Food prices matter most: Sensitive household inflation expectations

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Merge UK HH data on personal expenditure

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Merge UK HH data on personal expenditure with granular CPI rates (03Q1 - 22Q1), with UK HH data on inflation expectations (at demographic-group level)

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Can rationalise **upwards bias**

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Taken together:

Can rationalise **upwards bias**, is consistent with observed **cross-sectional heterogeneity** and 'supply-side' oriented view of economy.

Related Literature

Formation of inflation expectations

- HHs are inattentive Sims 2015
- Financial literacy levels (Bruin et al., 2010), cognitive abilities (D'Acunto et al., 2019), macroeconmic state (Cavallo et al., 2017), sources of information (Lamla & Lein 2008, 2015), transmission of policy communication Coibion et al., 2019; D'Acunto et al., 2020), personal inflation experiences
  - Aggregate lifetime experiences Malmendier & Nagel (2016), Angelico & Di Giacomo (2019)
  - Sensitivity to certain components
    - Food D'Acunto et al., (2021)
    - Energy Coibion & Gorodnichenko (2015); Binder & Makridis (2022); Binder (2018); Tehran (2011)
    - Implicitly through proxies Deitrich et al., (2022)

Heterogeneity across households

- In inflation expectations Arioli et al. (2017), Del Giovane et al. (2008), Jonung (1981)
- In personal inflation rates Kaplan & Schulhofer-Wohl (2017)

Contributions

1. Explicitly test sensitivity of inflation expectations to price changes across *entire* consumption basket

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3. Uncover heterogeneity in sensitivity
   - Above-median income sensitivity to food, despite being less exposed to food in their consumption basket

Data

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1. **HH expenditure: ONS's Living Costs & Food Survey (LCFS)**
   - Weekly Data on HH GDP expenditure across 85 CPI components
     - Aggregated into 4 sub-categories: food, energy, core goods, and services
   - Daily from 2003 Q1 to 2022 Q1
   - Repeated cross-section of 6,000 HHs through the year

LCFS shares | LCFS group shares

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2. **CPI micro data**
   - Granular CPI rates across components in the basket
3. **HH Inflation Expectations: BoE's Inflation Attitudes Survey (IAS)**
   - Micro-data for 0y (perceptions), 1y, 2y, and 5y-ahead expectations IAS Survey Questions
   - Quarterly from 2003 Q1 (2009 Q1) for 0y- and 1y (2y and 5y)
   - Repeated cross-section of approx. 2000 HHs

Novel dataset

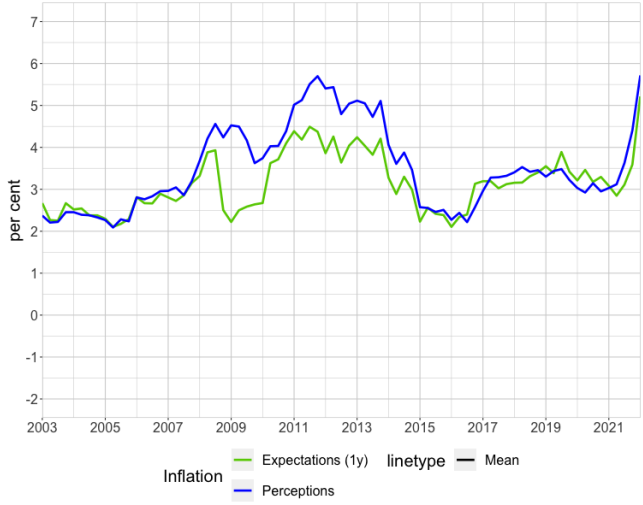
Synthetic pseudo panel

- Quarterly synthetic panel dataset 2003 Q1 - 2022 Q1
- Statistical matching at common demographic group level:
  - Age, Income, House Tenure
- Panel dataset constructed for each possible combination of groups

