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Time Integration: Agribusiness Structure for Competitive Advantage

by

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Motivation

Compared to other manufacturing activities, food production and availability historically has been a seasonal activity dependent on a climatic constraint. The availability of many perishable agricultural products was limited to a specific time of the year. In many regions of the world these supply conditions remain. During the last sixty years, an interstate transportation system and advances in storage, processing, packaging, and cold storage technologies have transformed U.S. food availability, including perishables, to a continuous status equaling or surpassing the availability of other manufactured goods.

Sourcing highly perishable fresh food products (i.e. shelf life of < 15 days) for year-around availability traditionally demanded a large staff of retail chain buyers either contacting middlemen (e.g. wholesalers) or grower-shippers directly. Buyers sought a large number, often hundreds, of sellers within and across growing regions to insure a stable supply of fresh products for their customers. Periods of no availability for certain perishable items were common in supermarkets less than 15 years ago.

In recent years consolidation in retail food markets has reduced the number of buyers, enhanced retailer market power, and increased the importance of non-price competitive factors such as quality (Kaufman et al; Sexton). New biological technologies have produced customized seed for microclimates (Wilson, Thompson and Cook). Advances in harvesting, packing, and shipping facilitate the movement of perishable goods to the store shelf in hours rather than days. Modern communication technologies facilitate buyer-seller interaction down to the field level where distance is no longer a barrier for timely business-to-business transactions (Cairncross). These economic and

technological forces have induced suppliers of perishable food products to seek organizational designs to increase the availability of their products (Calvin and Cook).

This paper provides a preliminary analytical snapshot of the organizational structure of the fresh produce industry in the western United States, Florida, and Mexico operating in this dynamic competitive environment. We first ask the question "Why do firms differ?" with the intention of understanding the degree of firm-level differences in the fresh product industry. Time integration then is defined and presented as a strategic, organizational decision by some firms to differentiate themselves from traditional grower-shipper firms. A sample of grower-shippers is categorized using cluster analysis to understand the nature of the organizational decisions to integrate over time. And finally, implications are drawn from this analysis for predicting further structural change in the agricultural sector.

Time Integration: An Organizational Design Response

Why Do Firms Differ?

Economics has a rather checkered past with regard to the structure of firms, that is, how people and activities are distributed within a governance framework to accomplish goals. Coase (1937, 1988) originally asked fundamental questions concerning firm existence and design but his work was ignored until the 1970s. Simon's in-depth research into decision making within the firm produced the concept of "bounded rationality" and "satisficing" implying that strategic choices made by managers may be rational but not economically optimal choices. In the business management literature, Chandler discussed the relationship between structure, strategy and performance in corporate America. Chandler's work, combined with modern industrial organization theory in

economics and management created the theoretical foundation for the current field of strategic management. Williamson drew upon this literature to develop the transaction cost theory of vertical integration. Most of this cited work remains on the periphery of mainstream economic research. Differences between firms have received little attention in neoclassical theory. The relationship between differences in firm structure and its importance for understanding economic performance has been under investigated.

Economic discussions of structural differences across firms revolve around three major themes: path dependency, management culture and decisions, and time (Nelson; Williams; Carroll). Firms find it difficult to break with their histories. The risk and transaction costs associated with new directions are too constraining for many management teams. Therefore, the future is significantly conditioned by the past regardless of the current competitive environment. Secondly, it is widely recognized that management makes decisions to varying degrees on opinion, perceptions, and expectations. Empirical evidence substantiates the claim that any two managers make decisions differently thereby producing variation in firm structure and strategy. Finally, as managers search for better ways of doing things over time, a host of complex strategic trajectories emerge with little managerial understanding of which strategy is optimal. Continuous searching by management for the most effective and efficient organizational design produces diversity in firm structure and strategy.

Time Integration

Successful organizational designs or structures potentially create greater gains to the business than technological advances. In fact, the appropriate business structure must be either in place or put in place in a timely manner to fully exploit new technologies and

market changes. Some grower-shippers in the fresh produce industry have responded in varying degrees to technological (e.g. improved cooling, packaging and transportation) and market changes (e.g. retailer demand for greater availability) by integrating their business operations across time. These firms organize to continuously supply highly perishable, fresh product to buyers throughout the year.

Some grower-shippers now find, develop, and maintain microclimatic advantages throughout viable production regions locally, regionally, nationally, and internationally. Transitory climatic advantages are exploited for brief, but important periods of time (Krugman). Just like the demand side (Thompson and Wilson, 1999), climate drives structural decisions on the supply side, not just local weather, but global climate.

