Does Consumer Search Matter in Retail Trade?

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Abstract: This study investigates the relationship between consumer search costs, inflation, and firm markups in retail trade by employing actual measures of consumer search cost gathered by way of an online consumer survey. Consistent with theory, results indicate that markups can be higher if consumer search costs are higher. Results from panel data also show that increases in inflation lead to increases in markups if consumer search costs are sufficiently high. This study's focus on retail trade allows for an evaluation of two competing hypotheses on the link between inflation and markups. One side of the argument is that consumer search costs are the link whereas the other side points to long-term relationships between sellers and buyers. Long-term seller/buyer relationships are rare in retail trade, thus the finding that consumer search costs do matter in retail trade implies that long-term seller/buyer relationship are not needed to link changes in inflation to changes in firm markups. Given this study's results, it is hard to justify studying how inflation impacts firm markups (and thus social welfare) without considering consumer search costs.

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I. Introduction

Consumer search has played an important role in the development of price theory. Whether a consumer chooses to search or not for a lower price on a product has significant implications for the flexibility of prices, price dispersion, firm marketing strategies, market power, firm markups, social welfare and more. While economic theory that employs consumer search to explain pricing patterns is relatively abundant and well developed, empirical work has been constrained by the availability of direct measures of the cost of consumer search.

This study employs an online consumer survey to gather direct measures of consumer search cost in order to investigate the impact of search costs on market performance in retail trade. While some limited search cost data has been identified for the manufacturing sector, no actual values of search cost have been forthcoming for retail trade. This study appears to be the first effort to quantify and analyze actual consumer search costs.

Retail trade is one of the best sectors of the economy to study the economic effects of search costs for several reasons. First, extensive market performance and individual industry data is publicly available for the retail sector (as is data for the mining, utilities, construction, manufacturing, and wholesale trade sectors). These 6 NAICS (North American Industrial Classification System[1]) economic sectors have a higher proportion of sales accounted for by publicly-held companies than the remaining 14 sectors.

Second, of the 6 sectors for which sufficient market performance data is available for analysis, there is less buyer heterogeneity to control for in "business-to-consumer" retail trade than the other 5 sectors that are primarily engaged in "business-to-business" sales. Fewer differences between individuals that participate in a sector market allow for a cleaner focus on

[1] Details on the North American Industrial Classification System are available at http://www.census.gov/epcd/www/naics.html.

the search cost variable of interest. Business buyers can differ widely in purchasing methods and bargaining power. For example, original equipment manufacturers (OEMs) are resellers that typically buy large quantities of the same good repeatedly whereas commercial and industrial (C&I) firms typically buy small quantities of goods as needed. OEMs are very price sensitive while C&I firms are less so, and seller markups vary accordingly. These differences in business-to-business sales can obviously complicate any examination of pricing strategies and a focus on retail trade allows us to in turn focus on consumer search costs.

Third, the purchase transaction itself in retail trade is relatively homogenous compared to almost every other sector of the economy. The typical retail transaction is short lived (there are few long-term contracts that are often found in business-to-business sales), the retail business-to-consumer relationship is typically passive and distant (unlike the active and close relationships between buyer and seller that often characterize business-to-business sales), and retail consumers search for prices on single units of discernable products (rather than bills of materials that vary widely in products and quantities).

Consumer search costs likely matter in every sector of the economy. However, they are most easily examined in retail trade because there are fewer factors besides search cost that matter for pricing.

Most of the literature that studies consumer search costs seeks to explain price dispersion. Price dispersion can occur if consumers incur a search cost to gather more information about price. Higher search costs lead to higher price dispersion which means more consumers are paying prices above the competitive outcome. The implication is that higher consumer search costs should lead to higher firm markups. The resulting reduction in output has negative

consequences for social welfare. This paper will study the direct affects of consumer search costs on firm markups rather than taking the indirect route through price dispersion.

A large literature studies how changes in nominal macroeconomic variables such as inflation can have real effects. One important stream of this literature studies whether inflation has an impact on firm markups. There appear to be two competing hypotheses about how inflation influences firm markups.

