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The Public Interest and Private Economic Power: A Case Study of the Northeast Dairy Compact

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The Public Interest and Private Economic Power: A Case Study of the Northeast Dairy Compact

Executive Summary

KEY POINTS

- Contrary to the economic theory of a competitive market and prior studies, processor-retailer margins increased when farm level fluid milk prices were stabilized by the Compact.

- Investigation indicates no transmission of farm level price changes to the retail level in the before compact period, creating a serious resource allocation and farm income problem, and invalidating prior studies of the Compact's impact that rely upon farm-to-retail price transmission models.

- Marketing channel firms used Compact implementation to lock in wide margins.

- A dramatic shift in retail pricing strategy occurs at Compact implementation and subsequently.

- Brand level analysis corroborates the earlier finding that Garelick and private label retail prices increased more than Hood retail prices.

- Suiza's rise to dominance in New England fluid milk processing is related to rising Garelick and private label prices.

- Increasing retail concentration and the dominance of Stop & Shop and Hannaford is related to rising retail milk prices.

- Chain level analysis of branded milk sales establishes that Shaws, DeMoulas, Hood, and Guida were price mavericks for a short period after Compact implementation.

- Estimation of market and brand level elasticities documents that the exercise of market power is a source of wider margins and higher retail prices in the post-Compact period.

- In the supermarket channel in New England, estimated loss to consumers due to the Dairy Compact are 19 million dollars, and consumer loss due to the exercise of market power are 49.4 million dollars.

- The Dairy Compact increased farm income 128.5 million dollars; but only 51.5 million came from the supermarket channel and of that only 19 million dollars came from consumers with the rest coming from the Compact's price support feature.

- Decomposing retail prices into payments for factors of production and profits documents how meager the Compact's contribution to higher prices is in comparison to the increase in profit by channel firms. In a before and after model centered on Compact Implementation in July 1997 for all New England, retail prices increase 29 cents per gallon to $2.78 per gallon. The Compact accounts for only 4.5 cents of this increase. Increased profits by channel firms accounts for 11 cents. The remaining 13.5 cents is due to increases in costs other than milk and increases in the farm price above the Compact minimum due to fleeting strength in the raw milk market.

- The exercise of market power by channel firms shifts the industry to a more elastic region of the fluid milk market demand curve thereby reducing the effectiveness of the Federal Milk Market Order system and Compacts.

The Public Interest and Private Economic Power:
A Case Study of the Northeast Dairy Compact

Executive Summary

The Northeast Dairy Compact has established a price floor at $16.94/cwt or $1.46/gallon for fluid milk purchases from New England farmers since July 1997. This Study uses a standard "before and after" model to analyze the impact on consumers, farmers, and supermarket channel firms. We use Information Resources Inc. (IRI) brand level scanner data for the four New England IRI market areas: Boston, Providence, Hartford/Springfield, and Northern New England. The before Compact period contains 18 quad weekly observations from February 1996 through early July 1997. Before the Compact the Federal Market Order Class I price for fluid milk in New England was extremely volatile. The price processors paid for raw fluid milk averaged $1.40 per gallon but, due to the extreme price volatility, it had a high standard deviation, .102 (see Table 1 and Appendix Figure F1). The main purpose of the Dairy Compact was to stabilize the farm price and elevate it slightly for the benefit of farmers. The Dairy Compact stabilized price (i.e. standard deviation was reduced to zero) during the 15 quad week periods after July 1997 at $1.46/gallon. This stable price constitutes a 4.3% price increase (6 cents per gallon) over the average price paid by processors in the before Compact period.

The economic theory of pricing a processed product when its primary raw input price is volatile unequivocally predicts that implementation of the Compact should elevate consumer price less than the 6 cents per gallon increase paid by processors to farmers. Since the Compact reduced input price volatility, marketing channel firms face less price risk and the risk (insurance) premium that is built into their margins can be reduced. Conceivably, retail prices

could remain stable or even decrease if the reduction in the risk premium is equal to or greater than the 4.3% increase in the farm price.

Empirical studies of asymmetric price behavior also predict that consumer price would be unaffected or increase by less than Compact increases of the farm price. The Compact eliminates price drops by establishing a price floor at $1.46/gallon. Asymmetric pricing studies report that market channel firms pass on price increases to consumers but they do not pass on price drops. Therefore, one would expect that the Compact move to eliminate price troughs would benefit farmers but not hurt consumers. Under this scenario the program captures margin from processors and retailers.

Both the risk reduction and asymmetric pricing theories predict that the marketing margin, i.e. the retail-farm price spread, will narrow after Compact implementation. Consumer prices will be higher only if the margin reduction is less than the farm price increase. Contrary to economic theory, we find that the marketing margin increased. Consumer prices went up by more than the 6 cents per gallon average price increase that the Compact bestowed upon farmers. Retail prices in the 15 periods after the Compact implementation increased on average 18 cents per gallon in Boston and 20 cents per gallon in all of New England.

The primary conclusion of our study is that yet another economic force is at work in the New England dairy industry, the exercise of market power by retailers and processors to increase their profits. The Compact served as a focal point for tacitly collusive price conduct by retailers and processors.[1] Industry trade associations, their paid consultants, and the firms themselves, in an extensive and expensive public relations and political lobbying offensive sought to defeat the

[1] Tacit collusion or coordination can have the effect of raising prices to non-competitive levels to the detriment of consumers, and thus has been criticized by economists (Scherer and Ross 1990, p. 347, Levy and Reitzes 1993.) Tacit collusion or coordination is a relevant factor to consider in evaluating an acquisition under the antitrust laws

Compact. They repeatedly asserted that any price increase that took effect at the implementation of the Compact would be fully passed on to the consumers. The price paid by processors at Compact implementation increased only 6 cents per gallon over the average price paid in the prior 18 periods, and price volatility was effectively eliminated. The consumer price, however, increased 18-20 cents per gallon effectively matching the Compact's 18 cent per gallon increase in the fluid milk price over the IRI four week period prior to July 1, 1997.[2]

This retail price behavior in July 1997 was dramatically different from prior retail price conduct. When farm prices dramatically increased (or decreased) during the before Compact period, retail prices hardly budged. At Compact implementation, market channel firms moved jointly behind an 18-20 cent increase in retail prices to lock in the extremely wide marketing margins that existed in June 1997.

We find that the exercise of market power eroded and completely disappeared by the end of the 15 periods during which the farm price was pegged at the Compact minimum price, $1.46 per gallon. However, when the farm price then spiked above the Compact minimum, marketing channel firms reverted to asymmetric retail pricing and again locked in wide margins. Wide margins persist in the industry up to the present time and most of the expanded margin is not due to increases in the cost of manufacturing inputs other than raw milk.

(U.S. Dept. Justice, Horizontal Merger Guidelines, 1992, S 2.1). We do not address the legality, under the antitrust laws, of the conduct documented in this report.

[2] Those familiar with Compact implementation may be confused by these statistics because at implementation in July 1997 the Compact increased fluid milk prices $3.00/cwt from $13.94 in June to $16.94 /cwt in July. On a per gallon basis this is a 26 cent increase from $1.20 to $1.46 per gallon. Our IRI data are for four week periods, not calendar months. The last before Compact period ends June 22, 1997 so it contains part of May 1997 where the FMO Class I price was higher. Thus in our last before Compact period raw milk price is $1.28/gallon. Since we want to analyze the relationship between farm and retail prices one needs the same time period for both data series. We adjusted the raw milk price series to the IRI metric. The reported results are consistent with the 26 cent elevation and a similar impact on retail prices for a monthly data set. Since we use the average farm price in the before Compact period, not the June 1997 farm price, adjustment of the time unit to the IRI metric has no impact on our damage estimates.

In this report, we document major horizontal mergers, acquisitions and increasing horizontal market concentration at the retail and processing level. This structural shift has contributed to market channel firms ability to implement asymmetric pricing in New England markets. But for such increasing concentration and its impact on prices, it appears that the tacit price move by the industry at Compact implementation was being eroded by other input cost increases and competition by erstwhile mavericks.

A recent study of the Compact's impact by Lass et al. comes to a very different conclusion than this study. Their basic economic approach and empirical model, however, are seriously flawed. Since a key question is the impact of farm price changes on consumer prices, Lass et al. cut to the chase and estimate a farm-to-retail price transmission model. However, the Lass et al. model is too constrained. It ignores input price risk and the stabilization objective of the Compact. Lass et al. also use monthly data from 1982 through July 1996 to estimate the relationship between farm and retail price, however, the organization and price formation processes of the industry changed dramatically during that period. Changes include an historic shift from federal government dominated dairy markets to market driven prices in the late 1980's, and several time periods since when cooperative and/or state based over-order pricing programs were in place. Lass et al. make no attempt to control for these structural shifts or to discuss whether price conduct varies with the cause of the farm price change.

Finally, their model forecasts prices in the 12 months prior to Compact implementation (July 1996 to June 1997) very poorly. In fact, when we estimate a farm-to-retail price transmission model for the Boston IRI Data, we find absolutely no relationship between farm and retail prices during the February 1996 to June 1997 period. Recall that this is a period when

farm fluid milk prices were extremely volatile. If the retail price was ever to respond to farm price changes, it should have done so then. It did not.

Carried to its logical conclusion, the farm-to-retail price transmission empirical model, estimated on the most recent data prior to the Compact finds that the Dairy Compact had no impact on retail prices. Our contention, however, is that it is the wrong model. The IRI retail price data are very disaggregate. With price and quantity data by brand in each of the major chains in each of the regions four IRI markets, we analyze individual supermarket chain and processor pricing conduct. Our analysis documents that the region's dominant supermarket chains, Stop & Shop and Hannaford Shop N Save, were price leaders in the industry's move to higher prices and profit margins in response to the Compact. The retail price data strongly suggest but cannot definitely confirm that the region's dominant processor, Suiza Foods, tacitly cooperated with leading retailers, Hannaford and Stop & Shop, by pushing up other retailers' wholesale prices. To definitively prove this we would need Suiza's wholesale prices over the 1996 to 2000 period. Our market-wide demand curve analysis, however, indicates that wholesale price elevation for its Garelick and private label milk would be profitable. It is very unlikely that Suiza allowed the retailers to eat all of its lunch, i.e. capture all of the documented increase in channel profits for its Garelick brand milk and the private label milk that it supplies.

On another point often mentioned in the literature as a benefit to concentration, there is no evidence that scale economies at the processor level, if they exist, have been passed forward to consumers via lower retail prices. As a consequence of price elevation throughout New England, Garelick (Suiza) brand and private label milk (predominantly supplied by Suiza and Stop & Shop) clearly lose volume and market share to Hood. Price elevation and output restriction are the primary indicia of the exercise of market power. Key players in the New

England milk industry appear to be fighting the Compact in the marketplace as well as in public and political forums.

All firms were not equally sanguine in this drive to elevate prices. Early in the post-Compact period, the H.P. Hood company, Guida-Seibert Milk Company, Shaws, and DeMoulas resisted the price increases and attempted to buck the industry leader's commitment to locking in 18-20 cent increases in their marketing margins. When prices did not revert to lower levels, these erstwhile mavericks conceded and moved to the higher price and profit plateau of the others. Estimated market and brand level demand elasticities reported here support this new high price, high profit equilibrium.

To estimate the impact of the Compact and industry pricing conduct on consumers, we use a before-after model. Rather than use the average retail price in the before period, we use a linear trend to estimate the retail price immediately prior to Compact implementation. Since the retail price trend is up, using this estimated before-Compact implementation price rather that the lower average retail price for the before-Compact period increases the before-Compact price and farm-to-retail margin. This reduces our estimate of damages due to the exercise of market power.

Our estimate of the before-Compact price is forecast into the after-Compact period as follows. We adjust it upward for the 6 cent per gallon Compact increase and increases in marketing input prices (labor, electricity, and gasoline). The model's after-Compact forecast prices are also adjusted up for permissible pass though of the farm price spikes when the Class I price moved, for short periods, above the Compact price. The difference between the actual observed retail prices and this forecast retail is the price gap due to the exercise of market power by processors and retailers.

In principle, one could estimate the reduction in the risk premium due to the stabilization of the farm price by the Compact; however, we have not done so here. Our model allows marketing firms to keep all risk reduction benefits generated by the Compact stabilization of milk prices. In a competitive market channel, risk reduction benefits would be passed forward to consumers thereby reducing consumer losses due to the Compact.

We find that the Compact increased supermarket shoppers' milk costs in New England 19 million dollars between July 1997 and July 2000 (approximately 36 months). The exercise of market power by supermarket retailers and processors increased consumer milk costs another 49.4 million dollars for a total consumer loss of 68.4 million dollars. Fully 72 percent of the consumer loss in supermarkets is due to margin widening conduct by retailers and processors. These consumer loss estimates are relative to what consumers paid for milk before the Compact was implemented.[3]

We also examine, on a per gallon basis, the retail price increase that occurred in the after-Compact period relative to the before-Compact benchmark. This allows us to determine how much the retail price increased and to decompose the retail price increase into amounts due to the Compact, the farm price spikes above Compact, non milk input cost increases and increases in channel firm profits. The report contains results for each of the four market areas as well as all New England. Here we discuss only the latter.

Part of the increase in retail prices is due to increase in the price that processors paid for raw milk. In the before-Compact period the raw milk price that processors paid, what we call the farm price, averaged $1.40/gallon. In the after-Compact period the farm price increased to an average $1.51/gallon. Not all of this price increase was due to the Compact. In July 1997 the

Compact increased the farm price 6 cents per gallon (4.3%) over the before-Compact average price ($1.40/gallon). However, during the after-Compact period there were 10 four-week segments where the farm price spiked above the $1.46 Compact price and the Compact had no impact (0 cent increase) on the farm price. Therefore, on average across the entire after-Compact period, processors paid only 4.5 cents per gallon more for milk because of the Compact's minimum price rule. The remaining 6.5 cents per gallon increase in the average farm price is due to strong raw milk markets.

