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Using market intelligence for the opportunistic shipping of fresh produce

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ABSTRACT

The main goal of this paper is to develop an opportunistic shipment policy that increases a farmer's commercialization reach within a secondary market with minimal or no capital investment, once a base market has been established. Basically, the operation would consist of sending fresh produce items into a secondary market (from the base) whenever momentary price differentials allows two-market transactions with a high probability of profit. A theoretical model is developed that maximizes potential operational revenues based on arbitrage opportunities existent within two-market structures. Ultimately, the validity and applicability of this model is demonstrated through the application of a case-study. The results of the case-study show that using the decision-making strategy defined by the proposed theoretical model cannot only increase the long-term profits of two-market operations but can also lower the profit variability, in comparison to only commercializing in a single base market.

1. Introduction

One of the primary issues facing agricultural producers in today's market environment is the risk associated with revenues from their crop sales. This is particularly true for fresh produce farmers whose revenues are dependent on a variety of external factors that are often outside of the farmers' immediate control such as the combination of market prices and weather variability. Furthermore, due to the perishable characteristics of fresh produce and its commodity-like nature, once the produce is sent to a particular terminal market a buyer can wait and/or selectively choose among the potential vendors offering the lowest price. Thus, perishability results in a loss of leverage when it comes to negotiating prices for the farmer or shipper that prepositions his/her product. Consequently, the underlying situation is one in which the farmers assume most of the risk associated with production variability and in turn receive reduced margins over the final revenues, estimated at a 20% of the final market price (Cook, 2010).

In the present paper, the main purpose is to develop an opportunistic, shipment policy that increases a farmer's commercialization reach with minimal or no capital investment within secondary markets once a primary or base market has been captured. In this case, the basic operation consists of delivering fresh produce items into a secondary market (from the base) whenever momentary price differentials allows two-market transactions with a high probability of a profit once the transaction costs are subtracted. Ultimately, a theoretical model is developed that maximizes potential operational revenues based on arbitrage opportunities existent within two-market structures. The methodology developed in this paper extends previous studies aimed at increasing the commercialization reach of Mexican fresh produce farmers in the US. For instance, Sanchez (2007) analyzes the implementation of logistic platforms that allow efficient distribution operations of fresh produce in an established US market directly from Mexican farms.

The structure of the rest of this paper is divided into four parts. First, a review of current literature details the current status of the fresh produce industry, including the dynamics, characteristics and trends within European and North American markets. The second half of the review consists of literature related to price integration of two-market structures and the arbitrage opportunities created by inefficient price transmissions. Thirdly, a theoretical model is derived from a proposed operational structure based on the characteristics of two US fresh produce markets, specifically perishables' market prices. Finally, the proposed theoretical model is assessed through the application of a real-world case-study.

2. Related works and current state of industry

Based on our literature review, little to no research has been dedicated to the development of operational shipment strategies based on the arbitrage conditions of two spatially separated markets. Most of the literature pertaining to commercialization strategies within the fresh produce industry has been focused on current and future developments within European and North American markets. Most of these developments have been a direct result of food retailing expansions, either as a deliberate

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and rational process, or as an emergent and non-intentional one (Borklakis and Bourlakis, 2001).

No other fresh produce industry is as advanced as European. Over the past few decades, the complexity and competitiveness of its food market industry has slowly consolidated the value chain of the products at both the producer and the retail side. For example, up until the early 1970s, multiple food retailers in Britain each had combined market share of 20%, trailing both the co-operative and independent sectors (Morelli, 1999). However, by 1971, the multiple sectors had overtaken the co-operative and independent sectors with 44% of the food market (Morelli, 1999). As of 2009, the four largest food retailers in Britain accounted for 75.6% of total grocery sales (Garner, 2009).

At this stage in Europe's food retail industry, increased marginal market share can only be created through fierce competition for small gains now held by small, independent retailers. As a result, food retail strategy has transformed from the initial growth strategies of the 1980s to strategies based on differentiation with own label, in which fresh produce (and meat) plays a key role (Fearne and Hughes, 1999). This fierce competition at the retail level for higher product differentiation has transferred over to the source of fresh produce. Producers are facing serious pressure from retailers, government, and consumers to not only adhere to product standards but also to improve their management practices to conform to evolving process standards (Palma et al., 2010). This has also created a consolidation process at the producer level towards greater control of the value chain structure in order to provide better goods.

