MARKET EFFECTS FROM OPENING AND CLOSING MEAT PROCESSING FACILITIES

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CHAPTER 1

LIVESTOCK AND MEATPACKING INDUSTRIES

Concentration and consolidation have become important concerns in the meatpacking industry over past decades. This growing trend has continued, as more meatpacking firms consolidate or exit the industry. In recent years, these conditions have caused livestock producers, policy makers, and the public to question the efficiency of the market. Concerns have arisen from the potential market power that meatpacking firms could use to influence the market. With these claims of oligopsonistic behavior in the industry, some research has shown that any losses due to market power are outweighed by increased processing efficiency (Azzam and Schroeter, Paul).

Changes in Livestock Production

Geographic location of livestock production and slaughter has been changing. The beef industry has seen this trend over the last half of the twentieth century. Prior to this time, livestock production in general and more specifically beef production occurred close to terminal markets and major population centers. With the development and improvement of farming techniques, irrigation practices, and available land, beef producers began to take advantage of the conditions in the Plains states. Producers also found that if local feed grain supplies were not adequate, it was more feasible to import grain from the Corn Belt than moving finished cattle to slaughter plants in the Plains.

Since 1980, fed cattle production has been shifting away from the Corn Belt. The level of production in the Plains states, compared to the rest of the United States, has been increasing. In 1980, the top four states in cattle marketings were Texas, Kansas, Nebraska, and Iowa (in order). These four states marketed 38.9% of all fed cattle that year. Over the next twenty years, fewer cattle were fed and marketed in the Corn Belt, while cattle feeding increased in the Plains states. By 2000, the leading states in cattle marketings included (in order), Texas, Kansas, Nebraska, and Colorado. These states marketed 46.7% of all fed cattle during that year (USDA-National Agricultural Statistical Service).

Packers have realized that to ensure a steady and adequate supply of cattle, it is advantageous for them to be located close to cattle feeding. Thus, meatpacking firms have been slaughtering more cattle in the Plains than the Corn Belt. The top four states (in order) in commercial cattle slaughter in 1980 were Texas, Nebraska, Iowa, and Kansas. These states processed 51.4% of all cattle. In twenty years, the top four states were Kansas, Nebraska, Texas, and Colorado. These states slaughtered 69.2% of all commercial cattle (NASS).

Hog production and slaughter has continued its strong presence in the Corn Belt, with some shifting to other regions. Over the last two decades, pork producers have continued to raise hogs close to sources of feed grains. Some production has been shifting to the Plains states with looser restrictions on environmental considerations, available land, and irrigated sources for grains. While some production has shifted to the Plains states, the majority of the change away from the Corn Belt has been to the Mid-Atlantic states. In 1980, Iowa was the top hog producing state, followed by (in order)

Illinois, Minnesota, and Missouri. The four states marketed 49.5% of all hogs during that year. By 2000, North Carolina emerged as one of the top states in hog marketings. Iowa was once again the leading state, followed (in order) by North Carolina, Minnesota, and Illinois. These four states combined to market 54.3% of all hogs, during 2000 (NASS).

Hog processing has followed trends similar to hog marketings. Slaughter plants have located close to sources of hogs. In 1980, the top four states in hog slaughter (in order) were Iowa, Illinois, Minnesota, and Ohio. These states processed 45.7% of all hogs during that year. By 2000, some slaughter had shifted to the Mid-Atlantic region. Iowa was the leading state in hog slaughter, followed by (in order) North Carolina, Illinois, and Minnesota. These states combined to process 56.2% of all hogs during that year (NASS). Over the past two decades hog slaughter and marketings have followed similar trends. Processing and production have intensified in the Corn Belt and Mid-Atlantic region.

The Canadian hog industry has had extreme changes in recent decades. In 1980, hog production (pig crop) was at 14.5 million head. The country slaughtered 13.9 million head and exported 238 thousand head of hogs that year. Over the course of the next twenty years the industry has seen rapid growth. In 2000, Canada's hog production was at 25.9 million head, processed 19.7 million head, and exported 4.4 million head of hogs (USDA-Foreign Agriculture Service).

Part of the production expansion has occurred in the central provinces of Canada. Recently, these provinces have started competing heavily with the hog markets in the U.S. Corn Belt. In 1984 Ontario marketed 4.9 million head, and by 2000 the province marketed 6.1 million head of hogs. The number of marketed hogs in Saskatchewan more

than doubled from 1984 to 2000, from 0.8 to 1.7 million head. However, some of the largest growth during this time period occurred in Manitoba. The province marketed 1.6 million head in 1984; by 2000 this number had climbed to 5.1 million hogs (Canadian Pork Council). While hog production and marketing has rapidly increased, the industry has relied on increased exports.

Canadian exports from hog production include live hogs and pork products. Live hog exports from Canada consist mainly of feeder pigs and market hogs. Some breeding stock is exported; however, this is a small proportion of total exports. In 1988 Canada exported 146 thousand feeder pigs and 716 thousand market hogs. Twelve years later (2000) the country exported 2.3 million feeder pigs and 2 million market hogs (Canadian Pork Council). This is a substantial amount of live hog exports. In 2000, Canada was the number one exporter of live hogs, with 61.6% of the world market. Canada is also a major exporter of pork products. Canada was the second largest pork exporter at 658 thousand metric tons of pork, in 2000. Exports at this level have given them 19.3% of the World pork market (USDA-FAS). The Canadian hog and pork industry has seen expansion and is expected to continue this pattern into the future.

The recent growth in Canadian hog production has allowed the industry to compete on the world pork market and supply the U.S. hog industry. The U.S. is the third largest pork exporter at 584 thousand metric tons, or 17.1% of the world market, in 2000. Canada is the second largest pork exporter. Thus, the two countries compete on the pork export market. However the U.S. also imports a large quantity of pork, unlike Canada. The U.S. imported 439 thousand metric tons and Canada imported 68 thousand tons in that same year (USDA-FAS).

With the enactment of the Canadian and United States Trade Agreement (CUSTA) and the North American Free Trade Agreement (NAFTA) in the late eighties and early nineties, the Canadian and U.S. markets have become more open to one another. This fact has become evident in the hog market. Both countries trade live hogs and pork, however, most of the trade is flowing into the U.S. In 2001, the U.S. bought approximately 51% of Canadian pork exports (Statistics Canada). These exports from Canada account for most of the U.S. pork imports. Also, almost all of the live hog exports from Canada enter the U.S. In 2000, only 2 thousand head of Canadian live hog exports did not enter the U.S. About 59% of feeder hog exports went to Iowa, Kansas, Missouri, and Nebraska to be finished. The majority of Canadian slaughter hog exports, 43 percent, went to Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming (Livestock Marketing and Information Center). The U.S. and Canadian hog industries have a definite relationship. The apparent flow of trade between the two markets requires that any analysis of the hog industry needs to consider this relationship and the impacts that may occur.

Changes in Meatpacking

Concentration and consolidation have become an accepted fact. However, the presence of concentration may not have a negative impact and the market may be encouraging this trend. Meatpacking has long been known as a low margin business, with high volume. Most packers pay similar amounts for their slaughter cattle and hogs. They also receive about the same about for the meat and byproducts they produce. If this holds true, every packer would have close to the same margin. The best way for a packer

to increase their net margin would be to lower their operating costs. Lowering costs is the best approach, because they have limited influence over livestock and meat prices. The lower cost firms have become more efficient and are more likely to stay in the industry.

The apparent advantage of being a low cost processor emphasizes the fact that economies of size are present in meatpacking. Economies of size relate to the presence of decreasing long-run average cost of a firm. Thus, a firm with lower costs and revenues that are competitive with the rest of the industry would have economies of size. Research done by McDonald et al. (2000) has shown that economies of size have been present in meatpacking.

Steer and heifer slaughter plant size has been shifting to larger plants, slaughtering more cattle (USDA Grain Inspection, Packers, and Stockyards Administration). In 1980, there were 520 plants that slaughtered 50,000 head or less per year. These plants processed 3.446 million head of steers and heifers that year. Plants with sizes ranging from 50,000 to 500,000 head per year, numbered 98. These mid-sized plants slaughtered 15.156 million head of fed cattle. The eight larger plants (over 500,000 head per year) processed 5.877 million head of fed cattle in 1980. By 2000, there were only 103 small plants (less than 50,000 head/yr) that slaughtered 0.427 million head of cattle. The eighteen plants that processed between 50,000 to 500,000 head/yr, slaughtered 4.183 million head of cattle that year. The larger plants increased their numbers to 22 and processed 24.78 million head in 2000.

Over the past two decades, the number of beefpacking plants has been reduced by almost half. In 1980, there were 1,411 federally inspected plants that processed cattle. After twenty years this number has decreased to 738 plants.

Porkpacking has seen similar changes in plant size over the past two decades. In 1980, the 333 small plants (processing less than 25,000 hogs) slaughtered 1.679 million hogs. There were 91 small plants that slaughtered 0.567 million hogs in 2000. Plants that processed between 25,000 and 300,000 decreased slaughter from 8.744 to 4.829 million hogs between 1980 and 2000. The number of these plants also decreased from 93 to 59. The number of plants that slaughtered more than 300,000 hogs per year, decreased from 83 to 37 by 2000. However, they slaughtered more hogs, from 82.5 to 88.5 million hogs, over the same period (GIPSA). These industries have been changing over the past two decades. Mainly due to economies of size, they are shifting from large numbers and small size to fewer numbers and larger plants.

Porkpacking plant numbers have followed a similar trend. There were 1,235 federally inspected hog slaughtering plants in 1980. Federally inspected hog plants decreased to 721 by 2000 (GIPSA).

Beefpacking has seen large changes in the level of concentration. In 1980 the top four firms processed 35.7 percent of all steer and heifer slaughter. This level of concentration had increased to 81.7 percent by 2000 (GIPSA). A majority of this change came in the 80's. From 1980 to 1990, the level of concentration of the top four firms processing fed steers and heifers increased by almost 36 percentage points. Boxed beef production has also become a trend in the beefpacking industry. With the increasing demand for boxed beef, many packing plants produce boxed beef to add value to their

output. In 1980, the top four firms produced 52.9 percent of boxed beef. By 2000, the top four firms produced 84.7 percent of boxed beef (GIPSA).

The porkpacking industry has similar, but less dramatic increases, than the beefpacking industry. The concentration level of the top four firms that process slaughter hogs was at 33.6 percent, in 1980. By 2000, the top four firms processed 57.1 percent of all slaughter hogs (GIPSA).

ConAgra Plant Closing

On December 25, 2000, the ConAgra beef processing facility in Garden City, Kansas, caught fire. At first ConAgra believed the damage was repairable, but after further consideration they decided to close the 4,400-head/day processing plant. This abrupt change had an effect on market conditions, not only for ConAgra, but also for other packers and producers. The ConAgra plant closing was located in an area of concentrated beef production (western Kansas), which makes this situation unique, compared to previous plant closings studied previously.

Cattle Slaughter Capacity

Excess slaughter capacity in the beef industry was believed to exist prior to the closing. There is no known media coverage of a potential capacity problem in the cattle slaughtering industry. Discussions with industry analysts confirm that excess capacity was not a problem at the time. Thus, it is assumed that during 2000 there was adequate excess capacity in the industry.

