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International Food and Agribusiness Management Review  
Volume 10, Issue 3, 2007

## Table of Contents

---

### RESEARCH

#### **What Adds Value in Specialty Coffee? Managerial Implications from Hedonic Price Analysis of Central and South American E-Auctions**

*M. Laura Donnet, Dave D. Weatherspoon, and John P. Hoehn.....p. 1*  
*1st Place, Best Paper Award, XVII IAMA Symposium, Parma, June 2007*

#### **Economic Analysis of Incentives for Foreign Direct Investment in Beef Systems in Argentina and Uruguay**

*Eric Thor, III, DeeVon Bailey, Alejandro R. Silva, and Steven S. Vickner.....p. 29*  
*Finalist, Best Paper Award, XVII IAMA Symposium, Parma, June 2007*

#### **EU-China Agricultural Trade in Relation to China's WTO Membership**

*Jyrki Niemi and Ellen Huan-Niemi .....p. 49*  
*Finalist, Best Paper Award, XVII IAMA Symposium, Parma, June 2007*

#### **Fruit and Vegetable Consumption among College Students in Arkansas and Florida: Food Culture vs. Health Knowledge**

*Christiane Schroeter, Lisa House, and Argelia Lorence.....p. 63*  
*Finalist, Best Paper Award, XVII IAMA Symposium, Parma, June 2007*

#### **The Role and Success Factors of Livestock Trading Cooperatives: Lessons from German Pork Production**

*Ludwig Theuvsen and Annabell Franz.....p. 90*  
*Finalist, Best Paper Award, XVII IAMA Symposium, Parma, June 2007*

### INDUSTRY INTERVIEW

#### **Executive Interview: Ronald D. Hampton**

*Chair and Associate Professor of Marketing University of Nebraska*

#### **International Trade, Consumer Behavior and Trust: Factors Affecting Agribusinesses in Developing Countries**

*Ingrid Fromm and Bonani Nyhodo.....p.113*



*International Food and Agribusiness Management Review*  
Volume 10, Issue 3, 2007

## **Executive Summaries**

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### **RESEARCH**

#### **What Adds Value in Specialty Coffee? Managerial Implications from Hedonic Price Analysis of Central and South American E-Auctions**

*M. Laura Donnet, Dave D. Weatherspoon, and John P. Hoehn*

The specialty coffee market has grown dramatically since the 1980s which is consistent with the trend in specialty foods. Specialty coffee E-auctions have changed the roaster's procurement information and decision making since the coffee price and quality information is fully disclosed. We analyze this information by estimating hedonic price equations for two types of e-auctions: small and large volume; the data contains 624 observations for the Cup of Excellence and 57 observations for the Q auction. By examining what makes specialty coffees different from the commodity coffees and different among themselves we compare the mainstream and specialty business models and draw implications for supply chain managers. Results indicate that the two auctions trade in specialty coffees that are valued differently by their respective market segments. The value added through product differentiation is larger for the Cup of Excellence than for the Q auction. Both markets obtain price premiums over the commodity price. The Cup of Excellence e-auction reveals a significant amount of information about the values associated with coffee ratings, rankings, quantities available, and country reputations. In the Q auction, information on coffee quality is more limited and tends to be remunerated to a lesser extent than in the Cup of Excellence coffees. We conclude that in the specialty coffee model the grower is the major player in producing the desired quality attributes. The role of coffee roaster managers' is to exploit this value added through procurement strategies that preserve the origin information. On the marketing side, their role is to transmit the information to consumers to capture their effective demand for the attributes, both material and symbolic.

#### **Economic Analysis of Incentives for Foreign Direct Investment in Beef Systems in Argentina and Uruguay**

*Eric Thor, III, DeeVon Bailey, Alejandro R. Silva, and Steven S. Vickner*

The European Union's (EU) ban of hormone-treated beef products in 1989 has virtually eliminated beef exports to the EU from countries where cattle are routinely implanted with growth hormones, such as the United States (US) and Canada. This study examined whether or not foreign direct investment (FDI) in beef systems in Argentina and Uruguay (countries where it is illegal to implant cattle with hormones) would provide a profitable alternative method for investors to export beef to the EU.

One objective of this research was to examine the potential profitability of FDI in the beef systems of Uruguay and Argentina. A second objective was to assess the risk to FDI resulting from the impact of government policies and foot-and-mouth (FMD) outbreaks. These events included the effects of government policies such as currency devaluations and export taxes as well as animal disease outbreaks like FMD which have led to either the cessation or significant reduction of beef exports from Argentina and Uruguay. The findings suggest that cattle production (cow/calf, grass fattening, and feedlot) segments of the marketing chain are competitive markets with long-run economic returns apparently equal to zero. Meat packing, especially for export, appears to offer the best alternative for FDI. However, government intervention injects substantial risk for investors in Argent

## **EU-China Agricultural Trade in Relation to China's WTO Membership**

*Jyrki Niemi and Ellen Huan-Niemi*

China is turning into one of the world's largest and most lucrative food markets. As the incomes of China's 1.3 billion people and urbanisation rates continue to rise, demand for quality, health and environment conscious food products will escalate. Domestic production will eventually be unable to meet the exponential growth in demand due to rising food consumption, marked changes in the composition of diets and continued stress on China's natural resources due to water scarcity and land degradation.

This paper examined China's agricultural imports in regard to income growth, import price changes, and tariff reductions due to China's trade liberalisation. More specifically, it attempted to model behavioural relationships in the agricultural trade between China and the EU by using annual trade data from 1986 to 2005. Econometric models were constructed for six agricultural products exported from the EU to China: frozen pigmeat, frozen fish, whey, barley, beer, and wine.

Imperfect competition arising from product differentiation underlies the theoretical framework of this paper. Price of the product is an obvious and often the most important factor affecting an importer's purchasing decisions. Nevertheless, the importer does not necessarily purchase all of its agricultural products from the least expensive supplier. There are other factors affecting the trade flows of agricultural products such as qualitative characteristics - brand image (for luxury goods), brand names and cultural background (marketing), quality, delivery time, reliability of

supplies, packaging - and established relationships (e.g. cultural, historical or political ties between trading partners).

The examination of the price elasticities confirmed the expectation that demand for Chinese agricultural imports is relatively inelastic to absolute price changes. However, Chinese importers are sensitive to relative price changes on a product basis due to price competition among suppliers. Chinese importers will seek for the cheaper products among the foreign suppliers. The estimations implied that the exporter's market share in China is influenced by price competition. The results support findings that EU companies wanting to compete on price in the Chinese market will need to produce goods in China itself in order to be cost-competitive.

China's WTO accession and deeper integration into the world economy present a range of opportunities and challenges for EU exporters. The results suggested that tariff reductions do not have an important role in changing the quantity of EU exports to China. China's import demand analysis suggested that income growth effects play a dominant role in determining China's import demand for agricultural products, both in the short and long term. Rapid income growth has fuelled most of China's increased appetite for imported agricultural products. Strong economic growth is the major force behind the increasing buying power of the Chinese consumers.

## **Fruit and Vegetable Consumption among College Students in Arkansas and Florida: Food Culture vs. Health Knowledge**

*Christiane Schroeter, Lisa House, and Argelia Lorence*

Many factors impact a person's food choice, from age to culture, from income level to tradition, from location of residence to health knowledge, and the list goes on. The impact of culture on food consumption can not be understated, yet it is rarely considered in agricultural economics and agribusiness literature. In the agribusiness industry, combined with the importance of relating food consumption and culture, is the issue of understanding food consumption for health. The increasing prevalence of obesity has led to debates on how to reverse the trend of increasing body weights, especially among children, adolescents, and young adults. Policy makers are increasingly interested in determining whether and to what extent a relationship between health knowledge, food consumption, and obesity among college students exists. Unfortunately, current evidence on the interaction of food culture and health behavior of college students is limited and no data is available regarding college students in Arkansas and Florida. The objectives of our study are to determine the impact of (1) demographics, (2) dietary and health knowledge, and (3) food culture on fruit and vegetable consumption of college students by developing a model consistent with economic theory. Data was collected via online surveys with undergraduate and graduate students enrolled at Arkansas State University and University of Florida. Statistical significance tests were applied to analyze relationships between students' responses to perception, knowledge, and culture/tradition questions with respect to their demographic

characteristics. This study provides information the impact of a) health knowledge, b) food culture, c) subgroup differences by region, college major, gender, and urban-rural location on fruit and vegetable consumption of college students. Understanding the antecedents to consumption for products like fruits and vegetables can lead to more effective decisions by agribusiness firms, policy makers, and organizations interested in decreasing the trends to obesity.

## **The Role and Success Factors of Livestock Trading Cooperatives: Lessons from German Pork Production**

*Ludwig Theuvsen and Annabell Franz*

Meat supply chains are complex networks that have been undergoing major changes resulting in stricter vertical coordination. Many authors expect competitive advantages of stricter vertically coordinated supply chains. Unfortunately, these arguments do not take into account the complexity of today's meat supply chains and the pivotal role livestock traders still play in many countries. Against this background, we analyze the role and success factors of livestock trading cooperatives in meat supply chains. More specifically, we focus on the following research questions: What role do livestock trading cooperatives currently play, how do they perceive their roles, what do they consider their success factors, and how do farmers perceive the role and success factors of trading cooperatives?

The study is based on an empirical analysis of livestock trading cooperatives in German pork, beef and turkey production. Questionnaire-based telephone interviews were conducted with 65 managing directors in 2005 and 2006. The questionnaire focused on the cooperatives' purchasing and marketing channels, service spectra and success. The survey was mirrored by interviews with 357 farmers, who were asked the same questions as the managing directors.

The results show that the cooperatives experience heavy competition from alternative marketing channels. Furthermore, managing directors' and the farmers' perception of the roles livestock trading cooperatives play are significantly different. Twelve organizations surveyed meet the criteria of a successful cooperative trader: growing or constant number of members and slaughter animals marketed, and positive or neutral perceptions of their own economic prospects. Livestock trading cooperatives are most successful when their service spectrum meets members' needs and offers an added value to farmers. Successful organizations offer a broader spectrum of services, whereas less successful organizations either offer fewer services or operate costly and, in many cases, unprofitable slaughterhouses. But, even in successful organizations, service spectra embrace mainly the traditional core functions of livestock traders, such as bargaining with abattoirs or organizing animal transport. With the support of farmers' quality assurance activities as the only exception to the rule, innovative services are still quite rare.

The study suggests that the cooperatives' service spectrum is a major source of competitive advantage and that the organizations should establish themselves as

preferred service providers to farmers. The study also highlights the need for cooperatives to improve their image, better communicate their services to members and intensify their supplier relations. Furthermore, livestock trading cooperatives are in most cases small compared to rapidly growing abattoirs. Therefore, more horizontal cooperation as well as mergers can be ways to improve the competitive position of traders. Last but not least, the cooperatives may consider professionalizing their management in order to cope more successfully with demanding meat markets.

From a theoretical perspective, the results suggest that there may not be “one best way of organizing” meat supply chains, whether open markets, contracts or vertical integration. The successful organizations show that, despite some theoretical doubts in transaction cost economics, livestock trading cooperatives may have a future in meat supply chains as long their service spectra offer an added value to farmers.

## **EXECUTIVE INTERVIEW**

### **International Trade, Consumer Behavior and Trust: Factors Affecting Agribusinesses in Developing Countries**

*Ingrid Fromm and Bonani Nyhodo*

#### **Executive Interview: Ronald D. Hampton**

*Chair and Associate Professor of Marketing University of Nebraska*

With the increasing complexity of global food systems, producers in developing countries are faced with challenges associated with market access to developed and other developing countries. There is clear evidence that the fastest growing developing countries are the ones engaging in trade and participating in the global market. The difficulty for developing countries, especially Small and Medium Enterprises (SMEs) in those countries is the logistics and agreements needed to enter international markets and benefit from trade. Global production networks are becoming extremely complex. Arms-length trade is now confined to commodities with low returns, thus access to high-income yielding activities requires participation in global value chains. Over the past decades, the global food system has concentrated in the hands of a few large companies. All these changes raise questions about market structures, market power, and strategies for small-scale agribusinesses in developing countries to insert themselves into the global food system. This paper summarizes the interview conducted with Dr. Ronald D. Hampton, Chair and Associate Professor of Marketing and Director of the Agribusiness Program at the University of Nebraska in Lincoln. Dr. Hampton has ample experience in international marketing, marketing management, retail management, leadership, and consumer behavior. The objective of this interview is to gain a better understanding of factors affecting small-scale agribusinesses in a context of international trade. This interview took place during the 17th Annual World Forum and Symposium in Parma, Italy in June, 2007.





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## **What Adds Value in Specialty Coffee? Managerial Implications from Hedonic Price Analysis of Central and South American E-Auctions**

M. Laura Donnet<sup>a</sup>®, Dave D. Weatherspoon<sup>b</sup>, and John P. Hoehn<sup>c</sup>

<sup>a</sup> *Ph.D. Candidate, Agricultural Economics, Michigan State University,  
108 Cook Hall, East Lansing, MI 48824, USA.*

<sup>b</sup> *Associate Professor, Agricultural Economics, Michigan State University,  
213C Agriculture Hall, East Lansing, MI 48824, USA*

<sup>c</sup> *Professor, Agricultural Economics and Natural Resource Economics,  
Michigan State University, 301A Agriculture Hall, East Lansing, MI 48824, USA.*

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### **Abstract**

We analyze price and quality information at the procurement level in the specialty coffee supply chain using data from small and large volume e-auctions. Hedonic price equations reveal that the Cup of Excellence auction is a more differentiated market disclosing more information about coffee values associated with ratings, rankings, quantities available, and country reputations whereas information in the Q auction is more limited and tends to be remunerated to a lesser extent. These results indicate that there are different business models and valuation of product characteristics within the specialty coffee industry. Management implications are drawn for specialty coffee producers and roasters.

**Keywords:** specialty coffee, e-auctions, hedonic analysis, business models

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®Corresponding author: Tel: + 517-355-1070

Email: [donnetma@msu.edu](mailto:donnetma@msu.edu)

Other contact information: D.Weatherspoon: [weathe42@msu.edu](mailto:weathe42@msu.edu)

J. Hoehn: [hoehn@msu.edu](mailto:hoehn@msu.edu)

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## Introduction

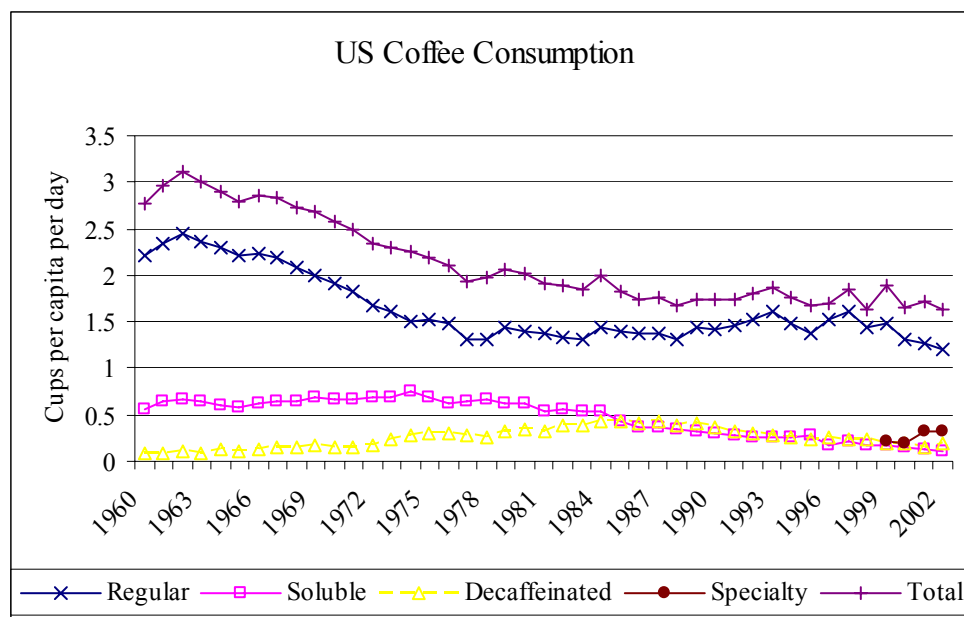
Specialty coffee is the revitalization of the art of cultivating, roasting, preparing and enjoying a beverage of superior aroma and flavor. Specialty coffees are those made of the highest quality coffee beans, properly roasted and brewed, for the displaying of their greatest flavor<sup>1</sup> potential. Specialty coffee is a growing market segment in an otherwise declining industry (Figure 1). The business model of mainstream coffee firms is partly responsible for the downward spiral of coffee consumption and loss of market share to other beverages from the early 1960s to the early 2000s (Ponte 2001). New ways of consuming coffee that focus on quality, differentiation and value-adding coffee characteristics have created a specialty coffee market segment that has grown dramatically since its formative years in the 1980s (Roseberry, 1996; Ponte, 2001). Consistent with a general trend in food upgrading and an increasing interest in a lifestyle of enjoying and appreciating fine foods and beverages, people are consuming less coffee in terms of physical quantities but more coffee of higher quality and value. The specialty coffee market is becoming the new wine of the food industry, with record prices paid for “Limited Editions” and “Roaster’s Reserve” coffees (Davids, 2006). The marketing strategies for this product are based on enhancing the product’s appeal to consumers’ hedonistic values of aesthetic cognition, traveling through taste and connection with the *terroir*<sup>2</sup> (Roseberry, 1996; Daviron and Ponte, 2005).

A coffee’s potential for flavor and aroma resides in the precursor compounds in the green coffee beans (Davids, 2002; Arvidson, 2003; Mabbett, 2006). Therefore, the procurement of high quality coffee beans is a crucial activity in achieving the strategic objectives of specialty coffee firms. To capture the value offered in the specialty market segment, high quality coffees are often associated with and named after their places of origin, such as Jamaican Blue Mountain, Hawaiian Kona and Kenyan AA. The potential for growth in the specialty coffee industry requires increasing quantities of high quality coffee supplies. To achieve the potential for growth, specialty coffee firms are expanding their procurement from the broad diversity of production areas.

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<sup>1</sup> This definition is from Don Holly, “The Definition of Specialty Coffee,” <http://kaffee.netfirms.com/Coffee/SCAASpecCofDef.html>. This definition emphasizes that specialty coffee stands for an outstanding product quality (aroma and flavor) and does not include coffees that focus on process attributes such as organic, fair-trade, and bird-friendly. This definition is increasingly being accepted in the industry.

<sup>2</sup> Terroir refers to a group of vineyards (or even vines) from the same region, belonging to a specific appellation, and sharing the same type of soil, weather conditions, grapes and wine making techniques, which contribute to give its specific personality to the wine.



**Figure 1:** U.S. per Capita Coffee Consumption. Source: Foreign Agricultural Service (2002)

Specialty coffee e-auctions have emerged as an innovative system for discovering, promoting and trading high quality coffee beans from new coffee sources (United Nations, 2003). Competitive e-auctions are market-based systems of trading coffee. E-auctions offer a low cost means for producers and buyers to interact, price, and, more importantly, reveal the values associated with alternative combinations of coffee qualities and coffee attributes (Ponte, 2002). While some industry people argue that the volumes traded in e-auctions are too small to reveal much about values in the broader specialty market (Knox, 2006), competition-auctions provide market exposure to previously unknown coffee origins and producers. Such exposure stimulates traders' interests in other coffees featuring similar characteristics (Ganes-Chase, 2006). Specialty coffee auctions bring together relatively large numbers of producers and buyers and reveal market values and other transaction information to all parties that participate in an auction. Thus, in contrast to one-to-one trading between a producer and seller, all participants in an auction market gain access to the value and transaction information generated by e-auctions. Such access to information reduces information asymmetries across market participants (Ponte, 2002; United Nations, 2003). Quality and price information disclosed by the competition and auction process should be viewed as a strategic instrument of supply chain coordination (Ponte, 2002) as they improve producers and buyers' understanding of products and market opportunities thus changing their informational and decision making roles as managers.

Specialty coffee e-auctions consist of both a cupping competition and internet auction. In the competition the coffees are cupped and rated according to their

quality on a 100-point scale. Quality ratings as well as coffee samples and production information are made available to potential buyers prior to the date of an e-auction. Once the rating, production information, and samples have been distributed to potential buyers, coffees are sold during an online auction that takes place on a specific date. There are two types of competitive e-auctions for coffee. One is the 'boutique' auction, in which small lots that average approximately 20 bags are traded. Coffees are evaluated by a jury of expert tasters who have an interest in procuring the specialty coffee. These auctions provide broad exposure to growers and give them an opportunity to showcase their high quality coffees. Such exposure tends to stimulate buyers' interests in coffees featuring similar attributes, leading to additional purchases and higher prices outside of a particular e-auction market, thus having a multiplying effect (Ganes-Chase, 2006). The other type of e-auction features much larger volumes of coffee. In large volume e-auctions, lots are measured in terms of the volume of a standard shipping container. Large volume e-auctions offer less information about traded coffees, since the uniqueness of a particular production location and a particular coffee variety can be lost in the mixing required to achieve a minimum lot size. Large volume e-auctions do offer the critical taste rating system based on the same 100-point scale as used in small volume e-auctions.

This paper analyzes the coffee attributes that add value in specialty coffees at the procurement level in the supply chain by estimating hedonic price equations for the two types of e-auctions. By examining what makes specialty coffees different from the commodity coffees and different among themselves we compare the mainstream and specialty business models and synthesize implications for supply chain managers. The analysis extends previous work on hedonic price analysis of specialty coffees by Donnet et al. (2007). In the previous paper, the authors analyzed the hedonic prices of coffees traded in small volume auctions. The approach of this paper is to compare value estimates from small volume e-auctions with estimates obtained from large volume e-auctions. Donnet et al. 2007 established the definition of specialty coffee attributes and distinguished between sensory and reputation attributes. This paper extends that work by contributing to the understanding of the role of e-auctions in disclosing information and creating value for the industry. We argue that specialty coffee auctions provide critical information for supply chain participants; information that can support improved decisions regarding product differentiation, resource allocation and marketing strategies within a new business model.

The paper is organized in the following manner. The next section presents a discussion of specialty and mainstream coffee business models. The third section provides a business model framework for accommodating managerial implications from hedonic price analysis along with examples from previous hedonic studies in wine. In the fourth section, we explain the empirical strategy. In the fifth and final sections, we present results and conclusion.

## Specialty Coffee Business Models

A business model is a description of the value a company offers to one or several segments of customers and of the infrastructure of the firm for creating and delivering value to generate sustainable profits (Osterwalder et al., 2005). Table 1 presents a comparison of business models in mainstream and specialty coffee firms. The business model of mainstream coffee firms consists of delivering an undifferentiated or standardized coffee product. In contrast, the specialty coffee business model seeks to deliver value-added, highly differentiated products. To underscore the differentiated nature of their products, specialty coffee businesses have borrowed wine terminologies to describe the aroma, flavor, body and character of coffees from different growing conditions. Also similar to the wine industry, they use a 100-point scale to summarize the taste and aesthetic qualities of a brewed coffee.

**Table 1:** Comparison of Mainstream and Specialty Business Models

		<b>Mainstream Business Model</b>	<b>Specialty Business Model</b>
<b>Value Proposition</b>	<b>Product characteristics</b>	Homogeneous.	Differentiated through quality ratings, origins, varieties and other.
	<b>Upgrading possibilities</b>	Limited due to undifferentiated trade.	Increasing through differentiated procurement and marketing.
	<b>Quality standards</b>	Based on type (Arabicas and Robustas), place (Colombia, Brazil or other) and bean traits.	Assessment of the quality in the cup, 100 point scale quality rating, taste descriptors following wine terminology.
<b>Customer</b>	<b>Target</b>	Standardized mass consumption.	Conspicuous and indulging consumption, target hedonistic values.
	<b>Consumption level</b>	Consumption leveled off during the 1950s and declined after the early 1960s.	Consumption started to grow in the 80s and increased exponentially in the 90s.
<b>Infrastructure E Management</b>	<b>Procurement</b>	In bulk, no quality information transmitted to growers.	Smaller quantities and more direct communication with growers with transmission of quality information.
	<b>Roasting</b>	Downgraded blends roasted in large quantities.	Prevalence of single origins, artisan roasting.
	<b>Market structure</b>	Concentration.	Fragmentation.

**Source:** Elaboration using Roseberry (1996), Ponte (2001) and Daviron and Ponte (2005); business model elements from Osterwalder and Pigneur (2002).

The mainstream model is associated with procurement practices in which coffee firms procure in bulk, seek to minimize cost and disclose as little information as possible to consumers (Daviron and Ponte, 2005). The mainstream coffee trade is organized around a grading hierarchy according to type (Arabica or Robusta), primary processing (wet or dry), and country of origin and grade (Ponte, 2001). Grades are solely determined by attributes of the dry beans, such as defective bean count, bean size standards, moisture content, uniformity, color and freshness. In contrast, procurement in the specialty coffee business model is characterized by an intense search for high quality coffee, careful evaluation of coffee attributes, and development of close business relationships between producers and buyers. In addition, the actual tasting of brewed samples of coffee in formal ‘cuppings’ is a crucial procedure used to evaluate coffee qualities<sup>3</sup>.

Coffee prices in the mainstream supply chains are set with reference to the New York Board of Trade (NYBOT) for Arabica coffees and the London International Financial Futures and Options Exchange (LIFFE) for Robusta coffees. The prices traded on these commodity exchanges reflect the value of a lot of standardized coffee. Lots are standardized based only on the physical characteristics of the unroasted coffee beans. Hence, the prices that emerge from such exchanges provide coffee producers and buyers with no information about the value of quality deviations from that of a standardized lot of coffee. The commodity markets leave producers and buyers without a means to communicate the value and cost of coffee qualities that differ from the standardized lot. Given only commodity prices, informational asymmetries persist and demands for quality coffee are unmet (Daviron and Ponte, 2005). In contrast, the view of the specialty coffee model—at least in its original proposition—is that prices should be based on quality and its associated costs of production. Specialty coffees are therefore delinked from the New York and London commodity prices (Ponte, 2002). For specialty coffees, competitive e-auctions are a promising innovation that facilitates quality-based price discovery and the exchange of critical value-added information.

In the mainstream model, roasters blend coffee beans from different origins to produce a homogenous product that is palatable to the mass of consumers. Mainstream marketing strategies are based on standardization, consistency in providing the standardized product, and branding (Daviron and Ponte, 2005). In contrast, the specialty coffee model acknowledges places of origin, coffee varieties, production location conditions, and ratings based on the flavor attributes. In the specialty model, origin and variety are valued characteristics since specialty coffees are “far more interesting and distinctive when left unblended” (Arvidson, 2003). While the mainstream model detaches coffee from information about coffee origin

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<sup>3</sup> Cupping is the examination of the coffee sensory attributes including olfaction, gustation, and mouth feel of the coffee, which are the tasting of the volatile, soluble and non-soluble coffee components respectively (Lingle, 2001).

and other specific qualities, these same qualities result in real value-added in the special coffee model and market (Roseberry, 1996; Daviron and Ponte, 2005). Within the mainstream model, consumer choice is largely limited to coffee brand. Within the specialty model, consumers choose from diverse combinations of characteristics, including place of origin, varieties, profile descriptions and characteristics of production locations (Roseberry, 1996). Finally, while the mainstream coffee market is dominated by a few major roasters and manufacturers that distribute through supermarkets and food services (Ponte, 2001), fragmentation is a fundamental feature of the specialty coffee model and market (Lingle, 2001b)<sup>4</sup>.

## **Management Implications of Hedonic Price Information**

The hedonic approach states that goods are valued according to their specific individual attributes<sup>5</sup>. Hedonic price analysis decomposes explicit market prices into implicit prices of individual product characteristics. Hedonic analysis consists of modeling the market price of individual products as a function of various attributes that can be encountered in them. Statistical methods are then used to estimate the implicit or marginal prices of such attributes. If the estimated implicit price is not significantly different from zero, the attribute is interpreted as not valued by procurement managers or consumers.

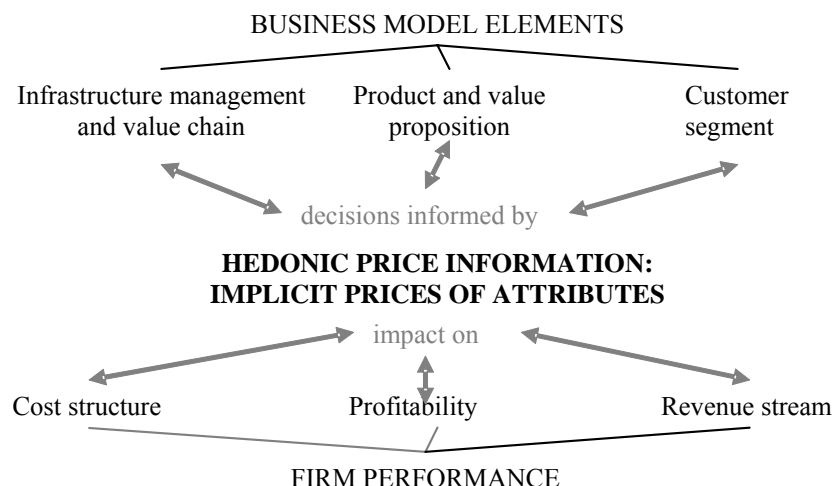
Implicit prices obtained from hedonic analysis provide key information for decision making in the supply chain since it allows managers to define their strategies according to the market value of the product (Figure 2). For this paper, we find it useful to classify managerial implications of price information according to the elements of business models following Pigneur (2002), Osterwalder (2004) and Osterwalder et al. (2005). Three major elements of business models can be distinguished: 1) the value proposition, 2) the market segments, and 3) the infrastructure and supply chain. The value proposition is the definition of the actual product and the customers' perception of its value. We consider implicit prices of attributes as direct indicators of the value proposition since they disclose which attributes are valued and by how much. The appreciation of new attributes in a given market generates product innovation and the transmission of attributes information to customers increases the quality perception of the product. The market segments define who the customers for the product are and allow the positioning of the firm in the area where it can gain a competitive advantage. Each segment has a distinctive supply and purchase criteria. We use hedonic analysis to distinguish among different quality segments (i.e. segments in which attributes have different valuations). Infrastructure and supply chain management refers to

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<sup>4</sup> In 1969 there were approximately 20 small roasters, by 1979 the number had doubled, and in 1989 it was 385; since 1990, the number of small roasters opening annually increased by increments of 100 with an estimation of 1,400 by 1999 (Lingle, 2001b).

<sup>5</sup> For the fundamentals of the hedonic approach see Rosen (1974) and Lancaster (1966).

how to organize and allocate the resource to respond to market opportunities and to manage the value chain. We take hedonic analysis as informative of where to use resources in production, processing and retailing activities.



**Figure 2:** Management Implications on the Business Model Elements from Hedonic Price Analysis. Source: Elaboration using Pigneur (2002), Osterwalder (2004) and Osterwalder et al. (2005)

The hedonic approach has been extensively applied to wines. Most of the earlier hedonic wine studies concentrate on identifying the attributes that have the greatest impact on price at the retail level, which directly refers to the value proposition of wineries. These studies found that wine prices were essentially determined by the characteristics that can be known from the information on the bottle (e.g. region of origin, grape variety, ranking<sup>6</sup> and vintage year) as opposed to those that refer to the wine sensory description by expert tasters (e.g. acidity, complexity of aromas and harmony of components) (Combris et al., 2000; Oczkowski, 2001; Lecocq and Visser, 2003; Troncoso and Aguirre, 2006). The reason is that attributes listed on a bottle are easily identifiable by non-expert consumers whereas sensory attributes are only appreciated by knowledgeable buyers. These results imply that product differentiation in wine is based primarily on attributes that appear on the bottle. In particular, ranking is the major indicator of vertical differentiation of products (Combris et al. 2000). Troncoso and Aguirre (2006) outline the importance of origin as a non-replicable differentiation factor to compete in global markets.

<sup>6</sup> Countries that produce wine have a ranking system to distinguish wines that meet specific criteria to determine the quality of a wine. For example the ranking system for Burgundy wines includes, from highest to lowers: grand cru, premier cru, communale and regionale.



Hedonic analyses suggest implications with respect to infrastructure and resource allocation. Oczkowski (1994) noted that implicit prices can be used to evaluate long-term investment decisions against their costs of implementation in order to redirect resources towards attaining the desirable quality attributes by, for example, using better quality grapes or better wine-making skills. However, the author notes that due to production lags, making resource allocations based on implicit prices now may have unexpected consequences in the future. Troncoso and Aguirre (2006) remark that since commercial success in the wine industry is primarily related to the right variety and winery location, variety and location are the crucial choice variables in vineyard operation. Similarly, Schamel and Anderson (2003) suggest a change in winery locations since consumers pay ultra-premium prices for cool-climate wines produced uphill versus lower and warmer regions in Australia. Davis and Ahmadi-Esfahani (2005) draw recommendations for wine storage according to the marginal prices of vintage years and optimal wine age from hedonic price analysis of Australian wines.

