Consumer Searching Behavior Under High Inflation

Youngdoo Choi*

UC San Diego

June 13, 2024

Summary

Do consumers search more for cheaper prices under high inflation? This paper studies the relationship between inflation and searching behaviors. I focus on the movement of price dispersion with inflation as the main mechanism since the dispersion represents return to search. The objective of this paper is to document the price dispersion channel's operation and its relevance to the aggregate economy's searching behavior. To do this, I follow the three steps. First, using a cross-sectional variation across products, I look into the cross-sectional inflation-searching relationship. After that, I explain the result by the dispersion channel. Lastly, I build a consumer searching model to answer the original question. The cross-sectional evidence shows that price dispersion increases and consumers search less as the absolute inflation of a category increases. Part of this result is somewhat counter-intuitive since we expect consumers to search more when inflation and dispersion is high. Meanwhile, the simple model predicts consumers search less with higher price level. This paper provides the insight into the relationship between inflation and markup, proposing a potential upward inflation-markup spirals.

*email: yoc005@ucsd.edu.

1 Introduction

Do consumers search more for cheaper prices under high inflation? Would consumers spend more time searching for lower prices if the inflation rate were, say, 10%? This paper studies the relationship between inflation and searching behaviors. Inflation can affect individuals' searching efforts through two potential channels: i) the real wage channel, and ii) the price dispersion channel. Regarding the real wage channel, decreased real wage due to higher inflation can affect searching behaviors in either direction. Consumers might search more due to lower purchasing power or lower opportunity cost of searching (real wage). On the other hand, they may have less time to search if they are working more to compensate the reduced purchasing power or income. As for the price dispersion channel, inflation can affect searching because the dispersion represents the return to search. Depending on how price dispersion changes with inflation, individuals might search more or less. In this paper, I focus on the dispersion channel as it is presumed to be the main channel. It is because even though consumers may want to search more due to lower real wages, if the return to search is small, they would rather prefer leisure or working more over searching.

To answer the research question, I follow the three steps. First, using a cross-sectional variation across products, I look into the cross-sectional inflation-searching relationship. In other words, I check if a product category (e.g. a milk) is being searched more when inflation of the milk is high. Second, I explain the cross-sectional evidence by the dispersion channel. By checking if the price dispersion of the category (a milk) is high or not when it is searching more or less, I interpret the result and provide a mechanism. Here the reason why I focus on the cross-sectional relationship instead of the aggregate is because it is hard to identify a causality by a time-series analysis. By exploiting the cross-sectional variation and using IVs, causal estimates can be identified. In addition, by focusing on product-level variations, the real wage channel can be ruled out. The dispersion channel will be the only one operating when controlling fixed effects. This makes us be clear how the dispersion channel explains inflation-searching relationships. Third, I build a general equilibrium model with consumer searching component to answer the original research question. This model is disciplined by the above two micro facts. Through lens of the model, I will be able to answer the relationship between aggregate inflation and searching behaviors.

The summary of results so far is as following. First, a correlation implies as the absolute inflation rate of a category increases, it is searched less. Second, a correlation implies as the absolute inflation rate increases, the price dispersion of that category increases. The results are counter-intuitive and not explained by the dispersion. We expect when a category inflation is high (dispersion as well), it should be searched more. However, it is being searched less when the inflation is positive and high. This should be investigated further since this is not a causal relationship. On the other hand, when inflation rate is negative, a category is being searched less even if it has high dispersion. This implies when inflation rate is negative, inflation itself plays more important role than the dispersion. Third, as a preliminary step, I investigate what is the prediction of a simple consumer searching model. I show that consumers search less as aggregate inflation increases, and search more as aggregate dispersion increases. I will connect the data to model as a next step.

This paper is important because this provides the insight into the relationship between inflation and markup. If consumers search less under high inflation, it implies that firms can set higher prices. If so, an increase in inflation will lead to an upward inflation-markup spirals: high inflation results in higher individual prices/markups. Regarding this potential amplification channel, there could be also policy implications. If the problem is less searching, the government could search instead of consumers. The government may want to compare prices and give information to consumers to prevent the vicious cycle. Even if consumers search more under high inflation, there could be an implication to pass-through of cost-push shock. The searching channel will dampen the shock as consumers' searching efforts make firms set lower markup.

The most relevant paper is Sara-Zaror (2021). Sara-Zaror (2021) finds an upsilon shape cross-sectional relationship between inflation and dispersion across product categories, and explains it by adding endogenous searching components in the model. The model predicts that under higher inflation, we should expect more searching from consumers. However, the higher inflation here is inflation of a product, rather than aggregate inflation. Therefore the paper does not answer my research question directly. I not only consider effects of the higher aggregate inflation, but provide the direct evidence on inflation and searching efforts.

