

Food Marketing Policy Center

**Post Merger Price Conduct: A Case Study
Of Pricing in Connecticut Markets
After the 1996 Royal Ahold-Stop & Shop Merger**

By Ronald W. Cotterill,
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Food Marketing Policy Center
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University of Connecticut
Department of Agricultural and Resource Economics

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Preface

This study was provided to the staff at the Federal Trade Commission in October, 1999. It expands the analysis of divestitures that was presented in an April 1999 report to the FTC (*An Antitrust Economic Analysis of the Proposed Acquisition of Supermarkets General Holdings Corporation by Ahold Acquisition Inc.*, Food Marketing Policy Center Research Report No. 46). The earlier study focused on market share changes in divested markets. This study examines price conduct. In December 1999, Royal Ahold withdrew its tender offer citing a new and tougher level of enforcement by the Federal Trade Commission. Piecemeal divestitures that sought to preserve competition in local market areas are now recognized as inadequate. The momentum of acquirers in local markets and concerns for buying power disparities that disadvantage "smaller" chains, as well as food manufacturers and farmers, now clearly seem to be on the antitrust agenda. For more general comments on these topics, see Cotterill, R.W. 1999, Continuing Concentration in the U.S.: Strategic Challenges to an Unstable Status Quo. In B. Ramsay, *The Future of the Global Food Industry—Strategic Directions*,. Financial Times Retail & Consumer Publishing Monograph Series, also available as Food Marketing Policy Center Research Report No. 48, University of CT, December; and also Cotterill, R.W., 1999, Continuing Concentration in Food Industries Globally: Strategic Challenges to an Unstable Status Quo. In M.F. Maciel Gomes and F.A. da Costa, eds. (*Des) Equilibrio Economico & Agronegocio* Vicoso:MG, also available as Food Marketing Policy Center Research Report No. 49, Univ. of CT. December.

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Several appendices were included in the report submitted to the Federal Trade Commission. To conserve space and make this publication available, the appendices were omitted. Copies of the appendices are available upon request.

Executive Summary

- This report analyzes the price conduct of Stop & Shop and Shaw's in Connecticut markets after the 1996 Royal Ahold/Stop & Shop merger. The key question is: were the divestitures adequate to promote or preserve competition. We find that they were not. Pricing reverts to higher levels after a period of low prices in divested markets, and Stop & Shop remains the price leader in highly concentrated markets.
- This study uses weekly price check data from Retail Data Services, Inc. as provided by Wakefern Food Corporation. The data are for Stop & Shop in 7 local markets from January 1, 1997 to September 22, 1999 (142 possible price checks for each store). For two of these markets, we also have price data for Shaw's supermarkets.
- After selecting a 561 item market basket of branded and private label items for analysis and cleaning the data, there are 88,450 prices for the nine stores during the 1997-1999 period. We computed an all item price index and price indices for branded and private label items. Due to the RDS price check method (all items and all stores were not price checked every week) price indices are not available for all weeks in the sample period. Nonetheless, there are ample data points to analyze price conduct.
- The five markets where divestiture occurred and /or where Shaw's operates have lower prices than the other two markets, controlling for a new store opening by Stop & Shop in one of those markets.
- Prices in these five impact markets including the two markets where we have Shaw's as well as Stop & Shop price data follow a negative (5 cases) or flat trend (2 cases) during 1997 and early 1998. Thereafter price trends in these markets turn positive and prices increase significantly converging towards prices in the two benchmark markets where no Shaw's and no divestitures were operating. We conclude that Shaw's entry often aided by divestiture, and divestiture to other competitors, did generate a period of low, often negative trend pricing during 1997 and early 1998.
- The divestiture related reversion to price competition ended in early 1998 when Stop & Shop, the dominant firm in nearly all of these markets signaled a desire to elevate prices and raised prices establishing a new positive price trend in all five of these markets.
- Graphical and statistical analysis confirm this conduct pattern for the two markets where we have Shaw's price data. Shaw's followed Stop & Shop's price lead effectively ending the post divestiture period of price competition.
- Since we do not have data for 1996, we can not determine whether Stop & Shop also led a move to price competition after divestiture, as part of a long run strategy to limit the penetration of the invigorated competitors.
- Nonetheless, that outcome happened. Between 1997 and 1999, Shaw's gained little market share. Stop & Shop, on balance, achieved gains in share and it already was the share leader in the five impact markets.

All seven markets in this study were highly concentrated in 1997 (HHI over 2100 points) and they remained so in 1999

1. Introduction

Mergers that tend to lessen competition are unlawful under federal and state statutes. In the grocery retailing industry, many recent mergers have passed muster after consent decrees that required divestiture of stores in highly concentrated areas were signed. The Royal Ahold acquisition of Stop & Shop required the divestiture of several stores in Connecticut to preserve or promote competition. A key question is, was the divestiture adequate to preserve or promote competition? This report uses extensive price data from 7 Stop & Shop supermarkets in 7 Connecticut local market areas and price data from 2 Shaw's in two of these areas to analyze price trends over 1997, 1998 and the first thirty eight weeks of 1999. These data were collected over this period by the Retail Data Services Corporation (RDS) in its routine business operations. Wakefern requested that RDS provide us with all price data collected on these 9 stores from the earliest possible available date to present.

Our task is as follows. The raw price data must be cleaned and aggregated into store level price indices on a weekly basis. Price indices are computed for all items, branded items and for private label subsets. These weekly price indices are then analyzed to see what we can learn about post merger competition in markets where Stop & Shop faced Shaw's and others who operated divested stores as opposed to markets where there was no divestiture.

The next three sections of this report describe the price aggregation procedures. It presents the price indices plus intermediate and supporting tables so that one can understand the scope and composition of the indices. The remaining sections of the report provide a preliminary analysis of post merger price conduct in these Connecticut markets.

2. Price Aggregation Procedures

RDS data files contain raw weekly data for each store over a 142-week period (1997, week 1 to 1999, week 38). Each product checked in a given store in a given week is a record. A record has the products' UPC number, price, number of units sold for that price (usually one but higher when, for example, the offer is "3 for a dollar") and whether the product was being sold on promotion. Our first step was to identify a market basket of items by UPC code that we could use to construct a price index.

RDS explained they did not check the same set of products each week. Figure one explains the RDS cycle for price checks. Their plan calls for checking grocery, frozen foods, dairy, and non-edible grocery products with selected foods from these categories being checked in one week of six weeks in their price check cycle. Thus, their plan is to check the same items every sixth week. Direct store delivery items and fresh meat and produce are not included because Wakefern, a dry grocery wholesaler, never asked RDS to check such items.

Using Table 1 as a guide we went to the most recent IRI *Marketing Fact Book* (1997) and identified the leading brands for each of the RDS checked product categories. Where the *Fact Book* listed private label volumes we also included private label. This gave us a market basket of 688 items.

For each product we recorded the volume share of its relevant IRI product category and its price per volume (pound, or other unit of measure). We also recorded the total sold for the category. This allows us to compute the dollar sales for each product in the market basket. We will use these dollar sales numbers to compute sales weights for each products price, as described below, to compute a weighted price index.

Our next step was to send the market basket of items to Wakefern so they could assign UPC numbers to each product. When they did this, 127 products were deleted from the basket because they did not have codes for them. Reasons included items were direct store delivery items and items although listed in IRI were not carried in the N.Y./Connecticut region. The basket that we merged with the RDS data set by UPC code contained 561 items.

After merging the market basket and the RDS data set we deleted all RDS data that did not pertain to the 561 items. Our first raw data set for the 9 stores and the 142 weeks contained 104,313 observations. In some of the weekly data files for a store, we had multiple data points with the same UPC code. This implies that the product was scanned more than once. If the data points had the same UPC code and the same price, then we take them as valid data points and kept one after deleting the rest of the copies. If these data points had the same UPC code but different prices, we deleted all records because it was not possible for us to ascertain which price was the correct one. After deleting multiple records, the data set contained 102,842 observations. We also deleted all records with products sold as multiples. After deleting multiple units the data set has 92,470 observations.

As expected when using exploratory data analysis techniques, we found quite a few outliers in the price variable. Some products were being sold for as much as \$20 each and others had a price of 1 cent. As a quick and efficient approach to eliminate these price outliers, which are probably coding errors, we use a cut off of 50% above or below the product's average price for all stores in a year. For example, if a product from our market basket had an average price of \$1.00 in 1997, then we deleted any data points in 1997 with price lower than \$0.50 and higher than \$1.50. After deleting any data points with 50% above average price, the data set was 91,101 observations. Deleting data points with 50% below average price, the data set was 90,767 observations.

Finally, to filter out the small weekly market basket observations, we then deleted all data from a store for any given week where we have that had less than thirty product prices. This leaves 88,450 observations.

3. Process of Index Estimation

We first estimate the relative price r_{isjt} for a branded product by dividing the price of the product in a given week by average price of the product for the three years. Relative prices control for differences in the size and value of different products (Cotterill, 1983; Geithman and Marion, 1993; Kaufman and Handy, 1993).

$$r_{isjt} = \frac{P_{isjt}}{\bar{P}_{i...}}$$

where, i = product, s = store, j = week, t = year.

We then weight the brand's relative price for a given week by its share of dollar sales for all brands checked in the store that week. Thus, the price index formula for a branded product is:

$$PI_{sjt}^B = \sum_i w_i^B r_{isjt}$$

where,

$$w_i^B = \frac{SD_i^B}{\sum_i SD_i^B}$$

where,

$i = 1...k_{sjt}^B$ and k_{sjt}^B is the number of branded products sold in store s in week j and year t .

SD_i^B = Dollar Sales of Branded product i computed from IRI-Marketing Fact Book.

Similarly for private label products price index is:

$$PI_{sjt}^{Pl} = \sum_i w_i^{Pl} r_{isjt}$$

where,

$i = 1...k_{sjt}^{Pl}$ and k_{sjt}^{Pl} is the number of private label products sold in store s in week j and year t .

SD_i^{Pl} = Dollar Sales of Private label product i computed from IRI-Marketing Fact Book.

