

The Organizational Structure of the North American Fresh Tomato Market:  
Implications for Seasonal Trade Disputes

by

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## 1. Introduction

Competitive trade creates expanded choices for consumers and new economic challenges for firms. In traditionally seasonal agricultural markets such as fresh produce, liberalized trade generates increased competition by narrowing seasonality niches and offering a greater range of choice throughout the year to produce buyers. Successful firms in all producing countries and regions adapt to these globalization pressures by adopting strategies to reduce costs, differentiate products, and target distinct market segments.

The historical trade dispute between the tomato industries in Florida and Northwest Mexico is rooted in U.S. trade disruption with Cuba nearly three and a half decades ago. With Cuba eliminated as a supplier to the winter market, the fresh tomato industries of south (e.g. Dade County) and central (e.g. Immokalee, Palmetto-Ruskin) Florida and Sinaloa (e.g. Culiacán, Los Mochis), Mexico developed rapidly in acreage and technological sophistication. Both regions built seasonal market shares on the strength of favorable winter growing conditions. Over the next two decades neither region extended its season to compete during the summer months with low-cost California or backyard garden tomatoes.

The relative competitive position of firms in each region has been understood historically by looking at relative climatic factors, per unit production costs, proximity to consumers, and exchange rates. Although weather created a competitive position for Florida and Northwest Mexico growers, the growing seasons in both regions experience periodic climatic shocks: freezes and hurricanes in Florida and tropical storms in Mexico. These events create favorable prices for one region or the other; rarely have poor growing or harvesting conditions occurred simultaneously in both regions. Growing and harvesting costs have tended to favor Mexico due to an adequate supply of low-cost labor. Transportation costs to major U.S. markets have favored the Florida industry. An over-valued peso has created Mexican markets for U.S. growers while a devalued peso provided export incentives for Mexican growers.

Seasonal fresh tomato trade disputes are a natural outcome of these competitive forces. Yet the Florida industry historically has viewed competitive pressures from Mexico as “unfair” (Mares 1987). Section 8(e), an amendment to the 1937 Agricultural Marketing Agreement Act, was passed in 1954 to create a “level playing field” for domestic and foreign growers of fresh produce. Grade, size, quality, and maturity rules were to apply on all tomatoes and other perishable commodities. In the 1968-69 season, however, greater size restrictions were enforced on vine-ripe tomatoes (largely Mexican imports) relative to mature green tomatoes produced in Florida, thereby restricting Mexican supply and raising Florida prices. The dual restrictions were in force for three seasons, eventually being removed by a court order in 1975. The next year, Florida producers initiated political pressure to alter packing requirements of imported fresh tomatoes, to limit imports of fresh tomatoes, to require country of origin identification at the retail level, and to implement trigger price mechanisms on imports to stabilize and support domestic prices. Failing in these largely legislative efforts, the Florida industry pursued legal means in 1978 by filing a petition with the Treasury Department which alleged dumping on the part of the Mexican industry. This tomato “war” continued until 1985 with all legal rulings decided in favor of the Mexican growers. Recent Florida-initiated charges of dumping, requests for the imposition of tariff rate quotas under NAFTA, and appeals for domestic industry protection represent a renewed effort to secure a competitive advantage.

This paper initially redirects the focus of this seasonal trade dispute from the market to the firm level. Firm-level data and analysis identifies selected organizational approaches adopted by grower-shipper firms (Florida, Northwest Mexico, California) which provide competitive advantages to the firm in a globalizing and industrializing North American fresh tomato market. With this firm-level understanding of the industry, we interpret complementary secondary data on shipments and prices in light of the current seasonal trade dispute between Florida and Northwest Mexico. Finally, we discuss five important lessons learned from this analysis which are useful for understanding seasonal trade disputes in a global agribusiness economy.

## **2. Tomato Industry Organization: Selected Firm-Level Characteristics**

The perception that the majority of agricultural commodities are produced on thousands of farms throughout the U.S. is a myth, or at least it is for fresh tomato production. Fewer than a thousand farms dominate fresh tomato production in North America and fewer than 50 shippers control the first marketing stage as tomatoes move into the wholesale, retail, and food service sectors. Often these shippers are also growers. Inter-firm rivalry is a daily reality with firm-level strategies and the resulting industry structure resembling oligopolistic markets more closely than perfectly competitive ones.

The unit of analysis for primary data collection in this study is the grower-shipper of fresh tomatoes based in California, Florida or Northwest Mexico (i.e. Culiacán, Sinaloa). Grower-shippers organize and manage the financing, growing, picking, packing, selling, warehousing, and truck loading of fresh tomatoes. Specialized farmers, brokers, and distributors do not fall within the bounds of this definition. Grower-shippers “source” and market fresh tomatoes to a portfolio of customers including food brokers, wholesalers, retailers, and food service providers.