In the Dutch fresh produce industry, this consolidation has taken place in the form of farmer co-operatives that have slowly evolved from small farming communities to important, international organizations. For example, in 1970, the number of growers and co-operative auctions in the Dutch fruit and vegetable industry was approximately 57,284 and 88, respectively; by the year 2000, those same numbers shrunk to 14,197 and 6, respectively (Bijman and Hendrikse, 2003). In this transition, smaller farmers without the capacity to innovate or offer "branded" quality products cannot compete with the larger farmer organizations; thus, these small farmers have little connection to the final client and are often bought or put out of business.

For the US farmer, the playing field within the industry is still in a maturation stage but it is progressively growing more complex. This is due to the increased number of players within the value chain which has increased the distance between the farmer and the final client. In part, this has made it difficult for single entities to control operations within the supply chain and provide unchanged quality and volume of perishable items over time, thus limiting the ability for differentiation and product branding of any one entity (Cook, 2001). As a result, the dynamics of the fresh produce markets has remained largely commodity-like, with most firms acting as price-takers (Cook, 2001).

With regards to the operations, the common grower–shipper often sells below total costs given the risk associated with weather and product perishability. In this case, planting tends to err on the side of excess planting, which creates a tendency for excess supply (Cook, 2001). Additionally, the price volatility common to fresh produce markets has contributed to a heavy reliance on daily spot market sales, as opposed to forward contracting between shippers and buyers (Cook, 2001). These characteristics of the fresh produce industry are the basis for developing the proposed operational structure in this paper.

2.1. Arbitrage within spatially integrated markets

The topic of this paper indirectly relates to arbitrage and its existence within two spatially separated fresh produce markets; topic which has received some attention in published literature. It is assumed by spatial market integration research that two regions are in the same economic market for a homogenous good if their price differential is equal to the transaction cost related to trade (Sexton et al., 1991). On the other hand, for markets farther away from their production source, there is a lower incidence of market equilibrium and increasingly inefficient price transmission across regions (Padilla-Bernal et al., 2003). In general, less perfect competitive behavior in these markets suggest higher levels of risk and uncertainty, which may also be evidence of strategic market shipments and price discrimination (Padilla-Bernal et al., 2003).

Econometric modeling is an alternative approach to analyze price relationships of commodity products within two-market systems. Several papers use co-integration testing as a way to analyze these price relationships and assess the level of integration of two markets for a particular product. Co-integration is a statistical framework to test for short-run and long-run or steady-state equilibrium relationships among several non-stationary series (Liang et al., 1997). Granger (1969) introduced the investigation of "Granger Causality" to investigate the effectiveness of one-time series to forecast another. However, Granger's causality test does not measure the relative strength of the relationships; neither can it distinguish between relationships that are real and those that are spurious (Ziemer and Collin, 1984). Blank and Schimiesing (1988) apply causality and path analysis to test for spatial relationships between two markets.

New empirical approaches have considered the important role that transaction costs have on spatial market integration. Liang et al. (1997) and Goodwin and Piggot (2001) use established methods to analyze the level of integration between two markets. Baulch (1997) uses the parity bounds model mentioned above as a way to test for the integration of food markets. The author argues that conventional methods for analyzing co-movement of food prices rely solely on price data and fail to capture the true transfer costs of the products.

One should note that this paper does not seek to estimate the level of integration between two markets but rather to simply use the inefficient temporary price transmissions to develop profitable, commercialization strategies.

2.2. Objectives of the study

As described earlier, the growing complexity of the fresh produce industry can reduce the visibility of the farmer in relation to the final consumer. As a result, the growing complexity of the industry pressures the farmer to seek additional marketing strategies that can help maintain his/her competitive position. In this case, farmers may want to seek new commercialization strategies within markets that have relatively low economies of scale and ease of entrance. In the US, wholesale markets can provide such an opportunity, since for the most part, the produce industry has remained largely commodity-like and competition is based mostly on pricing. Additionally, the volatility of wholesale market prices can allow farmers to design strategies that can diversify their operations in an opportunistic manner.

The objective of the study reported in this paper is to develop a strategy from which a farmer with limited operations may increase the commercialization reach of his/her perishable products within wholesale markets. The basic strategy is to continuously monitor two-market price differentials of fresh produce items with the purpose of uncovering potential arbitrage opportunities. This arbitrage opportunity will be in the form of time-lagged price-differentials large enough to allow profitable two-market transactions.