The closing of a large plant, such as this one, would have a direct and immediate impact on capacity. The actual slaughter capacity of the industry is difficult to measure. There are no known published sources of estimated U.S. slaughter capacity in 2000 or 2001. However, there was a change in slaughter after the plant closed. During the 55 weeks prior to the closure (mostly 2000), the average weekly slaughter in Kansas, Texas, Nebraska, Colorado, Iowa, and Minnesota was 461.16 thousand head. Over the next 55 weeks (mostly 2001) the average weekly slaughter in the same area was about 439.85 thousand head. This was a drop of 21.31 thousand head. If it is assumed the ConAgra plant was operating at 4,400 head per day and working 5.5 days per week, its weekly slaughter would be 24.2 thousand head. This value is almost equivalent to the drop in the average weekly slaughter in the market. After the plant closing, the slaughter capacity along with the actual slaughter dropped.

Maple Leaf Plant Opening

Maple Leaf Foods opened a 45,000-head/week hog processing facility on August 30, 1999, in Brandon, Manitoba. This plant was opened during a time of expansion in the Canadian hog industry. At the same time there was little to no excess capacity in the hog slaughter industry, in the U.S. or Canada. Few large plant openings, like Maple Leaf Foods, have not occurred since previous studies were completed. Also, few studies have examined a large plant opening in an expanding production area. The Maple Leaf Foods opening should have an impact on market conditions in an area of concentrated and expanding production and on a slaughtering industry with little excess capacity.

U.S. Hog Slaughter Capacity

Slaughter capacity was an issue at the time of the plant opening. In the second half of 1998, hog prices reached extremely low levels. In fact, prices reached a 35 year low of $13.92 in December of 1998 (Luby). This was caused and intensified by a backlog of hogs ready for processing. An article by an anonymous writer with *Successful Farming* helps to explain the situation. It states that the hog processing industry lost numerous plants and that the lack of capacity drove down prices. Luby goes into a more detailed explanation of the industry's problems in 1998. He points out the low market prices were a result of numerous factors occurring at the same time. The mid-nineties saw high market prices. With the high prices, producers began a rapid expansion of their operations. At the same time porkpackers were decreasing their operations because of low profits from the high hog prices. In fact, over 10% of the hog slaughter capacity closed in 1997 and 1998 (Luby). The abnormally low prices in 1998 were a result of the combination of rapidly increasing hog production and decreasing porkpacking. These situations forced a large number of hogs on the market with inadequate room to process and distribute the product.

The maximum slaughter capacity in the Canadian and U.S. hog industries has been estimated. Grier, Martin, and Mayer conducted a study on the Manitoba hog industry. Their report estimated the daily slaughter capacity in the U.S during 1999 and 2000. If it is assumed that U.S. plants were operating on 5.5 days/week, the maximum weekly slaughter capacity nation-wide would be 2137.4 thousand head. The average weekly slaughter in just the Iowa, Minnesota, and South Dakota markets was 792.03 thousand head during the 55 weeks prior to the plant opening. During the next 55 weeks,

the average weekly slaughter dropped to 757.85 thousand head. The decrease in slaughter is the result of several factors. The opening of the Maple Leaf plant decreased the number of finished hogs entering the U.S. for processing. The decrease in slaughter was also the market returning to its normal state from the high levels of slaughter levels in 1999 when the industry was working through an unusually high backlog of finished hogs.

Canadian Hog Slaughter Capacity

The same study also estimated the Canadian slaughter capacity. In 2000, it was estimated to be 410 thousand head per week. During the 55 weeks prior to the opening, the average weekly hog slaughter in Manitoba, Ontario, Saskatchewan, and Alberta was 157.1 thousand head. In the 55 weeks after the average weekly slaughter in this area was 175.5 thousand head. As would be expected, the opening of the plant increase slaughter capacity in the region. Actual slaughter in the provinces also increased, as fewer hogs were shipped to the U.S. to be processed.

Importance

Market efficiency in the livestock industry has long been questioned. With consolidation and concentration, there is a rare opportunity to study the effects of a plant opening and closing under the present market structure. These two cases allow the study of the price discovery process in the cattle and hog markets with the opening and closing of slaughtering plants. The loss of a large processing plant in an area of concentrated cattle production may have an effect on the market. Theoretically, when the plant closed

the market would have lost one competitor in the market. With the loss of a competitor the other buyers may not be as aggressive in their bidding. If this is the case, the price of fed cattle in that market would go down. The addition of a packing plant in southern Manitoba should increase the competition in that market. This may cause the firms to bid more competitively to meet their required volume. This would cause the price of slaughter hogs to increase in that market. Realistically, the effects from the two events may be more complex.

The actual effects will partially depend upon the reaction by the remaining firms in the market. With few firms in the meatpacking business the reaction would be more subtle. It must be realized that the ConAgra closure was a sudden impact to the market. This rapid market shift may determine the reaction from competing firms. The cattle that were ready for slaughter would have to be diverted to other plants or held until kill slots could become available. In the case of the Maple Leaf opening, the market would have time to prepare before it came online. The plant would probably not be operating at its ideal capacity during the first months of operation. Reaching an optimal slaughter rate would be a process that evolved slowly. This would allow the employees to become familiar with procedures and equipment. The combination of these effects may cause the market impacts to be more dispersed.

Consolidation and concentration in the porkpacking and beefpacking industries are important concerns. The results of this study will help to understand the market dynamics and adjustments under the current conditions. The industry is ever changing and the conditions my present a different picture than previous studies. If any different results are present, they should stem from the current competitive nature of the packing

industry. This study will answer the following questions: What are the fed cattle market impacts from the closing of the ConAgra plant in Garden City, Kansas? What are the hog market impacts from the opening of the Maple Leaf Foods plant in Brandon, Manitoba?

Objectives

The main objective of this study is to increase the understanding of the market impacts from the entry and exit of meatpackers, given the current industry structure. Specific Objectives are

1. Determine if a beefpacking plant closing in western Kansas and a porkpacking plant opening in Manitoba had an effect on slaughter livestock prices (cattle and hogs) in that region compared to surrounding markets.

2. Determine (if a price effect occurred from the event) how much time it took relative prices to return to levels prior to the opening or closing.

3. Determine fed cattle producers' perceived market effects from the closure of a beefpacking plant in Garden City, Kansas.

4. Determine slaughter hog producers' perceived market effects from the opening of a porkpacking plant in Brandon, Manitoba.

CHAPTER 2

CONCEPTUAL FRAMEWORK AND PREVIOUS RESEARCH

The underlying factors that influence a market will determine the effects from a plant opening and closing. Specific impacts on prices will depend upon how supply and demand for slaughter livestock react to the change. To understand how the changes in supply affect price, one must consider how prices are reached in the livestock industry. Effects from the plant closing and opening on supply and demand, and the aspects of the spatial market will be examined. Spatial price relationships are important in the livestock industry, because the majority of production and processing activities are located in the same geographical area. The opening of the Brandon plant and closing of the Garden City plant are good cases for event study analysis. The results and theories, and how they apply to this study will be discussed. While most event study analysis has occurred in the Finance field, studies that involved the meatpacking industry will be considered. These factors will give the theoretical background to formulate hypotheses of the impacts from the plant closing and opening.

Price Determination

Price is commonly determined at the intersection of supply and demand. How the supply and demand of a good interacts with one another is dependent upon the type of market structure. Market structure relates to the number of buyers and sellers, ability to

enter the market, product differentiation, and the size of firms (Tomek and Robinson). As discussed previously, the market structure of the meatpacking industry has been in question in recent years. Fed cattle and hog producers have inquired if the industry is acting under perfect competition. Theoretically, livestock price and quantity slaughtered would be determined at the intersection of supply and demand. However, this will not always be the exact price level. The process of price discovery must also be considered.

Livestock Supply and Demand

The price and quantity slaughtered in a market, is set by the packer demand for slaughter cattle and hogs, and the supply ready for slaughter. Firms that buy slaughter livestock for processing affect packer demand. Producers of slaughter livestock influence aggregate supply.

Aggregate Supply

The number of plants and/or firms would not immediately affect the market supply of livestock that is ready for slaughter. Three factors must be considered when determining if the supply of slaughter livestock shifts: production cycle, presence of outside influences, and type of commodity. Livestock available for slaughter cannot easily be changed on short notice, because production decisions have to be made months in advance due to the biological life cycle of livestock. Cattle production would take more time to make adjustments because of longer gestation period and longer time to reach market weight than hogs. Hog producers would be able to adjust production more rapidly to benefit from a current market. This is an important concern because slaughter

livestock is a non-storable commodity and cannot be held on a long-term basis to speculate on future prices.

There is no evidence that the aggregate supply of livestock shifted dramatically at the same time period as the opening and closing of the plants. Thus, it is assumed that the aggregate supply of slaughter livestock did not change or only changed in diminutive amounts during the plant opening and plant closing.

Market Demand

Packer demand for fed cattle and slaughter hogs is the same as the market demand for these livestock. Market demand, as defined by Nicholson, is the summation of each firm's demand curve. The market demand for fed cattle and slaughter hogs would be determined by the demand of the firms in the market.

Market demand is a summation of each firm's demand; therefore the number of firms would have a direct impact. If a new consumer entered the market, the market demand would shift to the right (Pindyck and Rubinfeld). The addition of the Maple Leaf Foods plant should shift the market demand outward to the right. Aggregate demand shifting to the right would cause the price and quantity of fed cattle and slaughter hogs to increase. This assumes that aggregate supply would not change and that other factors remain constant. The opposite of this case would hold true if a packer exited the market. The loss of a firm would cause the market demand to shift to the left. Market demand shifting leftward would cause the market price and the quantity to decrease. These assumptions would have to be based upon ceteris paribus.

Considering the effect on price from the changing of aggregate supply and demand from the opening and closing of a meatpacking plant is simple. The loss of the ConAgra plant would cause the market demand to shift to the left, because one fewer plant would lower the summation of total demand. Less market demand would mean that the market price and quantity would be lower. In the Maple Leaf Foods case, opening a plant would cause the market demand to shift to the right. The summation of market demand would increase because of the new plant. Additional market demand would lead to a higher market price and quantity slaughtered.

Elasticity of Demand

Shifting the market demand for slaughter livestock will change the price and quantity in the market. However, the amount of this change will depend upon the price elasticity of demand for fed cattle and slaughter hogs. Elasticity of demand is a measure of the percentage change in quantity of a good, when the price of that good changes by a certain percentage (Nicholson).

The elasticity of demand for slaughter livestock is important to consider when measuring the market impacts if market demand shifts. Elasticity of demand for slaughter livestock is inelastic (MacDonald et.al., 2000). This means that as the market price for slaughter livestock changes there is little to no change in quantity demanded. As described previously, when the ConAgra plant closed the market demand decreased. The exact impact on price and quantity would depend upon the elasticity of that demand. With the case of inelastic demand, shifting the market demand to the left would cause a greater decrease in price than quantity of slaughter livestock. With the Maple Leaf plant

opening, the increase in price would be more drastic than the increase in quantity of slaughter livestock. Of course, this would have to assume that the supply of livestock available for slaughter does not change. Elasticity of demand is not the only factor that would influence the market impacts from plant openings and closings. However, the level of elasticity of demand for slaughter livestock may explain how slaughter and prices change in relation to each other.

Price Discovery

Price discovery is the actual transaction price that is agreed upon by buyers and sellers, for a given quantity and quality, and a given time and place. The discovery of prices will be influenced by the market structure, available information, purchase methods, and futures market (Ward and Schroeder). The influence of these factors will cause slaughter livestock prices to fluctuate around the level set by the supply and demand curves. The variation between levels of price discovery and price determination would vary between markets and days. While available information, purchase methods, and futures markets are crucial in price discovery, this study is mainly concerned with market structure and its relationship with prices.