The first hypothesis is that inflation is linked to firm markups through buyer search costs. In a market characterized by monopolistic competition, Benabou (1988, 1992a) introduces the idea that the larger and more frequent price adjustments of (S,s) pricing during inflation offers consumers a scope for search. In equilibrium, consumer search is optimal given the price dispersion that results from the staggering of (S,s) pricing rules. Welfare effects depend upon the size of consumer search costs. Low search costs allow consumers to take advantage of price differences that lead to increased competition and positive welfare effects. High search costs imply even greater equilibrium prices and more price dispersion. The wasteful search costs and higher prices have negative implications for social welfare.

Benabou and Gertner (1993) find that the effect of inflationary uncertainty on market efficiency depends critically on the magnitude of buyer search cost. Low search costs make it possible that the benefits from an increase in inflation uncertainty outweigh the costs. Increased price competition may result in a benefit that is higher than the buyer's search cost. High search costs lead to the opposite result. An increase in inflationary noise allows sellers to charge higher real prices as they take advantage of the consumers' reduced information. Thus, high buyer search costs imply higher firm profit margins and decreased efficiency.

The second hypothesis is that long-term buyer-seller relationships connect inflation to firm markups. In a theoretical model that features long-term relationships between firms and consumers, Ball and Romer (2003) conclude that inflation decreases the informativeness of current prices concerning future prices. Less informed consumers may then make mistakes in choosing the correct firm with which to do business, and this would, in turn, permit firms to increase markups. Tommasi (1994) finds many of the same results, including the direct relationship between inflation and markups, in a model that also incorporates repeat purchases, but Tommasi differs from Ball and Romer in that he considers the impact of inflation on consumer search across firms.

The fact that few long-term contracts exist in retail trade affords the opportunity to test the veracity of two competing hypotheses about how inflation influences firm markups. Benabou (1988, 1992a), Benabou and Gertner (1993), Diamond (1993), and Fishman (1992) point to buyer search costs. Ball and Romer (2003) emphasize seller-buyer relationships. Ball and Romer (2003, p. 189) state that: "…, by suppressing search and other features of Tommasi's model, we capture the basic effects of inflation more simply." If seller-buyer relationships are indeed the basic route by which inflation affects markups, then there should be little if any evidence of inflation affecting markups in retail trade at all. While the Ball and Romer model is intuitively appealing, empirical verification of the model would be difficult if not impossible because of the difficulty of measuring long-term relationships between sellers and buyers. This study cannot reject the Ball and Romer model, but it can gauge the importance of search costs.

While there have been a number of empirical studies of the affects of consumer search in retail trade, none use an actual measure of search cost. Previous papers have either studied retail

trade in aggregate, specific retail industries where search cost can be indirectly characterized in some way, and related consumer products in finance, insurance, and real estate.

Benabou (1992b) studies inflation and markups in the aggregate U.S. retail trade sector, a sector in which he asserts low search costs play an important role in the empirically estimated relationship between inflation and markups. Using annual data from 1947 to 1985, Benabou finds expected and unexpected inflation to have a small but statistically significant negative impact on retail markups. Gwin, Taylor, and Gold (2004) challenge the findings of Benabou (1992b). They contend that the finding of a negative response of retail markups to inflation in aggregated retail trade data is erroneous because of composition bias. Based on panel data for a number of retail firms, their analysis shows that inflation and markups are actually positively related. The source of the composition bias appears to be that the share of low profit margin subsectors increases with inflation. The change in the composition of the retail sector accounts for Benabou's observation in aggregate retail trade data. A definitive understanding of how inflation affects markups in retail trade requires some measure of consumer search cost. That is the aim of this study.