*The Red Book*, *The Blue Book*, and annotated lists from three fresh tomato organizations (i.e. California Tomato Board, Florida Tomato Commission, CAADES) produced the “population” of grower-shippers. A stratified, random sample of firms was attempted for all three regions. Because larger grower-shippers were weighted more heavily in the sampling procedure, the completed interviews largely represent results from interviewing medium- and large-volume grower-shippers. One or two key executives were interviewed in each operation. These 38 businesses represent approximately 70% of the fresh tomato production in California, Florida, and Sinaloa, Mexico in 1994 (see Table 1).

Our interview process varied considerably from earlier cost of production/representative firm studies of the North American fresh tomato industry (Firch and Young; Fliginger et al. 1968, 1969; Simmons et al.; Zepp and Simmons 1979, 1980; Bredahl et. al. 1987; VanSickle, et. al. 1994). A two-person interview team structured its questions around a protocol which dealt with firm history, retailer/buyer relationships, geographic orientation of markets, new product development, sourcing, asset specificity, technology, labor, land, water, capital, trucking, and future firm-level developments. Cost of production data was not requested in the interview process although some executives volunteered this information to the interview team.

Firm-level heterogeneity characterizes the structure of the North American fresh tomato industry. Each grower-shipper has a unique entrepreneurial history. Various California- and Florida-based firms integrated backward into growing from wholesale marketing operations on the east coast of the U.S.. Some operations integrated forward from

growing operations into sales and repacking. Nearly all the sampled firms, both U.S. and Mexico, have their family roots in ethnic minorities. Most operations are closely held, family corporations with diverse and elaborate organizational structures. Only a few grower-shippers receive financial support from *Fortune 500* agribusiness companies. Each firm is unique in the location, quality, and quantity of the land farmed, in how it organizes its employees, in the products it produces, and in its market strategies.

One key factor in understanding the North American fresh tomato industry is the recognition that many firms have evolved or are evolving into multi-season suppliers (Figure 1). Ten of the 31 firms responding to our request for shipping information ship fresh tomatoes for at least 8 months of the year. Seven grower-shippers from California (3), Florida (2), and Mexico (2) pursue a year-round strategy shipping 11 or 12 months of the year with production located in widely dispersed geographic regions. The dynamic nature of extending shipping seasons is evidenced by a Florida-based firm which previously shipped during a six month season but with the recent acquisition of a California operation is now a year-round grower-shipper. The remaining grower-shippers extend their seasons by producing in a variety of micro-climates within a broad geographic area (e.g. various sequenced sites in the San Joaquin and Imperial Valleys in California).

Sourcing tomatoes over an extended period of time requires widespread land ownership or contracting arrangements with a diverse set of landowners and farmers. Grower-shippers based in California predominate in the group of firms which farm on less than 40 percent of their own land. California's agricultural sector enjoys many progressive farmers who contract with grower-shippers to produce fresh tomatoes leaving grower-shippers with more energy to focus on picking, packing, and sales. In striking contrast, grower-shippers headquartered in Florida and Mexico rely more heavily on owned land assets. These production areas are apparently not as "deep" in talented farmers and landowners so grower-shippers must take more responsibility for controlling the land assets directly through ownership.

From the perspective of sourcing arrangements, the grower-shippers interviewed can be classified into five groups (see Figure 1). The first group, "market specialists", owns limited fixed resources such as land, relying on superior relationship management and marketing skills to deliver a quality product to the market 4-12 months of the year. California firms dominate this group. Mexican firms predominate in the second group termed "transitional firms" in which 50 percent of their tomatoes are sourced on leased land and they ship for 5 to 6 months during the year. These firms depend on climatic advantage and lower per unit production costs to remain competitive. Transitional firms struggle with their position in the market due to their dependence on land contracting and a relatively short shipping season. Two Florida companies and one California firm have used their land base and contracting expertise to extend their shipping period beyond this transition category to "contractual year-round firms". The fourth industry group are "seasonal grower-shippers" whose competitive strength is derived from an owned land base which permits them to pursue low-cost production strategies during a well-defined season. Firms in all three regions fall into this category. Finally, four "landed regional firms" rely on their relatively large land base to source tomatoes 9 to 12 months of the year. Their land base provides a level of assurance and continuity that other growers may or may not enjoy. The transaction costs associated with sourcing tomatoes for these firms are relatively lower than similar costs for other multi-

season grower-shippers which must contract for more production.

With this brief description of the heterogeneity of grower-shippers in the North American fresh tomato industry, we now turn to an analysis of secondary shipment and price data to discern market-level changes in the industry. The understanding gained from primary data collection allows us to postulate several hypotheses and offer a few explanations regarding industry changes which might not otherwise be apparent to the policy analyst relying on secondary data.