Market Structure

Market structure in the beefpacking and porkpacking industries has been under debate for some time. Under current conditions it could not be considered a market with perfect competition. Tomek and Robinson describe a purely competitive market as one with many buyers and sellers, products from each competitor are homogeneous, no

government intervention, and free exit and entry into the market. Following this definition, the meatpacking industry is not a perfectly competitive market. The lack of many buyers is the most limiting factor for a purely competitive market. Previous research has classified the U.S. meat packing industry as an oligopsony (Azzam and Schroeter; Azzam and Pagoulatos; Koontz and Garcia). The results from studies on market power fail to agree on the degree of oligopsonistic behavior in the meatpacking industry. However, they do confirm that the current market structure is oligopsonistic.

Koontz and Garcia developed a noncooperative game-theoretic model of the conduct of meatpacking firms. This study covered the Plains and Midwest using regional data from the mid-80's. They found some evidence of oligopsony power in these geographic markets. However, it was not shown to be consistent across all time periods. A study by Azzam and Schroeter yielded similar results. They modeled the trade-off between oligopsony power and the cost efficiency from consolidating the beefpacking industry. Specifically, they found that the industry would have to have a cost savings of 2.4% to offset the effects of a 50% increase in concentration. This shows that the increasing concentration of the beefpacking industry has enhanced welfare. These studies have used different methods and time periods to reach a conclusion. However, they have both concluded that the beefpacking industry is acting under an oligopsony structure.

Capacity Utilization

Another factor that needs to be considered when examining the market impacts from the two events is capacity utilization. Capacity utilization is a comparison of the

actual amount of slaughter and the maximum amount that could be slaughtered. Another common way to measure this is excess capacity. Excess capacity is the number of additional head of livestock that could be slaughtered, if plants were operating at a maximum. Throughput utilization is an important factor for consideration for firms that process or produce some types of goods. High utilization means that firms are producing near the maximum capacity of their plant. Low utilization would allow a plant to handle future demands. However, low capacity utilization could cause some plants to leave the market. Kovenock and Phillips found that high capacity utilization is positively related to plant openings and negatively related to plant closings. This could help to explain why Maple Leaf Foods decided to open a plant. Due to the uncontrollable nature of the ConAgra plant closing this could not be applied to the beefpacking situation.

Utilization has a direct impact on plant costs. Every plant has a given level of fixed costs. If more head are being processed, fixed costs per head will decrease because these costs will be spread over more animals. The inverse is true for fewer head being processed. The level of slaughter also impacts variable costs. Each plant has a volume quantity level or range with the least cost per head to process. At lower and higher levels of processing the variable costs will be higher than an optimal level. Processing costs directly affect the price a packer can pay for livestock. As processing costs increase the amount a packer is willing to pay will decrease.

Excess Capacity during Events

As discussed previously, at the time of the time of the Maple Leaf plant opening there was minimal excess capacity in the hog slaughter industry. The opening of the

large plant in Brandon was expected to take some of the pressure off the capacity constraint problem. This event may not have caused a large change in market demand. With little excess capacity the market demand would already be considered tight, with little to no fluctuation between periods. The plant opening may have taken some of the market demand away from other plants, and possibly only changed the market demand minimally. Minimal change in demand would mean that price and quantity would only change slightly. This situation, as well as the fact the announced opening gave the market time to anticipate future events, may explain if little or no changes from the event are found in the market.

At the time of the ConAgra plant closing there was sufficient excess capacity in the cattle slaughter industry. The closing of a large plant in Garden City would reduce the available excess capacity that was available in the market. Losing the plant would force cattle to other plants for slaughter, thus increasing plant utilization and tightening the capacity in those plants as a group. Cattle would have to move to ConAgra plants in Dumas, Texas, and Grand Island, Nebraska, or to other packing firms. The excess capacity that was available in the market may also help reduce the impacts of the plant closing. Market demand may only decrease slightly with the plant closing; because other participants were able to process the available supply by increasing their individual demand.

Capacity utilization in the cattle and hog markets will influence the amount of impact the specified events will have. However, the impacts or lack of impact cannot be attributed entirely to this one factor. The presence of little excess capacity in the

porkpacking industry during 1999 and adequate excess capacity in the beefpacking industry during 2000, may limit the market impacts.

Spatial Aspects

Prices received for a given commodity or good, often vary by region. How local markets interact with one another to set prices is commonly referred to as spatial competition. The competition between firms determines the price relationship among the spatial markets (Greenhut and Ohta). Spatial markets determine prices and quantities among firms over some geographical area.

Spatial Competition

Spatial competition among the beefpacking plants and porkpacking plants would influence the markets' reactions to the plant opening or closing. How the packing plants in Texas, Colorado, and Nebraska reacted to the loss of the Garden City plant could influence the overall market impacts. Similarly, how packing plants in Manitoba and the northern United States adjusted to the opening of the Maple Leaf plant could influence the outcome of its impacts. This influence would be dependent upon whether or not spatial competition existed, and if so, how strong the competition was. Capozza and Van Order describe two conditions that need to be present in markets for spatial competition to exist. The first condition required is the presence of transportation costs. This is necessary because without transportation costs, firms could produce in any location and ship the product to any location and not incur any additional costs. In this case, every producer would be competitive with everyone, without any consideration of location.

This is not applicable in the fed cattle or slaughter hog industry. Studies conducted by Clary, Dietrich, and Farris, and Faminow and Sarhan have developed models that measured transportation costs in the beefpacking industry. These models have proven that costs influence the decision makers. Transporting livestock does have a cost, so this condition is satisfied for spatial competition.

Secondly, for spatial competition to exist, the average cost curves must be downward sloping. If economies of scale were not present over some range, firms would not have any incentive to concentrate production in some locations. Thus, consumers could produce their required quantity as cheaply as the firms. The meatpacking industry exhibits downward sloping average cost curves. MacDonald et al. (2000) studied the consolidation of meatpacking in the United States. Using a cost function, they proved that economies of scale existed in both hog and cattle processing. They found that scale economies were small but important. Specifically, they found that larger firms had a lower average cost than the smaller processors. This means that the average cost curves would be downward sloping over a range.

Beefpacking and porkpacking display the two conditions necessary for spatial competition. Spatial competition needs to be considered in this study. The reaction from the rival plants in Texas, Nebraska, and Colorado, to the closing of the ConAgra plant, and its effect on cattle prices in Kansas is a relevant issue. Also, how the competing plants in Saskatchewan, Ontario, and northern United States adjust will in part determine the overall effects on hog prices in Manitoba.

Spatial Price Differences

Livestock prices between two regions can be expected to differ. This raises the question of how much should these prices differ. According to Tomek and Robinson price differences between two regions should be less than or equal to the transfer costs. This is to say that the price of fed cattle in Kansas and Colorado should only differ by the cost of transportation. If this theory is correct in practice, price impacts from a plant opening or closing could be measured by observing any sudden changes in transportation costs. This would have to assume that transportation rates themselves did not change, and the variation in transportation costs could be attributed to the event. There is no evidence found that would indicate that transportation costs changed at the time of the plant closing or opening. This makes it unlikely that any change in the difference between livestock prices in two regions could be linked to changes in transportation costs that occurred at the same time.

Spatial markets are important in the slaughtering industry because many firms locate in areas of high livestock concentration to insure adequate supplies and to hold down transportation costs (Clary, Dietrich, and Farris). Clary, Dietrich, and Farris found that the southern and central plains have a comparative advantage in cattle production. Thus, changes in slaughter livestock demand in concentrated production areas could have a noticeable effect on prices. Faminow and Benson observed the effects of many institutional changes (marketing boards, formula pricing system, and introduction of electronic exchanges) in the Canadian hog market. Selected Canadian provinces adopted the institutional changes to increase the efficiency of the market and create more competitive bidding from packers. While the Faminow and Benson study found volatile

prices existed across much of Canada after the events, the study by Clary, Dietrich, and Farris used simulated events to determine price effects. By analyzing spatial markets, both found that a shock changed prices over a geographic area.

Event Studies

Event study analysis has developed into a widely used method of examining the reaction of prices to some known or unknown event. The use of event study analysis has been successful with corporate finance issues, and most have determined the impact on a firm's value from a specified event (MacKinlay). This methodology can either test the market's efficiency from increased information, or if an efficient market is assumed, the effects of a firm's financial position from the occurrence of some event (Binder; MacKinlay). MacKinlay's review of event study literature determined that in a normal market, prices would respond to new information. This is similar to a study by Tsetsekos and Gombola that was intended to determine the impacts from the closing of domestic and foreign plants. They found that the announcement of a plant closing had a negative impact on the market. However, this research dealt with the impacts on stock price instead of the impacts on input prices. Input prices for packers would include fed cattle and market hogs, which are the interests of this study. While, event study methodology was developed for finance and accounting research with multiple events, some of the principles can be applied to the economic analysis of meatpacking plant closings and openings.

Plant Entry and Exit Studies

Binder's review focused mainly on the behavior of security prices. Several event studies have analyzed the exit and entry of meat slaughtering plants. Love and Shuffett completed a notable hog slaughtering plant exit study in 1965, on the terminal market price impacts from a change in the Louisville market structure. Local hogpackers merged and/or closed, leaving one packer to purchase eighty percent of the hogs sold at the terminal market. They compared weekly price differences between the Louisville market and similar markets in Chicago and Indianapolis. This was done for sixty-nine weeks prior and eighty-seven weeks after the structural change. Love and Shuffett found that the structural change lowered the price $0.22/cwt. in Louisville compared with the Indianapolis market, and $0.26/cwt. compared with the Chicago market. They concluded that the increased market power for the remaining firm caused a decrease in market competitiveness and a lower price.

Ward completed a similar study on the price impacts from closing a hog slaughtering plant in Oklahoma, in 1981. The plant that closed had a considerable market share; it processed eighty percent of all slaughtered hogs in Oklahoma. Weekly Oklahoma City terminal market hog prices were compared to Omaha, Kansas City, and interior-Iowa-southern Minnesota hog prices for the year prior and after the plant closing. Ward found that after the plant closed prices were lower for the first 2 ½ quarters. For 3 ½ quarters, Oklahoma City prices were the same as Omaha prices, but lower than Kansas City and interior-Iowa-southern Minnesota prices.

Hayenga, Deiter, and Montoya attempted to determine what happened to market prices for hogs when slaughtering plants closed and then reopened. They examined six

plants that closed from 1978 to 1981 in Iowa, Illinois, Wisconsin, Missouri, and Oklahoma. Two of these plants later reopened. They found that in four of the six markets, there was at least a two-week period of significantly lower prices. The lower price was observed shortly after the plant closing and the effects tapered-off as more time elapsed. Reopening the plants caused prices in one market to gradually increase to above normal levels. Hayenga, Deiter, and Montoya found that the closing of processing plants could depress prices. However, they point out that the numerous closings would have more of an effect than a single closing. Hayenga, Deiter, and Montoya observed that the reopening of one of the plants decreased market power, pushed up prices, and increased excess capacity for four months. This effect would only be temporary and the market would be able to absorb the structural change.

All three studies compared prices relative to terminal market prices. This would not be as effective in the proposed study. The consolidation of the hog industry during the last twenty years (MacDonald and Ollinger) and the decrease in volume of hog trade on terminal markets makes the comparison of market prices to terminal prices less appropriate.