Davis and Ahmadi-Esfahani (2005) observe that market segments are formed in wine, usually by price, in which more specific recommendations from hedonic analysis can be made. The authors argue that a better distribution of Australian wines to various overseas and domestic markets could be made according to the attributes that are more valuable to the different consumer groups leading to a greater level of satisfaction for consumers and more profit for producers and marketers.

Donnet et al. (2007) determined the relative marginal prices of sensory and reputation attributes traded in small volume special coffee e-auctions. The authors found that variables referencing coffee sensory attributes and variables referring to the coffee origin, tree variety, quantity available and quality evaluation relative to other coffees traded in the same auction were important in determining coffee prices. The authors posit that reputation variables stand alone as quality signals affecting the buyers' willingness to pay. Donnet et al. also underscores the significant impact of the quality ranking, place of origin, variety and quantity available as important reputation attributes affecting specialty coffee prices.

## **Data and Empirical Model**

### *Data*

The data set is an extension of the small volume Cup of Excellence (CofE) data set used in Donnet et al. (2007) and a new data set of the large volume Q auction (Q). Table 2 shows the summary statistics. The total number of coffee lots is 624 for the CofE and 57 for the Q. The total volumes traded are 13,274 and 14,340 bags of 69 kg. in the CofE and the Q respectively. The coffee origins in the CofE are Brazil, Bolivia, Colombia, El Salvador, Guatemala, Honduras and Nicaragua for the

auctions in 2003 to 2006. The Q origins include Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua for the auctions in 2005 and 2006. The data set consists of the information available to bidders previous to the auction and the resulting price paid for each coffee lot at the auctions. This information is collected by the auction organization. The quality rating is the assessment of the jury in the cupping competition. For this study, we assume that the quality rating given by the competition jury is a proxy for a procurement manager's assessment of quality in the cup (recall that they are able to cup the coffee first hand). The quality ratings display a much wider range in the CofE. Prices in the CofE also vary widely, 1.2 to 49.75 dollars per pound. The ranking corresponds to the order of each coffee by its quality rating relative to all selected coffees in the competition, beginning with 1 for the first place lot, 2 for the second place, and so on, until the lowest rated lot in each auction. The CofE data includes the altitude of production and coffee variety such as Caturra and Catuai, information that is not available for the Q. The price of the commodity coffee during the auction month is included as a benchmark variable.

**Table 2:** Summary Statistics of the CofE and Q Auctions

	Cup of Excellence			Q auction		
	Average	Min	Max	Average	Min	Max
<b>Price (\$/lb)</b>	4.12	1.2	49.75	1.41	1.13	1.74
<b>Rating (points)</b>	86.77	80.25	95.85	83.34	80.83	86.54
<b>Lot size (bags)</b>	21	9	122	211	125	275
<b>Commodity price (\$/lb)</b>	0.96	0.55	1.35	1.27	1.1	1.35
<b>Ranking<sup>1</sup></b>	1 through -up to- 43			1 through -up to- 7		
<b>Year<sup>2</sup></b>	2004, 2005, 2006			2005		
<b>Country<sup>3</sup></b>	Bolivia, Brazil, Colombia, El Salvador, Guatemala, Honduras, Nicaragua			Costa Rica, Colombia, El Salvador, Guatemala, Honduras, Nicaragua		
<b>Altitude<sup>4</sup></b>	1284 - 1450, 1450-1600, more than 1600					
<b>Variety<sup>5</sup></b>	Bourbon, Caturra, Catuai, Pacamara, Typica, Other					

1 In CofE, dummy variables indicating if ranking 1, 2, 3 or 4, respectively. Base group is ranking 5 and above. In Q, ordinal variable.

2 Dummy variable indicating auction year. Base group is 2003.

3 Dummy variable indicating country of coffee origin. Base group is Brazil.

4 Dummy variable indicating variety of coffee. Base group is Bourbon.

5 Dummy variable altitude groups. Base group is Less than 1285 meters above sea level.

**Source:** Cup of Excellence and Q auction websites.

### *Model*

Applying the hedonic approach, we assume that buyers' bids reflect their valuation for the individual coffee attributes known from the information available prior to the auction. Thus, the price of the  $i$ -th specialty coffee is a function of the value the procurement manager attaches to its attributes  $Z_{ij}$  ( $j=1, \dots, m$ ). The hedonic price function for specialty coffees can be expressed as:

$$\ln(P_i) = \beta_0 + \sum_j f(Z_{ij}) \beta_{ij} + \varepsilon_i$$

where  $i=1, \dots, n$  are the observed specialty coffees,  $j=1, \dots, m$  are the attributes,  $\varepsilon_i$  is an independently distributed error term with mean 0 and variance  $\sigma^2$ ,  $\ln P_i$  is the natural logarithm function of individual prices; and the functions of one variable  $f(Z_j)$  are either the identity function, the logarithm function or a dummy variable which takes on the value 1 if the characteristic  $j$  is present for the  $i$ -th observation or 0 otherwise. In addition to the coffee characteristics we incorporate two control variables, the competition year and the commodity price of the corresponding coffee type during the auction month. The coefficient  $\beta_{ij}$ 's are the implicit prices for the attributes. We estimate the hedonic function using ordinary least squares. The semi-log functional form is chosen following the tests applied in Donnet et al. (2007).

## Results and Management Implications

Table 3 (*See Appendix A*) presents the implicit prices from the hedonic estimation for the CofE and the Q. The CofE and Q model specifications explain 85 and 68 percent of the variation in prices, respectively. The model coefficients can be interpreted as the marginal impact of the attribute on the price of coffees traded on average. The attributes that significantly influence CofE auction prices are the: quality rating, quality ranking, quantity available, commodity price, country of origin, year of the competition and the production altitude. In contrast, Q prices are influenced by the quality ratings and the country of origin and are not influenced by the ranking and the quantity available. As explained above, an altitude variable was not available for Q coffees.

The first level of product differentiation is based on whether a coffee is traded in the CofE or Q. In the CofE, prices contain more information on quality and remunerate quality more heavily. Quality information contained in Q prices is relatively more limited. The most outstanding differentiation attributes of the CofE coffees are the rankings and the idea of exclusivity conveyed by the limited availability of the CofE coffee lots. Being ranked first in the CofE increased the first ranked lot price by 122 percent above the average price of coffees ranked lower than fifth place. The prices of second, third and fourth best ranked coffees are higher by 28, 27 and 11 percent, respectively, over the average price of coffees ranked below fifth place. With respect to exclusivity, the estimates show a price decrease of 0.37 percent for each one percent increase in lot quantity offered in the CofE. This means that in a 20 bag lot, one more bag decreases price by approximately 2 percent; for example, increasing the lot quantity from 20 bags to 30 would decrease the price by 20 percent.

The borrowed-from-wine marketing strategies of competitive rankings and limited editions are the hallmark of value creation in the specialty coffee industry. For growers, the importance of this differentiation is that they have a way of creating

their own unique reputation by separating small coffee lots with specific combinations of characteristics that stand out among the coffees of other e-auction participants. Thus, participation in the CofE has a significant promotion effect for both roasters and growers. By offering this possibility, the CofE is an appealing source of supply for specialty retailers of highly valued coffees and a 'must-have' for firms targeting the upper-end customer segments.

Comparing the statistically significant coefficients side by side, the impact of the quality rating is almost four times larger in the CofE versus the Q. This means that an additional rating point increases price by 7.5 and 2 percent in the CofE and Q, respectively. In addition, the wider range of quality rating at the CofE (almost 15 points versus 5 points in the Q) can result in a very high total premium for the quality rating. For example, coffees rating 90 get a 35 percent premium with respect to coffees rating 85, *ceteris paribus*.

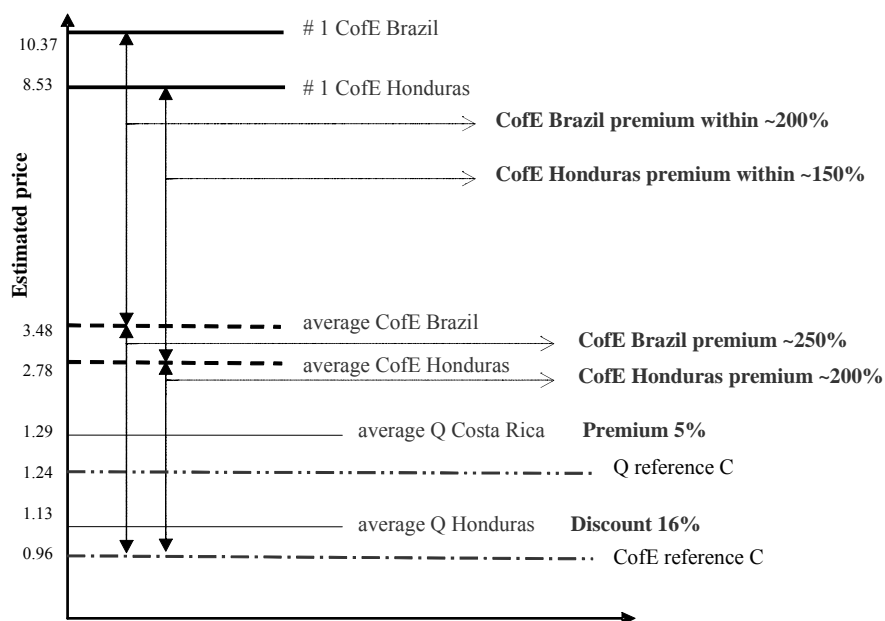
The impact of country reputation is higher in the CofE suggesting a greater degree of differentiation by origin in the CofE. Buyers in the small auction are more responsive to factors not captured by the rating but captured by the 'country' and that affect their valuation of quality. In the CofE, Brazil is the most highly valued country of origin while Costa Rica is most highly valued in the Q. Other origins appear to have similar rankings by value in both the CofE and Q. Guatemala is the second most highly valued in both auctions. In both auctions, the Central American origins; El Salvador, Nicaragua and Honduras are the most discounted in both auctions.

The CofE data set lends itself to more in-depth analysis than the Q-auction because of the available data. Altitude higher than 1,600 meters, an important factor for coffee quality, has a positive implicit price of 5.6 indicating that procurement managers pay on average five percent more for coffees produced at altitudes higher than 1,600 meters above sea level relative to coffees produced at altitudes lower than 1600 meters. Coffee varieties were not statistically significant, indicating that the different varieties are equally valuable to specialty coffee buyers participating in the CofE. However, the sign and magnitude of the coefficients for variety are in agreement with the reputation of Caturra and Pacamara varieties as consistent producers of high quality coffees.

Relative to the variables that are not quality attributes per-se but affect prices of specialty coffees, the hedonic equations indicate that CofE prices are less correlated with commodity market prices than are Q prices. CofE prices increase by 0.7 percent for each one cent increase in the commodity price while Q prices increase 1 percent for each one cent increase in commodity price. The latter result seems intuitively consistent with the idea that the quality of coffees offered in the Q are between those of the commodity markets and those of the high quality CofE coffees. In addition, the year 2005 was highly significant in the CofE. Buyers paid 13

percent less for the coffees auctioned during 2005 relative to coffees auctioned in other years. The connection between specialty and commodity prices suggests an ability to substitute coffees of different quality either within the supply chain, such as in roasting, or at the retail level.

Figure 3 illustrates the combined effect of desirable attributes in each of the two auctions. In the CofE, the combination of highly valued attributes yields the exceptional explicit prices that have attracted the attention of the industry and the media. The explicit price of a coffee is decomposed into three parts: 1) the price level of reference (commodity coffee), 2) the effect of the auction (i.e. the average differentiation of the trade system with respect to the commodity), and 3) the effect within the auction (i.e. the differentiation according to valued attributes in each auction).



**Figure 3:** Estimated Explicit Prices and Premiums of the Cup of Excellence Competition and Q Auctions

For example, the estimated explicit price for the first place Brazilian coffee is 10.37 dollars per pound. Decomposing the latter price, approximately 1 dollar corresponds to the general price level, 2.5 dollars correspond to being traded at the CofE and the remaining 7 dollars correspond to the rating, ranking, country, quantity and altitude effects within the CofE. Estimated explicit prices in the Q auction are much smaller. The average effect of the trade system relative to the commodity is 5 percent. Within the Q, since the rating has a small economic impact, the main effect is the country of origin. Thus, coffees from Costa Rica on average obtain 7 cents premium and coffees from Honduras obtain an overall discount of approximately 20 cents.

## **Conclusion**

The hedonic analysis indicates that the two competitive e-auctions trade in specialty coffees that are valued differently by coffee buyers. Both markets result in price premiums over the standard commodity price. The value added through product differentiation is larger in CofE than in the Q. The CofE e-auction reveals a greater amount of information about the values associated with coffee ratings, rankings, quantities available, and country reputation. In the Q, information on quality is more limited and tends to be remunerated to a lesser extent than in the CofE. These different valuations are indicative of different value propositions and business models within the specialty coffee industry.

The importance of the competition-auction system is that it places the grower at the center of the value adding process as opposed to the value adding created through corporate branding. In the specialty coffee model, the grower is the major player in producing the desired quality attributes. The role of coffee firm managers is to exploit this value added through procurement strategies that preserve the origin information. On the marketing side, their role is to transmit this information to consumers to capture their effective demand for the attributes, both material and symbolic. Furthermore, procurement managers' valuations reflect the value creation strategy to generating excitement around coffee, creating a demand for a different unprecedented high value product and matching willingness to pay for exceptional coffee determined by a panel of experts.

Before competition-auctions, most growers did not have quality information about their product and were not remunerated according to the detailed information that the cupping provides. Similarly, their resources and production costs used to be valued in a different context and thus the growers' reservation price is still largely the commodity price. Auctions offer the opportunity to enter a different business model as specialty coffee firms and buyers reveal the market value of specialty attributes. Hence, at these relatively early stage of development, our hedonic estimation can be taken as representing the demand side (buyers' willingness to pay) more than the supply side of the market (production costs). As knowledge on the costs of producing specialty coffee becomes available we might be able to provide insights on the final benefit from supplying the specialty markets. In particular for hedonic analysis, production costs will be reflected as sellers provide information on their reservation prices.

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## Appendix: A

**Table 3:** Implicit Prices of Specialty Coffee Characteristics from the Hedonic Price Log-Linear Model Estimates for the Cup of Excellence and Q Auction

Dependent variable: log (price)		Cup of Excellence			Q auction		
Independent variables		Coefficient	Sig.	Implicit price (%)	Coefficient	Sign.	Implicit price (%)
Rating (points)		0.075 (0.008)	***	7.5	0.02 (0.007)	**	2.0
Ranking <sup>1,2</sup>					-0.0007 (0.004)	*	-0.1
	First	0.847 (0.100)	***	121.9			
	Second	0.296 (0.093)	***	28.3			
	Third	0.283 (0.082)	***	27.4			
	Fourth	0.144 (0.075)	*	11.2			
Year <sup>3</sup>	2004	-0.039 (0.054)		□			
	2005	-0.277 (0.087)	***	-27.4			
	2006	-0.037 (0.079)		□			
Country <sup>4</sup>	Bolivia	-0.204 (0.108)	*	-22.7			
	Colombia	-0.365 (0.092)	***	-33.7			
	El Salvador	-0.238 (0.062)	***	-23.6	-0.083 (0.017)	***	-8.7
	Guatemala	0.03 (0.079)		□	-0.049 (0.021)	**	-5.8
	Honduras	-0.509 (0.065)	***	-41.8	-0.136 (0.016)	***	-13.4
	Nicaragua	-0.273 (0.058)	***	-26.1	-0.09 (0.037)	***	-10.3
Variety <sup>4</sup>	Catuai	-0.069 (0.047)					

	<b>Caturra</b>	0.033 (0.058)				
	<b>Typica</b>	-0.018 (0.071)				
	<b>Paca</b>	0.098 (0.09)				
	<b>Other</b>	0.002 (0.061)				
<b>Altitude<sup>6</sup></b>	<b>1285 - 1450</b>	0.036 (0.045)		□		
	<b>1450 - 1600</b>	0.039 (0.053)		□		
	<b>&gt; 1600</b>	0.109 (0.063)	*	<b>5.6</b>		
<b>Log of lot size (%)</b>		-0.379 (0.036)	***	<b>-0.4</b>	-0.000 (0.000)	□
<b>C Price (cent)</b>		0.689 (0.145)	***	<b>0.7</b>	1.007 (0.098)	*** <b>1.007</b>
<b>Constant</b>		-4.5 (0.717)	***		-2.544 (0.577)	***
<b>R-squared</b>		0.68			0.79	
<b>Observations</b>		624			57	

Robust standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The coefficient multiplied by 100 for continuous variables and  $\exp(\beta_j - 0.5 \text{ s.e. } \beta_j) - 1$  multiplied by 100 for dummies.



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## **Economic Analysis of Incentives for Foreign Direct Investment in Beef Systems in Argentina and Uruguay**

Eric Thor, III <sup>a</sup>, DeeVon Bailey <sup>b</sup><sup>Ⓢ</sup>, Alejandro R. Silva <sup>c</sup>, and Steven S. Vickner <sup>d</sup>

<sup>a</sup> *Former Graduate Student, Royal Agricultural College and  
Utah State University, 13641 S. 33rd Street, Phoenix, AZ, 85044, USA*

<sup>b</sup> *Professor and Interim Head, Department of Economics,  
Utah State University 3530 Old Main Hill, Logan, UT, 84322-3530, USA*

<sup>c</sup> *Director Professor, Agroindustrial Economics & Management, School of Agronomy  
University of Buenos Aires, Avda. San Martín 4453, C1417DSE – Buenos Aires, Argentina*

<sup>d</sup> *Associate Professor, Department of Economics,  
3530 Old Main Hill, Utah State University, Logan, UT, 84322-3530 USA*

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### **Abstract**

The European Union's (EU) ban of hormone-treated beef products in 1989 has virtually eliminated beef exports to the EU from countries where cattle are routinely implanted with growth hormones. This study examined whether or not foreign direct investment in beef systems in Argentina and Uruguay would provide a profitable method for investors who want to export beef to the EU. The results indicate that while investment in these systems is potentially profitable, government interventions designed to keep domestic beef prices low inject considerable risk into the investment decision.

**Keywords:** Investment in beef systems, South America, risk, cointegration

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<sup>Ⓢ</sup>Corresponding author: Tel: + 435.797.2300  
Email: [d.bailey@usu.edu](mailto:d.bailey@usu.edu)

Other contact information: E.Thor: [Thor\\_iii@yahoo.com](mailto:Thor_iii@yahoo.com)  
A. Silva: [silva@agro.uba.ar](mailto:silva@agro.uba.ar)  
S.Vickner: [svickner@econ.usu.edu](mailto:svickner@econ.usu.edu)

## **Introduction**

The European Union's (EU) ban of hormone-treated beef products in 1989 has virtually eliminated beef exports to the EU from countries, such as the United States (US) and Canada, where cattle are routinely implanted with growth hormones. The elimination of beef imports from locations such as North America at the same time that European beef production and exports have been declining in the aftermath of the European BSE crisis in the mid 1990s and the major foot-and-mouth (FMD) outbreak in the United Kingdom (UK) in 2001, has led to a relatively dramatic increase in beef imports into the EU from South America; especially from Argentina and Uruguay.

The EU became a net importer of beef in 2003 and interest is growing in places like the US for gaining access to the large EU beef market (USDA, FAS, 2005). Using hormone implants is illegal in Argentina and Uruguay and both countries have also established or are establishing traceability systems. Consequently, Argentine and Uruguayan beef meets the specifications demanded by the EU. This raises the question of whether or not foreign direct investment (FDI) in beef systems in countries like Argentina and Uruguay, which can export more freely to the EU than can the countries of North America, would provide profitable access to the EU beef market.

One objective of this research was to examine the potential profitability of FDI in the beef systems of Uruguay and Argentina. While prices and costs can be used to obtain a point estimate of profitability for FDI in these countries, significant market risk also exists as a result of government policies affecting cattle and beef prices, especially in Argentina. Also, animal disease outbreaks, such as FMD, can affect the ability to export beef from both of these countries. Consequently, a second objective was to assess the risk to FDI that has resulted from the impact of government policies and FMD outbreaks. This research examines events which have lead to the cessation or the reduction of beef exports from Argentina and Uruguay and which have thus increased the risk associated with FDI. These events include both the effects of government policies, such as currency devaluations and taxes, and also animal disease outbreaks.

## **Background**

We are unaware of publicly available published research studies which directly address the issue of FDI in the beef systems of Argentina and Uruguay for the purpose of exporting beef to the EU. However, a sizeable literature exists dealing with issues that would affect FDI decisions in the beef systems of these two countries. The following discussion attempts to place the current discussion and analysis into context with the most relevant portion of the literature addressing the issues that could affect the FDI decision.

The EU's trade ban on hormone-treated beef is one of the most contentious trade issues between the EU and the US (Alfnes and Rickertsen, 2004; Charlier and Rainelli, 2002). The EU represents one of the largest beef markets in the world with domestic production and consumption in the EU-25 countries totaling over 7.8 million and 8.2

metric tones (MT) per year, respectively (USDA, FAS, 2006).<sup>1</sup> EU beef production and exports have declined since 1990 in the aftermath of their BSE and FMD crises and imports have trended upward. It is reported that EU imports of beef will reach 1 million MT within the next decade (Robertson, 2007).<sup>2</sup> Consequently, there are huge incentives for beef exporters to try to be involved in exporting beef to the EU.

US beef exporters are generally uncompetitive if they are forced to meet EU requirements relating to assurances and/or certifications that American beef has not been treated with hormones (Clemens and Babcock, 2002). Consequently, eliminating or reducing the EU's ban is a top priority for the US. This explains why there has been continued pressure on the EU by the US to eliminate the export ban. However, the EU has continued to maintain the ban even though the World Trade Organization has ruled in favor of the US in this matter (e.g., Hill, 2001; Taylor, Walsh, and Lee, 2003; Alfnes and Rickertsen, 2004; and Charlier and Rainelli, 2002).

Considerable research has been done examining EU consumer attitudes regarding the ban on hormone-treated beef with most of the results concluding that European consumers prefer non-hormone treated beef (e.g., Lusk, Roosen, and Fox, 2003; Alfnes and Rickertsen, 2004; Alfnes, 2004). This suggests that there is political support within the EU for maintaining the ban. Possible solutions such as labeling imported beef as being hormone-treated have also not been acceptable to either side even though European consumers prefer mandatory labeling for hormone-treated food products (Alfnes and Rickertsen, 2004; Chakraborty, 2005).

The impasse relating to hormone-treated beef imports into the EU at a time when the market for imported beef into the EU is trending upward is a significant concern for US beef exporters (USDA, FAS, 2005). All of these factors including political support for the ban in the EU, resistance to labeling products as being hormone-treated, and the growth in the EU beef import market suggest that strong incentives exist for beef exporters in North America to find alternative methods for exporting beef to the EU.

One alternative might be for beef producers from North America or elsewhere to simply invest directly in beef systems in countries that are free to export to the EU, such as Argentina and Uruguay. Both Argentina and Uruguay have been increasing their beef exports since 2000 with much of this increase going to the EU especially to fill their so-called "Hilton" Quota (Boland, Perez, and Fox, 2007) (Figure 1). Reasons for increased exports from Argentina and Uruguay include the efforts by these countries to eliminate FMD (Ekboir et al., 2002) and world demand and supply conditions (Steiger, 2006)<sup>3</sup>. These two countries, together with Brazil, are expected to continue to capture market share in the international trade of beef (Steiger, 2006).

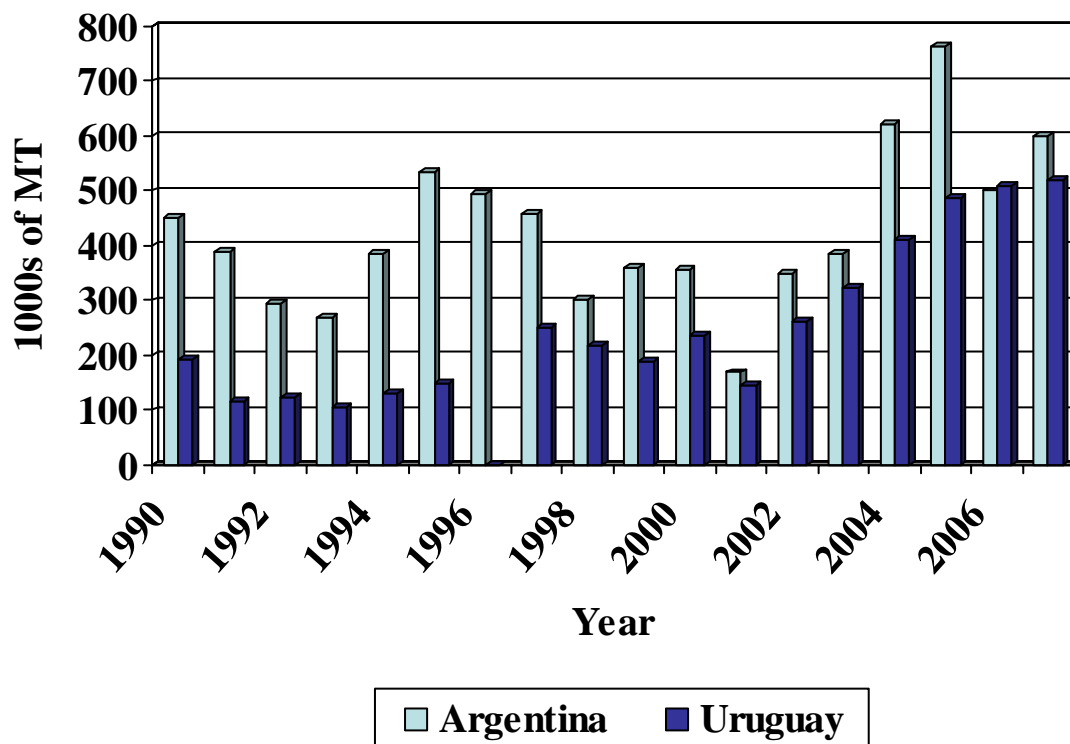
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<sup>1</sup> By contrast, US beef production is typically in the neighborhood of 11.5 – 11.8 million MT annually.

<sup>2</sup> By contrast, US beef exports to Japan at their peak were in the neighborhood of 600,000 MT annually.

<sup>3</sup> Boland, Perez, and Fox (2007) report that Uruguay was declared FMD free in 1995.

Although market conditions appear favorable for increasing exports from these countries, political issues and animal disease outbreaks may affect the ability of these markets to grow their beef exports. This is especially true for Argentina where



**Figure 1:** Beef and Veal Exports from Argentina and Uruguay, 1990-2007 project.

government policies are often designed to keep domestic beef prices low (Steiger, 2006; Thor, 2006). Work by Argentina and Uruguay to eliminate FMD has also contributed to export growth, but the re-emergence of FMD could eliminate or greatly reduce these markets (Boland, Perez, and Fox, 2007; Thor, 2006; Ekboir et al., 2002). Consequently, exogenous political risks and animal disease risks exist in these markets and should be examined when considering the possibility of investing in these markets.

Some large American food companies have had investments in the food industry of Argentina for sometime including investment in some of Argentina's largest food companies. Much of the American FDI in the food industry of Argentina is invested in food industries other than beef (USDA, ERS, 1998a). American investments in Argentina's food industry totaled slightly over \$1 billion in 1996. The total stock of American FDI for all industries in Uruguay in 2004 was reported by the Department of State to be \$533 million (U. S. Department of State, 2005) and was approximately \$11 billion in Argentina in 2003 (U. S. Trade Representative, 2005).

There appears to have been limited American FDI in the past in the beef marketing chains in Argentina and Uruguay upstream from actual food products. One notable exception to this is the recent joint venture between Tyson, Cactus Feeders, and Cresud in Argentina which is designed to provide grain-fed beef into domestic and export markets. Understanding the limiting factors relating to FDI in beef systems in Argentina and Uruguay should be helpful to potential investors considering the possibility of investing in beef systems in South America as a means for accessing the EU market. It is also important for researchers and academics to understand the incentives, risks, and barriers to FDI in these markets as total international beef trade increases and as the market share of world beef exports for Argentina and Uruguay continues to increase. This paper attempts to address some of these issues by examining profitability at different levels of the cattle marketing chain in Argentina and also price risks associated with exporting beef from Argentina and Uruguay.

## **Procedures**

Personal interviews were conducted in Argentina and Uruguay during the week of June 9, 2006 with industry participants from all levels of the marketing channel (e.g., producers, feedlot operators, and meat processors) as well as university researchers in both countries. Dr. Alejandro Reca of Rabobank International in New York City introduced the interviewers to Dr. Alejandro Silva of the Universidad de Buenos Aires. The interviews were then organized by Dr. Silva with additional help in setting up interviews being provided by Dr. Carlos Mezquita Benitez of the Universidad de la Republica, Uruguay and Dr. DeeVon Bailey of the Utah State University, USA.<sup>4</sup>

The purpose of these interviews was to familiarize the researchers with the economic environment relating to the beef systems of both countries that might contribute to their competitive advantage in international beef trade. The interviews also attempted to identify government policies and market events that might influence cattle and beef prices and thus contribute to risks associated with FDI. The interviews were undertaken in Buenos Aires and Villa Mercedes, Argentina and Montevideo, Uruguay. No set questionnaire was used during these interviews which were conducted by the researchers.

In summary, the interviews provided the blueprint for the analysis conducted in this research. From the interviews a basis for understanding the challenges and opportunities facing the beef industry in these two countries was established. This led to the selection of methodology and data used to conduct the research. The methodology included a detailed budgeting analysis of profitability at the different levels of the marketing chain to identify potentially profitable points in the chain for FDI. Also, because the interviews suggested that considerable price risk exists in Argentina and Uruguay as a result of government interventions and FMD outbreaks, an econometric analysis was conducted to quantify the potential risks associated with

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<sup>4</sup> Additional detail about who was interviewed and how the interviews were set up and conducted is available in Thor (2006).

these events (i.e., government intervention and FMD). A further discussion of the selection of methodology and a description of the data used to conduct this analysis is provided in the following paragraphs.

The interviews consisted essentially of the same questions about the market environment for the appropriate level of the marketing channel, sources of market information, government policies affecting cattle and beef prices, and other risks associated with the cattle and beef business such as animal disease outbreaks. Interview responses were recorded in written form by the researchers and were then distilled by the researchers to identify the main conclusions that could be drawn from the interviews. These conclusions used to develop a general overview of the competitive advantage of the beef industries in both countries and also the principal government policies and other events during the previous 10 years that had had major effects on the beef industry in the two countries. These policies and events were then incorporated into the price analyses used in this research to determine how they contributed to risks associated with FDI during the study period.

The interviews revealed that one of the principal difficulties associated with conducting this type of research in Argentina and Uruguay was the unavailability of publicly available data for costs and returns in the beef and cattle industry. Through the interviews we discovered that information for gross margins for different segments of the Argentine cattle industry is published monthly in a magazine called *Margenes Agropecuarios Magazine* (various 1996-2006). These estimates are reported in this study for cow/calf operations, grass fattening operations, and feedlot operations on a monthly basis between January 1995 and October 2006. These data provide some idea of the profitability existing at different stages of the beef marketing chain in Argentina and to a large degree also likely reflect conditions in Uruguay.

Although a complete set of publicly available time series data for all costs and returns in the beef systems of Argentina and Uruguay was not available, the interviews established that monthly average cattle prices were available from the Liniers Market in Buenos Aires and the INAC (Instituto Nacional de Carnes) in Uruguay. These cattle prices were analyzed using data between January 1996 and June 2006.

Information was also discovered during the interviews in Argentina and Uruguay suggesting that government policies and FMD outbreaks have likely affected cattle prices in the two countries. Combining this information (cattle prices, government policy, and FMD outbreaks) into regression models using binary variables to depict government policies and FMD outbreaks provided an estimate of the absolute impact of these events on cattle prices. The government policies considered most important by the interviewees included the unpegging of the Argentine peso to the US dollar (devaluation) in 2002, the levying of a major export tax on beef in Argentina, and the recent export moratorium imposed by the Argentine government on beef exports. The interviews also uncovered when FMD outbreaks between 1996 and 2006 had occurred in Argentina which resulted in the interruption of beef exports from that country. Because Uruguay had no FMD outbreaks during this study time period, we measured what the effect of an FMD outbreak in Argentina would have on Uruguayan cattle



prices. That is, if the much larger Argentine beef market was closed to export, one might expect this to have a positive impact on the beef market in Uruguay as importers substituted away from Argentine beef to Uruguayan beef.

