

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

Paper Authors: Eric Thor, III  
Former Graduate Student, Royal Agricultural College and Utah State University  
13641 S. 33<sup>rd</sup> Street  
Phoenix, Arizona 85044 USA  
Telephone: 530.902.1282  
Thor\_iii@yahoo.com

DeeVon Bailey, **Corresponding and Presenting Author**  
Professor and Interim Head  
Department of Economics  
Utah State University  
3530 Old Main Hill  
Logan, Utah 84322-3530 USA  
Telephone: 435.797.2300  
[d.bailey@usu.edu](mailto:d.bailey@usu.edu)

Alejandro R. Silva  
Director Professor  
Agroindustrial Economics & Management  
School of Agronomy  
University of Buenos Aires  
Avda. San Martín 4453  
C1417DSE – Buenos Aires, Argentina  
Telephone: (54 11) 4524-8089  
[silva@agro.uba.ar](mailto:silva@agro.uba.ar)

and

Steven S. Vickner  
Associate Professor  
Department of Economics  
3530 Old Main Hill  
Utah State University  
Logan, Utah 84322-3530 USA  
Telephone: 435.797.2963  
[svickner@econ.usu.edu](mailto:svickner@econ.usu.edu)

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

## **Executive Summary**

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 could include the effects of government policies such as currency devaluations and taxes as well as animal disease outbreaks like FMD which have led to either the cessation or significant reductions in beef exports from Argentina and Uruguay. The findings suggest that while segments of the beef industry in these countries are consistently profitable, government intervention injects substantial risk for investors in Argentina and subsequently in Uruguay because of the dominance of the Argentine market. Cattle prices are in fact negatively cointegrated with world beef prices because of policies in Argentina designed to keep domestic prices low relative to world prices.

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

### **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 injects considerable risk into the investment decision.

**Key Words:** *Investment in beef systems, South America, risk, cointegration*

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

## **Introduction**

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. 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 that have lead to the cessation or the reduction of beef exports from Argentina and Uruguay and thus increase 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**

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

---

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

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

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 from 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). This suggests that incentives exist for these exporters to consider alternative methods for exporting beef to the EU. One alternative might be to invest 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 (Fox, Perez, and Boland, 2005) (Figure 1). Reasons for increased exports from Argentina and Uruguay include their efforts to eliminate FMD (Ekboir et al., 2002) and world demand and supply conditions (Steiger, 2006). These two countries, together with Brazil, are expected to continue to capture market share in the international trade of beef (Steiger, 2006).

Although market conditions appear favorable for increasing exports from these countries, political issues and animal disease outbreaks may affect market growth. This is especially true for Argentina where 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 (Thor, 2006; Fox, Perez, and Boland, 2005; 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, 1998). 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 because beef exporters in the US and elsewhere are likely

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**

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. 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. However, the lack of data for econometric modeling of profitability led to the selection of a business model (Porter's Diamond) to assess the advantages and disadvantages of FDI in Argentina and Uruguay (Porter, 1990). The competitive advantage of a nation's industries will drive the long-run profit of those industries. Economic and finance theory indicates that an investor's goal when analyzing new investments opportunities is to maximize profit with acceptable risks. Consequently, one

expects investments to flow toward industries in nations with competitive advantage. The interplay of each attribute in Porter's Diamond demonstrates that the competitive forces, infrastructure, and resources in a nation determine its competitiveness in world markets rather than just a single industry.

Unlike Porter's Five Forces model, government plays a central role in Porter's Diamond model (Figure 2). In the world of agriculture in particular, governments are enacting rules and regulations and this interplay affects all parts of the agricultural supply chain. The Porter's Diamond analysis was completed to analyze the factors contributing or distracting from the establishment of competitive advantage for the beef systems in Argentina and Uruguay. Data for the Porter analysis were obtained through personal interviews with industry participants from all levels of the marketing channel (e.g., producers, feedlot operators, and meat processors) in Argentina and Uruguay as well as university researchers in the two countries. These interviews were undertaken in Buenos Aires and Villa Mercedes, Argentina and Montevideo, Uruguay during the week of June 9, 2006.