Conceptual Model

The strategic use of time integration and the possibility of a range of organizational designs are illustrated by the competitive framework in Figure 1 (Besanko, Dranove and Shanley). Suppose I_1 represents the indifference curve of a food retailer representing the tradeoff between the availability of a fresh product and the average annual price paid for that product. Higher levels of utility for the retailer are achieved with lower prices and higher availability. Firm X provides a lower priced product (P_X) with limited availability, A_X, at an annual unit cost of C_X. This is equivalent to traditional grower-shippers supplying their customers three to four months of the year.

Now Firm Y offers the same product with higher availability, say 10 months of the year (A_Y). But this greater availability (_A) is created at a higher average annual unit cost (C_Y). Given the higher availability and the retailer's desire for this service, Firm Y sees the additional benefit _B relative to the additional costs _C. Firm Y creates more

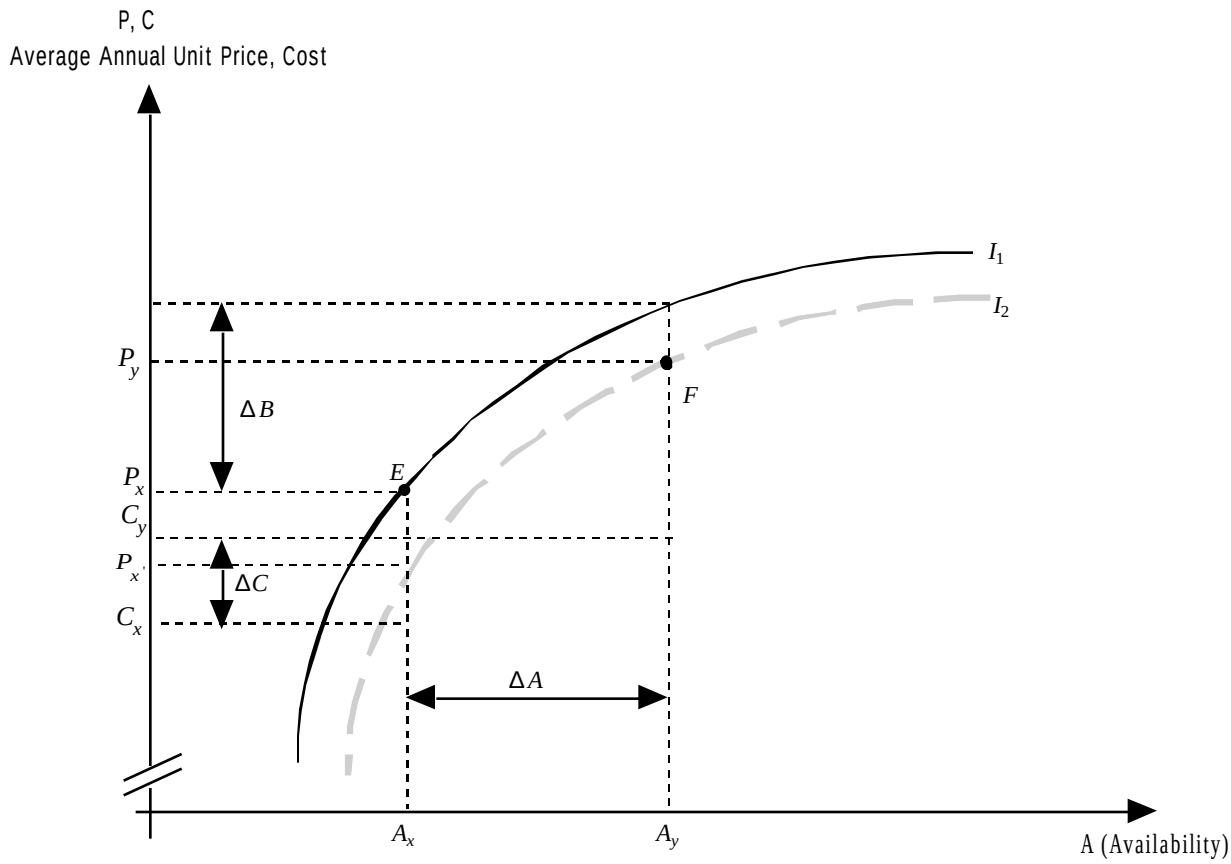

Figure 1: The Economic Logic of Availability Advantage

value to the retailer than Firm X. By setting its price at P_Y rather than on the retailer's indifference curve, Firm Y shares some of the additional consumer surplus with the retailer and is more likely to draw business away from Firm X. At P_Y, Firm Y moves to a higher level of retailer utility represented by indifference curve I_2. Even if Firm X cuts its price to $P_{X'}$ to restore consumer surplus parity with Firm Y, Firm Y still earns a higher profit margin.

