How Do Households Respond to Expected Inflation? An Investigation of Transmission Mechanisms

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Disclaimer: The views are those of the authors. No responsibility should be attributed to the Bank of Canada.

- How do inflation expectations affect household spending?
- In theory, various channels:
 - Eg 1: Intertemporal substitution (Fisher $r = i \pi$ & Euler equations) \rightarrow higher inflation expectations induce higher spending
 - Eg 2: Rigid income does not catch up with inflation \rightarrow higher inflation expectations induce lower spending
- How do people perceive the relationship between inflation expectations and their spending behavior?

Motivation: Empirical

Existing empirical evidence on relationship between inflation expectations and spending shows mixed results, and does not distinguish between different channels

• "But the inconsistent evidence across studies and across types of goods indicates that the literature has not yet fully grasped the mechanisms and models households use when relating inflation expectations to consumption decisions"

-Weber, D'Acunto, Gorodnichenko and Coibion, JEP 2022

- "Households can interpret information treatments in many ways, leading to different channels through which expectations affect spending responses. One channel is the standard intertemporal Euler equation intuition... But treatments can work through other channels as well... [W]e cannot distinguish between these different channels. Our approach therefore estimates the combined effect of all the channels through which a change in inflation expectations may affect spending."
 - -Coibion, Georgarakos, Gorodnichenko and Rooij, AEJ Macro 2023

Contribution and Overview of Results

We leverage experimental methods to study how inflation expectations affect current household spending, and identify the transmission mechanisms

We find that, following an increase in inflation expectations...

- Most households (74%) keep current spending the same
 - \cdot fixed budget
 - · do not consider inflation expectations for current spending decisions
- Minority of households (20%) reduce current spending
 - \cdot saver's wealth effects
 - nominal income rigidity
 - Inflation hedging
- Very small minority of households (6%) increase current spending
 - intertemporal substitution
 - stockpiling

Literature

Survey-based research on spending response to changes in inflation expectations

- *Positive relationship*: Duca-Radu et al. (2021), Vellekoop and Wiederholt (2019), D'Acunto et al. (2021), Burke and Ozdagli (2020), D'Acunto et al. (2023b), Coibion et al. (2022), Dräger et al. (2023)
- Insignificant or negative relationship: Bachmann et al. (2015), Galashin et al. (2020), Coibion et al. (2022), Coibion et al. (2023), Andrade et al. (2023), Burke and Ozdagli (2020)
- Contribution: assess mechanisms, long-term expectation, and highlight heterogeneity

Inflation narratives and subjective models of the economy:

- Consumers dislike inflation: Shiller 1996, Kamdar 2019, Hajdini et al. 2023, Stantcheva 2024
- Beliefs about inflation and unemployment are widely dispersed following hypothetical economic shocks: Andre et al. 2022
- Contribution: further understand how consumers link inflation and spending

Hypothetical scenarios:

- Andre et al. (2021), Armantier et al. (2022), Aidala et al. (2023), Fuster et al. (2020), Fuster and Zafar (2023)
- \cdot Contribution: change inflation expectations and assess effects on spending and mechanisms

Survey Design

- Primary goal: understand how and why higher inflation expectations may impact current spending decisions. Current spending: spending in next 3 months.
- Treatment variables:

Short Term (S) vs Long Term (L)

- Inflation expectations \uparrow for 1-year period after next 3 months by 3pp
- Average annual inflation expectations \uparrow for 10-year period after next 3 months by 3pp

Durable (D) vs Nondurable (N)

- Assess effect on *durable* goods consumption
- Assess effect on *nondurable* goods and services consumption

Pre-intervention Module

- Inflation expectations (next 3 months, 1 year, 10 years)
- · 'Prior' expectations on income growth, fed funds, financial situation predictability
- 'Prior' average monthly spending in next 3 months

Intervention Module

• Hypothetical ↑ in inflation expectations (for 1 year or 10 years after next 3 months)

Post-Intervention Module

- 'Posterior' expectations on income growth, fed funds, financial situation predictability, change in economic outlook
- 'Posterior' average monthly spending in next 3 months
- Mechanism solicitation: (1) open text (2) structured (3) ranking

Timing Visual (Short-Term Example)



- Use timelines and colors throughout survey for clarity
- Blue font refers to the next 3 months and red font indicates the 1-year period (or 10-year period), starting 3 months from now
- Elicit consumption over the next 3 months
- Intervention, priors, and posteriors are elicited over the 1- or 10-year horizon

Hypothetical Intervention to Inflation Expectations: Short-Term Wording

Now, imagine that you have received some information about future prices from a reliable source that you trust. In response to this new information, you update your expectations on prices as follows:

(1) Over the next 3 months from March 2023 to June 2023, you expect the percentage change in prices to be 2% (this is the **same** as your initial expectation).