Retail milk prices were also affected by increases in processing costs other than raw milk and increases in distribution costs. We estimate that increases in these other costs are 7 cents. Thus, the total cost increase for milk marketed in the after-Compact period compared to the before-Compact period is 18 cents. We forecast the retail price to be $2.49 per gallon immediately prior to the Compact, and the average price in the after-Compact period increases to $2.78/gallon. Retail prices increase 29 cents per gallon when costs increase only 18 cents per gallon. The difference, 11 cents per gallon, is increased profits due to the exercise of pricing power by market channel firms during the after-Compact period.

Elsewhere the Dairy Compact Commission and others have correctly computed that the Compact has generated over 120 million dollars in increased revenue for New England dairy farmers prior to July 2000. We estimate that the Compact increased dairy farm income 128.5 million dollars in the July 1997 to July 2000 period. The corresponding number for the supermarket distribution channel, which sells approximately 40 percent of all fluid milk, is 51.5 million dollars. If supermarket consumers paid only 19 million dollars more due to Compact-induced higher farm prices that channel firms passed forward, where does the rest come from? It

[3] This study analyzes only the sales of major white milk brands and private label in supermarkets however they account for 95 percent of fluid milk sales in supermarkets. Supermarket major brand and private label sales account

comes from drops in the Class I price below the Compact price that New England farmers avoided because of the Compact.

What would have happened if the market channel firms had not exercised market power against consumers? In the after Compact period, their profit margin would have been the same as in the before Compact period except for the added profits due to risk reduction (Report Section II). Price increases at retail would have covered only increases in raw milk costs and other input costs. Supermarket consumers would have lost only 19 million dollars and farmers would continue to receive 51.5 dollars in added income from the channel. For farmers, 32.5 million dollars (51.5-19.0) of added income from the sale of milk in supermarkets comes from the Compact farm price support feature and farm prices below $1.46 per gallon that were avoided.

To summarize, if market channel firms do not exercise market power, farmers continue to benefit from the Compact's price floor provision and the modest transfer from consumers (6 cents per gallon when the Compact price floor is in effect). Processors and retailers keep the same profit level as before the Compact plus profits from risk reduction. With a modicum of margin reduction by processors and retailers to reflect the benefits of input-price risk reduction, consumer loss would be lower than 19 million.

The impacts that this study reports, except for the exercise of market power by processors and retailers, are consistent with the rationale for the Northeast Dairy Compact. The exercise of market power in the marketing channel has distorted actual market performance to the benefit of processors and retailers at an expense to consumers that is far greater than the impact of the Compact on consumers. This suggests that the major policy issue now facing New England consumers of fluid milk is not the Northeast Dairy Compact. It is the exercise of market power

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for approximately 40 percent of all fluid milk sold in New England (Figure 11).

by the region's leading retailers and milk processor. There seems to be a clear and important role for the Northeast Dairy Compact Commission.

There is a need to monitor the price and margin performance of the New England milk industry. There is a need to ensure that competition is effective, and that consumer milk prices accurately reflect the cost of producing, processing, and distributing milk. The Commission's work could contribute to future antitrust enforcement or eliminate the need for enforcement if firms respond competitively to public scrutiny.

The need for effective competition is even more critical in the fluid milk industry than other food industries. Increasing concentration and the exercise of market power in the channel by processors and retailers is a direct attack on the classified pricing system of the Federal Milk Marketing Order system and the Northeast Dairy Compact. Classified pricing sets a price for milk sold to processors of fluid milk (the inelastic product) that is higher than the price for milk used in manufacturing (elastic products). Since the 1930's, the U.S. Congress and state legislatures have used or authorized the use of classified pricing to stabilize and increase dairy farm income. In an effectively competitive milk marketing channel, the inelastic fluid market demand curve can only be exploited by government and in a fashion that is deemed in the public interest.

Now with the increase in concentration and dominance in many local processing and food retailing markets, private firms are capturing the ability to price off the market demand curve. Profit maximizing firms will elevate price until quantity purchased is reduced to the level where demand for the product becomes elastic. As milk channel firms exercise market power to elevate prices, inelastic demand becomes more elastic. As a result, the ability of public agencies to increase dairy farm income via classified pricing is reduced. If milk prices are elevated to the

level where market demand is elastic, then public classified pricing programs are completely ineffective. Is this the future path of the U.S. dairy industry?

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I. Introduction

Dairy farming is an integral part of New England history and the classic New England landscape. The Northeast Dairy Compact was established to provide participating states, to date the six New England states, the opportunity to slow or possibly stop the disappearance of dairy farms due to low and highly volatile milk prices. Since July 1997 the Dairy Compact Commission, which includes consumer and dairy industry representatives as well as farmers, has set a minimum price that processors must pay for fluid milk, i.e. milk processed for consumption as a beverage. That price is $16.94 per hundredweight or $1.46 per gallon. Processors have paid this price except for two short supply periods when the federal market order price moved above $16.94/cwt and fluid processors paid higher prices for raw milk.

The Dairy Compact was vigorously opposed by many groups including the International Dairy Foods Association (IDFA), the trade group for the firms that process and distribute fluid milk, and the Food Marketing Institute, the trade association for supermarket chains. Some organized consumer groups, most notably the Consumer Federation of America, opposed it because they believed that it would elevate consumer prices. These groups continue to oppose the Dairy Compact and actively seek that it not be extended beyond its 2001 sunset date.

This report uses Information Resources Inc. (IRI) supermarket scanner data and other data to do a study of the supermarket channel. The supermarket channel is the leading distribution channel for fluid milk, accounting for approximately 40 percent of total fluid milk sales in New England. This report evaluates the Dairy Compact's impact, the impact of marketing channel firms' responses to the Compact, and the impact of increasing concentration at the processor and retail level on consumers, farmers, and firms in the market channel. First, it

examines the Compact's impact on prices paid by fluid processors for raw milk and its impact on raw milk price volatility experienced by fluid processors as well as farmers. Then we examine the response by processors and supermarket retailers by examining how retail prices and the marketing margin, the difference between retail and farm level prices, changed after Compact implementation. We find that Compact implementation was a focal point event that facilitated tacitly collusive pricing at the retail level.[4] Increased horizontal market concentration during the period at both the processing and retailing stages of the market channel also contributed to noncompetitive retail pricing. Price enhancement via private economic power has occurred and continues in New England milk markets. Finally, we use a before and after Compact damages model with controls for increases in non Compact related increases in raw milk and other input costs to estimate the impact of the Compact and processor/retailer market power on consumers.

Our basic conclusion is that leading firms in the supermarket marketing channel have used, and continue to use, their dominant market positions to elevate retail milk prices well beyond levels justified by the Dairy Compact Commission action. These higher prices and related consumer losses have been erroneously attributed by many observers to the Compact's operation and short supply conditions at the farm level. We estimate that consumer losses in supermarkets for all of New England due to the exercise of market power in the marketing channel total 49.4 million dollars for the July 1997 through June 2000 period (3 years). Consumer losses in supermarkets due to the Compact for all of New England are only 19 million dollars. Thus 72 percent of the price elevation in the supermarket distribution channel is due to exercise of market power by processors and retailers. This estimate controls for increases in

[4] Tacit collusion or coordination can have the effect of raising prices to non-competitive levels to the detriment of consumers, and thus has been criticized by economists (Scherer and Ross 1990, p. 347, Levy and Reitzes 1993). Tacit collusion or coordination is a relevant factor to consider in evaluating an acquisition under the antitrust laws

non-milk processing, distribution, and marketing costs. Our finding that 72% of the 68.4 million dollars increase in New England consumers milk bill at supermarkets is due to increased profits by supermarket retailers and milk processors is a startling conclusion; however, the facts and valid economic analysis support it.

A more general conclusion is that the exercise of private economic power by dominant firms in highly concentrated food processing and supermarket retailing markets can thwart public policies. To date, nearly all discussion of agricultural price and income policies have assumed that the post farm- gate market channel is competitive. When it is not, leading firms can influence, and in many cases, diminish or possibly defeat government initiatives in the market place.

II. Contrary to the Economic Theory of a Competitive Market and Prior Studies, Processor-Retailer Margins Increased when Farm Level Fluid Milk Prices were Stabilized by the Compact

When establishing the Dairy Compact, Congress and the USDA fully expected that reducing input price risk would lower the marketing margin of firms that process, distribute and retail milk. The Final Rule for the Dairy Compact Commission gives the following as a basic rationale:

> The Northeast Interstate Dairy Compact enables participating States collectively to regulate the New England farm price for Class 1 fluid milk, thereby enhancing and stabilizing dairy farmer income. … Other goals are to stabilize processor and retailer costs and consumer prices.
> Concomitantly, the findings of Hahn, et al.[5] with regard to the variability of milk farm prices and asymmetric price transmission are the basis for the theory that an Over-order Price Regulation on Class 1 fluid milk which brings about stable farm prices for Class 1

(U.S. Dept. Justice, Horizontal Merger Guidelines, 1992, S 2.1). This paper does not address the legality, under the antitrust laws, of the conduct documented in this report.

[5] Hahn, et al. 1994. Determinants of the Farm-to-Retail Milk Price Spread. Agricultural Information Bulletin #693, March.

> fluid milk will result in price stability—and potential price decreases—in Class 1 milk at the retail level for consumers over a period of time. [Federal Register, 5/30/97, p. 29629]

The basic idea of asymmetric price transmission theory is that retail prices rise when farm prices rise, but that retail prices do not drop as much when farm prices fall back to their original level. But for changes in other costs, firms prevent retail prices from dropping through the exercise of market power. Therefore, if the Compact eliminates farm price drops via its minimum price rule, it captures margin from the marketing channel firms. Due to asymmetric pricing, consumer prices do not decline if the Compact does not exist, so the Compact does not hurt consumers.

Congress also recognized that the Compact should reduce the marketing margin for another very powerful economic reason. Appendix H reprints verbatim from the Commission's Proposed Rules (Federal Register, April 28, 1997, p. 23049) an excellent discussion of the theory and empirical research that analyzes the impact of risk on the marketing margin. Business firms generally are risk averse, e.g. they buy insurance to avoid the sudden costs of adverse events. According to economic theory for risk averse firms, when one reduces or eliminates input price risk the margin for firms in a competitive market channel unambiguously narrows (Turnovsky, 1969; Brorsen et al., 1985; Holt, 1993; and Saleh, 1990). Azzam (1991) demonstrated that this also holds when the channel is an oligopoly, i.e. relatively few large firms who are not price takers in input and/or output markets operate in the channel.

Intuitively, when one reduces or eliminates input price risk firms no longer have a risk premium (an "insurance" payment) as part of their cost of doing business. This lowers costs and the marketing margin. Therefore, when the Compact lowers the variability of the price paid by processors for fluid milk, the marketing margin is expected to narrow and offset part or all of the Compact's increase in that price. When comparing mean (average) monthly retail prices for a

time period immediately before the Compact to mean retail prices for a time period immediately after Compact implementation, mean retail price should go up less than the Compact's increase in the mean farm price for the same time period.

To summarize, there are two economic hypotheses that predict the Compact will narrow the marketing margin thereby reducing, or possibly offsetting entirely, the farm level price increase. Asymmetric price transmission and input price risk reduction both predict lower margins. In the rest of this section we evaluate the risk reduction hypothesis. In the following section we examine the asymmetric pricing hypothesis.

Using Information Resources Inc. (IRI) data, the announced Federal Market Order Class I price, and the Northeast Dairy Compact prices, one can analyze the risk reduction hypothesis. The IRI Infoscan Scanner data that we use in this report and the underlying IRI markets in New England are described in Appendix G. The New England IRI markets are Boston, Hartford/Springfield, Providence, and Northern New England. Also discussed in Appendix G is our decision to focus on the major brands of white fluid milk, which account for more than 95% of the volume of white fluid milk in each New England IRI market area. We construct what we will call the "farm price" for fluid milk from the Class I and Compact prices. For the 18 four-week periods prior to the implementation of the Compact (the period ending 3/6/96 through the period ending 6/22/97) the farm price for fluid is the announced Class I price for Boston. For observations after Compact implementation in July 1997 the farm price is the higher of the Class I or Compact prices.[6] We compute the marketing margin in the supermarket channel by subtracting the farm price for fluid milk from the IRI retail price.

[6] Bailey (2000), and Dhar and Cotterill (1999) use the announced cooperative pay price for Class I milk in Boston instead of the FMO class 1 price. This price is the price charged by the Agrimark Cooperative, and it is somewhat higher than the Class I price because it includes charges for milk assembly services and balancing performed by the cooperative. A large share of milk, however, is purchased directly from farmers by processors at the Class I price.

To analyze the impact of input price risk on the marketing margin we use the mean variance approach first advanced by Friedman and Savage (1948) in a before and after Compact model.[7] The volatile input price, a random variable, is decomposed into a central tendency, its mean value, and volatility as measured by its variance or standard deviation (the square root of variance). One does this for both the before and after Compact periods. Then we examine the impact of the Compact on the mean value and the standard deviation of the farm price and the marketing margin (Tables 1a, 1b).

When the Compact was implemented in July 1997 it raised the farm price 6 cents a gallon over its mean (average) price for the 18 preceding "before" Compact observations (Table 1a). Given the supply and demand conditions at that time, processors and retailers fully expected that this over-order premium price would persist for the near term future. In fact, the farm price remained pegged at $1.46/gallon for the next 15 periods. Table 1a defines the "after" Compact period as these 15 observations from July 1997 through August 1998.[8]

To evaluate the risk reduction hypothesis, note first in Table 1a, that the standard deviation for farm prices was reduced by the Compact from .102 in the before Compact period to zero in the after Compact period. Processors paid on average 6 cents a gallon more for milk, but their input price risk was totally eliminated.

Turning now to the farm-to-retail milk price spread, i.e. the marketing margin, lets first examine the Boston market (Table 1a). The marketing margin for all milk sold through supermarkets in Boston averaged $.98/gallon in the before Compact period, but the elimination

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The two series are highly correlated. The margin widening behavior that we observe in this study was not due to Agrimark raising its full service prices. In fact the cooperatives premium (margin) narrowed after the compact: the action and power lies elsewhere in the channel.