Borenstein (1991) examines prices for leaded and unleaded gasoline. As leaded gasoline was phased out over a period of time, fewer and fewer gasoline stations carried it. Thus, a consumer with an automobile requiring leaded gasoline faced increasingly higher costs of search for a station that still pumped that type of gas. Borenstein documents evidence of price discrimination against consumer of leaded gasoline mainly due to their higher search costs. Benjamin and Lusht (1993) find that proxies for consumer search costs are positively related to apartment rents. Knittel (1997) finds that an increase in the number of competitors providing long distance services failed to reduce rates because of high consumer search and switching

costs. Adams (1997) studies convenience stores and finds low price dispersion for the out-of-store gasoline sales that has low consumer search costs while finding high price dispersion for in-store items that are associated with relatively higher consumer search costs. Sorensen (2000) studies pharmacies and finds that higher purchase frequency as a proxy for higher expected benefit of search leads to lower price dispersion and markups. Lynch and Ariely (2000) study wine stores. For wines common to two stores, they find that consumer price sensitivity increases if the two stores make it easier for consumer to compare prices. Lowering a consumer's search cost leads to the consumer caring more about price which in turn leads to more competition between the two stores. Johnson (2002) examines differences in the pricing of gasoline and diesel fuel. Johnson presumes that the diesel fuel market is characterized by lower search costs because truck drivers buy a great deal more fuel and have a much greater opportunity to make price comparisons. Johnson finds that prices respond to changes in costs much faster in the diesel market. Johnson also finds that asymmetric price adjustment (price goes up faster than it comes down) is more evident in gasoline markets where search costs are presumed to be higher. Brown and Goolsbee (2002) study the life insurance industry and find that the Internet likely reduced consumer search costs which in turn led to a reduction in prices. Yoskowitz (2002) shows that price dispersion and discrimination is spot markets for water is tied to search costs. Aalto-Setala (2003) studies grocery products and finds that search costs affect price dispersion.

Each of these studies of small slices of retail trade is based on suppositions about or proxies for consumer search costs in that small slice. None have direct measures of search costs nor do they present results that can be generalized to the general economy with suitable

prescriptions for policy. This study presents a more general result with specific policy implications.

There appears to be only one previous paper that examines the impact of inflation on markups with actual search cost data, but that paper addresses the manufacturing sector. In a study of 57 manufacturing industries, Gwin and Taylor (2004) use firm-level data to show that margins may be increasing in the presence of inflation, if search costs are sufficiently high. They interpret their results as support for the predictions of Ball and Romer (2003) and Tommasi (1994), but do not directly address whether the link between inflation and margins is consumer search costs and/or seller-buyer relationships. To do so with manufacturing industries would be extremely difficult, if not impossible, in practice because of the need to quantify inherently qualitative seller-buyer relationships. This study's emphasis on retail trade allows a focus on search costs without the need to control for long-term relationships. If consumer search costs matter in retail trade, then it may be that search costs provide a better explanation of how inflation affects firm markups than do seller-buyer relationships.

Section II details the data and empirical methodology employed in this study. Section III presents results and Section IV concludes.

II. Data and Empirical Methodology

A. The Data

Data was collected at the 4-digit NAICS subsector level. A complete list of these 27 subsectors is in Table 2. Search cost data was obtained for 20 subsectors that have products clearly discernable to consumers using a consumer survey. The 4-digit NAICS product definitions were chosen due to concerns about survey length and potential survey participant

confusion about product definitions. Additionally, retail trade data available from the U.S. Census Bureau is generally limited to the 4-digit NAICS subsector level.

Dependent Variable

The dependent variable is an annual series of gross margin rates for the aforementioned 27 subsectors of retail trade. Data from 1950 to present is drawn from Standard & Poor's *Compustat*[2] database to calculate these gross margin rates. Gross margin rate for each retail subsector is calculated by dividing *Compustat*'s "total operating revenue" less "cost of goods sold" by "total operating revenue." Table 2 includes a summary of the calculated gross margin rates at the 4-digit NAICS subsector level. Table 2 also includes gross margin rates from the U.S. Census Bureau Annual Retail Trade Data, Table 7: Estimated Gross Margin as a Percentage of Sales by Kinds of Business: 1993 Through 2002.[3] The U.S. Census data varies as to whether it is aggregated to the 3- or 4-digit level. As is clear from Table 2, the calculated gross margin rates from *Compustat* are very much in line with the estimates from the U.S. Census Bureau.