### **3. Trends in Fresh Tomato Shipments**

#### *3.1 Winter and Spring Seasons*

Shipments of fresh tomatoes from Florida and Mexico vary seasonally as specific climatic conditions within sub-regions of each region vary. The winter and spring seasons pit Florida production from four main regions--Homestead, Ft. Pierce-Pompano, Immokalee, and Palmetto-Ruskin--against Mexican-grown tomatoes from two major regions--Culiacán and Los Mochis. Shipments from the entire regions have tended to complement one another with Mexican imports peaking from January through mid-March while Florida shipments reach a trough in late January and early February when Palmetto/Ruskin, the northernmost of Florida region, nearly ceases shipping (see Figure 2). Thus Mexican-grown tomatoes from the Culiacán area compete most directly from mid-January through mid-March with the Homestead, Ft. Pierce-Pompano, and Immokalee areas which averaged shipments of 370,000, 275,000, and 660,000 cartons, respectively.

Beginning in late April, Palmetto-Ruskin's weekly production usually quadruples from 0.5 million to over 2.0 million cartons in three weeks time. Until the 1994/95 season, Mexican imports tended to taper by mid-April in the face of these huge jumps in production from Palmetto-Ruskin. However, after the devaluation of December 1994, Mexican imports surged to 1.8 million cartons/week in mid-April of 1995 after already having peaked in excess of 2.5 million cartons/week in mid-March. The 1995/96 season brought even more pronounced surges in imports from Mexico in mid-February (2.7 million cartons) and mid-March (2.8 million cartons) with the latest surge ever recorded on the week ending April 18, 1996 with 2.4 million cartons. The timing of these surges has affected firms producing in all four regions of Florida but those in Palmetto-Ruskin have been particularly affected by the "late" import surges from Mexico.

#### *3.2 Summer and Fall Seasons*

Many firms produce in multiple regions throughout the year to extend their shipping seasons. Some firms which traditionally shipped in the winter from Florida, now extend their seasons by producing in northern Florida and Georgia (Quincy), South Carolina, North Carolina, Virginia, Maryland, and even Pennsylvania. These are the Florida firms in the Contractual and Landed Year-Round categories in Figure 1. These production regions on the East coast tend to supply consumers east of the Mississippi River. Harvest seasons in each of these areas are relatively short, sometimes no longer than three or four weeks, and volumes shipped are relatively small, often less than 1.0 million cartons per week (see Figure 3).

A smaller subset of tomato grower-shippers produce on the East coast and in California during the summer months. Early production from the Imperial Valley provides a bridge from Sinaloa to Baja California production for West coast markets in May and June (see Figure 3). Shipments from the Imperial Valley seldom exceed 0.5 million cartons per

week but prices may be quite attractive. Central California grower shippers typically begin producing further south in the San Joaquin Valley (Huron, CA) and progress north to the Tracy-Stockton area where weekly shipments peak at 3.0 million cartons. A few grower-shippers produce in the southern end of the Salinas Valley during the summer and fall seasons.

Grower-shippers in Southern California (San Diego County) typically begin producing at the beginning of June and ship through the end of the calendar year with almost constant volumes due to the moderating influences of the Pacific Ocean. Moderate temperatures and small diurnal-nocturnal swings in temperature allow San Diego County producers to ship very large, high color tomatoes. Some San Diego County shippers have invested in Baja California operations which ship during the same season as southern Californian growers. Baja California shipments average around 225,000 cartons weekly from June through November before the 1994 devaluation. Since that time, shipments from Baja California have also surged to record levels: June-November average weekly shipments in 1993 and 1994 were approximately 250,000 cartons while weekly averages in 1995 were 550,000 cartons and through mid-August of 1996 weekly shipments average 615,000 cartons.

As noted in Section 2 on the organization of the fresh tomato industry, sourcing fresh tomatoes for the North American market clearly requires production in geographically distant areas throughout the year. The seasonal shipment patterns just described suggest that there are multiple ways in which to source fresh tomatoes year-round. In fact, the extended-season and year-round grower shippers interviewed rely on a multitude of sequences in order to ship tomatoes during the year. Shipment data by themselves, however, provide no hint of the arrangements and sequences followed by individual grower-shippers in achieving year-round shipping. Without access to firm-level information, the economic organization of much of the fresh tomato market would remain hidden in regional shipment figures.

#### **4. Trends in F.O.B. Prices**

Another type of secondary data commonly employed to analyze the fresh tomato industry are f.o.b. price series. The primary data described in Section 2 allow us to interpret recent trends in f.o.b. prices which might otherwise remain unclear.