Perceived, Expected, and Experienced Inflation

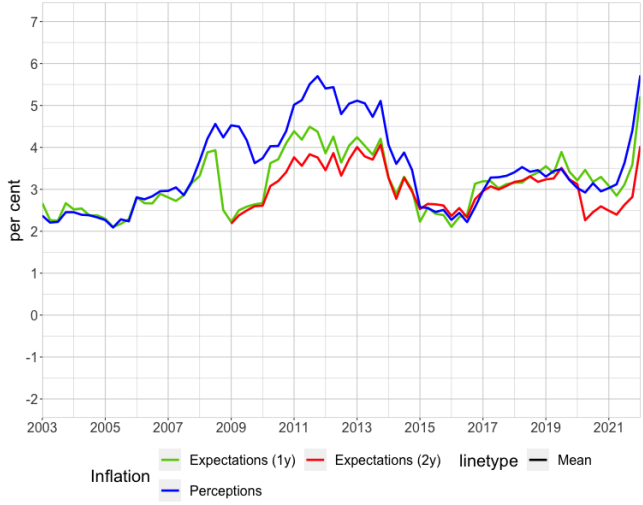
Perceptions co-move closely with expectations

Short-run



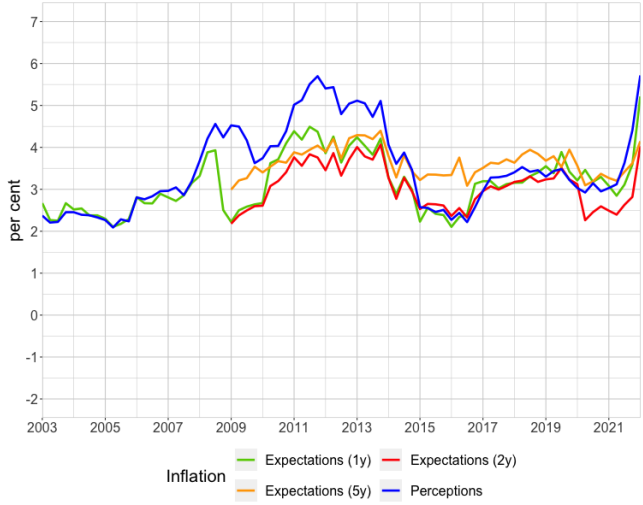
Perceptions co-move closely with expectations

