Menu Costs, Firm Strategy, and Price Rigidity

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Abstract

After controlling for chain-specific effects, higher menu costs are associated with a slight decrease in the probability of a price change and an increase in the size of a price change. Firm strategy is more influential in determining the incidence and magnitude of a price change.

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We use a unique panel data set from the retail grocery industry to provide evidence on the importance of menu costs in determining the incidence and magnitude of price changes. In general, we find that higher menu costs lower the probability of price changes and increase their magnitude, but the strength of these effects varies with firm strategy. Thus, our results suggest that menu costs affect pricing behavior, but that many other factors are also influential.

Existing theoretical work has established a potentially important role, even for small menu costs, in accentuating business cycle fluctuations.[2] Empirical work has attempted to uncover the contribution that menu costs make to price rigidity, but most of the existing work has not been able to control for firm-specific characteristics.[3]

Our work is most closely related to Levy, Bergen, Dutta, and Venable (1997) who examine the frequency of price changes at supermarket chains that operate in five different states. In their study, one of the chains operates in a state with an item pricing law which require prices to be displayed on individual items and therefore increases the cost of changing prices. Levy, et. al. provides descriptive statistics that show that the chain with higher menu costs changes prices less frequently and conclude that menu costs contribute to nominal rigidities.

We also examine the supermarket industry, but, due to the unique nature of our data set, are able to examine the behavior of competing supermarket chains that operate both in markets

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[2]See for example, Akerlof and Yellen (1985), Mankiw (1985), Parkin (1986) and Caplin and Leahy (1997).

[3]For example, Levy, Bergen, Dutta, and Venable (1997) look at pricing behavior at firms that operate under different regulatory environments but are not able to control for other factors that might affect pricing strategy. Buckle and Carlson (2000) find differences in behavior between small and large firms but also have limited information about other potentially important firm characteristics.

that have an item pricing law and also markets that do not.[4] Thus, our data allows us to better identify the effects of higher menu costs and isolate chain-specific effects that may also affect pricing decisions. This distinction is important because our analysis reveals that the effects of chain specific behavior are large. In what follows, we briefly describe our data, methodology, and report our main results.

Data

Our data consists of weekly observations of the prices of 220 goods at eight different supermarket locations in four markets in Upstate New York for 23 weeks from August through December 1999. In each of the four markets, we observe the prices of each item at two competing stores. In New York, item pricing laws vary by county, and two of the four markets for which we observe prices are subject to an item pricing law. Thus, we have data from four stores in each chain, with two of the stores from each chain facing higher menu costs for each price change. The data was provided by one of the observed chains which collected data on its own prices as well as those of its competitors for marketing purposes.[5] In all, our data consists of

[4]Similar to Levy et. al., we calculate the cost of a price change to be more than twice as high in a store subject to an item pricing law compared to one that is not. Using data provided by one of the stores in our sample, we calculated the variable cost of each price change to be $0.55 in a store not subject to an item-pricing law and $1.18 in a store subject to the pricing law. Details of the calculation are available from the authors upon request.

[5]Competitor price data is routinely collected in the supermarket industry by full-time "shoppers" who enter competitor locations with portable scanners and capture prices for a marketing data base. Because many of the prices in supermarkets are determined at the store level based on local conditions, these prices are collected locally, giving us a rich source of data to study pricing behavior.

over 40,000 observations on weekly price changes in eight different stores in four locations.[6]

Prices change relatively frequently in the grocery industry: 8.7 percent of our observations reflect a price change. Upward prices changes are only slightly more frequent than downward price changes, and although some price changes are less than one percent of the total price, the size of a price change can be substantial–a few of the price changes are greater than 100 percent. A little more than a fourth of our observations are on the prices of less-expensive private label goods.

The two supermarket chains in our sample follow different marketing strategies. One of the chains follows an "every day low price" (EDLP) strategy–a strategy in which the retailer charges relatively constant prices with few temporary discounts. The other chain follows a "Hi-Lo" strategy in which higher prices are charged on most goods but frequent promotions lower prices on specific goods below the EDLP price to increase store traffic.[7] In our sample, the Hi-Lo store was responsible for a little over 95% of all the price changes in these four markets. Thus, in examining the determinants of the incidence and magnitude of price changes, chain-specific effects will be important.

Results

If menu costs are associated with sticky prices, stores in the item-pricing markets would change prices less frequently and the magnitude of the price changes might be larger. In order to ascertain the effect of item pricing laws, we estimate a binary probit model with the incidence of

[6]Even in markets in which there is an item pricing law, certain items are exempt. We do not include these exempt items in our analysis.