When comparing f.o.b. prices for tomatoes grown in Florida and Mexico, the relative mix of mature greens and vine ripers produced in each region should be considered. Florida specializes in mature green tomatoes; during the three seasons from 1992/93 to 1994/95, just over 15% of shipments were vine ripers with the remainder mature greens (Florida Tomato Committee). In Sinaloa, by contrast, mature greens accounted for only 17% of tomatoes exported by volume during the same period (CAADES).<sup>1</sup> Prices for each type of tomato, therefore, correspond to small quantities supplied from one region with large quantities from the other. Firms producing large quantities of mature greens in Florida might be able to act as price leaders in the mature green market while firms producing large quantities of vine ripers in Mexico might act similarly in the vine ripe market.

##### *4.1 Mature Green F.O.B. Prices*

In the early 1990's, Florida mature greens consistently averaged from \$3.00 to \$4.00

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<sup>1</sup> Vine ripers accounted for another 53 percent of exports with romas and cherries accounting for the remaining 25 and 5 percent of exports, respectively.

per 25 lb. carton more than mature greens f.o.b. Nogales. By the 1993/94 season, however, Mexican-grown mature greens average over \$1.16/25 lb. carton higher (see Table 2). The following year, despite the now famous surges in fresh tomato shipments from Mexico after the December 1994 devaluation, mature green prices f.o.b. Nogales averaged \$1.38/25 lb. carton more than mature greens grown in Florida. The apparent trend towards relatively higher f.o.b. prices over time for Mexican-grown mature greens is significant because for at least three seasons prior to 1993, Florida-grown mature greens garnered sizable premia relative to their Mexican counterparts.

Tests for differences in these average prices were performed to verify if the differences were statistically significant. During the 1993/94 season, average prices were not statistically significantly different. From a statistical standpoint, market forces generated f.o.b. prices in each region which on average could not be differentiated from each other. One season later, however, despite the surges in exports from Sinaloa, average f.o.b. prices for mature greens differed statistically at an 8 percent confidence level. In fact, Mexican-grown mature greens posted average prices higher than those of Florida-grown in all but two weeks of the 1994/95. Thus Mexican-grown mature greens improved from a position of f.o.b. price discounts relative to Florida-grown mature greens in 1993 to a position of price premia by 1995.

#### *4.2 Vine Ripe F.O.B. Prices*

In the 1992/93 season, vine ripe tomatoes from each region averaged virtually identical f.o.b. prices: \$6.89 in Florida and \$7.05 in Mexico. But in the following two seasons, Mexican vine ripers consistently averaged higher f.o.b. prices, in excess of \$1.00/carton higher (Table 2) despite surges in shipments from Mexico. From a statistical standpoint, however, differences in average prices were not significant at a 10 percent confidence level.<sup>2</sup> Put differently, supply and demand forces generated distributions of f.o.b. prices in each region whose averages were indistinguishable during the last two seasons.

#### *4.3 Significance of F.O.B. Price Trends*

The relative increase in f.o.b. Nogales prices for both mature greens and vine ripers coincided with the introduction, adoption, and diffusion of extended shelf life (ESL) varieties in Sinaloa. Although the evidence is circumstantial, the relative increase in f.o.b. prices for Mexican-grown tomatoes suggests that buyers were willing to pay more for ESL's because of their preferred characteristics. Sustaining these relative price increases in the face of surges in shipments from Mexico is even stronger circumstantial evidence that ESL's possessed characteristics that buyers sought.

The shift in relative f.o.b. prices suggests that ESL's are a differentiated product with desirable characteristics at the f.o.b. market level. Two other market factors could have contributed to the changes in f.o.b. prices: (i) changes in transport costs from Nogales to U.S. and Canadian destinations; and (ii) improved marketing services on the part of distributors in Nogales. Neither of these factors appears to have changed appreciably during the last five years, however, which leaves the adoption of ESL's as the principal reason why f.o.b. prices of Mexican tomatoes increased relative to Florida prices.

### **5. Trends in Retail Prices**

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<sup>2</sup> P-values for one-tailed t-tests are smaller for the last two seasons than the p-value for the 1992/93 season. This result tends to suggest that f.o.b. price differences were approaching statistical significance at customary confidence levels during the last two seasons.

Average retail prices for fresh tomatoes are compiled on a monthly basis for four regions--Northeast, South, North Central, and West--in the United States. Comparison of these monthly prices across regions from November through May of each season allows a rough gauge of competitive behavior at retail between tomatoes shipped from Florida and Mexico. The majority of the fresh tomatoes sold at retail in the South and the Northeast are grown in Florida because of the proximity of major metropolitan areas in these two regions to shipping points in Florida. Hence, retail price differences between the South and the Northeast should give an approximate measure of transport and marketing costs between the two regions. Florida- and Mexican-grown tomatoes often share the market in most of the metropolitan areas in the North Central region while retail sales in the West are dominated by Mexican-grown tomatoes. Differences in retail prices between the North Central region and the South and West should give an estimate of the transport and marketing costs between these regions.