Short-run, medium-run

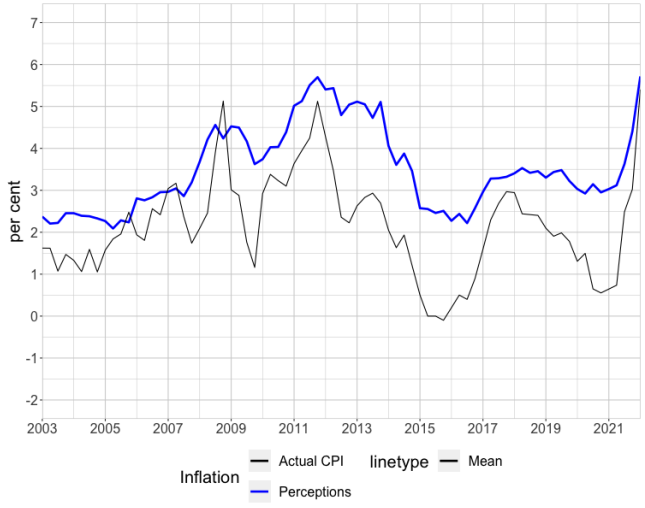


Perceptions co-move closely with expectations

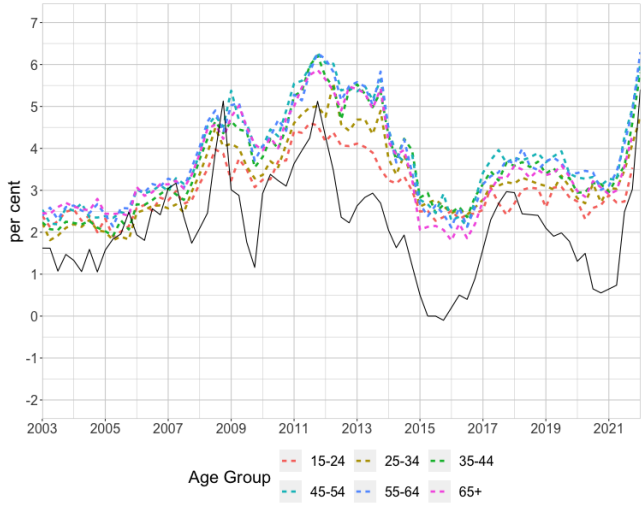
Short-run, medium-run, and long-run



Perceived inflation consistently higher than actual inflation

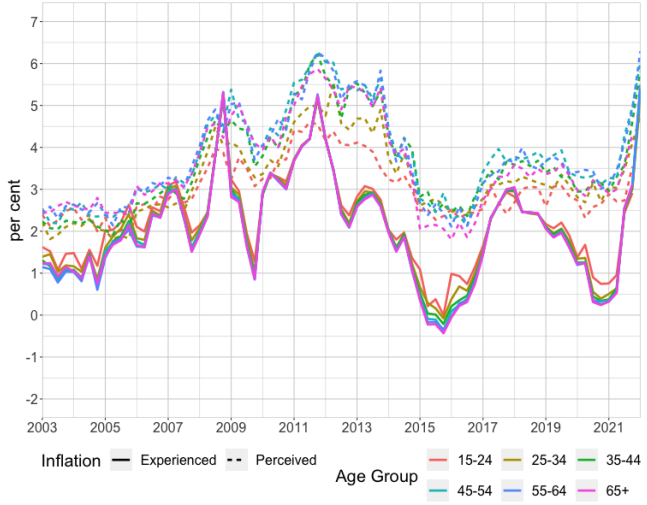


Significant heterogeneity in the cross-section



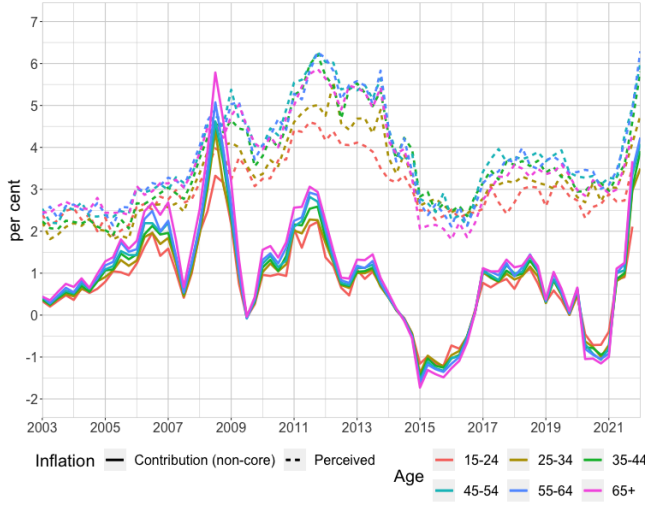
Could differences in experienced inflation explain this?

Doesn't look like it looking at 'total' experienced inflation ...



Could differences in experienced inflation explain this?

... But non-core component more heterogeneous and stronger co-movement



Regression Analysis

Regression Analysis

i. Baseline Results
   - Aggregate
   - Sub-Sample

ii. Implications for upwards bias

iii. Implications for cross-sectional heterogeneity

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Aggregate Analysis

Empirical Specification

$$\Delta \mathbb{E}\pi_{g,t|t+y} = \alpha + \beta_1 \Delta \pi_{g,t}^{Food} + \beta_2 \Delta \pi_{g,t}^{Energy} + \beta_3 \Delta \pi_{g,t}^{CoreGoods} + \beta_4 \Delta \pi_{g,t}^{Services} + \gamma_g + \epsilon_{g,t} \quad (1)$$

- y $\in \{0, 1, 2, 5\}$ such that $\mathbb{E}\pi_{g,t|t+y}$ reflects average expected inflation at some horizon amongst households in demographic group g at time t.
- $\Delta \pi_{g,t}^{Food}$ is the change in the inflation contribution of food in period t given the average composition of the consumption basket of a household in demographic group g in that period.
- γ_g represent group fixed effects.

Aggregate Analysis

Perfectly observant HH

	Dependent variable:
	$\Delta 0_y$
	(1)
Food	**1.00**
Energy	**1.00**
Core Goods	**1.00**
Services	**1.00**
Age FE	
Observations	
Adjusted R^2	
Note:	*p<0.1; **p<0.05; ***p<0.01

Aggregate Analysis

Perfectly observant HH. **Perfectly unobservant HH**.

