FOOD PROCESSING IN NEW YORK STATE: A COMPARATIVE ANALYSIS

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by

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ABSTRACT

Food processing as an activity, is crucial to the nation's economy both as part of manufacturing and the overall food system. The states across the nation have differed in their contributions to this sector, with New York having been the leader in the production of processed food before World War II. By 1960 it had slipped to second place, and it ranked seventh by 1982. Production of the food manufacturing industry increased by 24 percent during the period, but it was less than a fourth the US rate. The drop in employment was also four times the US rate.

Nevertheless, food processing still maintains a sizable share of both the nation and state's economy. This research aims at providing a portrait of food manufacturing with special emphasis on New York state. By making a comparative analysis of the state, the Mid-Atlantic region and the US, it is hoped that this quest will reveal the key regional and national factors that affect the food processing industry. The study uses data from the US Bureau of the Census to analyze performance of the sector.

The analysis reveals that although New York state may seem to be on the decline, its performance still compares favorably to the rest of the nation. Using Industrial Organization theory, a model is designed to quantify the performance response of the industry to the behavioral

environment it faces. It was found that as a whole, the industry's performance is heavily impacted on by the cost of labor as compared to other input costs. This suggests the increasing importance of human resources, with the skills and capacity of the work force taking on major consideration in determining the efficiency and competitiveness of the food processing industry.

BIOGRAPHICAL SKETCH

Alfred Kariuki Mukunya was born in Ithaca, New York in 1969, the son of an industrious couple, then studying in Cornell. Upon graduating, the family went back to Kenya where Kariuki attended Consolata Primary School in Nairobi. He then attended Lenana High School, a boarding school in the outskirts of the city. His interest in agriculture began early, as the family owned a small farm in the tropical highlands of central Kenya. He proceeded on to the University of Nairobi for a Bachelor of Science in Agriculture, where he graduated with high honors. He proceeded on to Cornell University on a State University of New York fellowship to pursue a Masters degree in Agricultural Economics. He continues on for a Masters in Business Administration at University of Pennsylvania's Wharton School of Business, commencing fall 1993.

Kürî Aciari

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This thesis brings to an end what I may well call an exhilarating two years in this country, both in academia and the professional world. My unique experience can be attributed to an exceptional personality I found in the chair of my committee, Ralph Christy. As a graduate student, I could not ask for a better Professor than one who lets a person explore, and yet always ready to hear what he finds. His expert guidance allowed fruitful search in what would otherwise have been a dry and barren expanse of academic tedium. Again in all sincerity, I extend my deepest appreciation to Ralph.

Edward McLaughlin is a person who is true to his career, as one who minimizes costs and time spent on any assignment, yet without sparing quality. As the minor member of my committee, his impressive efficiency was greatly appreciated. With ready comments at hand, he has always been the perfect feedback of work that I've produced.

The department and friends at Cornell can also not be forgotten, as they have been part and parcel of what I'll call the Warren Hall experience. I would like to thank all who ever gave me a reason to smile throughout these two years.

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Chapter One

Introduction

The US economy is normally divided into ten sectors that include agriculture, manufacturing, retail trade, wholesale trade and government. Of these ten sectors, manufacturing is the largest, accounting for about one quarter of the country's GNP. The food processing industries are among the largest of the twenty industry groups that form the manufacturing sector. Food manufacturing is also part of the overall US food system. The industrialization of the US food system has been one of the most important economic phenomena of the past century (Marion, 1986). National markets have grown as food production and distribution systems become more productive, efficient, and capital intensive. The food system has also become more integrated with the rest of the economy, as food processing, distribution and related activities moved from farm to nonfarm establishments. As late as the 1870's, the marketed value of unprocessed foods was greater than that of manufactured foods and beverages, while today, manufactures comprise over 90 percent of US household food purchases.

The GNP contribution, or value added by the US food system, has grown nearly fivefold since 1947. Food processing increased its share of food system value added from 15.8 percent to 21.3 percent in 1982, surpassing agriculture's contribution around 1980 (Connor, 1988). This thesis narrows down to New York state, and focuses on this

important element of the economy that is formally described as the Food and Kindred Products Industry, or Standard Industrial Classification (SIC) "20" by the Bureau of the Census.

Problem Statement

New York state was the leading state in the production of processed food before World War II. By 1960, it had slipped to second place behind California, and it ranked seventh by 1982. Production of this industry has increased by 24 percent during the period, less than a fourth of the US comparable rate. The 1963-1985 drop in employment in New York state has also been four times the US rate (Connor, pp. 192). This sector is important in that it accounts for about 9% of manufacturing in the state, employing more than 57,000 individuals in 1989. In 1987, food manufacturing had sales of more than $37,000 million worth of products (1982 figures).

These facts show the importance of the food processing industry to the state. The question also arises about the industry's performance relative to the rest of the nation, as the state's national importance declines. As an attempt to address this problem, this research will focus on New York state's recent performance in the industry.

In 1988, Connor analyzed patterns of food processing growth among the fifty states with data from 1985. This research will explore food processing in New York state up

to 1989. Secularly referred to as the 'rust belt', the North Eastern and North Central regions of the US, have been reported to loose manufacturing activity to the 'sun belt', or the Southern and Western regions of the country (Kelton, 1983). The Mid Atlantic region, or which New York state is a part of, belongs to the Northeastern region that has been reportedly shown this general migration of general industry during the twentieth century.

Both economic theory and industrial experience suggest that performance is influenced by the competitive interaction among its constituent firms, prices, profits and output levels resulting in the markets (Carlton and Perloff, 1991). This thesis will explore how performance is impacted upon by the economic environment of the food industry, and describe empirically how the state has performed relative to its immediate neighbors and the nation. This may help reveal the regional factors that affect the industry, or whether the trends observed affect the nation as a whole.

Importance of the Food Manufacturing Industry

Based on the value of shipments, the food processing industry is the biggest manufacturing sector in the US. In 1985, food processing shipments were over $85 billion ahead of the next largest industry group (Connor 1988), non electrical machinery- which included engines, farm equipment, construction machinery, industrial machinery and computers. A preferred measure of size between different industries is 'value added', since it avoids the double-

counting inherent in the value of shipments. It is the measure of contribution to the gross national product. Food processing and its associated industries, which include farming, distribution and food service, provide about 20% of the nation's gross national product. In 1987, food processing generated a total of $121 billion which was 10.4% of value added of the entire manufacturing sector (1987 values). Therefore, food processing is an enormous engine within the overall US economy.

Another critical dimension of the industry is its multiplier effect. The increase in the total economic activities of all industries, as a result of a one unit increase in the economic activity of a particular industry is called the industry's multiplier. For example, a bakery will demand plastics and paper, while a grain mill will provide starch for the paper industry. Investing in industries with high multipliers, has greater benefits to the overall economy than other industries with low multipliers. A totally closed industry has a multiplier of one. One that diminishes economic activity in a region, will have a multiplier less than one. Using 1977 data Blandford et al. (1988) calculated the income multiplier for the food processing industry as 3.81 compared to 2.15 for all industries, and 2.56 for all manufacturing. He also reported an employment multiplier of 3.74 compared to 2.18 of all other industries.

Why has such a vital and dynamic industry not received more attention from economic researchers? Connor of Purdue suggests that it is it's link to agriculture, civilization's first industry. Industrial economists prefer industries that appear to be more technologically progressive. Although the end goals of the food processors may be the same as in centuries past- for instance, flour milling essentially gives the same product- the process today is much different.

Objectives and Scope of Thesis

The primary objectives of the thesis can be summarized as follows:

(i) to discuss the trends of the food manufacturing industry of New York State;

(ii) to illustrate the applicability of the industrial organization (IO) approach for analyzing the food processing industry;

(iii) to examine and evaluate market performance of the food processing industry through a comparative study.

With these three main objectives in mind, this study hopes to provide a better understanding of the food processing industry, its contribution, problems and opportunities provided by the sector in New York state. First, the thesis will present the importance of the industry in the economy, the forces that influence it, and determinants of its location. The conceptual framework, IO theory and background on which empirical studies are based

is also dealt with. The research then reviews these studies and their methodologies, including others that have used a similar approach to analyzing performance.

The study then focuses on New York state's food manufacturing to present a descriptive analysis of the trends in the state. The Mid-Atlantic region (New Jersey, New York and Pennsylvania) and the whole nation's characteristics are used for comparison. The geographic location of the industry in the state is also graphically presented. The national rankings of divisions within the top industries by employment are also reported, in order to get a better understanding of where the state lies nationally in terms of specific food products.

A conduct-performance model, and how it came to being is then presented in order to characterize the industry's performance. The justification of the model, its use in the industry and the results are discussed before presenting the conclusions. The model also gives a comparison between the state's in the region and all of the US combined. This is done in order to detect any major differences in performance that may have New York at a disadvantage. Altogether, the three mentioned objectives will work towards explaining how performance of the food manufacturing industry is affected by its conduct.

The time period dealt with in the study is from 1972 to 1989. The data through 1987 are extracted from the Census of Manufactures, Geographic Area Series, while the 1989 numbers

are from the County of Business Patterns. The latter dataset only has numbers on the number of firms, employees and wages, therefore the latest year dealt with in the empirical analysis is 1987. The data used are adjusted for inflation to 1982 figures, and the deflators used are from the 1991 Economic Report of the President.

Thesis Outline

This chapter has dealt with the introduction and problem statement of the thesis. The next chapter will deal with the literature review and how IO is applied to the food manufacturing industry. The third chapter presents a descriptive overview of food processing trends, with focus on New York state while bringing in the Mid-Atlantic region and the rest of the US for comparison. In an attempt to characterize the performance of the industry, the fourth chapter presents the methodology, the specification and the results of the model. The model is designed to quantify the performance response of the industry to the behavioral environment it faces. By using it across the more recent census years, the food processing industry's trends in performance are also tabled. The last chapter gives the summary of the thesis findings and presents areas of future research.

Chapter Two
Review of Literature

Introduction

This chapter deals with the literature review by first outlining the forces influencing the sector. The theory and background of Industrial Organization as applied to the food processing industry is then presented while discussing the works that have influenced the direction of this research.

Forces Influencing Food Manufacturing

The factors that influence the food processing industry can be discussed under seven headings, the first two being pivotal in the economics of food processing. These are:

•**Demand** deals with the factors that shape the consumer's desire and ability to pay for food products. The demand for food is said to be a function of consumer's income, prices, taste and preferences, etc. All these are dependent on the growth, size and the general demographics of the population.

The food manufacturers are part of the overall food market that is an elaborate system that moves food from producers to consumers. Many have conceded that nothing short of a revolution is taking place in this sector. As Barkema, Drabenstott and Welch put it:

> "A quiet revolution in the US food market is underway that many change the way farmers and food processors deliver food to consumers. While consumers will still see grocery shelves stocked

> with the foods they want, the revolution will significantly alter the way producers and processors do business. Driving this revolution are changes in both consumer tastes and technology."[1]

The aggregate demand for processed foods can be said to be a function of income, prices and population. Of the more profound changes occurring in America's demand for food has been the shift in the types of food demanded. Three main forces have been used to explain this[2]:

-*New consumer preferences* on nutrition composition with the population's traditional high fat and protein diet changing to having less of it. Consumers seem to want more of nutrition and freshness while reducing on amount of cholesterol and fat.

-*New consumer lifestyles* that present a higher demand for convenience foods. Nearly three-fourths of women aged 25-54 are now in the work force, compared to about half 20 years ago (Barkema et al. ibid.). The amount of time spent preparing food by most households has cut back, which means that processors will process foods more fully.

-*Demographic shifts* have resulted in consumers demanding a wider variety of foods. The increasing ethnic diversity of

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[1]Alan Barkema, Mark Drabenstott, and Kelly Welch "The Quiet Revolution in the US Food Market." Economic Review. Federal Reserve Bank of Kansas City, (May/June 1991) pp. 25.

[2]Also see McLaughlin, Edward W. and Gene A. German. The Economic Environment for Food Distribution. They also state that "the changing consumer is and will remain one of the forces most responsible for the future shape of the food distribution industry".

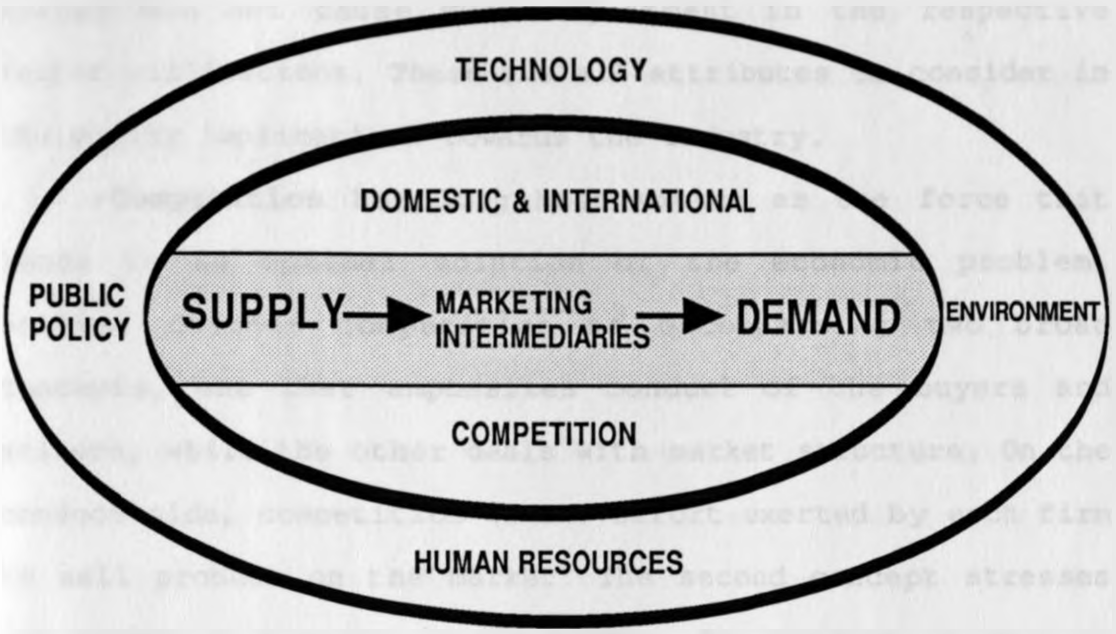

Figure 2.1 Overview of Factors Influencing Food Manufacturing (adapted from Kotler).

the population and the aging of the baby-boom generation are the two main demographic shifters recognized.

• **Supply** refers to the forces which shape the producers' ability to offer to the consumer what he desires. The inputs the manufacturers combine to accomplish this include farm produce, labor, other inputs such as packaging materials, energy and capital.

In a study of key non-food inputs for US food manufacturing, Huang (1989) analyzed the demand elasticities for capital, labor and energy. He found that these production factors are substitutable, especially capital and labor. The results also revealed that the demand for capital services was much more highly elastic than labor and energy. The relatively large changes in the prices of fuel and

energy did not cause much adjustment in the respective factor utilizations. These are all attributes to consider in the policy implications towards the industry.

•**Competition** has long been viewed as the force that leads to an optimal solution of the economic problem. Scherer defines competition as encompassing two broad concepts, one that emphasizes conduct of the buyers and sellers, while the other deals with market structure. On the conduct side, competition is the effort exerted by each firm to sell product on the market. The second concept stresses the number of players in the market. An industry is said to be perfectly competitive only when the number of firms is so great, with each firm's market share of the indifferentiable product being so small, that no individual firm can influence the commodity's price by varying the quantity of output.

Perfect competition vs. monopoly are the two extremes of the competition environment under which a firm may operate. A firm's average costs may remain constant, rise or fall as its output increases. If average costs fall as the output grows, then the firm is said to have economies of scale. As the demand for food products grows, it may be more efficient for fewer and larger plants to operate, as the food sector tries to meet market demands. Conglomerates and their economic behavior, dairy cooperatives, and the Ma & Pa's apple cider plants and how they are incorporated into the economy are the issues examined under this heading.

Generally, most industries within the food marketing system are becoming more economically concentrated and their behavior will generally reflect this[3].

Competition from abroad was once considered trivial when international trade consisted of only 5% of GNP in 1940's and 50's. However, one quarter of US's GNP is now attributable to international trade, while international borrowing has reached an annual rate of $80-100 billion. Globalization of the economy is now a common phrase, indicating both new opportunities and competition from the outside world.

A relatively new approach to defining competition in agricultural economics has been the use of game theory. By focusing on firm strategic behavior vis-a-vis its rivals, this approach serves to clarify which variables are critical to strategic choice and, in turn, to market operation (Caswell and Cotterill, 1988). Though simple in concept, game theory application in real markets poses many challenges. The model must indicate the specific players and the range of strategic options. In a real market, the number of possible outcomes can become unmanageable hence the need to identify the essential variables in defining the how the market functions.

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[3]The beer industry is an example of where economies of scale at the plant level have become increasingly important. Carlton and Perloff (pp. 49 and 50) show how the number of plants diminish from 465 in the year 1965, to 80 in 1983. In 1959, more than 100 plants had a capacity of 250,000 barrels or less, and two plants produced more than 4,000,000. In 1979, the small capacity plants were only 16 while the large capacity increased to 20.

•**Public Policy** involves the disposition of the federal, state and local governments toward the industry, and what rules are ultimately formed and enforced. Macro policy influences interest rates, which in turn bear on the availability of capital for industry. National policies affect the values of the dollar, taxation rates, wages and employment rates.

