Estimating Consumer Price Inflation by Household

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Aim Of The Study

- Seek to shed light on 2 issues:

  1. How do individuals form inflation expectations?

  2. How do individuals' personal CPIs differ?

Method

- We combine 2 data sources in our analysis:

    1. A survey that asks individuals about their views on inflation (both past and present) and the sources of their views on inflation.

    2. Individual-level purchase data over a 2-year period (2012-2013) collected via a home scanner.

- We are able to match data from the 2 datasets – the survey data and the home scanner data – for 12761 individuals.

Data Source 1: The Survey

- Survey of 15000 people conducted by Intage in March 2014 and March 2015.

- Sample taken from individuals using scanner to record their daily purchases → connect survey data with actual purchase data.

- Data collected through survey include:

  - Answers to 33-item questionnaire regarding prices.

  - Individual's personal data (e.g. age, family structure, gender, income, education, etc).

Data Source 2: The Purchase Data

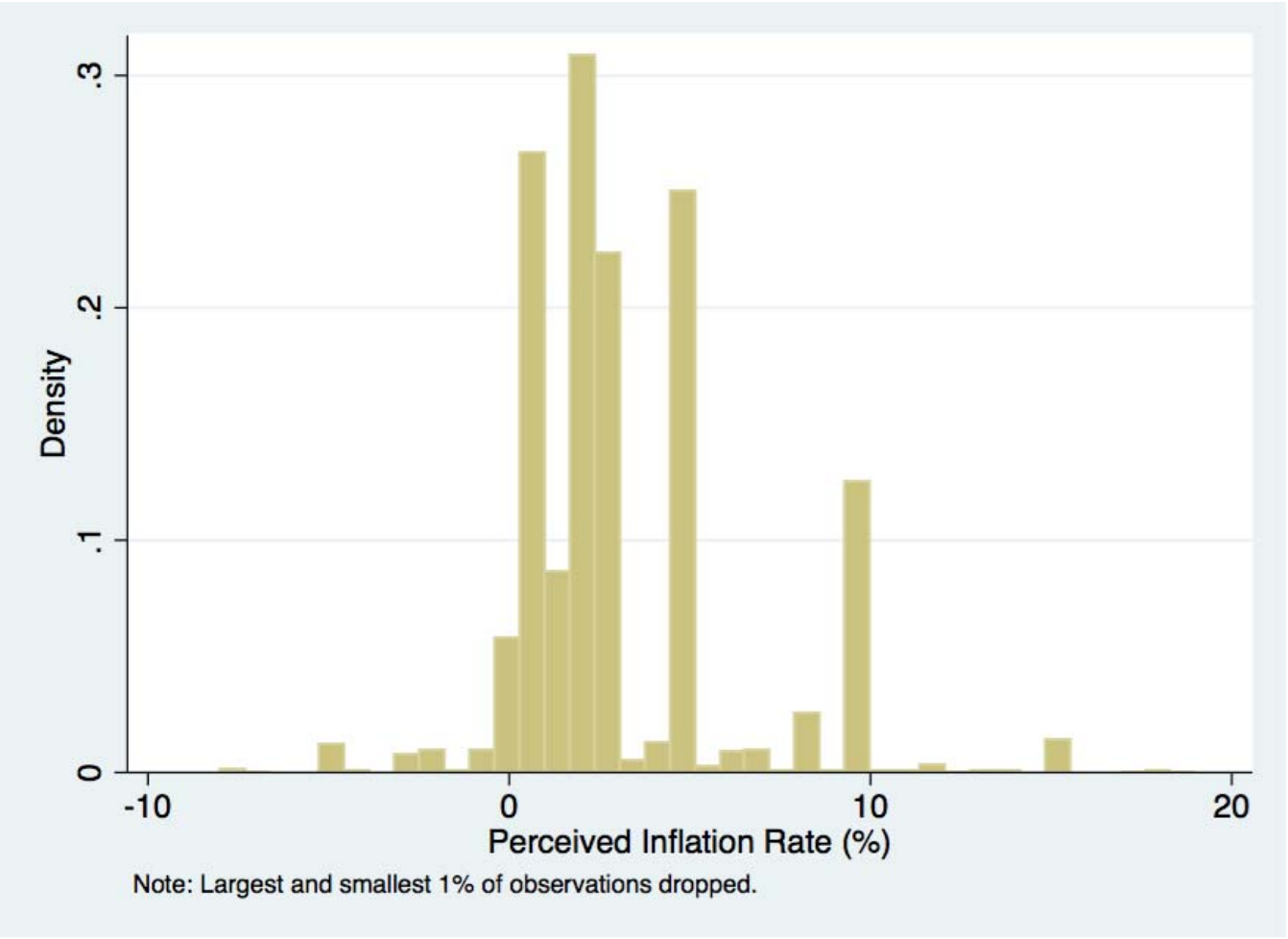
- Records individual's purchase history over the period 2012–2013.
- Data collected includes:
  - JAN code of product purchased
  - Quantity of product purchased
  - Price of product
  - Where the product was purchased