Anderson et al. found that plants in concentrated markets and ones on the outer edges of production are more likely to exit. A similar study by Muth et al. on the exit of meat packing plants from the implementation of Hazard Analysis and Critical Control Points (HACCP) found comparable results. Their model determined that the entry of new slaughter plants would raise input prices; this includes slaughter livestock. According to the model, if a new plant is opened in the market, the price of cattle or hogs

is expected to increase. If higher input prices exist in a particular market, the plants in the other markets would have a cost advantage (Anderson et al.).

Expected Results

The entry and exit of plants changes the livestock slaughter demand in a market. Market demand can be explained as the summation of individual demand by each plant, thus the number of plants affects demand. The exit of one plant would lower demand, ceteris paribus. With fewer buyers attempting to bid on cattle in the market, the price would be lower. ConAgra closing a large plant (4,000 head/day) would lower the immediate local demand. The other ConAgra plants and competing firms' plants in the area did have some excess capacity. However, it is assumed it would take time for them to adjust to processing the cattle that ConAgra could not handle.

The opposite would hold true for a plant opening. The market demand would increase from the addition of the Brandon plant, and the hog price would be higher. Opening a large plant (45,000 head/week) would increase the immediate demand for slaughter hogs and raise price. The change in fed cattle and slaughter hog prices can be attributed to the change in market demand under an oligopsonistic market structure. Transportation costs and aggregate supply changed only modestly, causing only small price changes. The inelastic demand for slaughter livestock would cause a greater change in price opposed to changes in quantity. This reasoning supports the following hypothesis

1. Fed-cattle prices in western Kansas will decrease and slaughter hog prices in Manitoba will increase, immediately after the change in demand for slaughter livestock in each respective region.

While price impacts will occur, the loss of one plant will not cause the effects to be permanent. The competitive nature of the meat slaughter industry will cause bidders to adjust their prices, in relation to surrounding markets to remain in business. With the closing of the ConAgra plant, the price of fed cattle will slowly return to levels comparable to surrounding markets. If the price in the ConAgra market drops, the higher priced surrounding markets will then increase their market share by procuring more of the available supply. Producers will sell their cattle in another market, if they can get a higher price and if transportation costs are not too high. Transportation costs would be less of a factor in the borders of the two market areas. The local packers in the Garden City area will eventually raise their prices, as they are able to adjust and absorb more slaughter capacity. Eventually, due to spatial competition, price differences between regions (KS, CO, TX/OK, and NE) will return to previously comparable levels.

The Maple Leaf hog slaughtering plant opening would increase the price for hogs in that area. However, the higher prices compared to other markets would not be sustained. Higher prices would attract more producers and expand the procurement area that the plant services. Hog producers in western Canada may send their hogs to the new plant in Manitoba because of a higher price. Surrounding packers would attempt to stay competitive by raising their prices to recapture their market share. The Maple Leaf plant would then gradually decrease their price until all the markets return to previous comparable price levels. This reasoning supports the following hypothesis.

2. After the initial shock of the opening in Manitoba and closing in Western Kansas, the price for slaughter hogs and fed cattle will adjust back to the relative levels observed in the surrounding markets in a matter of weeks.

Market participants should be in a good position to observe impacts. Their involvement on a daily basis would allow them to notice changes that aggregated USDA data may not account for. Producers are concerned about the concentration of packers and its effects on price transparency. The loss of a plant should increase this concentration, thereby increasing the chance for unfair markets. Adding a plant should decrease the concentration of packers in a market. When a majority of producers are dissatisfied with the number of packers in the slaughtering industry, they would welcome a new plant and despise the loss of one. However, trying to predict producers' perceptions is something that is difficult to do. With that said, the expected reactions are:

3. Fed cattle producers will think the loss of the ConAgra plant in Garden City, caused prices to decrease, and allowed the remaining packers to gain more control of the market.

4. Hog producers will think the opening of the Maple Leaf plant in Brandon, Manitoba, caused prices to increase, and decreased packer control of the market.

Market structure changes in the meat slaughtering industry can have dramatic effects because of the high concentration. The expansion and consolidation of the industry changes the price competition among firms. Previous research has studied such changes, and found that a change in the market affects prices. This could be beneficial because the available data may not allow the accurate measurement of price changes. The use of event study methodology and the consideration of spatial markets are needed to determine the competitive conditions in an industry. The continuing changes in the hog and cattle industries have created a new opportunity to determine the price effects from market changes.

CHAPTER 3

SECONDARY DATA PROCEDURES

The objectives of this research are to study the effects from the closing of the ConAgra plant and the opening of the Maple Leaf plant. This was completed by using modified models developed from comparable studies. In the course of this section the two models are discussed. These models use prices and quantity estimates that have been collected by United States and Canadian government agencies and entities. These data study the impacts from the events at a market level. The first model used in the analysis is a price differences model. This model was used in the analysis by Love and Shuffett; Hayenga, Deiter, and Montoya; and Ward. The second model discussed in this chapter is a partial adjustment model. This type of model has not been used in previous studies to test the market impacts from the opening and closing of meatpacking plants. However, the model was modified from other uses in agricultural studies. Both models will help to measure if there was any effect, and the duration of the impact, on the market from the events.

Data

The data set for the beefpacking plant closing study was gathered from several sources. Table 1 presents the variables and data sources. The data discussed in this chapter are all secondary data. In Chapters 5 and 6, the uses of primary data were

considered. Weekly prices for freight on board (FOB) live basis, 1100-1300 lb. fed steers, grading 35-65% choice, sold in western Kansas, Colorado, Nebraska, and Texas, were obtained from the Livestock Marketing Information Center (LMIC). Weekly quantities of combined steer and heifer federally inspected slaughter for the four mentioned states and weekly slaughter for Iowa/Minnesota were obtained from NASS. Previous studies have found that price changes normally last a few weeks to a few months. The ConAgra plant closed on December 25, 2000. To have an adequate time period to detect any market change, data from December 11, 1999 to January 12, 2002 was used (110 weeks). Data covered the 55 weeks prior to the plant closing and 55 weeks after. This time frame is similar to the ones used in previous studies. Love and Shuffett compared prices in three markets for 69 weeks prior and 87 weeks after the structural change. Most of the analysis done by Hayenga, Deiter, and Montoya compared prices for 6 months prior and 6 months after the plant closings and openings. The study conducted by Ward used data covering one year before and one year after the plant closing.

Data for the Maple Leaf Foods plant opening were obtained from similar sources. This plant opened on August 30, 1999. Weekly data from August 15, 1998 to September 16, 2000 were used for the study (110 weeks). The study compared prices 55 weeks before and 55 weeks after the plant opening; this is comparable to previous studies. Weekly prices used in this study are for two different types of hogs. The classification system used by USDA changed during the period used in the study. Prices used from August 30, 1998 to March 6, 1999 are U.S. 1-3 hogs weighing 230-250 lbs. Weekly prices used from March 13, 1999 to September 16, 2000, are live 49-52% lean slaughter

hogs, weighing 240 to 280 lb. Prices were collected for the following markets: Iowa/southern Minnesota direct, Sioux Falls, and south St. Paul markets. These series were available from USDA. Weekly prices for dressed slaughter hogs for the Manitoba, Ontario, Saskatchewan, and Alberta markets were obtained from several sources. (Refer to table 1 for a description of all the variables and sources.) Prices for U.S. hogs, byproducts, and cutout value are converted from U.S. dollars per 100 lbs to Canadian dollars per 100 kg[1]. Weekly federally inspected barrow and gilt slaughter for hogs from the above mentioned Canadian provinces are from AgriCanada. Weekly barrow and gilt slaughter for Iowa, Minnesota, and South Dakota are collected by NASS. The Sioux Falls price was compared with the South Dakota slaughter, the St. Paul price with the Minnesota slaughter, and the Iowa/southern Minnesota direct price with hog slaughter in Iowa.

The partial adjustment required some additional data. Weekly prices used for this model are the same as the prices used in the price differences model. NASS provides weekly quantities of combined steer and heifer slaughter in the appropriate states. Boxed beef prices for 600-750 pound select carcasses are available from LMIC. This is the cutout value of the primal cuts. An average weight of fed steers and heifers in the five state region (including Kansas) was taken from LMIC. This weight was used as the variable in all the models.

The model for the hog plant opening used a weekly average live weight from the National (U.S.) daily direct hog report for the weight variable. This variable is in pounds and was converted to kilograms to keep all variables in comparable units.[2] This model w

[1] To convert from US$ per 100 lb to CAN$ per 100 kg,, (exchange rate*Price)/ *.45359237
[2] To convert from pounds to kilograms, weight in pounds*.45359237

used 110 weeks of data for both the ConAgra plant closing and the Maple Leaf plant opening. This is the same as the price differences model.

Table 1. Data Descriptions and Sources

Variable	Description	Units	Source
Cattle	KS, TX, CO, NE, IA		
Price, KS, TX, CO, Omaha	FOB live, 1100-1300 lb fed steers, 35-65% choice	$US/100 lbs	AMS*
Slaughter, KS, TX, CO, NE, IA, MN	Federally inspected steer and heifer slaughter	1000's head	NASS
Boxed Beef Value	Reported value for 600-700 lb carcasses	$US/100 lbs	AMS*
Weight	Average weight for 35-65% choice steers from TX/OK, KS, CO, NE, IA/MN	lbs	AMS*
ByProduct Value	Average total steer byproduct value	$US/100 lbs	AMS*
Hogs			
Manitoba Price	Dressed barrow and gilts	$CAN/100 kg	Manitoba government
Alberta Price	Dressed barrow and gilts	$CAN/100 kg	
Ontario Price	Dressed barrow and gilts	$CAN/100 kg	AgriCanada
Saskatchewan Price	Dressed barrow and gilts	$CAN/100 kg	Saskatchewan government
US Prices	Live, 240-280 lbs, 49-52% lean	$US/100 lbs	AMS
US Slaughter	Federally inspected barrow and gilt slaughter	1000's head	NASS
Canadian Slaughter	Federally inspected barrow and gilt slaughter	1000's head	AgriCanada
Cutout Value	Average price for pork cutout	$US/100 lbs	AMS*
Weight	Average live weight for Negotiated hogs	lbs	AMS*
ByProduct Value	Average total hog byproduct value	$US/100 lbs	AMS*

*Data gathered and compiled by the Livestock Marketing Information Center (LMIC)

Price Difference Model

Price changes resulting from plant closings have previously been estimated by measuring the change in price differences between two markets (Love and Shuffett; Hayenga, Deiter, and Montoya; Ward). Regression analysis was then used to estimate the relationship between weekly average prices in the market where the plant closed/opened and comparable weekly prices in adjacent markets. Similar procedures were used in this study to estimate the price impacts from the plant opening in southern Manitoba and the plant closing in western Kansas. The developed model answered the first objective, whether or not the plant closing/opening affected local market prices, and if so, how long the effect existed.

