EFFECTS OF MARKET STRUCTURE, INSTITUTIONAL CONSTRAINTS AND SOCIO ECONOMIC FACTORS ON THE RETAIL PRICE OF MILK

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Once the factors affecting price that would probably not be changed by minimum price legislation were accounted for, no significant price difference between low and high income neighborhoods existed for the majority of milk sold.

Introduction

Milk is one of the most important sources of human nutrition especially for children. In 1975 annual per capita consumption of milk was approximately 310 pounds. Because milk is an important food item, its general availability and price have a significant effect on consumer welfare, especially for low income families.

The pricing structure of the milk marketing system is very complex due to the interaction of institutional constraints (in the form of government regulation) and traditional economic market forces. No other food product has as many marketing channels as milk. Milk is not only retailed through supermarkets, corner groceries and institutions as other food products but also through specialized channels such as dairy stores, vending machines, and home delivery routes. The farm price of most milk for fluid consumption in the United States is regulated through Federal and/or state marketing orders and the retail price is also regulated in many states. The form of retail price regulations vary from state to state with New Jersey and several other states having a minimum retail price. All of these interacting factors make an analysis of the mechanisms affecting the retail price of milk a complex but theoretically interesting endeavor. However, it is also important from a policy viewpoint to know how these factors interact and ultimately affect consumer welfare since over half the states in the United States have regulations that directly affect the retail price of milk. The status of state regulation of retail price is in a continuing state of flux as various interest groups lobby for their retention, removal or addition.

The arguments used in supporting legislation impacting on retail milk prices vary somewhat from state to state but there are also many similarities. Two of the most consistent justifications are the elimination of destructive price competition and the claim that the competitive nature of the retail milk business is such that it results in consumers from low income neighborhoods having to pay a higher price for milk than those in middle and upper income suburban neighborhoods.
For instance, these claims were used by proponents of a minimum retail price in New Jersey in a successful court case to retain minimum prices and raise their level. The argument used was as follows:1

"Possibly, the most persuasive testimony in the record with respect to the public interest is related to the study conducted by the Division of Dairy Industry on resale prices prevailing in low income neighborhoods in New Jersey as reflected in the model cities study. This study, which was representative of other areas in the state, strongly indicated that intense price competition in the suburbs resulted in higher prices being charged to the people least able to pay higher prices. (One of the primary reasons why this intense price competition has been possible in New Jersey where resale price was in effect, was the apparent action in securing the stay of Order 64-1. The stay has been in effect for almost two years, during which time producer milk prices have increased, and has prevented minimum resale prices from following producer milk price increases. Dealers competing for business in the suburbs where price competition has been intense have attempted to make up their losses by raising prices in the economically disadvantaged areas where dairy store competition does not exist.) The consumers in the North Jersey model city areas paid an average of 10.4 cents more for one-half gallon of milk and 6.3 cents more per quart than consumers buying from stores located outside the model city areas."

Considerable concern was also expressed in the Finding of Fact that if normal retail prices were not raised or were removed that destructive competition between dairy stores and supermarkets would result.

The primary problem with findings from studies such as that done by the NJDDI is that they are implicitly based on very simplistic assumptions. For example, while it was found that the poor did pay more for milk, however, this difference, to the degree of competition in the suburbs necessitates making the assumption that all other factors (such as outlet availability) are similar in the two areas. Due to the many variables affecting the retail price of milk these ceteris paribus assumptions are generally untenable. Therefore, it is necessary to try and separate out the differential influences of individual factors before any policy recommendations can be made.2 The objectives of this study were:

1. Do the poor pay more for milk purchased in supermarkets and dairy stores than persons living in the suburbs?
2. What is the effect of competition among and between various types of retail outlets on the price of milk?
3. What economic factors besides market structure affect the retail price of milk?

Methodology

Two multiple regression models were developed to examine the factors affecting retail milk prices—one for supermarkets and one for dairy stores. It was felt that any analysis of the effects of socio-economic area on milk prices must be examined through consideration of out-of-store prices in similar types of marketing systems. The differences
in cost structures, marketing strategies, and operating procedures between different types of retail outlets such as dairy stores, supermarkets, and "mom and pop" stores would make it impossible to isolate the effects of socio-economic factors and competition if prices from all outlets were included in one model. Models were developed for supermarkets and dairy stores since the majority of milk is marketed through these outlets. Finally, the average price of half-gallon containers was used as the dependent variable since this was the predominant container size in the market area (it was necessary to choose only the price of a certain container rather than the average price of all containers since there was no quantity data available for weighting purposes; however, prices of different sized containers were highly correlated within stores).

Data

The data used in this analysis were those collected by the New Jersey Division of Dairy Industry for their study of milk prices in model cities and the suburban areas. This was the study on which the previously quoted testimony was based. These data were used because they represented a good cross section of retail outlets in the Northern New Jersey area and findings could be directly compared with those from the NJDDI study. The data collected were retail milk prices for a nine-month period from 37 dairy stores and 105 supermarkets. The data also contained individual store information on the number of full-time employees, hours of operation per week, principal supplier of dairy products, and whether or not the store was owner operated.