Independent Variables

Following Benabou (1992b) and Gwin and Taylor (2004), independent variables include inflation (and alternatively expected inflation, unexpected inflation, and the standard error of unexpected inflation), the percentage change in real GDP[4] as a proxy for the business cycle, and a time trend. Control variables also include CR4[5] as a measure of seller concentration. CR4 is only available every 5 years from 1977 to 1997. In the panel regressions that follow, CR4 is interpolated in the intervening years. Inflation is calculated as the percentage change in the

[2] Additional information about S&P *Compustat* is available at http://www.compustat.com/www/.
[3] U.S. Census Bureau Annual Retail Trade Data is available at http://www.census.gov/svsd/www/artstbl.html.
[4] Gross domestic product data is available from the Bureau of Economic Analysis at http://www.bea.gov/.
[5] Concentration ratios for retail trade are available from the U.S. Census Bureau Establishment and Firm Size reports for the 1977, 1982, 1987, 1992, and 1997 Economic Census Subject Series. Details can be found at http://www.census.gov/econ/census02/.

consumer price index (CPI)[6]. Subsector-specific inflation is also calculated from each subsector consumer price index. Both measures of inflation are used in separate specifications below. The calculation of expected inflation follows Pilotte (2003) and is given by $E[\pi_t] = a + b_r r + b_{\pi_{t-1}} \pi_{t-1} + b_{\pi_{t-2}} \pi_{t-2}$ where r is the contemporaneous 3-Month Treasury Bill: Secondary Market Rate.[7]

A direct measure of consumer search cost was gathered with a consumer survey. The survey was administered online by e-Rewards Inc. (ERI).[8] ERI is a member of the Council of American Survey Research Organizations (CASRO)[9] and is used by top consulting and research firms as well as Fortune 500 companies. ERI maintains an online panel of consumers that allows it to accurately screen and solicit participation in a survey. To ensure reasonable response rates, ERI offers consumers rewards in the form of points that can be redeemed for travel (airline, hotel) or other products and services. The panel is comprised of more than 800,000 members representing a cross-section of the U.S.

6,686 respondents received an e-mail from ERI to complete the survey online. Within twenty-nine hours, 1,302 had clicked on the e-mail and 1,173 completed the survey for a response rate of 17.5%. The survey was terminated at that point because the number of surveys completed was more than four times the contracted amount. Of the completed surveys, 102 were eliminated due to incomplete answers or using the same response for the majority of the categories. The specific breakdown and reasons for elimination were: 89 surveys due to the absence of the actual time for multiple categories; 5 for entering exactly the same search time for

[6] CPI data is available at http://www.bls.gov/cpi/home.htm.
[7] Interest rate data is available from the FRED II database of the Federal Reserve Bank of St. Louis website at http://research.stlouisfed.org/fred2/.
[8] See http://www.e-rewards.com for more information on ERI.
[9] See http://www.casro.org/ for more information on CASRO.

the majority of the categories; and 8 because they entered 0 hours or never purchased for every category. As a result, 1,071 responses were used in the final analysis.

The sample was balanced as closely as possible to the 2000 U.S. Census demographics on geography, gender, age, household income, and ethnicity. Table 1 shows the sample composition as compared to 2000 U.S. Census.

For each of the products listed in Table 2, the first question of the survey asked:

> *For each of the products below, please think about the last time you bought this product. How much time did you spend researching the product and comparing brands and prices before you made a purchase?*
>
> *Please select the approximate number of hours and/or minutes from the drop-down menu beside each product below.*

Search cost was calculated as the reported search time multiplied by the survey participant's income (as a proxy for the opportunity cost of search). A mean and median search time and search cost was calculated from the 1,071 valid responses for the products indicated in Table 2. Means and medians are highly correlated across the products, thus only means are reported in Table 2.

B. Empirical Methodology

For the annual series on gross margin rates, the empirical model

$$MARGIN_{i,t} = \alpha + \pi_{i,t}\beta_{\pi} + y_t\beta_y + CR4_{i,t}\beta_{CR4} + t\beta_t + s_i\beta_s + (\pi_{i,t} \times s_i)\beta_{\pi,s} + \mu_{i,t}, \quad (1)$$

is estimated where $MARGIN_{i,t}$ is the gross margin rate for the *i*th selling subsector at time *t*; $\pi_{i,t}$ is either the aggregate inflation at time *t* or the subsector-specific inflation measure for subsector *i* at time *t*; y_t is the growth rate of real US GDP between time *t -1* and *t*; s_i is the subsector-specific, time-invariant measure of consumer search cost; and $\mu_{i,t}$ is the error term that varies across subsector and time.