	Dependent variable:
	$\Delta 0_y$
	(1)
Food	**0.00**
Energy	**0.00**
Core Goods	**0.00**
Services	**0.00**
Age FE	
Observations	
Adjusted R^2	
Note:	*p<0.1; **p<0.05; ***p<0.01

Aggregate Analysis

Under-reaction. Food matters most for 0y

	Dependent variable:
	$\Delta 0y$
	(1)
Food	**0.54*****
	(0.14)
Energy	**0.16*****
	(0.06)
Core Goods	0.20
	(0.20)
Services	0.22
	(0.18)
Age FE	Yes
Observations	454
Adjusted R^2	0.21
Note:	*p<0.1; **p<0.05; ***p<0.01

Aggregate Analysis

Under-reaction. Food matters most for 0y. Food matters also for 1y

	Dependent variable:	
	$\Delta 0y$	$\Delta 1y$
	(1)	(2)
Food	**0.54*****	**0.42****
	(0.14)	(0.21)
Energy	**0.16*****	0.11
	(0.06)	(0.08)
Core Goods	0.20	0.23
	(0.20)	(0.23)
Services	0.22	-0.01
	(0.18)	(0.25)
Age FE	Yes	Yes
Observations	454	454
Adjusted R^2	0.21	0.07
Note:		*p<0.1; **p<0.05; ***p<0.01

Aggregate Analysis

Under-reaction. Food matters most for 0y. Food matters also for 1y, then falls away

	Dependent variable:			
	$\Delta 0y$	$\Delta 1y$	$\Delta 2y$	$\Delta 5y$
	(1)	(2)	(4)	(6)
Food	**0.54*****	**0.42****	0.34	0.18
	(0.14)	(0.21)	(0.24)	(0.17)
Energy	**0.16*****	0.11	0.10	0.03
	(0.06)	(0.08)	(0.10)	(0.05)
Core Goods	0.20	0.23	**0.39***	**0.39****
	(0.20)	(0.23)	(0.23)	(0.19)
Services	0.22	-0.01	0.05	0.02
	(0.18)	(0.25)	(0.21)	(0.15)
Age FE	Yes	Yes	Yes	Yes
Observations	454	454	310	310
Adjusted R^2	0.21	0.07	0.09	0.03
Note:				*p<0.1; **p<0.05; ***p<0.01

Aggregate Analysis

Perceptions drive expectations

	Dependent variable:						
	$\Delta 0y$	$\Delta 1y$	$\Delta 1y$	$\Delta 2y$	$\Delta 2y$	$\Delta 5y$	$\Delta 5y$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Food	**0.54*****	**0.42****	-0.002	0.34	-0.04	0.18	-0.06
	(0.14)	(0.21)	(0.13)	(0.24)	(0.15)	(0.17)	(0.11)
Energy	**0.16*****	0.11	-0.01	0.10	0.0001	0.03	-0.03
	(0.06)	(0.08)	(0.08)	(0.10)	(0.10)	(0.05)	(0.05)
Core Goods	0.20	0.23	0.07	**0.39***	0.09	**0.39****	0.19
	(0.20)	(0.23)	(0.17)	(0.23)	(0.12)	(0.19)	(0.12)
Services	0.22	-0.01	-0.18	0.05	-0.19	0.02	-0.14
	(0.18)	(0.25)	(0.17)	(0.21)	(0.12)	(0.15)	(0.12)
$\Delta 0y$			**0.78*****		**0.63*****		**0.41*****
			(0.07)		(0.08)		(0.09)
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	454	454	454	310	310	310	310
Adjusted R^2	0.21	0.07	0.44	0.09	0.44	0.03	0.19

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

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Sub-Samples: Demographic groups

Perceptions: Food matters for all, especially for high income. Energy matters for young, renters and mortgagors.