Finally the total index for a given week in a store is estimated by weighting the Branded and Private label Indices in the following manner:

$$TPI_{sjt} = wPI_{sjt}^B + (1-w)PI_{sjt}^{Pl}$$

where,

$$w = \frac{\sum_i SD_i^B}{\sum_i SD_i^B + \sum_i SD_i^{Pl}}$$

4. How to Interpret these Indices

Perhaps an example of the aggregation procedure will help understand how these indices can and can not be used to analyze price conduct. Assume all nine stores (7 Stop & Shop and 2 Shaw's) sell Heinz Ketchup, other brands of ketchup and private label ketchup. We compute the Heinz relative price in each store for each week by dividing that price by the average Heinz price for all stores and all weeks. The relative price varies around 1.0 and has that value if a store's price for a particular week equals the average price. Similarly, the relative prices for the other ketchup product in our basket (Del Monte, Hunts, and private label) are indexed relative to their respective all store, all week sample averages.

Now to compute the brand price index for ketchup assuming no other branded products in this example, we would weight the Heinz relative price by its share of sales, and we would weight the Hunts and Del Monte relative prices by their share of sales. If this price index increases from 100 to 105 then branded ketchup prices increase 5 percent to consumers. Since prices are indexed to the all sample average, one can compare branded prices over time in a given store to branded prices over time in another store. For example, if the branded price index is 100 in one store and 90 in another, then the latter is 10 percent cheaper.

The private label price index and the all items price index, which is a weighted combination of the brand and private label indices, behave in a similar manner. One can compare each index across stores and over time. The one comparison that can not be made is to compare branded to private label. If the private label is 110, it means the private label products in a store that week are 10 percent above the sample average private label prices. If branded products in the same store for the same week

have an index value of 100, it does not mean private label products are 10 percent higher in price than the branded product. The all sample average branded price for a product such as ketchup is higher than the all sample average private label prices for the same product.

5. Price Aggregation Results

Aggregation of a data set of this size and complexity is a large-scale effort. To provide some perspective, we will present some intermediate results before discussing the end result, i.e. the price indices for each store over the 142-week period from January 2, 1997 to September 22, 1999. Table 2 identifies the stores in the data set and gives the total number of individual product price records for each store. Since there are 9 stores, if each had an equal number of records, each would have 11 percent. Percentages range from 8 percent for the Bristol Shaw's to 19.1 percent for the Manchester Stop & Shop. The coverage in the latter however is much higher than all of the other stores.

Table 3 gives a breakdown for each store. It indicates the number of branded and private label items in each department that was price checked and the number of each for the total store. In the Norwalk Stop & Shop, for example, we have prices on 7,505 branded and 1,621 private label products (last column of Table 3). As with the other stores, most of the products in the Norwalk Stop & Shop are grocery products. Grocery accounts for 60.7 percent of branded and 59.1 percent of the private label products in this store. Dairy is the next largest component of the market basket and then non-edible groceries and frozen foods. This same pattern holds for all of the other stores.

The market basket of prices checked in any given week varies from store to store and it varies over time. There are several reasons for this. The most important for variation over time is the alleged six-week cycle of price checks by RDS. Different products were price checked in different weeks. Variation at a point in time across stores is due to a checker not finding certain products. Inspecting these data reveals that RDS did not strictly adhere to its six-week cycle sampling strategy. Products from all cycles appear almost every week, however, sometimes a pattern appears where 50-70 percent of the products checked follow the six-week cycle. In other cases, the price check seems to be spread evenly across all six-cycle sets of items.

Our relative price aggregation method allows and incorporates this variation in the market basket in the index computation. Since each price is indexed to its

sample average, even if we have only one price, we have an index for the store. As the number of products in the basket increases, each is weighted by its share of the basket's total dollar cost. Recall however that we eliminated all index values that depend on less than 30 products. If one regards each product's relative price as a random variable and a draw from a pool of values that approximates the store's general price level, then the central limit theorem of statistics suggests that the average of repeated draws will converge to the true population mean value. When one has more than 30 draws, one obtains a more accurate estimate of the store price level.¹

Table 4 gives the descriptive statistics for the total, branded and private label indices for each store for the full time period. First, note in the far right column that we do not have index values for every week in the 142 week period. For some weeks, no price check was done and for others the number of checked items was less than 30, effectively giving no price check. The first column gives the mean index values for each store. Recall that we can compare a given index across stores (and time). We can not, however, compare the branded index to the private label index.

Examining the total price indices, the Norwalk Stop & Shop at 1.0935 has the highest average price for the period, products tend to be 9.35 percent above the average prices for the entire sample. Next, Norwich at 1.0433, or 4.33 percent above the sample average. Stop & Shop does not compete with its New England chief rival, Shaw's, in these markets, and there was no divestiture of stores in these markets as part of the 1996 Stop & Shop-Royal Ahold merger. The lowest mean price in this store sample are the two Shaw's stores. Shaw's in Bristol has a 0.9697 mean index value, so its prices are 3.03 percent below the sample average and 11.3 percent below Stop & Shop, Norwalk. Shaw's in Orange has a slightly lower 0.9660 mean index value, so its prices are 3.4 percent lower than the sample average and 11.7 percent below the Stop & Shop in Norwalk, a nearby local market. Our first conclusion, and a very important conclusion, is that prices do vary by chain and

¹ Although not done at this time, one could control for heteroskedasticity in the price indices by weighting the price index analysis by the number of products in the basket. One would expect lower errors when the number of items is high. Also, one could control for changes in the composition of the basket by introducing the percent product cycle variables into any statistical analysis. After preliminary checks, however, we doubt that these refinements would change the general conclusions presented in this report. This is especially true for the analysis of Shaw's and Stop & Shop pricing because data indicates that the market basket checked on any given date for these stores in Bristol (and in Orange) were essentially identical. Thus, the adjustment would tend to be identical, affecting levels but not conclusions.

by market in a very substantial fashion.

Table 5 gives descriptive statistics for the total price index for observations from each calendar year. If only the steady creep of inflation were behind price trends, one would see a small increase in the mean price index values for each store over the three years. This, however, is not the case. Mean values for Norwalk decline over the 3 year period. Mean values for the two other stores decline from 1997 to 1998 and then increase. In fact, when we do graphic analysis of the price trends, a period of declining prices into 1998 is apparent for several stores followed by a reversal to an upward price trend for the rest of the period. Something other than general inflation is determining price levels in these stores.

Tables 6 and 7 give similar descriptive statistics by year for the branded and the private label indices. They behave in a nearly identical fashion to the all item price index. This is not surprising since the latter is a weighted average of these sub-component indices with weights roughly 80 percent brand and 20 percent private label.

6. An Analysis of Price Conduct in These Markets

With the data in hand, we are now in a position to address some key questions. Is price conduct different in market where stores were divested and where they compete with Shaw's? Who is the price leader, Stop & Shop or Shaw's?

Figure 1 through 7 graph the total price index for the 7 Stop & Shop and the 2 Shaw's stores. Wakefern Food Corporation's marketing staff assembled these market data from internal sources. One set of tables identifies all grocery retailers and wholesale clubs within a five mile radius of each store in the sample for 1997 and 1999. Store size in square feet and estimated weekly sales are provided for 1997 and 1999. Using these data we then defined what we term "core markets" that include only large supermarket (superstore) competitors. Market share and Herfindahl indices (HHI) are computed for all of the markets. Stop & Shop is dominant in most of these markets with market share above 30 percent and often near 50 percent. The HHI are above 2000 indicating that all of these markets are highly concentrated. We will refer to the core market share and HHI as needed when analyzing price conduct.

Returning to the price graphs, Figure 1 is for the two markets where there were no divestitures and Shaw's is not in the market. The Norwalk store, the store with the highest mean price in the sample has, uniformly high

prices (values near 1.1) for the entire period. Stop & Shop share in Norwalk is 32.9 percent in 1999, up 5.6 percentage points from 1997 (Table 8). The HHI in Norwalk was 2453 in 1997 and 2783 in 1999. The Norwich store begins with prices at a similar level, but prices drop dramatically in September 1997, and stay low for nearly a year before moving back to Norwalk benchmark levels. The major event that triggered the price drop was the conversion of an older Stop & Shop in a new large Super Stop & Shop. One might expect that expanding a store and a price war would expand Stop & Shop's share in Norwich. In fact its share did increase, but only modestly from 23.9 in 1997 to 28.2 percent in 1999 (Table 8). The core market HHI decreased from 2854 in 1997 to 2827 in 1999 because the Norwich Shop Rite, the market leader lost share to Stop & Shop.

Our examination of these two "benchmark" stores/markets (no divestiture and no Shaw's) leads us to conclude that prices were higher in such markets controlling for another competitive factor, i.e. the price war in Norwich associated with the opening of the Super Stop & Shop. We cannot tell from the data who initiated the price war, but conversation with the Shop Rite store manager in Norwich, Mr. Kenneth Copano, indicates that Stop & Shop initiated it and ended it. Stop & Shop is the price leader in Norwich. Note in this study a price leader is a firm who initiates price changes that are followed by others. A price leader is not necessarily the lowest priced store in the market, nor the firm with the largest market share.

Figure 2 gives the total price index graphs for the Stop & Shop and the Shaw's in the Bristol/Southington market (Bristol for short). Note first that Shaw's tends to be lower priced than Stop & Shop throughout the period. Particularly important is the fact that prices trend downward in both stores throughout 1997 and to the 5th week of 1998. At that juncture, there is a distinct reversal with the beginning of a positive price trend that ultimately converges towards the levels observed in our benchmark Norwalk and Norwich stores in fall 1999.

Since the divestiture of the Edward's store to Shaw's in this market occurred in mid 1996, we do not have data from before divestiture nor do we have data for the initial few months of divested store operations. Thus we do not know who initiated the negative price trend that persists through 1997 and early 1998; nor do we know when it started. A visual inspection of the two price lines in the negative trend period suggests very independent pricing. At times when Stop & Shop prices are increasing (decreasing), Shaw's are decreasing

(increasing). Note at the end of the period Stop & Shop's prices are well above Shaw's, and Stop & Shop steadily lowers prices until they equal Shaw's.