Panel estimation techniques are needed since a cross-section of subsectors through time is studied. Recognizing the potential that $\text{cov}(\mu_{i,t}, \mu_{i,k}) \neq 0$ for $t \neq k$, and hoping to take advantage of the unobserved heterogeneity across industries, (1) is rewritten using an error-component, $\mu_{i,t} = \nu_i + \varepsilon_{i,t}$, where the error term in (1) can be separated into an industry-specific error term (ν_i) and an error term that varies by industry and time $(\varepsilon_{i,t})$. Thus, (1) becomes

$$MARGIN_{i,t} = \alpha + \pi_{i,t}\beta_\pi + y_t\beta_y + CR4_{i,t}\beta_{CR4} + t\beta_t + s_i\beta_s + (\pi_{i,t} \times s_i)\beta_{\pi,s} + \nu_i + \varepsilon_{i,t}. \qquad (2)$$

Both fixed-effects and random-effects estimators of the parameters are used in the analysis to follow. Note, however, that the presence of the time-invariant search cost parameter, s_i, in an OLS framework acts as a fixed effect that potentially captures the unobserved heterogeneity across selling industries. All three error term specifications are reported in the results section below.

The full effect of inflation on retail trade gross margin rates in (2) is now captured by

$$\partial MARGIN_{i,t} / \partial \pi_{i,t} = \beta_\pi + \beta_{\pi,s} s_i. \qquad (3)$$

Thus, the impact of inflation on gross margin rates will vary with search costs and depending on the estimated magnitudes of β_π and $\beta_{\pi,s}$, this effect may be either positive or negative.

III. Results

Table 3 presents the empirical results. Results based on annual or quarterly data are quantitatively similar, thus only the annual results are presented for brevity. Likewise, results using aggregate retail trade inflation or subsector specific inflation are similar and only the aggregate results are reported. Results are also robust as to whether gross margin rates from S&P *Compustat* or the U.S. Census Bureau are used as the dependent variable.

Mean search time, median search time, mean search cost, and median search cost are all highly correlated and the choice of which measure to use as consumer search cost makes virtually no difference in the regression results. Thus, results are reported with mean search cost.

The first hypothesis from the previous literature is that higher markups and price dispersion are associated with higher consumer search costs. Column (1) of Table 3 reports the results of a pooled OLS regression on the panel data. Inconsistent with the first hypothesis is the negative but small and insignificant coefficient on mean search cost. This inconsistency may be explained by the fact that the findings of the previous literature were all based on nondurable products. There are 3 major outliers in the 19 subsectors analyzed in column (1). These subsectors are 4411 Automobile Dealers, 4412 Other Motor Vehicle Dealers, and 4431 Electronics and Appliances Stores. These subsectors are characterized by high-ticket durable products with very low gross margin rates and very high consumer search costs. Column (2) of Table 3 reports a second pooled OLS regression that excludes these outliers. For the 16 remaining subsectors characterized by low-ticket durable/nondurable products, the positive and significant coefficient on mean search cost supports the hypotheses that retail gross margin rates may be higher in subsectors where consumers have high search costs.

The second hypothesis from Benabou (1988, 1992a), Benabou and Gertner (1993), Diamond (1993), and Fishman (1992) is that increases in gross margins rates associated with increases in inflation are higher if consumer search costs are higher. Column (3) of Table 3 reports the results of a fixed-effects model that tests this hypothesis. The one-time measure of the search cost parameter precludes the inclusion of that variable in a fixed-effects model. Consistent with the predictions of the search cost literature, the coefficient on the inflation/search cost interaction variable is positive and significant.