[7] For more information on the mean variance approach to decision-making in risky markets see Haley and Schall, (1973), any other corporate finance text, or the agricultural economics research cited in this section..

of input price risk did not, as expected, decrease the margin after Compact implementation. To the contrary, it increased 12 cents per gallon to $1.10/gallon. Thus retail prices increased 18 cents, 6 cents to cover the increase in average raw milk price and another 12 cents to widen the marketing margin, even though input price risk was effectively reduced to zero. At the same time the standard deviation for the all Boston milk marketing margin decreased 80 percent from .109 to .021. Marketing firms clearly used the Compact implementation to elevate and stabilize their margins. Retail prices increased well beyond the level needed to cover increased farm level milk prices.

To explore who took the lead in this price elevation activity, Table 1a also gives before and after Compact marketing margins by brand and by supermarket chain for the Boston market. Hood's margin increased only 2 cents per gallon and its after Compact margin was the least stable of the three brands. Clearly Hood was more willing to compete on price. Garelick/Suiza's margin increased 9 cents per gallon and supermarket chain private label milk increased the most, 13 cents per gallon. Supermarket private label margin variability also dropped the most. Its standard deviation dropped over 80% from .113, before the Compact, to .019, after the Compact.

When one decomposes the Boston marketing margin by supermarket chain one finds that Stop & Shop milk had the highest margin increase, 15 cents/gallon, and that its higher margin was the most stable margin in the after Compact period with a standard deviation of .014. This is an 88% reduction from its before Compact level, .123. This means that when farm prices went up 6 cents per gallon compared to average before Compact prices, Stop & Shop added another 15 cents, and consumers paid an additional 21 cents per gallon for milk in the post Compact period.

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[8] Appendix K contains farm-to-retail margins for the total post-Compact period (July 1997 through July 2000). Here we focus on the first 15 periods post-Compact where the farm price was flat at $1.46 per gallon. This period

Star Markets also increased the marketing margin by 15 cents a gallon and stablilized prices at the higher level. DeMoulas and especially Shaws seem to be somewhat more competitive with lower margin increases and more retail price volatility in the after Compact period. Nonetheless the marketing margin on Shaws milk expanded 9 cents/gallon; it expanded 12 cents per gallon on DeMoulas milk.

Table 1b gives similar marketing margin statistics for Hartford, Providence, Northern New England, and for all New England, the aggregation of the four markets. The marketing margin for all milk sold through supermarkets increased much more in the other three areas than it did in Boston. It increased 16 cents in Hartford and Northern New England and 14 cents in Providence. For all of New England the marketing margin increased 14 cents after Compact implementation.

At the brand level in Table 1b, Hood's margin went up less than other brands in the three markets. For all New England, Hood's margin increased 5 cents whereas Garelick's increased 11 cents after Compact implementation. The smaller brands in Table 1b experienced even higher margin increases than Hood and Garelick. Finally, private label margins increased 15 cents in Hartford and 14 cents in Providence and Northern New England. For all New England private label margin increased 13 cents.

Stop & Shop's margin in stores throughout New England increased 17 cents and Hannafords increased 19 cents. When compared to the all New England all milk margin increase, 14 cents, this indicates that the two leading firms priced more aggressively than all other supermarkets in New England after the Compact. They clearly were price leaders in the market power game.

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gives a more robust test of price conduct at Compact implementation in response to farm price stabilization.

For all New England, retail prices tended to increase 20 cents per gallon above the pre Compact average price (Table 1b). When processors and retailers shifted to their new price strategy, actual channel marketing margins widened. As we shall show in the next section this occurred because the Compact was implemented at a time of severely depressed farm prices when sticky retail prices already had generated very wide marketing margins. Market channel firms response to the Compact locked in those wide margins.

We conclude that the impact of input risk reduction on marketing margins, an impact that economic theory clearly and unambiguously predicts will offset part or all of the Dairy Compact's 6 cents/gallon increase in mean raw milk prices, is being swamped by another economic force. Similar to the ethyl case (Hay, 1999) and as suggested by the focal point theorem (Schelling, 1960) the implementation of the Compact, a distinct non-market event with considerable signaling of price intentions, seems to have facilitated tacitly collusive pricing by processors and retailers. Firms knew that the farm level price of fluid milk was going to increase in July $0.18 per gallon over its June 1997 price due to the implementation of the Dairy Compact.[9] Moreover both processors and retailers knew that the farm price would remain constant at that level into the near term future. In it's proposed rules the Compact Commission wrote on April 28, 1997:

> The price established by this rule will be a certain one; Berthiaume suggests that the combined, federal Order and Compact Over-order price will not vary for the six month term of its duration. At least for the short-term duration of this price regulation, the

[9] Those familiar with Compact implementation may be confused by these statistics because at implementation in July 1997 the Compact increased fluid milk prices $3.00/cwt from $13.94 in June to $16.94 /cwt in July. On a per gallon basis this is a 26 cent increase from $1.20 to $1.46 per gallon. Our IRI data are for four week periods, not calendar months and the last before Compact period ends June 22, 1997, so it contains part of May 1997 where the FMO Class I price was higher. Thus in our last before Compact period raw milk price is $1.28/gallon. Since we want to analyze the relationship between farm and retail prices one needs the same time period for both data series. We adjusted the raw milk price series to the IRI metric. The reported results are consistent with the 26 cent elevation and a similar impact on retail prices for a monthly data set. Since we use the volume weighted average farm price in the before Compact period, not the June 1997 farm price, this adjustment of the time unit to the IRI metric has no impact on our damage estimates.

> uncertainty of price variability in the region's Class I market will have been significantly reduced if not eliminated. [Federal Register, 4/28/97, p. 23049]

In the public relations and political battle that surrounded the Compact, industry spokesmen asserted that any announced Compact increase would be fully passed on to consumers and result in permanently higher milk prices. The Compact Commission acknowledged but dismissed the International Dairy Food Association's paid economic consultant's written claim on this point. The Commission wrote:

> The Commission recognizes that at least one comment suggested that the "impact" of any price regulation would be a straight dollar-for-dollar "pass through" from processors to consumers resulting higher retail prices. Alan Rosenfeld, December 19, 1996 at pages 183 et seq. The Commission is not persuaded by Rosenfeld's predictions for several reasons. It is, in the Commission's view, contrary to the weight of the comments submitted and the prevailing economic literature and anecdotal evidence. More fundamentally, however it is not descriptive and provides no reasoned explanation for the conclusion expressed therein. Nor does it respond in any way to the comprehensive literature suggesting precisely the opposite conclusion. [Federal Register, 4/28/97, p. 23049].

In retrospect, Rosenfeld was correct because the market channel firms exercised market power.

At Compact Implementation in fact many supermarket chains, including Stop & Shop, posted signs in their stores attributing all of their retail milk price increase to the Compact. The sign in Stop & Shop stated:

> Due to the increased cost of milk caused by the new "Northeast Compact" authorized by the U.S. Congress and signed by the U.S. Secretary of Agriculture, we have had to increase our milk prices. We hope this poses no inconvenience to anyone. [Massachusetts Dept. of Agriculture]

III. Investigation Indicates No Transmission of Farm Level Price Changes to the Retail Level in the Before Compact Period, Creating a Serious Resource Allocation and Farm Income Problem, and Invalidating Prior Studies of the Compact's Impact that Rely Upon Farm-to-Retail Price Transmission Models.

Graphs of retail prices, farm price, and marketing margins over the February 1996 to July 2000 period reveal a great deal of additional information on milk pricing. Figure 1 displays the

farm price for fluid milk and the all milk retail price for the Boston IRI market.[10] The vertical line in July 1997 identifies the implementation of the Compact. In this section we examine the relationship between farm and retail prices before the Compact.

Examination of Figure 1 is startling. Forget about an asymmetric retail price response to farm price moves in the before Compact period. Visual inspection suggests and statistical analysis confirms that there is absolutely no relationship between farm and retail prices.[11] Farm price fluctuates widely about its $1.40 per gallon average price over the 18 pre-Compact periods, but price transmission from farm to retail is virtually non existent. Retail prices march to a different drum and increase in a steady fashion throughout the period. The same result holds for Hartford/Springfield, Providence, and Northern New England (See charts A1, B1, and C1 in the Appendices.) Strong farm-to-retail price transmission exists in at least one other milk market. Figure 2 for the New York City market reveals that retail prices are very responsive to changes in Farm Prices.[12]

Another fact is clear when examining the before Compact relationship between farm and retail prices in Figure 1. Retail prices are not being set by marketing firms that are maximizing profits or using mark-up pricing in the current period or with a few lagged periods.[13] Under both of these behavioral models, retail prices would be very responsive to changes in the major input price in a fashion that would be clearly visible in Figure 1.

These are not trivial points for the analysis of the Compact. Agricultural economists have traditionally assumed perfect competition, no risk, and profit maximizing or mark-up

[10] Charts for the other market areas are similar and are in the Appendix.
[11] One reviewer questioned whether farm and retail prices would be related if our before period was longer. Figure F1 in Appendix F graphs the Class 1 price commencing with January 1993. Farm prices clearly are not as volatile prior to February 1996, the advent of our sample. Thus, we conclude that if farm price volatility effects retail prices in this market, it would have done so during our before period.
[12] This result may very well be due to the state's maximum markup law. It states that retail prices on at least one brand usually private label, can be no more than twice the FMO Class I raw fluid milk price paid by processors.

conduct based on costs in the current period and/or a few lagged periods when they have specified farm-to-retail price transmission models (e.g. Hein, 1980; Kinnucan and Forker, 1987). Recently, Lass et al. (2000, 2001) used this approach to frame a transmission model to analyze the impact of the Compact. It ignores the risk reduction hypothesis and generally is too constrained to capture recent price conduct in New England retail milk markets.

Lass et al. depart from a standard before and after impact analysis of the Dairy Compact. Rather than use all the data prior to Compact implementation to estimate their model, they only use monthly data from 1982 up to June 1996. Then they forecast prices in the 12 months prior to the Compact as well as 6 months after the Compact. As Figure 1 in Appendix E indicates, their model does a very poor job of forecasting prices in the 12 months prior to Compact implementation.[14]

One has to question their extended time series approach for another reason. It ignores the major structural changes that have occurred over the January 1982 to June 1996 period. Farm level milk pricing shifted from a government price support driver to commodity cheese and butter market drivers in the late 1980s. Over-order pricing shifted in and out of the New England market (Regional Cooperative Marketing Agency (RCMA) and state supported RCMA eras). The structure of New England milk processing shifted in complex ways during the period, including the dissolution of the Hood-Agrimark joint venture and steady processor consolidation. Supermarket consolidation also occurred in the New England area. To assert that the farm-retail price relationship is immutable over 15 years when major structural changes have occurred is too crude to capture recent pricing conduct in this industry.

[13] See Cotterill and Putsis, (forthcoming 2001), for tests for markup and/or profit maximizing prices.
[14] This figure is Figure 2 in the Lass et al. study.

Finally, and perhaps most important, is the following fact: if the traditional farm-price transmission model is applied only to the data immediately prior to the Compact (in our data set the 18 before Compact observations) one obtains dramatically different results. In Table 2, we estimate different versions of the Hein mark-up model. Regressing retail price on the farm price, or the farm price plus farm price lagged one and two months, produces a model so weak that the ordinary least squares (OLS) adjusted R^2 are negative. Using generalized least squares (GLS) to correct for auto-correlation also fails to establish a significant statistical relationship between farm and retail prices. Even when one controls for the prices of other marketing inputs there is no significant relationship between farm and retail prices. The best and only statistically significant predictor of retail price in these transmission models is the intercept term, which effectively is the average farm price in the before Compact period. This result is strong support for our mean-variance approach.

The Boston area Consumer Price Index (Table 2, equation 5) does a far better job of predicting retail milk prices than does the farm price. It has an adjusted R^2 of .711, i.e. variation in the CPI explains 71.1 percent of the variation in retail milk prices. In comparison, variation in the farm price (equation 1) explains –5.8 percent (i.e. none) of the variation in retail prices. A time trend variable (Table 2, equation 8) performs slightly better than the CPI with an adjusted R^2 of .74.

Since retail prices are not related to farm prices in the before Compact period, the farm-retail price transmission model predicts that retail prices at and after Compact implementation do not increase. The Compact has no effect on retail prices because no change in farm price has an impact on retail prices. Thus, all of the observed retail price elevation is due to changes in the conduct of the marketing firms. In other words, it is due to price increases of other inputs and/or

the exercise of market power. This strong conclusion of no Compact impact on consumers contrasts starkly with the Lass et al. results.

SIDE BOX: A DIGRESSION ON THE ABSENCE OF FARM-TO-RETAIL PRICE TRANSMISSION

The absence of farm-to-retail price transmission is not a trivial point in this market or in many other agricultural product markets. A General Accounting Office study confirms poor farm-to-retail price transmission was widespread in fluid milk markets during this time period:

From January 1996 through February 1998, retail fluid milk prices remained constant or increased in 27 markets and decreased in 4 markets. In contrast, farm prices decreased in 27 markets and remained constant in 4 markets. As a result of these price changes, the farm-to-retail price spread increased in 27 of the 31 markets over the 26-month period. [GAO, p. 35]

The uncoupling of retail prices is also very common in other food marketing channels.[15] Unresponsive or perverse retail price movement means that a supply imbalance at the farm level exacerbates farm level price volatility. Consumer purchases don't expand when supply is long and farm prices are low; and, they don't contract when supply is short and farm prices are high. Farmers bear the full impact of market price movements to short run equilibrium.

One of the primary reasons for the shift to the ill-fated Freedom to Farm Policy in the mid 1990's was the hypothesis that "free market" agriculture would allow prices to allocate resources more efficiently than government price stabilization and production control programs. This move was also expected to enhance farm income. Yet the Freedom to Farm policy was predicated upon a competitive marketing channel and responsive retail prices to help dampen volatile farm prices. In fact unresponsive or perverse retail prices have exacerbated farm price volatility. This, coupled with farmer's perennial tendency to overproduce and enmesh themselves in the classic over-production trap, has generated an agricultural depression that has required more, not less, federal dollars for farm relief since passage of the Freedom to Farm Act. This race to over-production benefits the marketing channel firms that procure raw agricultural products at cheap prices. The out-of-control agricultural economy cost the federal government $28 billion in 2000 and is destroying the American farmer (Egan 12/24/2000).