Although a complete set of publicly available time series for all costs and returns for the beef systems of Argentina and Uruguay was not available, cattle prices were available from the Liniers Market in Buenos Aires and the INAC (Instituto Nacional de Carnes) in Uruguay. Cattle prices were analyzed using monthly data between 1996 and June 2006. Information was also discovered during the interviews in Argentina and Uruguay regarding important government policies and FMD outbreaks that have likely affected cattle prices in the two countries. Combining this information (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 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. FMD outbreaks between 1996 and 2006 which resulted in the interruption of beef exports from Argentina and/or Uruguay were also considered.

An analysis of the relative impacts of these events on cattle prices was also undertaken by examining the price differences between prices in Argentina and Uruguay and the Chicago Mercantile Exchange' (CME) nearby live cattle futures price (sometimes referred to as the “world” cattle price). This yielded a basis analysis for Argentina and Uruguay and described how government policies and FMD outbreaks have affected Argentine and Uruguayan prices relative to the rest of the world. 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 for the jth livestock type (j=400-420 kg., 480+ kg. in Argentina and steers, cows in Uruguay) and the basis between the

real, exchange-rate adjust 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. 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 quarter dummy variables and were used to find if there were differences in the dependent variables in Argentina and Uruguay by quarter, with the fourth quarter being the base.  $MOR$  was a binary variable equal to one during periods of export moratoriums and zero otherwise. At the time the personal interviews were conducted, this moratorium was negatively affecting all parts of the cattle business in Argentina.

$DEV$  was a binary variable describing the impact on cattle prices and the basis of the 2002 devaluation in Argentina's currency in 2002. This was when the Argentine government decided to unpeg the one-to-one ratio for the peso to the dollar.  $DEV$  was set equal to one following this devaluation and was zero otherwise. The binary variable for  $FMD$  was one when the EU market was closed to Argentine and Uruguayan beef and zero otherwise. In 2005, Argentina tripled export taxes on domestic beef exporters.  $TAX$  is a binary variable that estimates the negative effect that this tax had on prices and was equal to one during the period the tax was in force and zero otherwise.  $NEWDES$  was a binary variable used to account for changes in reported weights at the Liniers market during the study period.  $NEWDES$  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*, was the residuals of the price or basis time series off a linear trend line. This captured the effects of systematic rises and falls in prices in Argentina and Uruguay due to cattle cycles.

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 Uruguay 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 would have 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). The vector error correction 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:

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

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

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 Argentina or Uruguay 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**

### *Historical Profitability*

Based on profitability reported in *Margenes Agropecuarios Magazine* (various 1996-2006), 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) have negative average returns. Returns are obviously cyclic, as would be expected because of the substantial biological lag associated with cattle production (Figure 3). 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 3). These figures are also consistent with Silva's (2003) point estimates for profitability at the different stages.

The cost structure of the cattle industry at each of these three stages can help explain some of these results. 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).

Profit in grass fattening operations depends 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 costs, 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 average). Examples of potential exogenous shocks include such things as the prices for feeder cattle, grains, energy, and the price for finished cattle. Short-run prices, of course, are 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.

The government of Argentina has recently attempted to influence the level of beef production by placing restrictions on the minimum weight at which cattle can be slaughtered. This has resulted in restricting available market supplies and driving up prices for live cattle exceeding the minimum required weight (Silva, 2006).

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 the results indicate that positive profits usually exist for the cow/calf and grass fattening segments, and negative profits for the feedlots.<sup>3</sup> If one accounts for the increase of energy prices by the previous (2002) and present administration (2003)<sup>4</sup>, the profit figures depicted in Figure 3 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).

In general, feedlots appear to be the most risky of the three levels of production considered. Profits have steadily improved for feedlots in Argentina but are heavily influenced by government policies. Low land prices and the lack of a need to purchase many external inputs contribute to lower relative risks associated with cow/calf and grass fattening than for feedlots and suggest a continued healthy grass-based livestock industry.

Feedlots may also be able to eventually become consistently profitable if markets are allowed to function with a minimum of government interference. This observation is based on the incredibly high annual per capita domestic beef consumption in Argentina

---

<sup>3</sup> It should be noted that there were only 88 point estimates for feedlots and 142 for cow/calf and grass fattening segments

<sup>4</sup> The prices of energy have been heavily regulated in Argentina since the devaluation in 2002

and Uruguay (65 kg. and 45 kg., respectively), the growing domestic economies of these two countries, and the projected growth in export demand.