Column (4) of Table 3 is a fixed-effects model after real GDP growth rate and interpolated CR4 are dropped. The coefficient on real GDP growth rate is always small and insignificant in any panel specification. Additionally, the real GDP growth rate is negatively and significantly correlated with CPI inflation leading to a potential multicollinearity problem. Interpolated CR4 is small and insignificant in the fixed-effects models. The coefficient on inflation is negative and significant. If consumer search costs are at or near zero, gross margin rates actually decline with increases in inflation. This result is consistent with the empirical findings of Benabou (1992b) which presumes search costs are low in retail trade. The coefficient on the inflation/search cost variable is positive and significant and essentially unchanged from column (3). The full effect of inflation on retail gross margin rates is given by $\partial MARGIN_t / \partial \pi_t = -0.287 + 0.005 s_i$. The critical level of search cost that separates a negative response of gross margin rates to inflation from a positive response appears to be about \$60 given the results of column (4). The results of column (3) would indicate a critical level of about \$200. A level of search cost between \$60 and \$200 appears to separate durable goods from nondurable goods in Table 2. Gross margin rates decline in response to inflation for nondurable goods where consumer search costs are generally less than \$60 and increase in response to inflation for durable goods where consumer search costs are generally more than \$200. Consumer information stock on durable goods is likely to be low because they typically purchase these types of products relatively infrequently. Durable goods firms seem to be able to take advantage of the depleted consumer information stock and increase their markups when inflation increases. Consumers may actually benefit from reductions in markups for nondurable goods during inflationary periods because their information stock is relatively high for these typically frequently purchased goods.

Column (5) of Table 3 is a random effects model of the same specification as column (3) except that the time-invariant mean search cost variable can be included in this specification. The main variables of interest are basically unchanged from column (3). Inconsistent with the first hypothesis, the sign on mean search cost is negative and significant as it was in column (1). Once again, outliers likely drive this result. If the same outliers are excluded as in column (2), then the sign on mean search cost is positive and significant as reflected in column (6) of Table 3.

The only remaining task is to examine the affects of expected inflation, unexpected inflation, and the standard error of unexpected inflation as did Benabou (1992b). The fixed-effects model of column (7) of Table 3 reports negative coefficients on expected and unexpected inflation (consistent with the findings for actual inflation). This finding replicates the results of Benabou (1992b). However, the interaction of expected inflation and search cost is positive and significant in the same manner as actual inflation which means that gross margin rates only decrease in response to inflation if search costs are low, a finding absent in the empirical results of Benabou (1992b) but entirely consistent with the theoretical predictions of Benabou (1988, 1992a). A very interesting finding in column (7) is that higher inflationary uncertainty can lead to higher gross margin rates. Benabou (1992b) also finds a positive coefficient, but his insignificant coefficient provided only weak support for the theories put forth in Benabou and Gertner (1993). While this study's results may on one hand provide more substantial support for Benabou and Gertner's hypothesis that markups can increase with increases in inflationary uncertainty in the presence of consumer search costs, there is the other hand that the results also show that the impact of inflationary uncertainty on markups actually declines with increases in search costs, a finding at odds with Benabou and Gertner. One possible explanation of this contradictory finding is that inflationary uncertainty erodes

consumer confidence and consumers delay purchases of durable goods until the uncertainty settles down. While higher expected inflation may prompt a consumer to purchase a durable good before prices increase, inflationary uncertainty prompts consumer indecision. There are likely a number of other possible explanations and future theoretical research may wish to address them.

The results of Table 3 provide substantial support to the theoretical literature that links inflation and firm markups by way of consumer search costs. Results confirm the hypothesis from Benabou (1988, 1992a), Benabou and Gertner (1993), Diamond (1993), and Fishman (1992) that increases in gross margins rates associated with increases in inflation are higher if consumer search costs are higher. This result is established in retail trade, a sector of the economy in which long-term relationships between sellers and buyers are relatively unimportant. While these results do not disprove by any means the intuitively appealing idea from Ball and Romer (2003) that long-term seller/buyer relationships are a factor in the inflation/markup relationship, they do show that consumer search costs cannot be ignored.