Average retail prices before the adoption of ESL's by growers in Mexico (1989-90 through 1991/92 seasons) and after (1993-94 through 1995/96 seasons) were calculated in order to investigate the effects on retail price differences across regions (see Table 3). Retail prices have tended to increase more in the South and the Northeast during the 1990's while prices in the North Central region have remained unchanged over the same period; nominal prices in the West climbed less than 3 percent. More importantly, the difference in retail prices across regions increased only between the South and Northeast by about 6¢ per pound. The competitive position of Mexican-grown tomatoes in the North Central region seems to be supported by a sizable reduction in retail prices between both the South (8.5¢/lb.) and the West (3.1¢/lb.). These reductions in the differences between retail prices suggest that consumers in the North Central and West regions have benefited in relative terms from increased competition between Florida- and Mexican-grown tomatoes. If ESL's provide more of the characteristics consumers there prefer, consumers in these regions not only enjoyed relatively lower real prices but improved product quality as well.

## **6. Implications for Trade Disputes**

### *6.1 Who Produces Tomatoes?*

The fundamental lesson drawn from foregoing analysis of primary and secondary data is that *firms* not states, regions, or countries produce tomatoes and firms compete with one another *within* and *across* political boundaries. While this observation is almost self-evident, much of the controversy surrounding competition between Florida and Mexico is couched in terms of regional competition when it is firms, regardless of their geographic locations, that compete with one another for many of the same customers. Understanding that firms grow and ship tomatoes raises various important implications for trade disputes, particularly in a dynamic industry in which firms themselves are changing rapidly and adopting new strategies to survive and prosper.

### *6.2 The Prominence of Grower-Shippers*

A number of market forces have worked jointly to lead to increased concentration among grower-shippers of tomatoes. The result of this concentration is that there are many fewer independent growers or farmers than even a decade ago. Dade County is good example of this phenomenon: during the 1995-96 season there was only a single packing shed left which packed tomatoes for independent growers. The rest of the sheds in south Dade are owned or managed by grower-shippers with some level of vertical integration between

growing, packing, and sales operations. Independent growers not affiliated with a grower-shipper appear to be a dying breed. Local growers who no longer have their tomatoes packed by an independent shed may still play a very crucial role in the production plans of vertically integrated grower-shippers if they have access to prime land and possess the growing skills prized by such firms. Concentration among grower-shippers has supplanted transactions organized through the market between independent growers and packers with coordination and contracting of the same transactions within the confines of the grower-shipper firm.

The legal and financial organization of the various entities housed under the auspices of a single grower-shipper is often complex and difficult to discern. Yet a select few decision makers within the grower-shipper operation make the key farming decisions about what will be grown, where it will be grown as well as how and when it will be grown. And many of the farming decisions are increasingly determined by marketing and sales decisions made within the operation.

One implication of the complex legal and financial organization of grower-shippers is that costs are incurred and profits are generated within various entities under the umbrella of the overall operation. Some large grower-shippers, for example, have separate business entities which lease land, develop and install drip irrigation systems, manage greenhouses for transplants, oversee harvest crews, and operate packing sheds, gassing rooms, and even repacking operations in major metropolitan areas. Any of these enterprises may make a profit even when tomato prices are low and growing operations are just breaking even. Allocating these costs and profits from distinct legal and accounting entities to a single overall entity, as is often done in analyses of Florida-Mexico competition (e.g. VanSickle et al.), requires detailed accounting records and weeks of painstaking work.

### *6.3 Extended and Year-Round Shipping Seasons*

Many grower-shippers have consciously decided to extend their shipping seasons in order to maintain uninterrupted supplies for longer periods to their customers (Wilson et al.). These firms must obtain access to land sequentially across various geographic areas through direct ownership, leasing, contracts of varying risk-sharing positions with local growers, or joint ventures. Some firms use a mix of arrangements--leasing and joint ventures, for example--*within* the same producing region as well as across producing regions over time. As arrangements to access land vary within and across regions, so too do production methods and the degree of direct control over growing. Employees of the grower-shipper may directly oversee operations or designated growers may be responsible. As a result, direct costs of production for the same firm will vary both within a given production region as well as through time as producing regions change.