Conditions in the meat packing and exporting industries may also be possibilities. The overall four-firm concentration ratio (CR4) for the meat packing in Argentina is only 9% and the Herfindahl-Hirschman Index (HHI) is 248 (Silva, 2003) compared to the CR4 in the US of 80% (Barkema, Drabentstott, and Novack, 2001) and for Australia of 29% (CICCRA, 2004). The US Department of Justice estimated a HHI for the US of 1936 (Barkema, Drabentstott, and Novack, 2001). The Hilton quota market in Argentina has a CR4<sup>5</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 for the different segments using Silva's (2003) point estimates for profits, quotes for ocean freight rates for meat shipped from Buenos Aires to Hamburg, Germany, and the potential impact of government interventions and disease outbreaks was calculated (Thor, 2006). It suggests that cow/calf operations and meat packing are the two segments in the marketing chain in Argentina that are profitable. Consequently, integration or joint ventures between segments of the chain are

---

<sup>5</sup> CR4 and HHI have been estimated (March 2007) using export quantities for the Hilton Quota in 2003

probably the best methods for investing in beef operations in these two countries (Table 1).

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. The most important barrier to further FDI in Uruguay is the limited cattle herd and availability 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).

#### *Porter's Diamond Analysis*

Results for Porter's Diamond analysis indicated that both Argentina and Uruguay have a competitive advantage in producing cattle and beef (Tables 2 and 3), but both face significant problems relating to expanding beef exports. Both Argentina and Uruguay have good factor and demand conditions, but Argentina has a larger land base and grain production than Uruguay. Both have specialized work forces and good infrastructures that can support the beef industry. Both countries have strong domestic beef consumption and face a growing demand for their exports. Both countries have governments that are strongly committed to the beef industry, but Argentina often

experiences governmental interference in its markets while the government of Uruguay promotes transparent and export-oriented markets and marketing strategies.

Essentially, both countries are well-engineered for producing beef. However, Argentina's beef market faces considerable risk from animal disease and governmental policies not conducive for international trade. Uruguay has a strong commitment to international trade, but lacks the land base and grain production to significantly increase its export base. It appears obvious that there are incentives for both countries to work in tandem to solve mutual problems, but political realities may not allow for this to take place.

#### *Price Analysis*

The price analysis revealed that the impact of government policies and FMD outbreaks can have up to a 20% 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 4 and 5). That is, the impact of government policies on cattle prices results in lower cattle prices in Argentina, but because these policies are often designed to eliminate or reduce beef exports to keep prices low in Argentina, it eliminates or significantly reduces the ability of exporters to participate in world trade when world prices are 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 were government policy is designed to promote beef exports.

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 6 and 7). FMD issues have been fewer and of shorter duration in Uruguay than in Argentina. Consequently, *FMD* did not have a parameter estimate significantly different than zero in the Uruguay models. There was not a statistically significant seasonal component to either prices or basis for Argentina (*Q1*, *Q2*, and *Q3* in Tables 4 and 5), but seasonality was indicated for steers in Uruguay, but not for cows (Tables 6 and 7). 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 4-7). That is, when domestic cattle numbers are relatively low (high) prices tend to be higher (lower) resulting in an improving basis with world prices.

#### *Cointegration Tests*

In Table 8, we found the Argentina price to be cointegrated with the US price, and the Uruguay price to be cointegrated with the US price.<sup>6</sup> In each case, we rejected the null hypothesis of no cointegrating vector and failed to reject the null hypothesis of at most one cointegrating vector. 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. However, these price series are negatively cointegrated. 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

---

<sup>6</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.

prices tend to move lower. 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.

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 provided above demonstrates. However, profits appear to be limited from time to time by different governmental actions.

### **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. Economic and business models are both used to examine 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 animal disease outbreaks inject considerable risk into these investments. Cattle markets in Argentina and Uruguay appear to operate efficiently, but government intervention that

restricts or eliminates beef exports reduces local cattle when prices could actually be higher if exports were allowed to flow in an unrestricted fashion. Profitable FDI appears possible, especially if markets are left unhindered by government intervention. The cow/calf sector and meat packing appear to be the most profitable segments of the beef marketing chain.