An analysis of the relative impacts of these events was also completed by examining price differences between local cattle prices in Argentina and Uruguay and the Chicago Mercantile Exchange's (CME) nearby live cattle futures price (sometimes referred to as the "world" cattle price). This yielded a basis analysis for Argentina and Uruguay which described how government policies and FMD outbreaks in Argentina have affected Argentine and Uruguayan prices relative to the rest of the world. This part of the analysis (relative prices) was important because it essentially revealed the opportunity costs associated with government policies and FMD outbreaks that restricted or disrupted beef exports during the study period. The following equations were used to analyze cattle prices in Argentina, with similar equations used to analyze prices in Uruguay:

$$(1) \quad PRICE_{jt} = \lambda_0 + \lambda_1 PRICE_{jt-1} + \lambda_2 QT1_{jt} + \lambda_3 QT2_{jt} + \lambda_4 QT3_{jt} + \lambda_5 MOR_{jt} + \lambda_6 DEV_{jt} + \lambda_7 FMD_{jt} + \lambda_8 NEWDES_{jt} + \lambda_9 TAX_{jt} + \lambda_{10} RES_{jt} + \rho_{jt}$$

$$(2) \quad BASIS_{jt} = \mu_0 + \mu_1 BASIS_{jt-1} + \mu_2 QT1_{jt} + \mu_3 QT2_{jt} + \mu_4 QT3_{jt} + \mu_5 MOR_{jt} + \mu_6 DEV_{jt} + \mu_7 FMD_{jt} + \mu_8 NEWDES_{jt} + \mu_9 TAX_{jt} + \mu_{10} RES_{jt} + \sigma_{jt}$$

The  $\lambda$ s and  $\mu$ s in equations (1) and (2), respectively, were estimated parameters and  $\rho$  and  $\sigma$  are error terms.  $PRICE_{jt}$  and  $BASIS_{jt}$  represent the real, exchange-rate adjusted cattle price in Argentina during time period  $t$  in US dollars for the  $j$ th livestock type ( $j=400-420$  kg.,  $480+$  kg. in Argentina and steers, cows in Uruguay) and the basis between the real, exchange-rate adjusted cattle price in Argentina and the deflated CME price in time period  $t$ , respectively. The variables  $PRICE_{jt-1}$  and  $BASIS_{jt-1}$  were lagged dependent variables for equation (1) and (2), respectively, and would be expected to have positive parameter estimates because current price levels should be positively related to price levels in the immediate past. Prices for cattle weighing 400-420 kg. represented primarily animals going to the domestic market in Argentina while those weighing over 480 kg. were similar to cattle that would eventually be exported as meat. Steers and cows in Uruguay represent markets for muscle meat and hamburger, respectively.

The three variables  $QT1$ ,  $QT2$ ,  $QT3$  were quarterly dummy variables and were used to correct for seasonality in the dependent variables in Argentina and Uruguay. The fourth quarter was used as the base. Typically one would expect prices to be highest in the spring ( $QT3$ ) compared to the summer ( $QT4$ ) because of the seasonal availability of cattle.  $MOR$  was a binary variable equal to one during the period of the export moratorium and zero otherwise.  $MOR$  would be expected to have a negative parameter estimate because restricting exports should reduce domestic cattle prices. At the time the personal interviews were conducted, a moratorium on beef exports had been in

place for four months and was thought by interviewees to be negatively affecting all parts of the cattle business in Argentina.

*DEV* was a binary variable describing the impact on cattle prices and the basis resulting from the devaluation in Argentina's currency in 2002. This was when the Argentine government decided to unpeg the one-to-one ratio between the peso and the US dollar. *DEV* was set equal to one following this devaluation and was zero otherwise. *DEV* would be expected to have a negative parameter estimate, especially for the basis equation, because after the devaluation domestic prices in Argentina should have declined relative to prices in the US.

The binary variable for *FMD* was equal to one when the EU market was closed to Argentine beef exports as a result of an FMD outbreak in Argentina. *FMD* was expected to have a negative parameter estimate for the Argentina model because a cessation in trade would be expected to result in lower domestic prices for exporters. However, *FMD*<sup>5</sup> was expected to have a positive parameter estimate for the Uruguay model because a cessation of beef exports from Argentina would be expected to enhance the demand for Uruguayan beef. In this respect, *FMD* in the Uruguay model becomes a proxy for the effect on Uruguayan prices of events in Argentina that either stopped or hindered Argentine beef exports.

In 2005, Argentina tripled export taxes on domestic beef exporters. *TAX* is a binary variable that estimates the effect this tax had on cattle prices. *TAX* was equal to one during the period the tax was in force and zero otherwise. *TAX* was expected to have a negative parameter estimate because an export tax is expected to reduce the amount of beef exported and, hence, domestic cattle prices. *NEWDES* was a binary variable used to account for changes in reported weights at the Liniers market during the study period and had no *a priori* expectation relating to the sign of its parameter estimate. *NEWDES* was equal to one for cattle reported as weighing 430-460 kg. and zero for cattle reported as weighing 401-420 kg. The final variable, *RES*, represented the residuals of the cattle price or basis time series off a linear trend line. This captured the effects of systematic rises and falls in cattle prices in Argentina and Uruguay due to cattle cycles. *RES* was expected to have a positive parameter estimate because prices above the trend line had a positive value for *RES* while prices below the trend line yielded a negative value for *RES*.

Finally, Johansen's (1991) cointegration tests were used to determine whether cattle prices in Argentina were cointegrated with US cattle prices. The analysis was then repeated for Uruguayan and US cattle prices. For a thorough discussion of cointegration methodology applied to agribusiness price analysis see Vickner and Davies (2000 and 2002). If the prices were cointegrated, it indicated that the prices in both pairs of markets adjust to the same information and that the markets are relatively efficient (if one considers the US cattle market price to be efficient). Efficient

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<sup>5</sup> Because Uruguay was FMD free during the study period, *FMD* in the Uruguay model examined the impact on Uruguayan prices of export cessations from Argentina resulting from FMD outbreaks.

markets are essential for one to have confidence that the market reacts appropriately and quickly to new information as it becomes available. The existence of inefficient markets would be a very negative signal for FDI because investors could not be certain that prices would adjust to actual supply and demand conditions. The vector error correction (VEC) model used to determine whether the Argentina or Uruguay price ( $P_1$ ) is cointegrated with the US price ( $P_2$ ) is given by a typical specification:

$$(3) \quad \Delta P_{1t} = \alpha_{10} + \alpha_{11} \Delta P_{1t-1} + \alpha_{12} \Delta P_{1t-2} + \beta_{11} \Delta P_{2t-1} + \beta_{12} \Delta P_{2t-2} \\ + \phi_1 (P_{1t-1} - \delta - \gamma P_{2t-1}) + \varepsilon_{1t}$$

$$(4) \quad \Delta P_{2t} = \alpha_{20} + \alpha_{21} \Delta P_{1t-1} + \alpha_{22} \Delta P_{1t-2} + \beta_{21} \Delta P_{2t-1} + \beta_{22} \Delta P_{2t-2} \\ + \phi_2 (P_{1t-1} - \delta - \gamma P_{2t-1}) + \varepsilon_{2t}$$

where the unknown parameters will be estimated using maximum likelihood methods. It is easily observed that the VEC is simply a vector autoregressive (VAR) model with an additional term  $P_{1t-1} - \delta - \gamma P_{2t-1}$  (i.e., the cointegrating relationship). The VAR expresses changes in price at time  $t$  as a function of both own and related price changes in earlier time periods ( $t-1$  and  $t-2$  specifically). The  $\alpha$  and  $\beta$  parameters capture these effects in the VAR portion of the VEC. The cointegrating relationship  $P_{1t-1} - \delta - \gamma P_{2t-1}$  relates the level of prices, not changes in price levels, in the last period. Both  $\delta$  and  $\gamma$  are common across (3) and (4). The key parameter here is  $\gamma$  since it characterizes the long-term relationship between the Argentine or Uruguayan cattle price ( $P_1$ ) and the US cattle price ( $P_2$ ). *A priori* we expect  $\gamma < 0$  since the two series move opposite one another when plotted. The remaining  $\phi$  parameters are the well-known speeds of adjustment. They characterize the length of time ( $P_1$ ) and ( $P_2$ ) take to get back into equilibrium in the short-run if the system experiences some kind of shock or disturbance to the long-run equilibrium path.

The following section relates the results of the profit and price analyses. The results indicate that profit potential exists for strategic FDI in the beef systems of these countries, but that this depends on the strategic business arrangements developed and the absence of government policies interfering with free trade.

## Results

### *General Overview of Potential Competitive Advantage*

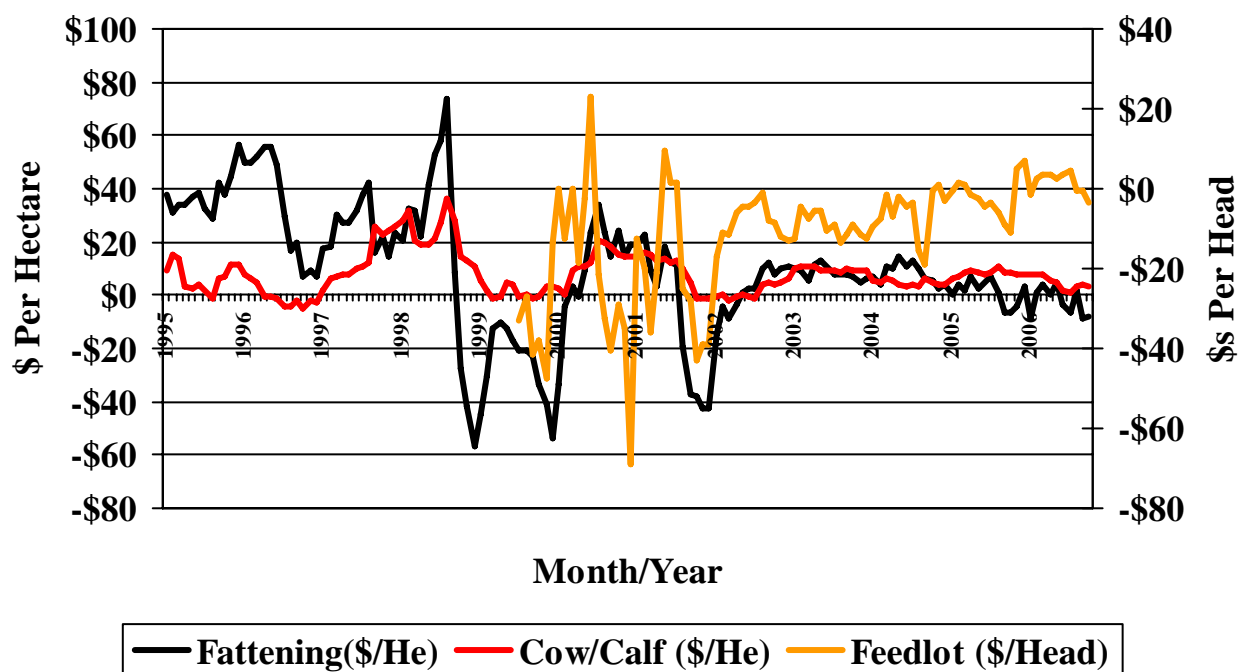
The interviews suggested that both Argentina and Uruguay have a competitive advantage in producing cattle and beef, but both countries also face significant problems relating to expanding beef exports. For example, both Argentina and Uruguay have strong domestic demand for beef as well as growing export markets. However, Argentina has a larger land and grain production base than Uruguay and, consequently, could support a cattle feeding industry more easily than Uruguay. Both countries have specialized work forces and good infrastructures that support the beef industry. While both countries have governments that are strongly committed to their

respective beef industries, Argentina often experiences governmental interference in its cattle and beef markets. On the other hand, the government of Uruguay promotes transparent and export-oriented markets and marketing strategies.

Both countries are well-engineered for producing beef. However, Argentina's beef market faces considerable risk resulting from the threat of FMD and also governmental policies which are not conducive for the international beef trade. Uruguay has a strong commitment to the international beef trade, but lacks the land base and grain production to significantly increase its export base. These conditions suggest that both countries have significant opportunities and barriers that could affect the growth in their beef export markets. Consequently, investors need to consider institutional influences beyond just costs of production and transportation costs when examining the possibility for FDI in the beef industries of these two countries.

### *Budgeting Analysis of Historical Profitability*

Based on average profitability reported in *Margenes Agropecuarios Magazine* (various 1996-2006) between 1996 and 2006, cow/calf operations (mean \$7.92/hectare and standard deviation \$7.73/hectare) and grass fattening (mean \$9.30/hectare standard deviation \$24.06/hectare) have positive average returns while feedlots (mean -\$11.20/head and standard deviation \$15.03/head) have negative average returns. Returns are obviously cyclic, as would be expected, because of the substantial biological lag associated with cattle production (Figure 2).



**Figure 2:** Exchange Rate-Adjusted Profitability for Different Segments of the Cattle Marketing Chain in Argentina Reported in US Dollars, January 1995 – October 2006.

Returns for grass-based operations are consistently positive (75% of the months for grass fattening and 84% of the months for cow/calf operations). Feedlot operations were profitable for only 17% of the months between 2000 and 2006. However, profitability in feedlots has been consistently improving since 2002 (Figure 2). These figures are also consistent with Silva's (2003) point estimates for profitability at the different stages of production in the beef marketing chain in Argentina. Because the data include a charge for land, the results are essentially an estimate of economic profit. They also reflect statistically speaking that economic profits are basically zero or normal. This suggests that markets are competitive at these three levels and as such may not represent significant opportunities for FDI as far as generating higher than normal profits.

Although returns are statistically zero for all three of these levels of the marketing chain, a discussion of the cost structure of the cattle industry at each stage of the marketing chain may be instructive as far as understanding the relative variability in returns at the three different levels. Cow/calf operations in these countries rely on few inputs other than land. In this sense, the cow/calf sector is a "closed system" in this part of South America that buys few inputs on the market (purchased inputs include sanitary products, labor, professional services, and tax services). Short-run exogenous shocks have limited direct effect on profit due to the long production cycle (15-16 months for calves and 33-35 months for cows).

Profits in grass fattening operations depend heavily on the purchase price for calves being placed on grass for fattening. For example, according to Silva (2003) if the ratio of calf price and steer prices exceeds 1.20, profit tends to be negative (the average ratio was 1.07 between 1990 and 2000). The price of calves represents about 61% of total cost for grass fattening operations, according to information reported in *Márgenes Agropecuarios Magazine* (2006).

Feedlots are more "open" systems than cow/calf or grass fattening operations and their profits are heavily influenced by short-run exogenous shocks due to the relatively short production cycle for feedlots (113 days/cycle on the average). Examples of potential exogenous shocks include such things as the prices of feeder cattle, grains, energy, and finished cattle. Short-run prices, of course, are also influenced by government policies and animal disease outbreaks. Pearcey (1999) suggests that feedlots in Argentina and elsewhere have high fixed costs due to investments in machinery and equipment. Consequently, capacity utilization is an important driver of profitability for feedlots.

Grass feeding cattle is the most efficient method of rearing cattle in Argentina, both in energy and economic terms (Silva, 2003), so it is not surprising that the results indicate that positive profits usually exist for the cow/calf and grass fattening segments, and negative profits for the feedlots.<sup>6</sup> If one accounts for the increase of energy prices by the

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<sup>6</sup> It should be noted that there were only 88 point estimates for feedlots and 142 for cow/calf and grass fattening segments.

previous Argentine administration (2002) and present administration (2003)<sup>7</sup>, the profit figures depicted in Figure 2 can be easily explained. Most grass fattening operations are diversified meaning that they are also cropping operations where cattle are considered a low-risk sideline investment but not the primary source of income for the operation (Silva, 2006).

Conditions in the meat packing and exporting industries were also considered. The overall four-firm concentration ratio (CR4) for meat packing in Argentina is only 9% and the Herfindahl-Hirschman Index (HHI) is 248 (Silva, 2003). This compares to the CR4 in the US of 80% (Barkema, Drabenstott, and Novack, 2001) and for Australia of 29% (CICCRA, 2004). The US Department of Justice estimated a HHI for the US of 1936 (Barkema, Drabenstott, and Novack, 2001). The Hilton Quota market in Argentina has a CR4<sup>8</sup> of 40% and a HHI of 653, showing greater concentration in exporting than in meat packing. Low concentration in meat packing suggests a relatively competitive market at that level. Exporting appears to be a less competitive market than meat packing. However, exporting plants have been systematically increasing their profit margins, due to extraordinarily high prices in the international market. The signals revealing that exporting firms expect to achieve important profits are the acquisition of local exporting firms by transnational corporations such as Cargill (US), Friboi (Brazil) and Tesco (UK) (Silva, 2006).

A point estimate of profitability in the packing industry for domestic and exported beef is provided in Table 1.<sup>9</sup> Silva (2006) believes that this point estimate is fairly representative of typical conditions in the packing industry in Argentina. The results presented in Table 1 indicate that the packing industry in Argentina is profitable. However, the results also indicate that exported beef has a higher profit margin than domestic beef. The reason for this is the value of the Hilton Quota in exporting to the EU.

The growth in beef imports expected in the EU might lead one to speculate that over time there will be increased incentives offered by the EU to beef importers. If so, then meat packing for export would appear to be an increasingly attractive investment over time. The results related to meat packing, qualified by the fact that they are based on a point estimate, support the notion that FDI will be drawn to the packing and export sectors. This conclusion would appear to be supported by the recent investments in beef exporting in Argentina by transnational companies.

Uruguay lacks the large amount of agricultural land existing in Argentina and is also energy dependent on imports. Consequently, Uruguay is committed to beef cattle production and forestry because exports industries are viewed as the main drivers for national development in Uruguay. The most important barrier to further FDI in

<sup>7</sup> The prices of energy have been heavily regulated in Argentina since the devaluation in 2002.

<sup>8</sup> CR4 and HHI as reported here were estimated in March 2007 using export quantities for the Hilton Quota in 2003.

<sup>9</sup> The results presented in this study are valid for the time period considered and for conditions during the period for when point estimates were made. Additional research that incorporated a time series for export and domestic packing industries would be appropriate in another study.

**Table 1:** Point Estimate of Relative Marketing Margins for Domestic and Exported Meat FOB Packing Plant, Argentina.

Calculation of Export Carcass Cut-Out Value: <sup>1</sup>						
Carcass Weight (kg.)	Primal Cut	%	Weight (kg.)	Beef Yield (kg.)	By Products Fat & Bone (kg.)	Price <sup>2</sup> (US \$/kg.)
278	Pecho (Chest)	36	100	68	32	\$2.32
	Parrillero (Grill)	14	38.92	35	3.92	\$2.32
	Rump & Loin	21	58.38	35.71	22.67	\$7.97
	Rueda	26	72.28	49.71	22.57	\$2.32
	Shrinkage	3	8.34			
	Weight Average					\$3.38

**Relative Marketing Margin for Export Meat Packing Plants As of April 6, 2007 (RMM):<sup>3</sup>**

Live Price for 480 kg. Steer	\$1 US/kg
Export Packer Price FOB <sup>4</sup>	\$3.38 US/kg
RMM	70%

**Relative Marketing Margin for Domestic Consumption RMM<sup>3</sup>**

Live Price for 420 kg. Steer	\$1 US/kg
Meat Packer Wholesale Price <sup>5</sup>	\$1.72 US \$/kg. (Sold on a carcass basis)
RMM	42%
Retailer Price <sup>6</sup>	\$2.60 US \$/kg (deboned carcass basis)
RMM	34%

<sup>1</sup> Technical information for calculating weights for cuts taken from Iriarte (2003).

<sup>2</sup> Includes just the revenue from beef, not from by products.

<sup>3</sup> RMM= (Sales Price – Purchase Price)/Sales Price [Relative Marketing Margin]. Export Prices for EU Hilton Quota: \$7,970 \$/MT and other fresh cuts 2,320 \$/MT

<sup>4</sup> The slaughter service (toll) is paid from the revenue from by products sold by the meat packing plant. The user of the service receives the carcass cut in halves with no cash costs beyond this.

<sup>5</sup> Average price for a kg. of beef in the carcass with an average yield of 58% from live weight.

<sup>6</sup> Average price for a kg. of beef sold over the counter with an average yield of 81.88 % from carcass weight.

Uruguay is the limited cattle herd and unavailability of additional land for cattle production. In the future there may be increasing cooperation between Uruguay and Argentina such as expanding the packing industry in Uruguay and slaughtering an increasing number of cattle from Argentina. Grain costs are lower in Argentina than in Uruguay, due to its relative abundance of land and infrastructure. Uruguay is closer to Buenos Aires or Rosario than many of the major cattle producing provinces in western, southern and northern Argentina (Silva, 2006). These factors would seem to indicate that incentives exist for Argentina and Uruguay to establish cooperation in developing cattle markets.

*Econometric Analysis of the Impact of Government Interventions and FMD Outbreaks*

The price analysis results are presented in Tables 2-5. The signs for the parameter estimates were those expected for almost all of the independent variables. The discussion in this section will focus on the variables of most interest (i.e., government

intervention and FMD). The analysis revealed that the impact of government policies and FMD outbreaks can have a substantial negative impact on absolute cattle prices in Argentina, but that the impact is even larger on relative prices as measured by the basis (see parameter estimates for *MOR*, *FMD*, *DEV*, and *TAX* in Tables 2 and 3).

**Table 2:** Price Regression Analysis Results for Argentina.

401/420 Price	Parameter Estimate	Standard Error	R <sup>2</sup>	480+ Price	Parameter Estimate	Standard Error	R <sup>2</sup>
<i>INTERCEPT</i>	8.965**	2.003	0.984	<i>INTERCEPT</i>	9.455**	1.978	0.981
<i>PRICE<sub>t-1</sub></i>	0.827**	0.042		<i>PRICE<sub>t-1</sub></i>	0.801**	0.043	
<i>Q1</i>	0.065	0.441		<i>Q1</i>	0.317	0.433	
<i>Q2</i>	-0.101	0.442		<i>Q2</i>	0.134	0.436	
<i>Q3</i>	-0.367	0.440		<i>Q3</i>	-0.033	0.436	
<i>MOR</i>	-0.828	1.496		<i>MOR</i>	-0.897	1.475	
<i>DEV</i>	-1.198	0.854		<i>DEV</i>	-1.278	0.790	
<i>FMD</i>	-2.952**	0.728		<i>FMD</i>	-3.026**	0.686	
<i>NEWDES</i>	-0.871	1.321		<i>NEWDES</i>	-0.953	1.304	
<i>TAX</i>	-1.585**	0.709		<i>TAX</i>	-1.777**	0.688	
<i>RES</i>	0.252**	0.050		<i>RES</i>	0.291**	0.051	

\*\*Statistically significant at the 5% level.

**Table 3:** Basis Regression Analysis Results for Argentina

401/420 Basis	Parameter Estimate	Standard Error	R <sup>2</sup>	480+ Basis	Parameter Estimate	Standard Error	R <sup>2</sup>
<i>INTERCEPT</i>	-6.046**	1.356	0.970	<i>INTERCEPT</i>	-8.087**	1.406	0.968
<i>BASIS<sub>t-1</sub></i>	0.608**	0.048		<i>BASIS<sub>t-1</sub></i>	0.575**	0.048	
<i>Q1</i>	0.847	0.719		<i>Q1</i>	1.017	0.694	
<i>Q2</i>	0.461	0.742		<i>Q2</i>	0.499	0.722	
<i>Q3</i>	-0.431	0.739		<i>Q3</i>	-0.530	0.723	
<i>MOR</i>	-1.436	2.480		<i>MOR</i>	-1.598	2.395	
<i>DEV</i>	-3.797**	1.270		<i>DEV</i>	-3.930**	1.161	
<i>FMD</i>	-7.018**	1.101		<i>FMD</i>	-6.942**	1.019	
<i>NEWDES</i>	-1.146	2.163		<i>NEWDES</i>	-1.547	2.092	
<i>TAX</i>	-4.743**	1.146		<i>TAX</i>	-4.902**	1.090	
<i>RES</i>	0.533**	0.062		<i>RES</i>	0.601**	0.061	

\*\*Statistically significant at the 5% level.

**Table 4:** Price Regression Analysis Results for Uruguay

Steer Price	Parameter Estimate	Standard Error	R <sup>2</sup>	Cow Price	Parameter Estimate	Standard Error	R <sup>2</sup>
<i>INTERCEPT</i>	-1.218**	0.583	0.984	<i>INTERCEPT</i>	-0.900	0.477	0.985
<i>PRICE<sub>t-1</sub></i>	0.970**	0.014		<i>PRICE<sub>t-1</sub></i>	0.973**	0.014	
<i>Q1</i>	1.573**	0.418		<i>Q1</i>	0.909**	0.336	
<i>Q2</i>	1.293**	0.414		<i>Q2</i>	0.832**	0.336	
<i>Q3</i>	2.222**	0.426		<i>Q3</i>	1.970**	0.338	
<i>FMD</i>	0.735	0.374		<i>FMD</i>	0.576	0.298	
<i>RES</i>	0.110**	0.037		<i>RES</i>	0.096**	0.035	

\*\*Statistically significant at the 5% level.



**Table 5:** Basis Regression Analysis Results for Uruguay.

Steer Basis	Parameter Estimate	Standard Error	R <sup>2</sup>	Cow Basis	Parameter Estimate	Standard Error	R <sup>2</sup>
<i>INTERCEPT</i>	-4.952**	1.328	0.951	<i>INTERCEPT</i>	-5.518**	1.519	0.938
<i>BASIS<sub>t-1</sub></i>	0.935**	0.024		<i>BASIS<sub>t-1</sub></i>	0.919**	0.028	
<i>Q1</i>	1.943**	0.922		<i>Q1</i>	1.348	0.888	
<i>Q2</i>	2.063**	0.921		<i>Q2</i>	1.707	0.881	
<i>Q3</i>	1.183	0.966		<i>Q3</i>	1.015	0.915	
<i>FMD</i>	0.988	0.810		<i>FMD</i>	0.853	0.772	
<i>RES</i>	0.245**	0.063		<i>RES</i>	0.267**	0.065	

\*\*Statistically significant at the 5% level.

For example, the average real, exchange-rate adjusted price for 480+ kg. cattle at the Liniers auction during the study period was approximately \$33/cwt. ( \$0.73/kg.). The average impact of a *FMD* outbreak on domestic (relative) prices was -\$3.03/cwt. (-\$6.94/cwt.), all other things being equal (Tables 2 and 3). This suggests a loss of 9% (21%) in the value of domestic live cattle that were sold during an FMD outbreak. This would be in addition to losses in the export market. For example, in 2006 Argentina exported approximately 500,000 MT of beef. The cessation of exports, if an FMD outbreak had been experienced during the entirety of 2006, would have been foregone income from exports of almost \$1.7 billion (\$3.38/kg.<sup>10</sup> \* 1000 kg. \* 500,000 MT). This would be in addition to losses experienced on live cattle sold domestically during that same time period. Consequently, the combined losses from cattle sales and lost exports would be much higher.<sup>11</sup> There are obviously huge incentives to avoid FMD outbreaks and this explains why so much effort has been made to eliminate FMD in Argentina and Uruguay.

A similar analysis could be conducted for the export tax (*TAX*). Based on the parameter estimate in Table 3, *TAX* would have resulted during the taxation period in reducing values for domestic cattle in Argentina relative to the rest of the world by approximately \$23.52/head (\$4.90/cwt. \* 4.8 cwt.). The Argentine devaluation in 2002, while likely being an appropriate government policy, resulted in a drop in the relative price of cattle in Argentina of approximately \$18.86/head (\$3.93/cwt.<sup>12</sup> \* 4.8 cwt.). The result of *DEV* was to make Argentine beef cheaper on world markets and exports from Argentina did increase after 2002 (Figure 2). The result of the devaluation was a stimulation of beef exports. This appears to run counter to government policies in Argentina that are often designed to eliminate or reduce beef exports as a method to keep domestic beef prices low. Consequently, subsequent government policies such as *TAX* and *MOR* may have been an attempt to counter the effects of the devaluation.

Government actions designed to keep beef prices low eliminated or significantly reduced the ability of exporters to participate in world trade when world prices were

<sup>10</sup> See Table 1 for explanation of export value (i.e., \$3.38/kg.).

<sup>11</sup> The cattle inventory of Argentina is over 50 million head (USDA, ERS, 1998b). If only 20% of these went to market each year, this could result in a potential loss of another \$145 million (\$3.03/cwt. \* 4.8 cwt. \* 10 million head.)

<sup>12</sup> See Table 3.

relatively high (i.e., the basis with world prices becomes weaker when world prices increase). Consequently, government involvement represents a significant risk to FDI in beef systems, especially in Argentina. This is much less of a problem in Uruguay where government policy is designed to promote beef exports. The effect of *MOR* in Argentina was negative but not statistically significant (Tables 2 and 3). The reason for this may be that the moratorium had been in place for only four months at the time the analysis was completed and this may have been an insufficient amount of time to establish the impact of *MOR* statistically.

No governmental policy variables were included in the models for Uruguay because the Uruguayan government had not implemented such policies during the study period (see Tables 3 and 4). However, *FMD* was included in the Uruguayan models essentially as a proxy for events in Argentina affecting Argentine beef exports and which might then have affected the Uruguayan cattle market indirectly. The parameter estimates for *FMD* in Tables 3 and 4 are positive as expected, but are not statistically significant. This would suggest that there is not strong statistical evidence that a cessation or reduction of beef exports from Argentina affects cattle prices in Uruguay. The reasons for this are likely the relatively small size of the Uruguayan market compared to Argentina and the fact that Uruguay faces significant barriers to increasing exports substantially in the short run.

There was not a statistically significant seasonal component to either prices or basis for Argentina (*Q1*, *Q2*, and *Q3* in Tables 2 and 3), but seasonality was indicated for steers in Uruguay, but not for cows (Tables 4 and 5). This should not be surprising because the price of cows is likely less influenced by world prices than the price of steers (steer meat would be more frequently traded in world markets). Cattle cycles had a strong influence on both prices and the basis in both countries (see *RES* in Tables 2-5). That is, when domestic cattle numbers are relatively low (high) prices tend to be higher (lower) resulting in an improving (weakening) basis with world prices.

These results indicate that a significant amount of risk is present in the cattle market in Argentina as a result of government policies and FMD outbreaks.<sup>13</sup> This analysis provides estimates of the negative impacts caused by these events. The impacts are of sufficient magnitude that investors should consider the probability of such events occurring when considering investment strategies in Argentina.

### *Cointegration Tests*

In Table 6, we found the Argentina price to be cointegrated with the US price, and the Uruguay price to be cointegrated with the US price.<sup>14</sup> This is a robust result as

<sup>13</sup> The results are, of course, qualified by the time period of the analysis (1996-2006), but should represent a long enough period to present a fairly accurate picture of the impact of government interventions and animal disease outbreaks.

<sup>14</sup> Due to page limitations, full model results, including parameter estimates in each VEC model and results from the battery of ADF tests and related specification tests, are available upon request from the authors.