Varying production methods within and across regions imply not only differing direct costs of production but also differing costs of coordination, oversight, and contract establishment, monitoring and enforcement (hereafter “coordination and oversight” costs). The organizational requirements necessary to guarantee smooth, continuous operation of such a complex mix of production activities over time across long distances are rigorous and non-trivial. When production crosses national borders, the level of complexity in organization and cost further escalates as language, business culture, currency, and commercial laws and codes change. These increasing organizational costs of extending shipping seasons prompted a pessimistic California grower-shipper to comment, “The further you get away from home, the more money you lose.”

The coordination and oversight costs represent the *transaction* costs, as opposed to direct production costs, of doing business on a continuous basis throughout the year in various geographic regions domestically and possibly internationally. Direct costs of production might be relatively low as could be the case in Mexico if labor costs remain low. Yet coordination and oversight costs would be high for a Florida-based grower-shipper attempting to produce in Mexico for shipment to the West coast market of the United States and Canada. By contrast, in domestic growing areas, sophisticated growing methods and high labor costs lead to relatively high direct costs of production but closer proximity to grower-shipper headquarters can translate into relatively lower coordination and oversight costs. The important implication of these types of costs is that not just direct costs of growing contribute to decisions about when and where to produce. Coordination and oversight costs are very real organizational costs to grower-shippers but are often difficult to quantify precisely and allocate to particular products sold on a per unit basis. Nonetheless, analysis which purports to measure unit costs of production should at least investigate qualitatively the costs of coordination and oversight for firms which produce over extended seasons or on a year-round basis.

Another key message implicit in extended-season or year-round shipping firms is that the relevant period for making profits will transcend any single season in any particular production area. Just as grower-shippers make the daily decision to harvest when unit prices just exceed unit harvest costs and profits are negative, so too grower-shippers may make the decision to continue shipping at a loss within the season so long as they expect to make up the losses later in the year. Trade analysts focusing solely on production in a single region as the relevant “season” may conclude that the grower-shipper is operating at a loss when, in fact, on an annual basis profits for the firm are positive. Basing the deliberation of trade disputes on a single season within the year may yield biased estimates of the financial well-being of extended-season or year-round grower-shippers.

#### 6.4 *Heterogeneity of Firms*

The primary data in Section 2 reveal that no single firm is identical to another; to the contrary, heterogeneity among firms in the fresh tomato industry is the rule. Diversity in the length of shipping seasons, geographical production areas, production methods, organizational structure, and product mix all suggest that no single estimate of unit cost of production for “Mexican” or “Florida” tomatoes will adequately reflect the distribution of cost structures among firms. Using a single point estimate of costs is akin to assuming there exists a representative firm within the region whose technology and costs adequately summarize cost structures for most or all of the firms in the industry. The firm-level information summarized earlier in Figure 1 suggest that a single set of cost estimates simply will not reflect important differences in cost structures among heterogeneous firms. Without resorting to complicated sampling techniques for collecting cost of production data and estimating the probability distribution of costs, perhaps estimates of lower and upper bounds on costs in particular regions at a specific time might be more indicative of the range of actual costs incurred by vastly different firms operating concurrently in the same areas.

Heterogeneity in firms also suggests that prices received are not identical for all grower-shippers. Prices will vary not only as a function of how adept sales staff are but also depending on the firm’s reputation for consistency and the bundled goods and services it provides. The impact of firms’ reputations on prices received is virtually impossible to

measure but key decision makers in many firms emphasized the importance of maintaining a reputation for consistency so that prospective buyers know what quality to expect on delivery.

The effects of product diversification and differentiation on price likely vary across firms. Some firms grow and ship an entire array of vegetables--melons, peppers, cucumbers, squash, etc.--in addition to tomatoes, offering customers “one-stop” shopping. Even within the generic tomato category important product differentiation occurs by types of tomatoes: mature greens, vine ripens, extended shelf life, roma or plum tomatoes, cherry tomatoes, cluster tomatoes (tomatoes with the stems still attached), yellow tomatoes, greenhouse tomatoes, organic tomatoes and so on. Each type of tomato can further be distinguished by size, quality, label, and packaging. Nearly all grower-shippers segment prospective customers by offering two and sometimes three “labels” of produce: first label guarantees premier quality of a given type and size of tomato while second and third labels have more lax quality criteria for the same type and size. Each of these differentiated types of “tomatoes” is sold at a different price.

Services provided with product arrays vary substantially across firms. Arranging truck brokerage for customers can be an added service which brings a higher product price. Some firms specialize in offering additional services such as “consolidation” which means sales personnel will fill “mixed loads” of different types of produce some of which may actually be purchased from a competitor. A few firms have a stronger orientation towards their retail customers as evidenced by their willingness to affix price look up stickers to individual fruit, provide merchandising materials to retailers, distribute point-of-purchase promotional materials, and experiment with tie-in offers to other products such as bagged salads. These added services may result in different prices for firms offering them.