One might proffer that one could "fix" the lack of price transmission in these models by suggesting that retail prices are based on a "long run" moving average of farm level prices. For

[15] Hog prices fell 39% from September 1997 to September 1998, but retail pork prices for the same period dropped only 1.5% (Tevis, 2000, p. 49). Also consider navel oranges. To raise public knowledge of the inflexible retail price problem, Western Grocers publishes weekly farm and retail navel oranges prices on its website. Writing on this issue, a *Los Angeles Times* reporter declares: "It's been a punishing year for most California orange growers. But you'd never know it by checking out the produce aisle. Although prices paid to farmers for this season's big crop of navel oranges have plunged, supermarket prices in many cases have jumped outpacing even last year when a freeze wiped out two-thirds of the crop. Quality problems and competition from imports have helped drive down farm prices for navel oranges to their lowest levels in years, as little as 6 cents a pound according to the Department of Agriculture. Meanwhile, the major Los Angeles-area supermarkets this week were charging 89 cents to 99 cents a pound for the fruit. The retail price for March is averaging $1.01, according to the Western Growers Association, a produce trade group" (Fulmer, 2000).

example, a 12 month average that smoothes out the monthly farm price cycle of the before Compact period might be significantly related to retail prices. Yet such a long-run market-smoothing theory does nothing to solve the short-run resource allocation and income variability problem, or the persistent long-run tendency to overproduction and low farm prices. Also, a long-run moving average model suggests that marketing firms have market power. In a competitive channel, firms would find it profitable to deviate from the "long-run" retail prices to generate retail prices that respond to more immediate changes in farm prices. Market channels that lack short-run price transmission are not competitive.

One might also suggest that farmers can use the recently established dairy futures markets to hedge. To us, however, this amounts to coping with a problem in the price system rather than fixing it. Also, the future's contracts are new and imperfect, and hedging is very demanding on a dairy farmers ability to forecast future prices. Dairy farmers in the first instance are not commodity analysts. Historically they have relied upon their cooperatives and public policies to create markets wherein they can focus upon what they do best, farm management issues related to the production of milk.

IV. Marketing Channel Firms Used Compact Implementation to Lock in Wide Margins

Before developing an alternative to the price transmission approach for impact assessment, let us analyze price conduct in New England milk markets in more detail. If you wish to opt out and want to move directly to our impact analysis jump to Section XI.

Figure 3 confirms that Boston retailers and/or processors locked in historically high marketing margins when the Compact was implemented in July 1997.[16] Notice that the margin for each brand was highest in the before Compact period during the 7 periods preceding the

Compact. As seen in Figure 1 this was due to low farm price. Margins do not narrow in July 1997 as one would have expected based upon prior observed price conduct in this market and economic theory. Hood and Garelick margins drift down during the first Compact price peg period (July 97 through August 98) but private label remains quite stable. When farm prices spike starting in September 98 and again in September 99, margins temporarily narrow but the trend in 1999 and 2000 is clearly up in a very strong fashion. Also the Hood premium over Garelick narrows and disappears by the end of the period. The margin on these two brands relative to private label clearly widens during this period and the underlying private label margin also widens.

V. A Dramatic Shift in Retail Pricing Strategy Occurs at Compact Implementation and Subsequently

Returning to Figure 1, note that just before the implementation of the Dairy Compact the spread between the retail and farm price was historically very wide. In fact, it was wider than at any other time during the before Compact period because the farm price was in a deep trough. This was the time to put a program such as the Compact into effect. Farmers clearly needed price relief and marketing firms had such fat margins that they could absorb an over-order premium without elevating retail prices. At least this is what reasonable observers would conclude after viewing the retail and farm price trends from February 1996 through June 1997 and the crystal clear lack of a relationship between them.

Now enters the difference between "could absorb" and "would absorb." In July 1997 retail milk prices in Boston went up 18 cents/gallon in response to the farm price increase of 6 cents/gallon over the average farm price of the before Compact period. Marketing firm price

[16] Similar charts for the other market areas are in the Appendices A, B, and C.

conduct shifted dramatically at the time of Compact implementation. Before the Compact, retail prices moved slowly higher along a very stable linear trend. Then retail prices jerk to life in lock step with the Commission's move.

After Compact implementation retail prices stabilized at the new higher margin level for as long as farm prices remained pegged at the $1.46/gallon level. When farm prices moved above that level in September 1998 and again in September 1999, retail prices again respond to the increase. When farm price fell back to the Compact minimum price of $1.46/gallon, retail prices do drop, however they do not drop back to the level observed in the first farm price peg period. Asymmetric retail pricing seems to exist in this market, but ironically only after the advent of the Compact. Since July 1997 consumers experiencing the price increases documented in these charts most certainly have received the impression that all retail milk price increases and subsequent persistent high prices are due to increased farm prices and nothing else.

VI. Brand Level Analysis Corroborates the Earlier Finding that Garelick and Private Label Retail Prices Increased More than Hood Retail Prices

Figure 4 decomposes the Boston all milk retail price series into its three major brand level components, Hood, Garelick, and Private Label milk.[17] Note that in the before Compact period, Hood milk sold at essentially a stable premium to Garelick and private label milk. The price for all brands of milk increase at Compact implementation, but over the ensuring 15 months the price of Hood milk erodes more than Garelick or Private Label. As we shall see below, Hood's volume jumps up in this "erosion" period after the Compact (Figure 12). Therein lies the source of the low 2 cent per gallon increase in the before versus after Compact price of Hood milk in Table 1a.

[17] Similar figures and results for the other 3 markets are available in Appendices A, B, and C.

VII. Suiza's Rise to Dominance in New England Fluid Milk Processing is Related to Rising Garelick and Private Label Prices

Note that the gap between Hood and Garelick prices in Figure 4 dramatically narrows in 1999 and 2000 due to very strong price increases in Garelick milk. What underpins this narrowing of the brand gap? It may be entirely due to changes in retailer price conduct, not processor price conduct. If we knew the wholesale prices for milk, we could definitely determine who widened the retail-farm margin, however we do not know them. Available public information and the IRI data nonetheless strongly suggest that Garelick wholesale price increases contributed to rising retail prices. The same is true for private label milk supplied by Suiza/Garelick.

The market structure of milk processing in New England collapsed during this period to a single dominant firm, Suiza Foods, with extensive private label processing and Garelick fresh milk brand. In July 1997, co-temporal with Compact implementation, Suiza purchased the Garelick Company and entered New England in a major fashion. In July 1998, it purchased another leading New England milk processor, West Lynn Creameries, and in August 1998 it purchased yet another leading processor, Cumberland Farms. Cumberland Farms had a reputation for being aggressively competitive when bidding against Suiza/Garelick for private label contracts (Healy).[18] Thereafter Suiza purchased Natures Best Dairy in Rhode Island and attained control of New England Dairies in Hartford, CT through a joint venture with Dairy Farmers of America.

Finally, on June 1, 2000, Suiza/Garelick commenced supplying private label milk as well as Garelick brand milk to Stop & Shop. Prior to that, for the entire period from February 1996,

[18] Several independent industry sources corroborate this fact.

Stop & Shop processed its own private label milk in addition to processing and distributing the Hood milk that it sold in its supermarkets.[19] Moreover, Stop & Shop also controlled the marketing, including pricing of Hood milk in its stores (Beatty). This means that for Stop & Shop there is no question who raised prices on 80 percent of the milk that it sold (Appendix Table F3). Since the company is fully integrated and controls the Hood as well as private label lines, Stop & Shop is responsible for higher retail prices on private label and Hood milk. Suiza and/or Stop & Shop are responsible for the higher prices on Garelick milk, which accounts for nearly all of the remaining milk sold in Stop & Shop supermarkets (Appendix Table F3).

Table 3 below gives an estimate of the market shares in all of New England for the leading milk processors for the year ending June 30, 2000. Before the Stop & Shop private label contract Suiza/Garelick accounted for 44.8 percent of fluid milk sales to supermarkets. This is more than twice the share of the number two processor, Hood. Suiza/Garelick is nearly three times larger than Hood if one removes the Stop & Shop Hood milk from Hood's share. After the June 2000 closing of the Stop & Shop plant Suiza controls 63.7% (44.8 + 18.9) of the New England supermarket channel. Since Hood's Stop & Shop volume will undoubtedly drop under the new arrangement because Stop & Shop clearly has less incentive to sell Hood milk, this share is understated (Baily, 3/24/2000). We estimate that after the consummation of the Stop & Shop deal, Suiza/Garelick will sell more than four times the volume of milk that its nearest competitor, Hood, sells in New England. Suiza/Garelick market share in the smaller Boston IRI market is even higher and probably falls in the 80-90 percent range after the Stop & Shop acquisition.

[19] This is common knowledge in the New England dairy industry. Several independent industry sources corroborate this fact. Also, one can use the USDA Health Inspection Service plant numbers that by law are printed on every container to identify the processing plant. Hood milk sold in Stop & Shop had the same plant number as Stop & Shop private label during this era. Today, Stop & Shop and nearly all other private label milk in southern New England comes from plant no 35-100, the Suiza plant in Franklin, Massachusetts that also bottles Garelick and Sealtest milk.

Strictly speaking, these market share estimates are for the supermarket channel, however, Suiza/Garelick's dominance in other channels is most probably similar. There are very few alternative suppliers. Suiza is unmistakably the dominant milk processor in New England.[20]

As Suiza has acquired its market share, it actually closed or caused the closure of several very substantial milk plants including the Stop & Shop Readville MA plant, the New England Dairies in Newington, CT, and the Cumberland Farms-Massachusetts plant. Today it operates two large plants in southern New England in the Boston IRI market area (Franklin, MA and W. Lynn, MA). Their East Greenbush, NY plant near Albany and two smaller plants in Vermont and Maine also supply milk to New England. As a result of Suiza's related plant closings, there is dramatically less processing capacity in New England and little excess capacity outside of the Suiza plant system (Healy).[21]

Given this very major increase in processor concentration in the New England market, we conclude that the Garelick and private label retail price moves in 1999 and 2000 that widen the marketing margin are at least in part due to price leadership by Suiza-Garelick at the processor level as well as the exercising of market power by supermarket chains at the retail level.

The only other explanation for the disappearance of the gap between Hood and the other two products is that retailers exclusively controlled the retail prices and priced in a fashion to generate a very significant shift in volume away from private label and Garelick to Hood. We find this most implausible. Manufacturers regularly monitor retailers to ensure "fair" markups of their products relative to their competitors.

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[20] Lest one think that this dominance does not effect conduct. Industry executives now request anonymity when providing information for fear of retaliation by Suiza.

[21] In response to the disappearance of capacity and increased demand for an alternative to Suiza, Guida-Siebert Dairy, New Britain, CT has recently expanded capacity. Plant numbers (see footnote 16) and information from Alex Guida, president of Guida-Siebert Dairy indicate that it now supplies BIG Y, a regional chain, with private label milk.

We also conclude that any scale, capacity utilization, or distribution economies that Suiza may have captured with its rise to dominance, have not been passed forward to consumers in the form of a lower retail-farm marketing margin and lower retail prices.[22]

Finally, based on Hood price trajectories, we conclude that Hood reluctantly followed and at times clearly was a price maverick.

VIII. Increasing Retail Concentration and the Dominance of Stop & Shop and Hannaford is Related to Rising Retail Milk Prices

Leading supermarket chains in the four New England markets have also achieved high levels of market concentration. Table 4 gives the all commodity volume (ACV) market shares for the leading grocery chains in each IRI market. Stop & Shop is the leader in the three Southern New England markets. It is a dominant firm in Hartford/Springfield and Providence with market shares of 41.8 percent and 47.3 percent respectively. Hannaford Stop N Save is the leader and dominant in Northern New England with a 36.7 percent market share and no close competitor. Market concentration, as measured by the four firm concentration ratio and a partial Hirshman-Herfindahl Index is very high and has increased in all four market areas. Moreover, IRI market areas are larger than the relevant retail market areas for antitrust analysis. Concentration and the dominance of Stop & Shop and Hannaford in smaller relevant market areas is higher than the levels reported in Table 4.

Returning to the Boston market we have milk sales data for the top four chains. Figure 5 displays the sum of the shares of these top four firms, i.e. the four firm seller concentration ratio for milk volume measured in gallons. Since Shaws acquired Star Market in July 1999, this is

[22] Suiza has provided no public documentation of economies related to its rise to dominance. The retail-farm marketing margin also widens, as we show below, when one controls for increases in non-farm market input costs.

actually a 3 firm concentration ratio after that date. The combined market share of these chains in the Boston market has increased since February 1996 from approximately 75% of supermarket milk sales to 85%. Figure 6 plots the market shares over time for the top 4 firms and all other supermarkets. Note that Stop & Shop, the all commodity volume (ACV) market leader in the Boston supermarket retailing market, is also the leader in the fluid milk category. Moreover, its share of fluid milk sales in supermarkets has increased since early 1996. Thus we not only observe a major increase in seller concentration at the processor level, we also have increases in seller concentration of all grocery products and fluid milk to very high levels at the retail level.

These structural changes are consistent with the observed price elevation for milk at Compact implementation and asymmetric pricing in response to subsequent farm price spikes. Recall from Tables 1a and 1b that the dominant firms, Stop & Shop and Hannaford increased margins the most during the after Compact period. Also, see Appendix Figures A2 and B2 for evidence of Stop & Shop dominance. They are routinely able to charge higher prices than other supermarkets for milk in Hartford and Providence.