**Table 6:** Johansen Cointegration Test Results for Argentina and Uruguay.

*401/420 kg. in Argentina and US CME*

Hypothesis	Likelihood Ratio Statistic	5% Critical Value	P-value	Eigenvalue
Trace				
$r = 0$	28.2357	15.4947	0.0004	0.2381
$r \leq 1$	1.0359	3.8414	0.3088	0.0103
Max-Eigen				
$r = 0$	27.1998	14.2646	0.0003	0.2381
$r \leq 1$	1.0359	3.8414	0.3088	0.0103

*480+ in Argentina and US CME*

Hypothesis	Likelihood Ratio Statistic	5% Critical Value	P-value	Eigenvalue
Trace				
$r = 0$	27.5846	15.4947	0.0005	0.2305
$r \leq 1$	1.3732	3.8414	0.2412	0.0136
Max-Eigen				
$r = 0$	26.2113	14.2646	0.0004	0.2305
$r \leq 1$	1.3732	3.8414	0.2412	0.0136

*Uruguay Steer and US CME*

Hypothesis	Likelihood Ratio Statistic	5% Critical Value	P-value	Eigenvalue
Trace				
$r = 0$	29.2838	15.4647	0.0002	0.2429
$r \leq 1$	1.4495	3.8414	0.2286	0.0143
Max-Eigen				
$r = 0$	27.8343	14.2646	0.0002	0.2429
$r \leq 1$	1.4495	3.8414	0.2286	0.0143

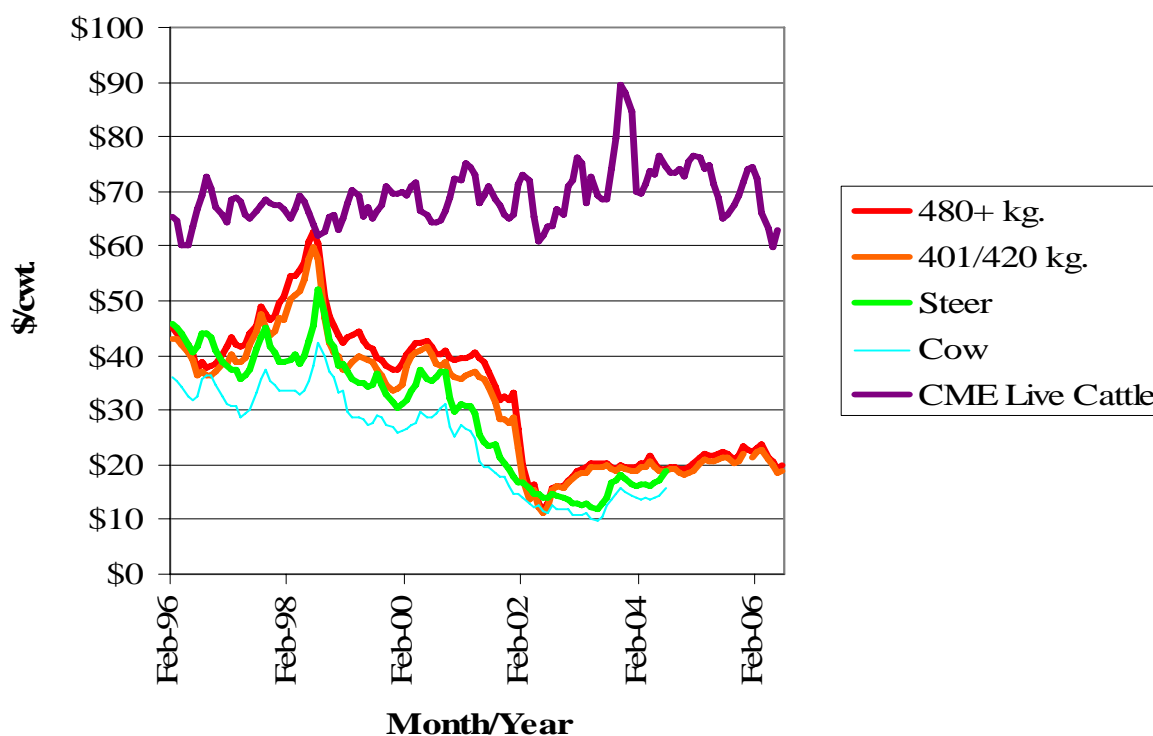
*Uruguay Cow and US CME*

Hypothesis	Likelihood Ratio Statistic	5% Critical Value	P-value	Eigenvalue
Trace				
$r = 0$	27.8883	15.4947	0.0004	0.2346
$r \leq 1$	1.1445	3.8414	0.2847	0.0113
Max-Eigen				
$r = 0$	26.7437	14.2646	0.0003	0.2346
$r \leq 1$	1.1445	3.8414	0.2847	0.0113

it persists using both the trace and eigenvalue likelihood ratio tests for each respective pair of price series. In each case, we rejected the null hypothesis of no cointegrating vector. That is to say under the null hypothesis  $r = 0$ , where  $r$  is the number of cointegrating vectors in the system, we strongly reject this hypothesis. It is noted  $r$  can be at most one minus the number of price series in the model. In this study, then  $r$  can be at most one. For this test, we failed to reject the null hypothesis of at most one cointegrating vector ( $r \leq 1$ ), again in each case. Thus, each pair of prices was

cointegrated indicating that the time series are reacting to the same market information and are therefore essentially the same efficient market. Further, these price series are negatively cointegrated ( $\gamma < 0$ ) as expected a priori. This implies that the series tend to react to the same market information but move in opposite directions.

For example, if market conditions tend to move the world price higher, local prices tend to move lower. This pattern is visually evident when plotting the respective pairs of prices (Figure 3). This could be explained by government interventions designed to keep local prices low when world prices increase. This result suggests that government policies of the past have provided at least some disincentive to invest in beef exporting from Argentina because exporters are unable to fully participate in world markets when prices are high.



**Figure 3:** Real, Exchange-Rate Adjusted Cattle Prices in the United States, Argentina, and Uruguay, 1996-2006.

This result suggests that governmental policy needs to align with corporate objectives to encourage FDI in the beef industry in South America. This does not necessarily mean that exporting from these countries is unprofitable because apparently it is a profitable venture as the profitability analysis, especially for meat packing provided above, demonstrates. However, profits appear to be limited from time to time by different governmental actions and FMD outbreaks.

## Conclusions

The expected growth in beef imports in the EU and the fact that North American beef exports are essentially shut out of the EU market provides significant incentives for finding alternative ways for exporting beef to the EU. This research examines the profit potential for FDI in the beef systems of Argentina and Uruguay by investors from places like North America so that they can become involved in exporting beef to the EU. Interviews with industry experts in Argentina and Uruguay established the foundation for this analysis and resulted in the selection of historical budgeting and econometric models being used as the basis for examining this question.

The findings suggest that while Argentina and Uruguay have a competitive advantage in beef production that should provide incentives for FDI in their beef systems, the potential for government policy interventions in cattle and beef markets (especially in Argentina) and FMD outbreaks inject considerable risk into these investments. FDI opportunities appear to be primarily at the export packer level rather than in raising cattle. Joint ventures by export packers and feedlots (i.e., Tyson, Cactus Feeders, and Cresud) and the expansion of the number of feedlots in Argentina suggest FDI strategies involving export packers are being positioned to enhance the quality of meat being both exported and sold domestically. Entrée to the export market appears to be a critical element of the FDI decision in Argentina and Uruguay and explains the current joint venture and FDI strategies being pursued by international firms investing in the beef systems of these two countries.

Cattle markets in Argentina and Uruguay appear to operate efficiently, based on the cointegration analysis, but government intervention that restricts or eliminates beef exports results in lower domestic cattle prices than if beef exports were allowed to flow in an unrestricted fashion. Profitable FDI appears possible, especially in beef exporting, if markets are left unhindered by government intervention. During the next decade, beef exporters can hardly ignore the export potential that exists into the EU. Restrictions on beef exports with added hormones coupled with additional requirements such as traceability make South America and specifically Argentina and Uruguay apparent targets for FDI by beef exporters. Some investment is occurring and is almost certainly being driven by the opportunities looming in the EU. However, the growth in FDI for beef exporting from Argentina and Uruguay is still relatively small but will likely continue to grow. However, this growth will probably occur more slowly than one might otherwise expect because of limitations inflicted on the beef export market by government policies in Argentina and limited expansion capability for beef in Uruguay.

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## **EU-China Agricultural Trade in Relation to China's WTO Membership**

Jyrki Niemi<sup>a</sup> and Ellen Huan-Niemi<sup>b</sup> 

<sup>a</sup> *Professor, MTT Economic Research, Agrifood Research Finland,  
Luutnantintie 13, FI-00410 Helsinki, Finland*

<sup>b</sup> *Researcher, MTT Economic Research, Agrifood Research Finland,  
Luutnantintie 13, FI-00410 Helsinki, Finland*

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### **Abstract**

China's trade with the world doubled after joining the WTO. This study attempts to identify and measure quantitatively the effects of changing economic environment and trade policies on China's global agricultural imports as well as imports from the EU. The approach is to model behavioral relationships in the agricultural trade between China and the EU by using annual trade data from 1986 to 2005. The results indicate that Chinese agricultural imports are relatively inelastic to absolute price changes, but relative price changes significantly affect the market shares of EU exports due to price competition. Trade liberalization in the form of tariff reductions is trivial in changing the quantity of China's agricultural imports from the EU. Rapid income growth has fuelled most of China's increased appetite for imported agricultural products.

**Keywords:** China, EU, WTO, agricultural imports, income, tariff, price, model

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<sup>①</sup>Corresponding author: Tel: + 358-09-56086314  
Email: [ellen.huan-niemi@mtt.fi](mailto:ellen.huan-niemi@mtt.fi)  
Other contact information: J. Niemi: [jyrki.niemi@mtt.fi](mailto:jyrki.niemi@mtt.fi)

## **Introduction**

The economic emergence of the world's most populous nation is having a mesmerizing effect on exporters from the western world. China is on course to overtake Germany as the third largest economy in the world, just behind the United States (US) and Japan. China is turning into one of the world's largest and most lucrative food markets. As the incomes of China's 1.3 billion people and urbanization rates continue to rise, demand for quality, health and environment conscious food products will escalate. Domestic production will eventually be unable to meet the exponential growth in demand due to rising food consumption, marked changes in the composition of diets and continued stress on China's natural resources due to water scarcity and land degradation.

China's economic performance has been remarkable since the process of economic liberalization began in 1979. China's gross domestic product (GDP) has increased more than ten fold with an average growth rate of over 9% a year in real terms. China has made a major effort to open up to world trade over the past decades by gradually reducing tariffs and non-tariff barriers, reforming its currency and developing its trade and legal system. China's integration into the globalizing economy accelerated after its entry into the World Trade Organization (WTO) in December 2001. According to studies done by the World Bank (Ianchovichina et al. 2003) and Carnegie Endowment (He Jianwu et al. 2007), WTO accession has generally benefited China's economy. World's trade with China has doubled from 2001 to 2005 with China's foreign trade rising above one trillion euros, making China the world's third-largest trading nation after the United States and Germany.

Previously, China had been a significant net exporter of agricultural products, but since 2003 the imports of agricultural products have exceeded exports. China is now a major net importer of agricultural products. The Chinese food market is considered as one of the most dynamic and promising food markets for EU agricultural exports. Given China's enormous size and catch-up potential, Zhi Wang (1997) and Colby et al. (2000) indicated that freer trade after China's WTO accession would substantially expand Chinese demand for food products. Schmidhuber (2001) argued that sharp tariff reductions will make EU exports competitive in China's market not only on quality basis but also in price, thus stimulating consumer demand for imported goods. China's middle class is expected to number 150 million by 2010. This means new opportunities for EU exporters in the growing processed and high-value food market, mainly in busy urban areas because of convenience, healthier choices, variation and quality. The Chinese market for high-value consumer goods is estimated to be worth 1 trillion euros by 2010 (DG Trade 2007a).

This paper examines China's agricultural imports in regard to income growth, import price changes, and tariff reductions due to China's trade liberalization. Many studies<sup>1</sup> have estimated the effect of trade policy on agriculture with aggregated commodities, but this paper examines the effect of trade liberalization on specific food products: frozen pigmeat, frozen fish, whey, barley, beer, and wine. More specifically, this paper attempts to model behavioral relationships in the agricultural trade between China and the EU by considering three issues in detail. The first is the long-term relationship between the growth rate of agricultural imports and the rate of income growth in China. The second issue concerns the effects of tariff reductions on China's agricultural imports from the EU and globally. The third issue concerns EU exporters' capacity to influence their market shares. This depends on product heterogeneity, which would suggest that EU can alter China's agricultural imports from the EU through relative-price changes.

The paper is divided into three main parts. First, the general trends and patterns of the agricultural trade between China and the EU countries are examined. Then, demand functions for China's agricultural imports from the EU and globally are estimated by applying a theory-based, dynamic econometric modelling framework and using a sample of annual data that cover EU exports to China from 1986 to 2005 for selected agricultural products. Finally, the estimated functions are used to examine the impacts of China's income growth and tariff reductions on China's agricultural imports from the world and the EU.

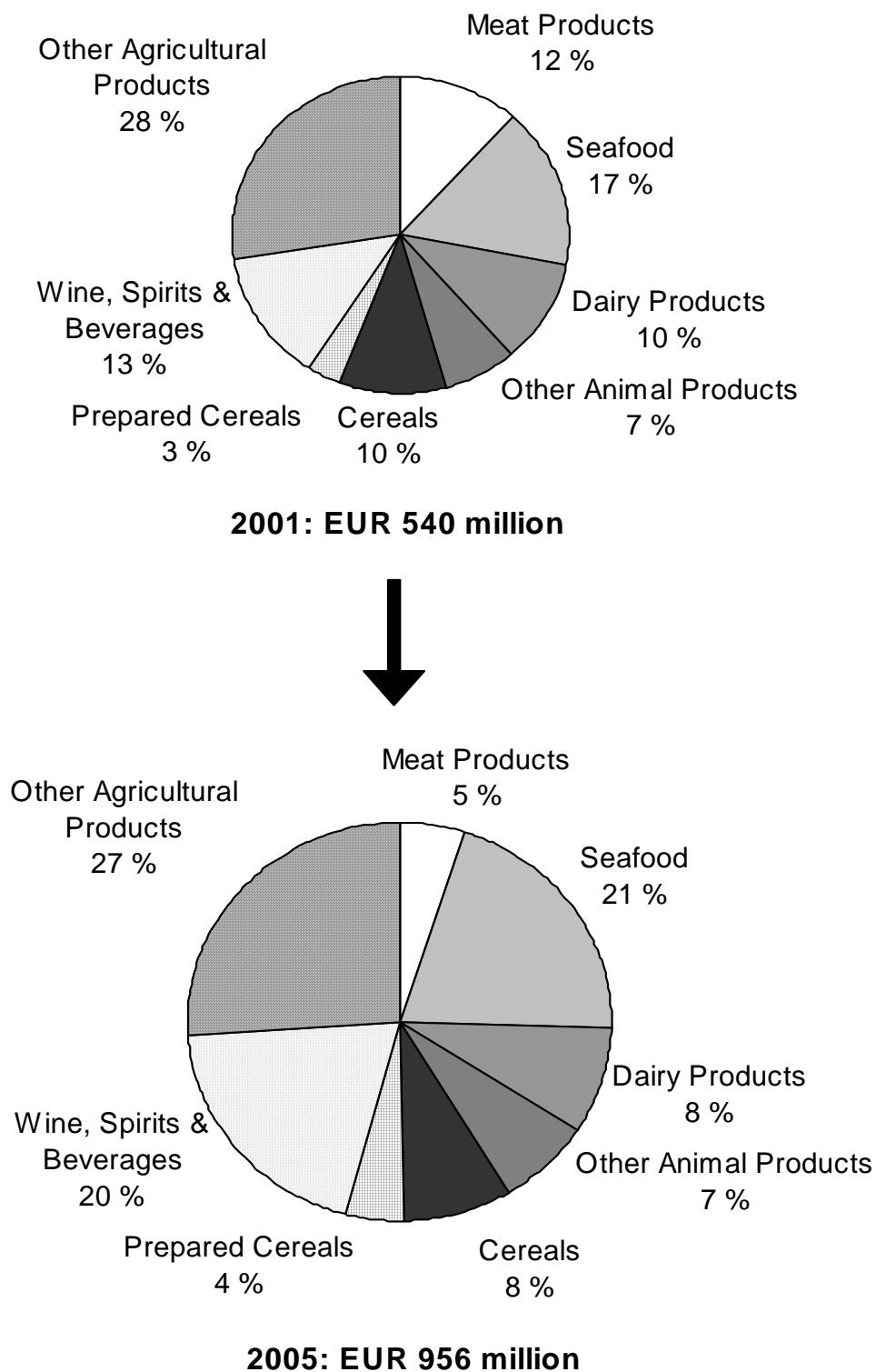
## **Agricultural trade relations between China and the EU**

The EU and China are two of the biggest markets in the world, and both are actively trading with each other. In 2006, China remained the EU's second largest trading partner right behind the US, whereas the EU continued in its role as China's first trading partner ahead of both the US and Japan. The EU enjoyed a trade surplus with China at the beginning of the 1980s, but now the EU is experiencing a sizeable widening deficit with China from €51 billion in 2001 to €128 billion in 2006, representing EU's largest bilateral trade deficit (DG Trade 2006).

Overall, China was a €25 billion (USD 32 billion) market for agricultural products in 2005, with the EU holding only a 3.8% share. EU's market share in China has been relatively steady over the recent years. The EU holds a commanding market share in China's alcoholic beverage imports and a substantial market share in dairy and meat products imports as well. The product composition of EU agricultural exports to China has stayed more or less the same over the period 2001-2005. The leading exported products groups are shown in Figure 1, and together these products accounted for more than 70% of EU agricultural exports to China.

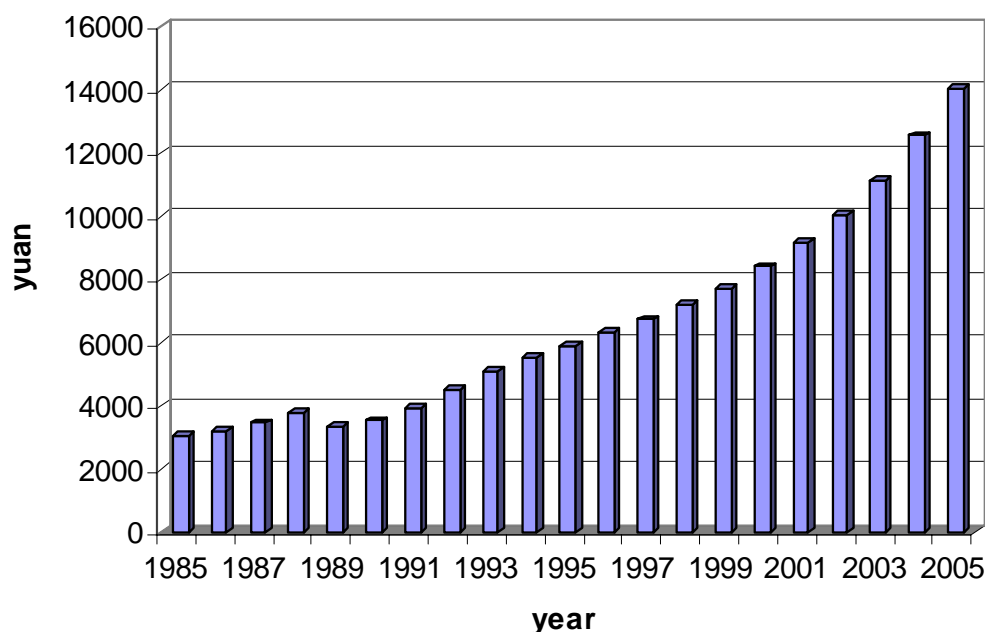
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<sup>1</sup> See for example Anderson and Martin (2006), Bouët et al. (2005), Francois et al. (2005).



**Figure 1:** The products groups in percentage share of total EU agricultural exports to China in 2001 and 2005 (Eurostat Comext 2007).

China is increasingly becoming an important destination for EU agricultural exporters even though the EU is having an agricultural trade deficit with China. In 2005, EU-15 agricultural exports (including seafood) reached €56 million (USD 1,214 million), €416 million or 77% more than the 2001 level. The growth in EU exports to China has increased from an averaged 4.6% per year in the period 1990-2000 to an averaged 14.3% per year in the period 2001-2005. The EU will see its agricultural exports to China exceed €2 billion in five years, if current trade trends continue. EU's agricultural exports are likely to hit €4 billion, when China's urban middle class reaches 200 to 250 million (People's Daily 2006). Booming middle class income levels have fuelled most of the country's increased appetite for imported food products and their tastes are expanding to include more western-style foods as more people become more affluent. From 2001 to 2005, the value of wines exported from EU to China rose from €12 million to €36 million, virgin olive oil grew from €500,000 to €8.4 million, cheese exports jumped from €500,000 to €2.7 million, and exports of processed agricultural products increased from €110 million to €206 million (People's Daily 2006). More than 90% of the agricultural trade with China used to be concentrated in raw products. It is worthy of note that the share of raw materials in EU exports is declining fast, and that value added goods are showing a high growth rate as China's buying power increases (see per capita income growth in Figure 2).



**Figure 2:** China's deflated per capita income growth from 1985 to 2005 (USDA 2007).

Growing incomes and the onset of a large middle class along with greater urbanization and westernization, particularly in China's coastal regions, has significantly increased the demand for alcoholic beverages such as wine and spirits. Though China produces a significant amount of wine, domestic brands are not often thought of as products of high quality. Opportunities for European wines therefore lie in well-priced and also high-quality varieties. French and Italian wine are the most highly recognized mainly due to marketing advantages as French wine has been heavily promoted for more than a decade. Spirits make up a large share of total alcoholic beverage consumption in China. Foreign spirits such as whisky and cognac are becoming popular among the affluent middle class. As currently there are no domestic companies that are producing such spirits at a quality and taste level equal to foreign products - and as the EU is the leading producer and exporter of spirit drinks worldwide - export potential for EU spirit industry to China is quite high (Fischer et al. 2007).

EU's marketing advantage in China has been supported with the help of production aid and export subsidies. France is the largest agricultural exporter to the Chinese market out of the EU-15 member states. In 2005, France holds a 31% share of the total EU-15 agricultural exports to China, followed by the Netherlands (20%), United Kingdom (11%), Denmark (10%) and Spain (8%). Foreign competitors confronting EU exporters in the Chinese food market are intensifying. Products that compete with EU food products originate from the US, Argentina, Brazil, Australia, Malaysia, Indonesia, Thailand, New Zealand, Canada, and Chile.

Despite success in penetrating to the Chinese market in some specific product markets such as alcoholic beverages, cereals, dairy and meat products over the recent years, EU exporters are facing an escalating number of unjustifiable non-tariff barriers in the form of product certification, labeling standards, import approval requirements, and customs clearance delays. The application of laws is often not uniform or transparent and regional variations in customs procedures have impeded trade. Unreasonable sanitary and health requirements can create barriers that hinder EU agricultural exports to China. Chinese national standards for food products often differ from international standards. These differences will create high compliance costs and extended delays for business transactions that affect particularly EU's small and medium sized enterprises ability to operate in the Chinese market. China's time consuming and cumbersome licensing and registration procedures have especially delayed the entry of new products into the Chinese market.

Regardless of the existing non-tariff barriers, China has progressively lowered its Most Favoured Nation (MFN) tariff and lessened the amount of non-tariff barriers to trade. Tariff remains one of China's main trade policy instruments and a significant source of tax revenue, accounting for some 4.3% of total taxes collected. As a result of WTO accession, China bound 100% of its tariff at ad valorem rates.

The average tariff for agricultural products has declined from 23.1% in 2001 to 15.3% in 2005. There are considerable variations within the different groups of products, with average rates for grains (34%), tobacco (25.4%), coffee and tea, cocoa and sugar etc. (20.2%) and beverages and spirits (20.3%) considerably higher than the overall average for agricultural products (15.3%). The final bound rate in 2010 for agricultural products is expected to fall to 15.2% (WTO 2006). According to the WTO, China's average applied tariff rates have closely followed its bound rates (MFN tariff) since it joined the WTO.

China's overall tariff is subject to negative escalation between unprocessed and semi-processed products and escalation between semi-processed and fully processed products. This would suggest that imports of semi-processed products would face lower tariff barriers than raw materials and fully processed goods. In 2005, negative escalation is especially pronounced between semi-processed and processed products in food, beverages and tobacco (WTO 2006).

Among the agricultural products selected for estimation, beer is foreseen to benefit the most with tariff decreasing from 42% to 0% (Table 1). The tariff for wine (in containers of 2 litres or less) has dropped sharply from 44.6% to 14%. The tariff for dairy products such as whey (animal feed) and tariff for cereals such as barley (animal feed) are remaining the same as the bound rates during WTO accession. Meat product such as frozen pigmeat has declined from 16.8% to 12%. The Carnegie Endowment predicted that reduced tariffs on agricultural products and the introduction of the tariff quota system will reduce the share of agriculture in China's exports and increase imports of agricultural goods into China with the full phasing in of China's WTO commitments by 2006 (He Jianwu et al. 2007).

**Table 1:** China's tariff schedule for selected agricultural products after accession to the WTO.

Product	HS Code	Bound Rate At Accession	Final Bound Rate
Frozen Pigmeat	020649	16.8	12
Frozen Fish	030379	16	10
Whey	040410	6	6
Barley	100300	3	3
Beer	220300	42	0
Wine	220421	44.6	14

**Source:** Schedule CLII – People's Republic of China, World Trade Organization.

## Theoretical and methodological framework of the study

Imperfect competition arising from product differentiation underlies the theoretical framework of the study. Several factors are assumed to affect an importer's

purchasing decisions. Price of the product is an obvious and often the most important factor. However, the importer does not necessarily purchase all of its agricultural commodity imports from the least expensive supplier. There are other factors such as qualitative characteristics (delivery time, reliability of supplies, packaging, brand names) and established relationships (e.g. cultural, historical or political ties between trading partners) affecting the trade flows of commodities. This leads to a presumption that importers differentiate between commodities by place of production. In dealing with China's demand for agricultural imports, it seems appropriate to adopt a theoretical framework, in which products are distinguished by their place of production and are not considered perfect substitutes for each other (product differentiation).

The estimation of the demand structures is therefore derived from the Armington's (1969) model, where it is assumed that the same goods of different origins are imperfect substitutes within an importing country's commodity market. In the model, the importing decision is split into two stages. At the first stage, the importer decides how much of the imported product to consume against all other goods. At the second stage, once the level of expenditures for the imported product is determined, the importer decides how much of the commodity to purchase from alternative suppliers by solving the utility maximisation problem.

Now that the assumptions are in place, it is straightforward to derive the importer's overall demand equation, representing a country's  $j$  imports ( $M$ ) as a function of economic activity ( $Y$ ) and real price of the good imported ( $PD$ ),

$$M_j^d = k_1 Y_j \left( \frac{P_j}{D_j} \right)^{\epsilon_m^p} \quad (1)$$

where  $k_1$  is a constant with expected sign  $k_1 > 0$ ;  $D$  is the deflator; and  $\epsilon_m^p$  is the price elasticity of import demand for good  $M$ . The income elasticity is equal to unity, a hypothesis that will later be tested.

Once the level of expenditures  $Y_j$  for the imported product  $M$  has been determined, the solution to the utility maximisation problem of how much of the product to purchase from alternative suppliers - let say an exporter of interest  $i$  and its competitors  $k$ , which refer each of the  $n-1$  other foreign supplying countries, to market  $j$  whose corresponding export prices are  $P_{ij}$  and  $P_{kj}$  - may be expressed as

$$X_{ij}^d = k_2 M_j \left( \frac{P_{ij}}{P_j} \right)^{\epsilon_x^p} \quad (2)$$



where  $X_{ij}^d$  is the quantity of the product exported from country  $i$  to country  $j$ ,  $k_2$  is a constant;  $P_{ij}$  is the price of the good imported from country  $i$  to country  $j$ ;  $P_j$  is the average price of the product imported to country  $j$ ; and  $\epsilon_x^p$  is the relative-price elasticity of export demand. Product differentiation in equation (2) is reflected in the ability of exporters to influence the demand for their exports through relative-price changes.

International trade of agricultural products does not usually occur without obstacles, however. Agricultural trade policies such as import tariffs, trade quotas and price controls are typical commodity-specific policies driving a wedge between domestic and border prices. The imposition of a tariff into the import demand equation (1) raises the price of the product to  $(1+t)P$  in the geographic market  $j$ . The resulting import demand schedule is

$$M_j^d = k_1 Y_j \left( \frac{(1+t)P_j}{D_j} \right)^{\epsilon_m^p} \quad (3)$$

The methodological challenge of the study is to combine the theoretical framework with applied econometrics in order to provide a good representation of China's import demand for agricultural products. Econometric models are efficient and convenient way to summarise the trade theory relevant to the study for empirical measurement and testing. Yet there is considerable distance between theoretical specification and empirical implementation in practical econometric models. For instance, the theory may provide little evidence on the process of adjustment, and which variables are exogenous and which are irrelevant or constant for the particular model under investigation. Numerous adjustments must be made in order to build models that fit real world situation and correspond at least approximately to the underlying theory.

Empirical analysis of the study is based on econometric models with recently developed econometric concepts that capture the dynamics underlying China's import demand for agricultural products. Long-run elasticities of Chinese import demand for agricultural products are of particular interest. However, estimating such long-run relationships is challenging because the variables - such as income, the price level, trade flows, and exchange rates - used in the analysis typically exhibit multicollinearity and non-stationarity.<sup>2</sup> Econometric modelling of import demand should be based on methods, which explicitly take these features of the

<sup>2</sup> If this is the case, the conventional hypotheses-testing procedures based either on small sample or asymptotic distributions of the estimates (based on t, F, chi-square tests, and the like) may be in suspect. The problems are often dealt with by taking first differences of all the variables before any estimation are done. Nonetheless, taking first differences is a major drawback because the long-run variation of the data is removed, and only short-run effects are explained by the model (Bentzen and Engsted 1992).

data into account, namely co-integration techniques and error-correction model (ECM).

Co-integration among a set of variables may imply that fundamental economic forces make the variables move stochastically together over time (Urbain 1992). Although the variables may drift away from equilibrium for a while, the ECM then corrects for any short-term disequilibrium between variables that are co-integrated in the long-term. There are two main advantages in using the co-integration techniques and ECM. First, it is possible to clearly distinguish between short-run and long-run effects. Second, the speed of adjustment toward the long-run equilibrium can be directly estimated. The approach follows closely the modelling strategy developed in a series of papers by Davidson et al. (1978), Hendry (1986), Lord (1991), Urbain (1992), and Carone (1996).

### Modelling demand functions for the imported products

In the first stage, the importer decides how much of the imported product to consume compared to all other goods. The decision is based on importer's income and price of the good. Recall equation (1), representing a country's  $j$  imports ( $M$ ) as a function of economic activity ( $Y$ ) and real price of the good imported ( $PD$ ).

Here we show how the theoretical structures are implemented in dynamic econometric models. The first-order stochastic difference equation as a logarithmic function of the theoretical relationship in (1) is expressed as

$$\ln M_{jt} = \alpha_0 + \alpha_1 \ln Y_{jt} + \alpha_2 \ln Y_{j,t-1} + \alpha_3 \ln(P_j / D_j)_{jt} + \alpha_4 \ln(P_j / D_j)_{j,t-1} + \alpha_5 \ln M_{j,t-1} + v_{1t} \quad (4)$$

where the expected signs are  $\alpha_1, \alpha_2 > 0$ ;  $\alpha_3, \alpha_4 < 0$ ; and  $0 < \alpha_5 < 1$ .

Next we convert equation (4) into ECM formulation, containing information on both the short-run and long-run properties of the model. Equation specified in this manner allows the relevant economic theory to enter the formulation of long-run equilibrium, while the data determines the short-run dynamics of the equation.

The demand for imports in Chinese market ( $\ln M_C^d$ ) has a steady-state response to the domestic economic activity ( $\ln Y_C$ ), and a transient response to the real price of imports ( $PD$ ). Transformation of the equation (4) to incorporate an ECM driven by economic activity, and with a 'differences' formulation of the real price term - nested in the levels form of the equation - results in the following demand functions for the imported products:

$$\Delta \ln M_{jt} = \alpha_0 + \alpha_1 \Delta \ln Y_{jt} + \delta_2 \ln Y_{j,t-1} + \alpha_3 \Delta \ln \left( \frac{P_j}{D_j} \right)_t + \delta_4 \left( \frac{P_j}{D_j} \right)_{t-1} + \delta_5 \ln \left( \frac{M_j}{Y_j} \right)_{t-1} + v_{1t} \quad (5)$$

where  $\delta_2 = (\alpha_1 + \alpha_2 + \alpha_5 - 1)$ ,  $\delta_4 = (\alpha_3 + \alpha_4)$ , and  $\delta_5 = (\alpha_5 - 1)$ . The expected signs of the coefficients are  $\alpha_1 > 0$ ,  $\delta_2 > \delta_5$ ,  $-1 < \delta_5 < 0$ , and  $\alpha_3, \delta_4 < 0$ . The fifth term of the equation,  $\delta_5 \ln (M_j/Y_j)_{t-1}$ , is the mechanism for adjusting any disequilibrium in the previous period. In other words, it measures 'errors' (divergences) from the long-run equilibrium and corrects for previous non-proportional responses in the long-run dynamic growth of the demand functions for the imported products.

The long-run dynamic solution of a single-equation system generates a steady-state response in which growth occurs at a constant rate, say  $g$ , and all transient responses have disappeared (Currie 1981, Lord 1992). With growth rates of domestic economic activity and the demand for the imported products,  $\Delta \ln Y_{jt} = g_1$  and  $\Delta \ln M_{jt} = g_2$ , respectively, the long-run dynamic equilibrium solution of equation (5), in terms of the original (anti-logarithmic) values of the variable, is

$$M_j = k_1 Y_j^{1-(\delta_2/\delta_5)} \left( P_j / D_j \right)^{-\delta_4/\delta_5} \quad (6)$$

where  $k_1 = \exp \{ [-\alpha_0 + (1-\alpha_1)g_1]/\delta_5 \}$ . Equation (6) encompasses the static equilibrium solution when  $g_1 = 0$ . The income elasticity of import demand is expressed as  $\epsilon_m^Y = 1 - (\delta_2/\delta_5)$ . The price elasticity of import demand is  $\epsilon_m^P = -\delta_4/\delta_5$ .

In summary, the first stage equation examines two key features: (1) the total response of China's imports to income and real price changes, (2) the length of time required for the mentioned total response to occur.