A major concern to the field of IO is antitrust law which is the major policy tool that the government uses to influence the ways in which firms compete with each other. Antitrust laws affect how firms attain and maintain market position and power. The three major statutes of antitrust policy are the Sherman Act passed in 1890, the Clayton Act passed in 1914, and the Federal Trade Commission Act also passed in 1914. The main principle behind antitrust policy has been to promote efficiency and protect society from needless inefficiency losses when firms exercise market power. Actions that the courts seek to prohibit include monopolization, attempts or conspiracy to monopolize trade or commerce, explicit cartels or contracts, price discrimination that substantially lessens competition and mergers that tend to lessen competition[4]. However, there are

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[4]An example of court action is early in 1986 when the Coca-Cola Company announced that it planned to buy the Dr Pepper Company and merge operations. Soon, PepsiCo had announced its intentions to purchase the Seven-Up Company, a subsidiary of Philip Morris Corporation. The mergers would have meant the consolidation of the first and fourth, and the second and third largest sellers, respectively, of concentrate for carbonated soft drinks in the United states. In June of 1986, the Federal Trade Commission decided that the mergers were likely to be anticompetitive and declared to oppose them. PepsiCo and Seven-Up withdrew the merger plans, but Coca-Cola and Dr

several critics that oppose many of these laws, saying that they are merely there to protect certain sections of society at the expense of others[5].

Safety and public health policy measures also affect the food processing industry. Agricultural sector policies are also considered by food manufacturers since that's where their major inputs are from. Research expenditures into post harvest studies from the USDA, land-grant universities are also other subsets of policy focus on the industry.

•**Environment** and how food processing interacts with the natural resource base has become a much larger issue in recent years. The linkage and influence of the food processing industry to the environment is important, as the food processing and its associated industries are heavy users of natural resources. The relationship between the industry and the environment will play a major role on the economic performance of the industry.

At the consumer level, a new concern with the disposability of the food processing industry's by-products has arisen in recent years. The problem of food packaging stems from the frequency the consumer purchases the product. The demand has increased for more convenience foods and this

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Pepper persisted to the point of a small scale trial which still ruled against the mergers.

[5] In an article titled "Is it Time to Retire Robinson-Patman?" in the Wall Street Journal (pp18: June 20, 1986), Robert E. Weigand proposes the repeal of one of the major acts of antitrust law claiming its obsolescence. He gave five arguments against it: 1. Economic conditions have changed; 2. The act encourages soft competition; 3. The countervailers are alive and prospering; 4. The act is a costly nuisance; and 5. The act is unpoliceable.

generally leads to more packaging. The trend towards 'environmentally friendly' packaging is predicted to have a much bigger impact in the future, both as a need and requirement for manufacturers.

•**Technology** determines the production limit after combining all inputs. This factor will determine the economic payoffs to the inputs over time, since the better the technology, the higher the efficiency and the greater the output per person. Historically, expenditures for research and development (R&D) within the food industry have been much lower than other manufacturing industries (Polopolus, 1986). As earlier stated, technology is linked to the population in driving the food industry revolution. As the demand shifts, technology promises to provide for the new demands.

Though R&D in the industry is much lower than in other industries, advances in other sectors greatly influence the food sector. From the scanning technology that ever more closely helps to identify consumers' needs and behavior (Russo and McLaughlin, 1991), to the increasing replacement of human labor by capital, technology is seen playing a role.

•**Human Resources** encompass the skills and capacity of the work force. This takes on major consideration in a global economy. Since human resources are considered a fixed resource, infrastructure being the other, public investment is likely to be directed toward human capital programs.

Human resources are playing a larger role in determining the efficiency and competitiveness of an industry or nation.

Geographic Placement of the Food Industry

When considering the nature of food manufacturing, Connor (1987) identified three main characteristics that can be said to influence the growth and placement of the food processing industry. Using these factors, a policy maker or investor would know how to distinguish a particular sector and how it would fare in a given region.

•Firms oriented to the ultimate local customer. These are plants whose location is mainly determined by the local demand. This selection would include such food groupings as fluid milk bottling and baking. The population and personal incomes of the local region would be the main influence of these industries and the perishability of the processed product.

•Firms oriented to local agricultural supply. Several food processing firms must locate in major agricultural production zones. This decision is largely influenced by bulkiness (corn, hogs, carcasses, soybeans), or perishability (tomatoes) of the raw commodity. The farmers could also be buyers of feed as in the case of slaughter livestock industry.

•Footloose/high value added firms. These are food processing firms in which the manufacturer's plant does not gain any efficiencies by locating near

sources of raw commodities or near the consumer centers. The costs for delivery of the raw material to the plant, and finished good to customer is relatively low, compared to the value of the product. These would include products like prepared flour mixes, confectionery, frozen foods among others.

The IO Approach to the Food Industry

General Background

The classical model of IO, the Structure-Conduct-Performance paradigm, was first conceived by Edward S. Mason at Harvard in the 1930's and further developed by his student Bain. The sequential relationship shown in figure 2.2 has formed the basis from which the conceptual framework of many industry studies have been built upon. In summary, the theory recognizes that the industrial performance of an economy is influenced by the conduct of market participants, which in turn depends on the structure of the industry. The determinants of market structure include the degree of market concentration, product differentiation and barriers to entry. Conduct of buyers and sellers involves pricing policies and tactics, product line strategies, research and development, overt and tacit collusion among firms, legal tactics and so on. Market structure and conduct will also be influenced by basic conditions which are comprised of the supply and demand characteristics of the products in question (Scherer 1990).

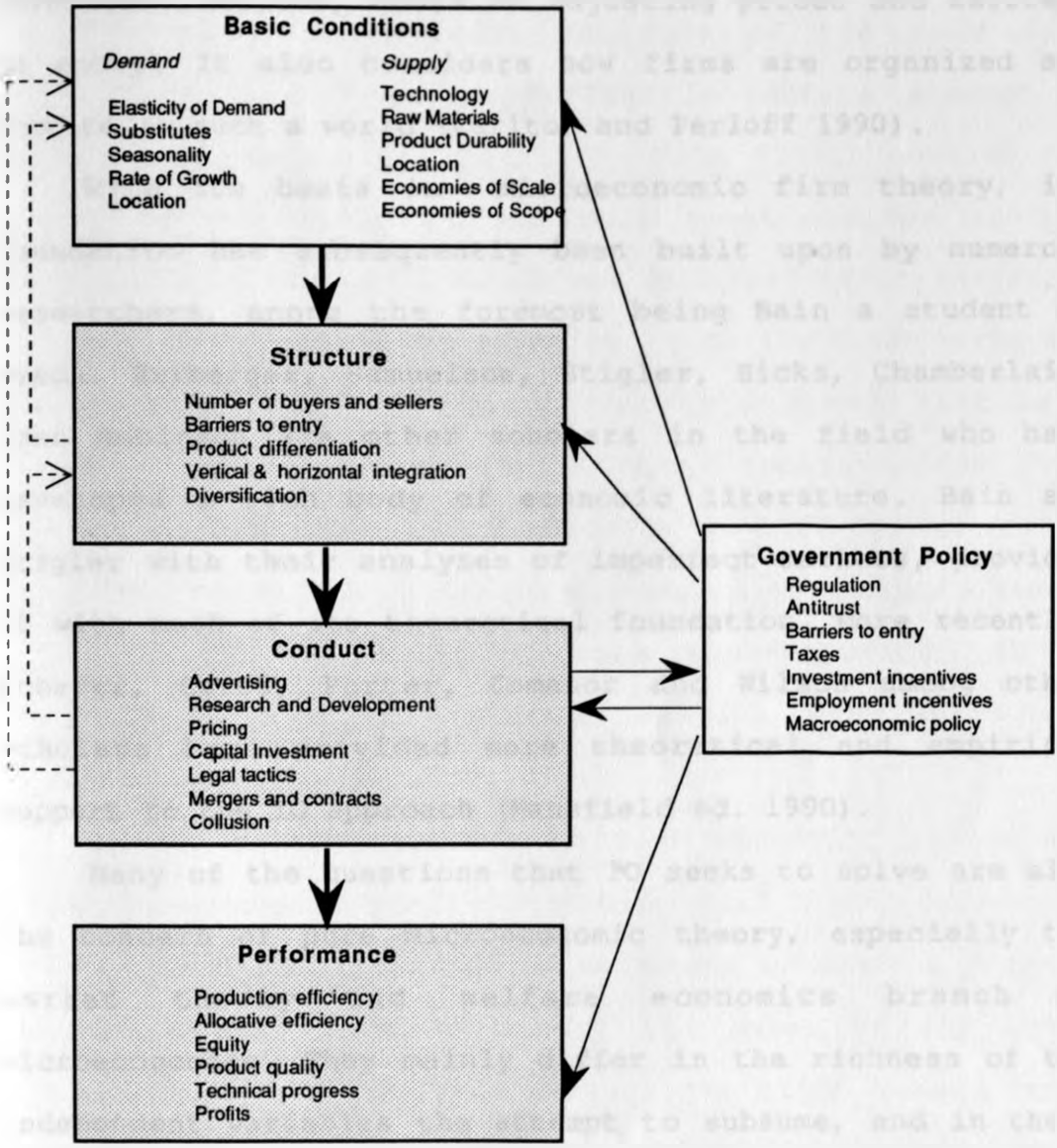

Figure 2.2 The Structure Conduct Performance Paradigm.
(Adapted from Scherer)

IO adds to the perfectly competitive model real world frictions such as limited information, transaction costs, government actions, costs of adjusting prices and barriers to entry. It also considers how firms are organized and compete in such a world (Carlton and Perloff 1990).

With its basis in microeconomic firm theory, its foundation has subsequently been built upon by numerous researchers, among the foremost being Bain a student of Mason. Harberger, Samuelson, Stigler, Hicks, Chamberlain, Joan Robinson are other scholars in the field who have developed a rich body of economic literature. Bain and Stigler with their analyses of imperfect markets, provided IO with much of its theoretical foundation. More recently, Scherer, Caves, Porter, Comanor and Wilson among other scholars have provided more theoretical and empirical support to the IO approach (Mansfield ed. 1990).

Many of the questions that IO seeks to solve are also the concern of pure microeconomic theory, especially the market theory and welfare economics branch of microeconomics. They mainly differ in the richness of the independent variables the attempt to subsume, and in their concern for predictions and explanations in to real world cases (Scherer). When a tradeoff is to be made, the pure theorist will sacrifice explanatory power for elegance, while the industrial organization specialist will prefer the opposite. Both approaches have their setbacks, and it is in

the interest of this research to seek a compromise between the two positions.

IO Analysis in Food Manufacturing

The first significant analysis of the food food processing industry was by Hoffman in 1938, a student of John Kenneth Galbraith. Later, Nichols (1941) applied the theory of oligopoly to vertical relationships in the agricultural industry. Clodius and Mueller (1961) rekindled interest in the field by applying it to the food marketing industries. Several technical reports followed both as a result of the book and the National Commission on Food Marketing, a presidential commission in 1965-66 (Connor et al. 1985). To gain a better understanding of the more recent works in the economics of food manufacturing, it is important to view the historical setting under which they took place.

As the century began, the food marketing system was comprised mainly of small and medium sized firms. During the 1920's, food manufacturing experienced a wave of mergers that only came to a halt with the onset of the Great Depression. Following World War II, the trend toward fewer and larger firms continued with smaller competitors being increasingly marginalized. As the mergers went on during the two decades after the war, the sector attracted the interest of both economists and the general public as to its overall competitiveness. This prompted the setting up of the National Commission of Food Marketing in 1964 to study and

investigate the food industry. However, it was judged to be 'workably competitive' and no corrective action was proposed (Hoffman in Connor et al., 1985). The report did concede a future of increased difficulty of entry into the food processing industry.

Soon after the commission reported its findings, another series of mergers started. Large retail chains found it worthwhile to engage in extensive manufacturing and contracted processing. Leading firms in different sectors of the food food processing industry, which many thought to be mature, merged with each other. This frenzy dubbed the 'merger mania' (Hoffman ibid.; Dirlam in Adams ed. 1977) continued on during the works to be described next.

Clearly, the reasons for the early mergers were for operating reasons: with firms trying to achieve optimal production size and scale[6]. The economy was also undergoing infrastructural change with fast technological and demographic changes going on at the same time. Vertical integration lowers transaction costs, while horizontal integration is likely to enhance market power and increase the firm's operating size.

The most recent behavior of the industry has raised several questions among scholars as to the welfare effects

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[6]Historical evidence shows four large spurts of merger activity in the US economy since 1900 (see Carlton and Perloff pp. 163-164). The first was in the early 1900's, the second in the late 1920's, the third in the late 1960's and the fourth in the 1980's. Stigler has named the first two *merger to monopoly* and *merger to oligopoly* movements respectively. The third has been dubbed the conglomerate movement and there is no common name for the most recent.

and productive efficiency of the continuously more concentrated industry. With mergers certainly enhancing market power through vertical and/or horizontal integration, there is the issue of whether this behavior displayed leads to needless consumer loss due to the tendency to monopolize. There is the other issue of whether it is simply the conduct of an industry with a high minimum efficient scale of operation, hence favoring such consolidation and other related behavior.

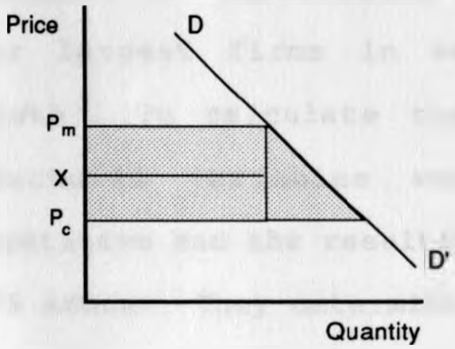

Figure 2.3 Consumer Loss Due to Monopoly

In characterizing the food processing industry, Parker and Connor in 1979 conducted a study on the amount of consumer loss due to monopoly in the US (see figure 2.3). P_m was defined as the monopoly price, X the level of his average costs and P_C the competitive level. Using this theoretical framework, they set out to find the total monopoly loss to consumers (shaded). Of interest was one of the three approaches they used which was the price-cost margins estimates method. Price-cost margins (PCM) are defined as the total dollar amount of value added in an industry less payroll and other direct costs (US Department of Commerce 1972). Therefore PCM's include returns to capital, executive salaries, and expenditures for

advertising and other contract services. PCM was also used as an index of performance by Collins and Preston in 1968, with the four-firm industry concentration ratio as an index of monopoly (structure) in their regression model. Other variables used by Collins and Preston were a capital-output ratio and a geographic market index. They used the equation on 1958 Census data, while Parker and Connor fitted it on 1972 data for forty-one food manufacturing industries.

Parker and Connor also augmented the model by adding variables for advertising as a percentage of sales of the four largest firms in each industry and for industry growth[7]. To calculate the total overcharge amount, the structural variables were set at levels considered competitive and the resulting PCM was compared to the actual 1975 amount. They determined that $12.2 to 13.6 billion was the total loss due to monopoly in the US food processing industry.

In studying economies of scale, an approach initiated by Stigler in 1968 is the survivorship principle which states that if a particular plant size is efficient, then eventually all plants in the industry should aproach that size. With a survivorship analysis, Bullock asked how higher cost firms could replace lower cost firms. He argued that the larger firms were in fact lower cost and hence the framework Parker and Connor used did not apply. He stated

[7]See Parker, R.C. and J.M. Connor. "Estimates of Consumer Loss Due to Monopoly in the US Food-Manufacturing Industries." American Journal of Agricultural Economics. 61 (Nov. 1979): pp. 631-633 for comprehensive summary of PCM method and results.

that the industry's costs could only be below the original cost of atomistic firms which was P_C. Bullock also cited what Greig called the social costs of atomistic competition[8]. Parker and Connor in a reply still insisted on a possible failure of market forces to regulate the food food processing industry and force the firms to an optimal scale of production.

Another empirical study that has used the S-C-P approach was one by Zellner in 1989. He sought to clear the debate on the effect of advertising and product proliferation as a mode of conduct on the food industry's performance. Again, he used the price cost margin as the measure of performance. He put forward a four equation simultaneous model to explain the association among advertising intensity, concentration, profits and new product introduction. The variables pertaining to conduct included capital output ratio, and the geographic market index as developed by Collins and Preston. He also used growth rate in real value of shipments from 1972 to 1977. The results of his analysis further strengthened the view that advertising is a barrier to entry rather than useful information that might facilitate entry. He also concluded

[8]Since atomistic markets approach perfect markets in terms of numbers and size, Greig states that the social costs would not remain at zero, as the market approaches this structure. Among other reasons tabled, due to mislocations, lack of optimal scale, excess capacity, unnecessary risk and uncertainty, the excessive coordination costs of atomistic food markets considerably outweigh the social cost of market power.

that advertising and product proliferation were substitute forms of conduct.

In characterizing and seeking to make projections of economic performance, Christy and Connor summarize the economic forces shaping the food processing industry. Using an econometric model to make projections, they use percentage change of value of shipments as the dependent variable. The independent variables were the changes in effective demand (population) and input prices from each state. Using value added per employee ratios, they also tabled regional trends in changes in labor productivity.