At the beginning of the positive price trend period (week 5, Stop & Shop low, to 13 in 1998, Shaw's low), a clear shift in price coordination occurs. Stop & Shop now increases prices, sometimes dramatically, signaling a new interest in higher prices and Shaw's follows Stop & Shop. They dance up and down in unison during the spring of 1998 (week 13 to week 21) and then move up in a cheek to cheek, straight line fashion for a few weeks, firmly establishing the upward price trend that continues with deviations around trend for the rest of the period.

Table 8 summarizes the market share changes that occurred between 1997 and 1999 in Bristol. Shaw's dollar sales remained constant but its market share dropped from 33.2 percent in 1997 to 26.3 percent in 1999, a 6.9 percentage point decrease. Stop & Shop's market share increased from 30.4 percent to 47.4 percent, a 17 percentage point increase. A major reason for this share gain was the opening of a new Super Stop & Shop in the market on November 5, 1998. Note however, unlike Norwich, Stop & Shop initiated no price war with this late 1998 opening. The market was recovering from a price war that seems related to the 1996 divestiture action.

Examining the other market where we have price data for both Shaw's and Stop & Shop yields strikingly similar price conduct. Figure 3 graphs the two chains price indices for Orange, Connecticut, a market that Shaw's entered by acquiring a divested Edwards store. Again, Shaw's prices tend to be lower than Stop & Shop and prices trend down throughout 1997 and up to week 2, 1998 for Shaw's and week 7 1998 for Stop & Shop. A similar dance with Stop & Shop leading occurs at this time and Shaw's ultimately follows Stop & Shop up to produce a positive price trend throughout the rest of the period. Again, low prices progressively vanish as these two stores converge towards the benchmark Norwalk and Norwich price level in the fall of 1999.

Figure 4 is for Manchester, CT. It contains only Stop & Shop prices, however, Shaw's is in the market and two stores were divested (one to Big Y and one to Buzzutos/Adams Supermarkets). The price trend line mirrors those for Bristol and Orange. It trends down through most of 1997 before turning up to produce a persistently positive trend for the rest of the period. Note however, prices don't move very much above 1.0 by the end of the period. Manchester is the lowest priced Stop & Shop market in the sample.

Figure 5 is for the Wallingford Stop & Shop. No store was divested here because a Shaw's was under construction and was soon to open. Prices in this market are generally quite low. The price trend in 1997 and 1998 is essentially flat. Thereafter it trends up as in the other markets where Shaw's and a divestiture were operating.

Figure 6 for Waterbury has a pattern nearly identical to Wallingford. There was divestiture of one Edward's to Shaw's in Waterbury (Table 8).

Figure 7 plots the 7 Stop & Shop price indices in one graph. It is very hard to identify individual stores but we did this for another reason. It shows that the five stores in markets with divestiture or Shaw's recent entry (Wallingford) have a common path. It is slightly downward in 1997 and then trends towards the Norwalk and Norwich stores at the end of the same period, but still seems to be slightly below them. We conclude that divestiture and the related push of Shaw's into Connecticut did lower prices for consumers in 1997. However, by early 1998, Stop & Shop appears to have reestablished its dominant firm leadership position after the price war and was successful in leading prices to significantly higher levels. Independent of whoever instituted these price wars, the competitive jolt of the divestiture had a short life.

Table 8 indicates that Stop & Shop gained share in 5 of the 7 markets and stayed even in another. Its market share decreased only a trivial amount in the market where it is most dominant. Its share in Wallingford decreased from 53.3 percent in 1997 to 51.2 percent in 1999. Shaw's, on the other hand, lost share in 3 of the 5 markets it is in and it stayed even in another market.

The HHI in Table 8 indicates that all of these markets were highly concentrated in 1997 and remained so in 1999. The 1997 HHI range from a low of 2132 in Manchester to 3450 in Wallingford. At this high level of concentration, relatively minor shifts in the share of the dominant firm can move the HHI 200 points. For example, Stop & Shop's decline in its share from 53.3 to 51.2 percent decreased its contribution to the HHI by 220 points. This really does not suggest that Wallingford is more competitive in 1999 than in 1997.

7. Statistical Analysis of Price Leadership in Bristol and Orange

The graphs for Stop & Shop and Shaw's in Bristol and Orange indicate clear periods of declining and increasing prices. They also indicate that Stop & Shop led prices up to significantly higher levels in 1998 and

1999. Causality analysis (Sims, 1972; Greene, 1993, p. 816) can help us understand the pricing dynamics in these markets. We want to know which firm leads and which firm follows when prices change. To answer this question, we determine whether Shaw's price in week t is a function of Stop & Shop's price in the prior week ($t-1$) as well as its own prior week. If it is, then we conclude that Shaw's follows Stop & Shop. In a second linear regression, we determine whether Stop & Shop's price in week t is a function of Shaw's price in the prior week ($t-1$) as well as its own prior week price. If it is, then we conclude that Stop & Shop follows Shaw's. As Table 9 indicates, there are four possible outcomes. In addition to the two described above (southwest and northwest quadrants in Table 9) one could find that neither firm follows the other. This is defined as independent pricing. It is not necessarily competitive pricing. It merely shows that there is no simple form of coordinated price game, on a weekly basis. Firms, for example, could have tacitly agreed to raise prices over time with independent variation around the trend or they could have agreed to maintain a certain price range, allowing independent pricing within that range.

The fourth possibility is dependent pricing or joint leadership. In this case, both firms follow the other firms lead. For the fun of it and in tune with our dancing patterns analogy in the prior section we will call this "love fest" pricing. This is what more mundanely is defined as tacit collusion in the economic literature. The statistical analysis confirms that each firm is closely attuned to what the other does and responds immediately to its moves on the dance floor. Love fest pricing can turn sour (a spat!) to produce negative price trends and well as positive price trends to higher profits. In the long run, however, one would expect coordination to produce higher profits.

Table 10 presents regression results for the Bristol market. First we apply the test to the whole time period, and find the data support dependent or co-leadership pricing. However, since price conduct varies dramatically over the time period, sub period analysis is more appropriate and should reveal more detail about firm strategies. When we look at the negative price trend period for Bristol, we find independent pricing. This confirms our visual inspection of Figure 2 where we can see that the two firms' prices often move in opposite directions. When we look at the early positive price trend period (1998), the results again conform to our visual inspection. Stop & Shop is the price leader and leads price up. In the remaining period (1999), the firms revert to independent pricing around trend.

Table 11 presents a similar analysis in the Orange market. For the whole period, one comes close to dependent pricing however, the coefficient on the lagged Shaw's price in equation 1 is only significant at the 11 percent level. Since one usually requires at least a 10 percent level of significance, we tentatively conclude that Shaw's was the price leader for the full time period. Again, however, a sub period analysis is more appropriate. In the negative trend period, as in Bristol, we find independent pricing. In the first price trend period, as in Bristol, we find that Stop & Shop is the price leader and leads prices up. In the remaining component of the positive price trend period, we do not find the independent pricing that we found in Bristol. We find that Shaw's is the price leader and leads prices up.

We conclude from this statistical analysis of price strategy that Stop & Shop was the firm that ended the price wars in these markets by signaling a desire for higher prices and leading Shaw's to higher prices around a long run positive price trend.

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Table 1. The Retail Data Service's Six Cycle Design for Checking Prices

Week	Cycle 1 1/6/1997	Cycle 2 1/13/1997	Cycle 3 1/20/1997	Cycle 4 1/27/1997	Cycle 5 2/3/1997	Cycle 6 2/10/1997
GROCERY	Nuts, Popcorn Cookies, Private Label Snacks (chex mix, pringles, crunch-munch p/t chips & pretzels) Bread Crumbs Stuffing, Coatings Powdered Drink Mixes Cereal (hot & cold) Granola bars Rice Cakes Pop Tarts Can&Bottled juice	Pancake Mixes Syrups Bread Mixes Cake/Cookie Mixes Brownie Mixes Muffin/Biscuit Mixes Flour Baking Needs Salt Sugar/Sweeteners Coffee Tea Choc Syrup/Cocoa Instant milk Coffee Lightner Canned Milk Jams/Jellies Peanut Butter Honey	Passover Items Chinese/Mexican Foods Canned Meat Canned Seafood Canned pasta Dry Prepared (hamburger helper, mac&cheese, noodle dinners, dry soup) Pork & Beans Olives/Pickles/Relish Mayonnaise/Miracle Whip Salad Dressings Catsup/BBQ Sauce Mustard/Vinegar Meat Sauces/Gravies Oils Dry Pasta Spaghetti Sauce	Canned Vegetables Tomato Products Instant Potatoes Rice Dry Beans Canned Fruit Dried Fruit Soups-Canned/Dry Desserts (puddings/jello) Cherries Ice Cream Toppings Baby Food Baby Formula Diapers/Wipes Charcoal Rock Salt	Air Fresheners (solid spray, disinfectant) Furniture Polish Floor Wax Rug Cleaners Oven Cleaners Window Cleaners Drain Cleaners (bowl/ Bathroom Cleaners Tub & Tile Cleaners Cleansers/ Scouring pads Ammonia Dish Detergents Soap, hand.bubble bath Water Conditioners Laundry Detergent Bleach/stain removers Wool Washes Fabric Softeners Starches Cat food/litter Dog Food/Treats Birdseed	Paper Products Napkins/Towels Facial/bath Tissue Alum. Foil/Wraps Food Bags-stor/freez Lawn/Leaf/Trash bags Bottled Water non-DSD Soda/Seltzer (p/l. faygo, shasta, IBC, C&C, Vintage) Adiron Water
FROZEN		Vegetables Potatoes Onion Rings Ethnic & Hors D'oevres Pizzas Italian Items Casseroles - 2 lb Frozen Chicken Entrees Low Cal. Dinners Exact Wgt Meat (jones Jamestown, Landis, Mama Lucia, Swift b&s, stk ums)		Pot Pies Dinners Seafood Pies/Cakes Oven Cooked Desserts Sweet Cakes Breakfast Items -All Bagels/Breads Low Cholesterol Items Coffe Lightner Whipped Toppings Fruit Drinks/Ades Juices Ice Cubes		Ice Cream Ice Cream Novelties
DAIRY	Milk & Milk by Products Whipped Toppings Puddings Gelatin Fruit Products Juices/Drinks-All Yogurts Cottage Cheese Dips Cream Cheese Sour Cream		Ricotta Mozzarella Sliced Cheese Bar/Stick Cheese Shredded Cheese Specialty Cheese Grated Cheese Cheese Spreads Refrigerated Dough Biscuits/Rolls/Cookies Butter Margarine		Bacon Packaged Lunch Meat Canned Hams Hot Dogs Refrigerated Pickles Sour Kraut Kosher Meats/Cheese Herring/Lox Horseradish	