Both firms make a profit. However, as the tradeoff between price and availability of fresh produce evolves, the competitive relationship between firms like X and Y will change as well. Grower-shippers will compete within the price-cost-availability space. Some firms will integrate temporally while others will compete as seasonal low cost grower-shippers. We hypothesize that grower-shippers of fresh produce are organized uniformly along this availability continuum with a positive correlation between firm size and higher levels of availability.

Data and Data Analysis

Sample

A two-phase research design was employed in this organizational research to exploit the unique strengths of qualitative and quantitative methods (Lee). Personal interviews following a well-designed protocol produced a rich understanding of the structure and strategy of firms. Quantitative methods (e.g. cluster analysis) applied to the data obtained during and after the interviews provided deeper empirical knowledge of the organizations. The two-phase approach produces a more complete understanding of the research question than reliance on only a qualitative or quantitative approach.

Grower-shippers of fresh produce were selected as the target for this research effort. Grower-shippers are businesses actively involved in the growing, harvesting, processing, packing, warehousing, and selling of their perishable products. Involvement ranges from financing the product under contract while personally concentrating on the packing, warehousing, and selling functions to sole control of all activities from land preparation to loading trucks with sold merchandise.

Two criteria dominated the selection of the non-random sample of grower-shippers: variability and size. Grower-shippers of lettuces, tomatoes, and melons represent a continuum of industrialization in agriculture with lettuce characterized by relatively large, customer-oriented agribusiness firms selling in national markets year-around to diversified melon grower-shippers evaluating their commitment to melon production on a year to year basis. Grower-shipper size, names, addresses, and telephone numbers were obtained from industry sources (e.g. Red Book, Blue Book), individual researcher contacts, and federal and state agricultural reporting agencies. The following number of firms were included in the sample:

Product	Location	Number
Lettuce	Salinas and Imperial County, CA; Yuma, AZ	21
Tomatoes	San Joaquin Valley, CA; Florida; Sinaloa, MX	39
Melons	Fresno and Imperial Counties; Arizona	26.

A conscious effort was made to interview the ten largest grower-shippers in each category and region with smaller producers included to serve as a source of comparison and validation. This sample of 83 grower-shippers was interviewed in 1995-96. At that time the interviewed firms represented approximately 80% of the lettuce and 75% of the

tomatoes shipped commercially in the U.S. and 60% of the melons shipped in Fresno and Imperial Counties in California and Maricopa County in Arizona.

Interviews

Only one of the eighty-three firms is publicly traded; the remaining firms are closely-held, family-controlled operations. Two, two-person teams interviewed the owner/operators, CEOs, and/or marketing directors of each firm. A set of instructions for interviewers was reviewed periodically by each team member. Interviews were conducted in English or Spanish. The research team understood *a priori* that the intensely competitive nature of these markets would constrain the teams' ability to elicit accurate cost, revenue and financial data from the respondents. Proprietary data is so closely guarded by these firms that assurances to protect the identity of data sources "fell on deaf ears." Therefore, the interviews focused on the organization of production and marketing activities as well as future strategies.

The identical questioning protocol was utilized for each semi-structured interview. A protocol is an outline of topics to be covered, providing the 2-person interview team the necessary flexibility to let the interview evolve while keeping note of the areas covered and not yet covered. The protocol outline featured four major divisions: factor conditions, demand conditions, related and supporting services, and firm position. Within this framework the interview teams gained an understanding of firm history, asset specificity, retailer-buyer relationships, market channels, the degree of product, vertical and geographic diversification, contracting, and firm organization. Interviews lasted from one to five hours. At the end of the interview a complementary data form was handed to the interviewee with request that they provide the information

requested and fax the form to the interview team. Ideally each team returned to their hotel room after each interview to record independently the results of their interview before their next interview. Generally a maximum of two interviews per day were conducted following this procedure. Interview results were reconciled by the research team. Sixty-nine firms represent the data set for this analysis.