IX. Chain Level Analysis of Branded Milk Sales Establishes that Shaws, DeMoulas Hood and Guida were Price Mavericks for a Short Period After Compact Implementation

Turning now to the pricing conduct of the top four Boston chains, Figures 7 through 10 give the price trajectories for Hood, Garelick and private label milk from February 1996 through July 2000 for each chain.[23] In Figure 7, Stop & Shop prices for all three products jump at Compact implementation. Private label prices (recall private label is bottled by Stop & Shop) remain extremely stable at this new level for 15 months until the advent of the first post-Compact farm milk price spike. Garelick brand milk remains stable until May 1998 and price increases

commence four months prior to the farm price spike. Prices for Hood milk, bottled and marketed under license from Hood by Stop & Shop, drop in May 1998.

There seems to be a disagreement between Stop & Shop and Suiza/Garelick as to what the price of branded milk should be. Suiza/Garelick wants it higher and Stop & Shop appears to be punishing them for their move by lowering Hood milk price rather than following their lead. Hood milk remains very competitively priced, i.e. the traditionally positive brand differential between Hood and Garelick is negative from the Fall of 1998 until June 2000. Suiza clearly was pushing Garelick prices and Stop & Shop was resisting with Hood prices. Appendix Table F3 details how brand shares in Stop & Shop moved in response to this pricing deal. Hood gained share and Garelick lost share.

Finally, note in Figure 7 that Stop & Shop prices for all brands follow the same pattern in 1999 and 2000 as the Boston market level prices (Figures 1 and 4). Retail prices elevate dramatically in response to farm price spikes but do not fully adjust down when farm price reverts to the Dairy Compact support level.

Milk pricing at Shaws Supermarkets is an entirely different story. Figure 8 chronicles a firm that is more squarely focused on price competition and willing to chisel or cheat on the price leadership of Stop & Shop at retail and Suiza/Garelick at wholesale. The primary vehicle for their aggressive attempt to lower milk prices during the 15 months after Compact implementation was the pricing of Hood milk that was introduced into their chain in April 1997. Shaws and Hood aggressively priced Hood milk forcing the Garelick brand price to drop back to before Compact levels by December 1997. Shaws private label milk also makes a distinct run immediately towards pre-Compact price levels, but Shaws caved in by January 1998 and reverted to the high level consistent with the 18 cent hike at Compact implementation. Although

[23] Similar charts for the other three market areas are in the Appendices A, B, and C.

we lack wholesale price data, this move is consistent with the refusal of its private label supplier to cut price. The chain seems to have a lower margin on private label for a few months in an attempt to force its suppliers' price down, but failed, and then reverted to cooperating with the leaders, Stop & Shop and Garelick/Suiza.[24] In 1999 and 2000, Shaw's price conduct clearly mirrors Stop & Shop pricing. A key question that we cannot answer definitively is who drove this reversion, Shaws or its supplier of private label milk, Suiza Foods Inc?[25]

Figure 9 gives the price trajectories for Hood, Garelick and private label milk at DeMoulas, the other chain that has a predilection for price competition. Note that Hood prices do not change at Compact implementation and trend down to levels below pre-Compact prices during the 15 month period after implementation when the farm price was pegged at $1.46/gallon. Garelick prices moved up three months in advance of the Compact and break back towards lower prices five months after implementation. Private label milk, which accounts for approximately 80% of DeMoulas sales, registers the 18 cent jump in July 1997.[26] DeMoulas, however, ceded back part of that price hike beginning in early 1998. During 1999 and 2000 DeMoulas general price conduct mirrors Stop & Shop and Shaws with large and asymmetric responses to farm price moves.

Note that DeMoulas prices for all three products are generally lower than Stop & Shop prices in the post-Compact period. Again, a key question is who is driving DeMoulas retail

[24] See Cotterill 1999 for a case study of Shaws attempt at price competition on all supermarket products in several Connecticut markets during 1997. The milk price scenario in Connecticut (see Appendix A) is identical to the one in Figure 5, and both are congruent with Shaws attempt to compete on price with Stop & Shop across all products in 1997. Cotterill (1999) concludes that by 1998 Shaws conceded defeat in Connecticut and reverted to the high price regime established by the market leader Stop & Shop.

[25] That Suiza supplied Shaws during this period is confirmed by Gillmeister and industry executives.

[26] See Appendix Table F3 for brand and private label market shares by chain and by market areas for pre and post-Compact time periods. Market share shifts corroborate the conclusions on pricing presented in this section.

prices? Is it DeMoulas or the milk processors.[27] Hood appears to have a hand in the stability of its retail price.

Figure 10 gives price trends for Boston's old line inner city supermarket chain, Star Markets. Star clearly follows the Stop & Shop and Suiza lead throughout the post-Compact period. Prices for its private label and its Garelick brand milk elevate at Compact implementation and remain very stable until the September 1998 farm price spike.[28] Hood milk price behaves very differently and suggests again, and this time quite clearly, that the Hood Company competed on price during 1998. Star's retail price for Hood does increase in the months after Compact implementation; but, it drops to pre-Compact levels in January 1998 and remains there until it reacts to the farm price spike in Fall 1998.

Based on the very different behavior of Hood milk relative to Garelick brand and Suiza/Garelick supplied private label in the Shaws, DeMoulas, and Star chains, we conclude as we did when analyzing Tables 1a and 1b that Hood did not participate in the tacitly collusive price elevation of milk prices at the implementation of the Dairy Compact. However, Hood ultimately followed other's price leads in 1999 and 2000. Stop & Shop, as a milk processor and the dominant retailer, and Suiza/Garelick as the dominant processor have been the price leaders throughout the July 1997 to July 2000 period. Like Hood, Shaws and DeMoulas attempted during the early post-Compact period to chisel on the new tacitly collusive high price regime, but failed to break it and thereafter have followed, effectively widening margins with the other players.

Additional evidence for this conclusion comes from two sources. First the popular press has documented a bitter and open marketing and public relations war between Hood and

[27] That Suiza and Crowley supplied DeMoulas private label is confirmed by Gillmeister and industry executives.
[28] Gillmeister and industry executives indicate that Star private label milk was supplied by Garelick/Suiza.

Garelick/Suiza (Mohl, 6/19/96; Macero, 10/18/97; Baily, 3/24/2000). Ultimately in early 2000 Suiza/Garelick raided Hood, hiring Hood's Chief operating officer (second in command) and its head of marketing. Ten days later Garelick fired the former claiming that Garelick staff refused to work under him (Baily, 3/24/2000).

In the next section, we estimate price elasticities for Hood, Garelick, and private label milk. Price elevation was profitable for Garelick and private label, even with relatively large losses of Garelick and private label volume. Hood actually benefits with increased volumes but ultimately finds it profitable to follow the others on price.

The Guida-Seibert Milk Company, New Britain, CT markets its branded milk in supermarkets other than Stop & Shop in the Hartford/Springfield area. Appendix Figure A3 indicates that Guida did not participate in the focal point pricing scheme at Compact implementation in July 1997. The retail price for Guida milk fluctuates but stays at approximately $2.45 gallon for three periods after Compact implementation. This was the retail price for their milk in the six periods prior to the Compact. In the fourth period after the Compact they capitulate and elevate price to over $2.60 per gallon. Note that private label milk is a very strong leader of the high price regime. It increases from $2.40 per gallon to $2.60 per gallon at Compact implementation and remains at that level until the September 1998 farm price spike when it accelerates up. Garelick supplied most of this private label milk.[29]

X. Estimation of Market and Brand Level Elasticities Documents that the Exercise of Market Power is a Source of Wider Margins and Higher Retail Prices in the Post Compact Period

[29] This is based on prior knowledge of the Connecticut industry and is confirmed by Gillmeister and industry executives.

In this section we use the IRI data to estimate market-wide all milk and market-wide brand level price elasticities. We use the results to document the exercise of market power and its impacts. Market power can be exercised in the channel by either processors, retailers, or both (Cotterill, Putsis and Dhar, 2000; Cotterill, 2001). Focusing on the Boston market, at the processor level when Hood is pricing, it works against the Hood retail demand curve. When Suiza/Garelick is pricing, it works against the retail demand curve for Garelick and private label milk since it supplies virtually all of the private label in the Boston supermarket market except for Stop & Shop. Since Stop & Shop also markets the Hood milk in its stores for all but the last four week period of the data set, the pricing game for Hood in other chains and Suiza/Garelick depends on Stop & Shop's price moves.

We conclude, based upon their leading positions, that Suiza and Stop & Shop are the key players in any market power game in Southern New England markets. If leading retailers choose to elevate retail prices without the tacit cooperation of Suiza, the processor could supply lower cost milk to the fringe retail firms and defeat the leading retailers attempt to elevate price. But why would Suiza want to do that? Suiza's tacit cooperation increases its profits as well as those of leading retailers. It also eliminates the double marginalization of two successive dominant firms in the channel (Spengler, 1950). Emerging "strategic partnerships or strategic alliances" between Suiza, leading retailers, very recently other processors, and Dairy Farmers of America are eliminating and/or foreclosing processing capacity.[30] Barring entry or expansion by fringe

[30] These are one and the same. Cartensen (2000) has written on the questionable features of strategic alliances. Steiner (2001) has written on strategic partnerships as a vehicle for exercising market power. Recently, Wessanen, a Dutch dairy processor announced the sale of Crowley Foods, the operator of Weeks Dairy in New Hampshire, to a "strategic partnership" run by former top level Suiza executives headquartered in the same town and owned by Dairy Farmers of America, Suiza's "strategic partner".

processors, channel profits are improving. Any efficiency gains in this new system are not being passed forward to consumers via lower prices.[31]

Having examined prices in detail in earlier sections of this report, let us now examine how the quantity of milk sold through Supermarkets in the IRI markets has varied over time. Figure 11 is a bar chart for total Class I milk sales in New England and sales by supermarkets in each of the four IRI market areas. It is limited to July 1997 through March 2000 by the availability of Class I sales data. The supermarket volume in our database accounted for an average 40 percent of Class I volume in New England during this period. Note that volume by supermarkets in the four geographic markets trends down over the post-Compact period. Total Class I volume in New England also seems to decrease over the period. Appendix Table F4 reports regression results that more carefully determine the trends in the All New England (ANE) fluid milk volume and the All New England supermarket milk volume series. There is a highly significant (1% level) negative trend in the latter, and a weak negative trend in ANE fluid milk volume that is marginally significant (10% level). The difference between the ANE fluid milk and supermarket milk volume series however, has a highly significant and positive trend over time. Half of the volume lost by supermarkets has gone to other milk distribution channels. The other half constitutes a decline in fluid milk consumption. The rise in retail prices over the period has to be a primary cause of these volume shifts.

Figure 12 plots the monthly quantity of Hood, Garelick, and private label milk sold in Boston over time.[32] Prior to the implementation of the Compact, the market position of these three products was relatively stable, and the overall quantity of milk sold (the sum of the three

[31] An alternative scenario is control of the supermarket accounts by Suiza prevents large efficient scale entry by others so Suiza can take higher margins elsewhere. Recently Suiza was the sole bidder on a state of Massachusetts contract and attempted to elevate price substantially over prior contracts (Healy, Harden). The result was considerable public outcry about the "milk monopoly" in the Boston press.

plotted lines) was also relatively stable since at best there is a very slight negative time trend for each brand. After the Compact there is a clear shift away from private label and Garelick milk. Hood gains some of these customers, but total milk sold through supermarkets in Boston drops during this period (Figure 11). Table F3 in the Appendix gives market share data by brand, chain, and market area for the before and after Compact periods. Garelick and private label lose share. Hood gains share. In summary these quantity movements and the previously discussed price increases of Garelick and private label prices relative to Hood prices are a classic example of the exercise of market power by the purveyors of Garelick and private label. Prices increase and output is restricted.

Now let us examine demand elasticities to see whether these prices and quantity trends increased profits. Figure 13 is a scatterplot for the all milk quantity and all milk weighted average price variables for the Boston market. The general slope of this data plot clearly suggests that it identifies a negatively sloped market demand curve, and in fact the estimated logarthmic line drawn in Figure 13, as we see in Table 5, provides a good statistical fit to the data. Since there was significant auto-correlation, as measured by the Durban-Watson statistic, we also report GLS results that use the Cochrane-Orcutt method to correct it.[33] The estimated own price elasticity for Boston is highly significant under both OLS and GLS methods, but we will discuss and use only the GLS result.[34] An own price elasticity of -.642 is inelastic (between 0 and –1.0). This means that a 1% increase in the price of milk sold in Boston produces a .642%

[32] For similar charts for the other market areas see Figures A4, B4, and C8.
[33] This is true for all GLS regressions reported in this study.
[34] One could specify more detailed demand relationships that would include income and controls for seasonability. The GLS method, however, controls for seasonability because it is a major source of autocorrelation in the residuals and income did not vary much over this four-year period in Boston. It probably increased slightly over the 1996 to 2000 period. Since milk is a normal good, we would expect it to increase demand thereby offsetting some of the impact of the price increases over time. This suggests that actual own and cross price elasticities may be slightly more elastic than our reported elasticities. Nonetheless, the total effect on a firm's ability to raise price during the period due to demand elasticity and rising incomes is accurately reflected by these estimates.

decline in the quantity sold. The market level own price elasticities in Table 5 for Providence, Hartford and Northern New England are also inelastic (-.787, -.712, and -.483 respectively) and statistically significant. A volume weighted average of these elasticities indicates that the All New England own price elasticity for supermarkets is approximately -.63.

A key question in our forensic exercise remains, was it profitable for marketing firms to raise price? If one cannot demonstrate that retail price elevation increased profits, then it is not market power. One can, in fact, use the market elasticity to show that jointly increasing price was profitable for marketing firms. Moreover, one can use brand level elasticities to show that it was profitable to elevate private label and Garelick prices more than Hood prices. First, we start with a market wide analysis for Boston. Then we present the brand level analysis that ranks the profitability of price moves by brand.

To analyze the profitability of a price move, ideally one needs cost and operating profit data from each of the channel players. We do not have it, but a Cornell study provides such data for a representative firm in New York City for 1995. Table 6 reproduces that study's decomposition of the retail price into cost components. Processor profit is 3% of the retail price. The retail gross margin is 19% of the retail price. If one assumes that the percent breakdowns are applicable to Boston and further assumes, generously, that the competitive rate of return on milk sales at retail is equal to the more capital intensive processor's margin, i.e. 3% of the retail price, we can compute the before Compact dollar profit margins for the Boston market channel players since we know the before Compact retail price averaged $2.42/gallon.