Table 2. Total Number of Individual Product Price Observations

	Frequency	Percent	Cumulative Percent
Norwalk Stop & Shop	9,126	10.3	10.3
Manchester Stop & Shop	16,871	19.1	29.4
Norwich Stop & Shop	10,813	12.2	41.6
Wallingford Stop & Shop	7,734	8.7	50.4
Waterbury Stop & Shop	9,575	10.8	61.2
Orange Stop & Shop	8,737	9.9	71.1
Orange Shaws	9,800	11.1	82.1
Bristol Stop & Shop	8,675	9.8	92.0
Bristol Shaws	7,119	8.0	100.0
Total	88,450	100.0	

Table 3: Number Of Individual Product Price Cross Tabulated By Private*National Brand*Department*Store: Full Time Period

Store			Department					Total
			Grocery	Dairy	HBC	Frozen Food	Non-Edible Grocery	
Norwalk-SS	Branded	Count	4572	1047	33	607	1246	7505
		ROW %	60.9%	14.0%	.4%	8.1%	16.6%	100.0%
	Private Label	Count	958	314		139	210	1621
		ROW %	59.1%	19.4%		8.6%	13.0%	100.0%
	Total	Count	5530	1361	33	746	1456	9126
		ROW %	60.6%	14.9%	.4%	8.2%	16.0%	100.0%
Manchester-SS	Branded	Count	8805	2451	109	1653	2721	15739
		ROW %	55.9%	15.6%	.7%	10.5%	17.3%	100.0%
	Private Label	Count	636	250		70	176	1132
		ROW %	56.2%	22.1%		6.2%	15.5%	100.0%
	Total	Count	9441	2701	109	1723	2897	16871
		ROW %	56.0%	16.0%	.6%	10.2%	17.2%	100.0%
Norwich-SS	Branded	Count	5652	1397	50	938	1300	9337
		ROW %	60.5%	15.0%	.5%	10.0%	13.9%	100.0%
	Private Label	Count	858	327		93	198	1476
		ROW %	58.1%	22.2%		6.3%	13.4%	100.0%
	Total	Count	6510	1724	50	1031	1498	10813
		ROW %	60.2%	15.9%	.5%	9.5%	13.9%	100.0%
Wallingford-SS	Branded	Count	4071	924	46	546	951	6538
		ROW %	62.3%	14.1%	.7%	8.4%	14.5%	100.0%
	Private Label	Count	712	265		77	142	1196
		ROW %	59.5%	22.2%		6.4%	11.9%	100.0%
	Total	Count	4783	1189	46	623	1093	7734
		ROW %	61.8%	15.4%	.6%	8.1%	14.1%	100.0%
Waterbury-SS	Branded	Count	4952	1161	50	754	1228	8145
		ROW %	60.8%	14.3%	.6%	9.3%	15.1%	100.0%
	Private Label	Count	899	277		111	143	1430
		ROW %	62.9%	19.4%		7.8%	10.0%	100.0%
	Total	Count	5851	1438	50	865	1371	9575
		ROW %	61.1%	15.0%	.5%	9.0%	14.3%	100.0%
Orange-SS	Branded	Count	4523	1071	37	593	964	7188
		ROW %	62.9%	14.9%	.5%	8.2%	13.4%	100.0%
	Private Label	Count	961	296		118	174	1549
		ROW %	62.0%	19.1%		7.6%	11.2%	100.0%
	Total	Count	5484	1367	37	711	1138	8737
		ROW %	62.8%	15.6%	.4%	8.1%	13.0%	100.0%
Orange-Sh	Branded	Count	5134	1184	42	586	1220	8166
		ROW %	62.9%	14.5%	.5%	7.2%	14.9%	100.0%
	Private Label	Count	1019	312		111	192	1634
		ROW %	62.4%	19.1%		6.8%	11.8%	100.0%
	Total	Count	6153	1496	42	697	1412	9800
		ROW %	62.8%	15.3%	.4%	7.1%	14.4%	100.0%
Bristol-SS	Branded	Count	4807	1159	52	547	895	7460
		ROW %	64.4%	15.5%	.7%	7.3%	12.0%	100.0%
	Private Label	Count	751	270		63	131	1215
		ROW %	61.8%	22.2%		5.2%	10.8%	100.0%
	Total	Count	5558	1429	52	610	1026	8675
		ROW %	64.1%	16.5%	.6%	7.0%	11.8%	100.0%
Bristol-Sh	Branded	Count	3901	798	35	442	751	5927
		ROW %	65.8%	13.5%	.6%	7.5%	12.7%	100.0%
	Private Label	Count	722	296		78	96	1192
		ROW %	60.6%	24.8%		6.5%	8.1%	100.0%
	Total	Count	4623	1094	35	520	847	7119
		ROW %	64.9%	15.4%	.5%	7.3%	11.9%	100.0%

Table 4. Descriptive Statistics for the Total, Branded, and Private Label Indices by Store: Full Time Period

	Mean	Median	Mode	Minimum	Maximum	Std Deviation	No. of Weeks
Total Index for SS-Norwalk	1.0935	1.0910	1.1290	1.0272	1.1966	.0310	87
Branded Index	1.0899	1.0888	1.1343	1.0176	1.1942	.0312	87
Private Label Index	1.1057	1.0995	1.1608	.9604	1.1995	.0532	81
Total Index for SS-Orange	.9903	.9896	.9323	.9213	1.0833	.0371	95
Branded Index	.9927	.9947	.9392	.9174	1.0833	.0410	95
Private Label Index	.9846	.9811	.8753	.8620	1.1171	.0531	87
Total Index for Sh-Orange	.9660	.9634	1.0362	.8163	1.0988	.0496	94
Branded Index	.9586	.9502	1.0309	.7866	1.0785	.0584	94
Private Label Index	.9779	.9688	1.0539	.8569	1.2486	.0611	86
Total Index for SS-Manchester	.9714	.9669	.8762	.8762	1.0610	.0442	113
Branded Index	.9743	.9767	1.0360	.8762	1.0681	.0473	113
Private Label Index	.9768	.9634	1.0247	.8306	1.0689	.0530	68
Total Index for SS-Norwich	1.0433	1.0456	.9255	.9255	1.1310	.0558	100
Branded Index	1.0472	1.0554	.9255	.9255	1.1541	.0590	100
Private Label Index	1.0304	1.0280	1.1029	.8931	1.1938	.0609	88
Total Index for SS-Wallingford	.9786	.9776	1.0415	.9020	1.0613	.0425	100
Branded Index	.9841	.9818	1.0346	.8973	1.1148	.0495	100
Private Label Index	.9624	.9499	1.0660	.8547	1.0760	.0420	95
Total Index for SS-Waterbury	1.0120	1.0128	1.0578	.9429	1.1118	.0418	99
Branded Index	1.0164	1.0190	1.0509	.8930	1.1750	.0517	99
Private Label Index	.9978	.9900	.9466	.9239	1.1251	.0441	90
Total Index for SS-Bristol	.9850	.9856	1.0466	.9073	1.0667	.0425	100
Branded Index	.9877	.9939	1.0447	.8992	1.1224	.0508	100
Private Label Index	.9753	.9693	1.0592	.8562	1.0742	.0406	94
Total Index for Sh-Bristol	.9697	.9721	1.0258	.8828	1.1058	.0494	97
Branded Index	.9649	.9672	1.0258	.8516	1.1103	.0573	97
Private Label Index	.9773	.9609	.9342	.8461	1.1489	.0577	94

Table 5. Descriptive Statistics for the Total Price Index: By Year

Year		Mean	Median	Mode	Minimum	Maximum	Std Deviation	No. of Weeks
1997	SS-Norwalk	1.1097	1.1099	1.0550	1.0550	1.1966	.0303	29
	SS-Orange	.9787	.9762	.9622	.9366	1.0521	.0258	34
	Sh-Orange	.9364	.9389	.8951	.8951	.9872	.0233	31
	SS-Manchester	.9326	.9353	.8762	.8762	.9702	.0227	41
	SS-Norwich	1.0677	1.1014	.9474	.9474	1.1310	.0671	38
	SS-Wallingford	.9428	.9380	.9020	.9020	.9952	.0225	34
	SS-Waterbury	.9785	.9725	.9429	.9429	1.0807	.0276	35
	SS-Bristol	.9538	.9504	.9206	.9206	1.0030	.0210	36
	Sh-Bristol	.9272	.9271	.8932	.8932	.9721	.0216	33
1998	SS-Norwalk	1.0895	1.0902	1.0272	1.0272	1.1440	.0300	31
	SS-Orange	.9715	.9722	.9323	.9213	1.0833	.0397	32
	Sh-Orange	.9453	.9410	.8163	.8163	1.0362	.0452	32
	SS-Manchester	.9668	.9747	.9191	.9191	1.0379	.0298	39
	SS-Norwich	1.0018	1.0189	.9255	.9255	1.0572	.0405	29
	SS-Wallingford	.9727	.9701	.9152	.9152	1.0415	.0356	33
	SS-Waterbury	1.0205	1.0200	.9484	.9484	1.1059	.0444	30
	SS-Bristol	.9759	.9851	.9073	.9073	1.0466	.0384	32
	Sh-Bristol	.9657	.9742	.8828	.8828	1.0479	.0414	33
1999	SS-Norwalk	1.0807	1.0786	1.0325	1.0325	1.1355	.0259	27
	SS-Orange	1.0248	1.0234	1.0009	.9975	1.0569	.0173	29
	Sh-Orange	1.0170	1.0249	.9627	.9627	1.0988	.0302	31
	SS-Manchester	1.0249	1.0248	.9986	.9986	1.0610	.0150	33
	SS-Norwich	1.0516	1.0515	.9755	.9755	1.0959	.0255	33
	SS-Wallingford	1.0214	1.0249	.9507	.9507	1.0613	.0226	33
	SS-Waterbury	1.0389	1.0342	.9929	.9929	1.1118	.0258	34
	SS-Bristol	1.0293	1.0314	.9443	.9443	1.0667	.0235	32
	Sh-Bristol	1.0192	1.0194	.9690	.9690	1.1058	.0308	31

