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Spatial and vertical price transmission in fresh produce markets have been studied extensively to assess the efficiency of the produce marketing system and to assess the functioning of markets both vertically and spatially separated. These studies are critical in assessing the impact of competition vertically across market segments, from producer to consumer, and to assess the impact of competition horizontally.

Farmers have expressed concern about price transmission as they have seen their share of the retail food dollar decline from 35 percent in 1984 to 22.4 percent in 2004 (table 1). Over that same period the farm share of the retail dollar declined from 34 percent to 19 percent for fresh market vegetables, from 34 percent to 19.3 percent for fresh fruit and from 24 percent to 16.3 percent for processed fruits and vegetables. In addition to farmers getting a smaller share of the retail dollar, competition has eroded the market share for fresh produce growers. Imports in the U.S. market have claimed a larger share of the market, increasing from 8.1 percent of total market share in 1980 for all fresh vegetables to 15.8 percent in 2004. Those impacts have been even more profound on selected items. Fresh market tomatoes have seen imports increase as a percent of the domestic market from 22.3 percent in 1980 to 35.1 percent in 2004. Broccoli imports have increased from a 0.2 percent market share in 1980 to 7.1 percent in 2004. At the same time that competition has increased, consolidation of retailers and shippers has led to even more concerns for farmers, some claiming that increased concentration has led to

decreased returns to growers and a smaller farm share of the retail dollar. On a brighter side for growers, consumption of fresh vegetables increased significantly to help offset some of these impacts. Per capita consumption of vegetables and melons in the U.S. increased from 356 pounds per person in 1980 to 445.6 pounds per person in 2004. Fruit and nut growers did not experience that kind of growth with consumption of all fruit and nuts increasing only slightly, from 280.4 pounds per person in 1980 to 286.1 pounds per person in 2004.

Increasing margins between the farm and consumer and increasing import shares in the market have led to many concerns being expressed by farmers. Fresh produce growers have no government programs like those for grains, dairy and sugar to support incomes of growers. Most are reluctant to ask for government help in supporting incomes to growers. They are vocal however in seeking fairness in markets. Growers have been active in seeking solutions to what they perceive as unfair markets. The trade cases taken to the U.S. International Trade Commission and the U.S. Department of Commerce are witness to their drive to experience fair markets (VanSickle, 1997).

Price Leadership and Asymmetry

Ward (1982) did some of the seminal work in price transmission for farm products moving from the producer to retail levels. Ward's study of pricing symmetry laid a foundation on which several markets have been evaluated since his work was completed (Kinnucan and Forker, 1987; Schroeder, 1988; Willet, Hansmire and Bernard, 1997). He developed a model that determined the point in the market (market level) that was primarily responsible for establishing price. He used another model to test for pricing asymmetries in the market to determine how well prices are transmitted through the

market system. His results suggested that that the pricing point for fresh produce existed at the wholesale market level with price transmission running from wholesale markets to retail and producer levels. Ward also concluded from his asymmetry tests that price decreases were more likely to be fully passed on to the retail and producer level sectors than were price increases. His reasoning for why this occurred was that retailers were more concerned that price increases would curb demand and result in product not moving and spoiling on the store shelf, therefore they were reluctant to pass on all price increases as efficiently as they did price decreases.

Renwick and VanSickle (1998) later argued that changes in the marketing system with better post-harvest handling procedures, direct procurement and extended shelf-life varieties reduced perishability problems and likely altered the relationships across markets. Girapunthong, et al. (2003) went on to update Ward's pricing asymmetry study for fresh tomatoes and found that the pricing point had shifted to the producer level with price changes at the wholesale and retail levels following. They concluded that causality in the market had changed because of structural changes in the market for fresh tomatoes since Ward completed his study. They also found that the conclusions Ward reached in his asymmetry tests for the market in 1982 had also changed. Their results suggested that wholesale prices respond more to falling producer prices than to rising producer prices. One of the changing market dynamics in the fresh produce industry is the rising level of direct procurement of product and the changing nature of the wholesale market. Wholesale markets that historically purchased product from producers and then sold to regional supermarkets and food retailing businesses no longer were the primary link between producers and consumers. In response, wholesale markets have lost the price

