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**Supermarket Competition through Price Promotions:
A Cross Category Analysis**

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Abstract

This study takes an important first step at quantifying the nature of competition between major supermarket chains through price promotions. Using data that covers virtually the entire product menus of supermarkets representing two major chains in 18 cities, I examine both the effect of direct competition on promotional intensity and the nature of promotional competition itself. In a counterintuitive finding, there appears to be slightly less promotional activity in cities in which both chains compete directly, as compared to cities in which only one chain operates. Moreover, most promotional activity tends to be retaliatory, rather than accommodating, in nature.

I. Introduction

The food retail industry in the United States is changing. Supermarkets are falling in number but growing in size in order to offer a wider range of products. Consumer demand is growing for vegetarian options, prepared foods, organics, and a wide variety of other specialty and niche products. Warehouse superstores such as Wal-Mart Supercenters are springing up all over the country, and their market shares are increasing in many regions. The supermarket industry is joining much of the rest of US retail in offering internet shopping. There is much that is not understood regarding to the directions in which food retail in the U.S. is heading during this period of flux. The purpose of this study is to investigate the manner by which two major US supermarket chains compete through prices and promotions. Fundamental to my research is the understanding that, through advancements in the internet, these two chains are now able to monitor each other's prices and promotions virtually without cost.

The strategic toolkit used by supermarkets includes both price promotions and non-price advertising and the distinction between the two is of fundamental importance to this study. Price promotions, for the purpose of this study, are defined by temporary reductions in the prices paid for products. In order to have their intended effects on consumers, promotions must be advertised to consumers through flyers, displays, the internet, or some other medium. It is therefore common in both the economic literature and the popular press for price promotions to be included under the umbrella term of "advertising." This study does not use data on non-price advertising, focusing instead on advertised and non-advertised price promotions.

Researchers have reached a consensus in the literature that promotions are increasingly accounting for a greater share of supermarkets' advertising budgets throughout the United States (Zenor, 1994; Blattberg, Briesch, and Fox, 1995 (hereafter BBF); Mela, Gupta, and Lehmann,

1997 (hereafter MGL); and Jedidi, Mela, and Gupta, 1999). Lal, Little, and Villas-Boas (1996) found this to also be true in the case of manufacturers and processors in the food retail industry. The reasons for this shift are not entirely clear, although researchers have determined that advertising and promotions have opposing effects on brand equity and consumer price sensitivity. Therefore advertising is more effective in building brand loyalty while promotions are more effective in building store traffic and generating store loyalty.

There is a small stream of literature dedicated specifically to the empirical investigation of promotional competition among stores. Leeflang and Wittink (1996) examined the reactions of supermarket managers to competitors' promotions while controlling for consumer response. In equilibrium, the authors' argued, managers seek to maintain steady market shares for brands within categories. Therefore when brand-level market shares increase or decrease following promotions in the local market and they do not return to previous levels within 10 weeks managers have either over- or underreacted to competitors' promotions. Leeflang and Wittink found that competitive reactions, as measured by the length and depth of price promotions, increase for brands with greater market share effects across stores and decrease for brands with greater effects on market share within stores. Display and feature ads accompanying promotions enhance competitive reactions, and managers have a greater tendency to overreact than to underreact. Brodie, Bonfrer, and Cutler (1996) conducted a replication of this study and did not find strong support for any of the Leeflang and Wittink's findings, but found even stronger evidence that managers tend to over- and underreact to competitors' price promotions.

In a study directly related to my own, Steenkamp, et al. (2005) examined the prevalence and the nature of supermarket managers' responses to promotional activity on the part of competitors. The authors clearly distinguish between advertising and promotions according to

the same criteria that I use. They also classify reactions as being either retaliatory, in that they focus on increasing sales for brands or product categories being promoted by competitors, or accommodating in that they cede brands or product categories to competitors. The major and most relevant findings of the study include: 1) The most common reaction to competitor reaction is no response at all. In the case of promotions the authors found no reaction 53.7 percent of the time and in the case of advertising there was no reaction 82.5 percent of the time, 2) Promotional reactions are far more likely to be retaliatory rather than accommodating, while there is no clear difference among the responses to advertising, 3) Short-term reactions are significantly stronger than long-term reactions, and 4) Relative to weaker brands, powerful brands within product categories result in more aggressive reactions and those reactions are more likely to be promotional in nature.