Sample Statistics (2014)

Variable	Obs	Mean	Std. Dev.	Min	Max
General					
Age	15507	46.68	12.14	17	69
Male	15507	0.50	0.50	0	1
Married	15507	0.68	0.47	0	1
Highest Education					
Junior/Middle School	15507	0.01	0.12	0	1
High School	15507	0.26	0.44	0	1
Technical High School	15507	0.04	0.19	0	1
Technical School	15507	0.12	0.33	0	1
Junior College	15507	0.12	0.33	0	1
College	15507	0.39	0.49	0	1
Graduate School	15507	0.04	0.20	0	1
Employment					
Regular Employee	15507	0.38	0.49	0	1
Self Employed/Owner	15507	0.07	0.26	0	1
Contract Employee	15507	0.07	0.26	0	1
Other Employees	15507	0.03	0.17	0	1
Part Time/Arubaito	15507	0.16	0.37	0	1
Stay-At-Home	15507	0.18	0.39	0	1
Student	15507	0.02	0.13	0	1

The Survey: Sample Statistics (2014)

- Please indicate numerically by how much do you think the prices of things you bought changed over the last year?



	Obs	Mean	Median	Std. Dev	Min	Max
Perceived Inflation	10188	3.52	2.00	6.03	−99.00	99.9

Inflation Expectations and Perceived Inflation

52.8% of observations on diagonal

		Previous Year's Inflation Perception								
		>10 % Inflation	5%–10% Inflation	2%–5% Inflation	0%–2% Inflation	No Change	0%–2% Deflation	2%–5% Deflation	5%–10% Deflation	>10 % Deflation
Expected Inflation	>10 % Inflation	5.03	3.43	0.34	0.05	0.81	0.27	0.02	0.05	0.10
	5%–10% Inflation	2.90	15.53	5.44	0.25	3.80	0.33	0.15	0.10	0.04
	2%–5% Inflation	0.66	5.72	14.23	2.19	5.46	0.32	0.14	0.06	0.03
	0%–2% Inflation	0.07	0.42	2.27	2.97	2.51	0.17	0.03	0.01	0.02
	No Change	0.46	2.07	2.75	1.15	14.51	0.51	0.25	0.13	0.08
	0%–2% Deflation	0.02	0.12	0.15	0.06	0.34	0.13	0.05	0.01	0.01
	2%–5% Deflation	0.01	0.12	0.09	0.02	0.29	0.04	0.16	0.04	0.01
	5%–10% Deflation	0.01	0.02	0.02	0.00	0.05	0.00	0.06	0.09	0.01
	>10 % Deflation	0.00	0.02	0.00	0.01	0.04	0.00	0.00	0.02	0.15

Ordered Logit: Expected Inflation and Perceived Inflation

	(1)	(2)	(3)
Perceived Inflation	−8.087*** (0.576)	−7.894*** (0.570)	−7.710*** (0.568)
Age		−0.022*** (0.001)	−0.022*** (0.002)
Male			0.103** (0.038)
Married			0.057 (0.036)
Year Dummies	Yes	Yes	Yes
Income Dummies	No	No	Yes
Education Dummies	No	No	Yes
Obs	20484	20484	20484
Pseudo-R2	0.015	0.019	0.021

Note: Standard errors clustered at individual-level. *** p < 0.001, **p < 0.01

Logit Results

- Positive relationship between perceived inflation and future inflation expectations.
- Robust positive relationship between age and inflation expectations.
- Might this variation in inflation expectations be related to actual (not simply perceived) inflation over the past year?