Cluster Analysis

Cluster analysis was employed to identify the underlying organizational structure, if any, of the fresh produce industry at the grower-shipper level (Lorr). The K-means algorithm identifies similarities in the data and then differentiates observational units (i.e. grower-shipper firms) into subgroups. The role of product availability in differentiating firms is given special attention in this preliminary analysis.

The K-means algorithm does not optimize a performance measure to yield an optimal number of clusters. Rather indexes (e.g. ratio of the within sum of squares for the clusters) are compared and qualitative judgements are important (Romesburg; Berhardt, Allen and Helmers). Five clusters were chosen at this stage to group grower-shipper firms with similar characteristic while differentiating them in a reasonable way from other firms.

Six firm characteristic variables were used in this preliminary analysis. The degree of geographic diversification (*Gdiv*) measures the number of distinct microclimates used by the firm. *Pdiv*, a measure of product diversification, is the number of crops grown and shipped by the firm. All the growers in the sample were diversified growers. Availability (*Avail*) is measured by the number of months of the year that the firm is shipping lettuces, tomatoes, or melons to the market. *Ddiv* measures the number

of major distribution channels (e.g. broker, distributor, wholesaler, etc.) through which the grower-shipper moves product. *Cspec* reports the percentage of the land base devoted to the crop being studied (lettuces, tomatoes, or melons). The final variable is the number of contracts (*Cont*) the grower-shipper has with other growers to source product during the year.

Results

Grower-Shipper Clusters

Cluster 1 (16 firms) is made up of relatively highly diversified grower-shippers of melons and tomatoes in California (60%) with the remaining firms in Florida and Mexico. The businesses produce or source product in relatively few microclimates. A similarity across these firms is the moderate availability (< 8 months) of their products. Although most major distribution channels are employed by these grower-shippers, intermediaries like brokers receive the majority of their shipments. The high level of crop diversification implies that less than 50% of their land base is devoted to melons or tomatoes.

Only eight firms compose Cluster 2. Most (70%) of these businesses are Mexican tomato producers while the remaining firms are California lettuce grower-shippers and Florida tomato producers. This cluster of firms is characterized distinctively by a low level of product diversification relative to the other clusters. Four of the nine firms market their products 12 months of the year while all the other grower-shippers are in the market six months or less. All channels of distribution are used but this cluster concentrates more on working directly with retailers.

Cluster 3 contains 20 predominately melon and tomato grower-shippers. On average these firms diversify across a moderate (3-6) number of products. One-third of

these firms market their melons or tomatoes year-around. They accomplish this by producing in a limited number of very distinct microclimates (California and Florida or Fresno County and Imperial County). The remaining firms produce locally (e.g. San Joaquin Valley) in several locations enabling them to market product five to six months of the year. These grower-shippers concentrate their marketing functions on retail food chains. The distinctive characteristic of these firms is their reliance on their own land base for production. Little external sourcing of product is utilized.

The smallest cluster is Cluster 4 (7 firms). This grouping is divided between melon and tomato firms. Four of these businesses produce melons in California while the tomato firms are located in California and Mexico. These businesses are moderately diversified firms producing their products on a seasonal basis. None of these firms market their products year-around. Another distinguishing characteristic of this cluster is the uniformity of market channel usage. No single sales channel receives more emphasis than another. Finally, the firms in this cluster predominately farm their own land, contracting with other growers on a limited basis.

Clusters 1,2 and 4 create a diverse picture of successful melon and tomato firms in four regions in the U.S. and Mexico. Very few firms are specialized in the production of only one crop. Most of these grower-shippers regularly produce 3-10 crops. Some chose to diversify across widely dispersed microclimates while others concentrate on intra-seasonal diversification. Those that continuously grow their product supply their customers 12 months out of the year while other grower-shippers are content to meet the needs of their clients 4-6 months of the year. One cluster of firms may focus selling directly to retailers while others market to a wide range of buyers, giving more emphasis

to growing than to marketing. Finally, some grower-shippers of melons and tomatoes follow the self-sufficient model of business organization where they produce most of their products on business-owned land while other firms diversify their product sources by using other local growers.

Cluster 5 is the "lettuce" cluster. Twelve of the eighteen firms are grower-shippers of lettuce. This cluster represents a consistently high level of diversification in all the variables. It is not unusual for these firms to have 12 or more distinct crops under production at any one time. At least three or four very distinct microclimates (e.g. Salinas, Huron, Brawley, CA; Yuma, AZ) are utilized to source product year-around. Crops are produced on firm-owned land while a large number of contracts and alliances also are used to source lettuce. This cluster of grower-shippers sells product to every type of buyers in the distribution channel with some emphasis given to direct selling to retailers.