The crucial implication of a range of prices received is that profits will vary accordingly even if unit costs were identical across firms. But, in fact, unit costs vary simultaneously across firms. Hence, trade analysts would do well to recognize lower and upper bounds on prices received while taking into account the range of costs among firms.

Implicit in the observation of heterogeneity among firms is that firms compete on more than just a cost basis. While most firms attempt to be low-cost producers, many simultaneously adopt other strategies such as product differentiation and diversification. As indicated earlier, grower-shippers may differentiate tomatoes by their intrinsic characteristics (e.g. extended shelf life, vine ripe, variety, etc.), year-round availability, reputation for consistency, and bundled services. A diversified array of produce items may also provide prospective buyers with additional services such as mixed loads and consolidation while affording the grower-shipper the risk-reducing effects of having a portfolio of products. The implication of there being more than a single business strategy adopted by a grower-shipper to compete with other grower-shippers is that trade disputes should be judged on the basis of many competitive factors, of which costs of production are one important factor.

#### *6.5 Role of Data Collection*

Past studies of the competitiveness of Florida- and Mexican-grown tomatoes have considered costs and returns as the key indicators of competitiveness. Estimates of costs of production are typically calculated using crop production budgets prepared by land grant institutions and growers associations adjusted perhaps using supplemental data gleaned from a few personal interviews with willing industry participants. For calculation of revenues,

f.o.b. prices are assembled from Agricultural Marketing Service (AMS) sources and trade associations such as the Florida Tomato Committee.<sup>3</sup> As an additional measure of geographical competitiveness, delivered costs to selected metropolitan markets are estimated using average truck rates reported by AMS. All these secondary data provide useful measures of competitiveness at the *market* level but they tend to disguise the dynamism of individual *firms* which adopt significantly varying strategies to compete with one another *within* the same region as well as *across* regions during a given season.

Primary data collection at the firm level is risky, costly, and time consuming. The risk facing researchers is that key personnel in the firms will refuse to cooperate. Even if they consent to cooperate, they may refuse to answer certain questions or may purposefully mislead interviewers.<sup>4</sup> Added to these risks are the formidable costs of assembling reliable lists of grower-shippers, deciding on plausible sampling schemes, setting up interviews, traveling to interview sites, interviewing, and compiling interview results. The professional rewards to economists from collecting primary data are quite limited. Published research often emphasizes advances in theory and quantitative techniques for empirical applications; very few professional journals recognize new data as one criterion on which to judge the acceptability of prospective articles. With such high costs and low expected rewards, it is no wonder that graduate students are almost the only economists to collect primary data.

Despite the costs and risks in collecting primary data, such data--both qualitative and quantitative--can provide insights into firm behavior which can generate either (i) new interpretations of patterns observed in secondary data or (ii) testable hypothesis for which secondary data at the market level may be used in empirical tests. For example, casual interviews with employees in grower-shipper firms and with industry officials have indicated the widespread adoption of ESL varieties in Mexico. A testable hypothesis generated from this kind of primary data "collection" is that ESL's represent a differentiated product for which buyers are willing to pay more. Circumstantial evidence from the f.o.b. price series presented in section 4 above suggests that price premia for ESL's may exist. Our more structured sampling and interview procedures indicated, however, that some firms are already investing in development of ESL varieties compatible with climatic conditions in Florida. To the extent buyers in the industry continue to demand ESL's, one would expect that premia for Mexican-grown ESL's will likely diminish as soon as appropriate ESL varieties are developed for Florida.

Primary data can also reveal industry structure which secondary data are incapable of

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<sup>3</sup> Future data collection on Mexican imports by the Market News Branch of AMS may be seriously impaired by the recent consolidation of offices: the Nogales, Arizona office of Market News has been closed and reduced personnel have been transferred to the Phoenix office. At the same time, the McAllen, Texas office was consolidated into the Dallas office. Removing Market News personnel from the border will likely hamper the collection of credible price and shipment data as well as its timely compilation and dissemination.

<sup>4</sup> These same pitfalls are faced by government employees responsible for collecting the secondary data economists typically use. However, once secondary data are compiled these problems are hidden from the view of subsequent users of the data. Occasionally, discrepancies in data reveal these problems: shipment of fresh tomatoes reported by AMS for Florida do not match packouts reported by the Florida Tomato Committee. In fact, AMS figures consistently under-report those of the Florida Tomato Commission. Unsuspecting users of AMS shipments from Florida would be using data with significant measurement error.

detecting. Shipment data from states and regions reported by AMS (presented in section 3 above) cannot illuminate the degree to which production in one state or region is coordinated by a grower-shipper in another area.<sup>5</sup> Our primary data suggest, however, that sequencing of production from diverse geographical areas is an important business strategy for grower-shippers seeking year-round shipping. If analysts were unaware of the trend towards extended-season or year-round shipping, shipment data from East coast states might be interpreted as indicating the existence of *independent* tomato growers in South and North Carolina as well as Virginia (see Figure 3). Some portion of the tomatoes shipped from those states are produced by local growers but often on contract or through joint venture arrangements. Much of the remaining tomato shipments corresponds to product directly grown by a vertically integrated grower-shipper on leased land. Unsuspecting analysts and policy makers might conclude from examining shipment data that growers in these states are independent producers when, in fact, they play a key role in the coordinated business plan of a Florida-based grower-shipper.