(2) Over the 12-month period from June 2023 to June 2024, you expect the percentage change in prices to be 8% (this is **3% higher** than your initial expectation).

(3) Over the 10-year period from June 2023 to June 2033, you expect the percentage change in prices <u>per year</u> on average to be 3% (this is the **same** as your initial expectation).

The table below summarizes your initial expectations and updated expectations on future prices.

Expectations on	Over the next	Over the 12-	Over the 10-
expectations on	3 months	month period	year period
	March 2023 to	June 2023 -	June 2023 -
prices	June 2023	June 2024	June 2033
Initial	2%	5%	3% per year
Updated	2%	8%	3% per year

Note: (1) Expected inflation over next 3 months was fixed to the household's prior to avoid mechanical increases in spending. (2) Control question for updated expectations.

A series of questions to solicit change in consumption plans in the next three months:

- In response to the change in your expectations, do you still plan to buy the same type and amount of goods over the next three months?
- If not, would you plan to change the dollar amount?
- · If so, would you increase or decrease dollar amount?

This results in four possibilities:

- Unchanged spending and bundle
- Unchanged spending, but different bundle
- Increase spending
- Decrease spending

If increase/decrease, also ask for dollar amount

- 1. Unstructured: Open-ended box
- 2. Structured: Show mechanisms that the respondent can say was or was not a consideration in their response
 - Note: Only show mechanisms consistent with previous responses
- 3. Ranking: Allocate 100 points to the applicable mechanisms to indicate the importance of each

- Fixed Budget: "I have a fixed budget plan and stick with it."
- Liquidity Constraints: "I don't have money and cannot borrow to increase my spending over the next 3 months."
- Not a Consideration: "When I plan my spending decisions over the next 3 months, price changes after the next 3 months do not matter."
- **Real Income Unchanged:** "My household income will keep up with price increases over this period. So, I will not change my spending decisions over the next 3 months."
 - Only shown if beliefs about income rise by 3pp following intervention

Proposed Mechanisms for a Decrease in Spending 1/2

- Saver's Wealth Effect: "As prices will rise even more after the next 3 months, my existing savings over this period won't be worth as much. So, I will buy less durable goods over the next 3 months."
- Inflation Hedge: "As prices will rise even more after the next 3 months, I will move more money to assets not as affected by rising prices, such as real estate, and buy less durable goods over the next 3 months."
- **Rigid Income:** "As prices will rise even more after the next 3 months, my household income will not keep up with the price increases over this period. So, I will buy less durable goods over the next 3 months."
 - Only shown if beliefs about income rise by less than 3pp following intervention

- Variable Debt: "As prices will rise even more after the next 3 months, the Fed (the central bank of the U.S.) will raise interest rates over this period. As a result, my household must pay more for our variable rate loans over this period. So, I will buy less durable goods over the next 3 months to save up for the higher future payments."
 - Only shown if beliefs about the fed funds rate rose following intervention
- Uncertainty: "As prices will rise even more after the next 3 months, my household will face higher financial uncertainty over this period. So, I will buy less durable goods over the next 3 months."
 - Only shown if beliefs about financial predictability fell following intervention

Proposed Mechanisms for an Increase in Spending 1/2

- Intertemporal Substitution: "As prices will rise even more after the next 3 months, the return on savings won't be worth as much after the next 3 months, thus saving over the next 3 months becomes less attractive. So, I will buy more durable goods over the next 3 months."
- **Stockpiling**: "As prices will rise even more after the next 3 months, I will buy more durable goods over the next 3 months before prices go up even more."
- **Debtors Wealth Effect**: "As prices will rise even more after the next 3 months, given that my debt payments are fixed and my income will increase over this period, I will have more money left after paying my fixed debts. So, I will buy more durable goods over the next 3 months."
 - Only shown if beliefs about income rose following intervention

- **Higher Real Income**: "As prices will rise even more after the next 3 months, my household income will rise faster than price increases over this period. So, I will buy more durable goods over the next 3 months."
 - Only shown if beliefs about income rise by more than 3pp following intervention
- Nominal Illusion: "As prices will rise even more after the next 3 months, my household income will increase over this period. So, I will buy more durable goods over the next 3 months."
 - Only shown if beliefs about income rise by 3pp or less following intervention

- Conducted using Dynata in late February through March 2023 (some robustness treatments in 2024 or Prolific)
- Online consumer survey, age 18 and over
- Dynata provides a "representative" sample across age, gender, race, and census region
- We use demographic weighting to offset the fact the sample was older and more educated than the US (2021 American Community Survey)
- Median completion time of 19 minutes
- After some cleaning, about 500 for main treatments

Results

How Do Individuals Adjust Beliefs about Other Economic Variables?