Table 6. Descriptive Statistics for the Branded Products Price Index: By Year

Year		Mean	Median	Mode	Minimum	Maximum	Std Deviation	No. of Weeks
1997	SS-Norwalk	1.1095	1.1087	1.0540	1.0540	1.1942	.0293	29
	SS-Orange	.9682	.9672	.9603	.9270	1.0395	.0256	34
	Sh-Orange	.9165	.9082	.8677	.8677	.9969	.0307	31
	SS-Manchester	.9321	.9353	.8762	.8762	.9702	.0238	41
	SS-Norwich	1.0663	1.1000	.9397	.9397	1.1427	.0697	38
	SS-Wallingford	.9412	.9325	.8973	.8973	.9972	.0248	34
	SS-Waterbury	.9721	.9653	.8930	.8930	1.0807	.0330	35
	SS-Bristol	.9475	.9380	.8992	.8992	1.0007	.0259	36
	Sh-Bristol	.9132	.9194	.8516	.8516	.9718	.0290	33
1998	SS-Norwalk	1.0838	1.0888	1.0176	1.0176	1.1343	.0284	31
	SS-Orange	.9819	.9802	.9392	.9174	1.0833	.0425	32
	Sh-Orange	.9406	.9373	.7866	.7866	1.0337	.0511	32
	SS-Manchester	.9714	.9849	.9188	.9188	1.0360	.0317	39
	SS-Norwich	1.0080	1.0251	.9255	.9255	1.0828	.0485	29
	SS-Wallingford	.9806	.9876	.9116	.9116	1.0576	.0423	33
	SS-Waterbury	1.0301	1.0309	.9539	.9539	1.1405	.0503	30
	SS-Bristol	.9820	.9939	.9064	.9064	1.0645	.0456	32
	Sh-Bristol	.9604	.9672	.8624	.8624	1.0451	.0433	33
1999	SS-Norwalk	1.0758	1.0792	1.0308	1.0308	1.1343	.0263	27
	SS-Orange	1.0332	1.0317	1.0102	1.0024	1.0669	.0180	29
	Sh-Orange	1.0194	1.0214	.9493	.9493	1.0785	.0302	31
	SS-Manchester	1.0302	1.0322	.9951	.9951	1.0681	.0200	33
	SS-Norwich	1.0596	1.0555	.9610	.9610	1.1541	.0335	33
	SS-Wallingford	1.0318	1.0356	.9304	.9304	1.1148	.0289	33
	SS-Waterbury	1.0498	1.0441	1.0102	1.0102	1.1750	.0346	34
	SS-Bristol	1.0386	1.0411	.9390	.9390	1.1224	.0285	32
	Sh-Bristol	1.0248	1.0189	.9858	.9858	1.1103	.0304	31

Table 7. Descriptive Statistics for the Private Label Products Price Index: By Year

		Mean	Median	Mode	Minimum	Maximum	Std Deviation	No. of Weeks
1997	SS-Norwalk	1.1137	1.1197	.9604	.9604	1.1995	.0576	29
	SS-Orange	1.0053	.9935	.9656	.8620	1.1171	.0536	32
	Sh-Orange	.9785	.9801	.9013	.9013	1.0486	.0425	31
	SS-Manchester	.9553	.9490	.8306	.8306	1.0332	.0667	7
	SS-Norwich	1.0765	1.1029	1.1029	.9595	1.1938	.0690	27
	SS-Wallingford	.9544	.9490	.9528	.8547	1.0103	.0276	33
	SS-Waterbury	.9904	.9893	1.0136	.9308	1.0502	.0283	33
	SS-Bristol	.9712	.9669	.9343	.9343	1.0212	.0244	35
	Sh-Bristol	.9596	.9542	.9106	.9106	1.0332	.0326	33
1998	SS-Norwalk	1.1021	1.0946	.9741	.9741	1.1782	.0551	29
	SS-Orange	.9454	.9429	.8753	.8753	1.0909	.0416	29
	Sh-Orange	.9511	.9403	.9535	.8569	1.0802	.0556	27
	SS-Manchester	.9505	.9473	1.0247	.8543	1.0438	.0408	31
	SS-Norwich	.9870	.9909	.8931	.8931	1.0374	.0406	28
	SS-Wallingford	.9486	.9475	.8787	.8787	1.0660	.0392	32
	SS-Waterbury	.9940	.9836	.9466	.9239	1.0811	.0447	28
	SS-Bristol	.9522	.9500	.8562	.8562	1.0592	.0377	28
	Sh-Bristol	.9734	.9492	.9342	.8461	1.1489	.0679	32
1999	SS-Norwalk	1.1001	1.0859	1.1608	1.0449	1.1874	.0453	23
	SS-Orange	1.0028	.9971	.9745	.9284	1.0909	.0389	26
	Sh-Orange	1.0033	.9751	.9749	.9152	1.2486	.0734	28
	SS-Manchester	1.0090	1.0048	1.0500	.9143	1.0689	.0440	30
	SS-Norwich	1.0295	1.0329	.9725	.9575	1.0824	.0374	33
	SS-Wallingford	.9860	.9837	.9255	.9236	1.0760	.0487	30
	SS-Waterbury	1.0099	1.0030	.9440	.9437	1.1251	.0556	29
	SS-Bristol	1.0009	.9923	1.0742	.9283	1.0742	.0443	31
	Sh-Bristol	1.0018	.9934	.9436	.9053	1.0962	.0609	29

Table 8. Market Share Positions, Change in Share, and Divestiture Activity in the Seven Markets

Market	Shaws		change	Stop & Shop		change	HHI	HHI	change	1996 Divestiture
	1997 SOM (%)	1999 SOM (%)		1997 SOM (%)	1999 SOM (%)		1997	1999		
Bristol	33.2	26.3	-6.9	30.4	47.4	17.0	2570	3177	607	1 1 Edwards to Shaws
Orange	9.5	9.2	-0.3	37.5	47.5	10.0	3220	3489	269	2 1 Edwards to Shaws
Manchester	9.4	8.7	-0.7	38.1	42.6	4.5	2132	2400	268	1 Edwards to Bozzutos 1 Edwards to Big Y
Wallingford	10.0	13.6	3.6	53.3	51.2	-1.9	3450	3272	-178	No divestiture
Waterbury	6.8	6.8	0	39.4	39.4	0.0	2222	2200	-22	1 Edwards to Shaws
Norwich				23.9	28.2	4.3	2854	2827	-27	No divestiture
Norwalk				27.3	32.9	5.6	2453	2783	330	No divestiture

1. Shaws sales in its 2 stores remain unchanged. Stop & Shop opened a new store at the A&P site to expand sales in the market by \$800,000/wk.

2. Shaws operated 1 store in 1997 and 1999. Its sales increased by \$50,000/wk. Stop & Shop operated 2 stores in 1997 and 1999. Their sales increased by \$590,000 to \$1,675,000/wk.

Table 9. Possible Leader/Follower Outcomes

		Stop & Shop	
		Follow	Does not Follow
Shaw's	Follow	Dependent Pricing/ Joint Leadership	Stop & Shop is Price Leader
	Does Not Follow	Shaw's is Price Leader	Independent Pricing

Table 10: Price Leadership/Followship Analysis for the Bristol Market¹

For the whole period (2nd week of 1997 to 38th week of 1999):

1. Shaw's Follows Stop & Shop:

$$PI_t^{Sh} = 0.149 + 0.442 * PI_{t-1}^{Sh} + 0.399 * PI_{t-1}^{SS} \quad (R^2 = 0.534)$$

(1.88) (4.46) (3.49)
[0.06] [0.00] [0.00]

(Number of Observations: 102; 3 missing observations for Stop & Shop and 6 for Shaw's. Missing observations are adjusted by the mean of the series.)

2. Stop & Shop Follows Shaw's:

$$PI_t^{SS} = 0.227 + 0.498 * PI_{t-1}^{SS} + 0.276 * PI_{t-1}^{Sh} \quad (R^2 = 0.57)$$

(5.22) (2.94) (2.99)
[0.00] [0.00] [0.00]

(Number of Observations: 102; 3 missing observations for Stop & Shop and 6 for Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Dependent Pricing with Co-Leadership.

Negative Price Trend Period (From 2nd week of 1997 to 5th week of 1998):

3. Shaw's Does Not Follow Stop & Shop:

$$PI_t^{Sh} = 0.688 + 0.224 * PI_{t-1}^{Sh} + 0.0318 * PI_{t-1}^{SS} \quad (R^2 = 0.055)$$

(3.62) (1.337) (0.19)
[0.00] [0.19] [0.85]

(Number of Observations: 38; 1 missing observation Stop & Shop and 3 for Shaw's. Missing observations are adjusted by the mean of the series.)

4. Stop & Shop Does Not Follow Shaw's:

$$PI_t^{SS} = 0.447 + 0.381 * PI_{t-1}^{SS} + 0.153 * PI_{t-1}^{Sh} \quad (R^2 = 0.178)$$

(2.34) (2.32) (0.91)
[0.02] [0.03] [0.37]

(Number of Observations: 38; 1 missing observation for Stop & Shop and 3 for Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Independent Pricing

¹ Numbers in the parenthesis () are the t-statistics and in [] are the significance levels.

Early Positive Price Trend period (From 6th week of 1998 to 50th week of 1998):

5. Shaw's Follows Stop & Shop:

$$PI_t^{Sh} = 0.389 + 0.059 * PI_{t-1}^{Sh} + 0.533 * PI_{t-1}^{SS} \quad (R^2 = 0.282)$$

(2.143) (0.254) (2.11)
[0.04] [0.80] [0.04]

(Number of Observations: 29; 1 missing observation for Stop & Shop and 2 for Shaw's. Missing observations are adjusted by the mean of the series.)