Other Industry Studies on Productivity and Costs

In addition to the food industry studies discussed, the following also gave bearing to this research. In 1968, Oliver Williamson presented a model in which wage rates operate as a barrier to entry. The work demonstrates raising rivals costs as a strategic behavior and the conditions under which it occurs, and its subsequent effects. By taking a Supreme Court case in perspective, he empirically demonstrates how a firm will prefer an increase in wages, though total profits in the industry go down. In the United Mine Workers vs. Pennington case, in a cross claim, the latter alleged that UMW and large operators considered overproduction as the key problem in the coal industry. The contested solution was to be the elimination of the smaller companies by agreeing (conspiring) with the large mine

operators not to oppose rapid mechanization. Neglecting to control the working time of miners and helping finance such mechanization, the result would be higher wages and productivity would eventually increase. The wage increases would also be demanded of the smaller companies whether mechanized or not. By referring to the case, the underlying concept of raising rival costs that is eventually used in the empirical analysis of this thesis, is explained succinctly by Williamson as:

> "The necessary condition for wage rates to act as a barrier to entry is that an increase in wages must provide a differential shift in the level of average costs to the relative disadvantage of small scale firms."

There had to be an existing agreement between the principal large scale firms and the union to impose a uniform wage on all firms irrespective of ability to pay.

Kelton (1983) performed a study on the factors affecting wages and productivity using a wage-market structure relationship. With a cross-sectional analysis of 59 product classes in food and tobacco manufacturing, Kelton used four different models. Of the four dependent variables used, percentage change in labor productivity was the most illustrative. She defined it as the change in product produced per worker hour. The underlying hypothesis was that wage rate increases over time are a reflection of productivity changes. Hence, one would expect product

classes showing high percentage wage rate increases, would also have experienced high labor productivity increase. On the basis of the model, it appeared that productivity change differentials are difficult to explain by market structure or labor characteristics (Kelton pp. 37).

Lopez and Pagoulatos (in Cotterill ed., 1993) set out to explain the variation of import tariffs across US food processing industries in terms of behavior of firms, as well as the industry structure. Of the several independent variables they used in an ordinary least squares (OLS) procedure, labor's share of value added was used to control for comparative advantage. It was actually a wage/product ratio (total payroll divided by value added) which they hypothesized to have a positive relationship to tariff level.

Summary

This section has discussed the factors that affect the food processing industry and presented the conceptual methods of presenting the food processing industry. The forces that influence food manufacturing performance, location and organization are introduced. The works presented include the key traditional SCP works that have led to works that emphasize the conduct-performance relationship, and productivity as a gauge of performance. Other studies presented are those that have dealt with productivity and costs in more detail.

Given IO's acceptance of real world imperfections, the SCP framework has been used extensively in food industry. Most of the studies described have focused on a structure-performance relationship. Monopoly, the effects of concentration and other behavior have been the principal focus. The indicator used to evaluate the industry has mostly been its profitability over time. A key relationship that has not been dealt with adequately, has been the productivity of the food processing industry. However, one study discussed (Christy and Connor) did use productivity as the measure of performance to project growth trends in the industry.

Relatively little analysis has been devoted to how a particular economic environment presents opportunity or obstacles to an industry, specifically food manufacturing (McLaughlin and Lee, 1984). This research seeks to address this issue with special focus on New York state and the Mid-Atlantic region's productive performance. It is a large and complex industry with several factors that determine the way it functions, hence the suitability of IO theory in approaching its analysis.

Chapter Three

Trends in Food Manufacturing

Food Manufacturing in the Mid Atlantic States.

The Middle Atlantic region consists of New Jersey, New York and Pennsylvania. The three states form the eastern core of the US industrial belt that extends from Boston to Milwaukee. For over a century until surpassed by California about two decades ago, New York had reigned first among all the states in industrial might and population (Connor 1988). In the early twentieth century, over 50% of all manufacturing employment was in the Northeast. By 1963, the ratio had fallen to 32% and by 1982 it was 25% (Connor 1988). During the years under study here, 1972 to 1989, the numbers of employees still continues to decline. Overall, the states have also been outstanding examples of relative shifts in the geography and productive capacities of industry (Kelton 1983). It seems that the food manufacturing industry has not escaped this phenomenon.

Manufacturing is still the largest sector of the economies of the Mid-Atlantic. In 1989, the region's highly diversified food processing industry provided a total of 176,000 jobs, 12% of the US total jobs in the industry. The value of shipments from the industry was close to $37,000 million[1] contributing about 11.8% of the nation's total. Food processing accounted for six percent of the total jobs in manufacturing. This compares to 7.4% nationally with New

[1]All dollars deflated to 1982 figures, unless otherwise stated.

Jersey having 5.6%, New York 4.7%, and 7.7% for Pennsylvania. Nationally, food processing still remains strong in these states although it provides a modest six percent of the region's total manufacturing output.

Though the number of employees in the sector have been decreasing steadily, the value of shipments per person has risen phenomenally. This rise in productivity per worker has also been characteristic of the nation in general.

The value of food shipments in 1987 was close to $37 billion, with Pennsylvania taking the lead with approximately 42% of the total, New York following with 35% and New Jersey taking about 23%. The national rankings of the three states were fourth, seventh and fifteenth for Pennsylvania, New York and New Jersey respectively. As seen from table 3.2, the strengths of the region's food processing industry came from the Beverages (SIC 208), Dairy Products (SIC 202) and Preserved Fruits and Vegetables (SIC 203) which contributed the most, while the least came from Fats and Oils. Looking at the value added for the industry, Preserved Fruit and Vegetables, Beverages and Bakery Products take the lead. Meat and Dairy Products are at the low end although they are among the top in value of shipments. This can be explained by the nature of their inputs much of which consists of livestock products.

Table 3.1 Number of Employees in Mid-Atlantic's Food Processing Industry, 1972-1989 (Thousands)

	1972	1977	1982	1987	1989
TOTAL INDUSTRY	**245**	**211**	**190**	**182**	**176**
Meat Products	28	27	25	23	22
Dairy Products	30	22	19	20	19
Preserved Fruits & Vegetables	37	31	28	27	26
Grain Mill Products	10	10	10	9	9
Bakery Products	49	42	39	38	37
Sugar & Confectionery Products	28	28	21	22	21
Fats & Oils	4	3	2	1	1
Beverages	37	27	25	21	19
Miscellaneous Food Products	23	21	21	21	21

Sources: Appendix Tables B.

Table 3.2 Value of Shipments from Mid-Atlantic's Food Processing Industry, 1972-1987 (1982 million dollars).

	1972	1977	1982	1987
TOTAL INDUSTRY	**32,757**	**33,119**	**33,517**	**36,655**
Meat Products	5,264	4,813	4,521	4,553
Dairy Products	4,822	4,481	4,718	5,414
Preserved Fruits & Vegetables	4,265	4,105	4,627	5,346
Grain Mill Products	2,216	2,795	2,859	3,273
Bakery Products	3,498	3,281	3,409	3,898
Sugar & Confectionery Products	3,469	3,984	3,797	4,200
Fats & Oils	803	949	586	167
Beverages	4,968	4,606	5,314	5,749
Miscellaneous Food Products	3,452	4,106	3,687	3,917

Sources: Appendix Tables B.

New York State's Trends in Numbers of Establishments

Table 3.3 Number of Firms in New York's Food Processing Industry, 1972-1989.

	1972	1977	1982	1987	1989
TOTAL INDUSTRY	**2,052**	**1,852**	**1,434**	**1,341**	**1,282**
Meat Products	245	246	171	146	130
Dairy Products	377	313	211	175	155
Preserved Fruits & Vegetables	212	191	155	127	130
Grain Mill Products	105	100	95	91	87
Bakery Products	435	411	329	365	372
Sugar & Confectionery Products	107	94	75	86	81
Fats & Oils	27	24	14	0	7
Beverages	250	205	172	137	119
Miscellaneous Food Products	294	268	212	208	194

Sources: Appendix Tables B.

The numbers of firms engaged in food processing in New York was about 2,000 in 1972, and the number decreased to close to 1,300 in 1989, a 38% decline. The business numbers have been in steady decline for all the three digit subsectors. The largest percentage change came from the Fats and Oils sub-sector that recorded a decline of more than 70%. In 1987 there were no firms in the subsector, and on taking a glance at the capital expenditures in the sector in

Table 3.4 Percentage Change in Number of Food Processing Firms, 1972-1989.

	New York	Mid-Atlantic	US
TOTAL INDUSTRY	-38	-37	-28
Meat Products	-47	-42	-31
Dairy Products	-59	-55	-52
Preserved Fruits & Vegetables	-39	-38	-26
Grain Mill Products	-17	-20	-18
Bakery Products	-14	-26	-18
Sugar & Confectionery Products	-24	-22	-12
Fats & Oils	-74	-64	-35
Beverages	-52	-52	-43
Miscellaneous Food Products	-34	-22	-12

Sources: Appendix Tables B.

the previous census year, there were none recorded. This would suggest a flight of this subsector away from the state. The Dairy Products and Beverages followed with 59 and 52% drops respectively. Grain Mill, Sugar and Confectionery products went down by less than 20% each.

Table 3.4 compares the percentage changes in food manufacturing firms in New York, Mid-Atlantic region and the

US. There is a consistent downward trend in business numbers. This decrease in the state has been comparable to that in the Mid-Atlantic region. Among the three-digit subsectors, only the Miscellaneous Food Products, Fats and Oils and the Bakery Products does New York have a difference of 10 percentage points or more; the first two having the state registering a faster rate of loss than the region and vice versa for Bakery Products.

A national comparison shows New York having a 10 percentage point difference with the US average at the aggregate level. Only Bakery Products and Grain Mill Products had ratios close to the US average. The rest were much higher, with some even being more than double (Fats and Oils, Miscellaneous).

On looking at percentage shares, New York's food processing firms over the years under study accounted consistently for about 44% of Mid-Atlantic's total number of firms. In 1989 the percentages for the three digit subsectors varied from a low of 21 for Fats and Oils to about half for Preserved Fruits and Vegetables and Bakery Products. All the rest varied from a third for Confectionery to 44% for Miscellaneous Products. These ratios stay quite consistent over the period, apart from the sharp dip for Fats and Oils when no production was registered in 1987.

Nationally, the percentage share dipped from 7.3 to 6.4 from 1972 through 1989 for food manufacturing firms. Again, the Fats and Oils saw half of its small share of 3.1 percent

Table 3.5 Percentage Share of New York's Food Processing Firms.

	Percentage of Mid-Atlantic		Percentage of US	
	1972	1989	1972	1989
TOTAL INDUSTRY	43.9	43.5	7.3	6.4
Meat Products	38.8	35.4	5.5	4.3
Dairy Products	47.2	42.8	8.2	7.0
Preserved Fruits & Vegetables	50.1	49.8	8.3	6.9
Grain Mill Products	36.2	37.5	3.4	3.5
Bakery Products	45.4	52.5	12.0	12.6
Sugar & Confectionery Products	35.1	34.2	8.6	7.4
Fats & Oils	29.3	21.2	3.1	1.2
Beverages	41.1	41.0	6.9	5.7
Miscellaneous Food Products	51.6	43.8	7.1	5.3

Sources: Appendix Tables B.

go. Bakery Products with the largest shares showed a slight rise from 12 to 12.6%. Grain Mill Products stayed almost the same throughout, at 3.5, while all the rest showed gradual declines.

New York State's Employment Trends

Table 3.6 Number of Employees in New York's Food Processing Industry, 1972-1989 (Thousands).

	1972	1977	1982	1987	1989
TOTAL INDUSTRY	**92.3**	**75.2**	**66.2**	**63.0**	**57.7**
Meat Products	9.8	7.5	6.4	5.0	3.9
Dairy Products	12.7	10.1	8.7	8.7	8.7
Preserved Fruits & Vegetables	12.9	10.9	9.9	9.9	8.5
Grain Mill Products	4.6	5.2	4.4	3.7	3.7
Bakery Products	18.0	14.4	14.6	14.0	13.9
Sugar & Confectionery Products	9.0	9.7	5.1	5.3	4.4
Fats & Oils	0.8	0.5	0.5	0.0	0.1
Beverages	16.6	10.3	10.1	10.0	9.2
Miscellaneous Food Products	8.0	6.6	6.4	6.3	5.2

Sources: Appendix Tables B

All the sectors in the food processing industry showed a steady decline in the number of employees from 1972 through 1989. The total number in the state went down from 92,300 in 1972 to 57,700 in 1989, which was a 37% decline. The sub-sectors that showed the steepest declines in

employment were Fats and Oils, Meat Products, and Sugar and Confectionery Products. They had declines of over 50% for the said years.

The average decline in New York's total employment was 10 percentage points lower than Mid-Atlantic's average ratio. This is unlike the number of firms which had an almost equal rate of decline. The state had one third of Mid-Atlantic's employees which decreased from 38% in 1972 which contrasts with a consistent 44% of the number of firms in the region. The state's decrease in number of firms was much faster than the US though comparable to it's counterparts, but it's decrease in the number of employees was higher. The displacement or flight of industry from the regions in question can achieve such an effect. Another explanation could be the consolidation of firms and assets in the food processing industry, coupled with higher rates of employee loss in New York compared to the rest of the country.

Table 3.7 Percentage Change in Food Processing Industry Employment, 1972-1989

	New York	Mid-Atlantic	US
TOTAL INDUSTRY	**-38**	**-28**	**-8**
Meat Products	-60	-22	17
Dairy Products	-31	-35	-25
Preserved Fruits & Vegetables	-34	-30	-20
Grain Mill Products	-21	-2	-8
Bakery Products	-23	-24	-8
Sugar & Confectionery Products	-51	-26	-15
Fats & Oils	-86	-64	-27
Beverages	-44	-48	-28
Miscellaneous Food Products	-35	-8	23

Sources: Appendix Tables B.

New York State's Output Trends

Table 3.8 Value of Shipments from New York's Food Processing Industry, 1972-1987 (1982 million dollars).

	1972	1977	1982	1987
TOTAL INDUSTRY	12,685	12,064	12,237	12,912
Meat Products	1,616	1,217	1,238	1,066
Dairy Products	2,252	2,306	2,208	2,402
Preserved Fruits & Vegetables	1,656	1,434	1,578	1,755
Grain Mill Products	1,138	1,354	1,376	1,377
Bakery Products	1,151	1,050	1,154	1,294
Sugar & Confectionery Products	1,277	1,529	1,182	1,055
Fats & Oils	203	198	132	0
Beverages	2,417	1,961	2,409	2,925
Miscellaneous Food Products	976	1,015	959	1,019

Sources: Appendix Tables B.

Using nominal values, the increase in value of shipments in the state has been large, from about $6,100 million in 1972 to over $15,000 million in 1987. The highest output value came from Beverages, Dairy Products and Preserved Fruits and Vegetables. Trends in value added shows the same increase with the amounts from the Dairy and Meat

sectors as expected, contrasting with the value of shipments. They are second and sixth respectively when ranked according to value of shipments but fifth and a poor eight when value added is used.

However, on correcting for inflation, the increases that prove to be substantial are the output (value of shipments) per employee. This ratio has occasionally been used as a proxy for indicating productivity (Christy and Connor, 1989). Table 3.9 shows the value of shipments per employee, while table 3.10 compares the state, regional and national productivity changes over time. If productivity and competitiveness of a sector could be connected, the eventual demise of the Fats and Oils could not have come as a surprise. The state's 1982 output/employee ratio of 265,000 contrasting sharply with the nation's value of 439,000 (Value of Shipments divided by number of employees. The industry as a whole remains a bit weaker in this respect with the Dairy, Bakery and Miscellaneous Food sectors giving less than average performances. The rest perform above the national average with Grain Mill products being particularly high.

New York's food processing industry percentage share of US employment has been declining over the years as has been its output. As New York's position weakened regionally and nationally, its industry's output /employment ratios have been forced to mirror the rest of the country's.

Table 3.9 Value of Shipments per Employee in Food Processing ($1,000 per person)

	New York		Mid-Atlantic		US	
	1972	1987	1972	1987	1972	1987
TOTAL INDUSTRY	**137**	**205**	**134**	**201**	**153**	**211**
Meat Products	165	213	185	195	213	210
Dairy Products	177	276	160	275	180	293
Preserved Fruits & Vegetables	128	177	117	197	103	162
Grain Mill Products	247	372	229	356	227	332
Bakery Products	64	92	71	104	70	101
Sugar & Confectionery Products	142	199	124	194	129	194
Fats & Oils	253	----	211	63	358	497
Beverages	146	292	135	278	136	273
Miscellaneous Food Products	122	162	152	185	129	171

Sources: Appendix Tables B.

For example, from table 3.10, Meat Product processors in New York showed a very high gain in productivity compared to the rest of the country, but table 3.9 will show that it was a matter of catching up for the state.

Table 3.10 Percentage Change in Productivity in the Food Processing Industry, 1972-1987

	New York	Mid-Atlantic	US
TOTAL INDUSTRY	**49**	**51**	**38**
Meat Products	29	5	-2
Dairy Products	56	72	63
Preserved Fruits & Vegetables	38	69	57
Grain Mill Products	51	56	46
Bakery Products	45	46	44
Sugar & Confectionery Products	40	56	51
Fats & Oils	--	-34	39
Beverages	101	105	100
Miscellaneous Food Products	33	21	32

Sources :Appendix Tables B.