## References

- Alfnes, Frode (2004). "Stated Preferences for Imported and Hormone-Treated Beef: Application of a Mixed Logit Model." *European Review of Agricultural Economics*, 31,1(March):19-37.
- Alfnes, Frode and Kyrre Rickertsen (2003). "European Consumers' Willingness to Pay for U. S. Beef in Experimental Auction Markets." *American Journal of Agricultural Economics*, 85,2(May):396-405.
- Barkema, A., M. Drabenstott, and N. Novack (2001). "The New U.S Meat Industry." *Economic Review*. Federal Reserve Bank of Kansas City, p. 56
- Chakraborty, Kalyan (2005). "Consumers' Attitude Toward Hormone-Free Milk: What Have We Learned?" *Applied Economics*, 12(1):633-37.
- Clemens, Roxanne, and Bruce A. Babcock (2002). "Why Can't U. S. Beef Compete in the European Union?" Iowa State University, Department of Economics, Staff General Research Papers.
- Charlier, Christophe, and Michel Rainelli (2002). "Hormones, Risk management, Precaution and Protectionism: An Analysis of the Dispute of Hormone-Treated Beef Between the European Union and the United States." *European journal of Law and Economics*, 14,2(September):83-97.
- CICCRA (2004). "Informes Económicos." Issues 46, 47 and 48. Cámara de la Industria y Comercio de Carnes y Derivados de la República Argentina.
- Ekboir, Javier, Lowell S. Jarvis, Daniel A. Sumner, Jose E. Bervejillo, and William R. Sutton (2002). "Changes in Food and Mouth Disease Status and Evolving World Beef Markets." *Agribusiness*, 18(2):213-29.
- Fox, J., L. Perez, and M. Boland (2005). Grassfed Certification: The Case of the Uruguayan Beef industry. Available online at <http://www.agmrc.org/NR/rdonlyres/CB436400-2034-4615-8EA0-488E877DB098/0/KStateGrassFedCertificationMay9.pdf>. Accessed March 23, 2007.
- Hill, Charles W. L. (2001). *International Business: Competing in the Global Marketplace*. Irwin McGraw Hill:New York.
- Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59, 1551-1580.

- Lusk, Jayson L., Jutta Roosen, and John A. Fox (2003). "Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States." *American Journal of Agricultural Economics*, 85,1(February):16-29.
- Márgenes Agropecuarios Magazine. 2006.. Año 21- N° 247. Enero 2006. Sarmiento 559 P 10, Buenos Aires, Argentina. Available at [www.margenes.com](http://www.margenes.com) . P. 80.
- Márgenes Agropecuarios Magazine. (Various issues 1996-2006).
- Maersk Shipping (2006). Shipping quotes. Available online at <http://maerskline.com/link/?page=appinfo&path=/rates>. Accessed in September.
- Pearcey, B. 1999. "Ranchers Renaissance". Harvard Business School. P. 28.
- Porter, M. (1990). *The Competitive Advantage of Nations*. New York NY: Free Press, Macmillan Inc.
- Robertson, Vic (2007). "EU Beef Sector Faces Import Crisis. In *The Scotsman*. January 31. Available online at <http://business.scotsman.com/topics.cfm?tid=476&id=160472007>. Accessed March 23.
- Silva, A. R. (2003). *Diferenciación de Producto: ¿Una Estrategia Competitiva Para el Sector Ganados y Carnes Argentino?* Thesis, Universidad de Buenos Aires. Buenos Aires, Argentina. P 135 Translated by: Freddy Broffman.
- Silva, A. R., (2006). Profesor, Universidad de Buenos Aires. Comunicación Personal. April.
- Steiger, Carlos (2006). "Modern Beef Production in Brazil and Argentina." *Choices*, 21,2(2nd Quarter):105-10.
- Taylor, Charles, Michael G. Walsh, and Christopher Lee (2003). "The US/EU Beef Controversy and a Proponed Framework for Resolving Standard Disputes in Internacional Trade." *Journal of Consumer Affaire*, 37,1(Summer):101-22.
- Thor, Eric, III (2006). *Economic Analysis of Investment Opportunities in the Beef Systems of Argentina and Uruguay*. Department of Economics, Utah State University and Royal Agricultural College, Cirencester, England.
- U. S. Department of State. (2005) U. S. and Uruguay Sign Bilateral Investment Treaty. Media Note, Office of the Spokesman. November 4. Available online at [http://www.sice.oas.org/TPD/URY\\_USA/Negotiations/modificationBIT\\_e.pdf](http://www.sice.oas.org/TPD/URY_USA/Negotiations/modificationBIT_e.pdf). Accessed March 23, 2007.