Retailer's before Compact dollar profit margin = .03 ($2.42) = $.0726

Processors before Compact dollar profit margin = .03 ($2.42) = $.0726

Total channel dollar before Compact profit margin (m) = $.1452

With the channel dollar profit margin, *m*, one can estimate the before Compact channel profits Π^B as follows:

1) $\Pi^B = m^B \cdot Q^B$

where Q^B = quantity of milk sold in an average four week period, before Compact.

Since the 18 cents price move at Compact implementation amounted to a 12 cents widening of the channel margin (6 cents went to farmers) the channel dollar profit margin after Compact implementation m^A is:

2) $m^A = (.1452+.12)/.1452 = 1.83m^B$

The 18 cent price increase raised the before Compact average retail price $2.42/gal (7.43 percent). Given that the Boston market demand elasticity is -.642, the quantity sold decreases (-.642 * 7.43) 4.78 percent. Therefore the quantity sold after the Compact Q^A, is:

3) $Q^A = (1 - .0478)Q^B$

Thus the after compact channel profits are:

4) $\Pi^A = 1.83m^B(1-.0478)Q^B = 1.74\Pi^B$

The 12 cents widening of the unit profit margin, even after accounting for its depressing effect on quantity sold, raised profits 74%. If our initial estimates of the profit margins are too high, then this number is too low. If costs other than milk increased to account for some of the 12 cent margin expansion, then this estimate is biased up. However, any increase in costs was most likely progressive over the post compact period which means that this profit gain was at best eroded slowly from the date of Compact implementation. We conclude that the observed market wide price elevation was very profitable.

Turning now to an analysis of demand for milk at the brand level, Figures 14, 15, and 16 are data plots for the price and quantity of Garelick, private label, and Hood milk respectively,

sold in Boston. The Garelick and private label data clearly suggest negatively sloped own-price demand curves and we have drawn in the logarithmic regression lines from results reported in Table 9 below.

The scatter plot for Hood does not suggest a typical demand relationship. This is because, as we have explained and will see below in a statistical fashion, shifts in the price of Garelick and private label are extremely important to Hood's quantity movement. In fact, as shown in Figure 16 and Table 9, there is a significant negative relationship between Hood price and quantity when one controls for changes in these other prices.

Table 7 contains the descriptive statistics for these data. Table 8 is a correlation matrix for the variables in the data set. It is very important to note that private label and Garelick prices are extremely correlated with r =.978. Both also are virtually identical to the all market price with correlations of .995 and .99 respectively with the Boston price. From the strategic perspective, this suggests formula pricing at wholesale of the Garelick brand off private label, e.g. 10 cents over private label price and an identical in-store markup over wholesale. The lack of a perfect correlation between Garelick and private label is due to slight differences in store merchandising.

Hood and private label retail prices are only somewhat less correlated with an r = .949. As we observed in the prior section, Hood did not always follow the price lead of the other two. Nonetheless its strategic deviations over the period are relatively minor when compared to the total observed price moves in the February 1996 to July 2000 period.

Given the extremely high level of correlation between brand prices, one really cannot talk about the exercise of unilateral market power, i.e. the elevation of one brand's price assuming that the other brand's prices remain constant. This is especially true for Garelick and private

label. Since these prices move in tandem, one is observing followship rather than non-followship demand curves (Cotterill, Franklin and Ma, 1996, p. 5). Therefore, our estimated demand elasticities for Garelick and Private Label tend to measure fully coordinated pricing of the two products (Merger Guidelines). This is not too surprising given that Suiza, or its predecessor Garelick, supplied both to nearly everyone in the Boston market, except Stop & Shop.[35]

Table 9 reports the results of logarithmic regression of a brand's quantity on its own price and the prices of competing brands. The reduction in own and cross price elasticities indicates that the lagged error correction process captures some temporal price reaction by the players and re-enforces our argument that the GLS results include coordinated effects. Since either competitor's price captures movement in the other, we dropped one competitor price in each demand model with little loss of R^2. We discuss only the final specification models which are reported in columns 5, 9, and 14 of Table 9. Each reported coefficient is an elasticity.

Hood is the most price elastic brand with an own price elasticity of -2.46. It is statistically significant at the 1 percent level. Hood is the only brand with a statistically significant cross price effect. A one percent increase in the price of private label increases Hood's quantity sold 1.685 percent. Since Garelick price is so highly correlated with private label price, part of Hoods increased volume in Figure 2 undoubtedly comes from Garelick.

Turning now to the exercise of market power by Garelick and private label; if the switching effect to Hood is strong enough, the loss of volume can be substantial. The switching effect would prevent Garelick and private label managers from profitably elevating price without Hood's tacit cooperation. Although Hood did not fully cooperate in pricing, and its volume and

[35] Garelick's role as a private label supplier in New England since early 1996 is well known and confirmed by industry sources and Gillmeister.

share increased when Garelick and Private Label increased prices, we find that Hood's disciplining action was not enough to prevent the exercise of power by the purveyors of Garelick and private label milk. The price increases that we observe in our trend analyses, in fact, are profitable for both Garelick and Private Label.

To see this, one examines the own price elasticities for Garelick, -1.8, and private label, -.53. Both are statistically significant at the 1 percent level. These elasticities are so low in absolute value that a price increase can easily generate a percent increase in the unit profit margin that outweighs the corresponding percent loss in volume. For Garelick, a 10 percent price increase more than doubles its profit sales ratio (price cost margin) but only reduces output by 18.06 percent. Consequently, total profits (price-cost margin times output) increases.

In this type of pricing environment Hood actually has little incentive to compete on price, even with its more elastic demand condition, because increases in the other brand prices shifts its demand curve out increasing demand for its products. In this situation, Hood will maximize its own profits by partly following the price lead of Garelick and private label (Levy and Reitzes; Werden and Rozansky; Cotterill, Putsis and Dhar).

XI. In the Supermarket Channel in New England, Estimated Loss to Consumers Due to the Dairy Compact are 19 Million Dollars, and Consumer Losses Due to the Exercise of Market Power are 49.4 Million Dollars

A critical question remains. What is the magnitude of the economic loss to consumers that can be attributed to the Dairy Compact and to the margin widening behavior of firms in the market channel? We will compute losses on a dollar and per gallon basis for consumers for each of the New England IRI markets: Boston, Providence, Hartford/Springfield and Northern New England. As the maps in Appendix G indicate, these market areas cover 90% of New England.

Since retail prices are not responsive to the farm price cycle in the before period, we maintain that use of a traditional farm price markup model (Kinnucan and Forker, 1987; Lass et al., 2000) to forecast retail prices "but for" the Compact is not appropriate. Our analysis indicates that retail pricing prior to Compact implementation is best based on the average farm price in the before period, a risk premium for farm price volatility, and stable trend line growth in the retail price to cover increases in other costs and profits (Table 2, equation 8).

To estimate the impact of the Compact and industry pricing conduct on consumers, we use a before-after model. Rather than use the average retail price in the before period, we use a linear trend to estimate the retail price immediately prior to Compact implementation. Since the retail price trend is up, using this estimated before-Compact implementation price rather that the lower average retail price for the before-Compact period increases the before-Compact price and farm-to-retail margin. This reduces our estimate of damages due to the exercise of market power.

Our estimate of the before-Compact price is forecast into the after-Compact period as follows. We adjust it upward for the 6 cent per gallon Compact increase and increases in marketing input prices (labor, electricity, and gasoline). The model's after-Compact forecast prices are also adjusted up for permissible pass though of the farm price spikes when the Class I price moved, for short periods, above the Compact price. We then subtract this forecast price from the actual price in each period to get a loss per gallon. This is multiplied by the gallons sold to obtain each period's dollar loss. These losses are then summed over periods to obtain the total dollar loss which also is divided by total gallons sold to furnish the average loss per gallon.

This method overstates the impact of the Compact on consumers and understates its impact on channel profits because it ignores the Compact's risk reduction benefits for market

channel firms. Such benefits imply that channel firms did not need to pass forward the full 6 cent raw milk average price increase to preserve their profit margins.

Starting with the Boston market, Figure 17 illustrates our consumer loss method in detail. The predicted retail price is virtually identical to the actual price in June 1997. However, this need not always be true and the trend line gives a more stable estimate of the underlying "before" price.[36] At implementation the Compact increased the farm price from the before Compact average $1.40 gallon to $1.46/gallon and effectively eliminates input price risk. In theory retail price in the after Compact period should increase less than 6 cents per gallon because of reduced risk. However, in our damages model we allow firms to pass forward the full 6 cent increase.

Next, one must forecast how price needs to change in the after Compact period to cover increases in the costs of the other marketing inputs listed in Table 6. We do not have data from the companies on their processing and marketing costs; however, Table 10 gives secondary source estimates for key cost components. The growth in the dairy manufacturing wage rate for the total U.S. is a proxy for the growth in wage rates in the New England dairy processing and retail sector. The growth in wages never exceeds 4% on an annual basis and averages 3% for 1997 through 1999 the years most congruent with our July 1997 to July 2000 damages period. Prices for plastic bottles, again for the total U.S., remained stable in 1997, decrease in 1998 increase in 1999. The average growth in plastic costs for the 3 years is 1 percent. Electricity for industrial purposes in Massachusetts increased 19.3 percent in 1997 but drops 7.1 and 18.6 percent in 1998 and 1999. The average growth rate for the entire period is negative 2 percent. Motor fuel for the U.S. dropped in price in 1997 and 1998 before advancing in 1999. The three-year average growth rate is 3.6%.

[36] The General Accounting Office has used a similar trend line approach to forecast price (GAO, 1998, p.35).

For comparison in Table 10, the Boston Producer Price Index average annual growth rate is 1.85% for the three-year period (July 1997 through June 2000). The CPI (Boston Area) average annual growth rate for the same period is 2.4%. Based on these growth rates, we conclude that a 3 percent growth factor for other inputs is the most appropriate adjustment to the farm-to-retail margin to cover increases in other costs. Since higher cost growth factors lower damage estimates, to explore the sensitivity of our estimates, we will also compute consumer losses for 4 and 5 percent growth rates in costs other than milk.

A three percent growth rate in the marketing margin to cover costs other than raw milk requires a smaller growth rate in retail prices. To find that rate we compute the average farm-to-retail margin in the before period, find the dollar value of a 3 percent increase in that margin and express it as a percent of the average retail price in the before Compact period. For the Boston market the average margin is $0.98 (Table 1a). Three percent of it, expressed as a percent of the average retail price, $2.38/gallon, is 1.24 percent. This is the annual growth rate for price needed to generate a 3% growth in margin. Returning to Figure 17, the forecast price line from July 1997 forward increases at a 1.24 percent rate annually.[37]

One major adjustment to our forecast prices remains. Note in Figure 17 that farm milk prices spike up above the Compact minimum twice in the after period. We will allow marketing firms to pass forward all of these milk cost increases to consumers. This means that the consumer loss in dollars is the difference in any time period between the actual retail price and the forecast retail price times the number of gallons sold, but the difference between the farm price and the Compact minimum price for any period where farm price is above the Compact

[37] One reviewer asked why we did not use the retail price trend line to forecast retail prices in the after-Compact period. The increase in retail prices during the before-Compact period represents some mixture of increases in non milk costs and increases in net profit margin. As such, it is not an accurate forecast of price increases needed to cover costs.

minimum times the number of gallons sold is also subtracted from the loss estimate as a legitimate cost.

Before discussing the actual dollar amount lost by consumers, note in Figure 17 that the channel firm's market power premium during the flat farm price period (July 1997 to August 1998) slowly erodes to zero. The actual retail price and the forecast price are effectively equal in August 1998. Retail prices erode and costs increase to eliminate the premium. Hood, Shaws and DeMoulas pricing behavior play a key role in this erosion. A similar erosion of the premium occurs in Providence (Figure B1), Northern New England (Figure C1) and Hartford (Figure A1). In Providence, the erosion is clearly not due to Stop & Shop. It is due to price-cutting by all other chains (Figure B2) and is due to price-cutting by Hood, not Suiza/Garelick or Suiza provided private label milk (Figure B3).

Returning now to the Boston market area supermarkets, Table 11 gives the consumer loss estimates due to the exercise of market power. Different margin growth rates (to cover non-milk processing and marketing costs) produce different estimates. Focusing on our best estimate, the 3% case, dollar damages at supermarkets for the Boston market in the post Compact flat farm price period, July 97 through August 98, total 3.58 million dollars and are, on average, 5.4 cents per gallon for this period. In the second part of the damages period, September 1998 through July 2000, total damages escalate to $19.33 million dollars and average 18.4 cents per gallon. Over the entire period dollar damages total $22.91 million and are 13.3 cents per gallon.

This is our best estimate of consumer loss due to the exercise of market power by the marketing channel firms in the Boston market. Note that the Compact increased the retail price 6 cents per gallon during 30 of the 40 post-Compact periods when the Compact minimum price was effective. Over the 40 periods, this averages to a 4.5 cent per gallon increase. The

marketing firms, in response to this farm price change and the two subsequent market-generated cyclical farm price spikes, increased the retail price another 13.3 cents per gallon. This 13.3 cent per gallon increase is above and beyond the price increases necessary to cover all cost increases including raw milk price increases due to the Compact or short supply. It is in excess of the price increase needed to protect and sustain the level of profitability that market channel firms enjoyed in the before-Compact period. Therefore, it added $22.91 million to marketing firms' operating profits. The 4% and 5%, margin growth rate results indicate that allowing for higher rates, ostensibly to cover growth in costs other than milk, does lower the loss estimate. However even at an unrealistic, high 5% growth rate, total dollar damages are $17.19 million and 10 cents per gallon.

We turn now to the ultimate questions. First, how much did New England consumers lose to farmers when the Compact elevated price 6 cents per gallon in 30 of the 40 after-Compact periods and stabilized price during the after compact period but for the two farm price spike episodes? Second, how much did New England consumers lose due to the exercise of market power by channel firms at Compact implementation and after the two farm price spikes?