Table 3.11 Percentage Share of Value of Shipments from New York's Food Processing Industry

	Mid-Atlantic		US	
	1972	1987	1972	1987
TOTAL INDUSTRY	38.73	35.23	5.29	4.23
Meat Products	30.70	23.42	2.46	1.49
Dairy Products	46.70	44.37	6.63	5.79
Preserved Fruits & Vegetables	38.84	32.83	6.93	5.21
Grain Mill Products	51.33	42.08	4.49	4.05
Bakery Products	32.92	33.20	7.00	5.90
Sugar & Confectionery Products	36.80	25.12	9.26	6.03
Fats & Oils	25.26	0.00	1.41	0.00
Beverages	48.65	50.88	8.37	6.67
Miscellaneous Food Products	28.27	26.02	5.62	3.78

Sources: Appendix Tables B.

Table 3.12 Percentage Change in Value of Shipments in Food Processing, 1972-1987.

	New York	Mid-Atlantic	US
TOTAL INDUSTRY	**1.8**	**11.9**	**27.5**
Meat Products	-34.0	-13.5	8.8
Dairy Products	6.7	12.3	22.1
Preserved Fruits & Vegetables	6.0	25.3	40.8
Grain Mill Products	21.0	47.7	34.4
Bakery Products	12.4	11.4	33.4
Sugar & Confectionery Products	-17.4	21.1	26.9
Fats & Oils	-100.0	-79.2	2.4
Beverages	21.0	15.7	51.8
Miscellaneous Food Products	4.4	13.5	55.4

Sources: Appendix Tables B.

Industrial Location in New York State

When ranked according to value of shipments, the top seven states are California, Illinois, Texas, Pennsylvania, Wisconsin, Iowa and New York. These are all states with high populations which is one of the factors that influence the placement of the manufacturing firms. Figures 3.2 and 3.3 show the activity levels of the industry in New York state by county, and it is apparent there is a high concentration of firms in the metropolitan areas with high aggregate demand. There is also a fair amount of dispersion over the interior which bears testimony to an efficient transportation network upon which the food industry is so dependent.

The 1989 data was from the County of Business Patterns. For the counties with food manufacturing going on, the mean number of firms was 21. Kings county had the most with 186 followed by Queens, New York, and Erie counties all with 100 or more firms. With a relatively high concentration of firms in the urban counties, at least six categories on the map were found necessary to capture the skewed distribution. Due to disclosure laws, the employment data from a few counties was not reported. These were counties with four or less companies owning the holdings.

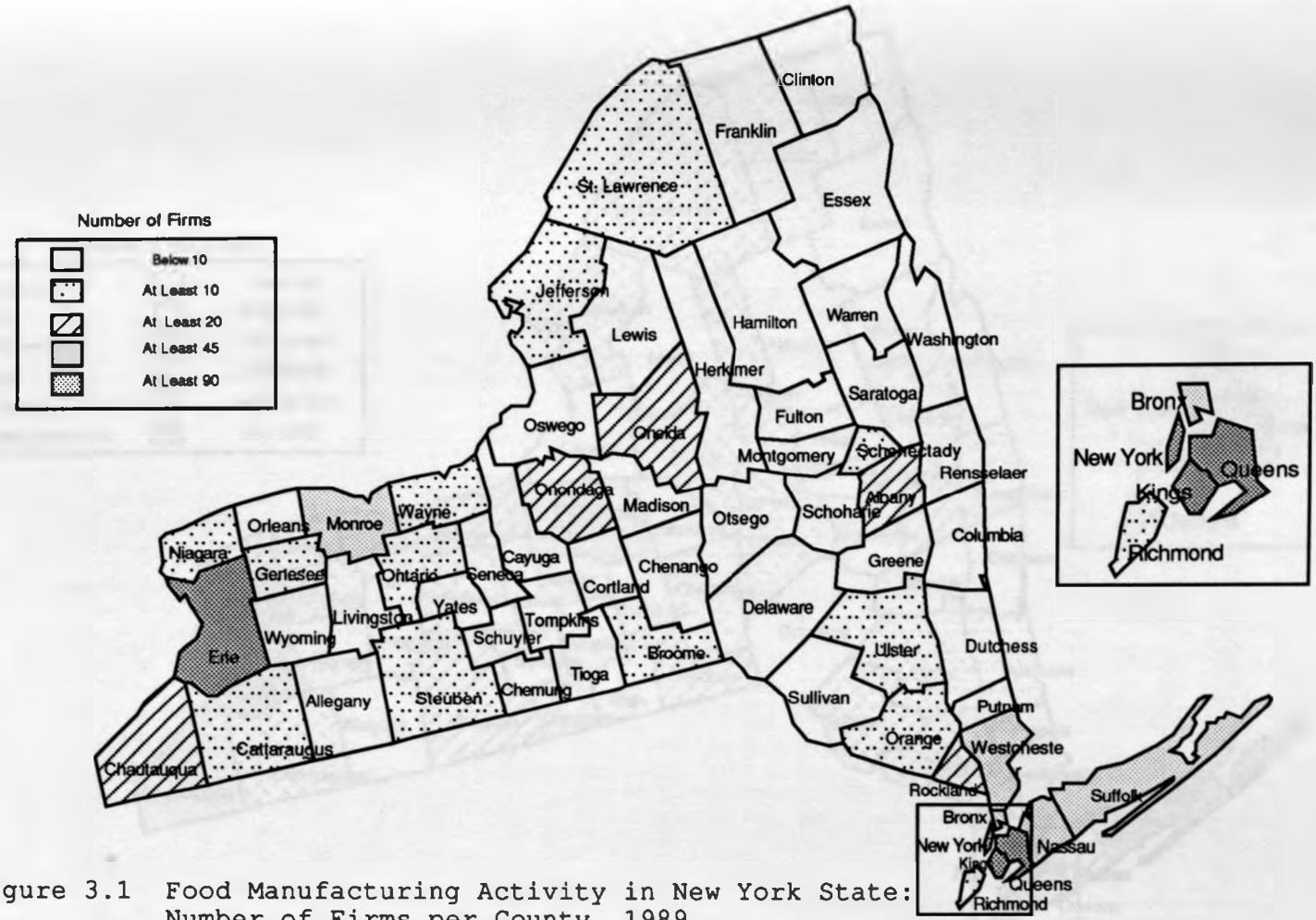

Figure 3.1 Food Manufacturing Activity in New York State: Number of Firms per County, 1989

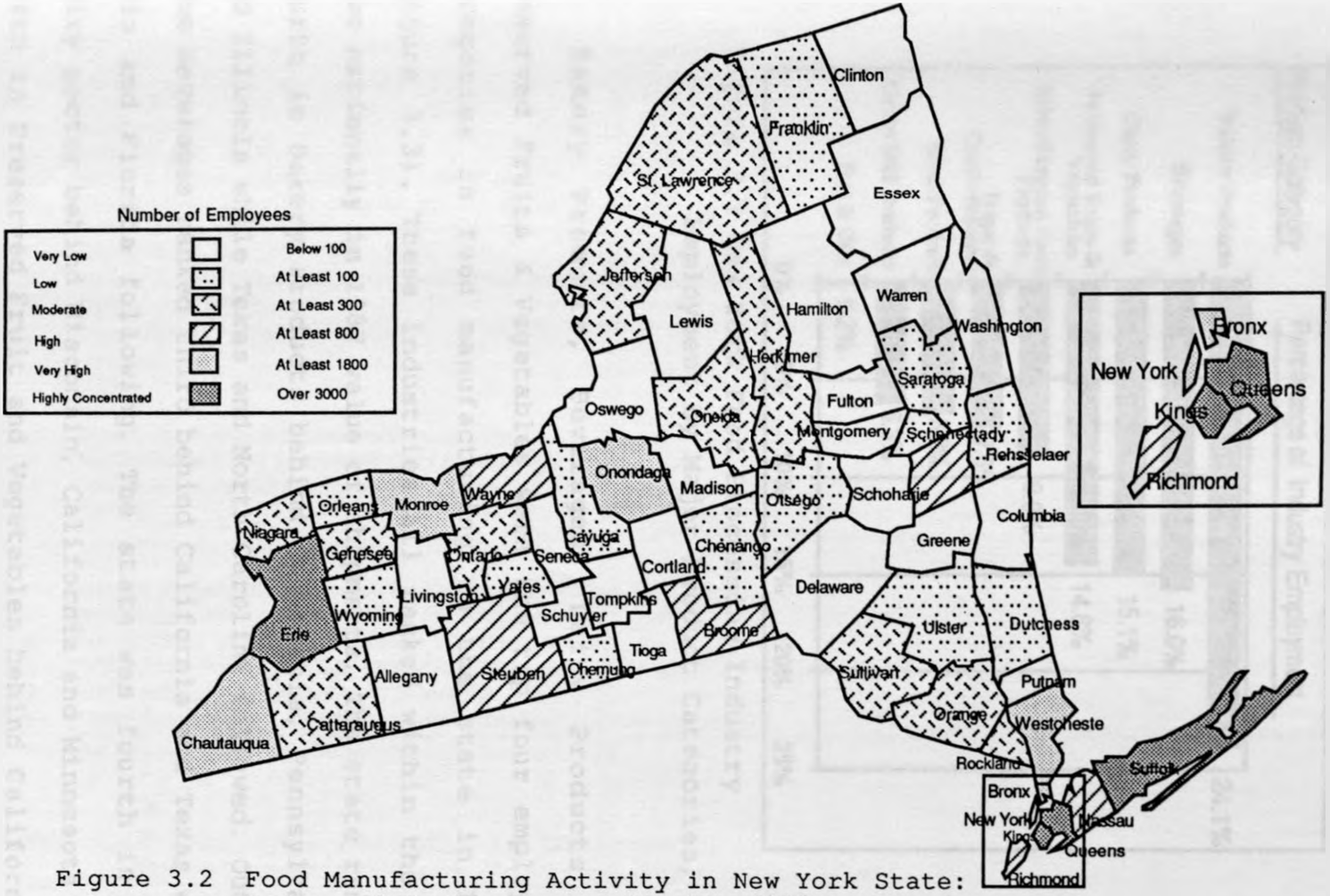

Figure 3.2 Food Manufacturing Activity in New York State: Number of Employees per County, 1989

Performance of Selected Industries

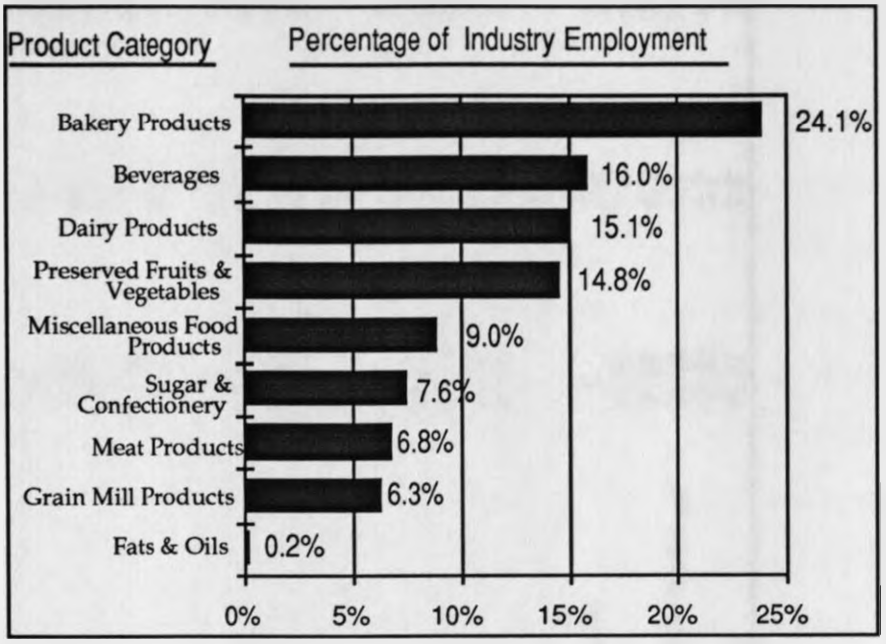

Figure 3.3 New York Food Processing Industry Employment by Major Product Categories, 1989.

Bakery Products, Beverages, Dairy Products and Preserved Fruits & Vegetables were the top four employing categories in food manufacturing in the state in 1989 (figure 3.3). These industries all ranked within the top five nationally in 1987 value of shipments. The state ranked fourth in Bakery Products behind California, Pennsylvania and Illinois while Texas and North Carolina followed. Output from Beverages ranked third behind California and Texas with Ohio and Florida following. The state was fourth in the Dairy sector behind Wisconsin, California and Minnesota and fifth in Preserved Fruit and Vegetables behind California, Florida, Pennsylvania and Ohio respectively. Of the other

SIC	Categories	Position[1]	Number of Employees (Thousands)	National Percentage of Employment
208	**Beverages**	3	10	6.3
2082	Malt Beverages	1| 22	2.9	9.4
2084	Wines, Brandy, and Brandy Spirits	2| 3	1.7	13.3
2086	Bottled and Canned Soft Drinks, and Carbonated Waters	4 | 48	5	5.4
2087	Flavoring Extracts and Flavoring Syrups, not elsewhere classified	6| 13	0.4	4.4
205	**Bakery Products**	4	14	6.6
2051	Bread and Other Bakery Products, Except Cookies and Crackers	2 | 47	12.3	9.1
2052	Cookies and Crackers	8 | 28	1.7	4.1
2053	Frozen Bakery Products except Bread	14| 14	0.2	2.1
202	**Dairy Products**	4	8.7	6.2
2022	Natural, Processed, and Imitation Cheese	4| 22	2.6	8.0
2023	Dry, Condensed, and Evaporated Dairy Products	15| 15	0.4	2.8
2024	Ice Cream and Frozen Dessert	4| 30	1.7	7.9
2026	Fluid Milk	4| 37	4.3	5.9
203	**Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties**	5	9.9	4.8
2032	Canned Specialties	4| 23	1.7	7.1
2033	Canned Fruits, Vegetables, Preserves, Jams, and Jellies	3| 28	3.6	5.6
2035	Pickled Fruits and Vegetables, Vegetable Sauces and Seasonings, and Salad Dressings	3| 26	1.7	7.4
2037	Frozen Fruits, Fruit Juices, and Vegetables	12| 21	0.7	1.4
2038	Frozen Specialties not elsewhere classified (eg. frozen dinners and pizza)	2| 27	2.8	7.6

Source: Bureau of the Census, Census of Manufactures, 1987

Table 3.13 National Position in Employment, Selected New York Food Industry Categories.

[1]Read "1 out of 22 states" for 1|22.

industries, the state ranked sixth in Sugar and Confectionery, ninth in Miscellaneous and Grain Mill Products and 24th in Meat Products.

The aggregate demand from urban dwellers is a key driving force to the sectors discussed below, though the Dairy sector faces a looming threat due to its comparatively low productivity compared to the rest of the country (Tables 3.9 and 3.10). Since the industry is mainly dependent on population and the proximity of processors to consumers, the state's main threat of competition is from neighboring states. Output per employee has been growing faster regionally than in the New York state itself.

•Bakery Products- In 1989, this sector had the largest share of employment in food manufacturing in the state which stood at 24%. In the four digit categories, Bread and Other Bakery Products, except Cookies and Crackers-SIC 2051- performed exceptionally well, with second position[2] behind California. This was out of 47 producing states in 1987. The state performs poorly in the relatively new Frozen and Bakery Products (SIC 2053), and ties in last position with Arkansas and Georgia out of 14 producing states. The state stands at eighth position out of 28 states in Cookies and Crackers (SIC 2052) with about 4% of national employment in the subsector.

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[2]The 1989 County of Business Patterns did not report several employment figures for the four digit categories, hence the rankings use the 1987 Census of Manufactures. The standings also rely heavily on employment figures, as Shipment Values were occasionally withheld by the Census Bureau.

•Beverages- With 16% of total employment in the industry, this sector had the second largest share of employees in New York's food processing industry. This sector includes alcoholic brews, of which production like a number of other products in the country, tend to be specialized among given areas (Greig 1984). The state lead the country in both employment and production of Malt Beverages (SIC 2082). This was out of 22 producing states. It was a far second behind California in Wines, Brandy and Brandy Spirits (SIC 2084), the only other recorded state being Washington. It did not produce Distilled and Blended liquors (SIC 2085), a domain that brings Kentucky to mind.

Soft Drinks and Carbonated Waters (SIC 2086) brought the state over $1,400 million in shipments and employed 5,000 people. With 5.4% of national employment, It ranked fourth out of the 48 producing states. The state showed a middle sixth out of 13 states which produced Flavoring Extracts and Syrups (SIC 2087).

•Dairy Products- The sector came second only to Beverages in terms of value of shipments in the state's food processing industry. It was fourth behind Wisconsin, California and Minnesota. Illinois and Pennsylvania followed. This is a sector that is also characterized by some regional specialization, with processors having to be near areas of high demand. In terms of national employment, it was also fourth in three other subcategories: Natural, Processed and Imitation Cheese, except Cottage Cheese (SIC

2022); Ice Cream and Frozen Desserts (SIC 2024); Fluid Milk (SIC 2026). Out of 15 states, New York tied at last position with Arizona, Pennsylvania and Vermont in producing Dry, Condensed, and Evaporated Dairy Products (SIC 2023).