A personal visit was made to each of the 142 stores included in the sample to facilitate the development of a socio-economic index and competitive index for the stores relevant market area. The socio-economic index ranged from a value of 1 to 3 (with 3 representing the most affluent type neighborhood) and was based on several factors such as the general condition and type of buildings in the market area, population density of the market area, and whether or not the area was predominantly occupied by minorities. For each store five indices of competitive concentration were developed with each index representing the number of a particular type of competing retail outlet in the stores market area. These indices were for dairy stores, supermarkets, vending machines, small "mom and pop" stores, and a total competition index. From secondary sources information was collected delineating the population densities of towns or boroughs in which stores were located, buying power indices for counties in which sample stores were located, and per capita incomes of counties in which stores were located.

On the basis of prior knowledge several other variables were hypothesized to have a significant effect on price such as: wholesale price, cost structure of stores, competition amongst handlers for a retailers business, and the level of nonprice competition existing in the market. It was not possible to obtain data for these variables but some were included in the analysis in the form of proxy variables. The following proxy variables were developed:

1. Size of supplier was used as a proxy for wholesale price. This was done because there are economies of scale in the processing of milk and if some portion of these were passed on to the wholesale prices should vary inversely with the size of supplier.

2. No accurate measure could be developed to measure competition among
handlers in a particular market although this was, admittedly, an important factor affecting the wholesale price of milk.

It was, thus, assumed that handler competition for retail outlet business would be similar for stores located in the same county.

3. It was hypothesized that owner operated dairy stores would have a cost advantage over chain dairy stores since some of them were vertically integrated operations. Owner operated supermarkets were hypothesized to have higher average costs because some of the pecuniary economies obtainable through chain store operations may not be available to them.

4. Hours of operations were hypothesized to be an indicator of nonprice competition.

Results

The results from the initial regression analysis of the two models did not yield very much insight into retail pricing practices. It appeared that some important factor or factors affecting retail prices were not included in this analysis. The primary factor initially considered to be of importance but not included in the regression analysis was the degree of handler competition in a market area. The only measure of this competition was based on proxy variable assumption No. 2, and, hence, retail prices were subsequently analyzed on a county basis. For supermarkets, it was found that in nine counties (representing 75% of the sample stores) very little price variation existed. In four counties there was considerable price variation. Near price stability in dairy stores was also found in nine counties (representing approximately 65 percent of the sample stores). It should be realized that stores in the stable counties were located in neighborhoods with varying socio-economic characteristics and market structures. Hence, it was not surprising that there were problems with the initial regression models since in the majority of cases there were fairly constant values for the dependent variable associated with varying values for the independent variables.

The primary conclusion to be drawn from the county analysis was that in the majority of cases there was very little price variation within store types, and, thus, neither the socio-economic or market structure characteristics of a market area had an impact on retail prices. In these areas the poor did not pay more for milk than persons in the suburbs when it was purchased from comparable types of retail outlets. It was hypothesized that the primary factor responsible for this price stability was the lack of competition or the existence of tacit collusion between handlers supplying these areas. There were some other factors, however, that could have contributed to this price stability in certain areas. For instance, in the supermarket model a much larger percentage of the sample stores (90 percent versus 46 percent) were members of large chain organizations in counties without price variability than in counties with variability. Since many chains follow centralized purchase and pricing policies for their products this factor could account for some of the price stability in these counties. There was little doubt that the consumer benefited from competition since prices were less in counties with price variability than in those with relatively stable prices.

After eliminating the counties with no price variability from the data sets multiple regression models were re-estimated utilizing the remaining data. The final models for the two classes of retail outlets were:
A. Supermarkets:

\[ P_S = 68.25 - 1.32S - 0.68c_1 - 0.095H \]

\[ R^2 = 0.95 \]

B. Dairy Stores:

\[ P_D = 55.6 - 0.81S + 2.21c_1 - 1.6c_2 - 1.4X \]

\[ R^2 = 0.98 \]

where:

- \( P_S \) = Average price of 1/2 gallon of milk in a supermarket.
- \( P_D \) = Average price of 1/2 gallon of milk in a dairy store.
- \( S \) = Socio-economic index of stores market area.
- \( c_1 \) = Number of supermarkets in stores market area.
- \( c_2 \) = Number of dairy stores in a stores market area.
- \( H \) = Hours of operation per week.
- \( X \) = 1 if store is owner-operated, 0 otherwise.

