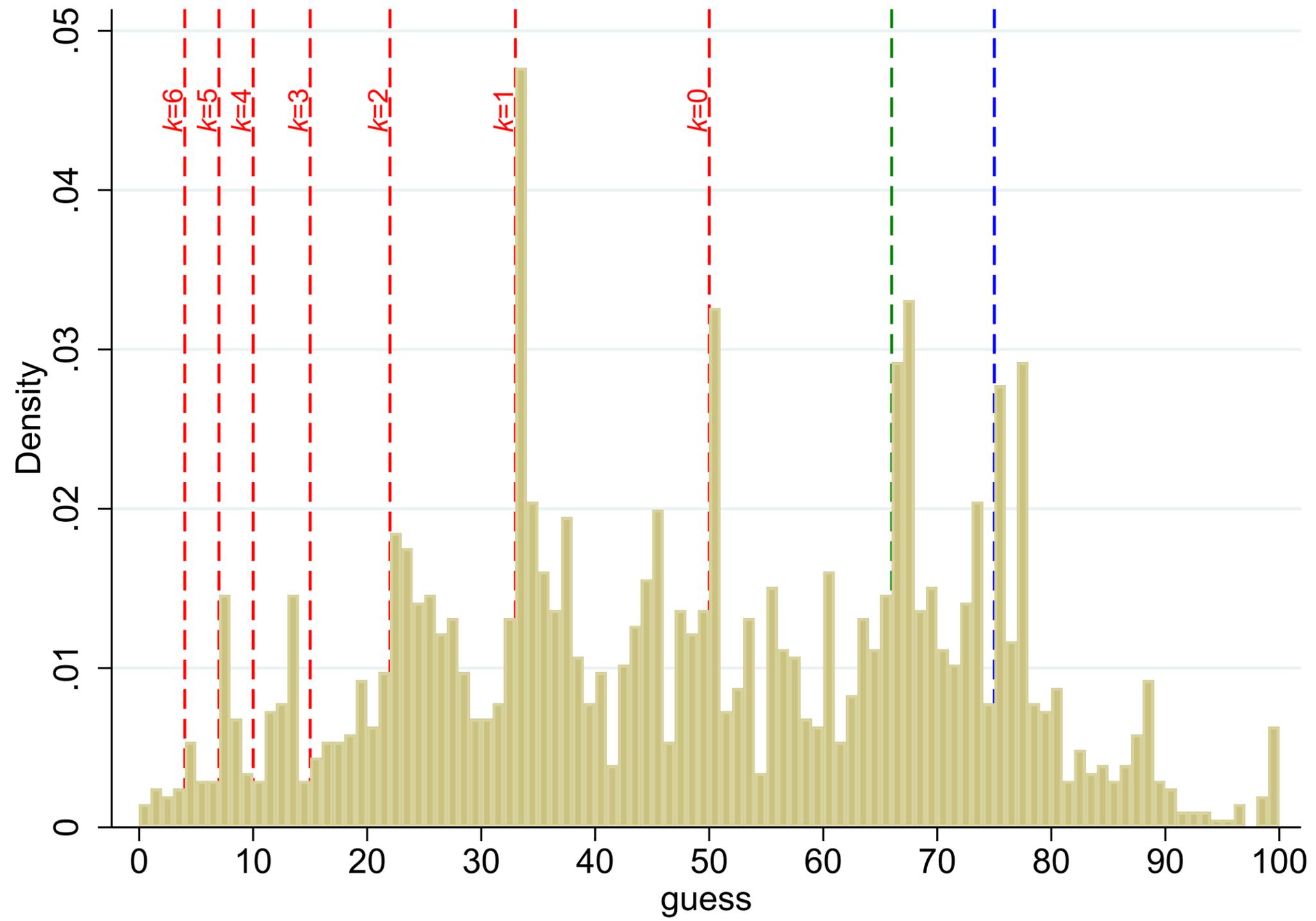
We will take your number as well as the numbers chosen by other participants to calculate the average number. The winning number will be the number that is closest to two-thirds (2/3) of the average number.

The participant with the winning number will receive €500.”

A k^{th} -level thinker provides the following guess $g(k)$:

$$g(k) = \left(\frac{2}{3}\right)^k \times 50$$

HETEROGENEITY



HETEROGENEITY OF THE INFLATION EXPECTATIONS RESPONSE

Dep. var: Posterior $E\pi$	Respondents' characteristic W	
	Level of thinking k	Money in liquid accounts enough to cover 3 months on non-durable consumption
Prior $E\pi$	0.563*** (0.036)	0.604*** (0.047)
Prior $E\pi \times$ Treatment	-0.139*** (0.045)	-0.220*** (0.062)
$W \times$ Treatment	-0.001 (0.075)	0.096 (0.185)
Prior $E\pi \times W \times$ Treatment	-0.015 (0.034)	0.062 (0.082)
Treatment	0.019 (0.107)	0.044 (0.141)
Prior $E\pi \times W$	-0.061** (0.028)	-0.046 (0.064)
W	0.077 (0.063)	-0.029 (0.149)
Observations	1,694	1,323
R-squared	0.352	0.392