•Preserved Fruits, Vegetables and Food Specialties-The state ranked fifth behind California, Florida, Pennsylvania and Ohio. Canned Specialties (SIC 2032) includes such products as baby foods, nationality specialty foods and soups. The state took fourth position with 1,700 employees, 7% of national employment in the subsector. It was second in Frozen Specialties (SIC 2038) a subcategory that includes frozen dinners and pizza. It also ranked third in two other subcategories-Canned and Pickled Fruits and Vegetables (SIC 2033, 2035-see table 3.13 for full names).

Summary

Comparing New York and US trends may help identify factors affecting the country as a whole, which can explain the various growth trends in the industry. A comparison to it's counterparts in the Mid-Atlantic should reveal the regional factors that affect the industry. For instance, a particular pattern that follows a regional rather than a national trend can be explained by factors determining the comparative advantage of the Mid-Atlantic.

New York's national importance in the food processing industry, even prior to the years of study, has been declining (Connor 1988). The trend still continues as its

overall employment share of US food processing dropped from 5.9 to 4.0% from 1972 to 1989. Output share also dropped from 5.3 to 4.2% from 1972 to 1987. As the state's position weakens regionally and nationally, the sectors in the industry that contribute to the weakness have been forced to adjust. This may continue as the state mirrors the country's dramatic changes in productivity of food processing.

Chapter Four

Food Processing: A Model for Economic Performance

Introduction

This chapter deals with the modeling the market's performance. An overview of the procedures, theory and hypotheses behind the analysis is explained. The aim is to provide an analytical framework with which to characterize the performance of the food industry. The aim is to compare New York state with its counterparts in the Middle Atlantic region and the nation. The data used comes from the Census of Manufactures Geographic Area Series (1972-1987) taken every five years.

Background and Theoretical Approach

The aim of presenting a framework explaining performance of the industry, suggests using the conventional structure-performance analysis, of which most of the earlier studies discussed apply. Price cost margins, a measure closely related to the Lerner's Index, as earlier said, measures the profitability (performance) of the industry. The determinants of market structure have included the degree of market concentration (four-firm concentration ratio), and product differentiation. The capital-output ratio has also been used.

This research intends to discuss performance at the state level. The Census data at this level does not include

variables that concern the structure of the industry. Though price cost margins can be calculated, the dearth of numbers for the various states precludes a traditional structure-performance analysis.

This leaves the option of a conduct-performance study which would still provide an adequate analytical framework. The basis of conduct of an industry is based on costs faced by the firms. Under the SCP paradigm, components of conduct will include advertising, R&D, pricing and investment. The underlying basis of this firm behavior is actually the input costs incurred in the production process. Therefore, the conduct variables used are the input-output ratios of the industry. Using PCM as the dependent variable, and the input-output ratios as the independent variables, a linear regression function was used to estimate the responsiveness of profits to the wage-output and cost-output ratios. The results showed an Rsq. of close to unity, and very significant t and F statistics. However, the actual definition of PCM (Collins and Preston, 1968) is:

$$\frac{\text{Value Added - Payroll - other costs}}{\text{Value of Shipments}}$$

The actual definition of the input output ratios is Wages (payroll) divided by value of shipments and material costs divided by value of shipments. The definition of PCM does actually include several of the variables therein, and hence the variability in PCM would actually explain some of that in the conduct side of the equation. This suggests using a

multi-system equation model, if specification of the model was to be met using PCM as the dependent variable. Unfortunately, the scope of this research and the data would not allow this. Zellner who was mentioned in chapter two did analyze this conduct-performance relationship, using PCM as the indicator of performance. He employed a four system equation model at the national level, where there are plenty of variables to suit such an analysis. Together with the need to quantify performance, all this leads to a need to looking at productivity as the one key indicator of performance.

Of the main behavioral (conduct) strategies described in IO, raising rivals' costs provides an insightful explanation of the independent variables used. If a firm can costlessly raise its rivals' costs relative to its own, it can increase its profit at the expense of its rivals (Carlton and Perloff, pp.418). *Ceteris paribus*, and given that all firms are profit maximizing, this suggests that the same can be said of these firms wanting to increase their productivities. Employing this scenario, we see the direct relevance of wages and other input prices in the industry on its performance. For instance, given two contemporary firms/industries with differing production technologies, one may use more labor per unit output. This would explain the different effects of one wage rate on the two, where one player could even prefer wage increases. All this will depend on the overall cost-output ratio the industry faces.

This relationship was demonstrated by Williamson's model discussed in chapter two, describing how costs can be a barrier to entry.

However, the converse situation is the multi-product multi-regional food industry, where a key assumption of the model is that the cost-output ratios are a given. Aggregated firms can only vary their productivities, though the incentive is definitely to raise rivals' costs. This leads to the hypothesis of a negative relationship between the cost-output ratio of an industry and its productivity, which is also what the model will seek to confirm. With all things equal, an increase in wages and/or other material costs will lead to the industry having a lesser productivity per person. Intuitively, that is the reason why an employer will want to increase the employees' productivities when faced with rising wages. As the SCP paradigm stipulates, the environment which involves the factors that influence strategic behavior, will affect the performance of the industry. This conduct-performance relationship is what this thesis attempts to define.

The Model

The specification of the model therefore takes the form of:

$$Y = \alpha_1 + \beta_2 X_1 + \beta_3 X_2 + \alpha_2 NJ + \alpha_3 PA + \alpha_4 US + \alpha_7 X_1 NJ + \alpha_6 X_1 PA + \alpha_5 X_1 US + \alpha_8 X_2 NJ + \alpha_9 X_2 PA + \alpha_{10} X_2 US$$

Where:

Y = Productivity (Value Added / Employee)

X_1 = Wage-Output Ratio (Total Payroll / Value of Shipments)

X_2 = Cost-Output Ratio (Material Costs / Value of Shipments)

Dummy Variables:

NJ = 1 if New Jersey, 0 otherwise

PA = 1 if Pennsylvania, 0 otherwise

US = 1 if United States, 0 otherwise

The OLS estimates will give the industry's productivity response to average wage and material costs (input-output ratios) of New York state. The slope and intercept dummy variables will also reveal the relative productivities of the state, and whether it fares better than the rest of the nation or New Jersey and Pennsylvania in terms of response to input-output ratio changes.

The Productivity (Y) is what each employee contributes to the economy's GNP, Value added divided by the number of employees. Value added, which is the equivalent of payments to all factors of production, is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries and geographic areas (Connor, 1988).The Wage-output ratio (X_1) is the total

payroll divided by the value of shipments, while the cost-output ratio (X_2) is the material cost ratio also divided by the value of shipments. The payroll includes the executive and workers wages while material costs include the charges paid for items consumed or put into production during the year, including freight and other direct charges incurred by the establishment in acquiring these materials. The ratios represent the input shares of total output.

The model will reveal the 'absolute'[1] productivity status of each region or industry, and how they would respond to the given economic environment. The model is fitted on cross sectional data across the four different census years, in order to establish the bearing of the industries' economic behavior on performance. The model tests the hypothesis that industry productivity is negatively associated with the said input-output ratios.

The intercept (α_1) indicates the productive efficiency of an industry given no costs. When comparing two regions, the one with a higher value can be said to have a comparative advantage in terms of productivity. $ß_2$ indicates the sensitivity of an industry to relative wage increases. When comparing two regions, the one with a higher $ß_2$ value will mean it's industry's productivity responds better to a wage increase. The same applies to $ß_3$, the cost-output ratio

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[1]Absolute in this sense refers to the productivity status of the industry, when the input-output ratios are zero, or the intercept of the equation.

coefficient. The higher the value, the better the response of the industry to a relative increase in material costs.

From the preceding chapter, it was found that the percent value of shipments from New York state has declined both regionally and nationally. The percentage change in output from 1972 to 1987 in the state has also been much less than the rest of the nation. However, the change in output per employee over this period has been greater in New York, than in the US. The change is almost the same when the Mid-Atlantic average is compared. It is also important to note that in 1972 the output per employee was highest in the US, with the Mid-Atlantic region and New York state being 19 and 16,000 dollars less respectively. This gap closes in 1987 with New York state surpassing the Mid-Atlantic region's average, and being only 6,000 dollars less than the US.

Given these trends, it would suggest that New York state's performance starts out weak when compared to the US, but measures up with the Mid-Atlantic region. It would also imply that performance picks up to later come close to matching the rest of the US and surpassing the rest of the region. The signs on the intercept dummy variables are therefore expected to be positive for the US, Pennsylvania and New Jersey in the early years of the analysis, but changing to negative signs in the later years, particularly for the US.

The state registered a higher percentage decline in employment than the rest of the US and the Mid-Atlantic. Given this response, the expected signs of the wage-output ratio coefficients for the dummy variables should be negative over most of the time period. Assuming wages have increased uniformly over the given time period, it is expected that New York state will substitute labor more readily than the rest of the nation.

There is no expected sign for cost-output ratio coefficients. However, the signs and their significance may indicate whether the higher declines in the number of firms registered in New York state result in better responsiveness to costs. This would be an indicator of whether the increasing concentration of firms, of which the decline in numbers has been mostly attributed, results in higher cost efficiencies or not.

Procedures

The data were first adjusted to 1982 terms using the respective deflators from the 1991 Economic Report of the President[2]. In order to preserve confidentiality, state level data is occasionally suppressed at the four digit level. To provided estimates for the missing data, interpolations were used. The number of employees was reported, and this was used to estimate the missing data points, after subtracting from the higher level total (at

[2]See appendices for actual deflators and sources used.

the three digit level). About one-half of New York and Pennsylvania's observations were not reported for Value Added, Value of Shipments, Total Payroll and Material Costs at the four digit level. New Jersey's had more than 60% of the data undisclosed, with observations for Grain Mill Products (SIC 204) and Fats and Oils (SIC 207) also being undisclosed, necessitating estimations at two levels. The estimation at the three digit level was done by assuming that the employees' compensation, productivity and output would be a reflection of the totals of the other two states. The data at the national level did not have this problem.

The model was then fitted across the 1987 four digit level data of the food industry. It was then found appropriate to use the three digit level data due to the missing observations at the more detailed level. This was done on the previous census years, 1972 to 1982. The statistics are then reported and diagnostic tests performed for the regressions.

Results

The results, shown in table 4.1 are highly significant, especially given the cross-sectional data. The results are significant across all the different time periods, both individually and collectively as indicated by the t-statistics and F-statistics. The null hypothesis is rejected at α=0.01 for all the estimated regressions. As expected, the signs of the respective coefficients are all negative

and significant at the 5% level, which supports the hypothesized negative relationship between the input-output ratios and productivity.

The presence of strong individual t-statistics with the significant F-calculated suggests that multicollinearity is not a problem. Multicollinearity occurs when the source of variation is captured by the model, but cannot be attributed to the individual variables. The correlation coefficients of the five models also displayed absolute values of less than 0.8.

The problem of unequal variance of the disturbance term μi, or heteroskedasticity, is more commonly associated with cross-sectional data. The possibility of unequal variation of the input-output ratios across the different sub-sectors was especially of concern during the analysis. A graphical analysis of the estimated residuals against the independent variable observations indicated no particular trend. However, the plots of the residuals against the Wage-Output ratio seemed to have a faintly decreasing trend. The 1972 plots did especially show this pattern and it was this that prompted performing the Goldfeld-Quandt test on this particular dataset (Gujarati pp. 333). The computed λ was 2.27, hence we may reject the assumption of heteroskedasticity at the 5 percent level. ($F_{11,11,.05} = 2.82$).

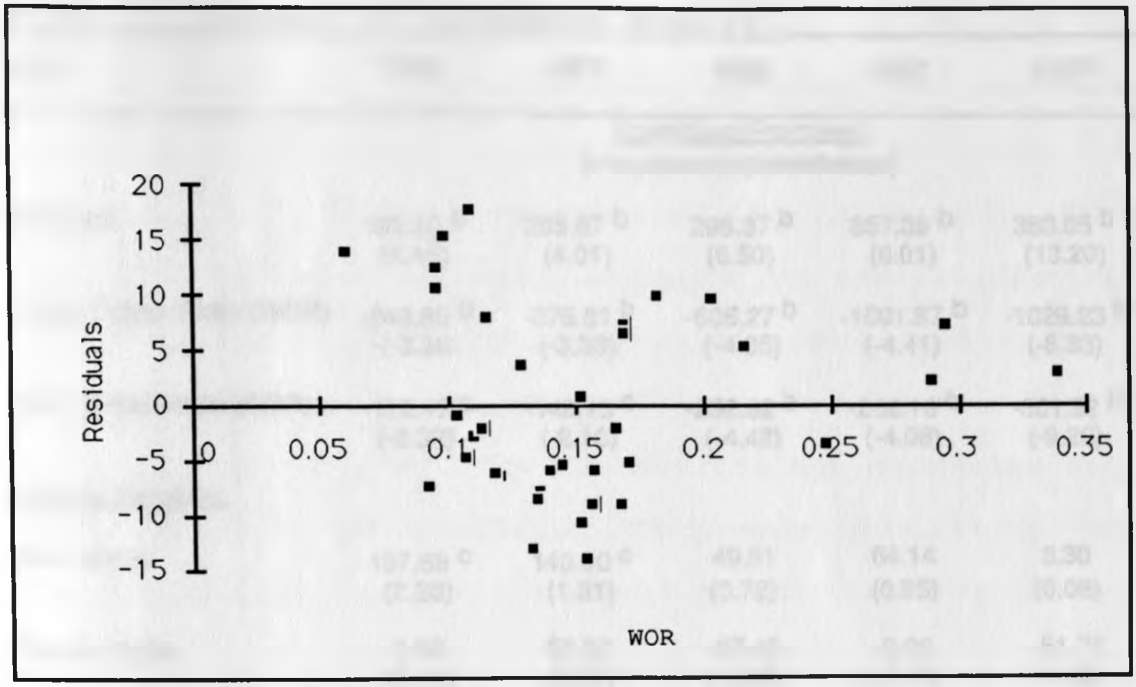

Figure 4.1 Plot of Residuals against Wage-Output Ratio (WOR), 1972

The residual plots also revealed no observable trends that could lead to a conclusion of autocorrelation across the data.

From table 4.1, the hypothesized negative relationship between the input-output ratios (WOR and COR) and productivity is confirmed at 1 percent level of significance, apart from the COR coefficient in 1972 and 1982 which are still significant at the 5 percent level. In 1972, α_i's that corresponded to New Jersey's intercept and slope differentials were all significant at the 5 or 1 percent level. Pennsylvania's and US's were not. In 1977 New Jersey's differential effects again were significant, though at the 5 and 10 percent levels while the others did not

Table 4.1 Summary of Regression Results

Year	1972	1977	1982	1987	1987[a]
	Coefficient Estimates (t-statistics in parentheses)				
Constant	169.90 [b] (4.15)	205.67 [b] (4.01)	298.37 [b] (6.50)	357.39 [b] (6.01)	383.05 [b] (13.20)
Wage-Output Ratio (WOR)	-249.80 [b] (-3.26	-375.61 [b] (-3.33)	-605.27 [b] (-4.85)	-1001.87 [b] (-4.41)	-1029.23 [b] (-8.33)
Cost-Output Ratio (COR)	-119.17 [c] (-2.32)	-142.13 [c] (-2.16)	-252.62 [b] (-4.42)	-262.16 [b] (-4.06)	-301.22 [b] (-9.20)
Dummy Variables					
New Jersey	137.68 [c] (2.26)	140.90 [c] (1.81)	49.51 (0.72)	64.14 (0.85)	3.30 (0.08)
Pennsylvania	8.62 (0.11)	59.93 (0.67)	-67.45 (-0.88)	-9.06 (-0.11)	-51.76 (-1.22)
US	19.50 (0.28)	39.63 (0.42)	-55.54 (-0.69)	-6.96 (-0.07)	57.50 [d] (1.47)
WOR*New Jersey	-351.58 [b] (-2.51)	-368.52 [c] (-1.92)	-401.19 [d] (-1.49)	-312.61 (-1.00)	-95.12 (-0.49)
WOR*Pennsylvania	-43.02 (-0.26)	-99.44 (-0.50)	89.02 (0.39)	-80.84 (-0.23)	10.45 (0.05)
WOR*US	-74.70 (-0.52)	-59.22 (-0.28)	70.14 (0.31)	-48.16 (-0.12)	-376.28 [c] (-2.17)
COR*New Jersey	-134.12 [c] (-1.91)	-154.98 [d] (-1.62)	-14.96 (-0.20)	-40.48 (-0.48)	15.77 (0.34)
COR* Pennsylvania	-14.23 (-0.16)	-87.32 (-0.82)	77.95 (0.90)	14.10 (0.16)	71.14 [d] (1.55)
COR*US	-22.95 (-0.29)	-64.88 (-0.57)	64.67 (0.70)	4.78 (0.05)	-29.28 (-0.68)
R^2	0.71	0.72	0.78	0.83	0.76
F	5.32	5.57	7.59	10.33	40.39
Degrees of Freedom	24	24	24	23	137

[a] Four digit level results
[b] Significant at 1 percent level
[c] Significant at 5 percent level
[d] Significant at 10 percent level

display any. In 1982, only New Jersey's WOR coefficient was significant at the 10 percent level, while in 1987 all dummy variables did not display any high level of significance. On the other hand, at the more detailed four digit stage, US's WOR slope differential and intercepts did show statistical significance, as well as Pennsylvania's COR coefficient.