IV. Conclusions

This study investigates the relationship between consumer search costs, inflation, and firm markups in retail trade by employing actual measures of consumer search cost. Consistent with theory, results indicate that markups can be higher if consumer search costs are higher. Perhaps more importantly, results also show that increases in inflation lead to increases in markups if consumer search costs are sufficiently high as predicted by Benabou (1988, 1992a), Benabou and Gertner (1993), Diamond (1993), and Fishman (1992).

This study's focus on retail trade allows for an indirect evaluation of two competing hypotheses on the link between inflation and markups. One side of the argument from the

aforementioned works is that consumer search costs are the link whereas the other side represented by Ball and Romer (2003) points to long-term relationships between sellers and buyers. Long-term seller/buyer relationships are rare in retail trade, thus the finding that consumer search costs do matter in retail trade implies that long-term seller/buyer relationship are not needed to link changes in inflation to changes in firm markups. Given this study's results, it is hard to justify studying how inflation impacts firm markups (and thus social welfare) without considering consumer search costs.

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Table 1: Sample Composition Versus 2000 U.S. Census Data		
Demographic	**Sample**	**U.S. Census**
Gender	%	%
Male	44	49
Female	56	51
Age*		
18-25/15-24	7.4	17.7
26-34/25-34	24.0	18.1
35-44	23.0	20.5
45-54	22.5	16.9
55-64	15.7	11.0
65+	7.4	15.8
Income		
Less than $25,000	10.7	28.6
$25,000-49,999	26.1	29.3
$50,000-74,999	22.5	19.5
$75,000-99,999	19.9	10.2
$100,000-149,999	13.4	7.7
$150,000-$199,999	3.8	2.2
$200,000 or more	3.6	2.4
Race		
African American	10.1	12.6
Asian American	5.6	3.7
Caucasian	80.6	76.9
Native American	0.8	1.0
Other	2.8	5.6
Hispanic or Latino	8.3	12.5
*Age breaks for our sample/U.S. Census.		

Table 2: Summary of 3- and 4-Digit NAICS Subsectors, 2002 Margins, Mean Search Time, and Mean Search Cost					
NAICS Code	**Subsector Description**	**Margin S&P Compustat (2002)**	**Margin Census Bureau[1] (2002)**	**Mean Search Time (Minutes)**	**Mean Search Cost (Dollars)**
441	Motor Vehicle and Parts Dealers		20.4		
4411	Automobile Dealers	15.36244	18.3	1623.02	935.981
4412	Other Motor Vehicle Dealers	24.58205	--[3]	784.0597	529.532
4413	Automotive Parts, Accessories, and Tire Stores	45.05482	38.5	182.5905	101.3485
442	Furniture and Home Furnishings Stores		43.9		
4421	Furniture Stores	43.89109	--[3]	598.3871	365.0157
4422	Home Furnishings Stores	43.22109	--[3]	486.8792	320.4003
443	Electronics and Appliance Stores		27.8		
4431	Electronics and Appliance Stores	26.2271	--[3]	421.3893	266.3497
444	Building Material, Garden Equipment, and Supplies Dealers		29.5		
4441	Building Material and Supplies Dealers	33.42043	29.9	237.5626	148.0697
4442	Lawn and Garden Equipment and Supplies Stores	30.06279	--[3]	192.646	114.8507
445	Food and Beverage Stores		28.5		
4451	Grocery Stores	25.40696	28.2	74.95472	46.4887
4452	Specialty Food Stores	--[2]	--[3]	53.84113	33.16554
4453	Beer, Wine, and Liquor Stores	--[2]	25.7	36.73543	24.38306
446	Health and Personal Care Stores		29.8		
4461	Health and Personal Care Stores	20.63384	25.6	57.31549	35.11193
447	Gasoline Stations		19.3		
4471	Gasoline Stations	20.85664	--[3]	25.51406	17.12203
448	Clothing and Accessory Stores		43.2		
4481	Clothing Stores	36.27551	42.4	135.9682	83.48988
4482	Shoe Stores	33.0574	42.6	93.73917	56.87598
4483	Jewelry, Luggage, and Leather Goods Stores	43.72949	--[3]	144.4263	90.91732
451	Sporting Goods, Hobby, Book, and Music Stores		39.8		
4511	Sporting Goods, Hobby, and Musical Instrument Stores	33.4627	--[3]	162.9029	94.29456
4512	Book, Periodical, and Music Stores	30.07624	--[3]	83.68744	50.91194