The remainder of the paper proceeds as follows: Section 2 presents the empirical results, and section 3 shows the theory. Section 4 summarizes future works to be done.

2 Empirics

In this section, I describe how to construct measures I need. Then I show preliminary results, with future research design plan.

2.1 Data Description

I use both Nielsen scanner data and household panel from 2006 to 2020. **Details will be written.**

2.2 Variable Construction

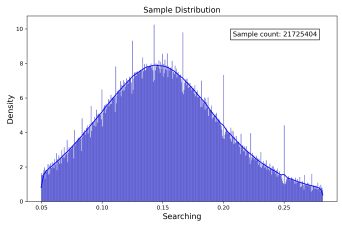
The analysis requires inflation, dispersion, and searching effort for each category $\times$ county $\times$ year. For the inflation and dispersion construction, I follow Sara-Zaror (2021) using the Nielsen scanner data. **Details will be written.** After that, I construct a novel measure for the category-level searching efforts using the Nielsen household panel. Literature such as Nord (2023) and Argente and Lee (2020) has measured household-level searching efforts so far, not the product category-level, by number of trips per purchases. For the category-level measure, I aggregate the household-level measure by expenditure weight of each household for each category. The intuition is as follows. If person A's searching effort is 1 and person B's effort is 0, and 80% of revenue of a milk is coming from person A, then searching measure for the milk is 0.8. It is a

weighted average across household-searching by expenditure weight. **Details and equations will be written.**

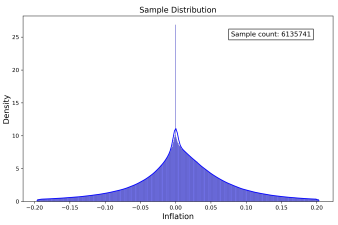
2.3 Results

Figure 1 shows the distribution of samples constructed in the previous section (category × county × year). Note that category-level inflation is dispersed from −20% to 20%.

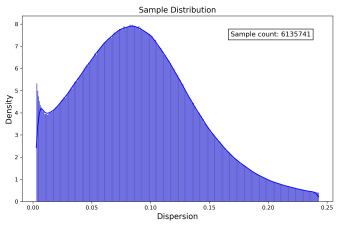
Figure 1: Sample distribution



1. Searching efforts



2. Inflation



3. Price dispersion

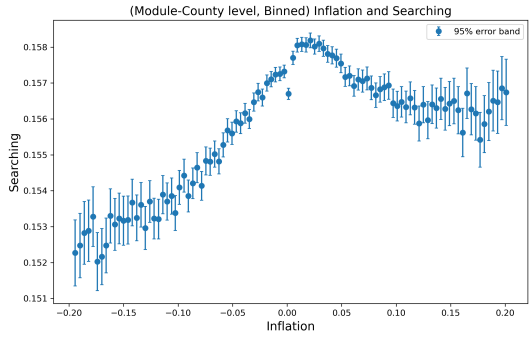
Following Sara-Zaror (2021), the objective is estimating the following regression of searching and dispersion on inflation:

$$S_{cm,t} = \sum_{n=1}^{100} \beta_n \mathbb{1}_{\{\pi_{cm,t} \in B_n\}} + a_{c,t} + b_{m,t} + \epsilon_{cm,t} \tag{1}$$

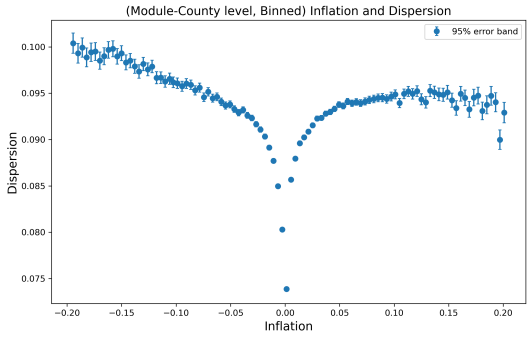
$$\sigma_{cm,t} = \sum_{n=1}^{100} \gamma_n \mathbb{1}_{\{\pi_{cm,t} \in B_n\}} + a_{c,t} + b_{m,t} + \epsilon_{cm,t} \tag{2}$$

Here $\{\beta_n\}_{n=1}^{100}$ and $\{\gamma_n\}_{n=1}^{100}$ are coefficients of interest. These coefficients represent each dot in the following binned scatterplots:

Figure 2: Binned scatterplots



1. Searching efforts



2. Price dispersion

The left panel shows that when a category is going through high deflation, consumers search less for that category. This makes since if things are cheaper than before, regardless of how prices are dispersed, consumers would not bother searching for cheaper prices. However, consumers also search less when inflation is high. This result is counter-intuitive since the price dispersion is also high when inflation is high (from the right panel). This result should be investigated further in the following section.