6. Stop & Shop Does Not Follow Shaw's:

$$PI_t^{SS} = 0.467 + 0.681 * PI_{t-1}^{SS} - 0.16 * PI_{t-1}^{Sh} \quad (R^2 = 0.353)$$

(3.084) (3.23) (-0.82)
[0.00] [0.00] [0.42]

(Number of Observations: 29; 1 missing observation for Stop & Shop and 2 for Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Stop & Shop is the Price Leader and Leads Prices Up.

Remaining Positive price Trend Period (From 51st week of 1998 till 38th week of 1999):

7. Shaw's Does Not Follow Stop & Shop:

$$PI_t^{Sh} = 1.068 + 0.112 * PI_{t-1}^{Sh} - 0.16 * PI_{t-1}^{SS} \quad (R^2 = 0.029)$$

(4.38) (0.62) (-0.83)
[0.00] [0.53] [0.41]

(Number of Observations: 33; 1 missing observation for each of Stop & Shop and Shaw's. Missing observations are adjusted by the mean of the series.)

8. Stop & Shop Does Not Follow Shaw's:

$$PI_t^{SS} = 0.922 + 0.053 * PI_{t-1}^{SS} + 0.051 * PI_{t-1}^{Sh} \quad (R^2 = 0.10)$$

(4.74) (0.35) (0.353)
[0.00] [0.73] [0.73]

(Number of Observations: 33; 1 missing observation for each of Stop & Shop and Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Independent Pricing.

Table 11: Price Leadership/Follower Analysis for the Orange Market¹

For the whole period (2nd week of 1997 to 38th week of 1999):

1. Shaw's Does Not Follow Stop & Shop:

$$PI_t^{Sh} = 0.195 + 0.588 * PI_{t-1}^{Sh} + 0.206 * PI_{t-1}^{SS} \quad (R^2 = 0.477)$$

(1.96) (6.07) (1.59)
[0.05] [0.00] [0.11]

(Number of Observations: 100; 6 missing observations for each of Stop & Shop and Shaw's. Missing observations are adjusted by the mean of the series.)

2. Stop & Shop Follows Shaw's:

$$PI_t^{SS} = 0.434 + 0.322 * PI_{t-1}^{SS} + 0.246 * PI_{t-1}^{Sh} \quad (R^2 = 0.338)$$

(5.22) (2.94) (2.99)
[0.00] [0.00] [0.00]

(Number of Observations: 100; 6 missing observations for each of Stop & Shop and Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Shaw's is the Leader.

Negative Price Trend Period (From 2nd week of 1997 to 51st week of 1997):

3. Shaw's Does Not Follow Stop & Shop:

$$PI_t^{Sh} = 0.502 + 0.492 * PI_{t-1}^{Sh} - 0.027 * PI_{t-1}^{SS} \quad (R^2 = 0.227)$$

(2.78) (3.00) (-0.19)
[0.00] [0.00] [0.585]

(Number of Observations: 34; 1 missing observation for Stop & Shop and 3 for Shaw's. Missing observations are adjusted by the mean of the series.)

4. Stop & Shop Does Not Follow Shaw's:

$$PI_t^{SS} = 0.618 + 0.08 * PI_{t-1}^{SS} + 0.300 * PI_{t-1}^{Sh} \quad (R^2 = 0.08)$$

(2.71) (0.44) (1.44)
[0.01] [0.66] [0.16]

(Number of Observations: 34; 1 missing observation for Stop & Shop and 3 for Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Independent Pricing.

¹ Numbers in the parenthesis () are the t-statistics and in [] are the significance levels.

Early Positive Price Trend period (From 2nd week of 1998 to 11th week of 1999):5. Shaw's Follows Stop & Shop:

$$PI_t^{Sh} = 0.537 + 0.071 * PI_{t-1}^{Sh} + 0.355 * PI_{t-1}^{SS} \quad (R^2 = 0.153)$$

(3.289)	(0.364)	(1.784)	
[0.00]	[0.71]	[0.08]	

(Number of Observations: 40; 2 missing observations for Stop & Shop and 3 for Shaw's. Missing observations are adjusted by the mean of the series.)

6. Stop & Shop Does Not Follow Shaw's:

$$PI_t^{SS} = 0.484 + 0.551 * PI_{t-1}^{SS} - 0.049 * PI_{t-1}^{Sh} \quad (R^2 = 0.28)$$

(3.355)	(3.139)	(-0.261)	
[0.00]	[0.00]	[0.79]	

(Number of Observations: 40; 2 missing observations for Stop & Shop and 3 for Shaw's. Missing observations are adjusted by the mean of the series.)

Conclusion: Stop & Shop is the Price Leader and Leads Prices Up.

Remaining Positive price Trend Period (From 12th week of 1999 till 38th week of 1999):7. Shaw's Does Not Follow Stop & Shop:

$$PI_t^{Sh} = 0.586 + 0.353 * PI_{t-1}^{Sh} + 0.076 * PI_{t-1}^{SS} \quad (R^2 = 0.141)$$

(1.65)	(1.65)	(0.203)	
[0.11]	[0.11]	[0.84]	

(Number of Observations: 24; 3 missing observations for Stop & Shop. Missing observations are adjusted by the mean of the series.)

8. Stop & Shop Follows Shaw's:

$$PI_t^{SS} = 0.744 + 0.0127 * PI_{t-1}^{SS} + 0.262 * PI_{t-1}^{Sh} \quad (R^2 = 0.206)$$

(3.69)	(0.06)	(2.164)	
[0.00]	[0.95]	[0.04]	

(Number of Observations: 24; 3 missing observations for Stop & Shop. Missing observations are adjusted by the mean of the series.)

Conclusion: Shaw's is the Price Leader and Leads Prices Up.