Price differences were developed for each case (opening and closing), in order to determine how prices in the shocked market changed in relation to surrounding markets (Love and Shuffett; Hayenga, Deiter, and Montoya; Ward). Differences between the weekly market price in the affected market and a comparison market are calculated by

$$PD_{ij} = P_i - P_j \tag{1}$$

where PD_{ij} is the price difference between markets i and j, P_i is the appropriate slaughter livestock price in the shocked market (plant closing or opening), and P_j is the appropriate slaughter livestock price in comparable markets. For the ConAgra closing study, i denotes the western Kansas weekly fed steer price, and the Manitoba weekly slaughter hog price for the Maple Leaf opening. The ConAgra study required j to denote the weekly fed steer price in Colorado, Nebraska, and Texas panhandle. Not only was the Nebraska price to be used for the Kansas-Nebraska comparison, it was used for the Kansas-Iowa comparison as well. There is no complete price series for fed cattle in

Iowa. The Nebraska price is the most comparable, thus it was used. Four models were estimated for the ConAgra study. For the Maple Leaf opening, *j* is the weekly Alberta, Ontario, Saskatchewan, Sioux Falls, south St. Paul, and Iowa/southern Minnesota direct slaughter hog price. A total of six models were estimated for the Maple Leaf study.

Slaughter differences were created to consider the relationship between slaughter in the shocked market and comparable markets (Love and Shuffett; Hayenga, Deiter, and Montoya; Ward). Differences between the weekly market slaughter in the affected market and a comparison market are calculated by

$$SD_{ij} = S_i - S_j \tag{2}$$

where SD_{ij} is the slaughter difference between markets *i* and *j*, S_i is the appropriate livestock slaughter volume in the shocked market *i* (plant closing or opening), S_j is the appropriate livestock slaughter volume in comparable market *j*. For the Maple Leaf opening, *i* will denote the weekly hog slaughter in Manitoba, and the weekly cattle slaughter in western Kansas for the ConAgra study. The hogpacking study required *j* to denote hog slaughter in the comparison markets: Alberta, Ontario, Saskatchewan, South Dakota, Minnesota, and Iowa. For the ConAgra closing, *j* indicates steer and heifer slaughter in the comparison markets; Colorado, Nebraska, Texas, and Iowa/Minnesota.

Model Specification

The price difference between the shocked market and comparison market (PD_{ij}) was analyzed using regression to determine which variables influence the difference. The model used is a combination of the model used in the studies by Love and Shuffett, Hayenga, Deiter, and Montoya, and Ward. The developed model is

$$PD_{ij,t} = \alpha + \beta_1 SD_{ij,t} + \beta_2 PlantOpnCls_t + \beta_3 Week_{t=56,57} + \beta_4 Week_{t=58,59} + \beta_5 Week_{t=60,61} + \beta_6 Week_{t=62,63} + \beta_7 Week_{t=64,65} + \beta_8 Week_{t=66,67} + e_{ij,t} \quad (3)$$

where SD_{ij} is a slaughter difference as calculated in equation (2), $PlantOpnCls_t$ equals one for any week after the plant closing/opening date t and zero otherwise, and $Week_{t=56\ldots67}$ are a set of six, two week periods after the plant closing/opening. This dummy variable will equal one for appropriate two weeks after the closing/opening and zero for all other weeks. The intercept term for the model is α. An estimation of the effect on the price difference from any change in the slaughter difference is shown by β_1. The long-term effect that the plant closing/opening had on the price difference is denoted by β_2. If this parameter is significant then the closing/opening did have an effect on the price difference. The sign of this parameter is important to determine if prices increased or decreased. The effects of the six lagged variables for two-week periods after the closing/opening on the relative price difference are expressed by $\beta_{3\ldots8}$. If these dummy variables are significant, then the closing had an effect on the price difference for that two-week period. As with the plant closing dummy variable, the sign of the parameter is important to determine the change in the difference. If it is determined that all six are significant, additional periods will be added, until the parameters are no longer significant. Based on the time period required for markets to adjust to plant closings in previous studies (Love and Shuffett; Hayenga, Deiter, and Montoya; Ward), six two-week periods were chosen.

Expected Signs for ConAgra Study

The expected signs for the price differences model (table 2) differ between the ConAgra and Maple Leaf studies. For the ConAgra study, the slaughter difference

variable should be negative. For example, if the Kansas slaughter goes down, due to the plant closing, the price in Kansas is expected to increase. If the Colorado slaughter goes up, due to the closing the plant in Kansas, the price is expected to decline. While this is the expected sign, it is possible for a positive sign. Using a price difference the sign will depend upon the changes in the opposing market as well as the Kansas market. One market could increase, while the other decreases, this would cause some confusion of what the expected sign would be. The slaughter difference variable was intended to capture the supply effect of the market. This is the main reason to expect a negative sign. The intention of the plant close dummy is to capture the price changes. The plant close dummy variable should be negative. With the loss of a packer in the fed cattle market, lowered competition would decrease the price paid for cattle. This should have the greatest impact on the Kansas price, which is the area of production. If the Kansas price goes down, relative to the other markets, the price difference will decrease. The expected signs of the variables representing the two-week dummies are unknown. This will depend how fast the market reacted to the event. A negative sign can be expected for the first few weeks, while the loss of a competitive bidder is still driving down prices. However, after some time the market should adjust back to normal price levels. This would mean that the signs of these parameters would be positive.

Expected Signs for the Maple Leaf Study

Expected signs for the Maple Leaf study can be found in table 2. Slaughter difference should be negative. The more slaughter in a market the lower the price would be. The plant close variable should be positive. When the Maple Leaf plant came online,

the market would experience the addition of new competitor. This should cause more competition between packers with more aggressive and higher bids for hogs. Similar to the ConAgra model, the expected signs of the two-week dummy variables is unknown. During the first weeks, the sign may be positive as the packers compete for the hogs in the market. After some time the market may adjust to this change and price would slowly decrease to previous levels. These would mean that the ending variables would be negative.

Table 2. Price Differences Model Variable Definitions and Expected Signs

Dependant Variable	Variable Definition		
$PD_{ij,t}$	Price difference between markets *i* and *j*		
Independent Variable	Variable Definition	ConAgra Study Expected Sign	Maple Leaf Study Expected Sign
$SD_{ij,t}$	Slaughter difference between markets *i* and *j*	-	-
$PlantOpnCls_t$	Zero-one dummy variable for event date, 1 for weeks after, 0 for weeks prior	-	+
$Week_t$	Zero-one dummy variable for 6 two week periods after event	-/+	-/+

Partial Adjustment Model

The second model used to measure the impacts from secondary data is the partial adjustment model. The form of this distributed lag model that is most commonly used today was developed by Nerlove to measure demand and supply elasticities. Dahlgran

and Fairchild used a similar procedure to estimate demand impacts in the chicken market from negative publicity. The partial adjustment coefficient that is calculated is the marginal effect after the market adjustment. This will allow the study and measurement of a market when it is believed that the recovery from an event was slowly distributed over many time periods. Carlberg and Ward applied a partial adjustment model to the fed cattle industry to discuss two approaches to price discovery.

Model Specification

Using a partial adjustment model, the effect of the plant closing and plant opening on slaughter livestock price was determined. The model was estimated for the markets where the events occurred (Kansas and Manitoba) and also the surrounding markets (Colorado, Nebraska, Texas, Iowa, Alberta, Saskatchewan, Ontario, St. Paul, Sioux Falls, and Iowa/Minnesota). This will help determine the market impacts in their specific area and the adjacent areas. The desired price under the current market conditions would be found using

$$\begin{aligned} \Pr ice_t^* &= \alpha_t + \lambda_1 MeatValue_t + \lambda_2 Number_t + \lambda_3 Weight_t \\ &+ \lambda_4 ByPrPrice_t + \lambda_5 PlantOpnCl\ s_t \\ &+ \lambda_6 Season\ 2_t + \lambda_7 Season\ 3_t + \lambda_8 Season\ 4_t + e_t \end{aligned} \tag{4}$$

where $Price^*_t$ is the actual weekly price of slaughter livestock under the current conditions, $MeatValue_t$ is the average weekly reported price of boxed beef for the cattle study and average pork cutout value in the hog study, $Number_t$ is the number of slaughter livestock processed in market t, $Weight_t$ is the weekly average slaughter weight for either hogs or cattle. The value of byproducts will also be considered, $ByPrPrice_t$ is the average weekly price of cattle or hog byproducts for there respective studies. The $PlantOpnCls_t$

variable has a value of one for any week after the closing and a value of zero for weeks prior. Seasonality is a concern, thus dummy variables will be created, *Season2*, *Season3*, and *Season4*. The first seasonal dummy variable was dropped to avoid multicollinearity issues. Seasonal influences on prices are different in the hog and cattle industries. The average monthly price for hogs and cattle over the two years of data for this study are graphed in figure 38 and figure 39 (Appendix I). For the ConAgra study *Season2* covers February, March, and April. The next variable, *Season3*, is May, June, and July. Finally, *Season4*, is August, September, and October. For the Maple Leaf study, *Season2* covers April, May, and June. July, August, and September will represent *Season3*. The last one, *Season4*, is October, November, and December.

The desired weekly price, or the price without the plant events, cannot be obtained, so a partial adjustment model was used. The relationship between the desired price and the actual price can be found with the following function

$$Price_t - Price_{t-1} = \gamma(Price^*_t - Price_{t-1}) \tag{5}$$

where $Price_t$ is the actual price in the market, and $Price^*_t$ is the desired price under the current market conditions. The value of γ is the partial adjustment coefficient, which is a measure of the long-term effect on the market.

Combining equations (4) and (5) and rearranging the model so that $Price_t$ is the dependent variable, allowed the model to be estimated. The relationship between the livestock price and the independent variables will be analyzed using ordinary least squares estimation. The model is

$$\begin{aligned} Price_t &= \alpha_t + \beta_1 MeatValue_t + \beta_2 Number_t + \beta_3 Weight_t \\ &+ \beta_4 LagPrice_t + \beta_5 ByPrPrice_t + \beta_6 PlantOpnCl s_t \\ &+ \beta_7 Season2_t + \beta_8 Season3_t + \beta_9 Season4_t + e_t \end{aligned} \tag{6}$$

where the variables are previously defined (table 3). $LagPrice_t$ is the weekly price of slaughter livestock in the previous period. The error term is expressed by e_t.

Expected Signs

The expected signs for this model are in table 3. It is expected that the meat value parameter (boxed beef value or pork cutout value) will be positive in both cases. As price of the output goes up, the price of fed steers or slaughter hogs should also increase. The parameter for weekly slaughter should be negative. As supply (slaughter livestock) increases, the price paid for that input should decrease. Average slaughter weight coefficient is expected to be negative for both studies. Fed cattle and slaughter hog weight is important to packers. The size of cattle or hogs coming into their plants will affect the quality of beef or pork they process. If the weight of cattle or hogs increases the price would go down. The expected sign for the seasonal dummy variables varies between the ConAgra and Maple Leaf. For the ConAgra study, *Season2* the sign is unknown. The expected sign for *Season3* is expected to be negative (figure 38). It is unknown what the sign of *Season4* should be. With the Maple Leaf study, *Season2* expected sign is unknown. A negative sign is expected to be negative for both *Season3* and *Season4* (figure 39).

Duration of Effects

The lag variable coefficient can be used to estimate how long it took for the market to adjust to the plant events. The partial adjustment coefficient can be found with the following formula (Dahlgran and Fairchild)

(7) $$\delta = 1 - LagPrice_t$$

where δ is the partial adjustment coefficient and $LagPrice_t$ is previously defined. The δ is the percent of adjustment that has taken place during one period of time (n). However, this study needs to determine the duration of the effects of the plant event. The proportion of adjustment remaining in the market can be found using

(8) $$(1-\delta), (1-\delta)^2, ...(1-\delta)^n$$

where all variables are as previously defined. This study will determine how long it takes for the market to adjust for 95% of the effect of the plant events. This would leave 0.05 for the proportion of adjustment remaining in time period *n*. Thus, to find the time period *n* the following formula can be used

(9) $$n = \frac{\log 0.05}{\log(1-\delta)}$$

where *n* and 1-δ are previously defined.