This study builds upon previous research in two key ways. The first is the breadth of the data set used to analyze competitive response. The Leeflang and Wittink study examined a single product category and the Steenkamp, et al. study examined approximately 400 product categories. My data set covers virtually the entire supermarket, with approximately 20,000 products classified into roughly 1,500 product categories and 35 departments. The data set includes new and emerging products, niche and organic offerings, and a complete set of national brand and private label substitutes.

The second major extension of this article is the examination of cross-category effects. Empirical studies that incorporate a large number of products or product categories are relatively scarce in the marketing and economic literature on food retailing. Studies that explicitly incorporate cross-category considerations are scarcer still. Exceptions to this include Fader and

Lodish (1990) as well as Bell and Lattin (1998), and both studies argue against using one or few product categories to draw inferences on all of food retail.

In this study, I use a sample of 17 metropolitan areas to examine empirically the extent to which supermarket chains react to one another's price cuts and price promotions. In five of the cities, the two chains are competing directly with one another while in the remaining 12 only one or the other is in operation. Hence the 12 cities without direct competition serve as a convenient baseline against which we can compare the incidence of contemporaneous and staggered promotional activity in the cities featuring direct competition. The statistical analysis of this study takes an important first step into investigating the nature of price and promotional competition in the supermarket industry today.

The remainder of this article is organized as follows. Section II presents the data and the statistical methods. Section III details the results, section IV provides a discussion including suggestions for further research, and section V concludes.

II. Data and Methodology

The data used in this study are the price and promotional data for two major US supermarket chains that operate primarily in the western United States. Given that both chains, hereafter referred to as Chain A and Chain B, offer online retailing and delivery, consumers have access to exhaustive price and promotional data. My price and promotional data are drawn directly from the chains' respective corporate websites in 17 major US metropolitan areas. Table 1 displays the metropolitan areas sampled as well as the chains operating in each and some relevant summary statistics.

Table 1: The Metropolitan Areas Sampled.

<i>City</i>	<i>Zip Code</i>	<i>Chain</i>	<i>Population</i>	<i>Median Household Income (\$)</i>
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Boise, ID	83705	A	185,787	42,432
Palm Springs, CA	92262	A	42,807	43,800
Salt Lake City, UT	84101	A	178,858	37,287
Los Angeles, CA	90023	Both	3,849,378	42,667
Las Vegas, NV	89103	Both	478,434	47,863
Portland, OR	97213	Both	537,081	42,287
San Diego, CA	92114	Both	1,256,951	55,637
Seattle, WA	98101	Both	582,424	49,297
Vancouver, WA	98660	B	158,855	40,743
Baltimore, MD	21075	B	631,366	36,949
Fresno, CA	93650	B	466,714	44,513
Philadelphia, PA	08026	B	1,448,394	35,365
Sacramento, CA	95815	B	453,781	44,867
San Jose, CA	95113	B	929,936	70,291
Phoenix, AR	85037	B	1,512,986	42,353
San Francisco, CA	94102	B	744,041	57,496
Washington, DC	20001	B	581,531	47,221

Source: Estimates from the US Census, 2005.

The cities sampled in this study show a great deal of variation in terms of size and income levels. A key aspect to my analysis is the effect of population demographics and market characteristics on the pricing and promotional strategies of supermarkets. For example, Hoch, et al. (1995) estimated the effects of a large number of demographic and competitive factors on consumer price sensitivity and found demographics to be far more significant determinants. The authors determined that education and house size share inverse relationships with price sensitivity and that shoppers with large families as well and blacks and Hispanics are more price sensitive. BCP found age and income to significantly decrease price sensitivity and education to be largely insignificant. Jones (1997) segmented consumers into “low-income” and “high-income” groups and calculated price sensitivity to be twice as high for the low-income shoppers.