## Modelling demand functions for the exported products from alternative suppliers

In the second stage, the importer decides how much of the product to purchase from alternative suppliers. The decision is based on total expenditure of the product and relative prices between the suppliers. Assuming that the importer view products from different suppliers as being distinct to some degree, each exporting country should possess some market power for manipulation. In other words, the product of each supplier is imperfectly substitutable for those produced by other suppliers in the market. This assumption will be tested.

Recall equation (2), which links country's  $j$  imports from a country  $i$  to country's  $j$  total imports and to the relative price of that imports. In terms of the general stochastic difference specification, the export demand relationship in (2) is expressed as

$$\ln X_{ijt}^d = \beta_0 + \beta_1 \ln M_{jt} + \beta_2 \ln M_{j,t-1} + \beta_3 \ln(P_{ij} / P_j)_t + \beta_4 \ln(P_{ij} / P_j)_{t-1} + \beta_5 \ln X_{ij,t-1}^d + v_{2t} \quad (7)$$

where the expected signs of the coefficients are  $\beta_1, \beta_2 > 0$ ;  $\beta_3, \beta_4 < 0$ ; and  $0 < \beta_5 < 1$ .

The results of the co-integrating regressions suggest that China's demand for exports from the EU ( $\ln X_{EU}^d$ ) has a steady-state response to China's total imports of the product ( $\ln M_C^d$ ). Meanwhile, China's demand for exports from the EU has a transient response to the relative price changes of EU exports ( $\ln P_{EU} / \ln P_C$ ). The following transformation of (7) incorporates an ECM driven by China's total imports  $M$ :

$$\Delta \ln X_{ijt}^d = \beta_0 + \beta_1 \Delta \ln M_{jt} + \gamma_2 \Delta \ln(P_{ij} / P_j)_t + \gamma_3 \ln(P_{ij} / P_j)_{t-1} + \gamma_4 \ln(X_{ij,t-1}^d / M_j)_{t-1} + v_{2t} \quad (8)$$

where  $\gamma_2 = \beta_3$ ,  $\gamma_3 = (\beta_3 + \beta_4)$ , and  $\gamma_4 = (\beta_5 - 1)$ . The expected signs of the coefficients are  $\beta_1, \gamma_2 > 0$ ,  $\gamma_3 < 0$ , and  $-1 < \gamma_4 < 0$ .

The disequilibrium adjustment mechanism in the fourth term,  $\gamma_4 \ln(X_{ij,t-1}^d / M_j)_{t-1}$ , corrects non-proportional responses in the long-run dynamic growth of the demand for EU's exports. If EU's market share were to fall below its long-run equilibrium level, the negative coefficient in the disequilibrium adjustment term would induce an increase in the demand for EU's exports. Conversely, if EU's market share were to increase above its long-run equilibrium level, that coefficient would generate downward pressure on EU's exports until the growth rate returned to its steady-state path.

With the growth rates of China's total imports and the demand for EU's exports,  $\Delta \ln M_{jt} = g_2$ ,  $\Delta \ln X = g_3$ , respectively, the long-run dynamic equilibrium solution of equation (8), in terms of the original (anti-logarithmic) values of the variable, is

$$X_{ij}^d = k_2 M (P_{ij} / P_j)^{-\gamma_3 / \gamma_4} \quad (9)$$

where  $k_2 = \exp \{[-\beta_0 + (1-\beta_1)g_2] / \gamma_4\}$ . Therefore, China's demand for EU's exports is assumed to have a unitary elasticity with respect to China's total imports. The price elasticity of China's demand for EU's exports is expressed as  $\epsilon_X^P = -\gamma_3 / \gamma_4$ .

In summary, the second stage equation examines whether the exporter's market share of a certain product is influenced by the total level of China's imports of the product, and whether the market share of the exporter is affected by relative price changes of the product.

## Data

The success of any econometric analysis ultimately depends on the availability of appropriate data. This section discusses the nature and sources of the data. The empirical analysis of the study will be conducted with a sample of annual data that cover China's agricultural imports from the EU and the rest-of-world for selected products from 1986 to 2005. To keep the task manageable, econometric analysis is restricted to six agricultural products: frozen pigmeat, frozen fish, whey, barley, beer, and wine. These products represented on average about 23 per cent of China's total agricultural imports from the EU.

Volume and value data on trade flows over the period 1986 to 2005 are obtained from EUROSTAT (2007) and FAOSTAT (2007). Volume data is compiled in metric tons, and value data in thousands of euros. The transaction value is the value at which goods were sold by the exporter at the frontier of the exporting country [free-on-board (fob) valuation]. The unit prices of China's imports ( $P_C$ ), and unit prices of exports by the EU ( $P_{EU}$ ), are derived by dividing value by volume. The gross domestic product (GDP) index and the consumer price index (CPI) are used as a measure of economic activity ( $Y_C$ ) and price deflator ( $D_C$ ) of China, respectively. The source of the data is the Economic Research Service of the United States Department of Agriculture (USDA 2007).

## The responsiveness of China's agricultural imports to income changes

The short-run and long-run responsiveness of Chinese agricultural imports to changes in incomes and absolute prices are summarized in Table 2. The estimated equations of import demand show, as expected, that income is statistically significant in explaining the level of demand for agricultural imports in China. The findings are consistent with earlier studies: Mohd. Yusoff and Salleh (1987), Honma (1991), and Lord (1991), among others, have shown that income is an important factor in determining the import demand for agricultural products. The estimated long-run income elasticities of import demand range from clearly less than unity (0.5) for beer to 3.0 for wine. The results suggest that a 1% increase in income level would increase beer imports by only 0.5%, but wine imports would increase by 3% (6 times more than beer imports).

The large differences in income elasticities have important implications for EU exporters. Wine exports have a considerably stronger growth potential in China than other products because of a strong response from consumers in China due to improvement in their real incomes. At the same token, wine exports will also be susceptible to larger swings of demand during business cycles. The results suggest that a 1% decrease in income level would eventually decrease wine imports by 3%.

The adjustment of import demand from one level of income to another is determined by the error correction term. For example, the coefficients of the error correction terms in the import demand relationships are close to unity in absolute terms for barley, frozen pigmeat, whey and wine. This fact reflects the relatively quick response of Chinese importers to changes in income and prices, i.e. it does not take a great deal of time for import demand to resume its long-term equilibrium growth path when a short-run disequilibrium arises between import demand and income. In the case of beer and frozen fish, the situation is slightly different. The error correction term in the import demand relationship is clearly less than unity (-0.35 and -0.37) in absolute terms. This fact reflects the relatively slow response of beer and frozen fish importers in China to changes in income and prices.

**Table 2:** Short-run and long-run elasticities of import demand in China for selected food products<sup>3</sup>.

Commodity	Income elasticity		Price elasticity	
	Short-run	Long-run	Short-run	Long-run
Frozen Pigmeat	1.77	1.65	-0.07	-0.39
Frozen Fish	0.17	1.49	-0.09	-0.26
Whey	-	1.00	-0.04	-0.14
Barley	0.39	0.98	-0.11	-0.07
Beer	-	0.47	-0.43	-0.47
Wine	1.50	3.04	-0.30	-0.80

### The responsiveness of China's agricultural imports to price changes

Examination of the price elasticities confirm the expectation that demand for Chinese agricultural imports is relatively inelastic with respect to price. Among the products listed in Table 2, five out of six products have elasticities less than 0.5 in the long-run. Barley has the lowest long-run price elasticity ( $\cong -0.1$ ). This result suggests that on average a 1% decrease (increase) in the real price of barley would increase (decrease) imports of barley by only 0.1% in the long-run. Wine has the largest long-run import price elasticity ( $\cong -0.8$ ). The policy implication of these low price elasticities is that exchange rate policies and commercial policy intervention measures in the form of tariff barriers to trade would not be very effective in changing the quantity of imports demanded.

<sup>3</sup> Tests for model validity yield satisfactory results. The Jarque-Bera test indicates that the data used in the equations do not violate the normality assumption. According to the Ljung and Box (LB) test, it is not possible to reject the assumption of serial independence for the residuals. The Breusch-Pagan-Godfrey (BPG) test shows that heteroskedasticity does not pose a problem at the 5% significance level in 4 out of 6 equations. Based on the RESET test it is not possible to reject the model specifications in 5 out of 6 equations.

The effects of a reduction in imports tariffs under China's WTO commitments are summarised in Table 3, from which a number of points can be made. The reductions in tariffs have had a price-decreasing effect on the Chinese import market. As a result, an increase in China's imports has taken place. Imports of frozen pigmeat and frozen fish have increased 14% and 83%, respectively, during the period from 2000 to 2005. However, according to our modelling results, the contribution of tariff reductions for these increased volumes of imports has been very small, 1.8% and 0.5%, respectively. Relatively low tariff cuts as well as low price elasticities of these products have resulted only very minor changes in import volumes. Most of China's increased appetite for imported pigmeat and fish has been fuelled by rapid income growth and increased trade.

In the case of beer and wine imports, tariff reductions explain part of the increase in China's import volumes. Our modelling results suggest that China has increased its wine imports by 33% due to tariff reductions, which is responsible for half of the total increase in import volume (63%) for wine from 2000 to 2005. The case is similar for beer, where tariff reductions accounts for about 18% increase in total imports; and China's total import of beer increase by 23% from 2000 to 2005.

**Table 3:** Percentage changes in prices and volumes imported into China due to WTO tariff reductions for selected food products.

Commodity	Import price	Import volume		Number of years for % response		
		Initial effect	Long-term effect	75%	90%	99%
Frozen Pigmeat	-4.6	0.3	1.8	1	1	4
Frozen Fish	-5.7	0.1	0.5	1	4	6
Whey	0	0	0	-	-	-
Barley	0	0	0	-	-	-
Beer	-29.6	16.3	17.8	3	5	7
Wine	-23.1	10.7	33.1	0	1	2

Since tariff reductions take several years to have a full impact on import demand, the effect would continue even after the tariff reductions have taken place. The estimations demonstrate the extent of the time lag between the initial reduction in import prices after tariff reduction and the time required for imports to adjust fully to the new price level in the Chinese market. Imports of frozen pigmeat and wine respond relatively quickly to changes in prices. In the case of wine, 90 per cent of the adjustments occur within one year after the tariff reductions have taken place. The case is similar for pigmeat, where it takes only one year to adjust to 90 per cent of the new import level (equilibrium). However, imports of beer and frozen fish react slower to price changes, a characteristic that is reflected in the lower coefficient level of the error-correcting term (clearly less than unity). More specifically, it takes four years for frozen fish imports, and five years for beer imports to adjust to 90 per cent of the new

import level (equilibrium). Hence, the impact of tariff reductions is faster on food products such as wine and frozen pigmeat, and the exporters should react quickly to the increase in demand for these products.

## China's demand for EU agricultural exports

The estimations indicate that relative price movements affect significantly China's demand for EU exports, implying that EU's market share is influenced by price competitiveness (Table 4). In other words, EU exporters confront a downward-sloping demand schedule in China. For the combined agricultural exports of the selected EU products, the trade-weighted average price elasticity for China's import demand from the EU (which is equivalent to the elasticity of substitution for market share in China) is equal to  $-3.5$  in the long run. This indicates that China's import demand for the selected EU agricultural products will increase by 3.5% on average if the relative prices of these products decrease by 1% on average.

**Table 4:** The short-run and long-run responsiveness of China's agricultural imports from the EU to changes in relative prices<sup>4</sup>.

Product	Relative price elasticity of export demand		EU's market share in China (%)	
	Short-run	Long-run	1995-1997	2003-2005
Frozen Pigmeat	-	-7.97	56.5	61.6
Frozen Fish	-4.22	-3.31	10.7	23.2
Whey	-2.27	-1.33	27.2	39.8
Barley	-3.18	-2.82	18.7	17.0
Beer	-1.41	-4.66	31.9	36.8
Wine	-0.94	-2.04	73.5	49.4

Among the examined trade flows, the export of EU whey is the least sensitive to relative price changes, followed by wine exports. Whey and wine exports from the EU have relative-price coefficients of  $-1.3$  and  $-2.0$ , respectively. This indicates that China's import demand for EU whey will increase by only 1.3% if the relative price of whey decreases by 1%. In contrast, the relative-price coefficient of the EU pigmeat exports is exceptionally large,  $-8.0$ . This indicates that China's import

<sup>4</sup> Tests for model validity yield satisfactory results. The Ljung and Box (LB) statistic does not reject the hypothesis of no autocorrelation in the residuals. According to the Breusch-Pagan-Godfrey (BPG) test, heteroskedasticity does not pose a problem at the 5% significance level. Based on the RESET test, it is not possible to reject the assumption of correct functional form in 5 out of 6 equations. In some cases, the Jarque-Bera test, however, provides evidence against normality of the residuals because of extra kurtosis and a few outliers.



demand for EU pigmeat will increase by 8% if the relative price of pigmeat decreases by 1%. The observed differences in relative-price coefficients by trade flow reflect the dynamic aspect of the Chinese agricultural trade, whereby trade flow rise and fall due to price competitions. Thus, price competition has the largest impact on frozen pigmeat and beer among the examined food products.

China's import demand from the EU generally takes several years to adjust to the relative-price change. China's imports of barley and frozen fish reflect quite quickly to changes in relative-prices. It takes only two years for China's barley imports from the EU to adjust to 90 per cent of the new import level (equilibrium). However, China's imports of beer and whey adjust slowly to the relative-price change, which is reflected in the near-zero coefficient of the error-correcting term. For example, it takes five years for China's beer imports from the EU and it takes four years for China's whey imports from the EU to adjust to 90 per cent of the new import level (equilibrium). Consequently, the impact of price competition is slower on food products such as beer and whey, and the exporters have more time to react to the increase in demand for these products.

The results from the import price elasticities (Table 2) combined with the results from the relative price coefficients (Table 4) indicate that China's total agricultural imports on a product basis is insensitive to absolute price changes, but Chinese importers are sensitive to relative price changes on a product basis due to price competition among suppliers; once the expenditure for the imports of a product is determined, Chinese importers will seek for the cheaper products among the foreign suppliers. The results support the key findings of a study (DG Trade 2007b) by the European Commission that assesses market opportunities for EU companies in China: EU companies wanting to compete on price in the Chinese market will need to produce goods in China itself in order to be cost-competitive. Successful European companies are already diversifying into China-based manufacturing because they want to compete in the domestic Chinese market and not to produce for the export market. Good examples would be China-based manufacturing for European beer and meat processing for European slaughterhouses.

## **Conclusions**

This paper examined China's agricultural imports in regard to income growth, import price changes, and tariff reductions due to China's trade liberalisation. More specifically, it attempted to model behavioral relationships in the agricultural trade between China and the EU by using annual trade data from 1986 to 2005. A relatively unrestricted, data determined, econometric modelling approach based on the error correction mechanism was used, in order to emphasize the importance of trade functions' dynamics. Econometric models were constructed for six agricultural products exported from the EU to China – frozen pigmeat, frozen fish, whey, barley, beer, and wine. Prior to the estimations, several econometric issues relating to

specification, pre-estimation testing and dynamic specification tests were implemented.

In dealing with China's demand for agricultural imports, products are distinguished by their place of production and are not considered perfect substitutes for each other (product differentiation). This leads to a presumption that importers differentiate between commodities by place of production. Imperfect competition arising from product differentiation underlies the theoretical framework of this paper. Price of the product is an obvious and often the most important factor affecting an importer's purchasing decisions. Nevertheless, the importer does not necessarily purchase all of its agricultural products from the least expensive supplier. There are other factors affecting the trade flows of agricultural products such as qualitative characteristics - brand image (for luxury goods), brand names and cultural background (marketing), quality, delivery time, reliability of supplies, packaging - and established relationships (e.g. cultural, historical or political ties between trading partners).

The results indicated that China's agricultural imports on a product basis are insensitive to absolute price changes. Therefore, the examination of the price elasticities confirmed the expectation that demand for Chinese agricultural imports is relatively inelastic to absolute price changes. However, Chinese importers are sensitive to relative price changes on a product basis due to price competition among suppliers. Chinese importers will seek for the cheaper products among the foreign suppliers. Among the examined trade flows, China's imports of EU whey are found to be the least sensitive to relative price changes, followed by China's imports of wine from the EU. In contrast, China's imports of EU pigmeat and beer are shown to be very sensitive to relative price changes. The estimations indicated that relative price changes affect significantly China's import demand from the EU, implying that the exporter's market share in China is influenced by price competition. The results support findings that EU companies wanting to compete on price in the Chinese market will need to produce goods in China itself in order to be cost-competitive. Successful European companies are already diversifying into China-based manufacturing where they want to compete in the domestic Chinese market and not to produce for the export market. Since the early 1990s, China has allowed foreign investors to manufacture and sell a wide range of goods on the domestic market. Now, the preferred form of foreign direct investment in China is the establishment of wholly foreign-owned enterprises. Foreign-invested enterprises produce about half of China's exports, and the flow of foreign direct investment into China increased from about USD 2 billion in 1986 to USD 72 billion in 2005. At the moment, China is the world's largest host country for foreign direct investment.

Opening to the outside remains central to China's economic development. China's WTO accession and deeper integration into the world economy present a range of opportunities and challenges for EU exporters. China's accession to the WTO meant

100% binding of China's tariffs and China's commitment to reduce agricultural tariffs. It was expected that this would eventually increase EU agricultural exports to the Chinese market. As tariff and non-tariff barriers are being reduced, the costs of China importing from the EU would be less. The results suggested that China's tariff reductions have been quite significant in changing the quantity of wine and beer exports from the EU to China. However, tariff reductions do not have an important role in changing the quantity of EU exports to China for the rest of the examined products. China's import demand analysis suggested that income growth effects play a dominant role in determining China's import demand for agricultural products, both in the short and long term. Rapid income growth has fuelled most of China's increased appetite for imported agricultural products. Strong economic growth is the major force behind the increasing buying power of the Chinese consumers. Continued growth in China's economy and huge domestic markets will fuel further export growth and opportunities for the world.

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## **Fruit and Vegetable Consumption among College Students in Arkansas and Florida: Food Culture vs. Health Knowledge**

Christiane Schroeter <sup>a</sup>®, Lisa House <sup>b</sup>, and Argelia Lorence <sup>c</sup>

<sup>a</sup> *Assistant Professor, California Polytechnic State University,  
Agribusiness Department, San Luis Obispo, CA 93401, USA*

<sup>b</sup> *Professor, University of Florida, Department of Food and Resource Economics,  
1177 MCCA, PO Box 110240 IFAS, Gainesville, FL 32611, USA*

<sup>c</sup> *Assistant Professor, Arkansas State University, Arkansas Biosciences Institute,  
PO Box 639, State University, AR 72467, USA*

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### **Abstract**

This study determines the impact of demographics, dietary and health knowledge, and food culture on fruit and vegetable consumption of college students in Arkansas and Florida. Our empirical analysis demonstrates that food culture significantly impacts consumption of fruits and vegetables; a finding which emphasizes the need to target cultural aspects when developing effective and efficient management of agribusiness firms. Understanding the antecedents to consumption for products like fruits and vegetables is important to agribusiness industry, policy makers and organizations interested in evaluating the effectiveness of health education in promoting college students' health and decreasing the trends to obesity.

**Keywords:** fruit and vegetable consumption, college students, food culture, health knowledge

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®Corresponding author: Tel: + 805-756-5000  
Email: [cschroet@calpoly.edu](mailto:cschroet@calpoly.edu)  
Other contact information: L. House: [lahouse@ufl.edu](mailto:lahouse@ufl.edu)  
A. Lorence: [alorence@astate.edu](mailto:alorence@astate.edu)

## Introduction and Objectives

Many factors impact a person's food choice, from age to culture, from income level to tradition, from location of residence to health knowledge, and the list goes on (Casper and Wakefield, 1975). The impact of culture on food consumption can not be understated, yet it is rarely considered in agricultural economics and agribusiness literature. Combined with the importance of understanding the relationship between food consumption and culture is the issue of understanding food consumption for health. The increasing prevalence of obesity has led to debates on how to reverse the trend of increasing body weights.

Increased policy attention has been placed on increasing health education and preventing obesity in adolescents and young adults, given that adolescent obesity tends to persist into adulthood, which increases the risk of a multitude of chronic disease health risks that are related with high costs to the individual and the society (Mokdad et al., 2000; U.S. Department of Health and Human Services (USDHHS), 2000). About 21% of all college students in the U.S. are overweight or obese (Lowry et al., 2000)<sup>1</sup>. Previous studies have shown that overweight or obese individuals may experience social stigmatization and discrimination in academic situations (American Obesity Association (AOA), 2005).

With the gene pool remaining relatively stable, factors such as change in eating habits and sedentary lifestyles are considered to be responsible for much of the increase in the obesity epidemic. The World Health Organization, the U.S. Surgeon General, and the *2005 Dietary Guidelines for Americans* associate the consumption of fruits and vegetables with the prevention of overweight, high blood pressure, heart disease, diabetes, and stroke (World Health Organization, 2003; U.S. Department of Health and Human Services/U.S. Department of Agriculture, 2005; CDC, 2007b). One of the national initiatives to increase the consumption of fruits and vegetables is the 5 A Day program, which encourages the consumption of 5 to 9 servings of fruits and vegetables a day (Five A Day, 2005). However, the National College Health Risk Behavior Survey (NCHRBBS) determined that 74% of U.S. college students eat less than five servings of fruits and vegetables daily and 22% eat three or more high-fat foods per day. To meet the *Dietary Guideline's* recommendations, Americans on a 2,000-calorie diet would need to increase daily fruit consumption by 132% and daily vegetable consumption by 31% (Buzby, Wells, and Vocke, 2006). Thus, there is a need to determine whether and to what extent a relationship between health knowledge, food culture, and fruit and vegetable consumption among college students exists.

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<sup>1</sup> Whether an individual is overweight or obese is determined by the Body Mass Index (BMI), which is determined by the formula: weight (in kilograms)/height<sup>2</sup> (in meters). Among adults, overweight is classified by a BMI between 25.0 and 29.9, while a BMI greater than or equal to 30.0 defines obesity (CDC, 2004 and 2006).



However, only limited evidence exists on the health behavior of college students. Aside from the NCHRBBS that took place in 1995, the prevalence of health-risk behaviors among college students has not been well characterized and no data exists regarding college students in Arkansas and Florida. Both states represent diverse cultures, which may be reflected in the consumption of fruits and vegetables. Arkansas was recently ranked as the seventh unhealthiest state in the United States due to its high levels of obesity, inactivity and smoking (Segal, 2006). Florida is one of the major producing states of fruits and vegetables and thus, health knowledge and consumption of produce may vary from Arkansas.

In order to address the missing link between dietary and health knowledge, food culture, fruit and vegetable consumption, and adolescent obesity, a deeper investigation is needed. The objectives of this study are to determine the impact of (1) demographics, (2) dietary and health knowledge, and (3) food culture on consumption of fruits and vegetables among college students by developing a model consistent with economic theory.

The findings of this study will provide important insights to agribusiness firms. How does dietary and health knowledge of college students vary by state, age, gender, rural-urban location, or income? How does the consumption of fruits and vegetables differ? What is the relationship between dietary and health knowledge, consumption of fruits and vegetables, and obesity? How does culture and tradition impact the consumption of fruits and vegetables? Do lifestyle choices influence the consumption of produce? These are issues that must be assessed in order to determine the impact of food culture and health knowledge on fruit and vegetable demand.

## **Background**

While the understanding of food culture in agribusiness research has only recently begun, cultural anthropology is rooted in identifying cultural variations among humans and the study of food and culture. However, while cultural anthropologists have been the pioneer in the definition and measurement of food and culture, they have not used it to predict behavior, such as food consumption. In this section, the most important concepts and definitions of food and culture are reviewed, as they are crucial for the formulation of the food culture variables that will predict fruit and vegetable consumption in our study. Furthermore, we review literature on public policy implications with regard to food consumption changes.

As stated by Counihan and Van Esterik (1997), “food is the foundation of every economy. It is a central pawn in political strategies of states and households...” There are many examples of the relationship between food and culture. For instance, Barthes (1997) uses sugar to demonstrate how these concepts are intertwined. He asks why sugar consumption is higher in the U.S. than it is in

other countries. This question could be approached from many angles, and indeed food is often studied by multiple disciplines, such as economics, sociology, and history. Besides the economics of sugar consumption, the sociologist would examine the relationship between standards of living and sugar consumption, and the historian would find how sugar evolved as part of the American culture. However Barthes (1997) describes the act of consuming food not from the standpoint of demographics, value or history, but as an attitude. This attitude encompasses the function of food (for example, the historical quality of cooking a traditional food), the anthropological situation of food (for example, avoiding foods that are considered a sign of inferiority), and the relation of food to health. These are seen as themes found in food and culture. In addition to themes, behavior surrounds food consumption. Behaviors, such as work, sports, leisure, and celebration, are also expressed through food consumption. It is this attitude that produces the rituals and customs associated with the consumption of a food item. Douglas (1997) uses different terminology but captures the same notion when she notes that food is a code, with the culture of food consumption encoded in messages found in the patterns of social relationships.

In cultural anthropology, measuring food and culture is frequently performed by identifying the most salient foods of a culture. This can be done by examining the common answers found in lists of foods cited by many participants in a study (Gittelsohn et al. 1999). By accumulating a list of foods identified by many, and selecting the most common elements, the researcher can use methods like pile sorts to understand the content and structure of that particular food subculture. In the 1999 study by Gittelsohn et al., children sorted food into the general categories of “good for you” and “not good for you”. Within this categorization, “things you drink”, “breakfast foods” and “fruits and vegetables” were identified as things that were in the “good for you” category.

To our knowledge, no recent study has measured food and culture among college students. Fifteen years ago, Counihan (1992) found that food rules in U.S. college culture focus on its emotional associations. Though certain foods were related to specific meanings (i.e. turkey and Thanksgiving), the overall interest in food came from the relationship to it, not from the food’s intrinsic qualities, such as nutritional content. Counihan determined that many students were vaguely aware of nutrition, but had trouble being explicit about specific nutritional recommendations. Fruits and vegetables were categorized as foods that were “good for you”. However, students stated they were more concerned about calories than the nutritional content of individual foods. “Good” eating was defined as including three meals per day. Eating was also seen as a way to express power, with individuals feeling some sense of control from selecting their own diet.

However, given the rise in obesity, several critics have argued that the public sector should take on more control with regard to an individual’s diet (Kuchler, Tegene,

and Harris, 2005). Although a number of state and federal proposals have been put forth to curb the rise in obesity, there remains an inadequate conceptual foundation for determining the transaction costs of market interventions, such as taxing “unhealthy” food or subsidizing “healthy” food, such as fruits and vegetables. Overall, many suggestions for public policy interventions that aim at reducing obesity may be difficult, if not prohibitively expensive, to implement (Cash, Sunding, and Zilberman, 2004). On one hand, taxing high-calorie foods may raise additional state revenue, while providing an important financial incentive to food manufacturers and fast-food restaurants to revise the nutritional content of their foods (USA Today, 2004). Accompanying the high-calorie tax could be an actual redistribution of income, given that especially low-income families depend on the consumption of the lower-priced fast foods (Cash, Sunding and Zilberman, 2004; British Broadcasting Corporation (BBC) News, 2004). On the other hand, a high-calorie tax would also punish snacking in moderation, which is probably not linked to too many negative consequences if combined with a healthy diet, and an additional policy would be needed that distinguishes between moderate and excessive snacking. Furthermore, Schroeter, Lusk, and Tyner (2007) evaluate various public policy implications within an economic framework and find that a tax on food away from home could actually lead to a body weight increases.

Thus, a policy that would encourage the consumption of fruits and vegetables may be valuable. In addition to improving the health of U.S. Americans, increasing the intake of fruits and vegetables would have several implications for U.S. agriculture. Previous studies have shown that if Americans changed their current fruit consumption patterns, U.S. production would need to rise by 117%. In order to meet the guidelines for vegetable consumption, U.S. farmers would need to increase their vegetable harvest by 137%. Substantial increases in U.S. fruit and vegetable production would also increase demand for farm labor, land, and transportation, which would increase labor and land costs. In some cases, the higher costs would likely be passed on to the consumer in form of higher fruit and vegetable prices. Furthermore, imports and exports would be affected; particularly the largest markets for U.S. vegetable exports, Mexico and Canada (Buzby, Well, and Vocke, 2006). Overall, firms along the supply chain in fruit and vegetable production would benefit from these increases in consumption. This expresses the further need to determine factors that impact food choices and lifestyle choice of U.S. adults in order to successfully provide direct results for the effective and efficient management of agribusiness firms.

## **Research Methodology**

### *Survey Design*

In this study, an online survey was designed using SurveyCrafter software to collect college student data (18 years or older). The survey included questions regarding

students' height, weight, dietary intake, demographics, lifestyle, dietary and health knowledge, and food culture. Questions from nationally representative surveys were incorporated into the survey in order to allow for cross-comparisons between average U.S. college students and college students in Arkansas and Florida. Several questions about dietary and health knowledge were drawn from the National Health and Nutrition Examination Survey (NHANES), which is administered by the U.S. Department of Health and Human Services (CDC, 2004). The National College Health Risk Behavior Survey (NCHRBBS) provided the dietary intake and lifestyle questions (CDC, 1997). Food culture questions were based on previous research findings from cultural anthropology that define food culture, such as locations of food purchase and food consumption, traditions, as well as eating patterns in college and at home.

### *Data Collection*

We conducted the online survey of undergraduate and graduate students at Arkansas State University and the University of Florida in March 2007. We invited 870 students of specific classes throughout the universities via e-mail to take the survey. The e-mail contained a link to the online survey, which was hosted at a non-University website to reduce bias from respondents from either University. The students were informed about the survey in their classes and where possible, they were offered extra credit to complete the survey. At Arkansas State University, the survey was distributed to approximately 440 students, while approximately 430 were invited from the University of Florida. A total of 473 students responded and completed the survey, for an overall response rate of 54.4%. Response rates varied by University, with a response rate of approximately 72% from Arkansas State University, and a response rate of 42% from the University of Florida.

### *Variable Selection*

This study employs five types of variables: 1) fruit and vegetable consumption; 2) demographics; 3) lifestyle variables, 4) dietary and health knowledge, and 5) food culture. Table 1 (*See Appendix A*) shows the definitions, means and standard deviations of each variable used in the regression analyses. While fruit and vegetable consumption served as our dependent variables, the remaining four variable categories were used as independent variables in our analyses.

*Fruit and Vegetable Consumption:* This study utilizes two food groups and estimates statistical models that determine the impact on these foods. The food groups are 1) fruits (the sum of fruit and fruit juice consumption) and 2) green salad. The respondents had to evaluate their eating habits on a ranking scale which assessed the frequency of consumption of these foods. As shown in Table 1, on average, respondents consumed fruits and fruit juices 1.64 times per day – far below

the required intake of 5 servings of fruits and vegetables per day. The average frequency to consume green salad was about 0.5 times per day.

*Demographics:* Several demographic variables may impact the consumption of fruits and vegetables, such as age, gender, BMI, income, and the university attended. Previous studies have shown that age plays an important role with regard to fruit and vegetable consumption. A recent study by the Centers for Disease Control and Prevention (CDC) determined that adults ages 18 to 24 ate the fewest vegetables, with almost 80% reporting they regularly do not consume any vegetables. Table 2 shows the age distribution of the survey respondents.

**Table 2:** Age Distribution of Survey Respondents

	Total (n=473)	ASU (n=299)	UF (n=174)
18 or under	9	9	0
19	37	30	7
20	63	39	24
21	107	62	45
22	103	54	49
23	43	20	23
24	31	18	13
25	15	7	8
26 or older	65	60	5

Regarding gender, previous research shows that the consumption of fruits and vegetables is typically lower among men in comparison to women (CDC, 2007a). In our study, 53% of all survey respondents were male. The BMI of the individual respondent was calculated, given the student's answers to body weight and height. On average, the respondents were slightly overweight, with an average BMI of 25.45. The average BMI for males (females) was 26.2 (24.6). In our sample, 53% (35%) of males (females) were overweight, while 17% (13%) of males (females) were obese. This is a considerably higher rate of overweight and obesity than the rate that was found by Lowry et al. (2000). Given the increasing rates of obesity over time, this is not unexpected.

Economic variables, such as individual income may influence the intake of fruits and vegetables. The analysis included two variables to assess income: low income and medium income. These two income groups typically have a lower ability to purchase fruits and vegetables, which are often perceived as higher priced. High income could also indicate a better access to nutrition information compared to lower income households (Drenowski, 2003). Table 3 shows the income distribution of the survey respondents.