The intercept shifts from 170 to more than double over the years under study. The WOR coefficient decreases four fold, while the COR coefficient decreases about twice over the same period, using the analysis at the three digit level alone.

The signs for the intercept dummy variable coefficients are as expected for the US and Pennsylvania, with the earlier years being positive while turning to negative later on. However, they are not statistically significant and New Jersey's signs were positive throughout. Apart from 1982, all other signs for the WOR slope dummy coefficients were as negative for Pennsylvania and the US. Again, they are not statistically significant.

The sign changes from positive to negative on the COR slope dummy coefficients for Pennsylvania and US. There is also the tendency to increase with regard to New Jersey. Since there is no statistical significance, the assumption of a lesser cost effectiveness (when considering material costs) of New York state firms cannot be affirmed.

Interpretations

It is evident that the productivity of the New York state food industry is negatively associated with higher *relative* wages and material costs. Using 1987[3] as a reference point, if the WOR was one unit more, the GNP contribution per employee would be $1,000 less. The productivity per person would be about $260 less if the COR was one unit more.

The constant term has shifted upwards indicating the overall increase in productivity of New York state's food industry. However, the industry is becoming increasingly sensitive to relative wage and material costs. This is especially so with wages, since its sensitivity changes about four-fold compared to the two and a half change of the material costs' response.

New York state's performance in the industry compares to the rest of the nation and the region. However, New Jersey's food industry did have a higher overall productivity in the early to mid seventies, compared to the rest of the Mid-Atlantic region and the US. This would be an incentive for the migration of industry into the state at the expense of the others. However, the state's performance in terms of input costs was worse than the other two. Relative increases in wages and material costs did harm New

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[3]The three digit level data is preferred over the four digit level, due to extensive interpolations and estimations used in the latter dataset. However, the results of were still presented in order to compare the key OLS estimates, α_1, β_1 and β_2.

Jersey's performance more than the rest of its neighbors. However, in the most recent years all the states performance has been virtually the same.

A policy focus on reducing the wage-output ratio would be the most promising. This is because of the larger magnitude of impact, and change of productivity response to labor costs. In a survey of New York state food industry senior management officials (McLaughlin and Lee, 1984), the most frequently cited constraints to economic growth were; (1) taxes; (2) labor costs; (3) costs due to regulatory compliance; (4) energy costs and capital costs. These were the main concerns related to what the survey termed as the high "costs of doing business" in New York (ibid., pp. 22). They do concede that many of the policy actions that would be aimed at controlling these problems may be out of the state's control, and are only addressable at the national or international level.

Summary

With this simple model, we see that New York state's productivity in the food industry still compares to that of the nation and the Mid-Atlantic region, with no significant difference in performance of the most recent census years. The response to costs in the food industry does not differ. In the early to mid seventies, New Jersey's performance was more sensitive to input costs. This may have put the state at a disadvantage because of greater negative cost response

over-riding the higher 'absolute' productivity of the state's industry.

Evidently, the costs of doing business in New York and across the nation has more or less been the same. Given the results of this research, to reduce the impact of costs on industry productivity, a focus on the wage-output ratio would be the most logical approach to enhancing the state's competitiveness. The paper (ibid., pp.23) did recommend aligning the added costs of labor represented by high unemployment compensation and workmen's compensation taxes. Other policy actions stated were the expansion of state support for research, technological development, training, education and extension activities in areas relevant to the food industry. All these are programs that directly or indirectly affect labor costs.

Chapter Five

Conclusions

Summary

The thesis has focused on New York state, and to an extent, Mid-Atlantic region's performance of their food manufacturing industries. It began with the statement of several research objectives. The study now concludes with an overview of the objectives and how they have been met. The first objective was to discuss and present an overview of trends in the food manufacturing industry. Another objective was to illustrate the applicability of the industrial organization approach for market performance analysis. The IO theory stipulates that market structure influences conduct and behavior which in turn affect performance. The third objective was to examine and evaluate market performance through this framework.

Chapter one dealt with the problem statement and importance of the food industry, thus giving reason why the area needs study. Chapter two discussed the overall forces that influence food manufacturing were also discussed, which included a short discussion on factors influencing its geographic placement. With IO's acceptance of real world imperfections, the structure-conduct-performance paradigm has been seen to fit well on the food industry, which is what this chapter also shows. Most studies have focused on how structure impacts on performance. The effects of concentration, monopoly, oligopoly and how they affect

performance as gauged by profitability, have been the main focus of the works done within this framework. Other performance dimensions will also include production efficiency, output levels and rates of growth, speed and character of technological change and resource conservation. Both theory and empirical evidence can be adduced to explain a variety of possible relationships among this complex of variables (Collins and Preston, 1968). This section shows some of the said productivity relationships that have been studied, with some conduct-performance studies being outlined.

This research has attempted to expand and apply the existing theoretical argument, by highlighting a particular relationship between the mentioned variables. McLaughlin and Lee in 1984 stated that relatively little analysis has been devoted to how a particular economic environment will present an opportunity or obstacles to food manufacturing. While the authors used a survey of management officials, this research analyzes census data collected at the state and national level.

Chapter three gave a descriptive analysis of the industry. The aim of the chapter was to compare New York, Mid-Atlantic region and US trends. Important variables discussed included the number of employees, firms and output (value of shipments). All this was to help identify factors that affect the country, and those that are only regional. A comparison to New York state's counterparts in the Mid-

Atlantic region should reveal the regional factors that affect the industry.

By observing the data, the trends seemed to indicate the gradual decline of New York state's importance in the food industry, as its position weakened regionally and nationally. The performance of selected industries at the four digit level is also presented. These are the industries that the state stands out nationally. However, all these observations need to be backed by empirical analysis which is what the next chapter set out to do.

Chapter four included a short discussion of the background and theoretical approach of the model, and how it was developed. Not many conduct-performance studies have been done in the food industry. Kelton in 1983 did perform a study on the factors affecting wages and productivity using a wage-market structure relationship. However, she sought to test the hypothesis that wage rate increases over time are a reflection of productivity changes. The empirical analysis of this study differs from hers in that it is does not look at productivity change over time, but the bearing costs, both wage and material, have over productivity at a given point in time and region.

Williamson's work on the United Mine Workers vs. Pennington case showed the conduct-performance relationship in an industry with just a few players. He illustrates clearly how conduct is an explanatory variable. The theoretical argument he poses, which is basically a tenet of

raising rivals costs approach in IO, still holds for any industry. The difference between the two scenarios is that in the food industry, statewide collusion is improbable - for instance, a conspiracy between the Meat products and Beverage product industries under analysis.

The results show that New York state's productivity in the food industry still compares to that of the nation and the Mid-Atlantic region, with no significant difference in performance of the most recent census years. The response to input costs in the food industry does not differ. Unlike what the observed trends may lead us to conclude, the empirical analysis reveals that the impact of input costs on business performance in New York and across the nation has more or less been the same. To reduce the impact of costs on industry productivity, a focus on the wage-output ratio would be the most logical approach to enhancing the state's competitiveness. This is because of the difference in magnitude between the two input effects, with the estimated coefficient of the wage-output ratio being much higher than that of the cost-output ratio. McLaughlin and Lee, as earlier mentioned, did recommend aligning the added costs of labor represented by high unemployment compensation and workmen's compensation taxes. Other policies considered were the expansion of state support for research, technological development, and extension activities in areas relevant to the food industry. All these are policy actions commensurate with the findings of the research.

The results at the four digit level did not match the three digit level for some of the dummy variables. The extensive interpolations used for the undisclosed data did not warrant a heavy reliance on the results. On the other hand, the variables other than the dummies did show the expected signs and levels of significance.

Implications and Direction for Further Research

The empirical analysis does show that New York state together with the Mid-Atlantic region, though occasionally described as part of the rust belt, are holding their own with respect to food manufacturing. From the descriptive results, there is an indication of a number of differences between the regions being compared, but when all results are taken into consideration, it is evident that New York's response to input costs is well within the national averages. Pennsylvania is a state that has overtaken New York in national position while the state slid to seventh position in production. Still, there was no significant difference between the two states.

Given this similarity in the state's conduct-performance relationship with the rest of the country, it would imply that the national environment provides the primary influence on the food industry. Macroeconomic policy, investment and employment incentives, taxes and other government instruments are what would affect the state's industry most.

Future research requires more data at the state level, in order to have concentration levels, profitability or some form of proxy for it. Gross book value of capital per state would also be another important variable in order to extend the traditional structure-performance analysis to the state level. Additionally, how profitability relates with capital, advertising and other structure and conduct variables at the state level presents another challenge.

In order to make forecasting possible, another issue is the change in productivity over time, in relation to both material and labor costs. It would be important to include other input costs together with wages, because compared with the rest of manufacturing, food processing is relatively materials, capital, and advertising intensive (Marion, 1986), and less labor intensive due to the increase in labor productivity. Admittedly, acquiring the data at the state level for all these variables would be difficult, but an analysis at this level is essential for better effectiveness of local government policy. A regional analysis, with the nation divided by the Census Bureau's divisions (Mid-Atlantic, North-England, Pacific, etc), would be the next best approach of data reporting, given the imminent non-disclosure laws that would prevent giving a complete dataset. The absence of data at the detailed level also limited the research in that only the three digit level data was relied on for much of the descriptive and empirical analysis.

Appendix Notes

•1972 to 1987 data was extracted from Census of Manufactures, Geographic Area Series (1972-82 on magnetic tape; 1987 on CD-ROM). 1989 data was extracted from County of Business Patterns (CD-ROM).

•Deflators were extracted from the Economic Report of the President, 1991. Actual indices used for each variable, and sources are shown in appendix A.

•New Jersey's 1987 values of Annual Wages through New Capital Expenditures for Grain Mill Products and Fats and Oils, were undisclosed. Values were estimated using the rest of Mid-Atlantic employee to respective variable ratios.

•All estimated data is in italics.

•All data in appendices is in 1982 real terms

Appendix A
Deflators and their Sources (1982=100)

Table A.1 Indices Used for Adjusting Data.

	Total Payroll	Value Added	Material Costs	Value of Shipments	New Capital Expenditures
1972	41.8	45.8	49.5	48	42.3
1977	60.6	67.1	79.6	74	65.2
1982	96.5	100	100	100	100
1987	114	112	99.2	108	110
1989	124	123	114	118	117

Source: Economic Report of the President, 1991

Table A.2 Key and Sources of Indices Used.

Total Payroll	Table B-60 CPI, commodities, services, and special groups (1982-84=100) -All items
Value Added	Table B-3. Implicit Price Deflators for GNP (1982=100) Non-durable goods.
Material Costs	Table B-63. Producer Price Indexes by stage of processing (Intermediate materials, supplies and components -foods and feeds.
Value of Shipments	Table B-65. Producer Price Indexes for major commodity groups (1982=100) -processed foods and feeds.
New Capital Expenditures	Table B-65. Producer Price Indexes for major commodity groups (1982=100) -machinery and equipment.

Source: Economic Report of the President, 1991

Appendix B

Table B.1 Food Processing Data, 3-digit level
New Jersey 1972-1989 (Cont...)

1987 Code	Product class	Number of Establishments (Total)	Number of Employees (Thousands)	Total Payroll ($Millions)
	1972			
20	TOTAL	864	53.7	1209.33
201	Meat Products	116	5.2	116.51
202	Dairy Products	89	3	72.73
203	Preserved Fruits & Veg.	95	10	190.67
204	Grain Mill Products	31	1	19.14
205	Bakery Products	185	11.8	248.56
206	Sugar & Confectionery	58	3.8	91.63
207	Fats & Oils	28	2.2	55.74
208	Beverages	140	9.2	234.45
209	Miscellaneous Foods	122	7.6	179.90
	1977			
20	TOTAL	753	43.2	983.17
201	Meat Products	96	4.4	93.07
202	Dairy Products	78	2.6	62.21
203	Preserved Fruits & Veg.	95	7.7	155.28
204	Grain Mill Products	32	0.9	18.15
205	Bakery Products	154	9.3	204.29
206	Sugar & Confectionery	50	3.1	64.69
207	Fats & Oils	22	1.5	38.45
208	Beverages	106	7.4	198.68
209	Miscellaneous Foods	120	6.3	148.35
	1982			
20	TOTAL	621	39.1	821.14
201	Meat Products	75	4.9	87.98
202	Dairy Products	67	2.6	55.75
203	Preserved Fruits & Veg.	69	6.7	129.12
204	Grain Mill Products	25	0.7	13.99
205	Bakery Products	125	7.9	161.76
206	Sugar & Confectionery	41	2.5	58.24
207	Fats & Oils	16	1.0	20.93
208	Beverages	90	6.3	157.93
209	Miscellaneous Foods	113	6.4	135.54
	1987			
20	TOTAL	589	36.1	807.57
201	Meat Products	73	4.1	74.21
202	Dairy Products	68	3.1	74.38
203	Preserved Fruits & Veg.	57	6.3	138.64
204	Grain Mill Products	25	0.7	*17.43*
205	Bakery Products	123	8.2	173.59
206	Sugar & Confectionery	46	2.6	66.02
207	Fats & Oils	12	0.7	*12.57*
208	Beverages	70	4.0	112.24
209	Miscellaneous Foods	115	6.0	128.08
	1989			
20	TOTAL	581	37.6	827.23
201	Meat Products	66	4.0	76.44
202	Dairy Products	70	3.4	76.45
203	Preserved Fruits & Veg.	62	6.5	142.91
204	Grain Mill Products	19	0.8	16.46
205	Bakery Products	120	8.6	183.92
206	Sugar & Confectionery	40	2.6	63.79
207	Fats & Oils	13	0.9	19.78
208	Beverages	70	4.3	125.99
209	Miscellaneous Foods	120	6.6	121.50

Table B.1 (Continued) Food Processing Data, 3-digit level New Jersey, 1972-1989.

1987 Code	Product class	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)	New Capital Expenditures ($Million)
	1972				
20	TOTAL	3303.49	4740.81	8019.38	205.20
201	Meat Products	244.32	804.85	1062.50	10.87
202	Dairy Products	153.93	408.48	566.67	11.58
203	Preserved Fruits & Veg.	416.81	700.81	1120.63	38.06
204	Grain Mill Products	36.03	125.25	162.92	4.73
205	Bakery Products	611.79	405.86	1000.83	48.70
206	Sugar & Confectionery	208.95	251.31	453.13	16.08
207	Fats & Oils	160.26	334.95	487.71	16.08
208	Beverages	683.41	737.17	1417.71	29.79
209	Miscellaneous Foods	787.99	972.12	1747.08	29.31
	1977				
20	TOTAL	2975.26	5104.77	8206.08	166.41
201	Meat Products	164.68	676.01	877.16	18.40
202	Dairy Products	135.77	439.07	594.86	10.28
203	Preserved Fruits & Veg.	493.14	595.35	1086.08	28.37
204	Grain Mill Products	85.39	125.75	210.00	1.69
205	Bakery Products	549.03	363.44	887.30	32.06
206	Sugar & Confectionery	215.05	359.80	590.27	10.89
207	Fats & Oils	187.18	329.65	524.86	15.18
208	Beverages	598.51	731.03	1329.46	23.47
209	Miscellaneous Foods	546.65	1484.55	2106.08	26.07
	1982				
20	TOTAL	3266.10	4769.10	8040.70	158.40
201	Meat Products	179.80	689.70	864.20	15.50
202	Dairy Products	185.10	597.60	778.20	17.80
203	Preserved Fruits & Veg.	535.40	658.10	1194.60	33.00
204	Grain Mill Products	35.10	107.80	142.70	1.80
205	Bakery Products	605.50	315.50	919.90	20.20
206	Sugar & Confectionery	280.60	368.70	657.20	9.30
207	Fats & Oils	46.70	246.60	297.30	5.20
208	Beverages	703.30	814.30	1514.40	24.90
209	Miscellaneous Foods	694.50	970.70	1672.10	30.80
	1987				
20	TOTAL	3736.81	4871.98	8369.05	336.41
201	Meat Products	182.62	544.46	688.32	8.24
202	Dairy Products	256.51	781.35	984.99	24.00
203	Preserved Fruits & Veg.	751.16	771.88	1488.97	131.97
204	Grain Mill Products	*118.46*	*137.44*	*249.04*	*5.66*
205	Bakery Products	616.04	333.97	943.84	27.08
206	Sugar & Confectionery	337.43	508.27	816.77	26.09
207	Fats & Oils	*33.94*	*67.46*	*97.70*	*2.92*
208	Beverages	777.72	745.36	1497.31	73.37
209	Miscellaneous Foods	625.22	897.38	1483.04	41.94

Sources: Census of Manufactures (1972-87) and County of Business Patterns (1989).

Table B.2 Food Processing Data, 3-digit level
New York 1972-1989 (Cont...)