We will answer these questions in reverse order. Table 12 gives consumer loss estimates for each of the four New England IRI market areas and for all of New England. It also decomposes the loss estimates for the farm price peg period (7/97-8/98) and the subsequent period (9/19/98-7/20/00) with the two firm price spikes. Focusing on consumer loss for the total period (approximately 3 years), consumers in New England paid 49.4 million dollars more for supermarket milk than they would have if no market power had been exercised. This amounts to an average overcharge of 13 cents per gallon. These losses continue to accrue after July 2000 and will do so until channel profit margins narrow to pre-Compact levels.

Turning now to the first question, consumer loss due to the implementation of the Compact, the computation is straightforward in our loss model. The Compact raised the price 6 cents per gallon over the before period average price in 30 after-Compact periods and it reduced price variation in the major input, raw milk. Economic theory predicts unambiguously that risk reduction is worth something because firms are generally risk averse. However, we will not reduce the cost increase for any such risk reduction because we have not estimated the channel's risk premium and its relation to variation in raw milk prices.[38] We assume that the 6 cent per gallon industry wide cost increase is fully passed on to consumers. Finally as we did for our estimate of monopoly overcharges, here we also remove the 10 farm price spike periods. When farm prices were above the $1.46 gallon Compact price, those prices were not due to the Compact. Therefore, in those periods, the Compact had no impact on consumers.

Table 13 gives the impact of the Compact on consumers. The total consumer loss for all of New England due to the Compact's slight elevation of price, 4.3 percent over average price in the before Compact period is 19 million dollars. This amount palls in comparison to the 49.4 million dollar loss due to the exercise of market power at Compact implementation and after the price spikes.

The total consumer loss for the three year period was 68.4 million dollars. Fully 72 percent of consumer loss is due to the exercise of market power by firms in the marketing channel, most notably the New England dairy industry leaders Stop & Shop and Hannaford at retail and Suiza/Garelick at the processor level. Other firms at both stages, however, tended to follow their lead.

Recall that this study focuses on only major brand and private label sales in supermarkets. These sales account for only 40 percent of all fluid milk sold in New England

[38] In principle this could be done.

(Figure 11). If one assumes that supermarkets set a price umbrella or benchmark price for other fluid milk channels, then losses due to the Compact and the exercise of market power in those channels would be similar and in proportion to their share of all fluid milk sales.

Our results clearly document that the leading retailers and processors did more than oppose the Compact in the political arena. They have used their power in markets to elevate prices. They also have attributed higher retail market prices to farmers and the Compact program (Massachusetts Department of Agriculture).

XII. The Dairy Compact Increased Farm Income 128.5 Million Dollars; but only 51.5 million came from the Supermarket Channel and of that only 19 Million Dollars came from Consumers with the rest Coming from the Compact's Price Support Feature.

Elsewhere the Dairy Compact Commission and others have correctly computed that the Compact has generated over 120 million dollars in increased revenue for New England dairy farmers prior to July 2000. We estimate that the Compact increased dairy farm income 128 million dollars in the July 1997 to July 2000 period. The corresponding number for the supermarket distribution channel, which sells approximately 40 percent of all fluid milk, is 51.5 million dollars. If supermarket consumers paid only 19 million dollars more due to Compact-induced higher farm prices that channel firms passed forward, where does the rest come from? It comes from drops in the class I price below the Compact price that New England farmers avoided because of the Compact. These raw milk price decreases would not have been passed on to supermarket consumers if there had been no Compact. Recall that there is no relationship between farm and supermarket retail prices in the before Compact period.

SIDE BOX: Different Benchmarks Give Different Impacts

Impact analysis can be confusing unless one understands that there are two benchmarks. One can measure the change in the level of a target variable such as the farm raw milk price over

time, i.e. before and after a stimulus such as Compact implementation. Alternatively, one can measure what the level of the target variable would have been during the after period if there had been no stimulus. Consider the Dairy Compact implementation in July 1997. In the 18 weeks before the Compact, the raw fluid milk price, i.e. the farm price, averaged $1.40 per gallon. In the 15 weeks after the compact, it was constant at $1.46 per gallon. The price that farmers received increased 6 cents per gallon. One can also ask how much did the Compact increase farm price over what farmers would have received if there had been no Compact. This differential is the Compact premium, i.e. the difference between the compact price and the Class I fluid milk price. In the 15 weeks after the Compact, the average difference was 13 cents per gallon ($1.46-$1.33). The counterfactual results is 7 cents higher than the before-after result because the class I price dropped 7 cents. Both the before-after and counter factual approaches provide a valid measure of the impact of the Compact on farmers.

One continues to have two alternative benchmarks when examining the impact of the Compact on retail price; however, the analysis is necessarily more complicated. Since the Compact directly impacts the farm price, one needs an economic model to identify the linkage between farm and retail prices. We demonstrate that the appropriate theoretical and empirical model is on that recognizes input price risk and controls for the exercise of market power and changes in non-milk marketing input costs. Our model identifies how retail price changed over time due to the Compact and these other factors. This is the correct benchmark for consumer analysis when the question is how much did the Compact increase prices over what consumers previously paid. The counterfactual question is how much would consumer prices drop "if there were no Compact." For some issues, this too is a valid question.

What would have happened if the supermarket market channel firms had not exercised market power against consumers? In the after Compact period, their profit margin would have been the same as in the before Compact period except for the added profits due to risk reduction. Price increases at retail would have covered only increases in raw milk costs and other input costs. Supermarket consumers would have lost only 19 million dollars and farmers would continue to receive 51.5 dollars in added income from the supermarket channel. This analysis ignores expanded demand due to lower retail prices. Demand expansion would increase both of these estimates slightly.

To summarize, if market channel firms do not exercise market power, farmers continue to benefit from the Compact's price floor provision and the modest transfer from consumers. The transfer is 6 cents per gallon when farm price is at the Compact minimum (1.46). Processors and retailers keep the same profit level as before the Compact plus profits from risk reduction. With

a modicum of margin reduction by processors and retailers to reflect the benefits of input-price risk reduction, consumer loss would be lower than 19 million in total or 6 cents per gallon.

The impacts that this study reports, except for the exercise of market power by processors and retailers, are consistent with the rationale for the Northeast Dairy Compact. The exercise of market power in the marketing channel has distorted actual market performance to the benefit of processors and retailers at an expense to consumers that is far greater than the impact of the Compact on consumers. This suggests that the major policy issue now facing New England consumers of fluid milk is not the Northeast Dairy Compact. It is the exercise of market power by the region's leading retailers and milk processor. There seems to be a clear and important role for the Northeast Dairy Compact Commission. There is a need to monitor the price and margin performance of the New England milk industry. There is a need to ensure that competition is effective, and that consumer milk prices accurately reflect the cost of producing, processing, and distributing milk. The Commission's work could contribute to future antitrust enforcement or eliminate the need for enforcement if firms respond competitively to public scrutiny. To date, they have responded in an anticompetitive fashion to public intervention.

XIII. Decomposing Retail Prices into Payments for Factors of Production and Profits Documents

How Meager the Compact's Contribution to Higher Prices is in Comparison to the Increase in Profit by Channel Firms.

Who gained from the retail milk price hikes that occurred at Compact implementation and subsequently through July 2000? The factors of production are raw milk and non-milk marketing inputs. Table 14 gives the breakdown between these factors and profits for all New England, and for the four component markets–Boston, Providence, Hartford, Northern New

England. We will discuss in detail only the all New England results. All statistics are on a per gallon basis.

Note in Table 14 that the average farm price in the Before-Compact period was $1.40. In the After-Compact period the average farm price increased 11 cents to $1.51. This increase can be decomposed into the increase due to the Compact's price floor at $1.46 and the increase due to the price spikes above Compact. Since the Compact minimum was not in effect during the spike periods the per gallon impact of the Compact averaged across all milk sold in the After-Compact period is less than 6 cents/gallon. On average during the After-Compact period consumers paid only 4.5 cents per gallon more due to the Compact. The price spikes above Compact contributed the remainder of the 11 cents increase in the farm price (6.5 cents). Our best estimate of the increase in non-milk costs is a 3 percent annual growth rate in the before-Compact marketing margin. This growth adds 7 cents to the retail price. The total cost increase is the sum of the farm price increase and the increase in other costs. It is 18 cents.

Our forecast retail price prior to Compact implementation for all milk in all New England is $2.49. The retail price in the After-Compact period averages $2.78. Retail price increased 29 cents. Subtracting the total cost increase from the price increase gives the increase in profits that channel firms captured with their power pricing game. For all supermarkets in all New England it is 11 cents.

In conclusion, increased channel profits contributed as much to retail price increases as did the combination of the Compact program and the sporadic strong raw milk market. The Compact by itself had a meager impact on retail prices when compared to other causes of retail price increase. Its 4.5 cent contribution is only 15.5 percent of the 29 cent increase in retail prices, and it constitutes only a 1.8 percent increase in the before-Compact retail price.

XIV. The Exercise of Market Power by Channel Firms Shifts the Industry to a more Elastic Region of the Fluid Milk Market Demand Curve Thereby Reducing the Effectiveness of the Federal Milk Market Order System and Compacts.

The need for effective competition is even more critical in the fluid milk industry than other food industries. Increasing concentration and the exercise of market power in the channel by processors and retailers is a direct attack on the classified pricing system of the Federal Milk Marketing Order system and the Northeast Dairy Compact. Classified pricing sets a price for milk sold to processors of fluid milk (the inelastic product) that is higher than the price for milk used in manufacturing (elastic products). Since the 1930's, the U.S. Congress and state legislatures have used or authorized the use of classified pricing to stabilize and increase dairy farm income. In an effectively competitive milk marketing channel, the inelastic fluid market demand curve can only be exploited by government in a fashion that is deemed in the public interest.

A fundamental law in economics is: profit maximizing firms will elevate price until quantity purchased is reduced to the level where demand for the product becomes elastic. Now with the increase in concentration and dominance in many local processing and food retailing markets, private firms are capturing the ability to price off the market demand curve. As milk channel firms exercise market power to elevate prices and profits, inelastic demand becomes more elastic. As a result, the ability of public agencies to increase dairy farm income via classified pricing is reduced. If milk prices are elevated to the level where farm level market demand is elastic, then public classified pricing programs are completely ineffective. An increase in farm price no longer increases farm revenue. It reduces farm revenue. Is this the future path of the U.S. dairy industry? If so, it does not bode well for farmers or consumers.

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Table 1a. Farm Price and Farm to Retail Milk Marketing Margins for Fluid Milk: Before and After the Northeast Dairy Compact, Boston ($/Gallon)

		mean	St. Dev
Farm Price	Pre	$1.40	0.102
	Post	$1.46	0.000
	Change	+.06	
Margin by Brand			
All Boston Milk	Pre	$0.98	0.109
	Post	$1.10	0.021
	Change	+.12	
Hood	Pre	$1.40	0.124
	Post	$1.42	0.069
	Change	+.02	
Garelick/Suiza	Pre	$1.12	0.107
	Post	$1.21	0.046
	Change	+.09	
Private Label	Pre	$0.87	0.113
	Post	$1.00	0.019
	Change	+.13	
Margin for Leading Retailers			
Stop & Shop	Pre	$1.01	0.123
	Post	$1.16	0.014
	Change	+.15	
Shaws	Pre	$1.01	0.121
	Post	$1.10	0.038
	Change	+.09	
Star	Pre	$1.12	0.112
	Post	$1.27	0.024
	Change	+.15	
Demoulas	Pre	$0.80	0.112
	Post	$0.92	0.035
	Change	+.12	

Source: Calculated from Food Marketing Policy Center IRI database, Federal Marketing Order One.
Pre NEDC = 18 obs., February 1996 through June 1997; Post NEDC = 15 obs., July 1997 through August 1998.

Table 1b. Farm to Retail Milk Marketing Margins for Fluid Milk: Before and After the New England Dairy Compact; Hartford, Providence, Northern New England, and All New England.

		Hartford		Providence		N New England		All New England	
Margin by Brand		Mean	St. Dev	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
All Milk	Pre	$1.14	0.112	$1.06	0.128	$0.99	0.136	$1.03	0.119
	Post	$1.30	0.022	$1.20	0.027	$1.15	0.037	1.17	0.019
	Change	+.16		+.14		+.16		+.14	
Hood	Pre	$1.37	0.108	$1.45	0.138	$1.30	0.168	$1.38	0.119
	Post	$1.48	0.046	$1.47	0.074	$1.38	0.056	$1.43	0.043
	Change	+.11		+.02		+.08		+.05	
Garelick/Suiza	Pre	$1.20	0.182	$1.22	0.127	$1.24	0.134	$1.15	0.117
	Post	$1.42	0.089	$1.33	0.046	$1.25	0.085	$1.26	0.047
	Change	+.22		+.11		+.01		+.11	
Guida	Pre	$1.09	0.123					$1.09	0.123
	Post	$1.21	0.182					$1.21	0.128
	Change	+.12						+.12	
Sealtest	Pre	$1.65	0.141					$1.65	0.141
	Post	$1.82	0.067					$1.82	0.067
	Change	+.17						+.17	
Booth	Pre					$1.60	0.160	$1.60	0.160
	Post					$1.76	0.062	$1.76	0.062
	Change					+.16		+.16	
Oakhurst	Pre					$1.46	0.185	$1.46	0.185
	Post					$1.64	0.040	$1.64	0.040
	Change					+.18		+.18	
Weeks	Pre					$1.01	0.123	$1.01	0.123
	Post					$1.28	0.059	$1.28	0.059
	Change					+.27		+.27	
Private Label	Pre	$1.05	0.116	$0.93	0.134	$0.87	0.130	$0.92	0.120
	Post	$1.20	0.016	$1.07	0.028	$1.01	0.046	$1.05	0.023
	Change	+.15		+.14		+.14		+.13	
Margin for Leading Retailers									
Stop & Shop	Pre	$1.17	0.142	$1.04	0.151			$1.09	0.135
	Post	$1.38	0.012	$1.23	0.017			$1.26	0.013
	Change	+.21		+.19				+.17	
Shaws	Pre					$0.95	0.123	$0.95	0.123
	Post					$1.07	0.026	$1.07	0.026
	Change					+.12		+.12	
Shop N Save	Pre					$1.08	0.158	$1.08	0.158
	Post					$1.27	0.064	$1.27	0.064
	Change					+.19		+.19	

Source: Calculated from Food Marketing Policy Center IRI database, Federal Marketing Order One.