It must be realized in interpreting these equations that this analysis applied to approximately 25 percent of the supermarkets and 36 percent of the dairy stores in the sample. In this subset of stores, the price of milk increased as the socio-economic characteristics of the store's market area progressed from high to low income. The increase was greater for supermarkets where the average price in the highest income neighborhood was approximately 2.6 cents lower than in the lowest income neighborhood. The comparable difference in price between neighborhoods for dairy stores was approximately 1.6 cents. From the data available in this study it was not possible to determine the reasons for this price difference but there were many possibilities such as: A difference in wholesale price, a reflection of differences in operating costs, or discriminatory pricing practices. It is interesting to note that when the impact of socio-economic area on price is isolated, by removing the effects of outlet type and interstore competition, the difference between low and high income areas is considerably less than the 10.4 cents estimated and used as the basis for policy recommendation by the NJDDI.

The other factors affecting the price of milk in supermarkets were related to the degree of competition in their relevant market areas. The average price declined both as the number of competing supermarkets and the degree of nonprice competition (as measured by hours of operation) within a store's market area increased. Interestingly, the concentration of dairy stores within a supermarket's market area did not significantly affect the price they charged. Hence, while supermarkets appeared to be in direct competition with one another it appeared that they did not try to compete on a price basis with dairy stores.

From the dairy store models it was evident that they also competed directly with each other since the average price decreased as dairy store concentration within a market area increased. It was also evident that milk price competition amongst dairy stores was more intense than amongst supermarkets. This was not an unexpected result since dairy stores compete mainly on the price of milk while...
supermarkets compete on a complete line of products (even though the price of milk is considered to be an important traffic builder in supermarkets). An interesting finding from the dairy store model was the fact that the average price increased as the concentration of supermarkets increased. The apparent reason for this relationship was that geographically isolated dairy stores needed a larger price incentive to attract customers than those located in close proximity (perhaps in the same shopping center) to supermarkets. This finding gave further support to the conclusion that there was not a great deal of price competition between dairy stores and supermarkets. Finally, it was estimated that, on the average, prices in vertically integrated dairy stores were approximately 1.4 cents per half gallon lower than in other dairy stores.

Many other independent variables were tested in the two models but they did not prove to be significant. For instance, it was found that the concentration of vending machines and "mom and pop" stores did not affect the retail price of milk in the outlets examined. In supermarkets there was no significant difference between the prices charged by independents and chains. Finally, it was found that county-wide economic indicators such as per capita income or the buying power index were too aggregated for use in models relating retail prices to the socio-economic conditions of market areas.

Summary and Conclusions

In conducting research that will influence policy recommendations affecting retail prices it is imperative that models be developed to isolate the individual impacts of the many social and economic factors affecting such prices. Over half the states in the United States currently have regulations affecting the retail price of milk. One of the justifications for such legislation used in New Jersey and other states was that without such regulations persons in low income neighborhoods would pay more for milk than those in upper income suburban neighborhoods. A study conducted by the New Jersey Division of Dairy Industry estimated the difference between the average price per half gallon of milk in low and high income neighborhoods to be 10.4 cents and they implied that minimum retail prices would have an impact on lessening this difference. However, once the factors affecting price that would probably not be changed by minimum price legislation (such as differences in outlet types between neighborhoods, competition and/or collusion between handlers, and inter-store competition) were accounted for, it was found that there was no significant price difference between low and high income neighborhoods for the majority of milk sold. In the instances where there was a difference the impact of market area income factors on milk was much less than that estimated by the NJDDI. The study also indicated that while supermarkets and dairy stores compete on prices to some extent amongst their own store type the intense price competition often assumed to exist between the two store types was not evident. Finally, it would have to be concluded from the study that any public policies aimed at increasing competition between handlers and/or retailers would result in lower consumer prices.

FOOTNOTES


2 One immediately obvious difference between inner city and suburban markets is the mix of retail outlets. Inner cities generally have a higher proportion of
"mom and pop" stores which tend to be a higher price outlet than supermarkets regardless of where they are located.

3. The standard deviation of prices in these counties was less than 1 cent.

4. Standard deviation of prices in these counties ranged from 2.3 to 6.1 cents.

5. In the counties with stable prices the standard deviation was less than 1 cent while in those with price variability it ranged from 2.1 to 3.7 cents.

6. This finding would coincide with findings from the USDA study which concluded the following: "The most significant form of competition among milk dealers is that which results in a recognized structure of prices...This form of competition is influenced by the laws and public policies that place obstacles in the way of open and formal agreement. Written agreements are taboo. The actual process of arriving at a price structure or of amending prices becomes an interfirm activity that the participants try to carry out with the same degree of privacy as they carry out activities within the firm," USDA, Price Wars in City Milk Markets, Ag. Econ. Report No. 100, p. 8.

7. The average difference between prices in counties with price stability and those with price variability was 2.3 cents for dairy stores and 1.8 cents for supermarkets.

8. Numbers in parentheses beneath the estimated parameters are t statistics.

9. It could, perhaps, be argued that this intense price competition between dairy stores and supermarkets did not exist during the sample period because there was a prevailing minimum price in New Jersey at this time. However, only a small percentage of the stores in the sample were actually charging the minimum price and the NJDDI and others argued that the minimum price was at too low a level to be an effective deterrent to destructive competition.