Mittal (1994) and Kim, Blattberg, and Rossi (1995) argued that in order to optimally set prices among categories and brands, retailers need to understand the local distribution of consumer price sensitivity. This distribution can be inferred, at least partially, using demographics. Only one study, to my knowledge, directly examines the differences in demographics among online and conventional grocery shoppers. Degeratu, Rangaswamy, and Wu (2000) compared conventional, in-store shoppers to those using the online delivery service Peapod. Online shoppers were found to be younger, with smaller families and higher price sensitivity. The authors determined that price promotions have less of an impact online because shopping online facilitates the direct comparison of products according to several attributes other than price, especially nutritional information. These differences between online and brick and mortar shopping may manifest themselves in lower prices or shallower promotions in cities with the greatest amount of online shopping.

The price and promotional data cover virtually the entire product offerings of the supermarkets for Chains A and B. There are certain exceptions, such as alcohol in the case of chain B as well as stationary or large pieces of general merchandise for both chains. The time series for Chain A is nine months and the time series for Chain B is one calendar year. The current difference in terms of temporal length is due to issues with data collection. In order to examine promotional activity exhaustively, the data are organized into 35 supermarket departments. Table 2 presents the categories and provides descriptive statistics.

Table 2: The Promotional Frequency by Department.

Department	Total Number of Products		Average % of Promotions		Percentage Difference (χ^2)
	Chain A	Chain B	Chain A	Chain B	
Bakery	52,213	43,993	8.42	8.27	0.15
Beauty Aids	225,184	382,338	27.91	44.03	16.12***

Baby Care	107,648	199,537	31.37	51.26	19.89***
Baking and Cooking	181,951	220,051	40.67	29.35	11.32***
Boxed Dinners	77,809	50,462	48.78	48.28	0.50
Beer	45,542	N/A	57.20	N/A	N/A
Beverages	281,109	702,558	66.06	57.08	8.98
Candy	95,308	163,381	36.48	35.78	0.70
Cereal and Breakfast	93,164	182,157	45.37	61.53	16.16**
Canned Goods	147,403	288,005	50.32	38.60	11.62**
Cleaning Products	112,594	295,521	36.06	45.76	9.70*
Condiments	186,717	235,055	37.99	34.35	3.64
Coffee and Tea	121,319	287,944	41.31	38.58	2.73
Dairy	209,254	507,654	52.02	63.24	11.22*
Delicatessen	69,229	129,245	20.91	22.76	1.85
Salad Dressing	73,938	263,090	42.85	56.49	13.64**
Dairy Substitutes	155	1,354	12.90	33.86	20.96***
Frozen Foods	383,040	623,388	70.28	84.48	13.68
General Merchandise	261,339	782,094	27.53	40.68	13.15***
Health Aids	391,328	948,147	33.57	38.14	4.57
Kosher	9,360	10,773	23.64	37.34	13.70***
Mexican	78,606	223,683	34.43	42.88	8.45*
Meat and Seafood	161,382	638,043	24.06	37.80	13.74***
Meat Substitutes	141	23,023	0.00	22.42	22.42***
Organics	41,600	179,727	17.65	49.12	31.47***

Packaged Breads	67,940	275,857	22.53	31.94	9.41***
Pet Care	100,965	395,701	40.70	46.95	6.25
Produce and Floral	83,198	534,706	11.21	33.20	21.99***
Pasta, Rice, and Beans	88,888	483,146	51.23	48.21	3.02
Soup and Chili	100,978	494,305	43.63	36.39	6.94
Tobacco	12,767	17,211	0.00	3.21	3.21
Snacks	370,838	2,422,591	41.16	50.05	8.89
Spirits	50,445	N/A	71.51	N/A	N/A
Spices and Seasonings	98,286	741,786	29.40	32.02	2.62
Wine	146,382	N/A	80.43	N/A	N/A
Total	4,558,309	12,848,391	42.72	45.72	3.00

*:Significant at the .10 level. **: At the .05 level. ***: At the .01 level.

As table 2 shows, there is a wide range of promotional activity across the chains and departments. In aggregate, both across time and departments, the percentage of products on promotion is statistically the same for both chains. Chain A offered 42.72 percent of its products on promotion over a nine month period while Chain B offered 45.72 percent of its products on promotion during one year of measurement. Chain B offered a significantly higher share of products on promotion than Chain A for several of the largest in-store departments, such as produce, meat and seafood, dairy, general merchandise, and breakfast foods. Chain A offered a significantly higher promotional share than Chain B for canned goods, baking products, and a number of other smaller departments. There is no significant difference in promotional offerings between the two chains for several other major departments, including snacks and health aids, which are the largest departments by product volume and shelf space.