2.4 Research Design

The structural equation of interest is:

$$S_{cm,t} = \beta \pi_{cm,t} + X_{cm,t} + a_{c,t} + b_{m,t} + \epsilon_{cm,t} \tag{3}$$

where $X_{cm,t}$ is a set of controls, and $a_{c,t}, b_{m,t}$ are fixed effects. β is coefficient of interest. To estimate a causal relationship, an instrument is need for $\pi_{cm,t}$. I follow a similar approach with DellaVigna and Gentzkow (2019) and Stroebel and Vavra (2019). There are two potentially plausible IV strategies, and **details will be written.**

3 Theory

In this section, I provide a model prediction about effects on aggregate inflation on aggregate searching efforts. The model is not connected to the empirics yet, it will be studied further.

3.1 Model

The model is a simplified partial equilibrium version of the model in Sara-Zaror (2021). There is a continuum of consumers, who take the posted price distribution F of a homogeneous good as given. Each consumer j searches sequentially, which means that they can choose how many times to draw (S_j) the price and when to stop. Whenever they draw a new price, they have to pay a labor cost γ_j, which is heterogeneous across consumers. The distribution of searching cost is given as G.

The consumer j's problem is:

$$\max_{S_j, c_j, L_j} \frac{c_j^{1-\sigma} - 1}{1-\sigma} - L_j \tag{4}$$

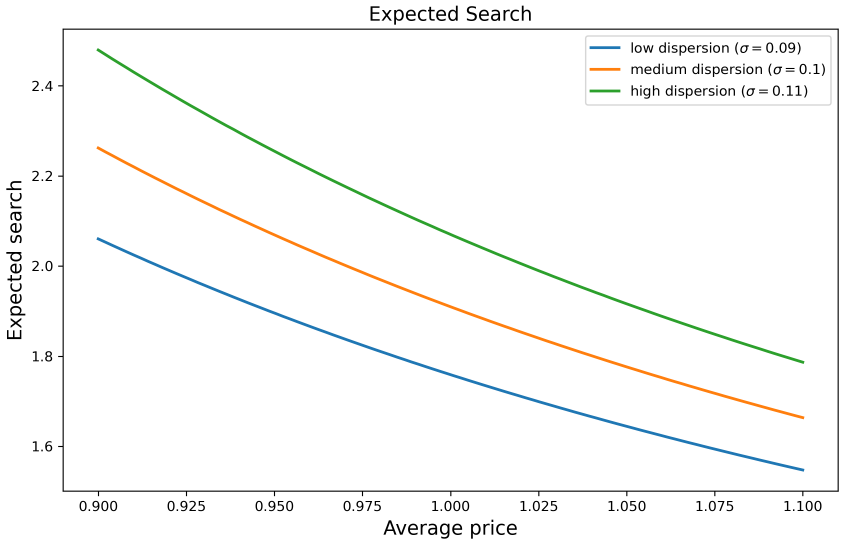
$$\text{s.t. } P_i(S_j) c_j + W \gamma_j (S_j - 1) = W L_j \tag{5}$$

where W is the wage given exogenously. Note that the price P_j is a function of searching efforts S_j. The first draw of the price is free. I solve the model by computing the optimal stopping rule and reservation price, following Sara-Zaror (2021). **Details and equations will be written.**

3.2 Results

Figure 3 shows the result from the model. The figure implies that for given price dispersion (standard error of F), aggregate searching efforts decrease as the average price level increases. In addition, for given average price level, aggregate searching increases as the dispersion increases. This is quite intuitive since the dispersion represents return to search. If we fix the average price level, we should expect more searching with higher dispersion.

Figure 3: Sample distribution



4 Future Works

The following is the list of future works:

- Be clear again if Sara-Zaror (2021) does not answer the research question. The paper was updated last month.
- Rationalize the category-level searching measure.
- Interpret the results from the binned scatterplots.
- Identify causal effects.
- Understand the simple model's mechanism and complicate.

References

Argente, David and Munseob Lee, "Cost of Living Inequality During the Great Recession," *Journal of the European Economic Association*, 06 2020, *19* (2), 913–952.

DellaVigna, Stefano and Matthew Gentzkow, "Uniform Pricing in U.S. Retail Chains*," *The Quarterly Journal of Economics*, 06 2019, *134* (4), 2011–2084.

Nord, Lukas, "Shopping, Demand Composition, and Equilibrium Prices," *Working Paper*, 2023.

Sara-Zaror, Francisca, "Expected Inflation and Welfare: The Role of Consumer Search," *Working Paper*, 2021.

Stroebel, Johannes and Joseph Vavra, "House Prices, Local Demand, and Retail Prices," *Journal of Political Economy*, 2019, *127* (3), 1391–1436.