Figure 1. Norwich and Norwalk Stop & Shop Total Price Index, 1997-1999

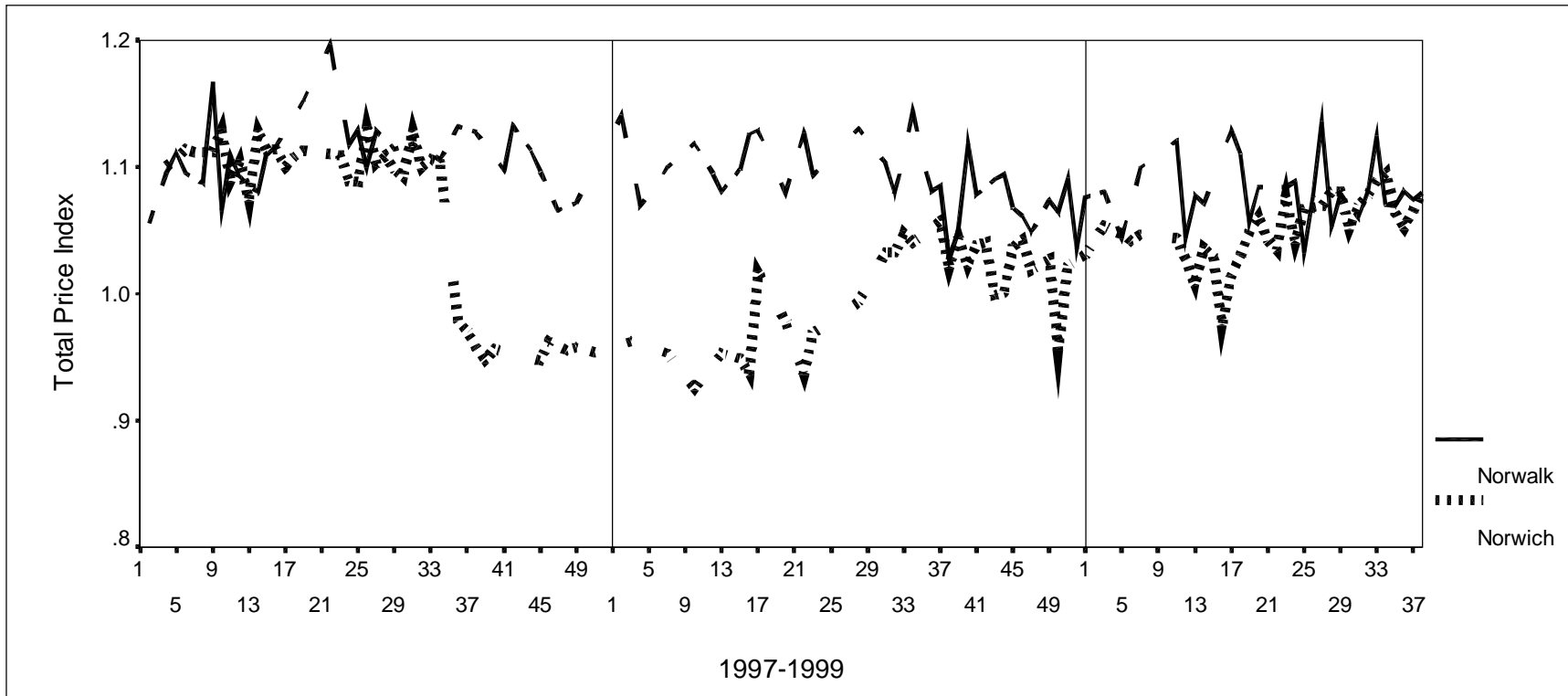


Figure 2. Bristol Stop & Shop and Shaws Total Price Index, 1997-1999

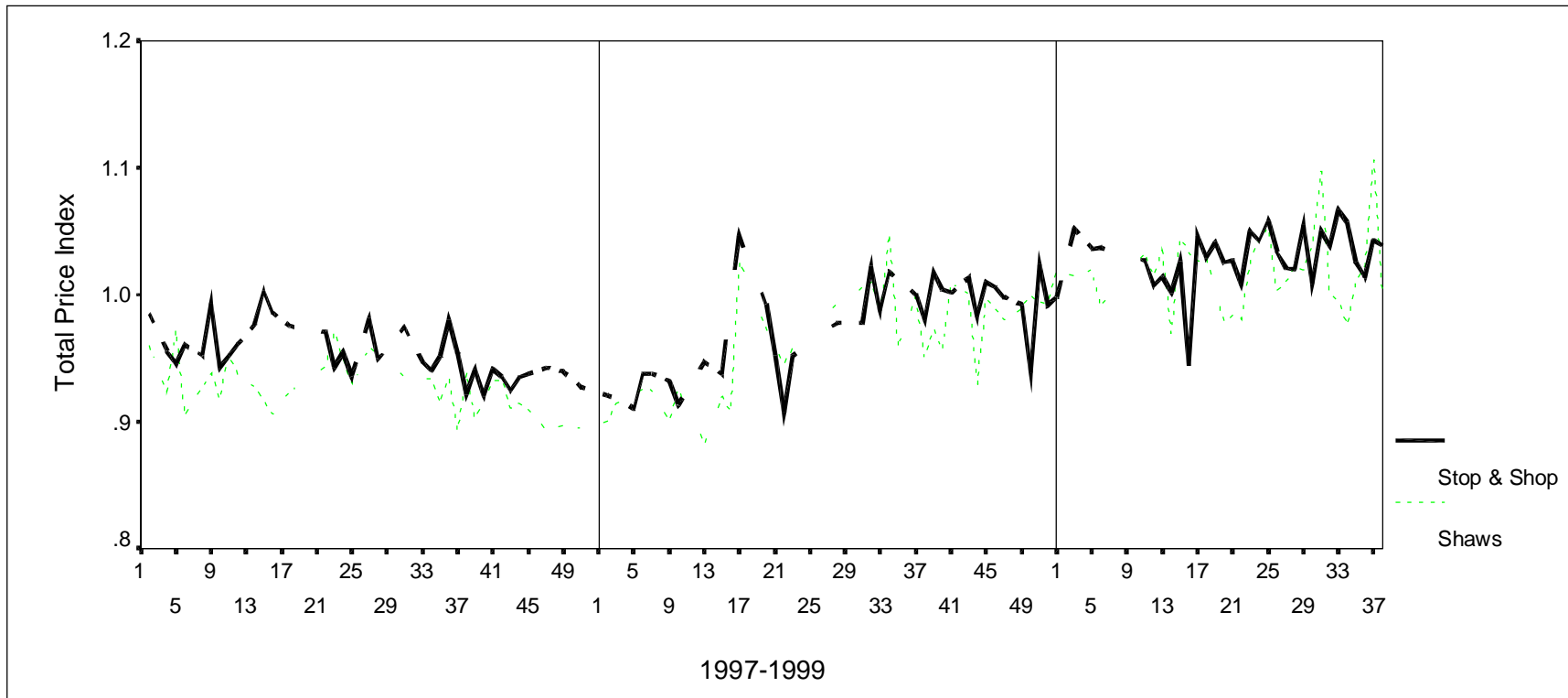


Figure 3. Orange Stop & Shop and Shaws Total Price Index, 1997-1999

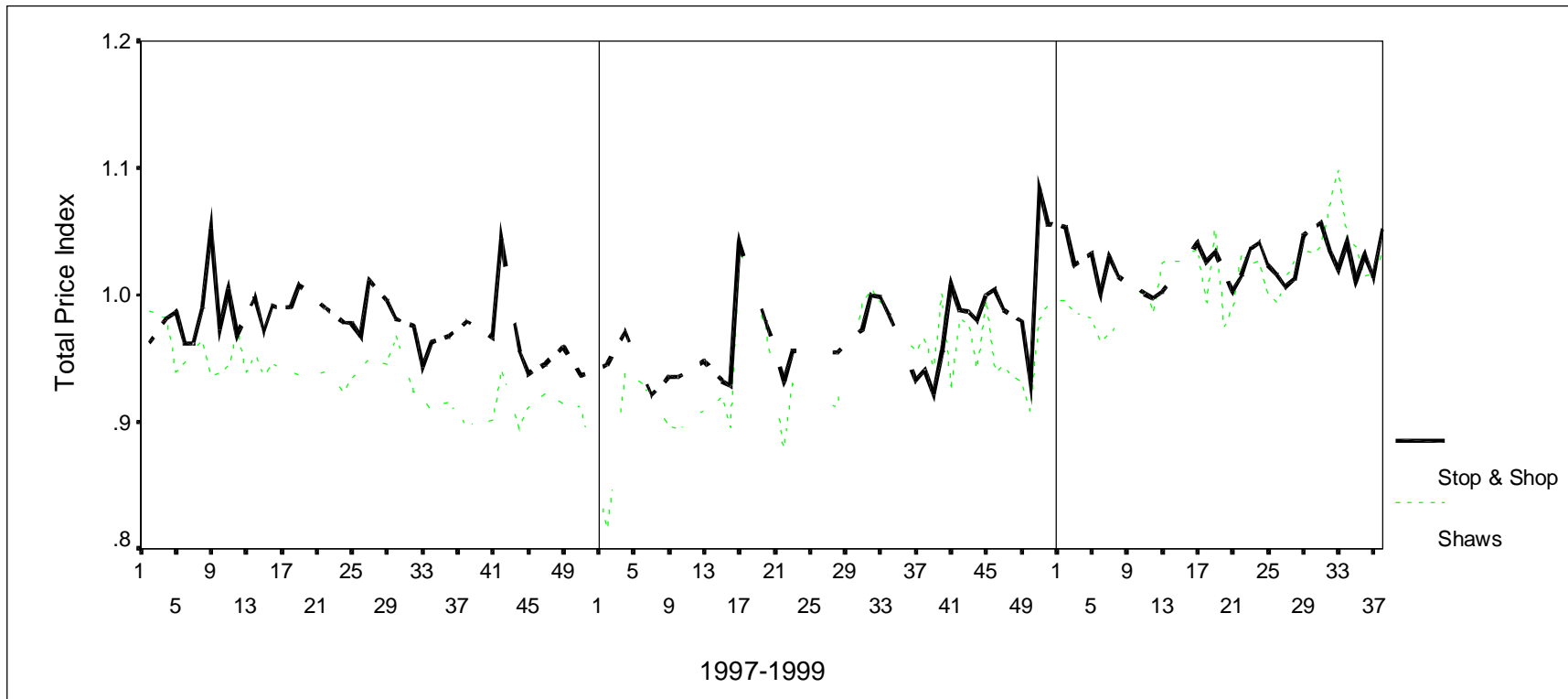


Figure 4. Manchester Stop & Shop Total Price Index, 1997-1999