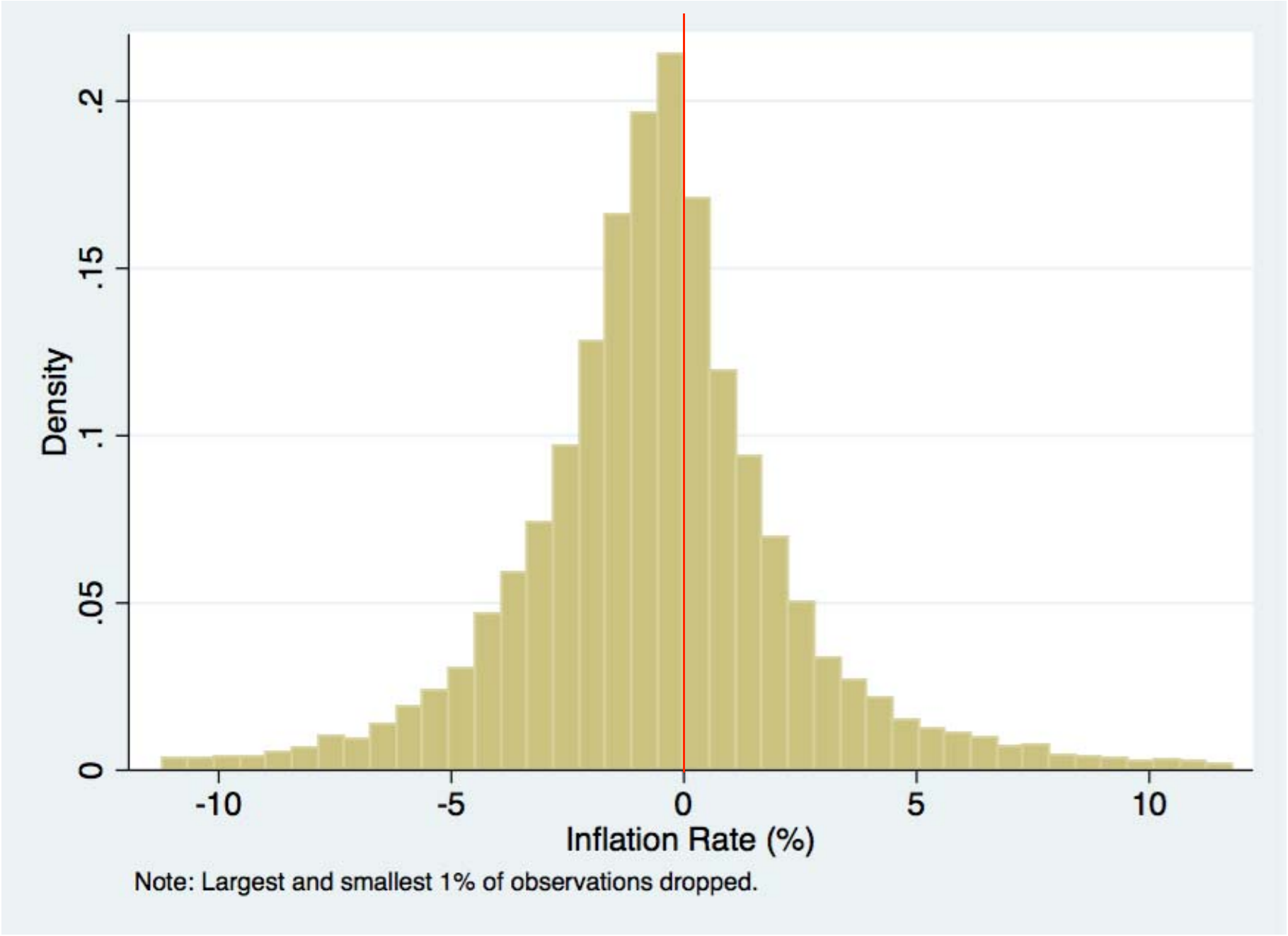
Individual-Level Inflation Rates

- Using the scanner data, we apply Tornqvist weights to construct an inflation rate for each individual from the JAN-level data, which we refer to as the "***Individual-Level Inflation Rate***."

- Product's weight is the product's share in total expenditure ***for the individual*** in a given year.

- Price for each product is the mean price of the product in the given year paid by the individual.