Product Availability

Our conceptual model produces the expectation that a wide range of product availability would be found in successful fresh produce firms. Some firms would strive to be low-cost producers, delivering their products during a limited or seasonal time during the year. Other grower-shippers would use microclimates to extend their growing and shipping seasons to exploit buyers' desire for a few year-around suppliers. The data in Figure 2 validates the hypothesized diversity of firms across availability and size. These melon, tomato and lettuce firms differ for many reasons: the nature of the product produced, decisions to grow larger or not, the technological environment surrounding the product, decisions made to integrate over time or not, and the history of the firm.

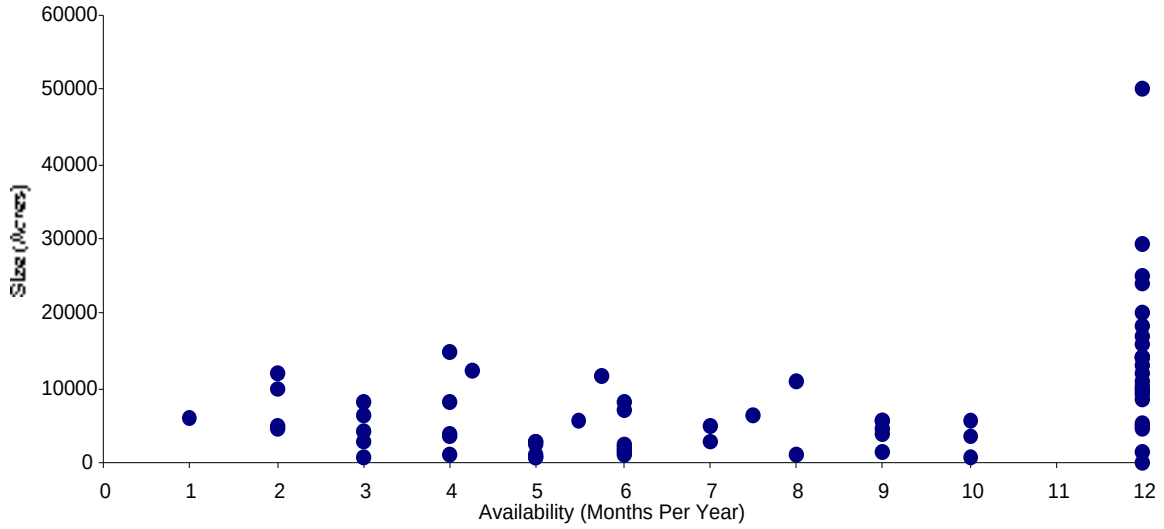

Figure 2: Product Availability by Grower-Shipper Size

The decision to integrate over time is evident in Figure 2. Forty percent of all firms grow and ship fresh products 12 months of the year. Lettuce grower-shippers dominate this group with 86% of the surveyed firms shipping all year. A majority (51%) of all firms grows and ships at least nine months of the year. This non-traditional, extended season strategy is made possible through the use of microclimates, alliances, and contracts.

So What?

Successful agribusiness firms do not always follow a single competitive model. A variety of strategic paths are followed within the history and management culture of the firm. No single or representative organizational structure characterizes the fresh produce industry. Secondly, our interviews indicated that there is a trend towards year-around commercialization given the changing utility functions of retailers. Time integration is on the minds of many decision makers in these surveyed firms. Some grower-shippers presently in the market 5-7 months of the year are planning to enlarge their market

window further to 8 or 9 months in the near future and possibly to 12 months in three to five years. The traditional seasonal model of production of fresh produce fails to capture the reality in this industry.

With the above said, it is clear that modern technologies (e.g. seed, harvesting, packing, packaging, cooling, and marketing) combined with increasing consolidation in the buying sector produce a degree of competitive homogeneity in the grower-shipper sector. The cluster analysis clearly indicates that all the dominant lettuce grower-shippers have converged to a year-around model. Rather than competing on availability, they compete on price, quality, responsiveness, and customer satisfaction. Our data indicates that the fresh tomato industry is trending gradually towards the "lettuce" model. We predict that the tomato group will reflect this competitive year-around framework in five years, particularly with the continued growth of greenhouse tomatoes. Melon growing and shipping will lag given the consumer's seasonal (i.e. hot weather product) buying habits towards this product. However, the year-around model in melons is being explored and exploited by a small group of entreprenuerial U.S. grower-shippers using Central American and Mexican microclimates.