Table 3. Partial Adjustment Model Variable Definitions and Expected Signs

Dependant Variable	Variable Definition		
$Price_t$	Price of slaughter livestock in market *t*		
Independent Variable	**Variable Definition**	**ConAgra Study Expected Sign**	**Maple Leaf Study Expected Sign**
$MeatValue_t$	Value of meat sold	+	+
$Number_t$	Number of livestock slaughtered in market *t*	-	-
$Weight_t$	Average slaughter weight for livestock	-	-
$LagPrice_t$	Price of slaughter livestock in previous period in market *t*	+	+
$ByPrPrice_t$	Value of byproducts sold	+	+
$PlantOpnCls_t$	Zero-one dummy variable for event date, 1 for weeks after, 0 for weeks prior	-	+
Season2	Zero-one dummy variable for appropriate months, 1 for months in that season, 0 otherwise	-/+	-/+
Season3	Zero-one dummy variable for appropriate months, 1 for months in that season, 0 otherwise	-	-
Season4	Zero-one dummy variable for appropriate months, 1 for months in that season, 0 otherwise	-/+	-

Chow tests

Chow tests were conducted on the partial adjustment models to determine if there was a change in price between the two periods. Each partial adjustment model of the ConAgra study (Kansas, Texas, Nebraska, Colorado, Iowa) and all the partial adjustment models in the Maple Leaf study (Manitoba, Alberta, Ontario, Saskatchewan, St. Paul, Iowa/Minnesota, and Sioux Falls) were analyzed. Chow developed this method to test if additional observations should be used in the same regression. He used this to test if the demand for automobiles in the United States remained stable over time. In this study the partial adjustment models are used to determine if there was a difference in price between the 55 weeks prior to the plant event and the 55 weeks after the plant event.

To conduct the Chow tests the data were divided into two groups for both the ConAgra and Maple Leaf studies. The first group for both studies consisted of the first 55 weeks of data. The second is the remaining 55 weeks of data. After the models are ran using the data before and after the plant event the sum of square errors (SSE) was pooled to get the unrestricted SSE (equation 10). The unrestricted SSE can be found with the following

(10) $$SSE_U = SSE_1 + SSE_2$$

where SSE_U is the unrestricted SSE, SSE_1 is the SSE for the first 55 weeks, and SSE_2 is the SSE for the remaining weeks. Then running the models using all 110 weeks of data gave the restricted SSE. The restricted and unrestricted SSE was used to conduct an F-test to determine if there are any changes in price between the two periods.

CHAPTER 4

SECONDARY DATA RESULTS

This chapter presents the results from the analysis of the secondary data. First, the results from the price difference model for the ConAgra and Maple Leaf studies are discussed. The results and expected signs of the partial adjustment model are compared for both models. The mean of each variable before and after the plant event are examined. The price difference model results for the ConAgra and Maple Leaf events are studied. Proceeding from there, an explanation of the partial adjustment models is discussed. This includes the estimation of the duration of the plant closing and plant opening effects on their specified markets. Finally, the results of the Chow tests on the partial adjustment models are presented.

Fed Cattle Price and Slaughter

Figure 1, shows prices paid for fed steers over the 110 weeks of the study. Prices for comparison between markets follow the same trend, with only small variation between markets within a given week. Around the time of the plant closing, prices vary some and seem to slow the increasing prices that were occurring at the time. However, the plant did close during the holiday season. The time of year may have contributed to the market slow-down over those few weeks.

While no apparent changes in prices can be noticed, there are some changes in regional slaughter (figure 2). During the week immediately following the plant closing, there was a sharp decrease in slaughter. As mentioned, some of this can be attributed to the possibility of a short slaughter week due to the holidays. Prior to the closing, weekly Kansas slaughter was running around 160 thousand head. At the second week after the closing, slaughter had dropped to 117 thousand head. Over the next several months, slaughter levels slowly returned to levels around 150 thousand head. During this period of slow recovery in the Kansas market, the Nebraska and Texas markets saw much larger increases. By May 12, 2001, Nebraska was processing 3 thousand head more than Kansas, at 148 thousand head per week. In the following months, Kansas and Nebraska continued to trade places for the leader in fed cattle slaughter. With the loss of the plant, a drop in fed cattle slaughter in Kansas can be expected. The ConAgra plants in Dumas, Texas, and Grand Island, Nebraska, may have increased their slaughter. The remaining plants in Kansas and plants belonging to other firms also may have increased their processing.

Hog Price and Slaughter

The prices paid for barrow and gilts in the U.S. and Canada seem to follow the same pattern (figure 3). After the plant opening, there does not appear to be any changes in the pattern of prices. All prices are decreasing, but this could be caused by the cyclical pattern of the market rather than a plant opening. A few months after the event the Manitoba prices seem to be greater than the comparison markets, when compared to the period before the opening.

Slaughter in the U.S. and Canada did not experience any dramatic changes after the Maple Leaf plant opened (figure 4). Iowa hog slaughter decreased from around 600 thousand head to around 500 head over the period. However, this slow decline can not be linked directly to the new plant in Manitoba. This may be partly from the backlog of hogs that the market was trying to work through from the price crash during the end of 1998.

A few months after the opening, the weekly Manitoba slaughter surpassed both the Ontario and South Dakota weekly slaughter. Over the last few months of the time period, Manitoba slaughter was in the 70 thousand head range.