Individual-Level Inflation Rates



Ordered Logit: Expected Inflation and Individual-Level Inflation Rate

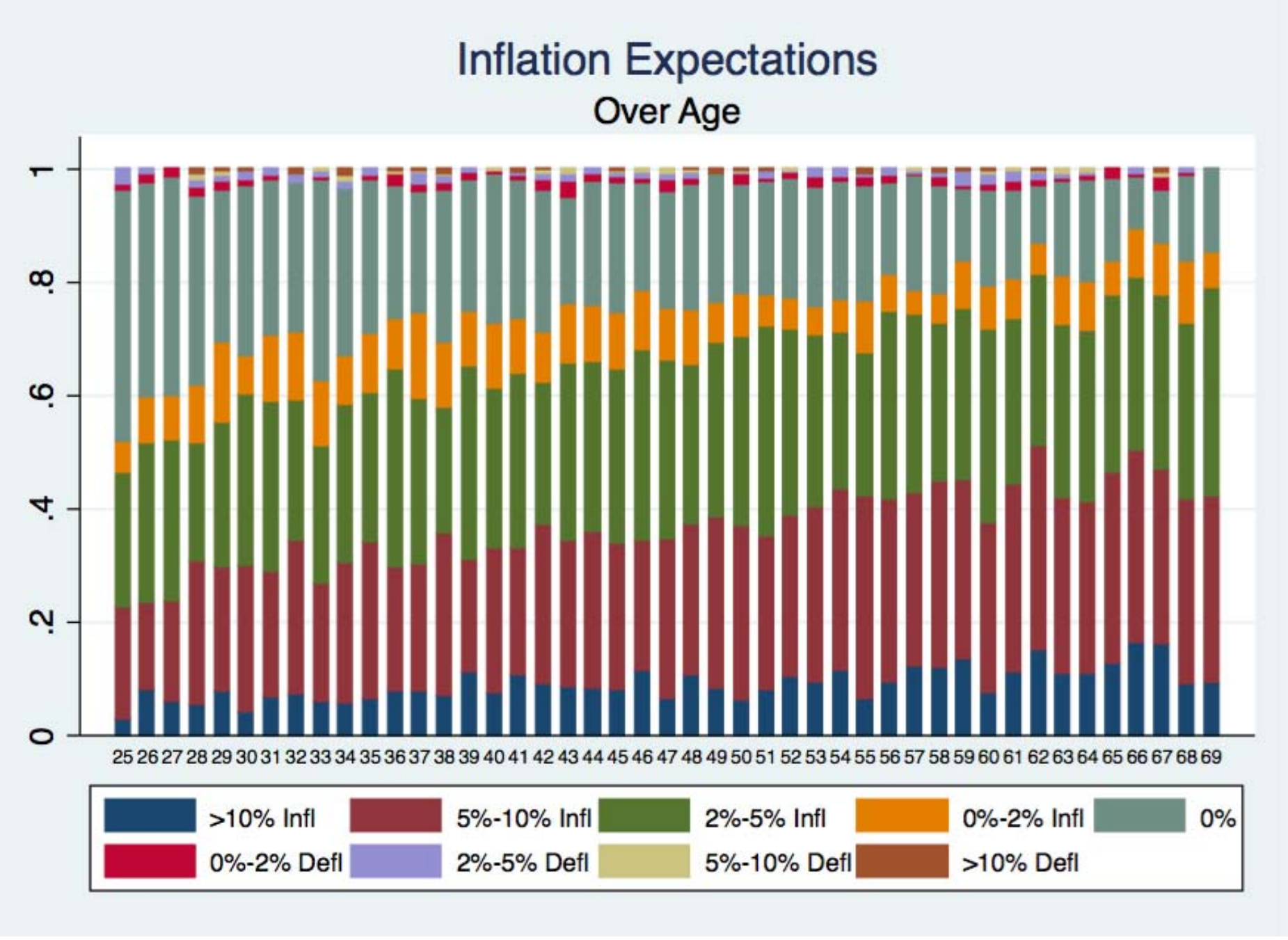
Individual-Level Inflation Rate	−0.440 (0.474)	−0.274 (0.511)	−0.259 (0.509)
Perceived Inflation		−7.463*** (0.813)	−7.137*** (0.807)
Age			−0.020*** (0.002)
Male			0.124*** (0.048)
Married			−0.017 (0.044)
Income Dummies	No	No	Yes
Education Dummies	No	No	Yes
Obs	12114	10188	10188
Pseudo-R2	0.000	0.012	0.018