1987 Code	Product class	Number of Establishments (Total)	Number of Employees (Thousands)	Total Payroll ($Millions)
	1972			
20	TOTAL	2052	92.3	1996.89
201	Meat Products	245	9.8	225.60
202	Dairy Products	377	12.7	268.90
203	Preserved Fruits & Veg.	212	12.9	218.66
204	Grain Mill Products	105	4.6	108.61
205	Bakery Products	435	18	389.47
206	Sugar & Confectionery	107	9	172.01
207	Fats & Oils	27	0.8	22.01
208	Beverages	250	16.6	439.00
209	Miscellaneous Foods	294	8	152.63
	1977			
20	TOTAL	1852	75.2	1624.59
201	Meat Products	246	7.5	170.46
202	Dairy Products	313	10.1	220.46
203	Preserved Fruits & Veg.	191	10.9	189.11
204	Grain Mill Products	100	5.2	133.99
205	Bakery Products	411	14.4	309.90
206	Sugar & Confectionery	94	9.7	190.76
207	Fats & Oils	24	0.5	14.03
208	Beverages	205	10.3	273.93
209	Miscellaneous Foods	268	6.6	121.95
	1982			
20	TOTAL	1434	66.2	1294.30
201	Meat Products	171	6.4	122.69
202	Dairy Products	211	8.7	163.01
203	Preserved Fruits & Veg.	155	9.9	155.34
204	Grain Mill Products	95	4.4	110.26
205	Bakery Products	329	14.6	292.33
206	Sugar & Confectionery	75	5.1	96.17
207	Fats & Oils	14	0.5	12.02
208	Beverages	172	10.1	242.49
209	Miscellaneous Foods	212	6.4	99.90
	1987			
20	TOTAL	1341	63	1308.45
201	Meat Products	146	5	103.43
202	Dairy Products	175	8.7	174.30
203	Preserved Fruits & Veg.	127	9.9	170.42
204	Grain Mill Products	91	3.7	93.13
205	Bakery Products	365	14	272.01
206	Sugar & Confectionery	86	5.3	113.20
207	Fats & Oils	0	0	0.00
208	Beverages	137	10	270.25
209	Miscellaneous Foods	208	6.3	109.24
	1989			
20	TOTAL	1282	57.7	1181.57
201	Meat Products	130	3.9	74.23
202	Dairy Products	155	8.7	171.61
203	Preserved Fruits & Veg.	130	8.5	146.57
204	Grain Mill Products	87	3.7	90.90
205	Bakery Products	372	13.9	260.62
206	Sugar & Confectionery	81	4.4	94.75
207	Fats & Oils	7	0.1	2.14
208	Beverages	119	9.2	249.30
209	Miscellaneous Foods	194	5.2	91.02

Table B.2 (Continued) Food Processing Data, 3-digit level New York, 1972-1989.

1987 Code	Product class	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)	New Capital Expenditures ($Million)
	1972				
20	TOTAL	5083.19	7607.27	12685.42	310.17
201	Meat Products	398.03	1200.40	1615.83	20.57
202	Dairy Products	599.56	1631.52	2251.67	48.46
203	Preserved Fruits & Veg.	756.55	904.04	1656.25	47.04
204	Grain Mill Products	355.24	775.56	1137.71	14.66
205	Bakery Products	678.38	488.48	1151.46	23.17
206	Sugar & Confectionery	542.58	729.70	1276.88	34.04
207	Fats & Oils	65.28	133.94	202.71	5.20
208	Beverages	1263.32	1181.62	2417.08	84.87
209	Miscellaneous Foods	424.02	562.22	976.04	32.39
	1977				
20	TOTAL	4934.58	7063.32	12063.51	292.94
201	Meat Products	349.03	840.83	1217.43	17.33
202	Dairy Products	555.29	1675.25	2305.68	32.67
203	Preserved Fruits & Veg.	712.82	731.78	1433.51	20.09
204	Grain Mill Products	567.06	783.04	1354.05	17.79
205	Bakery Products	659.31	420.48	1050.14	19.94
206	Sugar & Confectionery	778.99	763.94	1528.51	63.65
207	Fats & Oils	48.14	142.59	198.38	4.29
208	Beverages	860.51	1097.11	1960.95	93.71
209	Miscellaneous Foods	403.43	608.17	1015.14	23.62
	1982				
20	TOTAL	4702.90	7545.20	12236.70	369.50
201	Meat Products	275.40	961.30	1238.00	*19.20*
202	Dairy Products	457.70	1753.50	2208.40	32.80
203	Preserved Fruits & Veg.	703.30	878.40	1578.30	57.00
204	Grain Mill Products	573.60	803.80	1376.00	33.50
205	Bakery Products	687.40	466.10	1153.70	25.40
206	Sugar & Confectionery	466.20	719.80	1182.20	15.20
207	Fats & Oils	44.20	87.90	132.40	0.00
208	Beverages	1118.80	1291.00	2408.50	160.30
209	Miscellaneous Foods	376.40	583.40	959.30	26.10
	1987				
20	TOTAL	5198.84	8151.92	12912.14	292.12
201	Meat Products	223.98	905.85	1066.08	*12.59*
202	Dairy Products	529.06	2020.56	2402.32	60.69
203	Preserved Fruits & Veg.	864.53	958.17	1755.05	45.29
204	Grain Mill Products	625.40	793.85	1377.29	25.82
205	Bakery Products	813.55	489.42	1294.25	32.61
206	Sugar & Confectionery	420.23	675.40	1055.24	25.91
207	Fats & Oils	0.00	0.00	0.00	0.00
208	Beverages	1250.00	1716.23	2924.93	62.86
209	Miscellaneous Foods	462.12	584.17	1019.09	26.36

Sources: Census of Manufactures (1972-87) and County of Business Patterns (1989).

Table B.3 Food Processing Data,3-digit level
Pennsylvania 1972-1989(Cont...)

1987 Code	Product class	Number of Establishments (Total)	Number of Employees (Thousands)	Total Payroll ($Millions)
	1972			
20	TOTAL	1762	99.1	1944.98
201	Meat Products	271	13.4	273.68
202	Dairy Products	332	14.5	305.02
203	Preserved Fruits & Veg.	116	13.7	226.08
204	Grain Mill Products	154	4.1	90.67
205	Bakery Products	339	19.4	390.19
206	Sugar & Confectionery	140	15.1	273.92
207	Fats & Oils	37	0.8	18.90
208	Beverages	219	10.9	244.26
209	Miscellaneous Foods	154	7.1	122.01
	1977			
20	TOTAL	1579	92.3	1884.49
201	Meat Products	259	14.9	299.83
202	Dairy Products	256	9.6	202.31
203	Preserved Fruits & Veg.	109	12.3	221.45
204	Grain Mill Products	153	4.2	93.07
205	Bakery Products	297	18.1	387.79
206	Sugar & Confectionery	141	15.3	297.03
207	Fats & Oils	34	1	22.44
208	Beverages	181	9.2	225.41
209	Miscellaneous Foods	149	7.8	135.31
	1982			
20	TOTAL	1225	85.1	1553.37
201	Meat Products	207	13.6	223.73
202	Dairy Products	178	8	150.16
203	Preserved Fruits & Veg.	88	11.7	197.10
204	Grain Mill Products	150	4.8	103.01
205	Bakery Products	205	16.1	300.31
206	Sugar & Confectionery	111	13.6	252.95
207	Fats & Oils	22	0.8	16.27
208	Beverages	132	8.8	185.28
209	Miscellaneous Foods	132	7.8	124.56
	1987			
20	TOTAL	1127	83.1	1561.62
201	Meat Products	188	14.2	226.76
202	Dairy Products	146	7.9	158.10
203	Preserved Fruits & Veg.	71	11	190.49
204	Grain Mill Products	132	4.8	118.49
205	Bakery Products	210	15.3	292.43
206	Sugar & Confectionery	117	13.8	266.81
207	Fats & Oils	14	0.5	8.98
208	Beverages	115	6.7	150.18
209	Miscellaneous Foods	134	8.9	149.30
	1989			
20	TOTAL	1081	81.0	1538.40
201	Meat Products	171	14.2	230.88
202	Dairy Products	137	7.4	146.48
203	Preserved Fruits & Veg.	69	10.7	191.84
204	Grain Mill Products	126	5.0	120.83
205	Bakery Products	216	14.9	289.16
206	Sugar & Confectionery	116	13.8	278.38
207	Fats & Oils	13	0.3	7.28
208	Beverages	101	5.6	120.48
209	Miscellaneous Foods	129	9.2	152.89

Table B.3 (Continued) Food Processing Data, 3-digit level Pennsylvania, 1972-1989.

1987 Code	Product class	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)	New Capital Expenditures ($Million)
	1972				
20	TOTAL	4535.81	7532.53	12052.08	387.00
201	Meat Products	482.10	2066.87	2585.42	42.79
202	Dairy Products	645.85	1353.74	2003.54	63.83
203	Preserved Fruits & Veg.	663.76	835.35	1487.71	65.48
204	Grain Mill Products	309.83	612.73	915.83	50.35
205	Bakery Products	839.30	529.70	1345.63	33.33
206	Sugar & Confectionery	713.76	1031.72	1739.38	73.05
207	Fats & Oils	44.76	67.47	112.08	3.78
208	Beverages	531.66	611.11	1133.13	42.79
209	Miscellaneous Foods	304.80	423.84	729.17	11.58
	1977				
20	TOTAL	4776.30	7942.84	12849.05	366.26
201	Meat Products	563.93	2062.69	2717.97	54.60
202	Dairy Products	408.49	1128.02	1580.68	30.37
203	Preserved Fruits & Veg.	662.15	913.57	1585.54	27.15
204	Grain Mill Products	402.53	804.27	1230.68	55.98
205	Bakery Products	875.26	510.93	1343.24	36.20
206	Sugar & Confectionery	761.55	1097.74	1865.27	76.84
207	Fats & Oils	54.99	164.57	225.68	6.44
208	Beverages	639.94	687.94	1315.27	54.14
209	Miscellaneous Foods	407.45	572.99	984.86	24.54
	1982				
20	TOTAL	4950.00	8316.60	13239.50	304.40
201	Meat Products	493.70	1934.00	2418.80	42.80
202	Dairy Products	385.10	1350.00	1731.00	26.70
203	Preserved Fruits & Veg.	783.10	1072.10	1853.70	34.20
204	Grain Mill Products	464.90	871.80	1339.90	35.30
205	Bakery Products	813.60	524.00	1335.60	28.50
206	Sugar & Confectionery	927.90	1041.00	1957.60	54.50
207	Fats & Oils	44.50	112.10	156.20	4.60
208	Beverages	553.50	840.30	1390.90	46.80
209	Miscellaneous Foods	483.80	571.20	1055.70	30.90
	1987				
20	TOTAL	6273.89	9663.81	15373.77	326.72
201	Meat Products	547.86	2427.42	2798.33	38.22
202	Dairy Products	531.73	1607.26	2026.97	33.79
203	Preserved Fruits & Veg.	973.26	1187.70	2102.13	48.82
204	Grain Mill Products	813.10	875.10	1646.80	42.93
205	Bakery Products	1052.94	619.56	1660.15	37.86
206	Sugar & Confectionery	1164.62	1232.06	2328.08	59.78
207	Fats & Oils	24.24	48.19	69.79	2.08
208	Beverages	482.09	899.60	1326.69	28.17
209	Miscellaneous Foods	684.05	767.04	1414.92	35.14

Sources: Census of Manufactures (1972-87) and County of Business Patterns (1989).

Table B.4 Food Processing Data, 3-digit level
U.S., 1972-1989 (Cont...)

1987 Code	Product class	Number of Establishments (Total)	Number of Employees (Thousands)	Total Payroll ($Millions)
	1972			
20	TOTAL	28183	1569.3	30909.6
201	Meat Products	4437	307.7	6085.2
202	Dairy Products	4590	188.7	3819.1
203	Preserved Fruits & Veg.	2557	233.1	3668.7
204	Grain Mill Products	3080	111.4	2423.0
205	Bakery Products	3633	234.6	4854.1
206	Sugar & Confectionery	1249	107.1	1989.2
207	Fats & Oils	860	40.2	876.6
208	Beverages	3624	212.3	4862.9
209	Miscellaneous Foods	4153	134.2	2330.6
	1977			
20	TOTAL	26656	1520.6	30599.8
201	Meat Products	4490	293	5771.8
202	Dairy Products	3723	153.7	3191.7
203	Preserved Fruits & Veg.	2352	227.8	3754.5
204	Grain Mill Products	3021	111.9	2584.8
205	Bakery Products	3371	218.2	4646.9
206	Sugar & Confectionery	1159	95.8	1831.8
207	Fats & Oils	819	38.4	871.9
208	Beverages	3100	194.8	4693.4
209	Miscellaneous Foods	4393	139.2	2376.7
	1982			
20	TOTAL	22131	1493	27079.3
201	Meat Products	3594	316.9	5162.3
202	Dairy Products	2716	144.1	2684.7
203	Preserved Fruits & Veg.	2073	216.1	3388.2
204	Grain Mill Products	2621	101.5	2141.6
205	Bakery Products	2752	214.4	4151.9
206	Sugar & Confectionery	1006	87.9	1588.0
207	Fats & Oils	679	36.4	754.4
208	Beverages	2582	193.8	4385.8
209	Miscellaneous Foods	3909	150.7	2271.4
	1987			
20	TOTAL	20583	1448.8	26643.9
201	Meat Products	3240	340.5	5018.2
202	Dairy Products	2366	141.5	2832.2
203	Preserved Fruits & Veg.	1918	208.5	3331.3
204	Grain Mill Products	2607	102.4	2379.9
205	Bakery Products	2850	217	4190.8
206	Sugar & Confectionery	1075	90.3	1752.9
207	Fats & Oils	586	29.6	617.6
208	Beverages	2211	160.9	3979.5
209	Miscellaneous Foods	3730	158	2541.5
	1989			
20	TOTAL	20182	1446.0	26451.0
201	Meat Products	3048	359.0	5175.5
202	Dairy Products	2208	141.2	2773.3
203	Preserved Fruits & Veg.	1885	186.3	3346.0
204	Grain Mill Products	2516	102.6	2329.3
205	Bakery Products	2962	216.9	4112.6
206	Sugar & Confectionery	1102	91.4	1774.9
207	Fats & Oils	562	29.2	607.8
208	Beverages	2081	153.3	3682.0
209	Miscellaneous Foods	3641	164.9	2633.6

Table B.4 (Continued) Food Processing Data, 3-digit level U.S., 1972-1989.

1987 Code	Product class	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)	New Capital Expenditures ($Million)
	1972				
20	TOTAL	77761.6	161198.0	239690.6	5567.4
201	Meat Products	10831.7	53783.0	65579.0	708.3
202	Dairy Products	8851.7	24816.4	33982.3	649.4
203	Preserved Fruits & Veg.	9856.8	14018.6	23913.8	847.3
204	Grain Mill Products	8075.8	17179.0	25337.9	630.3
205	Bakery Products	9906.1	6782.0	16449.0	490.1
206	Sugar & Confectionery	5399.3	8406.3	13791.9	440.2
207	Fats & Oils	2817.7	11461.6	14376.7	287.0
208	Beverages	14604.8	14742.0	28894.6	1106.9
209	Miscellaneous Foods	7417.7	10009.3	17365.6	407.8
	1977				
20	TOTAL	83550.1	172065.3	260691.4	6433.7
201	Meat Products	10525.8	45080.4	57944.2	772.5
202	Dairy Products	8402.7	25603.3	35099.6	590.8
203	Preserved Fruits & Veg.	11152.3	15486.3	26735.8	696.3
204	Grain Mill Products	9807.2	19596.4	29929.9	903.1
205	Bakery Products	10382.7	6414.7	16307.4	547.2
206	Sugar & Confectionery	5521.2	7544.8	13068.1	413.5
207	Fats & Oils	2678.8	14654.8	18420.9	300.8
208	Beverages	14735.5	16943.3	31480.4	1414.1
209	Miscellaneous Foods	7795.8	13756.2	21855.0	403.7
	1982				
20	TOTAL	88473.9	192425.6	280793.6	6727.4
201	Meat Products	10969.3	56464.2	67436.2	673.1
202	Dairy Products	8411.8	30480.0	38830.4	709.4
203	Preserved Fruits & Veg.	12134.9	17298.2	29359.6	810.3
204	Grain Mill Products	9747.1	19686.8	29518.1	649.9
205	Bakery Products	10629.4	7416.4	18042.3	469.8
206	Sugar & Confectionery	5810.0	8525.3	14322.5	375.2
207	Fats & Oils	2602.7	13333.9	15995.7	310.6
208	Beverages	16595.9	22042.7	38593.1	1528.3
209	Miscellaneous Foods	9381.9	13419.2	22787.0	498.0
	1987				
20	TOTAL	108380.5	210438.6	305584.2	6519.5
201	Meat Products	12337.2	63734.3	71364.5	802.4
202	Dairy Products	10558.5	33208.3	41478.3	674.3
203	Preserved Fruits & Veg.	15476.2	19271.5	33681.9	928.8
204	Grain Mill Products	13733.2	21520.2	34047.3	970.7
205	Bakery Products	13559.1	8566.4	21943.7	666.6
206	Sugar & Confectionery	7545.7	10638.4	17504.2	435.3
207	Fats & Oils	2861.2	12841.2	14717.8	227.4
208	Beverages	20129.1	25067.7	43862.1	1135.1
209	Miscellaneous Foods	12180.2	15590.7	26984.6	678.9

Sources: Census of Manufactures (1972-87) and County of Business Patterns (1989).