[7]See Hoch, Dreze and Purk (1994) for a discussion of these two pricing strategies.

a price change being the dependent variable and the following independent variables: if the store is in a pricing market, the store's overall marketing strategy (i.e., if the store is part of an EDLP chain), an interaction between the pricing dummy and the marketing strategy, a dummy for private label goods, and two market characteristics: median age and median income. We also include a week-specific effect to control for any seasonal patterns in grocery prices.[8]

The results of this estimation, (Column 1, Table 1), indicate that higher menu costs are associated with a lower probability of a price change, but this effect only holds for the store with the EDLP strategy.[9] Furthermore, the marginal effects on the probability of a price change associated with the coefficients in Table 1 indicate that firm strategy is the most important determinant of the probability of a price change. A product in an EDLP store not subject to a pricing law has a probability of a price change 16 percentage points lower than an item in a Hi-Lo store in a non-pricing market. If the EDLP store is in a market subject to the item-pricing law, the probability of a price change is 17 percentage points lower. Therefore, the higher menu costs associated with the item pricing law lowers the probability of a price change by only one percentage point. There is no evidence that higher menu costs affect the probability of a price change in Hi-Lo stores.

The effect of higher menu costs on the magnitude of price changes is examined in the estimations reported in columns two through five of Table 1. Column 2 reports results from estimations examining the absolute value of the percentage change in prices, treating upward and

[8]For example, promotions during holiday weeks may cause more or bigger price changes.

[9]Estimating the probability of a price change in a multinomial logit model, distinguishing between upward, downward, and no price changes, provides qualitatively similar results.

downward price changes symmetrically.[10] These results suggest that price changes are bigger in pricing markets, consistent with the idea that menu costs cause some nominal rigidities. Again, however, the marketing strategy of the supermarket chain plays a more influential role, with the EDLP grocer making smaller price changes in both pricing and non-pricing markets: The marginal effects associated with the coefficients in column 2 indicate that the magnitude of the effect of adopting an EDLP strategy is six times as large as the effect of being in a pricing market.

The estimations in columns three through five examine only a subset of our sample in which price changes occur and allow the magnitude of upward and downward price changes to differ. The results reported in column 3 reveal that downward price changes are smaller than upward price changes, but this downward stickiness is not accentuated by higher menu costs in the item-pricing market. Estimations reported in columns 4 and 5 also generally confirm that higher menu costs tend to increase the magnitude of price changes, but that effect can vary with the strategy of the firm. Hi-Lo stores had bigger upward price changes in stores with higher menu costs and both types of stores had bigger downward price changes when subject to an item pricing law.

Finally, market characteristics such as age and income influenced the magnitude of price changes. Stores in markets with higher average ages implemented smaller price changes. The results in column 5 also indicate that stores in more affluent areas implement smaller downward price changes. These differences may be the firms response to varying degrees of price sensitivity among different demographic groups.

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[10]In the data, .01 is one percentage point.

Conclusion

The results presented here suggest that menu costs modestly influence the incidence and magnitude of price changes, but that firm strategy is more important. One interpretation of these results is that for some stores, adopting a strategy that requires frequent price changes has benefits much larger than the menu costs associated with it.[11]

In comparing these results to those in Levy, et. al., which finds a much bigger role for menu costs, it is important to note an indirect role that higher menu costs may play by influencing the firms strategy. In particular, higher menu costs make the Hi-Lo strategy a more expensive one to implement.

[11]In fact, Hoch, et. al. find evidence that the implementation of an EDLP strategy created an 18 percent decrease in retailer profits.

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Table 1: Estimation Results

	(1)	(2)	(3)	(4)	(5)
	Probability of Price Change	Absolute Value of Percentage Change	Absolute Value of Percentage Change (Changes Only)	Percentage Change (Upward Only)	Percentage Change (Downward Only)
Pricing	.028 (.138)	.137** (.067)	1.05** (.543)	1.97* (1.04)	-.288** (.047)
EDLP	-1.66** (.053)	-.835** (.028)	1.97** (.352)	3.11** (.610)	.069* (.036)
Pricing* EDLP	-.184** (.082)	-.096** (.041)	-2.06** (.557)	-3.24** (.972)	.022 (.057)
Private Label	.030 (.022)	.017 (.011)	.087 (.087)	.156 (.168)	-.007 (.008)
Down			-.284** (.115)		
Pricing* Down			.181 (.159)		
Median Income	-.002 (.004)	-.003 (.002)	.000 (.016)	.000 (.033)	.003** (.001)
Median Age	.001 (.036)	-.029* (.017)	-.329** (.140)	-.579** (.271)	.070** (.012)
Observations	39,228	39,074	3,515	1,802	1,713
Estimation Method	Probit	Tobit	OLS	OLS	OLS

**Significant at the 5% level, *significant at the 10% level.