Note: Robust standard errors used. *** p < 0.001

Logit Results

- No relationship between the individual-level inflation rate and expected inflation.
- Positive relationship between perceived inflation and expected inflation persists even after controlling for the individual-level inflation rate.
- The positive relationship between age and expected inflation persists.
- Why? Life Experiences?

Inflation Expectations Over Age (2014)



Age-Group "CPI"

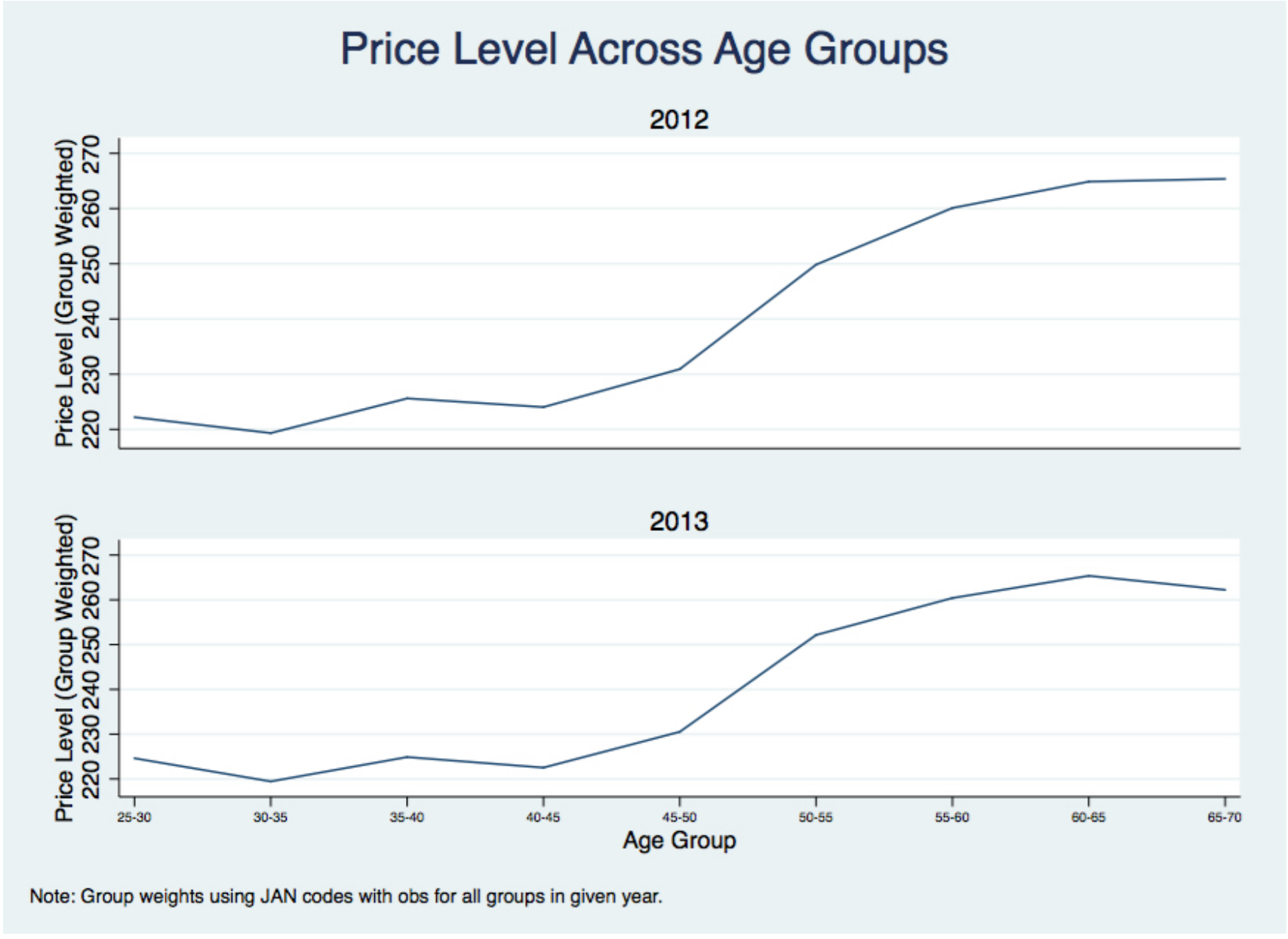
- We divide the sample into 5-year age groups (e.g. 25-30, 30-35, etc).