Following an increase in inflation expectations,

Income

majority do not expect income to keep up: 7% down, 47% same, 11% up by < 3pp

• FFR

majority (55%) expect FFR to stay the same; a large proportion (39%) expect FFR to rise

• Financial predictability

majority (65%) expect financial predictability to stay the same; 24% expect more difficult to predict financial situation

• Economic outlook

41% expect a worsening economy; 35% expect no change Spending Responses

How Do Individuals Adjust Spending? Extensive Margin



Spending Table Spending by Treatment

How Do Individuals Adjust Spending? Intensive Margin



Mechanisms

Mechanisms: Open Text

- "I have a very good income and buy what I want when I want and inflation does not really effect those decisions" [No Change: Not a consideration]
- "Having a budget and sticking to that budget" [No Change: Fixed budget]
- Red"I would plan on spending the same amount, BUT would be much more choosey about what I spend on, buying generic vs brand products to offset." [Same Spending/Different Bundle: Fixed budget]
- "Since the price of goods is increasing at a higher rate than I anticipated & my income will not keep pace with that increase in must decrease what I am spending." [Decrease: Rigid income]
- "i will have to buy less products. try to buy cheaper items. use more coupons and shop at dollar stores more." [Decrease: Other-General wealth effect]
- "If prices will go up it makes more sense to buy long-lasting items sooner than later" [Increase: Stockpiling]

Mechanisms: No Change



Mechanisms: Same Spending, Different Bundle



Mechanisms: Decrease



Mechanisms: Increase



Predictors of a Decrease in Consumption

- Logit regressions of likelihood to decrease spending based on characteristics
 - Demographic variables: CRT, education, gender, race, political stance, age
 - Economic status variables: liquid savings, income
 - Posterior beliefs on other economic variables related to higher inflation expectations: FFR, financial predictability, income growth, economic outlook
- Variables associated with higher chance of reducing spending (and significantly so):
 - Female
 - Middle-aged
 - Low liquid savings
 - Middle income
 - Expect the economy to worsen
 - Expect their own financial uncertainty to rise
 - Expect their income to decrease

- Spending response to higher inflation expectations
 - Majority (76%) report no change: fixed budget, irrelevance of future inflation
 - Minority (20%) report decrease: income rigidity, erosion of savings, inflation hedging
 - Small minority (6%) report increase: stockpiling; intertemporal substitution
 - Intensive margin effects stronger for durable goods
- Policy implications
 - \cdot \uparrow inflation expectations as a policy tool to stimulate economy may be ineffective
 - $\cdot\,$ Subjective models about macroeconomy are heterogeneous and affect decisions
- Modeling implications: important to model wage rigidity, heterogeneity

- \cdot Direction of change
- Contrast interest rates versus inflation expectations as policy tools on consumption and savings/investment within a unified framework $r = i \pi$
- \cdot Source of inflation
- \cdot Replicate in period of lower inflation
- Firms

Thank you!

Treatment Effects

Posterior beliefs

- + Long-term treatment \rightarrow more likely to expect
 - Income to keep up or outpace inflation (**)
 - FFR to rise (*)
 - Financial uncertainty to rise
 - Economy to worsen

Spending

- Extensive margin: similar across treatments
- Intensive margin:
 - Effects of durable and long-term are negative and individually insignificant
 - + Combined effects \rightarrow consumption in LD significantly different from 0

Treatment Effects: Channels

Channel	Long-term treatment	Durable treatment
No Change and Same Spend		
Liquidity Constraint		selected more (*)
Decrease		
Inflation Hedge		selected less
Savers Wealth Effect	selected more	
Variable Debt	selected more (**)	
Uncertainty	selected more	
Rigid Income	selected less	
Increase		
Intertemporal Substitution		selected more (*)
Stockpiling		selected more
Debtors Wealth Effect	selected more	
Flexible Income	selected more (**)	
Nominal Illusion	selected more (***)	