### **7. Concluding Thoughts**

Primary data elicited from grower-shippers in the North American fresh tomato industry indicate a wide variety of firms with geographically based strategic positions which compete within and across regions for increasingly longer periods throughout the year. Competition between these grower-shippers has induced substantial investment in new varieties, technology, and organization which have apparently lead to f.o.b. price premia for Mexican tomatoes relative to those of Florida. At the same time, consumer choices have been enhanced by providing extended shelf-life varieties at relatively low retail prices. In focusing on regional and seasonal trade disputes, analysts should consider regional trade impacts in the context of fresh tomato grower-shippers who increasingly produce for extended seasons or on a year-round basis. And the benefits to consumers of competition among grower-shippers in the North American fresh tomato market should not be ignored.

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<sup>5</sup> Even Census of Agriculture figures would likely tell very little about coordination and contracting between growers in Virginia, say, and a grower-shipper with headquarters in Florida.

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**Table 1. Fresh Tomato Grower-Shippers Interviewed**

<b>Region</b>	<b>Number of Grower-Shippers Interviewed</b>	<b>Size Range (Acres in Tomatoes)</b>	<b>Approximate Percentage of Region's Total Shipments</b>
California	15	650 - 6,500	80%
Florida	9	800 - 7,500	75%
Mexico	14	500 - 6,000	60% (Exports)

Source: Primary Data.

**Table 2. Average Daily and Weekly F.O.B. Tomato Prices**

<i>Mature Greens, All Sizes</i>						
<b>Season</b>	<b>Florida</b>	<b>Mexico</b>	<b>Florida - Mexico</b>	<b>T-Statistic</b>	<b>P-Value (One Tailed)</b>	<b>Sample Observations</b>
<b>1989-90</b>	\$24.95	\$20.98	\$3.97	1.67	0.05	42 Daily
<b>1990-91</b>	\$11.17	\$8.23	\$2.94	4.51 <sup>a</sup>	1.00 x 10 <sup>-5</sup>	52 Daily
<b>1991-92</b>	\$16.13	\$13.20	\$2.93	1.44	0.08	15 Daily
<b>1992-93</b>	\$7.45	\$6.32	\$1.13	2.39	0.01	54 Daily
<b>1993-94</b>	\$7.02	\$8.18	-\$1.16	0.89	0.19	14 Weekly
<b>1994-95</b>	\$8.99	\$10.37	-\$1.38	1.44	0.08	16 Weekly

<i>Vine Ripes, All Sizes</i>						
<b>Season</b>	<b>Florida<sup>b</sup></b>	<b>Mexico<sup>c</sup></b>	<b>Florida - Mexico</b>	<b>T-Statistic</b>	<b>P-Value (One Tailed)</b>	<b>Sample Observations</b>
<b>1992-93</b>	\$6.89	\$7.05	-\$0.16	0.13	0.45	16 Weekly
<b>1993-94</b>	\$6.49	\$7.77	-\$1.29	1.06	0.15	18 Weekly
<b>1994-95</b>	\$7.81	\$9.00	-\$1.19	1.12	0.13	24 Weekly

<sup>a</sup> T-statistic calculated using unequal variances.

<sup>b</sup> Weighted-average prices.

<sup>c</sup> Simple-average prices.

Source: Florida Tomato Committee; Market News Branch, AMS.

**Table 3. Nominal Retail Prices for Fresh Tomatoes, Seasonally Unadjusted,  
(Nominal Dollars per Pound)**

Season	<i>Average Price, November-May</i>				<i>Difference in Average Prices</i>			
	South	North-east	North Central	West	North-east minus South	North-Central minus South	North-Central minus West	West minus South
1989/90 -								
1992/93	\$1.069	\$1.306	\$1.182	\$1.131	\$0.236	\$0.112	\$0.050	\$0.062
1993/94 -								
1995/96	\$1.155	\$1.455	\$1.182	\$1.162	\$0.300	\$0.027	\$0.019	\$0.008
Percentage Change	8.0%	11.4%	0.0%	2.7%	27.1%	-75.9%	-61.3%	-87.7%

Source: Bureau of Labor Statistics, U.S. Department of Labor.