**Table 3:** Respondent's Monthly Individual Income

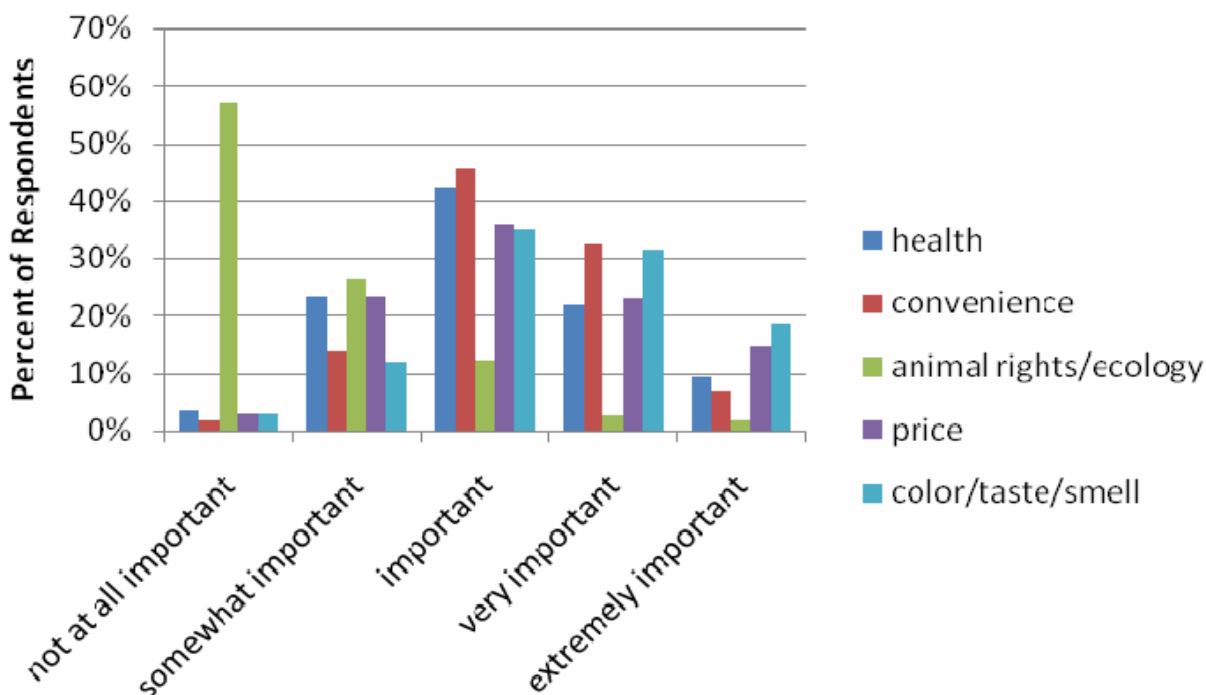
Variable	Definition	Total (n=473)	ASU (n=299)	UF (n=174)
Low Income	Less than \$500	41.9%	36.9%	50.6%
Medium Income	\$500 – \$999	29.7%	28.7%	31.4%
High Income	\$1,000 or more	28.4.%	34.5%	18.0%

Furthermore, being in the workforce while in school may impact fruit and vegetable consumption. A higher number of college students working may be one driving force for the increased demand for convenience food, particularly for college students. Placing a higher value on labor market time leads to decrease in the time spent in the household, and thus, less time can be devoted to preparing meals. The decrease in home time has increased the demand for easy-to-prepare meal solutions such as fast-food restaurant meals. Working college students might go out more often for meals, buy take-out, or use ready-to-prepare entrees (Capps, Tedford, and Havlicek, 1985; Chou, Grossman, and Saffer, 2004). In our study, the number of students working while attending school varied by school. Overall, 64% of all respondents work while attending school. At ASU, 74.3% of respondents worked, while only 45.6% at UF did.

The variable 'university' assessed differences by university that the respondent attended. Given that Florida is one of the major states to produce fruits and vegetables, students enrolled at UF may show a higher average fruit and vegetable consumption due to the increased availability. While 39% of all respondents had not eaten any fruits the previous day; there were only 33% of respondents from UF, compared to 43% of students from Arkansas State that had not eaten any fruits.

*Lifestyle:* Several lifestyle variables such as physical activity, importance of various factors on food choice, physical health, TV watching, nutritional quality, and eating away from home were included in the survey. Given that exercising goes along with a healthier lifestyle, respondents that regularly engage in physical activity may consume healthier food choices such as fruits and green salad. Additionally, students were asked to identify how often they participated in physical activity per week. Only 6% indicated they participated in zero days of any type of activity. Regarding physical health, as shown in Table 1, most respondents rated their overall physical health as average.

The survey included several variables assessing the importance of various characteristics on food choice. Empirical evidence from consumer marketing studies suggests that food purchases are mainly influenced by taste, cost, and convenience, with health assuming a subsidiary role (Drenowski and Levine, 2003). In our study, the survey respondents rated the importance of convenience, ecology/animal rights, health, price, color, taste, and smell in their food choice (Figure 1). In Table 1, it is



**Figure 1:** Ranking of Importance of Food Choice Determinants

shown that on average, 86% of respondents indicated that color, taste, and smell are the most important factors in their food choice. Other factors in food choice, in descending order of importance, were price, health, convenience, and animal rights/ecology (Figure 1). Convenience is another important decision factor for the food purchasing decision, which is consistent with previous research that shows that the individual cost of nutritional and leisure time choices have increased over the past two decades (e.g. Chou, Grossman, and Saffer, 2004). Moreover, a loss of proper cooking skills increases the need to eat convenience food or food away from home (European Food Information Council, 2005).

As Table 1 shows, food prices play a major role when making purchasing decisions and on average, 74% of all respondents place a high importance on this characteristic. This finding is consistent with empirical evidence from consumer marketing studies (Drenowski and Levine, 2003). Interestingly, U.S. Americans spend a smaller share of their income on food than citizens of any other country – the current share is about 14% of disposable income. Of each consumer dollar, food accounted for 13¢ in 2003, which is down from 32¢ in 1950 and 43¢ in 1901 (Atkinson, 2005)<sup>2</sup>. In one sense, these facts represent the success achieved by the American food production and processing system to reduce relative food costs while generating additional value for consumers. Unfortunately, this great success may

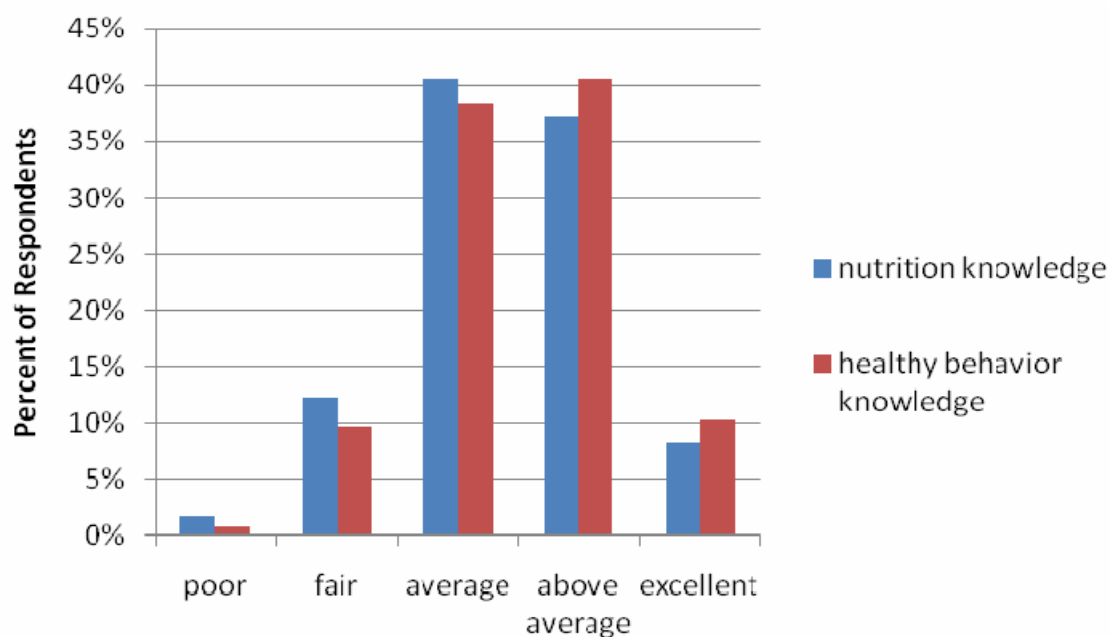
<sup>2</sup> Recent estimates by the U.S. States Department of Agriculture/ Economic Research Service (USDA/ERS) suggest that the share of disposable income spent on food is approximately 11% (USDA/ERS, 2003).

also have non-market costs linked to it, because these lower cost energy sources have been noted for their high fat and sugar content, which ultimately increases the prevalence of overweight and obesity (Drenowski, 2003; Cutler, Glaeser, and Shapiro, 2003).

Respondents were also asked about the daily frequency of eating out and 83% of all respondents eat out in a restaurant, fast-food place, diner, and cafeteria per day. We expect that respondents, who eat out frequently, consume fewer servings of fruits and vegetables. The typical meal is less healthy than home-cooked food, since it is more calorie-dense and contains more total fat, more saturated fat, less calcium, fiber, and iron (Chou, Grossman, and Saffer, 2002; Lin and Frazão, 1999, Lin and Frazão, 1997). One factor contributing to the increased demand for food away from home is the fact that the per capita number of fast food restaurants doubled between 1972 and 1997, which reduces the search and travel time (Chou, Grossman and Saffer, 2002).

Regarding nutritional quality, respondents were asked to rate the nutritional quality of their diet. Most students rated their nutritional quality as average, while 33% rated it as below average and 27% as above average. A higher intake of fruits, fruit juices, and green vegetables should be expected from the respondents with higher-rated nutritional quality.

*Dietary and health knowledge:* In this section of our survey, we asked the respondents to self-rate their knowledge about knowledge of nutrition and health (Figure 2). A positive relationship between higher self-rated nutrition and health knowledge, and fruit and green salad consumption is expected.



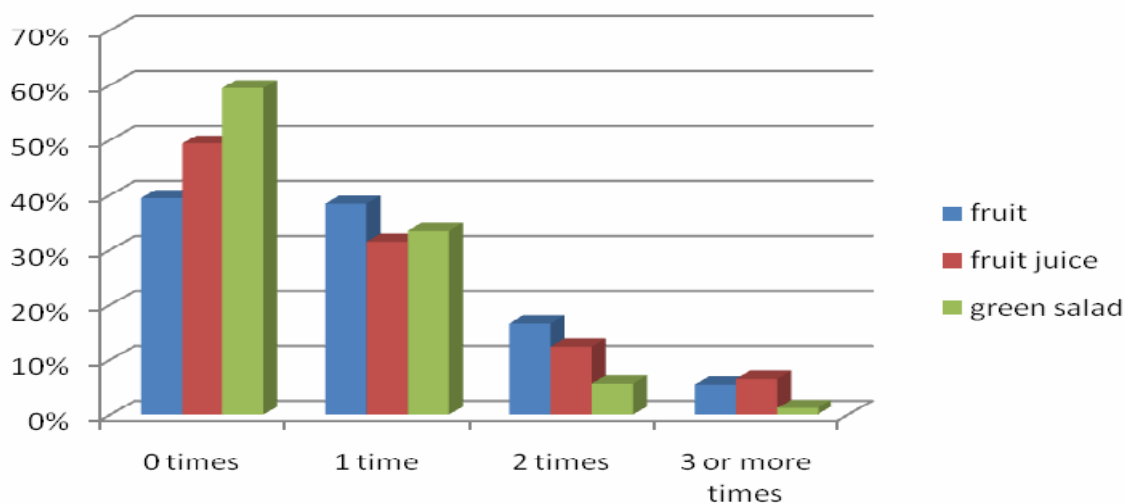
**Figure 2:** Self-rating of Health and Nutrition Knowledge.



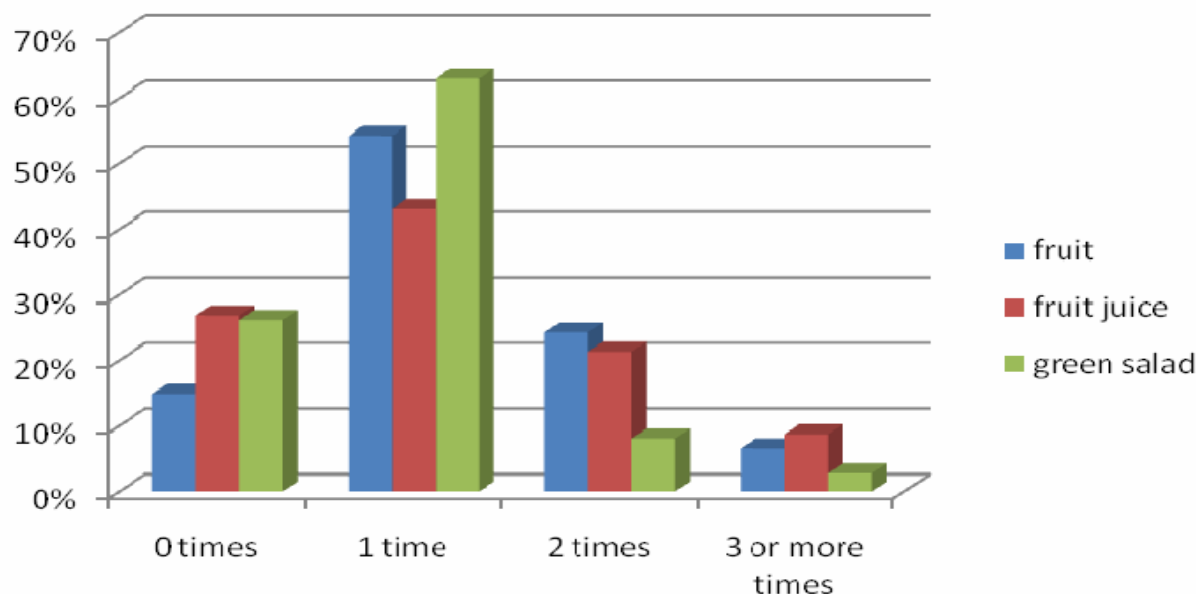
In terms of the link between fruit and vegetable consumption and vitamin consumption, respondents that value their health more, may additionally take vitamins. In our sample, 66% of respondents indicated they take vitamins at least sometimes, with 29% indicating they take them regularly. Thus a positive relationship may be expected between fruit and vegetable consumption and vitamin intake.

In our study, 64% of respondents thought that healthy food is expensive. This finding is consistent with previous research. A recent study by the Rand Corporation [Central Broadcasting Station (CBS), 2005] suggests that on average, a high price of fresh fruits and vegetables contributes 29 pounds to the weights of individuals. Students who live in communities where fruits and vegetables are expensive, may be more likely to be obese than students who live in areas with lower produce cost.

*Food culture:* The survey included several questions to assess the impact of food culture and tradition on fruit and vegetable consumption. Food consumption has a strong cultural element, as it is not just influenced by food availability, but also by the traditions that extend across large numbers of people. Having students identify the expected behavior of food consumption in their family home serves as a measure of the ideal set of goods (i.e. similar to how food culture was measured in Gittelsohn et al. (1999)). This represents their knowledge of the set of cultural foods typically eaten by their family. We also included variables representing the consumption of fruits and fruit juices, green salad, and other vegetables in the family home. It is expected that a larger frequency of consumption of a food product in the family will lead to a higher frequency of the product's consumption by the individual college student. Figure 3 compares the respondent's fruit and green salad consumption to



**Figure 3:** Daily Frequency of Fruit and Vegetable Consumption by the Individual



**Figure 4:** Daily Frequency of Fruit and Vegetable Consumption when with Family

However, as the college students are exposed to new cultures and encounter a different availability of foods, these behaviors may change. In addition to including food culture as measured by the family's food consumption pattern, previous studies show that ethnic origin determines food culture. A recent study determined that while Hispanics showed the highest fruit and lowest vegetable intake, the opposite was true for Caucasians (CDC, 2007a). Table 4 shows the distribution of all respondents by ethnic origin. While 16% of ASU students were Black, Hispanic or of another race, 36.6% of UF students were from ethnic origins other than Caucasian.

**Table 4:** Ethnic Origin of all Survey Respondents

Variable	Total (n=473)	ASU (n=299)	UF (n=174)
Caucasian, non-Hispanic	80.3%	84.4%	73.4%
Black, non-Hispanic	9.0%	10.2%	6.9%
Hispanic/Latino	6.4%	2.0%	13.9%
Other Race	4.3%	3.4%	5.8%

Additionally, food consumption is cultural as it is usually done in a ritual (Barthes, 1997). Considering the meal activities or locations of meal consumption will allow us to investigate the impact of culture. The variables meal activity and home meal activity measure whether the meal is typically eaten while sitting at a table without the TV on. This is measured for both school and family meals. At school, 28% of respondents indicated they eat meals sitting at a table without the television on, while 59% watch TV while eating. At home, 93% of the respondents typically shared at least one meal together as a family. Of all respondents, 76% indicated they ate

more than one meal together. For those that ate meals together as a family at home, 65% indicated they ate the meal at a table without television, while 33% indicated they watched television during the meal. Likewise, families that eat out more, may impact the students' frequency of eating out, hence consuming less fruits and green salad.

In order to assess urban-rural differences, a variable was included that determined whether the student was raised in an area with more than 50,000 inhabitants (Table 5). Overall, 73.4% of ASU students were raised in a rural area, while the majority of UF students grew up in a city.

**Table 5:** Population of City where Student was raised

Variable	Definition	Total (n=473)	ASU (n=299)	UF (n=174)
Rural	Less than 50,000 people	61.8%	73.4%	42.1%
City	More than 50,000 people	38.2%	26.6%	57.9%

## Results

### *Data Analysis*

The data collected from the survey was analyzed using statistics and econometrics. The relationship between fruit and vegetable consumption, health knowledge and food culture, was estimated, while controlling for demographics, lifestyle and urban-rural living characteristics. Statistical significance tests were applied to analyze relationships between students' responses to perception, knowledge, and culture/tradition questions with respect to their demographic characteristics.

Two models were estimated for this study. The first dependent variable was consumption of fruits and fruit juices on the previous day (0 = no consumption, 1 = consumption 1 time, 2 = 2 servings consumed; 3 = consumption of 3 or more servings). The first model used an ordered probit model. The second model used the consumption of green salad on the previous day as the dependent variable. Due to a lack of variation, this model was estimated using a probit analysis with 0 = no green salad consumption and 1 = green salad consumption regardless of frequency. The same set of independent variables was used in both models.

The advantage of using a probit analysis is that even though a variable coefficient might be, for example, positive in the regression analyses and thus implies an increase in fruit and vegetable consumption, this variable might not increase the probability of consuming fruits and vegetables, which would be shown by the probit analysis. The probit analysis increases the explanatory power of the independent variables and delivers practical relevance for the interpretation of factors determining fruit and vegetable consumption of college students.

In the probit model, the dependent variable  $Y_i$  is discrete and binary, and has the outcome  $Y_i = 1$  for to indicate individuals that consume green salad; and  $Y_i = 0$ , if the respondent does not consume this food. The probability mass function for  $Y_i$  under a Bernoulli probability model for the data sampling process is

$f(Y_i) = p_i^{y_i} (1 - p_i)^{1-y_i}$  with  $p_i = \text{Prob}[Y_i = 1]$ ,  $E[Y_i] = p_i$ , and  $\text{var}(Y_i) = p_i(1 - p_i)$ . Assuming that the individual-specific decision outcomes are dependent upon a set of explanatory variables  $x_i$ , a model should reflect the linkage of the decision outcomes to these variables. Each Bernoulli success probability can be set equal to a linear combination of the explanatory variables, which delivers  $p_i = x_i\beta$ . The probit model can be defined as  $Y_i^* = x_i\beta + \varepsilon_i$ , where  $Y_i^*$  is an unobservable variable,  $x_i$  is a set of independent variables,  $\beta$  is a coefficient vector,  $\varepsilon_i$  is the noise component with  $\varepsilon_i \approx N[0,1]$ . The observed dichotomous choice variable  $Y_i$  is related to  $Y_i^*$  in the following manner:  $Y_i = 1$  if  $Y_i^* > 0$  and  $Y_i = 0$  if  $Y_i^* \leq 0$ . A positive (negative) coefficient in the probit analysis means that higher values of this explanatory variable are linked to an increase (decrease) in the likelihood of consuming green salads. Assuming that the individual decisions are independent, the log-likelihood function based on the observations for  $n$  individuals can be written as:

$$\ln L(\beta; y, x) = \sum_{i=1}^n y_i \ln(p_i(x_i\beta)) + \sum_{i=1}^n (1 - y_i) \ln(1 - p_i(x_i\beta)) \quad (\text{Mittelhammer, Judge, and Miller, 2000}).$$

Regarding estimating determinants on fruit consumption, an ordered probit model was chosen, given that the order of the discrete choice mattered. The frequency of fruit consumption varied by respondent, as the standard deviation of 1.44 shows (Table 1). As in the probit model, the ordered probit model is:  $Y_i^* = x_i\beta + \varepsilon_i$ .

Although  $Y_i^*$  is not directly observable, the observed dichotomous choice variable  $Y_i$  consists of ordinal responses, i.e  $Y_i = 0$ ,  $Y_i = 1$ ,  $Y_i = 2$ , etc. Thus,  $Y_i$  is related to the  $Y_i^*$  in the following manner:  $Y_i = 0$  if  $Y_i^* \leq 0$ ,  $Y_i = 1$  if  $0 < Y_i^* \leq \alpha_1$ ,  $Y_i = 2$  if  $0 < Y_i^* \leq \alpha_2$ , and  $Y_i = J$  if  $\alpha(j-1) \leq Y_i^*$ , where  $\alpha_i$  are unknown threshold parameters.

Results of both models are shown in Table 6.

**Table 6:** Results from the Ordered Probit and Probit Models

<i>Demographics</i>	<b>Fruits</b>		<b>Green Salad</b>	
	Coefficient	St.Err.	Coefficient	St.Err.
Age	0.053	0.131	-0.019	0.160
Male	-0.240*	0.141	-0.444***	0.172
BMI	0.004	0.012	0.032**	0.015
Work	-0.305**	0.143	-0.181	0.170
Low Income	-0.538***	0.162	-0.087	0.193
Medium Income	-0.559***	0.166	-0.067	0.199
University	-0.136	0.146	-0.130	0.178
<i>Lifestyle</i>				
Low Overall Physical Health	0.335*	0.197	0.276	0.241
High Overall Physical Health	-0.012	0.170	0.162	0.205
Low Level of Physical Activity	0.122	0.180	0.052	0.224
High Level of Physical Activity	0.340*	0.186	0.204	0.229
Time Exercise	0.021*	0.012	-0.002	0.015
TV	-0.071***	0.026	-0.047	0.036
Importance of Convenience	-0.227	0.180	0.147	0.213
Importance of Ecology/Animal Rights	0.253	0.180	0.199	0.213
Importance of Health	0.379**	0.162	0.267	0.198
Importance of Price	0.022	0.147	0.064	0.176
Importance of Color, Taste, Smell	0.160	0.180	-0.480**	0.213
Eating Out	-0.149*	0.086	0.111	0.103
Low Nutritional Quality	-0.352**	0.178	-0.197	0.217
High Nutritional Quality	0.090	0.173	0.107	0.205
<i>Dietary and Health Knowledge</i>				
Low Nutrition Knowledge	-0.141	0.282	0.000	0.342
High Nutrition Knowledge	0.190	0.205	0.089	0.245
Low Health Knowledge	0.002	0.241	0.119	0.290
High Health Knowledge	-0.177	0.209	-0.144	0.251
Vitamins	0.322**	0.132	0.017	0.160
Healthy Food Price	0.149	0.130	-0.090	0.155
<i>Food Culture</i>				
Family Fruit and Fruit Juice	0.462***	0.057	-0.069	0.065
Family Green Salad	-0.318*	0.164	0.444**	0.197
Family Vegetables	0.068	0.099	0.081	0.119
Other Race	-0.422	0.300	-0.095	0.358
Black	0.266	0.240	-0.107	0.289
Hispanic/Latino	0.168	0.277	0.154	0.337
Meal Activity	0.096	0.153	-0.230	0.185
Home Meal Activity	-0.011	0.137	0.345**	0.163
Family Eating Out	0.062	0.094	0.010	0.112
City	-0.017	0.134	0.271*	0.160
Log-Likelihood	-523.17		-255.23	
Correct Prediction	45.9%		66.2%	
Naïve Prediction	29.0%		59.9%	

Significance indicated by \*, \*\*, and \*\*\* at the 90%, 95%, and 99% confidence levels.

## Interpretation

Results of this study provide information the impact of a) health knowledge, b) food culture, c) lifestyle, and d) subgroup differences by region, college major, gender, and urban-rural location on fruit and vegetable consumption of college students.

### *Health knowledge*

Self-rated health knowledge had little impact on respondent's consumption of fruits and green salad. The only significant variable in this category was vitamin consumption. Students indicating they consumed vitamins (either regularly or irregularly) were 8.4% less likely to consume no fruit or fruit juice and 7.9% more likely to consume three or more servings of fruits.

This finding is consistent with previous research, as typically, self-rated knowledge, also known as subjective knowledge, impacts food consumption. Objective knowledge could be tested by asking respondents a set of multiple choice questions and open-ended questions about nutrition and health to directly test knowledge in various subject areas. The most representative survey to test diet and health knowledge is the Diet and Health Knowledge Survey (DHKS), which is the companion to the Continuing Survey of Food Intakes by Individuals (CSFII). Both of these surveys are conducted by the U.S. Department of Agriculture (USDA). During the DHKS, the household's main meal planner is asked to answer two sets of questions: One set of questions relates to nutrient knowledge and another set of questions captures diet-health awareness. To test nutrient knowledge, one sample question would be to identify which of two foods has the higher fiber content: fruit or meat, cornflakes, or oatmeal, popcorn or pretzels. The diet-health awareness questions take the general form, Have you heard about any health problem that might be related to how much of a particular nutrient (e.g. fat) a person eats? (Variyam et al., 1999). Thus, in order to expand and improve the current survey questionnaire, measures of objective knowledge could be included into the survey. For example, we could ask respondents to identify foods with the highest vitamin C content. Furthermore, diet-health awareness could be assessed by asking, What are some health benefits of fruits, vegetables, and other foods?

### *Food Culture*

As expected, the food culture variables were highly significant in determining the consumption of fruits and green salad. Family consumption of fruits was highly predictive of the individual's consumption of fruits. The same is true for the green salad model. Interestingly, family consumption of green salad significantly decreased the consumption of fruits. This may be indicating that within the family, if the culture emphasized the consumption of vegetables such as salad, it did not stress fruit consumption jointly with it. For each one serving increase in fruit

consumption in the family, the likelihood of having no servings of fruits at school decreased by 11.5% and the likelihood of having three or more servings increased by 11.8%. For each one serving increase in green salad in the family, the likelihood of having green salad at school increased by 16.9%. Consumption of green salad in the family increased the likelihood to eat no servings of fruits by 7.9%.

In addition to the family consumption variables, the family meal activity variables significantly impacted the consumption of green salad. Respondents who indicated their family ate dinner at a table without watching television were 12.9% more likely to consume green salad. It could be hypothesized that salads are more likely consumed at a table than on-the-go, therefore, the tradition of sitting at a meal table would increase the likelihood of consuming products like green salad. This finding is consistent with previous research which determined that watching television during meals has been found to be related to higher fat consumption in adolescents and adults (Boutelle et al., 2003). Other research showed a relationship between television watching and overweight, given that television viewing is such a sedentary activity (Strauss and Knight, 1999; Agras and Mascola, 2005; Salmon et al., 2005). ). This research indicates that tradition of eating at the dinner table carries forward to healthy eating behaviors in college. These findings are consistent with recent research. Fitzpatrick, Edmunds, and Dennison (2007) identified that families who eat dinner together at the dinner table with the television off eat more fruits and vegetables than those who eat separately or watch television while eating. Thus, there is need to promote meal environments that support healthful eating. Parents can play a role by limiting television and video games or other sedentary activities during meal times (Ritchie et al., 2005; Lindsay et al., 2006). Finally, those survey respondents who were raised in urban areas were 10.4% more likely to consume green salad, indicating that a different food culture exists between the urban and rural respondents. Urban respondents may have an increased ability to purchase fruits and vegetables, given a higher density and variety of grocery stores (The Economist, 2002).

### *Lifestyle*

Many lifestyle variables had a significant impact on fruit consumption, but only one had a significant impact on green salad consumption, indicating the types of products we studied are considerably different. For green salad, the only significant lifestyle variable was based on whether a person indicated that color, taste, and smell are important factors in food choice. In this case, these respondents were 18.8% less likely to consume green salad. On the other hand, respondents who indicated health was an important factor in food choice were 8.9% more likely to eat three or more servings of fruits and 10.3% less likely to consume no fruits. Behavior did impact consumption of fruits to a lesser degree. For each additional hour of television watched above the average of 2.5 hours, respondents increased their likelihood to consume no fruits by 1.8%. These findings are consistent with previous research that determined for each additional hour of television viewed per

day, fruit and vegetable consumption decreased by 0.16 servings per day (Boynton-Jarrett et al., 2003). In addition, research showed that television shows targeted at adolescents feature mostly commercials for high-calorie and high-sugar foods (Strauss and Knight 1999).

Those that ate out more frequently were 3.7% more likely to consume no fruits. On the other hand, for every exercise activity above the average amount, the likelihood to consume three or more servings of fruits increased by 0.5%. Finally, those who rated their level of physical activity as higher than average were 8.2% less likely to eat no fruits.

One unexpected relationship was discovered in this category. Students who rated their overall physical health as below average were 7.4% less likely to consume no fruits. A possible explanation for this outcome could be that concern about their physical health has led these students to consume more servings of fruit.

### *Subgroup differences*

Demographics did impact both fruit and green salad consumption. However, they influenced these variables differently. Gender differences were similar, with males 3.3% and 6.2% less likely to consume two or three servings of fruits, respectively, and 16.9% less likely to consume green salad. Students who worked were 7.3% more likely to consume no fruits and students with relatively lower incomes were about 15% more likely than those in the highest income category to consume no fruits. Finally, for green salad, for each unit increase in BMI above average, the likelihood to consume green salad increased by 1.2%. This was not the expected relationship, though perhaps it could be indicating that those with higher BMIs are concerned about their weight and act on that concern.

Also of interest were the demographic variables that were not significant. Age and location were not significant, indicating there were no statistical differences between UF and ASU students, though UF students were expected to eat more fruit and fruit juice given their proximity to production and given Arkansas' position as one of the states with the largest rates of obesity.

## **Conclusions**

The impact of culture on food consumption can not be understated, yet it is rarely considered in agricultural economics and agribusiness literature. Culture is not measured by income levels and cities of residence. Often, the proxy used for culture is ethnicity, which is often underrepresented in survey research. Additionally, this provides a view of culture that is based on demographics. In this study, we measure food culture by including family behavior versus the behavior of the individual studied. In anthropology, a field where culture is the focus of study, family behavior



is likened to an ideal set of goods. Aggregating this ideal set across people would allow patterns to emerge that would be considered culture, or similarities among different groups of people. Additionally, family behavior impacts food choice, as well as food consumption behavior. Food consumption is considered to be cultural because it is often done in rituals. An example is the ritual of eating dinner at the table, without the television on. If this was common in the family, we found that it would increase the likelihood of consuming green salad.

This study showed that fruit and vegetable consumption decreased with an increased frequency of eating away from home. This finding is consistent with previous studies. Eating away from home has been associated with poor diet quality. This may be due to fewer food choices, or less information about the nutrient content of the foods consumed. Another reason may be that consumers regard eating away from home as a 'splurge', independent from its frequency and use it as an opportunity to enjoy foods other than their usual diet, such as desserts. In this case, behavioral strategies need to change consumer attitudes regarding eating out or modify the environmental setting of fast food and full service restaurants. Increased information on the nutrient content of foods should be provided or institutional meal plans should adjust to more healthful food choices in order to reduce the intake of high-calorie foods (Guthrie, Derby, and Levy, 1999). Since there is no expectation that the trend of eating away from home is going to reverse itself, there is need for nutrition policy, education, and promotion strategies that focus on improving the nutritional quality of food away from home (Lin, Guthrie, and Frazão, 1999). For college students, an improved quality of the on-campus cafeteria food could be reached by incorporating more dishes with fruits and vegetables.