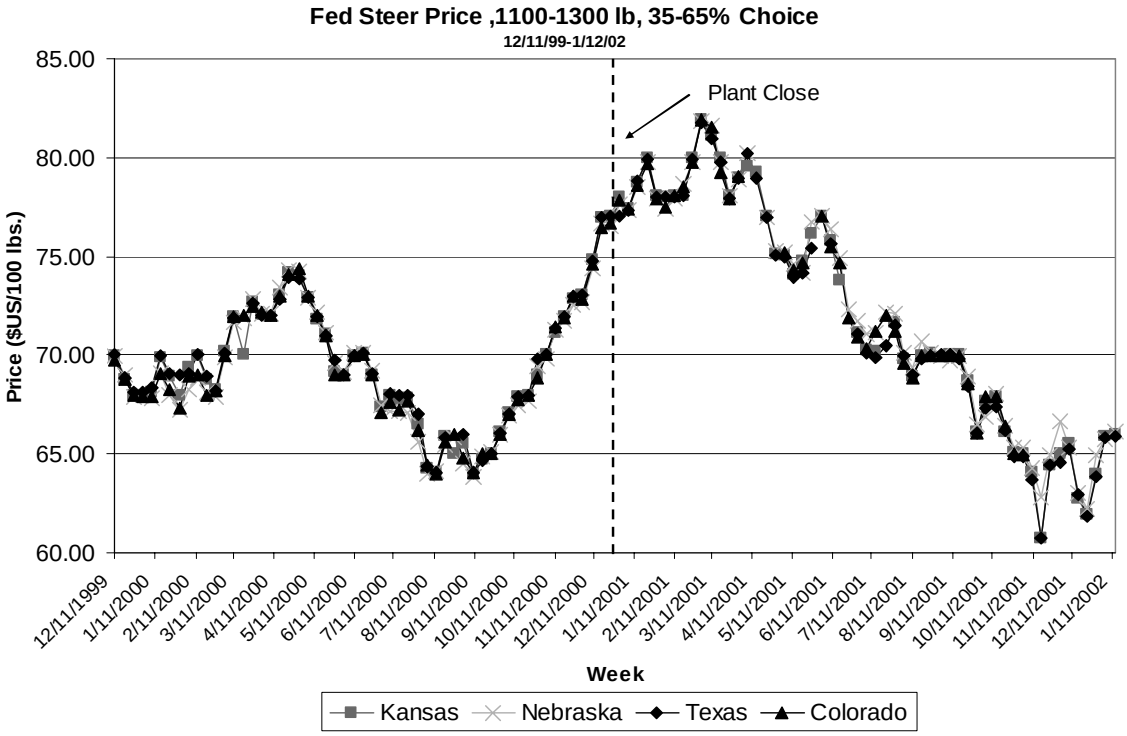

Figure 1. Fed Steer Prices

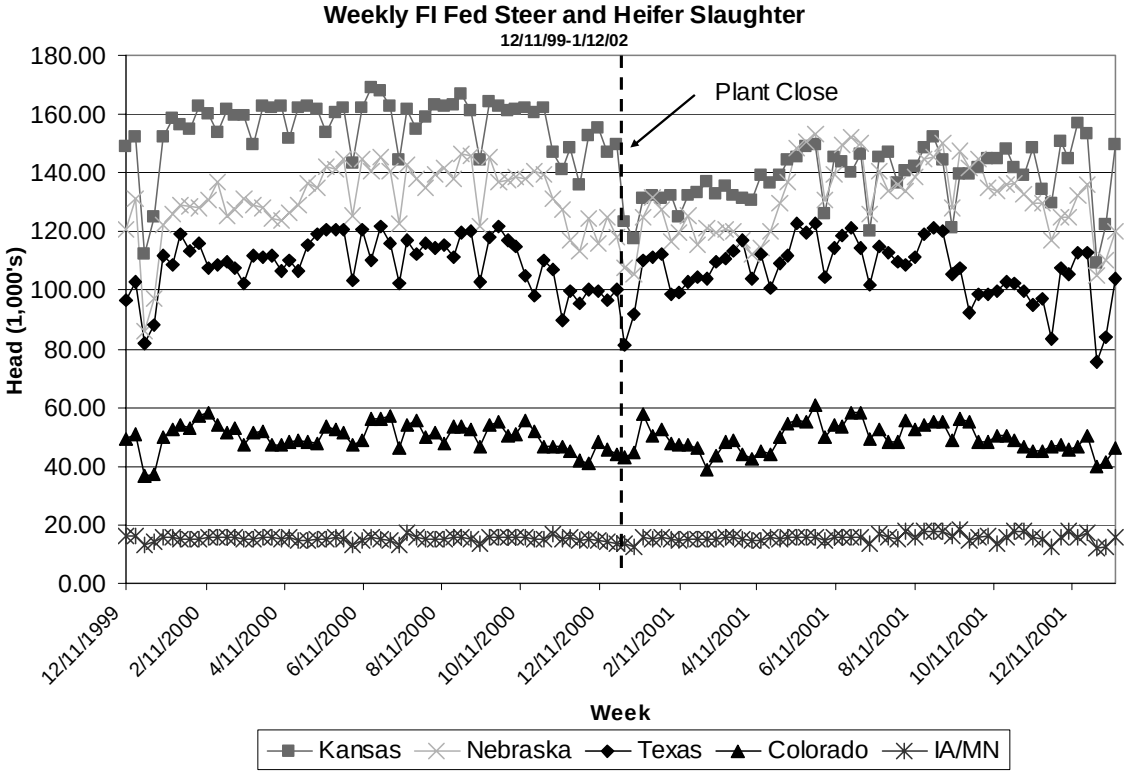

Figure 2. Fed Steer and Heifer Slaughter

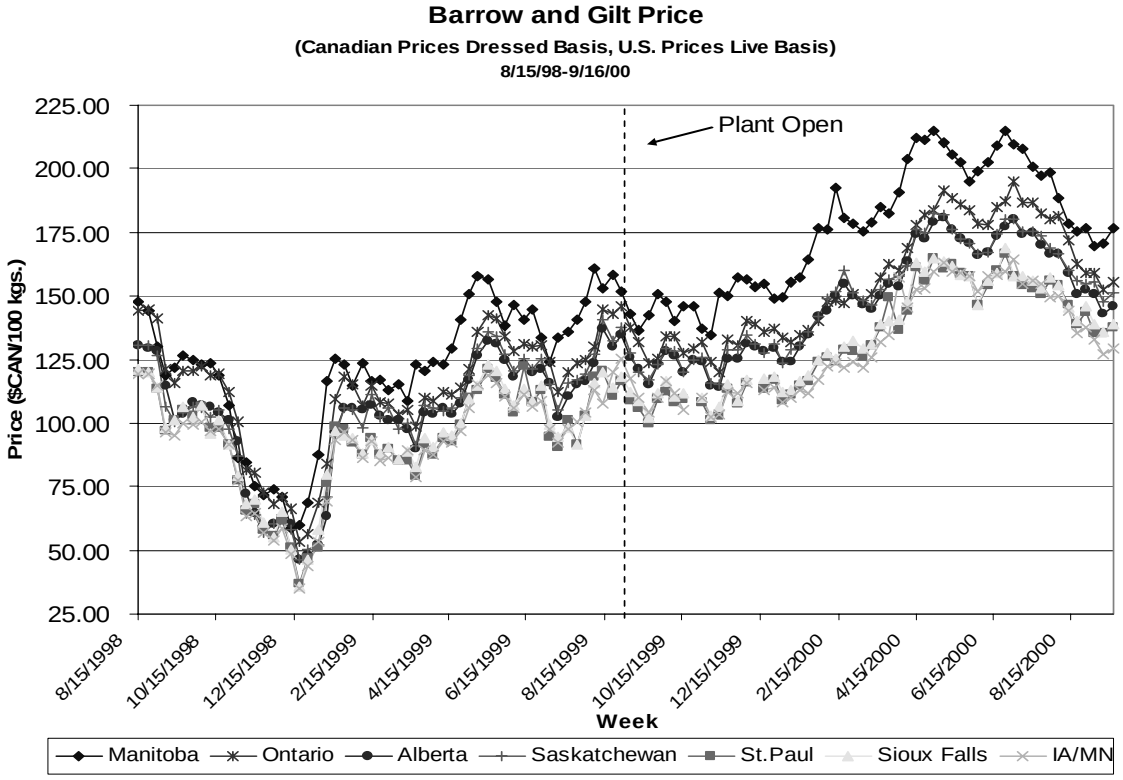

Figure 3. Barrow and Gilt Prices

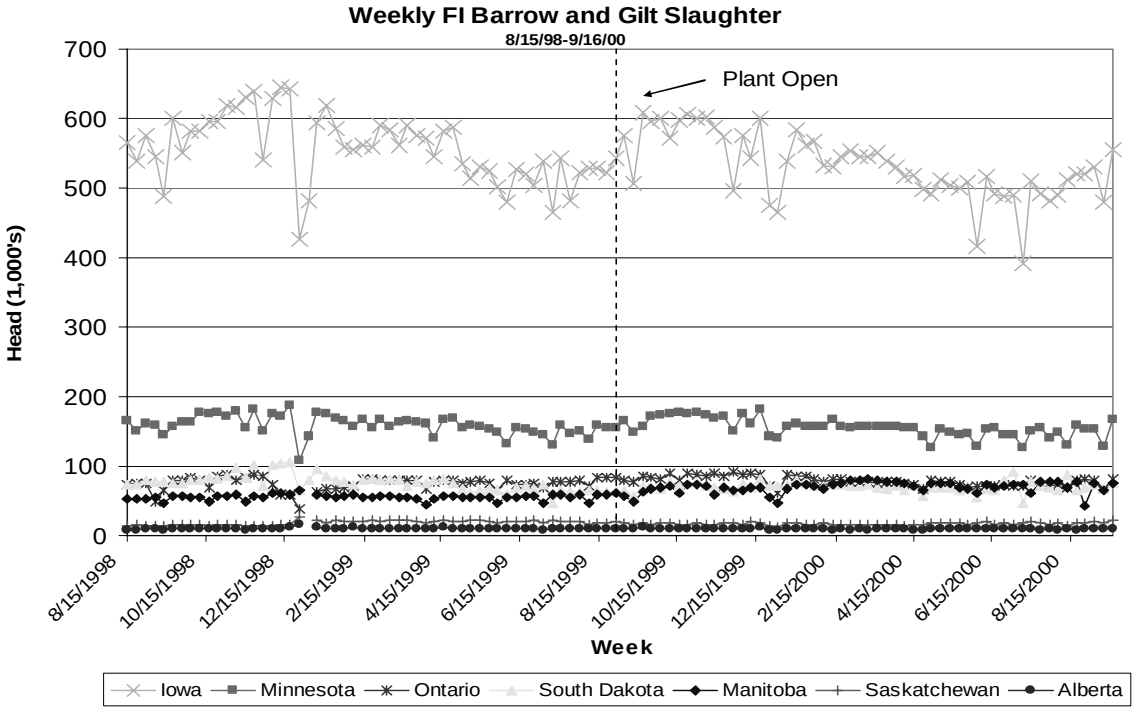

Figure 4. Barrow and Gilt Slaughter

Price Difference Model

The price differences models in this study were developed to determine if the plant events caused the price between two regions to change. The price differences model, found in equation (3), was estimated with the SAS system using ordinary least squares. The data used in this model were confirmed as normally distributed from the use of a Jarque-Bera test. Heteroskedasticity was tested using Breusch-Pagan, Glesjer, Harvey-Godfrey, and White tests using a 5% confidence level. All tests on all the models, for both studies, failed to reject the null hypothesis of homoskedasticity.

Autocorrelation was also tested using a Durbin-Watson test to detect AR (1) errors. These tests concluded that autocorrelation was found in the Kansas-Colorado and the Kansas-Texas models. To alleviate this problem the Cochrane-Orcutt procedure was used. Cochrane and Orcutt study developed a method for correcting autocorrelation, while maintaining more efficiency than previous methods. With this procedure the Kansas-Colorado and Kansas-Texas models were estimated using Feasible Generalized Least Squares (FGLS). The models were also tested for specification with Ramsey's reset test. The price differences models for the three U.S. markets in the Maple Leaf study had some slight problems and the specification could be adjusted. However, this was not done because changing the functional form of some models would make comparing the results between markets more difficult.

ConAgra Study

Combining the data gathered for the study (table 1) and the developed price differences model (equation 3), the fed cattle market was analyzed. This was done to

determine if the closing of the ConAgra plant would have an impact on the Kansas market compared to markets in surrounding states. The results from the four models are inconsistent. The results of the ConAgra study are discussed in detail below. The mean values for the dependent and slaughter difference variables can be found in table 4. The parameter estimates and standard errors are presented in table 5.

Kansas versus Colorado Model

The model had a R^2 of 0.057, which is considered low. The mean price difference and slaughter difference can be found in table 4. This table shows the mean variable value over three periods: the 55 weeks prior to the plant closing, the 55 weeks following the plant closing, and the entire 110 weeks. For the 55 week period prior to the study, the average difference between fed cattle in Kansas and Colorado was 0.10 $US/100 lbs. The 55 weeks after the closing found this average difference to be only 0.01 $US/100 lbs. The difference in weekly slaughter between the two states also decreased over the two periods. The difference changed from 105.7 to 88.7 thousand head per week.

The results of this model are presented in table 5. The data and model failed to help explain any of the changes in the price difference. None of the independent variables are significant. The insignificant slaughter difference and plant close variables have negative signs. It was expected that an increase in the slaughter difference would decrease the price difference. The plant closure was also expected to decrease price.

Kansas versus Nebraska Model

This model had a much higher R^2 value, 0.206. The average price difference and slaughter difference between the two markets changed (table 4). Prior to the plant closing, the average price difference was 0.161 $US/100 lbs. The 55 weeks following the event, the average price was -0.233 $US/100 lbs. The difference in weekly slaughter numbers between the two markets also decreased over the period, from 24.90 to 7.68 thousand head.

The results of this model (table 5) found only two variables significant. The plant closing decreased the price difference by 0.373 $US/100 lbs. This variable was significant at 5% and had the expected the sign. The fifth and sixth week after the plant closing, the price difference increased by 0.685 $US/100 lbs. Slaughter difference was positive, but was not significant and the estimate was small, 0.007 thousand head.

Table 4. ConAgra Price Difference Models Means

Variable	Mean before closing	Mean after closing	Mean 110 wks
KS-CO price	0.103	0.012	0.065
KS-NE price	0.161	-0.233	-0.031
KS-TX price	-0.076	0.142	0.032
KS-IA/MN price	0.161	-0.233	-0.031
KS-CO slaughter	105.729	88.686	97.207
KS-NE slaughter	24.898	7.684	16.291
KS-TX slaughter	46.562	31.860	39.211
KS-IA/MN slighter	140.513	122.573	131.542

Kansas versus Texas Model

The total R^2 for the Kansas-Texas model is 0.274. The average price difference for fed steers increased between the two periods. The weeks leading up to the plant closing the difference was -$0.076. During the 55 weeks after the closing the difference in price was at 0.142 $US/100 lbs. The difference in weekly slaughter decreased over the two periods.

This model has three significant variables (table 5). It is estimated that as weekly slaughter difference increases by one thousand head the difference in price will increase 0.007 $US/100 lbs. This value is comparable to the Kansas-Nebraska model. The negative sign on this parameter is not expected. The plant closing event had a positive impact on the price difference. In the weeks following the closure, the price difference increased 0.302 $US/100 lbs. During the first and second week after the closing, the price difference increased 0.39 $US/100 lbs.

Kansas versus Iowa/Minnesota Model

This model had a R^2 of 0.198. This shows that little of the variation in price difference can be explained by the independent variables. The average weekly price difference for this model is the same as the Kansas-Nebraska model (table 4). This is because an Omaha market price was used for both models. The average price difference decreased from the first period to the second. The average weekly slaughter difference decreased. During the first 55 weeks, the average was 140.51 thousand head per week.

During the course of the 55 weeks after the closing, the average slaughter difference was 122.57 thousand head.

The plant closing variable was significant and negative, as expected (table 5). The closing of the ConAgra plant caused the price difference to decrease 0.49 $US/100 lbs. During the fifth and sixth week after the closing the difference between the Kansas and Iowa price increased. Over this period the price went up 0.71 $US/100 lbs. Slaughter difference was not significant and was positive. The estimated value for this parameter was 0.00027.