In order to test empirically whether or not these supermarket chains are competing through promotions, I use two statistical methods. First, I seek to determine whether or not promotional activity is more intense in absolute terms in the cities in which these terms compete with one another both electronically and with brick and mortar stores. In order to achieve this goal I test for equality between total promotional activity in the five cities in which these chains compete (hereafter known as Competitive Cities) and that in the 13 cities in which only one or the other competes (hereafter known as Noncompetitive Cities), across all departments. Second, I seek to measure the extent to which the two chains are reacting to one another's promotions and price cuts. In order to do so, I calculate the correlation of promotional activity between chains and across time for each of the departments in each of the five competitive cities.

III. Results

The first step of the empirical process examines whether or not promotional activity is more intense in Competitive Cities, or those in which both chains compete. Promotional activity is measured as the average share of products on promotion. In order to compare promotional intensity across Competitive and Noncompetitive Cities, I subtract average promotional activity in Noncompetitive Cities from that in Competitive Cities and test for a statistical difference from zero. The results are compiled in table 3.

Table 3: Differences in Promotional Activity across Cities, by Department.

Department	Chain A Avg. Difference²	Chain B Avg. Difference	Overall Avg. Difference
Bakery	0.007**	0.006	0.005
Beauty Aids	-0.037***	0.003	-0.041***

² The average percentage difference is calculated as the difference between the average number of products on promotion in Competitive cities minus the same average, calculated in Noncompetitive Cities. Hence a positive number is interpreted as a greater average in Competitive Cities and a negative number implies a greater average in Noncompetitive Cities.

Baby Care	-0.068***	-0.007	-0.055***
Baking and Cooking	-0.081***	0.010***	0.011***
Boxed Dinners	-0.006	0.021***	0.010*
Beer	0.068***	N/A	0.068***
Beverages	-0.070***	0.008***	0.002
Candy	-0.073***	-0.008***	-0.025***
Cereal and Breakfast	-0.079***	-0.016***	-0.063***
Canned Goods	-0.042***	0.012***	0.015***
Cleaning Products	-0.041***	-0.008***	-0.035***
Condiments	-0.035***	-0.007***	-0.007***
Coffee and Tea	-0.093***	0.007**	-0.015***
Dairy	-0.069***	0.011***	-0.031***
Delicatessen	-0.022***	0.009**	-0.003
Salad Dressing	-0.016*	0.012***	-0.020***
Dairy Substitutes	-0.010	-0.063***	-0.058***
Frozen Foods	-0.024***	0.024***	-0.016***
General Merchandise	-0.052***	0.013***	-0.030***
Health Aids	-0.042***	0.001	-0.025***
Kosher	0.065***	-0.011**	-0.007
Mexican	-0.030***	-0.007***	-0.029***
Meat and Seafood	-0.011**	0.001	-0.026***
Meat Substitutes	0.000	-0.088***	-0.127***
Organics	-0.043***	0.029***	-0.047***

Packaged Breads	-0.022***	-0.036***	0.005**
Pet Care	-0.021***	0.022***	-0.008**
Produce and Floral	-0.004	-0.022***	-0.054***
Pasta, Rice, and Beans	-0.026***	0.006**	0.000
Soup and Chili	-0.032**	-0.014***	-0.008**
Tobacco	0.000	-0.015*	-0.015**
Snacks	-0.069***	0.001	-0.034***
Spirits	-0.065***	N/A	-0.065***
Spices and Seasonings	-0.082***	-0.025***	0.041***
Wine	0.121***	N/A	0.121***
Total	-0.033***	0.003***	-0.014***

*:Significant at the .10 level. **: At the .05 level. ***: At the .01 level.

Table 3 demonstrates the counterintuitive finding that overall, there is significantly greater promotional activity in the Noncompetitive Cities. Standard economic theory posits that there would be greater promotional competition in the Competitive Cities, as the two major chains are competing directly. It is important to note, however, that this analysis does not control for differences in demographics or the depth of promotional activity. Therefore this finding holds true only in the case of promotional frequency but not necessarily for the total monetary value of all promotional activity.