- Larger increase in expected inflation for SD: 10 pp (versus 3 pp for main treatment)
- Modified timing of short-term hypothetical (SN and SD) Inflation rate increases by 3pp in the upcoming year, average inflation remains same for the following years 2 through 10 (vs. average inflation remains same for the following 10 years)
- In both sets of robustness treatments
 - Extensive margins similar to main treatments
 - Intensive margin: reduction in spending on durables becomes statistically significant
- Reinforce the message that higher inflation expectations are unlikely to boost consumer spending

- Fixed Budget: "I have a fixed budget plan and stick with it."
- Liquidity Constraints: "I don't have money and cannot borrow to increase my spending over the next 3 months."

Same Spending

How Do Individuals Adjust Spending?

Spending Response By Treatment									
	(1)	(2)	(3)	(4)	(5)				
	SD	SN	LD	LN	All				
Extensive Margin (Percentage)									
No Change	70.3	57.4	57.2	66.5	63.2				
Same Spending Different Bundle	7.2	11.9	14.7	9.8	10.8				
Increase	5.7	5.6	6.7	5.8	6.0				
Decrease	16.8	25.0	21.4	17.9	20.0				
Intensive Margin (Dollar Spending)									
Prior Spending	533.10	888.46	538.75	831.72	687.39				
Spending Change	11.59	-6.40	-44.27**	-16.35	-13.86				
Percentage Change	2.17%	-0.72%	-8.22%	-1.97%	-2.02%				
Ν	504	504	497	498	2,003				

How Do Individuals Adjust Spending?

Spending Response By Treatment									
	(1)	(1) (2) (3) (4)							
	SD	SN	LD	LN	All				
Extensive Margin (Percentage)									
No Change	70.3	57.4	57.2	66.5	63.2				
Same Spending Different Bundle	7.2	11.9	14.7	9.8	10.8				
Increase	5.7	5.6	6.7	5.8	6.0				
Decrease	16.8	25.0	21.4	17.9	20.0				
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How Do Individuals Adjust Spending?



How Do Individuals Adjust Spending? Intensive Margin



Spending Intensive Margir

Mechanisms: No Change

Of the majority of households that decide not to change their consumption whatsoever, most say they have a fixed budget plan or future inflation does not affect their current spending plans

Households that Select Fach Mechanism

	As a Percent of 'No Change' Households								
		(1)	(2)	(3)	(4)	(5)			
_		SD	SN	LD	LN	All			
	Fixed Budget	66.6	61.4	69.1	63.2	65.3			
	Not a Consideration	64.6	67.7	66.2	59.7	64.2			
	Liquidity Constraint	46.8	32.9	53.8	38.1	43.4			
	Real Income Unchanged	13.1	16.4	21.3	11.7	15.3			
	Ν	364	305	310	319	1,298			

Mechanisms: Same Spending, Different Bundle (Selection of Proposed Mechanisms)

Similarly to the households that would make no change, households who keep their spending the same while buying a different bundle often say this is due to fixed budget plans. Liquidity constraints are also common.

Households that Select Each Mechanism

As a Percent of 'Same Spending, Different Bundle' Households

	(1)	(2)	(3)	(4)	(5)
	SD	SN	LD	LN	All
Fixed Budget	73.2	82.7	65.9	75.5	73.4
Liquidity Constraint	48.8	46.6	53.1	59.9	52.4
Ν	31	52	52	65	200

Mechanisms: Decrease (Selection of Proposed Mechanisms)

Of the households that decrease their consumption plans, they most often say it is because of the wealth effect, rigid incomes, and hedging motives

Households that Select Fach Mechanism

As a Percent of 'Decrease' Households								
	(1)	(2)	(3)	(4)	(5)			
	SD	SN	LD	LN	All			
Savers Wealth Effect	79.2	92.4	79.3	97.5	87.0			
Rigid Income	45.7	67.2	44.5	63.9	55.3			
Variable Debt	22.8	30.1	35.1	49.5	34.3			
Inflation Hedge	68.4	67.3	55.0	64.9	63.6			
Uncertainty	26.6	36.6	37.0	52.9	38.1			
Ν	81	117	105	91	394			

Of the minority of households that increase spending, they most often select intertemporal substitution or stockpiling.