Appendix C

Table C.1 Food Processing Data, 4-digit level, New Jersey 1987*

1987 Code	Product class	Number of Employees (Thousands)	Total Payroll ($Million)	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)
2011	Meat packing plants	0.4	*5.55*	*13.78*	*51.42*	*61.49*
2013	Sausages and other prepared meats	2	45.07	110.25	274.50	365.52
2015	Poultry and egg processing	1.7	*23.59*	*58.59*	*218.54*	*261.31*
2022	Cheese, natural and processed	0.5	8.27	22.10	153.23	163.76
2024	Ice cream and frozen desserts	0.4	*8.80*	*15.15*	*72.18*	*82.58*
2026	Fluid milk	2.2	57.31	219.25	555.95	738.65
2032	Canned specialties	1.7	*33.61*	*166.00*	*174.16*	*332.27*
2033	Canned fruits and vegetables	1.3	29.58	141.53	200.91	332.34
2034	Dehydrated fruits, vegetables, and soups	0.7	*13.84*	*68.35*	*71.71*	*136.82*
2035	Pickles, sauces, and salad dressings	0.6	14.17	140.91	79.23	218.44
2037	Frozen fruits and vegetables	0.7	*13.84*	*68.35*	*71.71*	*136.82*
2038	Frozen specialties, n.e.c.	1.7	*33.61*	*166.00*	*174.16*	*332.27*
2045	Prepared flour mixes and doughs	0.4	*8.71*	*59.23*	*68.72*	*124.52*
2047	Dog and cat food	0.2	*4.36*	*29.62*	*34.36*	*62.26*
2048	Prepared feeds, n.e.c.	0.2	*4.36*	*29.62*	*34.36*	*62.26*
2051	Bread, cake, and related products	4.2	88.03	351.96	149.50	503.34
2052	Cookies and crackers	2.5	*73.76*	*227.66*	*159.03*	*379.74*
2053	Frozen bakery products, except bread	0.4	*11.80*	*36.43*	*25.44*	*60.76*
2064	Candy and other confectionery products	1.9	47.71	293.14	309.48	588.69
2066	Chocolate and cocoa products	0.4	*9.15*	*22.15*	*99.40*	*114.04*
2067	Chewing gum	0.4	*9.15*	*22.15*	*99.40*	*114.04*
2077	Animal and marine fats and oils	0.4	*4.57*	*12.34*	*24.53*	*35.53*
2079	Edible fats and oils, n.e.c.	0.7	*8.00*	*21.60*	*42.93*	*62.17*
2082	Malt beverages	1.7	*43.65*	*236.87*	*206.64*	*436.82*
2085	Distilled and blended liquors	0.4	10.12	77.81	116.53	187.58
2086	Bottled and canned soft drinks	1.7	40.49	365.51	337.10	693.05
2087	Flavoring extracts and syrups, n.e.c.	0.7	*17.97*	*97.53*	*85.09*	*179.87*
2091	Canned and cured fish and seafoods	0.5	6.60	22.91	29.84	51.99
2092	Fresh or frozen prepared fish	0.7	*13.63*	*62.70*	*63.55*	*123.83*
2095	Roasted coffee	2.2	57.39	371.57	574.40	922.71
2097	Manufactured ice	0.2	*3.90*	*17.91*	*18.16*	*35.38*
2098	Macaroni and spaghetti	0.7	*13.63*	*62.70*	*63.55*	*123.83*
2099	Food preparations n.e.c.	2	39.52	110.34	177.72	277.29

Source: Census of Manufactures, 1987.

*Italicized entries are estimates- interpolations from three digit level totals and number of employees.

Table C.2 Food Processing Data, 4 digit level, New York 1987*

1987 Code	Product class	Number of Employees (Thousands)	Total Payroll ($Million)	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)
2011	Meat packing plants	0.8	11.97	24.15	262.90	265.62
2013	Sausages and other prepared meats	3.5	80.11	179.86	591.83	732.25
2015	Poultry and egg processing	0.8	11.36	19.96	51.11	68.12
2022	Cheese, natural and processed	2.6	47.27	144.39	612.10	709.18
2023	Dry, condensed, and evaporated milk products	0.4	*6.56*	*21.90*	*59.08*	*77.07*
2024	Ice cream and frozen desserts	1.7	*27.86*	*93.07*	*251.10*	*327.56*
2026	Fluid milk	4.3	92.61	269.70	1098.29	1288.51
2032	Canned specialties	1.7	*22.23*	*97.23*	*117.12*	*208.55*
2033	Canned fruits and vegetables	3.6	64.61	403.03	513.10	897.50
2035	Pickles, sauces, and salad dressings	1.7	*22.23*	*97.23*	*117.12*	*208.55*
2037	Frozen fruits and vegetables	0.7	*9.15*	*40.04*	*48.22*	*85.87*
2038	Frozen specialties, n.e.c.	2.8	52.20	227.01	162.60	354.59
2041	Flour and other grain products	0.8	22.36	62.66	289.82	331.97
2043	Cereal breakfast foods	0.7	*19.41*	*153.57*	*79.28*	*231.79*
2045	Prepared flour mixes and doughs	0.7	*19.41*	*153.57*	*79.28*	*231.79*
2047	Dog and cat food	0.7	16.73	206.51	142.74	344.11
2048	Prepared feeds, n.e.c.	0.8	15.23	49.11	202.72	237.63
2051	Bread, cake, and related products	12.3	239.44	733.51	418.35	1146.99
2052	Cookies and crackers	1.7	*29.14*	*71.61*	*63.59*	*131.76*
2053	Frozen bakery products, except bread	0.2	*3.43*	*8.42*	*7.48*	*15.50*
2062	Cane sugar refining	1.7	*36.31*	*154.50*	*276.01*	*411.72*
2064	Candy and other confectionery products	2.4	40.58	111.23	123.39	231.79
2066	Chocolate and cocoa products	1.7	*36.31*	*154.50*	*276.01*	*411.72*
2082	Malt beverages	2.9	100.53	635.74	528.02	1147.91
2084	Wines, brandy and brandy spirits	1.7	*36.27*	*124.17*	*218.87*	*367.32*
2086	Bottled and canned soft drinks	5	124.91	460.87	917.84	1323.26
2087	Flavoring extracts and syrups, n.e.c.	0.4	*8.53*	*29.22*	*51.50*	*86.43*
2091	Canned and cured fish and seafoods	0.4	*7.67*	*36.36*	*34.71*	*69.81*
2092	Fresh or frozen prepared fish	0.2	*3.83*	*18.18*	*17.35*	*34.90*
2095	Roasted coffee	0.5	12.15	53.57	178.73	221.22
2096	Potato chips and similar products	0.7	*13.41*	*63.64*	*60.74*	*122.16*
2098	Macaroni and spaghetti	0.8	15.67	71.84	55.04	126.14
2099	Food preparations n.e.c.	3.6	56.51	218.54	237.60	444.86

Source: Census of Manufactures, 1987.

* Italicized entries are estimates- interpolations from three digit level totals and number of employees.

Table C.3 Food Processing Data, 4-digit level Pennsylvania 1987*

1987 Code	Product class	Number of Employees (Thousands)	Total Payroll ($Million)	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)
2011	Meat packing plants	3.6	63.29	143.94	1,021.37	1,088.97
2013	Sausages and other prepared meats	5	92.69	259.18	909.58	1,105.47
2015	Poultry and egg processing	5.6	70.77	144.74	496.37	603.89
2022	Cheese, natural and processed	1	17.25	46.97	328.83	352.46
2023	Dry, condensed, and evaporated milk products	0.4	*9.68*	*57.93*	*230.54*	*271.36*
2024	Ice cream and frozen desserts	1.8	36.18	109.98	231.45	323.54
2026	Fluid milk	4.7	94.98	316.84	816.43	1,079.61
2032	Canned specialties	3.6	76.41	373.80	346.77	705.00
2033	Canned fruits and vegetables	2.7	39.35	246.97	317.94	548.56
2034	Dehydrated fruits, vegetables, and soups	0.2	*3.72*	*20.58*	*35.69*	*54.35*
2035	Pickles, sauces, and salad dressings	1.7	*31.58*	*174.96*	*303.33*	*461.96*
2037	Frozen fruits and vegetables	0.5	8.27	20.94	42.44	60.70
2038	Frozen specialties, n.e.c.	2.5	31.16	136.01	141.53	271.55
2041	Flour and other grain products	0.3	5.46	19.96	109.88	122.06
2043	Cereal breakfast foods	1.7	*33.42*	*379.37*	*181.65*	*561.11*
2045	Prepared flour mixes and doughs	0.4	*7.86*	*89.26*	*42.74*	*132.03*
2047	Dog and cat food	1.6	41.29	218.81	166.03	377.48
2048	Prepared feeds, n.e.c.	1.5	30.46	105.70	374.80	454.12
2051	Bread, cake, and related products	9.2	165.93	578.79	319.66	895.92
2052	Cookies and crackers	4.8	100.53	334.85	211.90	538.46
2053	Frozen bakery products, except bread	1.3	25.97	139.30	88.00	225.67
2064	Candy and other confectionery products	8	126.14	560.25	517.14	1,052.64
2066	Chocolate and cocoa products	4.2	114.52	478.07	622.68	1,062.65
2067	Chewing gum	1.7	*23.39*	*113.00*	*82.53*	*190.39*
2068	Nuts and seeds	0.2	*2.75*	*13.29*	*9.71*	*22.40*
2077	Animal and marine fats and oils	0.4	*7.18*	*19.39*	*38.55*	*55.83*
2082	Malt beverages	1.6	42.25	133.60	200.30	324.47
2085	Distilled and blended liquors	0.4	*10.21*	*46.03*	*72.38*	*113.81*
2086	Bottled and canned soft drinks	4.1	87.50	256.42	554.54	774.61
2087	Flavoring extracts and syrups, n.e.c.	0.4	10.21	46.03	72.38	113.81
2092	Fresh or frozen prepared fish	1.2	22.36	142.07	243.85	371.46
2096	Potato chips and similar products	4.9	82.66	285.12	288.81	560.70
2098	Macaroni and spaghetti	0.4	*11.71*	*57.93*	*46.67*	*101.76*
2099	Food preparations n.e.c.	2.1	32.57	198.93	187.70	381.00

Source: Census of Manufactures, 1987.

* Italicized entries are estimates- interpolations from three digit level totals and number of employees.

Table C.4 Food Processing Data, 4-digit level, U.S. 1987 (Cont...)

1987 Code	Product class	Number of Employees (Thousands)	Total Payroll ($Million)	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)
2011	Meat packing plants	113.9	1,903.52	4,694.21	40,627.92	42,202.59
2013	Sausages and other prepared meats	78.7	1,419.19	3,972.37	12,183.37	15,341.33
2015	Poultry and egg processing	147.9	1,695.51	3,670.59	10,922.78	13,820.57
2021	Creamery butter	1.7	34.24	119.07	1,301.71	1,316.40
2022	Cheese, natural and processed	33	579.05	2,339.39	10,419.96	12,021.32
2023	Dry, condensed, and evaporated milk products	14.1	351.50	2,131.55	3,490.93	5,427.90
2024	Ice cream and frozen desserts	20.3	387.41	1,132.26	2,683.57	3,629.75
2026	Fluid milk	72.4	1,480.02	4,836.19	15,312.10	19,082.95
2032	Canned specialties	24.5	461.97	2,363.99	2,722.18	4,958.39
2033	Canned fruits and vegetables	65.1	1,022.10	4,848.57	6,518.04	11,019.00
2034	Dehydrated fruits, vegetables, and soups	10.1	167.96	832.09	932.16	1,688.51
2035	Pickles, sauces, and salad dressings	21.4	397.71	2,268.09	2,527.02	4,680.54
2037	Frozen fruits and vegetables	49.8	692.61	2,662.03	3,699.09	6,122.52
2038	Frozen specialties, n.e.c.	37.5	589.00	2,501.43	2,872.88	5,212.97
2041	Flour and other grain products	13.3	312.15	1,191.35	3,686.49	4,619.83
2043	Cereal breakfast foods	16	527.20	4,371.21	1,683.27	6,084.99
2044	Rice milling	4.5	78.43	418.54	826.01	1,144.49
2045	Prepared flour mixes and doughs	12.1	242.87	1,139.75	1,350.40	2,432.90
2046	Wet corn milling	8.6	263.12	1,848.93	2,716.13	4,438.28
2047	Dog and cat food	13.4	322.01	2,443.40	2,315.32	4,698.15
2048	Prepared feeds, n.e.c.	34.5	634.15	2,319.96	8,942.54	10,628.54
2051	Bread, cake, and related products	161.9	3,132.04	9,381.28	5,742.64	15,033.46
2052	Cookies and crackers	45.3	887.06	3,642.96	2,253.93	5,830.21
2053	Frozen bakery products, except bread	9.9	171.65	534.85	569.96	1,080.07
2061	Raw cane sugar	6.2	126.14	449.38	798.49	1,148.66
2062	Cane sugar refining	5.5	156.16	396.97	2,018.95	2,280.07
2063	Beet sugar	7.9	167.34	546.52	1,287.30	1,697.41
2064	Candy and other confectionery products	45.8	791.81	3,420.41	3,191.13	6,468.77
2066	Chocolate and cocoa products	11	249.38	1,291.71	1,690.93	2,880.17
2067	Chewing gum	5.2	110.48	668.18	349.90	1,010.47
2068	Nuts and seeds	8.8	151.50	772.55	1,301.61	2,018.54

Table C.4 (Cont....) Food Processing Data, 4-digit level, U.S. 1987

1987 Code	Product class	Number of Employees (Thousands)	Total Payroll ($Million)	Value Added ($Million)	Material Costs ($Million)	Value of Shipments ($Million)
2074	Cottonseed oil mills	2.6	39.44	95.28	381.85	436.24
2075	Soybean oil mills	7	151.85	901.52	8,168.65	8,409.73
2076	Vegetable oil mills	0.9	17.52	73.71	356.15	399.91
2077	Animal and marine fats and oils	9.8	185.83	667.65	1,024.80	1,624.75
2079	Edible fats and oils, n.e.c.	9.3	222.98	1,123.08	2,909.58	3,847.17
2082	Malt beverages	31.9	1,193.13	6,492.69	6,362.70	12,621.50
2083	Malt	1.4	38.91	136.90	370.97	492.03
2084	Wines, brandy and brandy spirits	13.9	301.06	1,229.95	1,845.97	2,973.31
2085	Distilled and blended liquors	9	214.79	1,842.87	1,532.36	3,219.93
2086	Bottled and canned soft drinks	95.6	2,004.75	7,491.09	13,565.32	20,232.07
2087	Flavoring extracts and syrups, n.e.c.	9.1	226.76	2,935.56	1,390.52	4,323.26
2091	Canned and cured fish and seafoods	6.7	88.82	252.50	486.29	710.84
2092	Fresh or frozen prepared fish	38.2	470.07	1,380.57	4,267.94	5,359.59
2095	Roasted coffee	10.7	266.73	2,308.20	3,805.65	5,931.97
2096	Potato chips and similar products	33.1	547.80	2,941.89	1,764.31	4,671.73
2097	Manufactured ice	4.7	67.78	180.84	87.40	268.40
2098	Macaroni and spaghetti	6.6	123.24	547.24	438.61	971.36
2099	Food preparations n.e.c.	58	976.94	4,568.98	4,740.52	9,070.71

Source: Census of Manufactures, 1987

Appendix D

Table D.1 Food Processing Data, New York State by County* (Cont.....)

County	Number of Employees	Total Payroll ($Thousands)	Number of Establishments
Albany	1,473	41,749	29
Allegany	0	0	3
Bronx	2,030	47,407	60
Broome	900	15,740	13
Cattaraugus	374	9,365	13
Cayuga	182	4,006	6
Chautauqua	2,196	46,392	31
Chemung	156	3,056	6
Chenango	168	3,223	7
Clinton	0	0	3
Columbia	0	0	4
Cortland	0	0	4
Delaware	0	0	4
Dutchess	154	3,327	9
Erie	7,420	175,156	100
Essex	0	0	1
Franklin	175	3,311	4
Fulton	0	0	1
Genesee	342	10,515	12
Greene	0	0	2
Hamilton	353	7,356	6
Herkimer	448	9,683	11
Jefferson	6,497	167,689	186
Kings	0	0	3
Lewis	0	0	6
Livingston	0	0	6
Madison	2,897	72,671	52
Monroe	0	0	6
Montgomery	1,020	24,295	67
Nassau	2,024	38,711	113
New York	715	17,793	14
Niagara	680	12,755	28
Oneida	2,167	72,699	25
Onondaga	707	18,611	12
Ontario	346	6,471	17
Orange	298	5,879	7
Orleans	0	0	6
Oswego	137	2,629	5
Otsego	0	0	2
Putnam	6,491	169,859	109
Queens	136	2,391	5
Rensselaer	355	11,546	10

*All zeros under 'Number of Employees' and 'Total Payroll' are due to undisclosures.

Table D.1 (Cont...) Food Processing Data,
New York State by County

County	Number of Employees	Total Payroll ($Thousands)	Number of Establishments
Richmond	603	14,391	20
Rockland	506	10,864	14
Saratoga	260	4,848	8
Schenectady	247	5,844	12
Schoharie	0	0	1
Schuyler	72	463	5
Seneca	0	0	7
Steuben	1,206	32,791	11
Suffolk	3,909	115,123	81
Sullivan	378	6,812	8
Tioga	0	0	2
Tompkins	77	891	8
Ulster	163	2,246	15
Warren	0	0	3
Washington	0	0	1
Wayne	1,028	22,627	15
Westchester	2,162	65,366	51
Wyoming	228	5,652	7
Yates	141	2,628	5

Sources: County of Business Patterns, 1989.

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