- We then combine the product (JAN level) data from the scanners of all individuals in a given age group.

- From these aggregated age-group data, we use a Tornqvist index to construct a "CPI" for each age group, which we refer to as the "***Age-Group Price Level***."

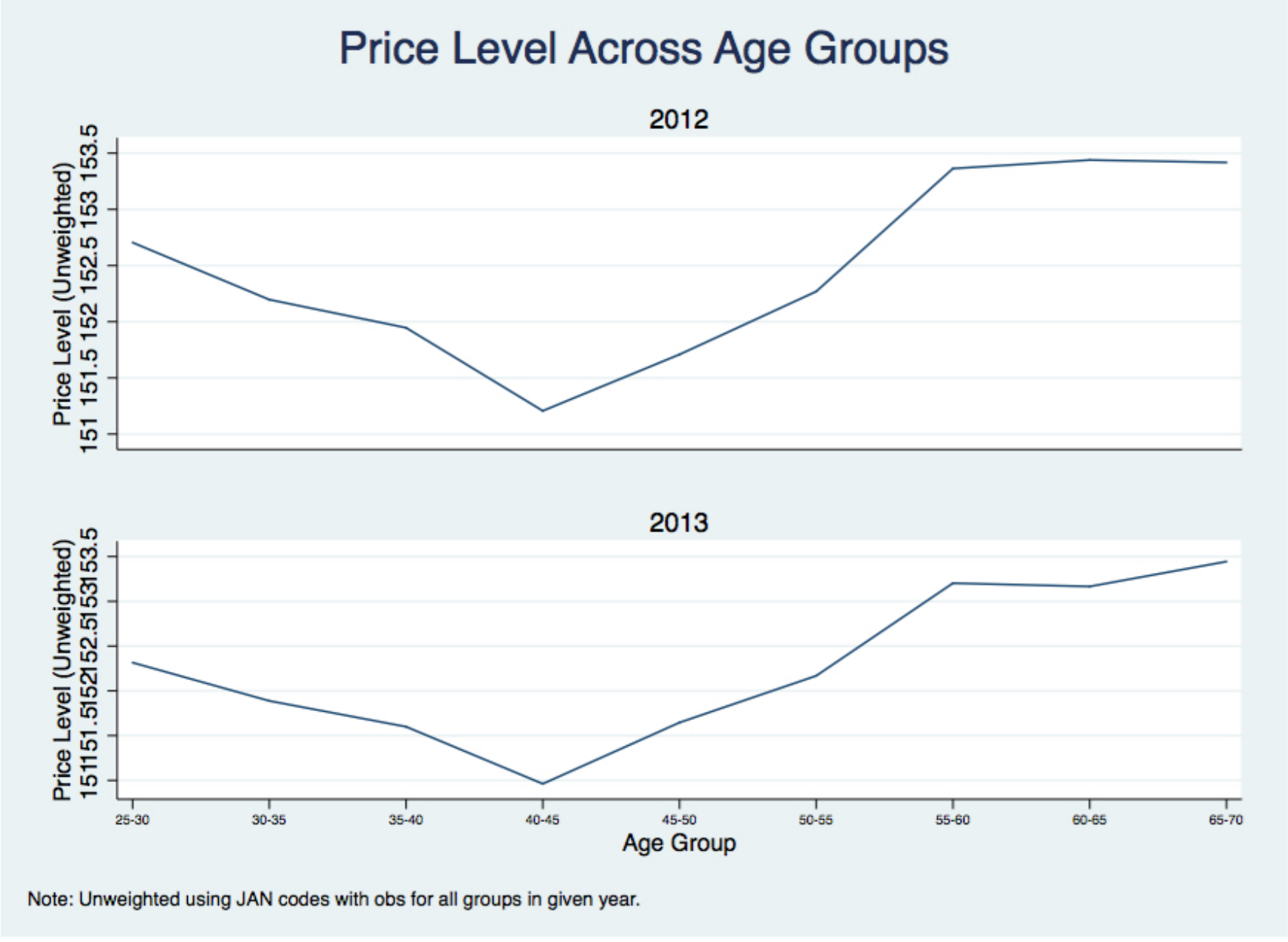
- Basically, we aggregate individual data at the age-group level and use the same method that we used to calculate individual-level inflation rates.

Age-Group Price Level: Weighted



Note: Group weights using JAN codes with obs for all groups in given year.

Age-Group Price Level: Unweighted



Age-Group Price Level: Summary

- People younger than 45 face similar age-group price levels.
- Older people appear to have higher age-group price levels.
- Pattern of the unweighted age-group price level over age suggests that young people pay higher prices for their goods and that the price paid falls until age 45.
- Similar to the weighted age-group price level, the prices paid increase from age 45 until age 60.

Age-Group Inflation Rates

Age-Group Inflation Rates: Summary

- Although there is variation across age, all age groups experienced deflation.
- Both the age-group price level and the age-group inflation rates also increase with age.
- Furthermore, it appears as though the age-group inflation rates begin to decrease after the age of 60.

Decomposing Age-Group Inflation Rates

- In order to understand why age-group inflation rates vary, we decompose the inflation rate into 4 parts:

  1. An average inflation rate (common to all groups)

  2. A deviation of the group's prices of goods from average prices in the common basket.

  3. A deviation of the group's weights on goods from the average weights in the common basket.

  4. A group-specific basket component.

Decomposing Age-Group Inflation Rates

Decomposing Age-Group Inflation Rates

- Most of the variation across age appears to be driven by 2 effects:

  1. the weight effect – differences in amounts consumed of goods that all age groups consume

  2. the group-specific basket effect – differences in the actual goods consumed by each age group

- However, it is important to observe that the more groups we divide the sample into, the smaller is the common set on goods that is consumed by all groups  the group-specific effect.

Summary

- We find **no relationship between the individual-level inflation rate and expected inflation.**
- However, we do find a **positive relationship between perceived inflation and expected inflation**, even after controlling for the individual-level inflation rate.
- Both the **age-group price level and the age-group inflation rates increase with age.**
- Most of the variation in age-group inflation rates comes from the **weight-effect** and the **group-specific basket effect.**