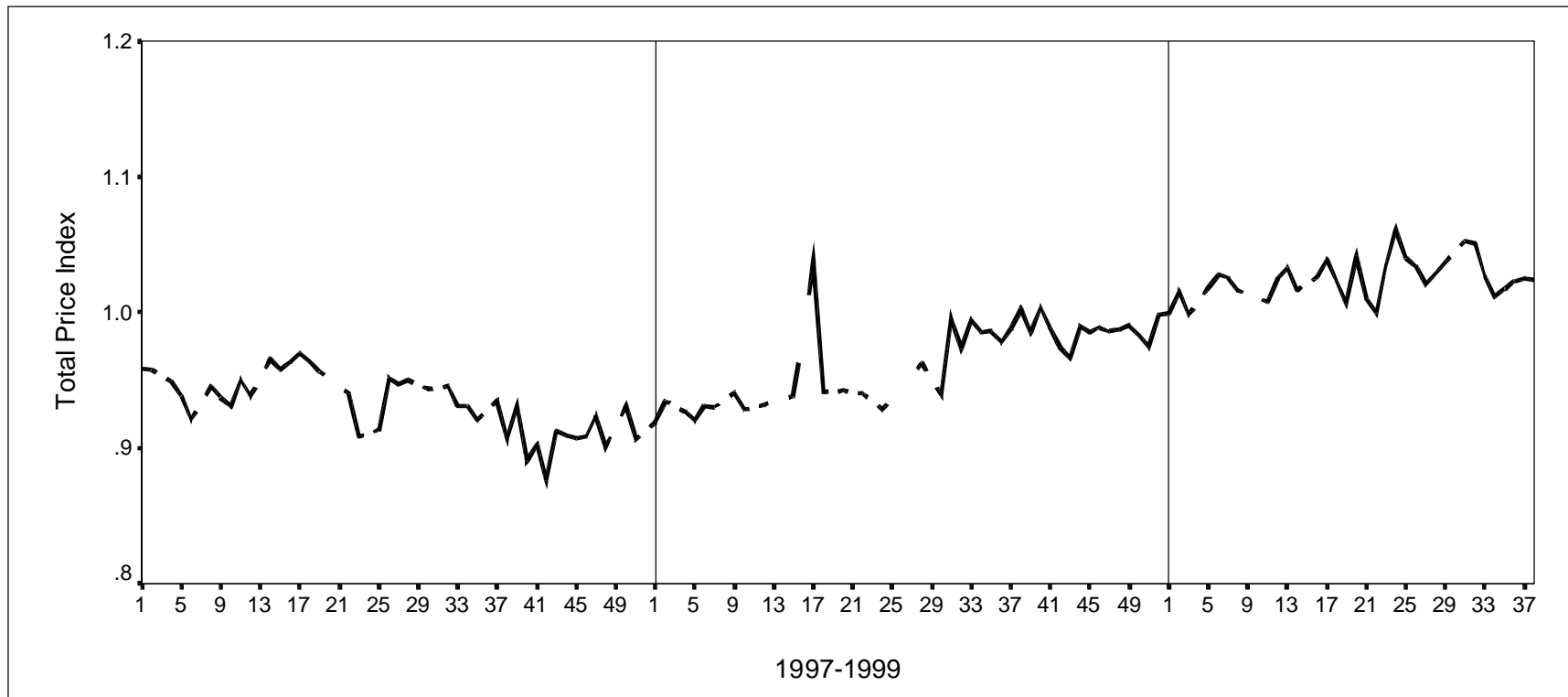


Figure 5. Wallingford Stop & Shop Total Price Index, 1997-1999

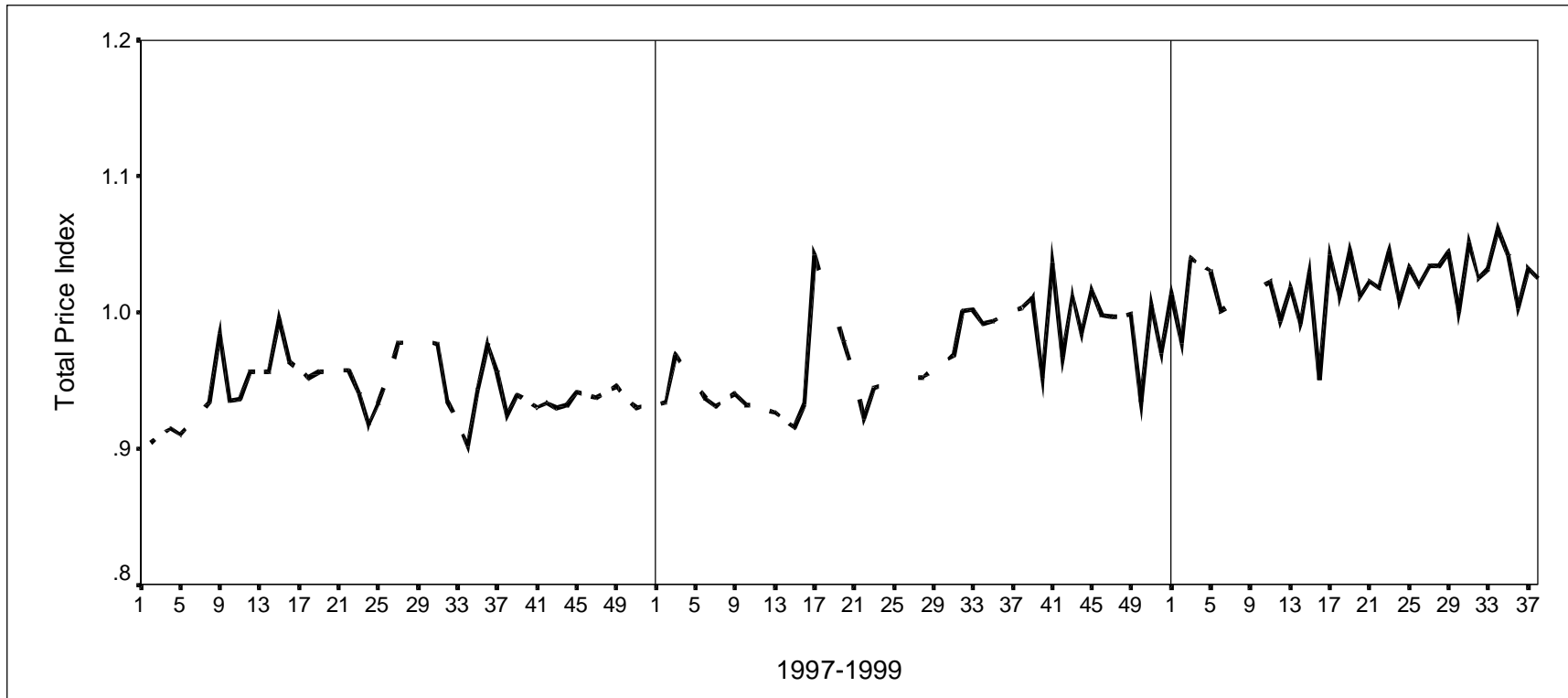


Figure 6. Waterbury Stop & Shop Total Price Index, 1997-1999

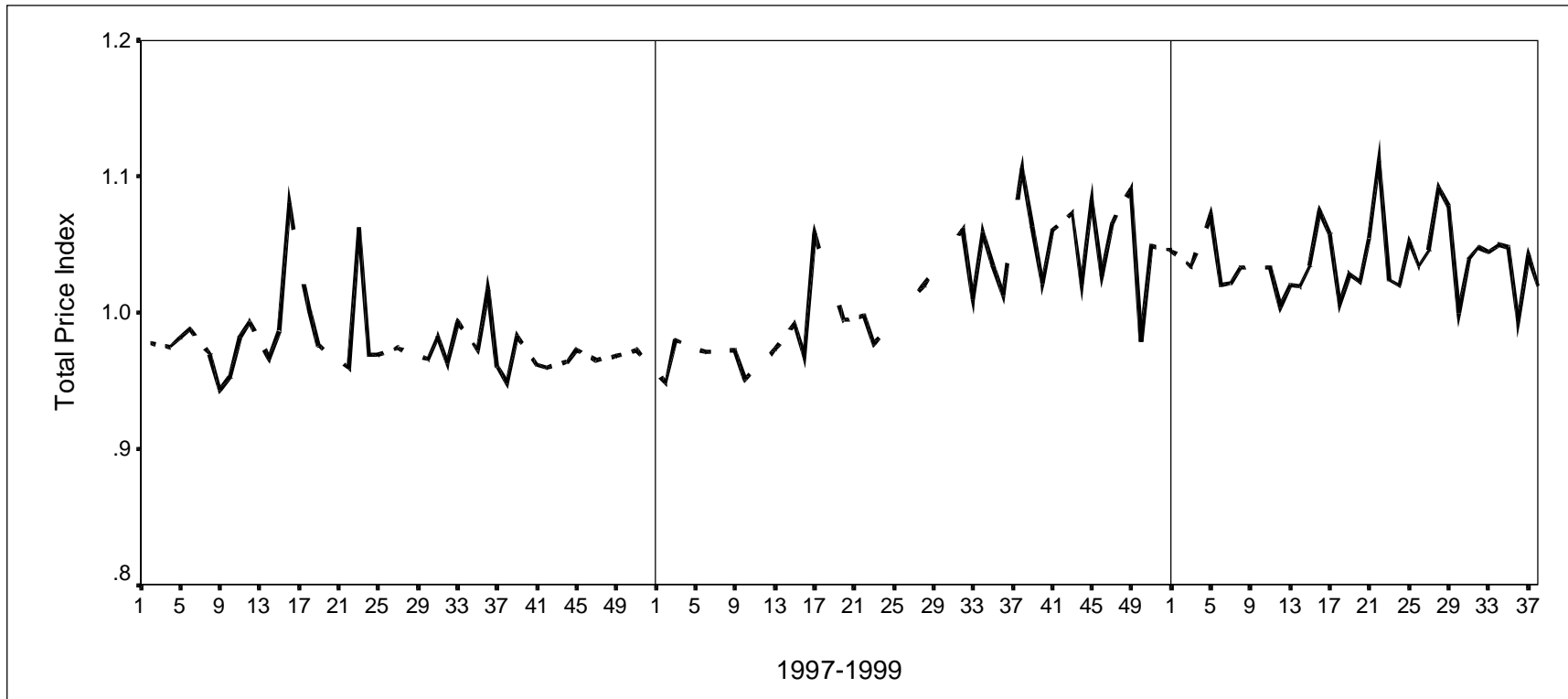
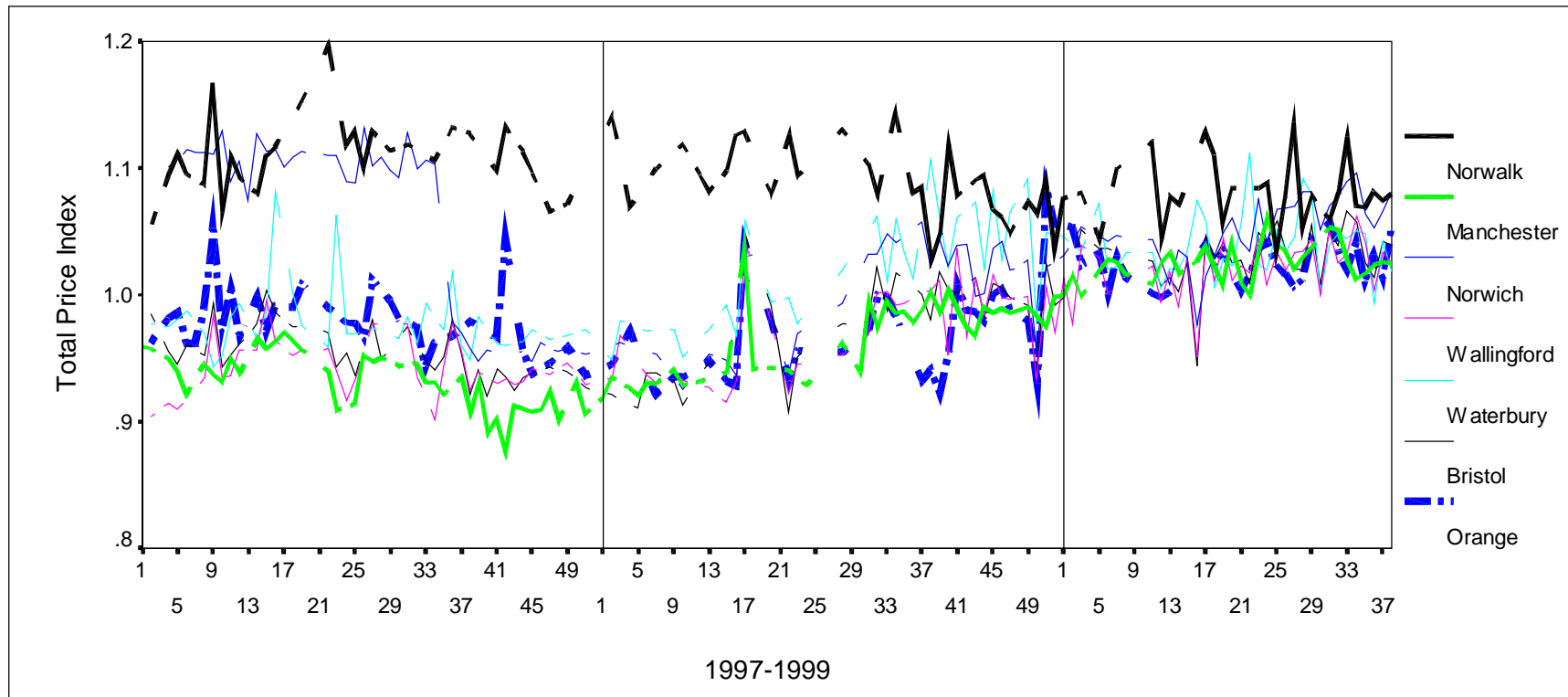


Figure 7. Stop & Shop Total Price Index, 7 Stores, 1997-1999



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