In addition to improving students' health, increasing fruit and vegetable demand would be beneficial for agribusiness companies. Recent studies suggest that small estimated changes in fruit and vegetable consumption would lead to adequate time for U.S. agriculture to adjust production and for the food industry to develop and market new packaged fresh-food options and new processed foods (Buzby, Wells, and Vocke, 2006). U.S. agriculture has proven to be flexible in response to constant changes in consumer demand, new production and processing technologies and supply shocks, such as in the case of the recent wave of low-fat and low-carb products (Buzby, Farah, and Vocke, 2005). The food and agribusiness industry has expressed the need for studies to explain consumption patterns, as it closely watches whether and how consumers will react to the call for increased fruit and vegetable consumption by the new dietary guidelines. Hence, this study forms an important step to understanding underlying demand drivers. This information will help to determine efficient management decisions. Furthermore, the availability of this information may provide help considering design, development, and improvement of fruit and vegetable marketing decisions. Understanding consumer demand will also help restaurant and other food outlets to determine what appears

on their menus (Buzby, Wells, and Vocke, 2006). Thus, a deeper understanding of the relationship between food culture and health knowledge on food consumption directly benefits agribusiness companies along the supply chain.

This study leaves some questions open for future research. The impact of family consumption of green salad decreased the likelihood to consume fruits. Relationships between variables, and inclusion of other vegetables would prove interesting for future research. Additionally, the BMI, which is frequently used as a measure of quality of diet, was not significantly related to fruit consumption and was positively related to green salad consumption. Investigation into this relationship could provide answers to these outcomes, such as that those respondents with higher BMI's might be more conscious of their diets and thus, more likely to eat healthy in an attempt to reduce their BMI. In fact, those respondents that were overweight were more likely to rate their physical health lower than those who were not overweight, indicating a certain level of awareness. Related to this subject is the limitation that this was an online study. Self-reporting of variables, like weight and diet habits, is typically more reliable in intervention studies when these data can be more directly collected.

An additional limitation of this study is that data on consumption was collected by asking respondents to report their eating habits "yesterday". It can always be argued that the previous day was not a typical day, and thus, is not representative of their true behavior. However, this has to be balanced with the ability of the respondent to recall their eating habits over a period of time. Typical food diary studies, such as the national representative Behavioral Risk Factor Surveillance System (BRFSS) collected by the CDC, rely on the 24-hour recall method – what foods have you eaten in the last 24 hours – because of the inability of people to accurately recall what they ate over a longer period of time (CDC-BRFSS, 2005). Intervention studies that observe eating behaviors are a more accurate, but also a more costly method of data collection. As a preliminary study in this area, the online survey provides us with evidence of issues to be further investigated and directions that agribusinesses and policy makers should consider. This study indicates that food culture, demographics, and lifestyle have an impact on fruit and green salad consumption of college students in Arkansas and Florida. Unfortunately, when sampling college students, it is difficult to compare the sample to the population. Expanding the geographic focus of the study to include more states, or even other countries, would also enrich the findings, given that obesity is a global epidemic.

Among the interesting findings was that self-reported knowledge had little impact on produce consumption. Future research should consider both objective and self-reported knowledge, but this preliminary finding indicates that emphasis should be placed on food culture and lifestyle if attempting to influence fruit and vegetable consumption. Typically, public health policies have focused on education, hence

aimed at increasing knowledge. It is possible that increased communication about the importance of family traditions, like eating at the dinner table would have a greater impact than increasing information on the number of servings of fruits and vegetables people should consume. Additionally, information targeted at different demographic segments, as well as at different subcultures, needs to be adjusted according to subgroup, to reflect the different behaviors of these groups.

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## Appendix: A

**Table 1:** Definitions, Means and Standard Deviations of Variables used in the Regression

Variable	Definition	Mean and Std.deviation
<i>Fruit and Vegetable Consumption</i>		
Fruits	Frequency of consuming fruits /fruit juices per day	1.64 (1.44)
Green Salad	Frequency of consuming green salad per day	0.47 (0.63)
<i>Demographics</i>		
Age	Age of respondent (>18 years)	22.0 (2.14)
Male	=1 if male, =0 if female	0.53
Body Mass Index (BMI)	Weight (kg)/ (Height (m)) <sup>2</sup>	23.45 (5.33)
Work	=1 if individual works while attending school, = 0 otherwise	0.64
Low Income	Individual income of less than \$499 per month	0.42
Medium Income	Individual income of \$500-\$999 per month	0.30
High income	Individual income of ≥\$1,000 per month (omitted variable)	0.28
University	=1 if individual attended ASU, =0 if individual attended UF	0.63
<i>Lifestyle</i>		
Low Overall Physical Health	Self-rating of overall physical health is poor or fair	0.16
Medium Overall Physical Health	Self-rating of overall physical health is average (omitted variable)	0.44
High Overall Physical Health	Self-rating of overall physical health is above average or excellent	0.40
Low Level of Physical Activity	Self-rating of physical activity is poor or fair	0.27
Medium Level of Physical Activity	Self-rating of physical activity is average (omitted variable)	0.33
High Level of Physical Activity	Self-rating of physical activity is above average or excellent	0.41
Time Exercise	Frequency of performing physical activity and exercise per week, as measured by number of times involved in cardiovascular, strengthening, stretching, and walking exercises (range 0-28)	8.51 (6.66)
TV	Number of hours the respondent watches TV per day	2.50 (2.46)
Importance of Convenience	Rated importance of convenience on food choice as important or higher	0.84
Importance of Ecology/Animal Rights	Rated importance of ecology/ animal rights on food choice as important or higher	0.15
Importance of Health	Rated importance of health on food choice as important or higher	0.74



Importance of Price	Rated importance of price on food choice as important or higher	0.74
Importance of Color, Taste, Smell	Rated importance of color/taste/smell on food choice as important or higher	0.86
Eating Out	Frequency of respondent eating out in a restaurant, fast-food place, diner, cafeteria, etc. per day	0.83 (0.76)
Low Nutritional Quality	Self - rating of nutritional quality of diet is poor or fair	0.33
Medium Nutritional Quality	Self - rating of nutritional quality of diet is average (omitted variable)	0.40
High Nutritional Quality	Self - rating of nutritional quality of diet is above average or excellent	0.27
<i>Dietary and Health Knowledge</i>		
Low Nutrition Knowledge	Self - rating of nutrition knowledge is poor or fair	0.15
Medium Nutrition Knowledge	Self - rating of nutrition knowledge is average (omitted variable)	0.39
High Nutrition Knowledge	Self - rating of nutrition knowledge is above average or excellent	0.46
Low Health Knowledge	Self - rating of health knowledge is poor or fair	0.11
Medium Health Knowledge	Self - rating of health knowledge is average (omitted variable)	0.38
High Health Knowledge	Self - rating of health knowledge is above average or excellent	0.51
Vitamins	= 1 if respondent took vitamins during the past year; = 0 otherwise	0.65
Healthy Food Price	= 1 if respondent thinks that healthy food is expensive; = 0 otherwise	0.64
<i>Food Culture</i>		
Family Fruit and Fruit Juice	Frequency of fruit and fruit juice intake in family home per day	2.30 (1.37)
Family Green Salad	Frequency of consumption of green salad in family home per day	0.84 (0.65)
Family Vegetables	Frequency of consumption of cooked vegetables, French fries, and potato chips in family home per day	2.14 (1.07)
Caucasian	= 1 if respondent is Caucasian (omitted variable); = 0 otherwise	0.82
Other Race	= 1 if respondent is Pacific Islander or Asian	0.04
Black	= 1 if respondent is non-Hispanic Black; = 0 otherwise	0.08
Hispanic/Latino	= 1 if respondent is Hispanic; = 0 otherwise	0.06
Meal Activity	= 1 if respondent typically consumes meal while sitting at a table without TV on when at school; = 0 otherwise	0.26
Home Meal Activity	= 1 if respondent typically consumes meal while sitting at a table without TV on when at home; = 0 otherwise	0.58
Family Eating Out	Frequency of respondent eating out in a restaurant, fast-food place, diner, cafeteria, etc. in family home per day	0.68 (0.71)
City	= 1 if respondent was raised in an area with more than 50,000 people; = 0 otherwise	0.39
Rural	= 1 if respondent was raised in an area with less than 50,000 people (omitted variable); = 0 otherwise	0.61



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## **The Role and Success Factors of Livestock Trading Cooperatives: Lessons from German Pork Production**

Ludwig Theuvsen<sup>a</sup> and Annabell Franz<sup>b</sup>

<sup>a</sup> *Professor, Department of Agricultural Economics and Rural Development Georg-August University, Department of Agricultural Economics and Rural Development, Goettingen, Germany*

<sup>b</sup> *B. Sc., Department of Agricultural Economics and Rural Development Georg-August University, Department of Agricultural Economics and Rural Development, Goettingen, Germany*

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### **Abstract**

In recent years the organization of meat supply chains has been among the most animatedly discussed topics in agriculture and the food industry. Many authors hypothesize that contracts and vertical integration are paramount for the future competitiveness of meat production. But most arguments do not take into account the complexity of today's meat supply chains and the pivotal role private and cooperative livestock traders still play in many countries. In this paper we analyze the role and success factors of livestock trading cooperatives in modern meat supply chains. The results show that livestock trading cooperatives are most successful when their service spectrum meets members' needs and offers an added value to farmers. From a theoretical perspective, the results indicate that the idea of searching for "one best way of organizing" food supply chains might be misguided and current writing on this topic might be too deterministic.

**Keywords:** Cooperatives, Equifinality, Livestock trading, Meat industry, Success factors.

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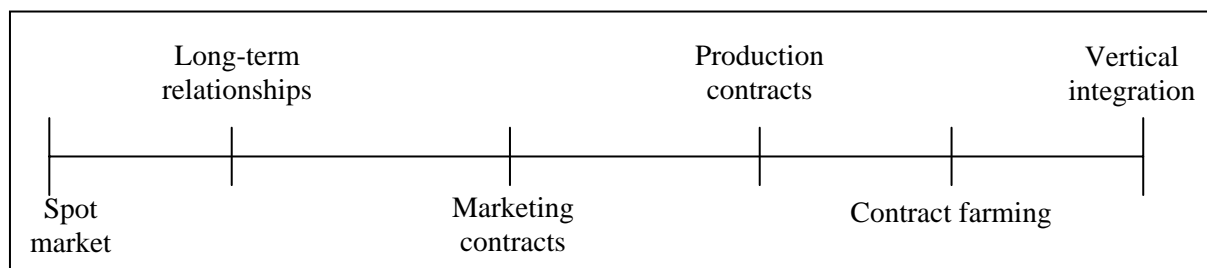
<sup>①</sup>Corresponding author: Tel: +49-551-394851  
Email: [Theuvsen@uni-goettingen.de](mailto:Theuvsen@uni-goettingen.de)  
Other contact information: A. Franz: [mreichm2@gwdg.de](mailto:mreichm2@gwdg.de)

## Introduction

Today's food supply chains are complex international networks characterized by a vast variety of organizational and managerial aspects (Bijman et al, 2006; Ondersteijn et al, 2006). The vertical coordination of meat supply chains and the way relationships between producers and processors are organized are among the most animatedly discussed research topics. Many authors argue that the way meat supply chains are organized strongly determines their future competitiveness (Windhorst, 2004). In many countries, including the United States, meat supply chains have been undergoing changes resulting in stricter vertical coordination (Martinez, 2002a, 2002b; MacDonald et al, 2004).

Transaction cost economics provides the most widely used theoretical framework for analyzing the vertical organization of meat supply chains (Schulze, Spiller and Theuvsen, 2006a). Two key variables in transaction cost theory that characterize the situation under which transactions take place are the degree of asset specificity and the amount of uncertainty in a market (Klein, Crawford and Alchian, 1978; Williamson, 1985). In the comparative analysis of discrete structural alternatives proposed by Williamson (1991), organizational alternatives are evaluated according to their ability to cope with these contingency factors due to their adaptive capacity either through autonomous or cooperative decision making, incentive intensity and level of administrative control.

Due to the dominant role of transaction cost theory in the discussion about the vertical coordination of meat supply chains, most papers refer to the distinction between spot-market transactions, hybrid organizational forms and hierarchy proposed by Williamson (1985, 1991). Peterson, Wysocki and Harsh (2001), for instance, describe specification contracts, relation-based alliances and equity-based alliances as typical organizational alternatives to spot-market relationships in meat supply chains. Similarly, Spiller et al (2005) distinguish between spot markets, informal long-term relationships, marketing and production contracts, contract farming and vertical integration (Figure 1).



**Figure 1:** Vertical Coordination of Meat Supply Chains (Schulze, Spiller and Theuvsen, 2006c, p. 374)

More recently, ideas stemming from the relationship marketing literature (Morgan and Hunt, 1994; Wilson and Jantrania, 1994; Ballantyne, Christopher and Payne, 2003) have been introduced into the analysis of food supply chains. So, besides the structural aspects stressed by transaction cost economics, behavioral determinants of efficient governance structures such as trust (Hansen, Morrow and Batista, 2002; Batt, 2003; Fritz and Fischer, 2007), preferences (Key, 2005; Key and MacDonald, 2006) and commitment (Spiller et al, 2005) have also been taken into account in more recent studies. Trust, for instance, is expected to have a positive impact on relationship performance through reducing behavioral uncertainty and, thus, transaction costs (Galizzi and Venturini, 1999), supporting commitment and improving cooperation and communication (Morgan and Hunt, 1994; Batt and Rexha, 1999). Therefore, trust management is strongly recommended in food supply chains for gaining and sustaining competitive advantage (Spiller et al, 2005; Schulze, Spiller and Theuvsen, 2006c; Schulze, Spiller and Theuvsen, 2007).

Although the discussions inspired by transaction cost economics and other theoretical frameworks shed some new light on the question of how to efficiently organize supply chains, they do not fully take into account the complexity of today's meat industries. In most cases, the discussion about how farmers should organize their business relationships with abattoirs does not consider the pivotal role private and cooperative livestock traders still play in agribusiness value chains in many countries. So, in fact, in many countries, such as Germany, the marketing of slaughter animals is organized as a two-tier system, with livestock traders mediating the business relationships between producers and processors, whereas most of the existing literature discusses the efficient design of single-tier livestock marketing systems characterized by direct business relationships between farmers and abattoirs. Therefore, one important alternative for organizing meat supply chains has not received much attention; so far the future role and the success factors of agricultural trading cooperatives have rarely been investigated and are still unclear.

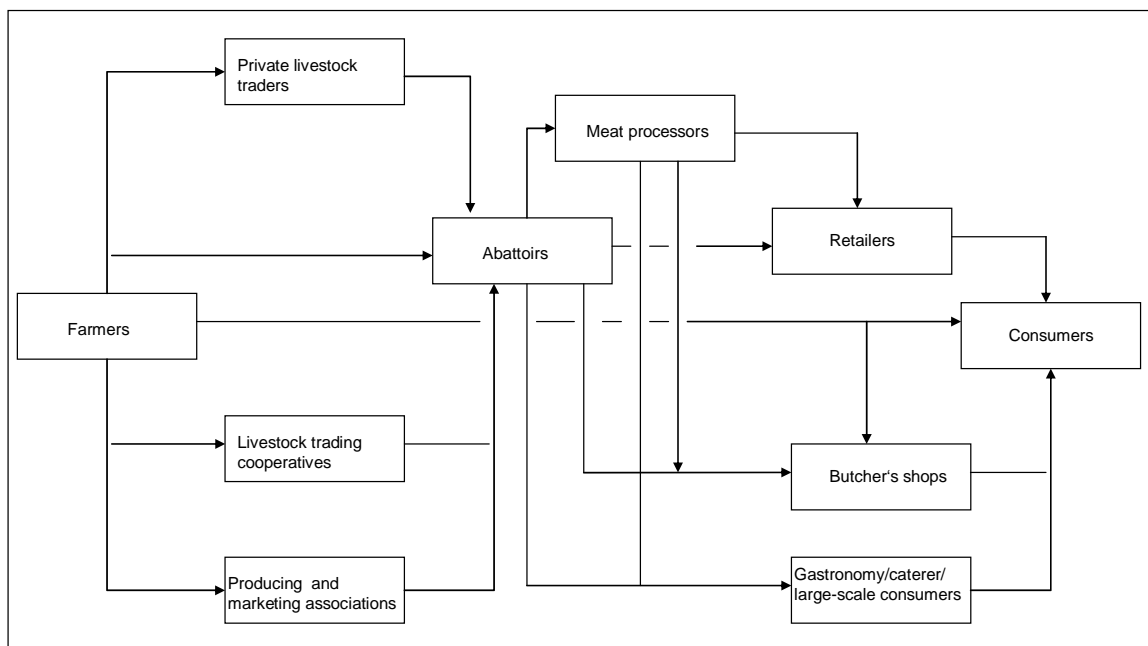
Although in many Western countries cooperatives have played pivotal roles in food supply chains for more than a century, structural changes in agriculture resulting in bigger farms and making single-tier systems more efficient as well as the ongoing discussion about the competitive advantages of stricter vertically coordinated meat supply chains (den Ouden et al, 1996; Lawrence et al, 1997, 2001) contribute to the weakening of the market position of livestock trading cooperatives. Decreasing numbers of members and sales volumes and a growing number of mergers between livestock trading cooperatives are indicators of the economic pressures these organizations are currently facing. They compete heavily with private traders, direct marketing relationships between farmers and processors and vertically integrated production systems set up by processors.

## Objective and research questions

Against the background described above, the objective of this paper is to analyze the role and success factors of livestock trading cooperatives in modern meat supply chains. We focus on the following research questions: What role do trading cooperatives currently play in food supply chains, how do the organizations perceive their roles in meat supply chains, what do they consider their success factors, and how do farmers perceive the role and success factors of trading cooperatives in food supply chains? The study is based mainly on an empirical analysis of livestock trading cooperatives in German pork production. Additional analyses focus on trading cooperatives in the beef and turkey chains.

## Livestock trading cooperatives in German pork supply chains

In Germany, producers of slaughter pigs can choose between very different marketing channels (Czekala, 2003; Spiller et al, 2005). A small minority of farmers have established direct marketing relationships with consumers based on on-farm slaughtering, cutting and in some cases even processing their own pigs. Another group of farmers directly deliver their slaughter pigs to abattoirs (single-tier system). Westfleisch eG, Germany's third largest abattoir, strongly promotes marketing contracts with farmers, whereas the vast majority of competing private and cooperative abattoirs favor spot-market or informal, long-term relationships with farmers. A third group of farmers rely on livestock traders when selling their slaughter pigs (two-tier system). In this distribution channel, private and cooperative traders compete heavily for market shares. Figure 2 illustrates that



**Figure 2:** Business relationships in meat supply chains (Spiller et al, 2005, p. 86)

abattoirs have a bottleneck function in meat supply chains—except for the small niche market of direct marketing relationships with consumers. Therefore, deciding on marketing channels and the design of business relationships with abattoirs is of fundamental importance to pig producers.

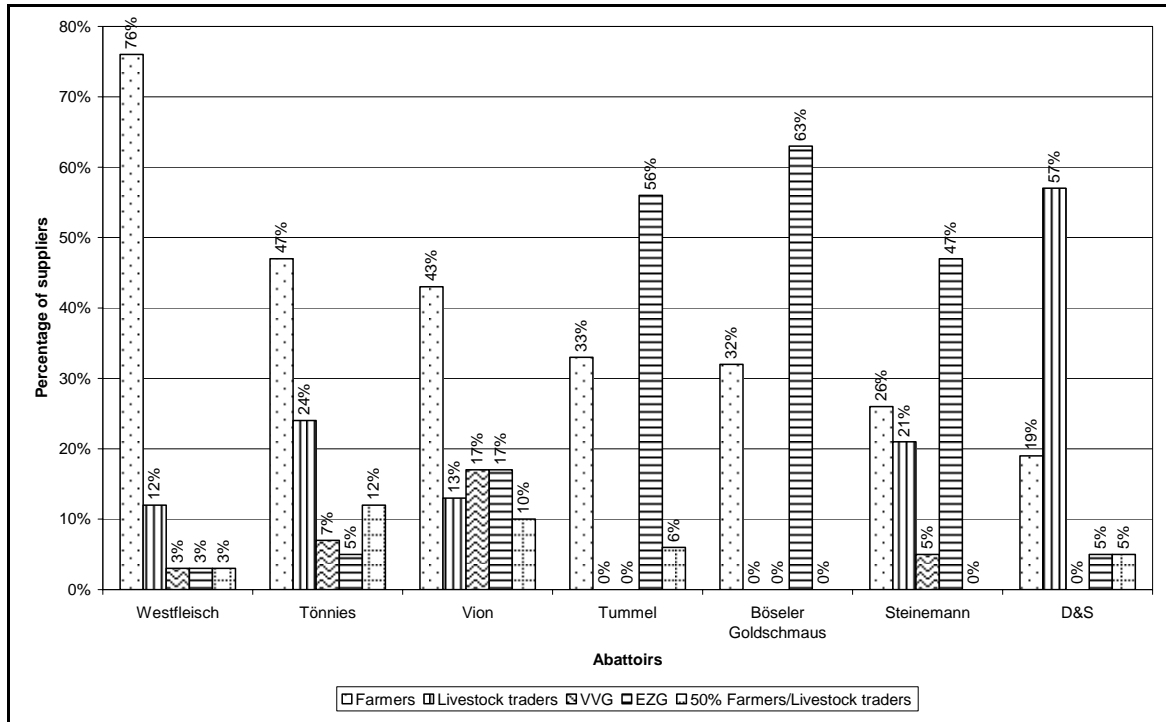
For historical reasons, two very similar but not identical groups of cooperatively managed organizations can be distinguished in the livestock trading industry: producer-owned livestock trading cooperatives (*Viehvermarktungsgenossenschaften*, or *VVGs*) and producing and marketing associations (*Erzeugergemeinschaften*, or *EZGs*).

VVGs are based on the German Law on Cooperatives (*Genossenschaftsgesetz*). Their main goal is to pool the marketing of livestock and to organize sales and transport of slaughter animals. VVGs are organized according to the economic principles of cooperatives: self-help, self-administration, personal responsibility, democracy, identity, and solidarity and advancement (Rhodes, 1983; Beuthien, 1990; Theuvsen, 2006). Therefore, VVGs are sometimes considered most appropriate for small-scale farming operations that are not big enough to allow the establishment of direct marketing relationships with abattoirs (Theuvsen and Recke, 2007).

EZGs are founded in accordance with the German Law on Market Structures (*Marktstrukturgesetz*). The Law on Market Structures allows exceptions from general laws on anti-competitive behavior in the agribusiness sector if collusive behavior allows the supply and marketing of agricultural products to be better tailored to market requirements. Therefore, EZGs not only pool the marketing and organize sales and transport of livestock but also set up rules that improve the quality and homogeneity of products produced by farmers. Therefore, they typically establish closer relationships with farmers than VVGs and require them to market all their livestock to the EZG, whereas VVGs also allow farmers to have alternative business relationships with abattoirs or private livestock dealers (Spiller et al, 2005). From a legal perspective, EZGs are not organized as cooperatives but as registered for-profit associations. Nevertheless, their main objectives are very similar to those of the cooperative movement so that EZGs and VVGs can be both regarded as varieties of livestock trading cooperatives.

An empirical study conducted by Spiller and his colleagues (2005) in Germany's leading pig-producing areas in Westphalia and the Weser-Ems region, both located in the northwestern part of the country, showed that the share of farmers who directly contract with abattoirs, prefer private or cooperative traders or use a mixture of direct and indirect sales of slaughter pigs varies remarkably depending on the abattoir involved (cf. Figure 3). Not surprisingly, the single-tier system is most preferred by farmers delivering to the Westfleisch eG due to the processor's strong preference for marketing contracts. The picture is much more mixed with

regard to competing abattoirs in the region. Although not statistically significant, firm size seems to play a role since Vion and Toennies, Germany's largest and second-largest abattoirs, reveal higher percentages of direct relationships with farmers than their smaller competitors.



**Figure 3:** Preferred marketing channels of pig producers in Westphalia and the Weser-Ems region (Spiller et al, 2005, p. 301)

The empirical study referred to in Figure 3 strongly focused on farmers of above-average size pursuing growth strategies. The picture is more mixed when a more representative sample of farmers is surveyed. In an earlier study in Lower Saxony that included, but was not restricted to, the above-mentioned Weser-Ems region, Traupe (2002) reports that 7.4% of farmers directly deliver their pigs to slaughterhouses, 34.3% prefer private livestock traders and 58.3% prefer livestock trading cooperatives. Regardless which study more accurately represents the reality of slaughter pig marketing, an important role is attributed to cooperative livestock traders.

## Methodology

German livestock trading cooperatives were surveyed in two waves between February and April 2005 and May and June 2006. The first wave focused on cooperative slaughter pig traders in Northwestern Germany. The survey was strongly supported by the EZG umbrella organization in Lower Saxony

(*Vereinigung der Erzeugergemeinschaften fuer Vieh und Fleisch e. V.*) and regional cooperative associations. In this survey, questionnaire-based telephone interviews of 20 to 25 minutes were conducted with 36 managing directors of VVGs and EZGs. The former were based mainly in Westphalia, whereas the vast majority of the latter were located in the neighboring Weser-Ems region (Theuvsen and Recke, 2007; Recke et al, 2006).

The second survey included 29 managing directors of VVGs and EZGs in the German states of Baden-Wuerttemberg, Bavaria, Hesse, North-Rhine Westphalia and Thuringia. Sixteen of the respondents managed organizations in Bavaria alone due to the strong support of the study by the Bavarian EZG and VVG umbrella organization (*Ringgemeinschaft Bayern e. V.*). In the other states, the survey was supported by farmer associations, the ministry of agriculture or environment or other regional authorities. Unlike in the first survey, we included not only pig trading cooperatives, but also VVGs and EZGs trading cattle, piglets or turkeys. This extension seemed reasonable since it allowed us to come up with a larger and more representative sample and because the questionnaire could also be answered easily by EZGs and VVGs outside the pork industry. Again, telephone interviews of 20 to 25 minutes were conducted using the same questionnaire that had already guided the first survey.

The questionnaire focused on EZGs' and VVGs' purchasing and marketing channels, service spectra and success, i.e. the "hard" variables. It left out "soft" factors such as trust and commitment. Nevertheless, results will also be discussed in the light of the business-to-business marketing literature. The questionnaire consisted of open and closed questions. Where respondents were asked to comment on pre-formulated statements, seven-point Likert scales were used (1 = very high / very important / strongly agree; 7 = very low / very unimportant / strongly disagree).

The first wave of the survey was mirrored by face-to-face interviews with 357 farmers in Westphalia and the Weser-Ems region, who were asked the same questions as the managing directors of the EZGs and VVGs (Spiller et al, 2005). This allowed us to compare organizations' self-perception with that of their members and to get a picture of the organizations' role in supply chains that is less biased than the one obtained from perceptual measures (Ailawadi, Dant and Grewal, 2004).

## Results

### *Background: Livestock production in Germany*

Germany is one of the major livestock producers in the world. At the end of 2005, there were 281,000 livestock farms in Germany, including 183,400 cattle farmers and 88,700 pig farmers. The number of cattle decreased from about 14.5 million



animals in 2000 to 12.7 million in 2006 due to the existence of milk quota in the EU that limit production and ongoing changes in EU Common Agricultural Policy. Major production areas of cattle are the mountainous regions in Southern Germany (Bavaria and Baden-Wuerttemberg) and the coastal regions in North-Western Germany (Lower Saxony and Schleswig-Holstein). Bavaria (3.49 mio. animals), Baden-Wuerttemberg (1.04 mio.), Lower Saxony (2.49 mio.) and Schleswig-Holstein (1.15 mio.) represent about three quarters of German cattle herd size. Total beef production was nearly 1.15 mio. tons in 2006. Average farm size varies greatly between the production regions. In 2005 average farm size was only 51.4 animals (24.5 dairy cows) in Bavaria compared to 95.9 animals (46.4 dairy cows) in Lower Saxony (Destatis, 2006; Destatis, 2007a; Destatis, 2007b).

Germany is the world's third largest pork producer with an output of 4.7 mio. tons in 2006. In the European Union, Germany is the largest pork producer, followed by Spain, France, Poland and Denmark. After German reunification, German pork production declined due to the privatization process in Eastern Germany and the reduction of production capacities in the new German states. As a result, between 1990 and 1996, herd size decreased from 34.2 million pigs in 1990 to 26.5 million pigs in 1996 (Spiller et al, 2005). Since then, production has slowly recovered; in 2005, 88,700 pig farmers kept 26.86 mio. pigs. Due to growing imports of slaughter pigs, pork production reached an all-time high in 2006. In 2006, for the first time in history, Germany was a net exporter of pork (Burchardi et al, 2007).

The major pig producing area is located in North-Western Germany close to the Dutch border where 30,400 farmers keep about 14.5 mio. pigs, i.e. about 54% of the German pig herd. A second important production area is, again, Southern Germany (Bavaria: 3.7 mio. pigs on 25,300 farms; Baden-Wuerttemberg: 2.26 mio. pigs on 13,200 farms). Similar to cattle production, farm size is much larger in Northern Germany. Average herd size is 494.3 pigs in the North-West compared to only 146.7 pigs in Bavaria (Destatis, 2006; Destatis, 2007a).

Poultry production was 1.02 mio. tons in 2006. Similar to pork production, North-Western Germany is a major production area where more than 50% of German poultry production is located (Destatis, 2006; Destatis, 2007c).

German livestock production is characterized by deep structural changes. Between November 2005 and November 2006, 8.9% of all pig farmers and 4.0% of all cattle farmers exited production. Within the same period of time, the total number of pigs in Germany decreased by only 0.6% and the herd size of cattle was reduced by 1.9%. This means that the remaining livestock farmers grow remarkably. Therefore, about 60% of cattle are now kept on farms with a herd size of 100 or more animals. Concentration is even more impressive in pig farming where only 7,300 farms (out of 88,700 in Mai 2005) produce more than 50% of all German pigs. Average farm size in this category has gone up to 1,859.2 animals (Destatis, 2006).

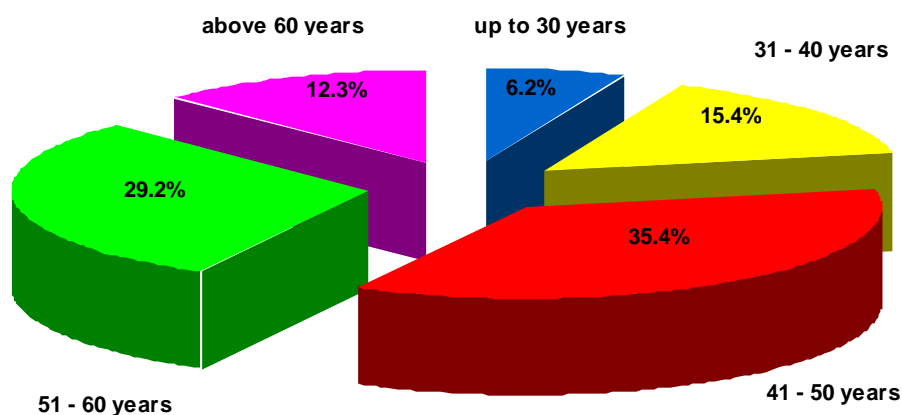
### *Sociodemographic characteristics*

All in all, 65 organizations participated in the survey—45 EZGs and 20 VVGs. Of these, 84.3% are slaughter pig traders (about 10.6 m. animals traded in 2004/05), 9.2% are cattle traders (about 100,000 animals marketed in 2004/05) and 6.2% are piglet or turkey traders (about 1.6 m. animals marketed in 2004/05). The EZGs were on average larger than the VVGs (Table 1).

**Table 1:** Sample

	Total sample	EZGs	VVGs
Number of EZGs / VVGs surveyed	65	45	20
Average number of members in 2004/05	684	756	522
Total number of animals traded in 2004/05	12,256,127	8,983,672	3,272,554
Average number of animals traded per EZG or VVG in 2004/05	191,504	204,174	163,628

Of the respondents, 98.5% were male—a typical result in the industry surveyed. The average age of the respondents was 44 years (Figure 4). Their formal qualifications were very mixed. About one-third hold university degrees, 6.2% have high school diplomas, and 60% visited other kinds of secondary schools (such as vocational schools).



**Figure 4:** Age of respondents

### Purchasing and marketing channels

Of EZGs and VVGs 56.1% buy livestock from farmers who have signed contracts with the organizations. Another 43.1% of livestock are purchased from noncontracting farmers, and the remaining 0.8% are purchased from private livestock traders. All in all, the numbers in Figure 5 indicate that EZGs do indeed establish somewhat closer relationships with their members. Trading livestock purchased from noncontracting farmers or private traders plays a markedly smaller role in EZGs. This indicates that they can count more on their members, who are not allowed to sell livestock to other traders.