- USDA, Economic Research Service (1998). U. S. Foreign Direct Investment in the Western Hemisphere Processed Food Industry. Agricultural Economics Report (AER760), March. Available online at <http://www.ers.usda.gov/publications/aer760/>. Accessed on March 23, 2007.
- USDA, Foreign Agricultural Service (2005). Livestock and Products: U. S. Beef Faces Strong Competition on the European Market. GAIN Report Number E35178. September 8. Available online at <http://www.fas.usda.gov/gainfiles/200509/146130828.pdf>. Accessed March 20, 2006.
- USDA, Foreign Agricultural Service (2006). EU-25 Livestock Products Annual. GAIN Report Number E36107. July 14. Available online at <http://www.fas.usda.gov/gainfiles/200607/146208314.pdf>. Accessed March 23, 2006.
- U. S. Trade Representative, Office Of. (2005). Argentina. Available online at [http://www.ustr.gov/assets/Document\\_Library/Reports\\_Publications/2005/2005\\_NTE\\_Report/asset\\_upload\\_file710\\_7452.pdf](http://www.ustr.gov/assets/Document_Library/Reports_Publications/2005/2005_NTE_Report/asset_upload_file710_7452.pdf). Accessed March 23, 2007.
- Vickner, Steven S. and Stephen P. Davies (2000) "Estimating Strategic Price Response in a Product-Differentiated Oligopoly: The Case of a Domestic Canned Fruit Industry." *Agribusiness: An International Journal*. 16(Spring):125-140.
- Vickner, Steven S. and Stephen P. Davies (2002). "Estimating Strategic Price Response Using Cointegration Analysis: The Case of the Domestic Black and Herbal Tea Industries." *Agribusiness: An International Journal*. 18(Spring):131-144.

**Table 1. Margins in Beef Supply Chain in Argentina from Silva (2003) and Thor (2006).**

<b>Stage in Supply Chain</b>	<b>Purchase Price</b>	<b>Sales Price</b>	<b>Total Value/Head</b>
Cow/calf		\$180/head	\$180.00
Fattening	\$180/head	\$0.79/kg.	\$347.60
Freezer (Packer)	\$0.79/kg.	\$1.64/kg.	\$432.96
Domestic Retailer	\$1.64/kg.	\$2.56/kg.	\$533.91
Exporter Packer	\$0.79/kg.	\$1.61/kg.	\$424.78
Delivered Break-even Price in Hamburg <sup>a</sup>	3.81/kg		

<sup>a</sup> Based on ocean freight quotes from Maersk (2006) indicating shipment costs of approximately \$2.20/kg. between Buenos Aires and Hamburg.

**Table 2. Porter's Diamond Model Analysis for Beef System of Argentina.**

<b>Component</b>	<b>Analysis</b>
Factor Conditions:	Temperate climate and fertile soil; large land base; large beef industry infrastructure; large labor force specialized in beef industry; pricing influenced by government policies
Demand Conditions:	Extremely high domestic per capita beef consumption; growing export demand; growth hormones illegal; traceability system being implemented
Related and Supporting Industries:	Large level of grain production; relatively competitive meat packing sector; paved roads in most regions; relatively good price reporting
Firm Strategy and Rivalry:	Strong commitment to the beef industry; government policies often not aligned with corporate goals; small number of feedlots; competitive packing industry with a less competitive export sector;
Chance:	Relatively predictable climate; animal disease is a potential concern; governmental interference in markets