Households that Salast Each Machanism

Households that Select Each Mechanism									
As a Percent of 'Increase' Households									
	(1) (2) (3) (4								
	SD	SN	LD	LN	All				
Intertemporal Substitution	71.2	41.5	76.4	56.1	62.9				
Stockpiling	68.8	45.6	75.7	54.3	62.5				
Debtors Wealth Effect	33.3	27.1	21.8	53.1	33.6				
Flexible Income	5.2	9.4	20.8	48.6	21.4				
Nominal Illusion	37.8	21.7	5.9	5.1	17.2				
Ν	28	30	30	23	111				

Word Clouds



(a) 'No Change'





(b) 'Same Spend, Different Bundle'



(c) 'Decrease'

How Do Individuals Adjust Their Beliefs? Household Income

Following an increase in inflation expectations, most households expect their income to be unchanged. In long-term treatments, households are significantly more likely to think their income will rise or even outpace inflation (5% level)

	(1)	(2)	(3)	(4)	(5)		
	SD	SN	LD	LN	All		
Adjust downwards	4.9	10.3	6.7	5.4	6.6		
No change	49.0	50.9	39.9	50.4	47.4		
Adjust upwards by less than 3	12.0	12.1	10.9	10.7	11.4		
Adjust upwards by 3	18.0	17.4	22.2	18.0	18.9		
Adjust upwards by more than 3	16.1	9.2	20.4	15.5	15.6		
N	504	504	497	498	2,003		

Posteriors of Household Income Growth

How Do Individuals Adjust Their Beliefs? Household Income

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	(1)	(2)	(3)	(4)	(5)
	SD	SN	LD	LN	All
Adjust downwards	4.9	10.3	6.7	5.4	6.6
No change	49.0	50.9	39.9	50.4	47.4
Adjust upwards by less than 3	12.0	12.1	10.9	10.7	11.4
Adjust upwards by 3	18.0	17.4	22.2	18.0	18.9
Adjust upwards by more than 3	16.1	9.2	20.4	15.5	15.6
Ν	504	504	497	498	2,003

Posteriors of Household Income Growth

While the majority of households do not change their beliefs about what the Fed will do in response to the higher inflation expectations, a large minority of households think the Fed will increase rates to bring inflation down (consistent with the Taylor rule).

	(1)	(2)	(3)	(4)	(5)
	SD	SN	LD	LN	All
Adjust upwards	34.9	39.8	43.0	40.2	39.4
No change	61.3	55.3	50.4	52.6	55.0
Adjust downwards	3.8	4.8	6.6	7.2	5.6
Ν	504	504	497	498	2,003

Posteriors of Federal Funds Rate

While the majority of households do not change their beliefs about what the Fed will do in response to the higher inflation expectations, a large minority of households think the Fed will increase rates to bring inflation down (consistent with the Taylor rule).

	(1)	(2)	(3)	(4)	(5)
	SD	SN	LD	LN	All
Adjust upwards	34.9	39.8	43.0	40.2	39.4
No change	61.3	55.3	50.4	52.6	55.0
Adjust downwards	3.8	4.8	6.6	7.2	5.6
Ν	504	504	497	498	2,003

Posteriors of Federal Funds Rate

While $\approx 20 - 30\%$, believe the treatments increase their financial uncertainty, the treatment does not change the majority of respondents' sense of financial predictability

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	(1)	(2)	(3)	(4)	(5)
	SD	SN	LD	LN	All
More difficult	19.4	25.3	23.6	28.6	24.1
As difficult as before	65.6	65.9	65.9	63.7	65.3
Less difficult	15.0	8.8	10.6	7.6	10.6
Ν	504	504	497	498	2,003
N	504	504	497	498	2,003

Posteriors of Financial Predictability

While $\approx 20 - 30\%$, believe the treatments increase their financial uncertainty, the treatment does not change the majority of respondents' sense of financial predictability

)				
	(1)	(2)	(3)	(4)	(5)
	SD	SN	LD	LN	All
More difficult	19.4	25.3	23.6	28.6	24.1
As difficult as before	65.6	65.9	65.9	63.7	65.3
Less difficult	15.0	8.8	10.6	7.6	10.6
Ν	504	504	497	498	2,003

Posteriors c	of Financial	Predictability
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Most individuals associate higher expected inflation with a worsening economy

Posteriors of General Economic Outlook						
		(1)	(2)	(3)	(4)	(5)
		SD	SN	LD	LN	All
Impro	ove	25.3	20.7	25.9	22.6	23.7
No cł	nange	40.0	33.3	33.2	34.9	35.5
Wors	en	34.8	46.0	40.9	42.6	40.8
Ν		504	504	497	498	2,003