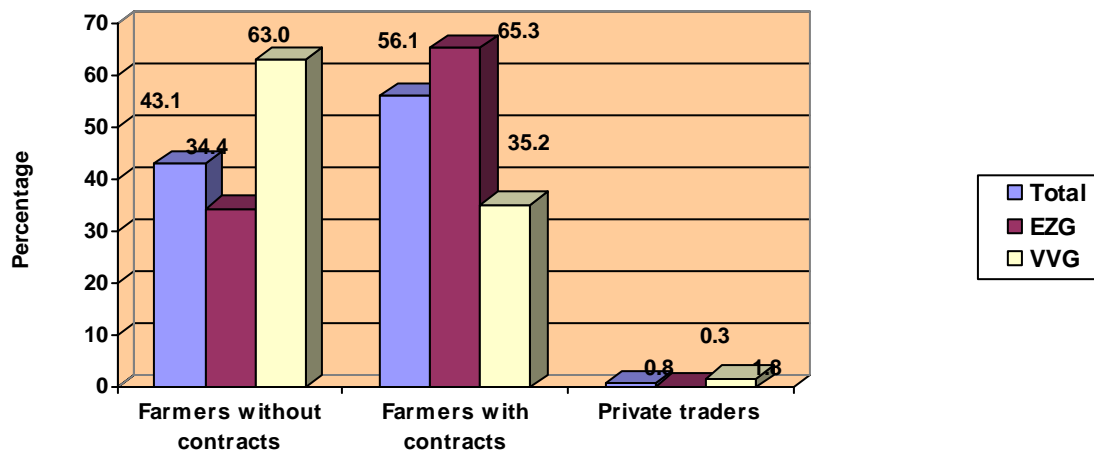


Figure 5: Purchasing channels of cooperative livestock traders (n=65)

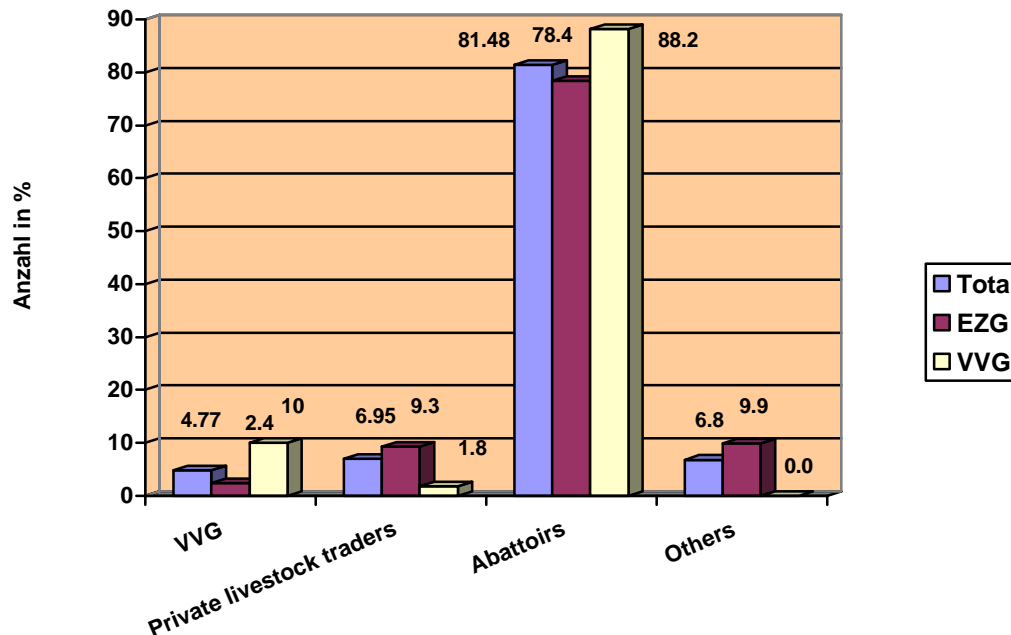
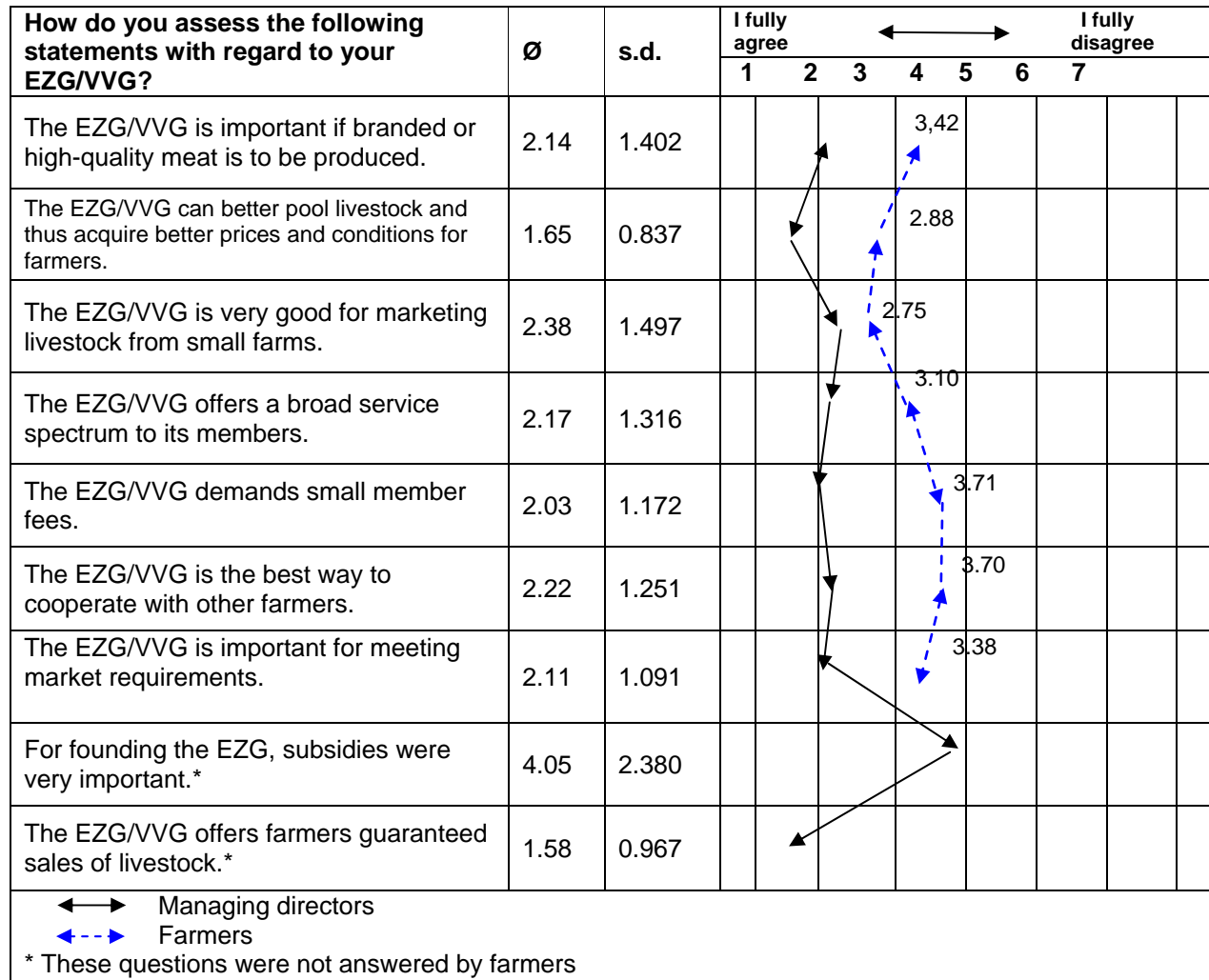


Figure 6: Marketing channels of cooperative livestock traders (n=64)

The marketing channels of VVGs and EZGs are quite similar. Not surprisingly, abattoirs are the main buyers of slaughter animals, regardless of whether livestock is traded by EZGs or by VVGs. But about 10% of livestock are also sold to other cooperative and private traders. “Others” in Figure 6 refers to slaughter animals sold to small butchers and direct sales of meat to consumers by EZGs and VVGs operating their own slaughterhouses. The comparatively low importance of sales to private traders confirms earlier analyses by Pottebaum et al (1996), who reported that the once much more important sales of VVGs to private traders had largely diminished and were replaced by marketing relationships with abattoirs.



**Figure 7:** Perception of EZGs' and VVGs' roles (n=63; Spiller et al, 2005)

### *The roles and service spectra of cooperative livestock traders*

Managing directors of EZGs and VVGs were asked how they perceive the roles of their organizations in meat supply chains. Figure 7 shows that the managing

directors have a very positive self-perception of their organizations and consider them important partners for farmers. Farmers, on the other hand, have a somewhat more neutral perception of livestock trading cooperatives. They are, in fact, nearly indifferent with regard to the statements that cooperatively organized traders are necessary for meeting the future requirements of livestock markets and can be considered the best form of farm cooperation when marketing animals to slaughterhouses. It is also striking that the large farmers surveyed consider EZGs and VVGs appropriate partners for small farmers. T-tests show that average values given by managing directors and the farmers are significantly different (sig. = .000, except the third statement where values are significantly different at the 10% level). Against the background of structural changes in agriculture and growing farm sizes, this indicates a future challenge for cooperative livestock traders. If farms grow and farmers at the same time consider a two-tier marketing system most appropriate for small farms, then the future of EZGs and VVGs is highly insecure.

The perceptions of the farmers surveyed are interesting from a relationship marketing perspective. Trust is often considered a major determinant of relationship commitment (Kwon and Suh, 2004; Dyer, 1997). The degree of commitment determines the efforts of supply chain partners at maintaining their relationship (Morgan and Hunt, 1994). The somewhat sceptical assessment of livestock trading cooperatives by farmers indicates a lack of trust in the future role of these organizations and, thus, a more or less instable relationship between farmers and cooperatives. A considerable number of farmers that have left these cooperatives over the years reflects a somewhat loose relationship at arm's length (Spiller et al, 2005).

Obviously, VVGs and EZGs experience heavy competition from alternative marketing channels, such as the single-tier system. This is underpinned by 48 farmers in our farmer survey, who said that they had left a VVG or a EZG. Farmers who had never been members of a VVG or EZG argued that they prefer direct business relationships with abattoirs (29.1%), perceive competing marketing channels as more attractive (19.6%) or do not anticipate gaining advantages from joining a livestock trading cooperative (22.1%; several answers allowed). Other arguments, such as fees charged to members (9.0%), dissatisfaction with services offered (7.8%) or the organizations' management (5.9%), the strict regulations to be followed (5.9%), a general lack of trust in the organization (3.0%) or the distance to the nearest organization (2.5%), are of minor importance (Spiller et al, 2005). We can conclude from farmers' answers that it is paramount for livestock trading cooperatives to develop attractive services that promise clear advantages to large farmers and improve the organizations' competitiveness compared to private traders and direct business relationships with abattoirs.

The current service spectrum of VVGs and EZGs mainly consists of traditional core functions, such as bargaining with abattoirs, organizing animal transport, supervising slaughtering (especially classification of carcasses) and billing through slaughterhouses, the organization of piglet and calf purchases and paying interests on member funds. This service spectrum is deliberately complemented by new services, such as supporting members introducing quality assurance schemes or developing recommendations for improving profitability of farms. Today, due to the high financial risks and capital requirements, operating an own slaughterhouse is quite rare (cf. Table 2).

**Table 2:** Service spectrum of cooperative livestock traders

Service	%
Bargaining with abattoirs (n= 62)	93.8
Organizing animal transport (n= 65)	89.2
Operating a truck fleet to provide animal transport** (n= 65)	53.8
Supervision of slaughtering* (n= 61)	69.2
Supervision of billing through of slaughterhouses (n= 65)	96.9
Support of introduction of quality assurance schemes (n= 64)	92.3
Developing new marketing channels (n= 64)	89.2
Developing recommendations for improving profitability* (n= 64)	64.6
Organizing piglet and calf purchases (n= 64)	89.2
Paying interest on member funds** (n= 65)	23.1
No operation of an own slaughterhouse (n= 63)	84.6

\* typical service of EZGs

\*\* typical service of VVGs

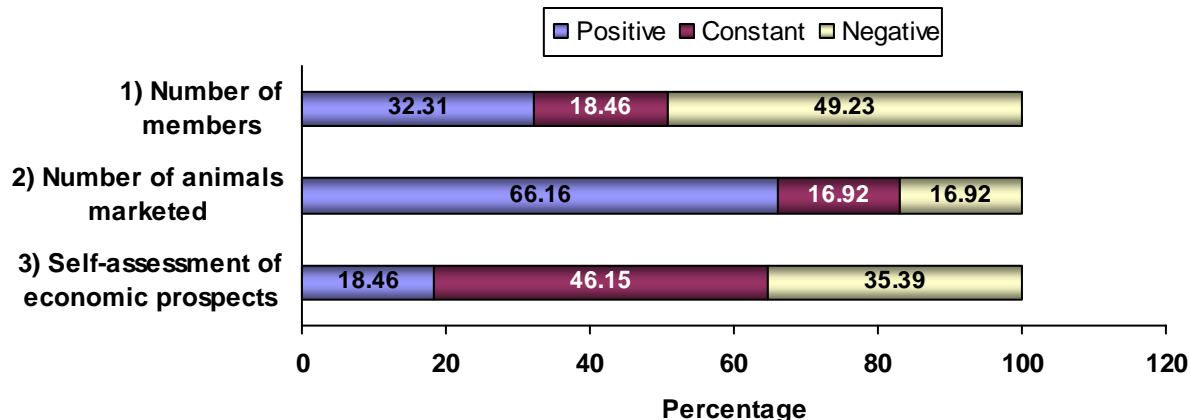
The great significance of traditional core functions raises the question whether cooperative livestock traders in Germany are well prepared for accelerating structural changes in agriculture and the fierce competition with other marketing channels. Furthermore, collaboratively organized services are scarce. Therefore, developing innovative services that improve the organizations' attractiveness for highly professionally managed large farms is still a challenge for EZGs and VVGs.

### *Success factors of cooperative livestock traders*

One of the main objectives of this survey was to identify success factors for livestock trading cooperatives. But how should a cooperative's success be measured? According to its constitutive idea, the goal of cooperatives is the sustainable economic improvement of economically weak individuals and small farms and

businesses (Theuvsen, 2006). Therefore, acquiring better prices for farmers can be considered the foremost task of livestock trading cooperatives. Unfortunately, this information is generally regarded as highly confidential and not revealed to outsiders. Therefore, we defined a successful livestock trading cooperative as an organization that has (a) a growing or, at least, constant number of members, (b) a growing or, at least, constant number of slaughter animals marketed to abattoirs, and (c) a positive or, at least, neutral perception of its own economic prospects. The latter was measured on a seven-point Likert scale, on which respondents were asked to assess their organizations' economic prospects. Answers from 1 (= very good) to 3 (= somewhat good) were classified as positive economic self-assessments, 4 (= neither good nor bad) as a neutral perception, and answers from 5 (= somewhat bad) to 7 (= very bad) as negative self-assessments.

Figure 8 shows that nearly half of the organizations surveyed suffered from declining numbers of members between 2001 and 2004/05 and only about one-third of the organizations were able to attract a growing number of farmers. The situation is more promising with regard to number of animals marketed due to growing farm sizes and mergers between organizations that result, at least in some cases, in growing businesses despite declining numbers of members. A minority of EZGs and VVGs attribute to themselves positive future economic prospects, whereas nearly half of the respondents anticipate neither good nor bad prospects.



**Figure 8:** Self-assessment of economic prospects (1): n 2001= 62, n 2004/05= 64; 2): n= 64, 3): n= 65)

Of the 65 organizations surveyed, twelve EZGs and three VVGs—23% in total—meet all the criteria of a successful cooperative trader specified above. Of the traders, 66% report growing numbers of animals being marketed and, subsequently, growing turnovers but have declining numbers of members and/or a negative outlook on their economic future. If our hypothesis that an attractive service spectrum is key to the future success of a livestock trading cooperative is true, the

current service spectra may also explain why some EZGs and VVGs are more successful than others. A closer look at the service spectra of the successful organizations in our sample reveals that all of these organizations offer similar services to their members (Table 3).

**Table 3:** Service spectrum of successful cooperative livestock traders

<b>Service spectrum of successful</b>	
<b>EZGs</b>	<b>VVGs</b>
Bargaining with abattoirs	
Organizing animal transport	
Supervision of billing through slaughterhouses	
Supporting members in certification processes	
Developing new marketing channels	
Developing recommendations for improving profitability	Paying interest on member funds
Supervision of slaughtering	Operating a truck fleet to provide animal transport
	Organizing piglet and calf purchases
	No supply of members with operating resources
	No operation of an own slaughterhouse

Generally speaking, successful livestock trading cooperatives offer a broader spectrum of services to their members, whereas less successful organizations either offer fewer services to members or operate costly and, in many cases, unprofitable slaughterhouses. But, even in successful organizations, service spectra embrace mainly the traditional core functions of livestock traders. With the support of farmers' quality assurance activities as the only exception to the rule, innovative services are still quite rare even in successful EZGs and VVGs. This provides a starting point for developing more attractive services that may have the potential to provide EZGs and VVGs with unique selling position features that allow them to gain competitive advantages over alternative marketing channels.



## **Conclusions and theoretical implications**

The study presented here provides one of the rare insights into the livestock trading business, an industry often overlooked in agricultural economic research (but see also Wachenheim, deHillerin and Dumler, 2001). It becomes obvious that meat supply chains in developed countries, like Germany, are organized in a much more complex way than the often quoted simple spot market–contract–vertical integration trichotomy suggests.

The wide gap between the self-perception of VVGs and EZGs, on the one hand, and the role farmers attribute to these organizations, on the other, highlights the need for the organizations surveyed to better adapt their service spectra to farmers' needs, improve their image, better communicate their services and added value to farmers and, in this way, convince farmers of the advantages of joining a cooperative, be it a VVG or an EZG. Relationship management may be an appropriate way to deepen relationships with farmers and improve trust in the organizations and commitment.

The results also show that the organizations surveyed are characterized by remarkable success differences regarding numbers of members, sales volumes and future economic prospects. Obviously, success in the livestock trading industry is not only determined by external contingency factors, such as structural changes in agriculture and the slaughter industry or chance but can also be influenced strongly by the way the organizations are managed. Since trading cooperatives are under severe competitive pressures from low-cost private livestock traders, their service spectra need thorough examination and enhancement.

Successful organizations show that, despite some theoretical doubts in transaction cost economics, livestock trading cooperatives may have a future in modern meat supply chains as long their service spectra meet members' needs and offer an added value to farmers.

Changing market requirements, such as the introduction of certification systems and neutral third-party audits into European as well as global agribusiness (Schiefer and Rickert, 2004; Hatanaka, Bain and Busch, 2005; Theuvsen et al, 2007), offer new opportunities for trading cooperatives by, for instance, establishing themselves as preferred service providers for their members.

Furthermore, in the presence of rapidly growing and internationalizing abattoirs (Theuvsen and Ebner, 2005; Tozanli, 2005), many farmers strongly prefer more centralized marketing activities, hoping for better prices vis-à-vis large slaughterhouses with market power. Existing EZGs and VVGs can serve as starting points for more centralized marketing of slaughter pigs and cattle. In this spirit, Spiller et al (2005) suggested a new organization model for German pork production

based on a more centralized marketing approach by transforming existing EZGs and VVGs into larger and more powerful marketing offices, informal long-term or open market relationships between farmers and slaughterhouses, and more advanced supplier relationship management approaches.

Third, in food chains characterized by sharp conflicts over sharing limited resources between different parts of the value chain, market intermediaries, such as EZGs and VVGs, have the important role of smoothing conflicts and, thus, saving transaction costs. Thus, all in all, neither farmers nor the managers of the cooperatives surveyed subscribe to the widespread view that stricter vertically coordinated supply chains are the only future of meat production in Germany (Schulze, Spiller and Theuvsen, 2006b).

These findings have interesting theoretical implications since they suggest that there may not be “one best way of organizing” food supply chains, whether open markets, marketing or production contracts or vertical integration. Therefore, there may also be a chance for well managed trading cooperatives to find an economically sustainable position and profitable role in food supply chains. This insight parallels the idea of equifinality widely shared in today’s organization theory (Katz and Kahn, 1966). Equifinality means that there is more than one effective way to design firms or supply chains in a given environment (Gresov and Drazin, 1997).

Therefore, even in a world where contract farming systems are becoming increasingly important in transition and developing economies (World Bank, 2005) as well as some developed countries (Martinez, 2002a, 2002b; Haley, 2004), there may be viable alternatives, for example, the prevalence of trading cooperatives with tailor-made service spectra that meet the demanding needs of farmers in developed economies. In contrast to this, current writing on the organization of food supply chains, which strongly advocates stricter vertical organization, still seems too much inspired by deterministic approaches typical of, for instance, early contingency theory (Donaldson, 2001) as well as current transaction cost theory.

## **Managerial implications and future research**

The study has several interesting managerial implications. One of the most important findings is that the organizations’ management should consider the cooperatives’ service spectrum a major source of competitive advantage. They may, for instance, establish themselves as preferred service providers to farmers in the growing quality assurance business where farmers need assistance prior to external audits through certifying firms. The study also highlights the need for cooperatives to improve their image and better communicate their services to current and potential members and intensify their supplier relationship management activities. Recent research into supplier relationships in food supply chains has identified a number of suitable internal and external relationship management activities. These include codes of ethics, clarification of personal responsibilities for supplier

management, employee training, communication activities (newsletters, meetings etc.), improved transparency of business activities, personal interaction with suppliers, improved participation of suppliers, more intense communication with opinion leaders and improved complaint management (Spiller et al, 2005).

Furthermore, livestock trading cooperatives are, at least in most cases, small compared to rapidly growing abattoirs. Therefore, more horizontal cooperation between traders as well as mergers can be ways to improve the competitive position of traders. This might be most important for the less successful organizations that suffer from declining numbers of members or animals marketed or have a negative perception of their own economic prospects. So far, cooperation is quite rare in the livestock trading business. Last but not least, EZGs and VVGs may consider professionalizing their management. At present, the smaller organizations, at least, are often still managed by unpaid voluntary or part-time managers. Integrating more professional management know-how into livestock trading cooperatives should allow them to cope more successfully with demanding meat markets (Schulze, 2002).

Meat supply chains are interesting research objects. Future research should seek to map more precisely the organizational details of these chains and refrain from coarse conceptualizations of organizational alternatives for designing food supply chains. In this context, more thorough analyses of the role intermediaries play in supply chains are required. Communication in business transactions and relationships, for instance, is often neglected (Hinner, 2007; Theuvsen and Plumeyer, 2007). Future research should also further extend sample sizes, include other cooperatives, like those in the poultry, egg, grain, and vegetable sectors, and relate empirical findings to existing theoretical knowledge about the internal functioning of value chains. Furthermore, thorough assessments of the feasibility, costs as well as potential effects of alternative supplier relationship management activities would help managers in livestock trading cooperatives. Finally, the exact relationship between formal contracts between farmers and cooperatives, farmers' ownership of and interest in the cooperatives, and non-contractual relationship management activities needs further research.

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## **International Trade, Consumer Behavior and Trust: Factors Affecting Agribusinesses in Developing Countries**

**Executive Interview: Ronald D. Hampton, Chair and  
Associate Professor of Marketing University of Nebraska**

Ingrid Fromm<sup>a</sup> and Bonani Nyhodo<sup>b</sup>

<sup>a</sup> *PhD Candidate, Small Enterprise Promotion and Training Program, University of Leipzig & Research Fellow, German Institute of Global and Area Studies, Hamburg, Germany*

<sup>b</sup> *Senior Economist, National Agricultural Marketing Council and post graduate student, University of Stellenbosch, Pretoria, South Africa*

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### **Abstract**

With the increasing complexity of global food systems, producers in developing countries are faced with challenges associated with market access to developed and other developing countries. There is clear evidence that the fastest growing developing countries are the ones engaging in trade and participating in the global market. The difficulty for developing countries, especially *Small and Medium Enterprises* (SMEs) in those countries is the logistics and agreements needed to enter international markets and benefit from trade. Global production networks are becoming extremely complex. Arms-length trade is now confined to commodities with low returns, thus access to high-income yielding activities requires participation in global value chains. Over the past decades, the global food system has concentrated in the hands of a few large companies. All these changes raise questions about market structures, market power, and strategies for small-scale agribusinesses in developing countries to insert themselves into the global food system. This paper summarizes the interview conducted with Dr. Ronald D.

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<sup>①</sup>Corresponding author: Tel: +49-551-394851

Email: [fromm@uni-leipzig.de](mailto:fromm@uni-leipzig.de)

Other contact information: B. Nyhodo: [Bonani@namc.co.za](mailto:Bonani@namc.co.za)

Hampton, Chair and Associate Professor of Marketing and Director of the Agribusiness Program at the University of Nebraska in Lincoln. Dr. Hampton has ample experience in international marketing, marketing management, retail management, leadership, and consumer behavior. The objective of this interview is to gain a better understanding of factors affecting small-scale agribusinesses in a context of international trade. This interview took place during the 17th Annual World Forum and Symposium in Parma, Italy in June, 2007.

**Keywords:** Marketing, branding, bilateral agreements, spirituality.

## **Introduction**

Without a doubt, globalization has brought many changes that affect small-scale agribusinesses in developing countries. Although international trade has been increasing at a faster rate in the past 30 years, this increase is also associated with increasing inequalities around the world. While some countries have experienced growth and prosperity, many countries, especially in Africa have fallen behind, and as a whole, have less representation in the total world trade. In just 25 years, Africa's share of the world trade has fallen from six to two percent. Yet the question of participating in trade and international markets is not the real problem. There is clear evidence that the fastest growing developing countries are the ones that engage in trade and participate in the global market. The difficulty for developing countries, especially SMEs is how to reach international markets and benefit from trade.

China has experienced an economic growth rate of eight percent for the last 20 years (DFID, 2005). This means that 200 million people have been lifted out of poverty. This accelerated growth rate would not have been possible if China had not opened its door to trade. Over the past 25 years, exports from China grew threefold. Other Asian countries have also experienced growth—South Korea, Singapore, Taiwan are just a few. As a whole, Asian countries have become the fastest growing economies in the world. On the other end of the spectrum, African countries have fallen behind, once sharing six percent of the world trade, now, a quarter of a century later, accounting for only about two percent of the total world trade. Clearly, trade has been beneficial to Asian economies.

Yet for small-scale producers in developing countries there are many obstacles to participation in the global economy. Global production networks are becoming extremely complex. Arms-length trade is now confined to commodities with low returns, thus access to high-income yielding activities requires participation in global value chains. Over the past decades, the global food system has concentrated in the hands of a few large companies. This concentration has taken place in several points along the chain, including not only retailers, but also processors and input suppliers (i.e. chemicals, seeds, and feedstock). As a consequence, private and public

standards have increased in number and complexity becoming more stringent. Humphrey (2005) argues that this concentration has implications for access to agribusiness value chains for small producers, and also the returns producers obtain from participating in these chains. Furthermore, it raises questions about market structures and market power, as well as strategies to offset this power: regional branding, geographical indicators, niche products and alternative marketing channels.

Identifying new markets is one of the great challenges for small-scale agribusinesses in developing countries. Particularly, international markets require certain level of competence for SMEs. As a pre-requisite, most agribusinesses must become familiar and comply with these standards. At the local level, in many developing countries, firms have to deal with a number of legislations and regulations, and the time and cost of these transactions is usually high. Finally, the access to capital is critical. Producers in the agricultural sector usually have to overcome a number of hurdles before they are able to receive credits.

## **Executive Interview**

*Is the access to markets the critical factor hindering trade with developing countries?*

Access to market is critical, but surviving in an international market is just as important. SMEs not only in developing countries need to have extensive knowledge of what the consumer wants; they need to understand consumer behaviour. If SMEs understand this relationship with the consumer, they will minimize the risk of participating in global markets. Another critical factor is building trust with the consumer. Many SMEs fail because of trust issues. If a firm has to deliver a product within a specified time frame and they don't do it, the trust with the consumer will be affected. SMEs should also be able to communicate what their values are. Consumer loyalty depends on this. Research on American consumers has found that consumers tend to simplify—once they find a product they like, they are loyal to it. Many consumers now decide what to purchase depending on the values of a company. The market for fair trade and organic products is expanding, and this can be explained by the increasing consumer awareness that they have to power to change things or situations. Trust is also needed during transactions. Trust affects the ways in which people and enterprises engage in economic activity. In the exchange goods and services trust is needed. Lack of trust can result in high transaction costs for the firm.

*What alternatives do SMEs have, given the concentration of the global food system?*

There are several alternatives SMEs in developing countries can explore. As long as there is demand for agricultural products, there will be an opportunity for

producers. Niche markets are worth exploring. It is also very important for producers to understand the importance of strategic marketing. Product branding is another alternative a producer has in order to create product value. Consumers are aware of brands and usually loyal to them.

*Can producers in developing countries compete by “branding” their products? Is this a feasible alternative?*

Branding is a good alternative and there are some examples of successful initiatives in developing countries and in the United States and Europe as well. In Ecuador, a project was started to incorporate small-scale farmers in the fair trade coffee market, selling their product in the United States. In order to do this, they had to develop their brand. Yet there are two factors that determined the success of this project. First, there was an advocacy group which helped the farmers find business contacts in their target market. They worked to identify opportunities in the United States. Second, a local association helped coffee farmers come together and export their coffee as an association. In this process, they created a brand that is beginning to be recognized in the fair trade coffee market. Coffee from Ecuador is not as widely recognized as coffee from Colombia, but with these grass-roots initiatives to create and develop a brand, consumers will soon be aware of the quality attributes of coffee from Ecuador.

Regional branding is another way for small-scale farmers to successfully compete. This is a geographic-based brand in which high-value agricultural products are promoted based on geographical linkages. Parma is a great example of successful regional or geographic-based branding. Ham and cheese from Parma are recognized world-wide. In the United States, high-quality beef is produced in the mid-west, around Interstate 80. The term I-80 beef was chosen because Japan's beef industry often refers to corn-fed U.S. beef as “I-80 beef”. In this initiative, different boards and interest groups are collaborating to develop the brand.

Geographic-based brands have a great potential for farmers in developing countries. Once a brand is recognized, there are further benefits for the local economy. In South Africa, there is a booming tourism industry where wine enthusiasts visit production areas, local wineries and taste wines. Linkages are created in the service sector, providing employment opportunities for the locals. Hotels, hostels and bed-and-breakfasts start to open, as well as tour operators and agencies, employing local people in the tourism industry.

*You have experience in spirituality and marketing. Is spirituality an issue in international trade? How do religious beliefs influence international trade?*

Spirituality is a big issue not only in international trade, but in most human interactions. Regional law also plays a role in international trade. It is part of a

wider cultural context and this context includes the language, beliefs and religion, and even the forms in which the culture is expressed through traditions and art. Understanding this cultural context is critical for conducting business. For example, a study on American Evangelicals has shown that spirituality affect the way they behave as consumers. They look at corporate values before making a purchase decision and if these values do not resemble their own values, they will not buy a product. As consumers, they are loyal to brands that they know, once they understand the values of the company, and are satisfied with them, they will remain loyal consumers. This identification with corporate values can be seen in other cultures as well. Japan is also a good example.

*Is there any mechanism SMEs can use to capitalize target market spirituality for survival?*

SMEs should focus their attention on the way consumers behave, these include culture were customs, language are the determinants of the consumers response. Market access issues addressed from issues of spirituality can benefit the SMEs. Further, is an understanding and compliance with international, domestic and regional laws. An important factor which to some extent plays an important role is the trust between traders in different countries.

*In your opinion, who will benefit from the collapse of Doha round?*

It should be acknowledged that very few SMEs have built trust in international markets. The use of non-tariffs should not discourage SMEs. Market barriers can be overcome with creativity. The emergence of very creative ways of doing business such as bribery in certain economies where such conduct is legal needs to be fully utilized. Fully understanding the relationship of trust, how to build trust and reduce the risks of doing business are fundamental to the survival of SMEs.

*There is what was labelled a “spaghetti bowl problem” with the formation of bilateral negotiation and regional trade. In your opinion what is the way to go?*

The World Trade Organisations members are members of different regional, bilateral and unilateral trade blocks. If agreements are legal and profitable for all parties it does not matter to the third party. This gives an indication that there may be a demand for certain countries products in different countries. The corporate values such as donations, brand loyalty and purchasing process may determine the affiliation and lastly the cost of doing business.

*How can African SMEs maximize agreements they have with the rest of the world to their benefit?*

Acceptance and clear knowledge of the critical factors hindering trade from a developing countries perspective and are one of the market powers that big retailers have. A number of businesses become successful from their uniqueness. This involves using geographic names, regional branding, and language from the original country or ethnic group. The protected destination of origin may be helpful in making full use of the available agreements and deeply understanding the social structures of the target market may also play an important role in the success of the SMEs.

## Conclusion

International markets can benefit from clearly understanding the social structures of their target markets. Important, yet often overlooked in international trade literature are issues of religion, language and spirituality which emerged during the course of this interview as vitally important. The market power possessed by big retailers may pose a challenge for SMEs attempting to enter international markets. However, concludes, Professor Ronald D. Hampton, *“success does not necessarily bring joy”*.

## References

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