	Dependent variable: $\Delta 0y$												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
$\Delta\pi$(Food)	0.28	**0.55*****	**0.68*****	**0.63*****	**0.64*****	**0.41*****	**0.37*****	**0.46*****	**0.37***	**0.90*****	**0.39*****	**0.78*****	**0.57*****
	(0.23)	(0.13)	(0.22)	(0.21)	(0.18)	(0.12)	(0.11)	(0.12)	(0.19)	(0.27)	(0.13)	(0.20)	(0.16)
$\Delta\pi$(Energy)	**0.24*****	**0.18*****	**0.24*****	0.11	**0.13***	0.10	**0.15****	0.10	**0.18*****	**0.14****	**0.22*****	**0.15****	0.08
	(0.08)	(0.05)	(0.09)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)
$\Delta\pi$(CoreGoods)	**0.41****	0.26	0.19	-0.04	0.25	0.12	-0.19	0.30	-0.04	0.20	0.11	0.18	0.28
	(0.19)	(0.19)	(0.22)	(0.36)	(0.26)	(0.28)	(0.37)	(0.29)	(0.22)	(0.20)	(0.23)	(0.21)	(0.26)
$\Delta\pi$(Services)	0.03	0.20	0.27	0.41	**0.64***	0.08	0.10	0.23	0.59	0.30	0.20	0.34	0.42
	(0.10)	(0.26)	(0.23)	(0.31)	(0.35)	(0.31)	(0.20)	(0.33)	(0.39)	(0.26)	(0.19)	(0.25)	(0.32)
Demographic Group	15-24	25-34	35-44	45-54	55-64	65+	¡£10k	£10k-£20k	£20k-£35k	>£35k	Renters	Mortgagors	Owners
Observations	75	76	76	76	76	75	76	76	76	76	76	76	76
Adjusted R^2	0.20	0.21	0.30	0.18	0.25	0.11	0.16	0.14	0.16	0.27	0.22	0.32	0.22

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

▸ food ▸ energy

Sub-Samples: Demographic groups

Perceptions: Food matters for all, especially for high income. Energy matters for young, renters and mortgagors.

	Dependent variable: $\Delta 0y$												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
$\Delta\pi$(Food)	0.28	**0.55*****	**0.68*****	**0.63*****	**0.64*****	**0.41*****	**0.37*****	**0.46*****	**0.37***	**0.90*****	**0.39*****	**0.78*****	**0.57*****
	(0.23)	(0.13)	(0.22)	(0.21)	(0.18)	(0.12)	(0.11)	(0.12)	(0.19)	(0.27)	(0.13)	(0.20)	(0.16)
$\Delta\pi$(Energy)	**0.24*****	**0.18*****	**0.24*****	0.11	**0.13***	0.10	**0.15****	0.10	**0.18*****	**0.14****	**0.22*****	**0.15****	0.08
	(0.08)	(0.05)	(0.09)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)
$\Delta\pi$(CoreGoods)	**0.41****	0.26	0.19	-0.04	0.25	0.12	-0.19	0.30	-0.04	0.20	0.11	0.18	0.28
	(0.19)	(0.19)	(0.22)	(0.36)	(0.26)	(0.28)	(0.37)	(0.29)	(0.22)	(0.20)	(0.23)	(0.21)	(0.26)
$\Delta\pi$(Services)	0.03	0.20	0.27	0.41	**0.64***	0.08	0.10	0.23	0.59	0.30	0.20	0.34	0.42
	(0.10)	(0.26)	(0.23)	(0.31)	(0.35)	(0.31)	(0.20)	(0.33)	(0.39)	(0.26)	(0.19)	(0.25)	(0.32)
Demographic Group	15-24	25-34	35-44	45-54	55-64	65+	¡£10k	£10k-£20k	£20k-£35k	>£35k	Renters	Mortgagors	Owners
Observations	75	76	76	76	76	75	76	76	76	76	76	76	76
Adjusted R^2	0.20	0.21	0.30	0.18	0.25	0.11	0.16	0.14	0.16	0.27	0.22	0.32	0.22

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

▸ food ▸ energy

Sub-Samples: Demographic groups

Perceptions: Food matters for all, especially for high income. Energy matters for young, renters and mortgagors.