It is clear that this overall difference in promotional activity across cities is driven by Chain A. Chain A utilizes a pricing strategy known as everyday low pricing (EDLP), which is marked by fewer and shallower price promotions than high-low pricing (HLP), the practice used by Chain B. Overall, the stores of Chain A offer 3.3 percent fewer promotions in the Competitive

Cities than they do in the Noncompetitive Cities. However B offers a statistically significant margin of 0.3 percent more promotions in the Competitive Cities. It is therefore clear that these two chains are responding to competitive conditions differently across cities.

The second component of the empirical analysis goes beyond the examination of absolute promotional intensity and examines whether or not the chains are responding to each other's promotional activity. Only the Competitive Cities are relevant in this case, as I am calculating the correlation coefficients between promotional activity over time for pairs of stores representing Chain A and Chain B for each of the five Competitive Cities and test for coefficients greater than zero in absolute value. The results are summarized in table 4. Positive and significant correlation coefficients are interpreted as retaliatory reactions, while negative and significant correlation is identified as accommodating reactions. Retaliation is defined as a response to a rival's promotional activity through increased promotions in the short term, while accommodation is defined as response through decreased promotions.

A value of "N/A" denotes that one of the two chains does not carry any products within the associated category or that there was no promotional activity for one or both chains.

Table 4: Correlation Coefficients of Promotional Frequency across Chains, by City.

Department	City and Zip Code				
	Las Vegas, NV: 89103	Los Angeles, CA: 90023	San Diego, CA: 92114	Portland, OR: 97213	Seattle, WA: 98101
Bakery	0.259	0.228	0.183	0.181	0.238
Beauty Aids	0.130	0.172	0.020	-0.220	-0.379
Baby Care	-0.149	-0.218	-0.242	-0.287*	-0.040
Baking and Cooking	0.787***	0.642***	0.789***	0.688***	0.538***
Boxed Dinners	0.121	0.101	0.071	-0.273*	-0.165
Beer	N/A	N/A	N/A	N/A	N/A

Beverages	-0.282*	-0.238	-0.264*	0.047	0.042
Candy	-0.157	0.075	-0.171	-0.391**	-0.531***
Cereal and Breakfast	-0.141	-0.344**	-0.347**	0.017	-0.171
Canned Goods	0.634***	0.504***	0.647***	-0.053	0.039
Cleaning Products	0.198	0.146	0.087	-0.037	0.132
Condiments	0.134	0.182	0.068	0.311**	0.409**
Coffee and Tea	0.265*	0.512***	0.468***	0.499***	0.488***
Dairy	0.644***	0.653***	0.657***	-0.301*	0.091
Delicatessen	-0.109	-0.041	-0.018	-0.231	0.041
Salad Dressing	0.095	-0.136	0.077	-0.256	-0.083
Dairy Substitutes	N/A	N/A	N/A	N/A	N/A
Frozen Foods	-0.052	-0.125	-0.245	-0.072	-0.062
General Merchandise	0.062	0.195	0.282*	-0.282*	-0.155
Health Aids	0.482***	0.557***	0.693***	0.134	0.258
Kosher	0.860***	0.875***	0.810***	0.389**	0.529***
Mexican	0.335***	0.105	0.217	-0.038	0.030
Meat and Seafood	0.179	0.256	0.153	0.038	0.044
Meat Substitutes	N/A	N/A	N/A	N/A	N/A
Organics	0.211	-0.127	0.039	0.274*	0.584***
Packaged Breads	0.271*	-0.059	0.056	0.092	0.041
Pet Care	0.258*	0.259	0.132	0.103	0.114
Produce and	0.456***	0.002	0.216	0.030	0.321*

Floral					
Pasta, Rice, and Beans	0.560***	0.761***	0.673***	-0.422***	-0.020
Soup and Chili	0.182	0.252	0.288*	-0.571***	-0.562***
Tobacco	N/A	N/A	N/A	N/A	N/A
Snacks	0.306*	0.386**	0.248	-0.220	0.018
Spirits	N/A	N/A	N/A	N/A	N/A
Spices and Seasonings	0.373**	0.258	0.323**	0.449***	-0.030
Wine	N/A	N/A	N/A	N/A	N/A
Total	0.676***	0.751***	0.635***	-0.311*	0.051

*:Significant at the .10 level. **: At the .05 level. ***: At the .01 level.