452	General Merchandise Stores		24.7		
4521	Department Stores	34.91619	29.2	--[4]	--[4]
4529	Other General Merchandise Stores	23.70237	20.2	--[4]	--[4]
453	Miscellaneous Store Retailers		42.3		
4531	Florists	41.01648	--[3]	47.5917	27.81546
4532	Office Supplies, Stationery, and Gift Stores	29.47468	--[3]	82.02673	50.32457
4533	Used Merchandise Stores	--[2]	--[3]	--[4]	--[4]
4539	Other Miscellaneous Store Retailers	33.0137	--[3]	--[4]	--[4]
454	Nonstore Retailers		42.8		
4541	Electronics Shopping and Mail Order	--[2]	40	--[4]	--[4]
4542	Vending Machine Operators	33.70454	--[3]	--[4]	--[4]
4543	Direct Selling Establishments	31.92333	--[3]	--[4]	--[4]

1. Gross margin from U.S. Census Bureau Annual Retail Trade Data at http://www.census.gov/svsd/www/artstbl.html (Table 7: Estimated Gross Margin as a Percentage of Sales by Kinds of Business: 1993 Through 2002)
2. --: Missing data. No companies are listed in S&P Compustat for NAICS subsectors 4452, 4453, 4533, and 4541.
3. --: Missing data. No gross margin was reported by the U.S. Census Bureau.
4. --: Missing data. Search cost measures could not be collected for NAICS subsectors 4521, 4529, 4533, 4539, 4542, or 4543 because these subsectors have no discernable product.

Table 3: Panel Analysis of the Relationship between Retail Gross Margin Rates, Inflation, and Consumer Search Costs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS, Excluding Outliers[1]	Fixed Effects	Fixed Effects	Random Effects	Random Effects, Excluding Outliers[1]	Fixed Effects
Annual CPI Infl (AVG-AVG)	0.011 (0.04)	0.056 (0.25)	-0.998 (5.32)**	-0.287 (2.46)*	-0.819 (4.39)**	-0.318 (1.73)	
Inflation/Search Cost Interaction	0.005 (4.50)**	0.001 (0.82)	0.005 (9.19)**	0.005 (9.28)**	0.005 (9.08)**	0.001 (0.88)	
Expected Inflation							-0.339 (1.62)
Expected Inflation/Search Cost Interaction							0.002 (3.22)**
Unexpected Inflation							-0.770 (2.68)**
Unexpected Inflation/Search Cost Interaction							0.001 (0.79)
Standard Error of Unexpected Inflation							28.320 (3.23)**
Standard Error of Unexpected Inflation/Search Cost Interaction							-0.202 (6.84)**
Mean Search Cost	-0.008 (1.36)	0.062 (9.34)**			-0.015 (2.01)*	0.064 (4.75)**	
Real GDP Growth Rate	0.365 (1.46)	0.053 (0.25)	-0.196 (1.07)		-0.102 (0.55)	-0.141 (0.82)	0.023 (0.12)
Interpolated CR4	0.172 (3.11)**	0.363 (7.72)**	-0.081 (0.69)		-0.024 (0.24)	0.202 (2.38)*	-0.183 (1.70)
Time	0.403 (6.75)**	0.142 (2.77)**	-0.162 (1.62)	0.155 (7.68)**	-0.070 (0.78)	-0.025 (0.31)	-0.025 (0.24)
Constant	11.053 (3.16)**	13.117 (4.08)**	39.117 (10.62)**	23.832 (31.14)**	36.109 (8.93)**	23.179 (6.60)**	44.568 (4.72)**
Observations	362	307	362	762	362	307	362
R-squared	0.31	0.54	0.21	0.17			0.35
Number of 4-Digit NAICS Code			19	19	19	16	19

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

[1]Excluded outliers include high-ticket durable products in subsectors 4411 Automobile Dealers, 4412 Other Motor Vehicle Dealers, and 4431 Electronics and Appliances Stores