leadership role they once had and now respond to producer price declines in order to maintain market share. The retail level of the market was also found to be asymmetric in price response - in the other direction. Retailers were found to respond more to increasing prices at the producer level than to price declines. Sexton et al. (2003) completed a study to analyze grocery retailer behavior in the procurement and sale of fresh produce commodities. They found similar results in the link from farm to retail in their analysis of price spreads. They concluded that there is considerable independence in retailers in setting prices for produce commodities. They extended their model to estimate the impact that volume of product had on the farm-to-retail price spread. They concluded that higher volumes led to larger margins, a conclusion consistent with Girapunthong et al. who found that the retail trade is more likely to respond to producer price increases than to price decreases. Sexton et al. go further in their conclusions by suggesting that higher volumes of product in the market are used as a tool to bid down producer prices without equal declines in retail prices, widening the farm-to-retail margin. These results suggest that retailers have been more aggressive in using their market power to influence prices paid to producers for product. Many shippers have also consolidated their businesses with other firms and in other areas of production to counter the market power exercised by large retailers. All of these issues are important to the trade in fresh fruits and vegetables and must be understood to evaluate the alternatives that growers and others have for managing their business in this environment.

Integration and Behavior in the U.S. Market for Fresh Produce

A second issue related to efficient marketing of fresh produce relates to the integration of spatially separated markets. This issue has surfaced in validation of the law

of one price (LOP) in international trade. Jordan and VanSickle (1995) evaluated the extent of spatial integration in the U.S. winter fresh tomato market to determine the level of integration between the two primary winter market suppliers, Florida and Mexico. They adapted a dynamic model of spatial price adjustment originally developed by Ravillion (1986) to deal with trade between a central market and a set of local markets. The model allowed testing of both short run and long run integration in the market. They found that Florida and Mexico were integrated in the same market in the long run, but that only Mexico was integrated in the short run. The results suggest that while price changes are not instantaneously diffused to the other, those changes will eventually be reflected in the prices of the other area. The second major conclusion they reached was that while information flow between the areas is relatively efficient, the information flow is asymmetric. They suggest this asymmetry is likely due to the distance Mexico is from the U.S. market. Granger causality tests suggested that Florida was the price leader in this market with Mexico responding to changes in the Florida price. The asymmetry in pricing suggests however that Mexico is slower in responding to market forces, possibly due to their location disadvantage.

Conclusions

Pricing issues are important in the produce market. The perishable nature of these crops increase the risk to producers who have fewer alternatives available during the harvest and selling period. I advise growers to know where they will market their crop prior to planting the first seed (VanSickle, 2005). That increases their knowledge of the market and their opportunities for success. Policy makers have the same responsibilities for understanding the markets for products that are influenced by the policy they

implement. It is the responsibility of academics to give growers and policy makers the best science for understanding these markets and the influence of market structure and policy. Analyses of spatial and vertical price transmission is important to understanding markets and the impact of policy.

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Table 1: Farm value as a percentage of retail price for domestically produced foods, 1984 and 1994

<i>Items</i>	1984	1994	2004
Livestock products:			
Meats	50	36	32.4
Dairy	47	34	33.5
Poultry	56	43	42.1
Eggs	65	47	35.5
Crop products:			
Cereal and bakery	12	8	6.2
Fresh fruits	34	18	19.3
Fresh vegetables	34	23	19.0
Processed fruits and vegetables	24	20	16.3
Fats and oils	31	25	20.6
Market basket, average	35	24	22.4

Sources: USDA: <http://www.usda.gov/new/pubs/factbook/001d.pdf>
<http://www.ers.usda.gov/publications/agoutlook/aotables/2006/02Feb/aotab08.xls>

Table-2: Import share of U.S. fruit and vegetable consumption

<i>Selected Items</i>	1985	1990	1995	2000	2001
			Percent		
Fruits - - fresh and frozen	9.0	13.2	15.6	22.3	23.1
Vegetables - - fresh and frozen	8.0	9.6	11.2	14.0	16.6
Tomatoes	24.0	20.5	30.5	32.4	35.5

Source: Economic Research Service/USDA

Table-3: U.S. per capita use of selected, commercially produced, fresh, and processed vegetables, fruits, and tree nuts, 1980-2004

<i>Crop</i>	1980	1985	1990	1995	2000	2004
Vegetables and melons	356.0	384.6	410.0	432.9	449.8	445.6
Fruits and nuts	280.4	279.6	258.5	274.1	289.9	286.1

Sources: <http://usda.mannlib.cornell.edu/data-sets/speciality/89011>
 Fruit and Tree Nuts Situation and Outlook Yearbook/FTS-2005/October 2005
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