Table 4 displays a wide variety of information on the nature of competition through price promotions. In aggregate, across time and departments, the results suggest that Chains A and B are responding to one another's price promotions through retaliations in Las Vegas, Los Angeles, and San Diego. However these same two chains are respond to one another accommodatingly in Portland and not in any significant fashion in Seattle. These findings are generally in line with those of Steenkamp, et al., who found retaliation to be the norm and accommodation to be the exception.

IV. Discussion

As stated above, this study serves as an important first step in applying empirical methods to the examination of the nature of promotional competition between major US supermarket chains. The results, as they stand, apply to aggregate data and do not control for important factors such as demographics, brand-level market share, or the presence of additional or heterogeneous competitors within metropolitan areas.

The results with respect to total promotional activity across cities reveal one very surprising figure, namely that across almost all departments and in aggregate there is significantly less (more) promotional activity in cities with (without) both chains competing directly. It is conceivable that there is, on average, more fierce retail competition overall in the Noncompetitive Cities or that the total dollar value of promotions is greater in the Competitive Cities, but such insights cannot be drawn from the data at this time. At present, the results suggest some form of mild collusion between the two stores, possibly resulting from the transparency of prices through the internet, that results in less over promotional activity but not necessarily weaker retaliation to one another's promotions.

There is also a significant difference in the way the two chains behave in Competitive vs. Noncompetitive Cities. Chain A, which is smaller and uses EDLP, promotes significantly fewer items in Competitive cities as compared to Noncompetitive cities. Indeed, from the data section above, we know that Chain A engages in fewer promotions overall than does Chain B, though the difference is not significant. It is entirely possible that the EDLP chain responds to direct promotion with the HLP chain by lowering its average prices and decreasing promotional activity, thus more closely adopting the full EDLP strategy. Chain B engages in slightly more promotions in Competitive Cities, though the difference is significant. The intuition behind this finding may be similar to that of the EDLP chain, namely that Chain B responds to direct competition with Chain A by raising its overall prices slightly but offering more and deeper promotions.

The findings in table 4 are much more in line with previous research on the nature of promotional competition, although the examination in terms of such a wide variety of departments is an addition to the literature. There are striking differences in the nature of

promotional activity both across cities and across departments. The two chains compete very fiercely in terms of promotional activity in Las Vegas, Los Angeles, and San Diego. Those three constitute the largest three markets, by far, of the five Competitive Cities, and so this may well represent a longstanding competition for highly lucrative foot traffic. Seattle demonstrates no promotional competition at all between the two chains, which is most likely explained by the presence of additional competition such as Wal-Mart Supercenters.

Portland, OR, demonstrates the interesting phenomenon of negative and significant correlation in promotional activity between the two chains. This represents accommodating responses to one another in promotions, in that they are responding to promotional activity on the part of rivals with downturns in promotions. Hence in Portland the two chains are most likely operating promotional calendars that are sufficiently staggered so as to not draw customers away from one another, but rather to enhance the loyalty of existing customers.

Among departments, baking and cooking, canned goods, coffee and tea, dairy, health aids, pasta, and spices and seasonings all show significant and usually retaliatory promotional competition. These are all large and varied departments, which largely discounts the potential explanation of simultaneous or closely staggered price promotions resulting from manufacturers' trade promotions. I also find highly significant and positive correlations among cities for the kosher department, but the relatively small size of that department suggests that trade promotions could be highly influential in driving this result.

For several other large and financially important departments, such as meat and seafood, produce, frozen foods, and general merchandise, there is little to no evidence of promotional interaction between the two chains. The rationale for supermarkets in choosing to compete in

some major departments and not others is a highly interesting and important question that will be explored further in forthcoming versions of this paper.

V. Conclusions

This study begins the process of answering a number of very important, longstanding questions in food retail in the United States. The study produces two major studies, one of which goes against expectations and other conforms to expectations. In the former case, I find that promotional activity between two competing chains is significantly decreased in the cities in which they compete directly, as compared to cities with only one of the two chains. In the latter case, I find that most promotional interaction between chains tends to be retaliatory, though there is strong evidence for accommodating interactions within certain supermarket departments or metropolitan areas.

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