**Table 3. Porter's Diamond Model Analysis for Beef System of Uruguay.**

---

<b>Component</b>	<b>Analysis</b>
Factor Conditions:	Temperate climate and fertile soil; small land base; excellent beef industry infrastructure; specialized labor force; transparent pricing and strong government support for exporting beef
Demand Conditions:	Extremely high domestic per capita beef consumption; growing export demand; growth hormones illegal; excellent traceability system in place
Related and Supporting Industries: competitive meat	Small amount of grain production; relatively packing sector; paved roads in most regions; excellent price reporting
Firm Strategy and Rivalry:  commitment to beef exporting	Strong commitment to the beef industry; government policies closely aligned with corporate goals; small number of feedlots; competitive packing industry and strong
Chance:	Relatively predictable climate; animal disease is a potential concern; strong government support for the industry and exports

---

**Table 4. 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 5. 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 6. 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 7. 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.

**Table 8. Johansen Cointegration Test Results for Argentina and Uruguay.**

<i>401/420 kg. in Argentina and US CME</i>				
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
<i>480+ in Argentina and US CME</i>				
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
<i>Uruguay Steer and US CME</i>				
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
<i>Uruguay Cow and US CME</i>				
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

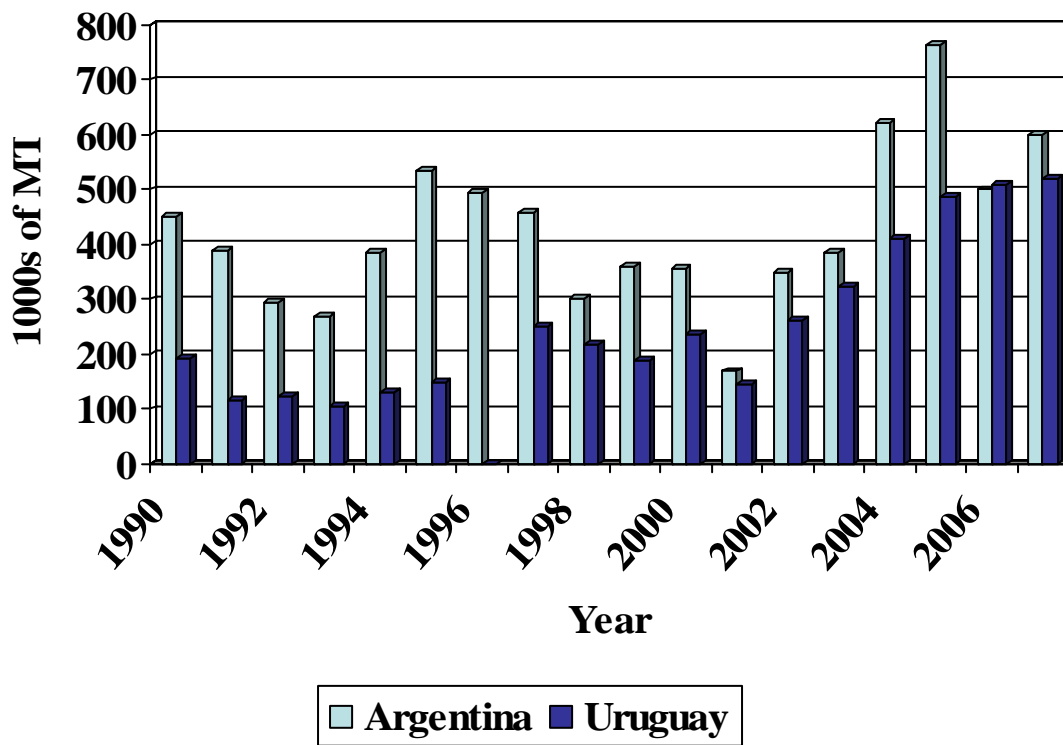
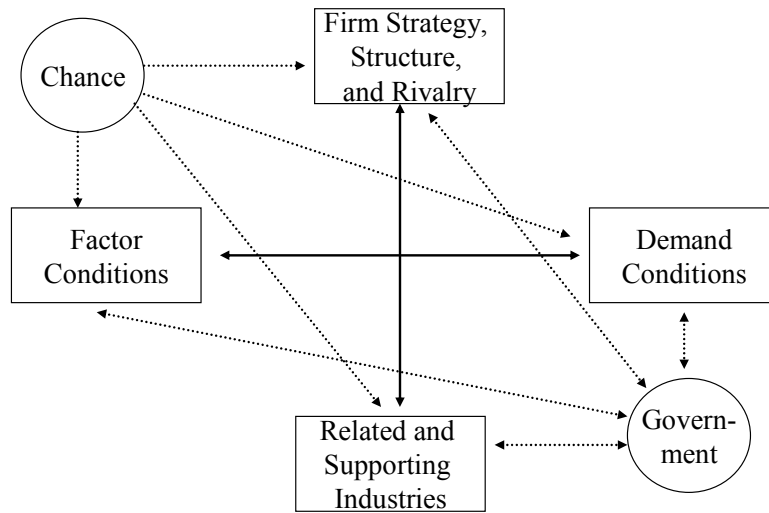
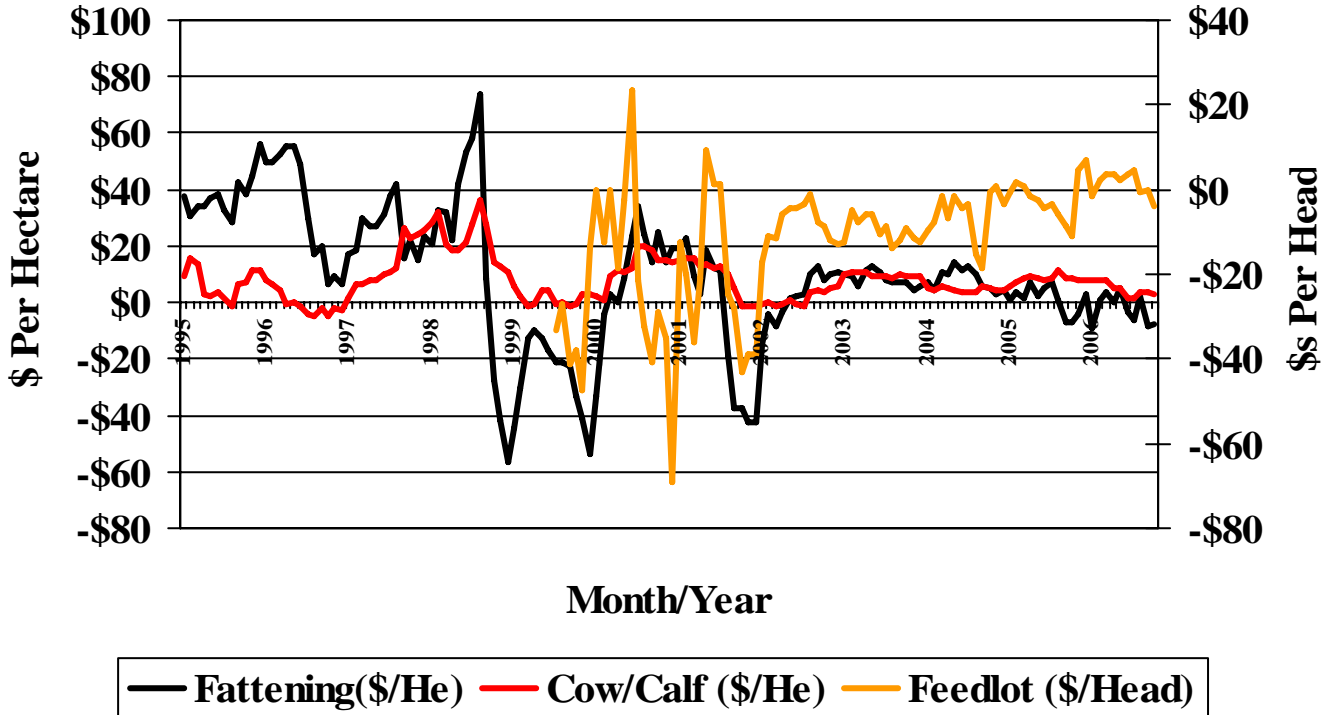


Figure 1. Beef and Veal Exports from Argentina and Uruguay, 1990-2007 proj.



**Figure 2. Porter's Diamond Model.**



**Figure 3. Exchange Rate-Adjusted Profitability for Different Segments of the Cattle Marketing Chain in Argentina Reported in US Dollars, January 1995 – October 2006.**