Finally, the diversity of firms and varying degrees of time integration are critical facts in agricultural and trade policy formulation. Policies designed for representative firms can create unintended economic welfare consequences for the businesses that do not conform to our traditional understanding. For example, the longstanding trade dispute between Florida tomato producers and their counterparts in Sinaloa, Mexico often has not recognized the importance of time integration (Thompson and Wilson 1997). The dominant Florida grower-shippers ship tomatoes 9-12 months of the year by producing

tomatoes along the East Coast or Florida. The economic success of their business is not solely dependent on their winter market window. Likewise, Mexican grower-shippers are extending their season by using microclimates and rustic greenhouses throughout Western Mexico and Baja California. The largest Mexican grower-shippers are rapidly approaching full time integration.

References

Berhardt, K.J., J.C. Allen and G.A. Helmers. "Using Cluster Analysis to Classify Farms for Conventional/Alternative Systems Research." *Review of Agricultural Economics* 18(1996): 569-611.

Besanko, D., D. Dranove and M. Shanley. *The Economics of Strategy*. New York: John Wiley & Sons, Inc., 1996.

Calvin, L. and R. Cook (Coordinators). *U.S. Fresh Fruit and Vegetable Marketing: Emerging Trade Practices, Trends, and Issues*. Agricultural Economic Report No. 795, Washington, D.C.: USDA/ERS, 2001.

Cairncross, F. *The Death of Distance: How the Communications Revolution Will Change Our Lives*. Boston, Massachusetts: Harvard Business School Press, 1997.

Carroll, G.R. "A Sociological View on Why Firms Differ" In *Fundamental Issues in Strategy: A Research Agenda*, eds. R.P. Rumelt, D.E. Schendel and D.J. Teece, pp. 271-290, Boston, Massachusetts: Harvard Business School Press, 1994.

Chandler Jr., A.D. *Strategy and Structure*. Cambridge, Massachusetts: The MIT Press, 1962.

Coase, R.H. "The Nature of the Firm." *Economica* 4(1937):33-55.

_____. "The Nature of the Firm: Influence" *Journal of Law, Economics, and Organization* 4(1988): 33-47.

Kaufman, P.R., C.R. Handy, E.W. McLaughlin, K. Park, and G.M. Green. *Understanding the Dynamics of Produce Markets: Consumption and Consolidation Grow*. Agriculture Information Bulletin No. 758, Washington, D.C.: USDA/ERS, 2000.

Krugman, P. *Geography and Trade*. Cambridge, Massachusetts: The MIT Press, 1991.

Lee, T.W. *Using Qualitative Methods in Organizational Research*. Thousand Oaks, California: Sage Publications, 1999.

Lorr, M. *Cluster Analysis for Social Scientists*. San Francisco: Jossey-Bass, 1983.

Nelson, R.R. "Why Do Firms Differ, and How Does It Matter?" In *Fundamental Issues in Strategy: A Research Agenda*, eds. R.P. Rumelt, D.E. Schendel and D.J. Teece, pp. 247-269, Boston, Massachusetts: Harvard Business School Press, 1994.

Romesburg, H.C. *Cluster Analysis for Researchers*. Belmont, California; Lifetime Learning Publications, 1984.

Sexton, R.J. “Industrialization and Consolidation in the U.S. Food Sector: Implications for Competition and Welfare.” *American Journal of Agricultural Economics* 82,5(2000):1087-1104.

Thompson, G.D. and P.N. Wilson. “The Organizational Structure of the North American Fresh Tomato Market: Implications for Seasonal Trade Disputes.” *Agribusiness: An International Journal* (September/October 1997):533-547.

_____. “Explaining Seasonal Consumption of Bagged Refrigerated Salads.” *Journal of Agricultural and Resource Economics* 24(1999): 463-481.

Williams, J.R. “Strategy and the Search for Rents: The Evolution of Diversity Among Firms” In *Fundamental Issues in Strategy: A Research Agenda*, eds. R.P. Rumelt, D.E. Schendel and D.J. Teece, pp. 229-246, Boston, Massachusetts: Harvard Business School Press, 1994.

Williamson, O.E. *The Economic Institutions of Capitalism*. New York: The Free Press, 1985.

Wilson, P.N., G.D. Thompson, and R.L. Cook. “Mother Nature, Business Strategy, and Fresh Produce.” *Choices* First Quarter (1997):18-21,24-25.