	Dependent variable: $\Delta 0y$												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
$\Delta\pi$(Food)	0.28	**0.55*****	**0.68*****	**0.63*****	**0.64*****	**0.41*****	**0.37*****	**0.46*****	**0.37***	**0.90*****	**0.39*****	**0.78*****	**0.57*****
	(0.23)	(0.13)	(0.22)	(0.21)	(0.18)	(0.12)	(0.11)	(0.12)	(0.19)	(0.27)	(0.13)	(0.20)	(0.16)
$\Delta\pi$(Energy)	**0.24*****	**0.18*****	**0.24*****	0.11	**0.13***	0.10	**0.15****	0.10	**0.18*****	**0.14****	**0.22*****	**0.15****	0.08
	(0.08)	(0.05)	(0.09)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)
$\Delta\pi$(CoreGoods)	**0.41****	0.26	0.19	-0.04	0.25	0.12	-0.19	0.30	-0.04	0.20	0.11	0.18	0.28
	(0.19)	(0.19)	(0.22)	(0.36)	(0.26)	(0.28)	(0.37)	(0.29)	(0.22)	(0.20)	(0.23)	(0.21)	(0.26)
$\Delta\pi$(Services)	0.03	0.20	0.27	0.41	**0.64***	0.08	0.10	0.23	0.59	0.30	0.20	0.34	0.42
	(0.10)	(0.26)	(0.23)	(0.31)	(0.35)	(0.31)	(0.20)	(0.33)	(0.39)	(0.26)	(0.19)	(0.25)	(0.32)
Demographic Group	15-24	25-34	35-44	45-54	55-64	65+	¡£10k	£10k-£20k	£20k-£35k	>£35k	Renters	Mortgagors	Owners
Observations	75	76	76	76	76	75	76	76	76	76	76	76	76
Adjusted R^2	0.20	0.21	0.30	0.18	0.25	0.11	0.16	0.14	0.16	0.27	0.22	0.32	0.22

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

▸ food ▸ energy

Sensitivity of above-median income to food

	Dependent variable: $\Delta 0y$			
	(2)	(4)	(6)	(8)
Food				
Individualised	0.37***	0.46***	0.37*	0.90***
	(0.11)	(0.12)	(0.19)	(0.27)
Consumption Basket	Indiv	Indiv	Indiv	Indiv
Income Group	<£10k	£10k-£20k	£20k-£35k	>£35k
Observations	76	76	76	76
Adjusted R^2	0.16	0.14	0.16	0.27
Note:				*p<0.1; **p<0.05; ***p<0.01

Sensitivity of above-median income to food

We identify this by disentangling *sensitivity* from *exposure*

	Dependent variable: $\Delta 0y$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Food								
Rep. Basket	0.40***		0.46***		0.39**		0.63***	
	(0.14)		(0.13)		(0.17)		(0.19)	
Individualised		0.37***		0.46***		0.37*		0.90***
		(0.11)		(0.12)		(0.19)		(0.27)
Consumption Basket	Rep	Indiv	Rep	Indiv	Rep	Indiv	Rep	Indiv
Income Group	<£10k	<£10k	£10k-£20k	£10k-£20k	£20k-£35k	£20k-£35k	>£35k	>£35k
Observations	76	76	76	76	76	76	76	76
Adjusted R^2	0.18	0.16	0.14	0.14	0.17	0.16	0.26	0.27
Note:							*p<0.1; **p<0.05; ***p<0.01	

Regression Analysis

i Baseline Results
- Aggregate
- Sub-Sample

ii Implications for upwards bias

iii Implications for cross-sectional heterogeneity and 'supply-side' orientation

Upwards bias

HHs more sensitive to *increases* in food price-driven inflation. Can explain nearly *half* of the upwards bias

	Dependent variable:	
	$\Delta 0y$	$\Delta 0y$
	(1)	(1*)
$\Delta\pi$(Food)	0.54***	0.15
$\Delta\pi$(Food) $*$ Positive		**0.61***
$\Delta\pi$(Energy)	0.16***	0.12
$\Delta\pi$(Energy) $*$ Positive		0.02
$\Delta\pi$(CoreGoods)	0.20	−0.39
$\Delta\pi$(CoreGoods) $*$ Positive		0.72
$\Delta\pi$(Services)	0.22	0.74
$\Delta\pi$(Services) $*$ Positive		−0.56
Age FE	Yes	Yes
Observations	454	454
Adjusted R^2	0.21	0.24
Note:	*p<0.1; **p<0.05; ***p<0.01	