Pre NEDC = 18 obs., February 1996 through June 1997; Post NEDC = 15 obs., July 1997 through August 1998.

Table 2. Time Series Models to Predict Retail Prices in the Before Compact Period: Boston.

Eqn.	Method	Intercept	Farm Price	1 month lagged Farm Price	2 month lagged Farm Price	Boston CPI	wage	electricity	Fuel	Plastic containers	Date	DW	Adj. R^2
1	OLS	2.413 (22.546)***	-0.020 (-0.266)									0.345	-0.058
2	GLS	2.304 (23.23)***	0.057 (0.805)										0.602
3	OLS	2.419 (19.893)***	-0.144 (-1.187)	0.181 (0.974)	-0.058 (-0.444)							0.740	-0.111
4	GLS	2.214 (13.63)***	0.061 (0.711)	0.015 (0.149)	0.050 (0.546)								0.403
5	OLS	-0.161 (-0.414)				0.016 (6.545)***						1.196	0.711
6	OLS	0.412 (0.954)	0.016 (0.250)				0.148 (4.254)***	0.0001 (0.011)	-0.0006 (-0.499)	0.001 (0.146)		1.823	0.795
7	OLS	2.336 (299.5)***									0.005 (7.054)***	1.236	0.742
8	GLS	2.338 (234.3)***									0.005 (5.328)***		0.745

*** Significant at 1%
** Significant at 5%
* Significant at 10%
Number of Observations = 18.

Table 3. Volume Sold to Supermarkets and Market Share by Manufacturer, All New England, July 1999 through July 2000.

	million lbs	share
Suiza (Garelick and PL)	652.99	44.8
Hood (Stop & Shop)	69.4	4.8
Hood (All Other)	222.6	15.3
Guida	96.02	6.6
Crowley	33.69	2.3
Oakhurst	108.79	7.5
Stop & Shop (PL)	275.26	18.9*

* Effective June 1, 2000, Suiza began supplying Stop & Shop private label milk. Suiza's estimated share going forward in 2000 increases to 63.7%. The Stop & Shop plant is closed.
Source: Calculated from Food Marketing Policy Center IRI database.

Table 4. IRI Market Area All Product Market Shares of Leading Supermarket Chains, 1996 and 2000.

IRI Market Area	1996	2000
Boston		
Stop & Shop	26.2	28.4
Shaws	16.9	27.0
Demoulas	13.1	12.5
Roche Bros.	5.1	4.5
Star	3.5	
CR^4	61.3	72.4
Partial HHI	1169.7	1712.1
Providence		
Stop & Shop	46.8	47.3
Shaws	17.8	23.4
Edwards	8.7	-
RoJacks	2.8	8.7
Daves	-	3.2
CR^4	76.1	82.6
Partial HHI	2590.6	2870.8
Hartford/Springfield		
Stop & Shop	40.4	41.8
Big Y	13.9	15.3
Shaws	7.7	7.5
A&P	11.7	6.9
CR^4	73.7	71.5
Partial HHI	2021.6	2085.2
Northern New England		
Hannaford	36.6	36.7
Shaws	19.7	21.7
Demoulas	12.7	12.3
Grand Union	9.1	6.5
CR^4	78.1	77.2
Partial HHI	1971.8	2011.3

The Partial HHI is the sum of the squared market shares of the four leading firms presented in this table.
Source: Calculated from Trade Dimensions *Market Scope 1997* and *2000 Update*, Interactive Market Systems, Wilton, CT.

Table 5. Estimated Demand Elasticities for Milk: Boston, Providence, Hartford, and Northern New England

	Boston		Providence		Hartford		Northern New England	
	1	2	3	4	5	6	7	8
	OLS	GLS	OLS	GLS	OLS	GLS	OLS	GLS
Intercept	2.053	2.096	0.521	0.407	1.655	1.640	1.746	1.683
t-statistic	(34.7)***	(19.18)***	(6.462)***	(2.223)**	(17.74)***	(8.466)***	(18.98)***	(9.691)***
Price	-0.595	-0.642	-0.816	-0.712	-0.795	-0.787	-0.545	-0.483
t-statistic	(-9.696)***	(-5.680)***	(-10.20)***	(-3.949)***	(-8.818)***	(-4.208)***	(-5.688)***	(-2.678)**
R^2	0.620	0.750	0.644	0.869	0.574	0.826	0.355	0.713
DW	0.795		0.403		0.500		0.486	

*** Significant at 1%
** Significant at 5%
* Significant at 10%
Number of Obs. = 58

Table 6. Cost Components of Milk Sold at Retail: New York City, 1995*

	$/gal	Percent
Raw Milk	1.31	64.9
Processing Costs		
Plant Costs	.24	11.9
Packaging	.10	5.0
Selling	.05	2.5
Administration	.07	3.5
Profit	.06	3.0
Total Processing	.52	25.7
Retailing Margin	.19	9.4
Retail Price	2.02	100.0

Source: Erba. E.M., R.D. Aplin, M.W. Stephenson. 1997.

Table 7. Descriptive Statistics, Retail Milk Price and Quantity, March 1996 – July 2000.

	Minimum	Maximum	Mean	St. Dev.
Price ($/gal.)				
All Boston	2.33	3.03	2.62	0.220
Hood	2.69	3.36	2.97	0.193
Garelick	2.46	3.29	2.78	0.263
Private Label	2.21	2.84	2.49	0.197
All Hartford	2.46	3.23	2.81	0.229
All Providence	2.37	3.20	2.74	0.262
All N New England	2.30	2.99	2.61	0.193
Quantity (Million Gals.)				
All Boston	3.70	4.90	4.40	0.268
Hood	.33	.76	.54	0.140
Garelick	.81	1.52	1.14	0.183
Private Label	2.23	3.10	2.72	0.215
All Hartford	1.93	2.65	2.31	0.194
All Providence	.59	.86	0.75	0.007
All N New England	2.85	3.85	3.41	0.224

Source: Calculated from the Food Marketing Policy Center IRI database.
Number of observations = 58.

Table 8. Correlations of Retail Prices and Quantities, March 1996 – July 2000.

	Boston Price	Hartford Price	Providence Price	N New England Price
Boston Price	1.000			
Hartford Price	0.983	1.000		
Providence Price	0.996	0.985	1.000	
N New England Price	0.963	0.954	0.960	1.000

	Boston Price	Hood Price	Garelick Price	PL Price	Boston Quantity	Hood Quantity	Garelick Quantity	PL Quantity
Boston Price	1.000							
Hood Price	0.960	1.000						
Garelick Price	0.990	0.963	1.000					
PL Price	0.995	0.949	0.978	1.000				
Boston Quantity	-0.805	-0.771	-0.798	-0.778	1.000			
Hood Quantity	0.821	0.660	0.778	0.818	-0.611	1.000		
Garelick Quantity	-0.890	-0.813	-0.892	-0.886	0.901	-0.798	1.000	
PL Quantity	-0.773	-0.658	-0.746	-0.750	0.874	-0.808	0.795	1.000

Source: Calculated from the Food Marketing Policy Center IRI database.
All Correlations are significant at the 99% level.
Number of observations = 58.

Table 9. Estimated Demand Elasticities for Hood, Garelick, and Private Label: Boston

	Hood Quantity					Garelick Quantity				PL Quantity				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	OLS	OLS	OLS	GLS	GLS	OLS	OLS	GLS	GLS	OLS	OLS	GLS	GLS	GLS
Intercept	-0.811	-0.649	-1.281	0.658	0.489	1.255	1.243	1.639	1.639	1.313	1.294	1.461	1.398	1.447
t-statistic	(-2.108)**	(-1.361)	(-3.755)***	(1.260)	(0.956)	(5.816)***	(5.799)***	(6.479)***	(6.543)***	(7.775)***	(7.615)***	(6.884)***	(6.428)***	(6.839)***
Hood Price	-6.240	-5.756	-5.212	-2.442	-2.461	1.255	1.219	0.296	0.294	0.928	0.873	0.003	-0.090	0.025
t-statistic	(-7.392)***	(-5.519)***	(-6.955)***	(-5.430)***	(-5.346)***	(2.651)**	(2.598)**	(0.634)	(0.681)	(2.506)**	(2.348)**	(0.116)	(-0.395)	(0.100)
Garelick Price	2.151	6.119		-0.0.916		-2.098	-2.398	-1.803	-1.806	-0.770	-1.220	-0.009	-0.302	
t-statistic	(2.338)**	(8.498)***		(-1.821)*		(-4.066)***	(-7.406)***	(-3.526)***	(-5.765)***	(-1.908)*	(-4.749)***	(-0.303)	(-1.547)	
PL Price	5.195		6.892	2.509	1.685	-0.393		-0.005		-0.589		-0.454		-.528
t-statistic	(5.555)***		(11.249)***	(3.607)***	(3.188)***	(-0.749)		(-0.007)		(-1.434)		(-1.189)		(-2.026)*
Adj. R^2	0.827	0.732	0.812	0.953	0.951	0.841	0.842	0.878	0.881	0.595	0.587	0.836	0.835	0.839
DW	1.086	1.038	0.741			1.108	1.101			0.601	0.641			

*** significant at 1%
** significant at 5%
* significant at 10%
Number of Observations = 58.

Table 10. Annual Percent Change in Dairy Marketing Inputs, the Boston Producer Price Index, and the US Consumer Price Index.

	1996	1997	1998	1999	1997-1999 Average
Dairy Manufacturing Wage	3.3	2.2	3.9	2.8	3.0%
Plastic Bottles	1.3	0.1	-2.3	5.1	1.0%
Industrial Electric	-1.2	19.3	-7.1	-18.6	-2.0%
Motor Fuel	9.2	-6.9	-12.8	30.5	3.6%
Boston Producer Price Index	-0.9	-1.6	0.6	6.5	1.85%
U.S. Consumer Price Index	2.2	1.7	2.1	3.5	2.4%

Source: Calculated from, Bureau of Labor Statistics, Dept. of Energy and WEFA Group Inc. Econbase
data.

Table 11. Boston Market Level Estimates of Consumer Loss and Loss per Gallon Due to Market Power at Different Margin Growth Rates, July 1997- July 2000.

Margin Growth Rate	Price Growth Rate	Units	Post Compact Flat Farm Price Period July 1997- August 1998	Farm Price Spike Period September 1998- July 2000	Total Period July 1997- July 2000
3.0%	1.24%	Million $	3.58	19.33	22.91
		$/gal	0.054	0.184	0.133
4.0%	1.65%	Million $	3.19	16.88	20.06
		$/gal	0.048	0.161	0.117
5.0%	2.06%	Million $	2.79	14.40	17.19
		$/gal	0.042	0.137	0.100

Table 12. Consumer Loss Due to the Exercise of Market Power since the Advent of the Northeast Dairy Compact by Market Channel Firms, July 1997 – July 2000.

	Corresponding Retail Price	Dollar Loss (millions)			Loss per Gallon		
	Growth Rate for 3% Cost Adj.	Period 1 7/97-8/98	Period 2 9/98-7/00	Sum	Period 1 7/97-8/98	Period 2 9/98-7/00	Sum
Boston	1.24	3.58	19.33	22.91	0.05	0.18	0.13
Hartford	1.35	2.71	10.85	13.56	0.07	0.20	0.15
Providence	1.29	0.41	3.78	4.20	0.04	0.22	0.15
Northern New England	1.24	2.63	6.14	8.77	0.05	0.08	0.07
Total (All New England)		9.33	40.10	49.43	0.05	0.16	0.11

Table 13. Consumer Loss Due to the Implementation of the Northeast Dairy Compact, June 1977-July 2000

	Million Dollars
Boston	7.7
Hartford	4.1
Providence	1.3
Northern New England	5.9
Total (All New England)	19.0

Table 14. Who Gained from the Retail Milk Price Hikes: July 1997 to July 2000

	Before the Compact	After the Compact	Change per gallon
All New England			
1 Average Farm Price	$1.40	$1.51	0.11
Increase due to Compact			0.045
Increase due to Strong Raw Milk Market			0.065
2 Increase due to non Milk inputs			0.07
3 Total Cost Increase (1+2)			0.18
4 Retail Price	$2.49	$2.78	0.29
Increase in Profits (4-3)			0.11
Boston			
1 Average Farm Price	$1.40	$1.51	0.11
Increase due to Compact			0.045
Increase due to Strong Raw Milk Market			0.065
2 Increase due to non Milk inputs			0.06
3 Total Cost Increase (1+2)			0.17
4 Retail Price	$2.43	$2.73	0.30
Increase in Profits (4-3)			0.13
Hartford-Springfield			
1 Average Farm Price	$1.40	$1.51	0.11
Increase due to Compact			0.045
Increase due to Strong Raw Milk Market			0.065
2 Increase due to non Milk inputs			0.08
3 Total Cost Increase (1+2)			0.19
4 Retail Price	$2.60	$2.94	0.34
Increase in Profits (4-3)			0.15
Providence			
1 Average Farm Price	$1.40	$1.51	0.11
Increase due to Compact			0.045
Increase due to Strong Raw Milk Market			0.065
2 Increase due to non Milk inputs			0.07
3 Total Cost Increase (1+2)			0.18
4 Retail Price	$2.54	$2.87	0.33
Increase in Profits (4-3)			0.15
Northern New England			
1 Average Farm Price	$1.40	$1.51	0.11
Increase due to Compact			0.045
Increase due to Strong Raw Milk Market			0.065
2 Increase due to non Milk inputs			0.06
3 Total Cost Increase (1+2)			0.17

4 Retail Price	$2.47	$2.71	0.24
Increase in Profits (4-3)			0.07