Regression Analysis

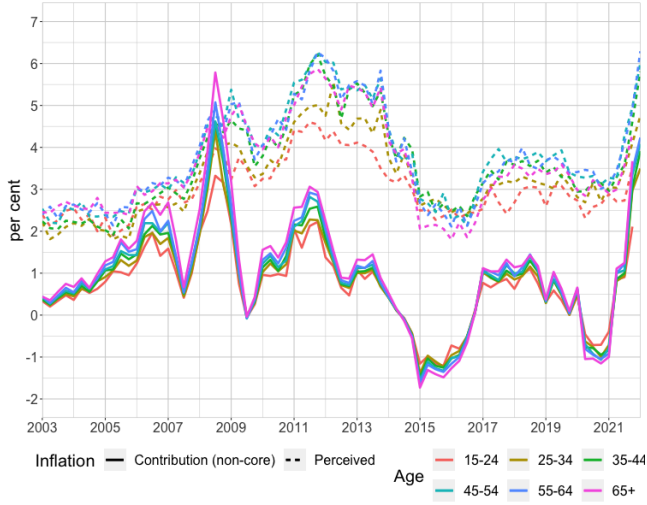
i Baseline Results
- Aggregate
- Sub-Sample

ii Implications for upwards bias

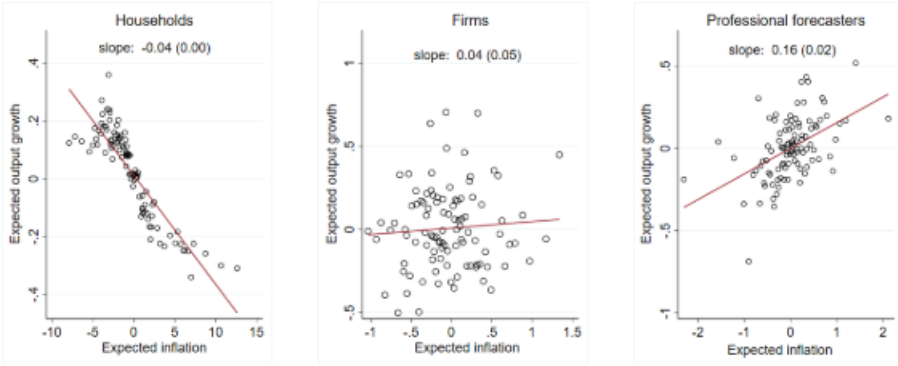
iii Implications for cross-sectional heterogeneity and 'supply-side' view of inflation

Implications for cross-sectional heterogeneity

Heterogeneity consistent in direction, and about half the magnitude of that in perceptions.



Implications for 'supply-side' view



Notes: Each panel plots a bin-scatter for the joint distribution of expectations for output growth rate and inflation in the next year across different economic agents in the United States. For each variable, I take out the time fixed effect so that all variables are mean zero.

Data Sources: Michigan Survey of Consumers; The Livingston Survey; The Survey of Professional Forecasters.

Source: Zhang 2024

Conclusions

Conclusions

1. HHs' short-horizon expectations are sensitive to changes in experienced inflation
   - Most sensitive to **food** price-driven inflation
   - Significantly more so than **energy**
   - But insensitive to other components (core goods and services)
2. Asymmetry: more sensitive to $\uparrow$ than $\downarrow$ in food price-driven inflation
3. Cross-sectional heterogeneity:
   - in HHs' *exposure* to different items in the basket
   - in HHs' *sensitivity*: above-median income HHs most sensitive to food
4. Mechanisms: HHs' *perceived* current rate of inflation key for *expected* inflation

Taken together:

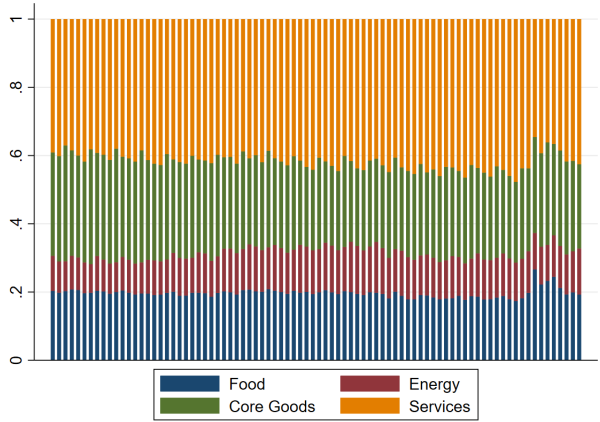
Can rationalise **upwards bias** and is consistent with observed **cross-sectional heterogeneity** and 'supply-side' oriented view of economy.

Policy Implications

- Households' expectations may be most likely to become elevated when shocks impact food prices, and may remain high even once the shock has subsided
- Monetary authority may wish to respond more strongly to food-price shocks in order to reduce the risk of inflationary pressures persisting (even if the shock is transitory)

Appendix

Composition of consumption baskets

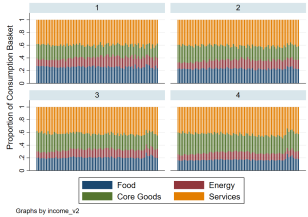


Source: UK household consumption shares from Living Costs and Food Survey (LCFS, ONS)

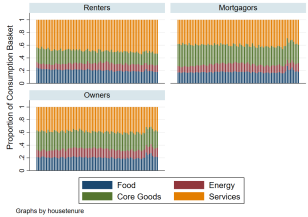
back

Heterogeneity across groups

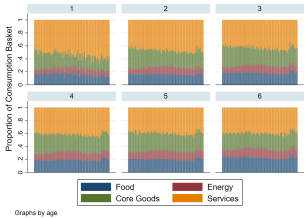
(i) income



(ii) house tenure



(iii) age



IAS Survey Questions

Perceived inflation: *"How much have prices in the shops generally changed over the past 12 months?"*

Expected inflation (1y-ahead): *"How much would you expect prices in the shops generally to change over the next 12 months?"*

back

Sensitivity to food by Age x Income

Table: Age x Income Group Summary: Food

	Dependent variable: 0y					
	(1)	(2)	(3)	(4)	(5)	(6)
Income Group						
<£10k	0.34*	-0.02	0.33	0.66**	0.47*	0.33
	(0.17)	(0.28)	(0.25)	(0.28)	(0.28)	(0.21)
£10k-£20k	0.39	0.51***	0.14	0.25	0.53*	0.26
	(0.39)	(0.16)	(0.20)	(0.22)	(0.29)	(0.17)
£20k-£35k	0.71	0.52*	0.46	0.48	0.41*	0.18
	(0.50)	(0.31)	(0.31)	(0.36)	(0.23)	(0.22)
>£35k	0.92*	1.03***	1.00***	0.80***	0.99***	0.37
	(0.56)	(0.28)	(0.39)	(0.24)	(0.33)	(0.31)
Age Group:	15-24	25-34	35-44	45-54	55-64	65+
Note:						*p<0.1; **p<0.05; ***p<0.01

Sensitivity to energy by Age x House Tenure

Table: Age Group x House Tenure Summary: Energy

	Dependent variable: 0y					
	(1)	(2)	(3)	(4)	(5)	(6)
House Tenure						
Renters	0.36***	0.18**	0.27**	0.22***	0.07	0.15
	(0.13)	(0.08)	(0.10)	(0.09)	(0.11)	(0.13)
Mortgagors	0.11	0.20***	0.22**	0.08	0.21***	0.21
	(0.09)	(0.07)	(0.09)	(0.08)	(0.08)	(0.17)
Home-owners	0.07	-0.04	0.30***	-0.01	0.09	0.08
	(0.32)	(0.10)	(0.06)	(0.14)	(0.09)	(0.05)
Age Group:	15-24	25-34	35-44	45-54	55-64	65+
Note:						*p<0.1; **p<0.05; ***p<0.01