Table 5. ConAgra Price Difference Model Results

Independent Variable	KS-CO Estimate	KS-NE Estimate	KS-TX Estimate	KS-IA/MN Estimate
Intercept	0.397	-0.003	-0.395**	0.123
	(0.644)	(0.177)	(0.139)	(0.771)
SD	-0.003	0.007	0.007**	0.000
	(0.006)	(0.007)	(0.003)	(0.005)
Plant Close	-0.188	-0.373**	0.302**	-0.488**
	(0.145)	(0.460)	(0.059)	(0.138)
Week 1-2	0.089	0.511	0.394**	0.563
	(0.314)	(0.374)	(0.162)	(0.384)
Week 3-4	0.257	0.593	-0.056	0.573
	(0.312)	(0.371)	(0.167)	(0.375)
Week 5-6	0.324	0.685*	-0.051	0.706*
	(0.308)	(0.371)	(0.164)	(0.375)
Week 7-8	-0.207	0.104	-0.045	0.102
	(0.309)	(0.371)	(0.163)	(0.377)
Week 9-10	0.192	0.388	-0.031	0.457
	(0.306)	(0.377)	(0.163)	(0.373)
Week 11-12	0.163	0.112	0.087	0.160
	(0.305)	(0.374)	(0.166)	(0.374)
Observations	93	107	103	107

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Maple Leaf Study

The price differences model, equation (3), was used to analyze the slaughter hog market in Canada and the northern United States. The purpose was to determine if the opening of the Maple Leaf plant in Brandon, Manitoba affected prices. The results from each one of the six models are discussed below. The Maple Leaf models are more consistent than the ConAgra study. Overall, the Maple Leaf models had a higher R^2 value and all the plant open estimates are significant, except Saskatchewan. The plant open estimates ranged from 4 to 10 $CAN/100 kg. Several of the models have some of the two week dummy variables significant. In a few of the cases, the 5^{th} and 6^{th} along with the 9^{th} and 10^{th} week dummies estimated are significant. The inclusion of additional weekly dummy variables could not be justified because of inconsistency within and across models. The mean values for the independent and slaughter difference variables can be found in table 6. The parameter estimates and standard errors are presented in table 7.

Manitoba versus Alberta Model

The R^2 for this model is 0.165. The mean price difference between Manitoba and Alberta increased from one period to the next (table 6). The average slaughter difference also increased, from 45.5 to 60.0 thousand head. An increase in slaughter difference can be expected with the opening of a plant in Manitoba. After the opening of the plant, the price difference increased 4.5 $CAN/100 kg (table 7). The estimate was positive, as expected, and significant.

Manitoba versus Saskatchewan Model

The average price difference between Manitoba and Saskatchewan increased about 3 $CAN/100 kg (table 6). From the first 55 weeks to the remaining 55 weeks, the price difference went from 7.7 to 10.9 $CAN/100 kg. The mean weekly slaughter difference increased about 15 thousand head, between the two periods. This model had an R^2 of 0.139. The plant open dummy variable was insignificant and estimated to be 4.1 $CAN/100 kg (table 7). The estimate for the slaughter difference variable was small, at 0.02, but significant.

Manitoba versus Ontario Model

The plant closing impacted the slaughter hog prices in the Manitoba and Ontario markets. In the 55 weeks prior to the closing the average Ontario price was 1.5 $CAN/100 kg higher than the Manitoba price. During the 55 weeks after the closing the average Manitoba price was 4.87 $CAN/100 kg higher than the Ontario price. The average Manitoba versus Ontario slaughter difference decreased by about 10 thousand head per week (table 6).

This model had a R^2 of 0.198. After the opening of the plant in Brandon, the price difference between the two regions increased 6.8 $CAN/100 kg. This estimate is significant and had a positive sign as expected. The slaughter difference was estimated to be 0.06 (table 7). This is not the sign that was expected, but the estimate is not significant.

Table 6. Maple Leaf Price Difference Model Means

Variable	Mean before opening	Mean after opening	Mean 110 wks
Man-Alb price	8.216	12.671	10.443
Man-Sas price	7.707	10.891	9.299
Man-Ont price	-1.500	4.874	1.687
Man-St.Paul price	17.721	28.136	22.832
Man-SxFalls price	16.779	26.517	21.558
Man-IAMN price	19.083	29.238	24.113
Man-Alb slaughter	45.492	59.991	52.808
Man-Sas slaughter	36.863	52.242	44.623
Man-Ont slaughter	-19.330	-8.972	-14.103
Man-St.Paul slaughter	-103.645	-86.019	-94.751
Man-SxFalls slaughter	-20.517	-0.853	-10.595
Man-IAMN slaughter	-502.199	-461.897	-481.863

Manitoba versus St. Paul Model

In this model, the average price difference increased by about 10 $CAN/100 kg between the two periods (table 6). The average price difference may seem large for the models that compare the Manitoba market and markets in the United States. As mentioned before, this is because the Canadian prices are expressed as a dressed weight basis and the U.S. prices are on a live weight. The average weekly slaughter difference also increased. During the 55 weeks after the plant opening, Minnesota processed about 86 thousand more hogs than Manitoba.

The Manitoba-St. Paul model has a R^2 value of 0.3668. The plant open and slaughter difference variable are significant. Following the opening of the plant the average price difference for barrows and gilts increased about 9.07 $CAN/100 kg (table 7). The slaughter difference variable is positive, not as expected. For every 1,000 head increase in the slaughter difference the average price difference will increase 0.12 $CAN/100 kg.

Manitoba versus Sioux Falls Model

The average price difference between Manitoba and the Sioux Falls market also increased approximately 10 $CAN/100 kg. The average weekly slaughter difference went up from -20.9 to -0.9 thousand head (table 6). Weekly slaughter in Manitoba increased more rapidly than in the South Dakota market.

This model had the highest R^2 value of all price difference models, 0.490. The slaughter difference parameter estimate was positive and significant, at 0.34. During the 55 weeks following the plant opening the price difference for barrows and gilts increased by 4.4 $CAN/100 kg (table 7).

Manitoba versus interior Iowa/southern Minnesota Model

The average price difference between Manitoba and Iowa/Minnesota increased about 10 $CAN/100 kg. This is similar to the other models comparing the Manitoba market to U.S. markets. The average weekly slaughter difference decreased over the two periods. However, the difference in average weekly slaughter is still large. During the

55 weeks after the opening, Iowa processed 461.9 thousand more hogs than Manitoba (table 6).

The R^2 for this model was high compared to the models involving the Canadian provinces, 0.406. The slaughter difference variable was significant and positive, 0.04 (table 7). A positive estimate was not expected, but it represents a small change in price difference. After the plant opening the price difference between Manitoba and Iowa/Minnesota increased by 10.18 $CAN/100 kg.

Table 7. Maple Leaf Price Difference Model Results

Independent Variable	Alberta Estimate	Saskatch. Estimate	Ontario Estimate	St. Paul Estimate	Sx Falls Estimate	IA/MN Estimate
Intercept	3.630	6.490	-0.541	30.196**	23.554**	38.895**
	(6.174)	(4.473)	(2.149)	(6.461)	(1.605)	(9.691)
SD	0.093	0.023*	0.062	0.123**	0.335**	0.040**
	(0.134)	(0.118)	(0.092)	(0.061)	(0.063)	(0.019)
Plant Open	4.489*	4.145	6.797**	9.071**	4.419**	10.178**
	(2.339)	(2.459)	(2.190)	(2.20)	(1.953)	(2.004)
Week 1-2	-8.009	-8.026	-11.903*	-6.372	-8.612*	-16.004**
	(6.303)	(5.661)	(6.70)	(6.099)	(5.151)	(5.952)
Week 3-4	0.800	1.467	3.655	1.768	0.262	-1.538
	(5.835)	(5.315)	(6.560)	(6.036)	(5.142)	(6.152)
Week 5-6	-10.497*	-10.051*	-8.649	-5.820	-10.003*	-11.716*
	(5.766)	(5.269)	(6.502)	(6.099)	(5.128)	(6.046)
Week 7-8	-3.474	-1.837	-1.305	-1.306	-2.991	-0.010
	(5.799)	(5.279)	(6.537)	(8.582)	(7.205)	(8.43)
Week 9-10	-10.071*	-9.68*	-9.895	-8.063	-10.565**	-10.777*
	(5.770)	(5.272)	(6.501)	(6.075)	(5.128)	(6.109)
Week 11-12	3.772	2.652	5.422	1.906	-0.722	-0.080
	(5.847)	(5.326)	(6.642)	(6.127)	(5.134)	(6.055)
Observations	109	109	109	107	107	106

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Partial Adjustment Model

The partial adjustment model (equation 6) was used to determine if the plant closing and opening impacted price and the duration of such effects. The SAS system was used to estimate this model with ordinary least squares. The data used in this model were confirmed as normally distributed from the use of a Jarque-Bera test. Heteroskedasticity was tested using Breusch-Pagan, Glesjer, Harvey-Godfrey, and White tests using a 5% confidence level. All tests on all the models, for both studies, failed to reject the null hypothesis of homoskedasticity.

Partial adjustment models contain a lagged variable. Thus, autocorrelation must be tested with a Durbin-h statistic instead of the more common Durbin-Watson test. All models were tested at a 5% level and rejected the null hypothesis of no autocorrelation. With autocorrelation in each model, the positive AR(1) was corrected using the Cochrane-Orcutt procedure. This was accomplished by estimating each model with FGLS. The partial adjustment models were tested for specification with Ramsey's reset test. The Maple Leaf models had a few problems with specification. Specifically, the U.S. models, Ontario, Saskatchewan, and Alberta models had minor levels of misspecification. Changing the functional form was not done, because this would make comparing the results between markets more difficult. It would be difficult to compare market impacts with the results of different models.

ConAgra Study

The mean values for ConAgra variables are found in table 8. All of the markets saw average prices increase. Average slaughter between the two periods remained stable,

except the Kansas market. Average boxed beef value saw an increase from 108.57 to 114.37 $US/100 lbs, between the two periods. The average weight dropped about 8 lbs. The average byproduct value during the first 55 weeks was around 8 $US/100 lbs. During the 55 weeks after the closing the average increased to 8.5 $US/100 lbs.

The results of the models can be found in table 9. The results of the Texas, Nebraska, Colorado, and Iowa models are consistent. The Kansas model does not follow the same pattern as the others. The boxed beef, byproduct, and lag price are significant in all the models, except Kansas. The duration of the market impacts are calculated from the partial adjustment coefficient (equation 9). Excluding the Kansas model, the duration varies between 3 and 5 weeks.

Kansas Model

The average price for fed steers in the Kansas market increased about 3 $US/100 lbs between the two periods. The average weekly slaughter decreased from 155 to 138 thousand head during the two periods (table 8). All of this decrease can not be contributed to the plant closing. Some of the decrease may be related to the current cattle cycle. However, the loss of the large plant should magnify the decline. The R^2 of this model is high, at 0.9491. The boxed beef parameter estimate is 0.3138 (table 9). This is significant and positive, as expected.

The sign of the lag price parameter is negative, which was not expected. This model does not follow others and produces a negative partial adjustment coefficient. This would imply that the duration of the plant closing occurred prior to the actual event. The actual estimate of the duration of the plant closing is -28 weeks. The reason for this

estimation cannot be explained. The data were checked for errors. Data were also divided into two groups and the model run several times omitting some variables. However, no logical explanation could be found for a negative coefficient.

Texas Model

The average price for fed steers in Texas in the 55 weeks prior to the plant closing was 69.7 $US/100 lbs (table 8). In the 55 weeks after, the average price was 71.8 $US/100 lbs. Average weekly slaughter in Texas dropped about 3 thousand head between the periods. The model also had a high R^2, at 0.955. The boxed beef, slaughter number, plant close dummy, lag price, and byproduct price parameters are significant and have the expected signs. During the weeks after the plant closing the price in Texas decreased 0.92 $US/100 lbs. The duration of impacts on the Texas market is calculated at 4.8 weeks. This is the amount of time it took 95% of the effect on price to subside.

Nebraska Model

As observed in the other models, the average price increased approximately 3 $US/100 lbs between the time period before and after the plant closing. The average weekly slaughter in Nebraska remained stable, around 130 thousand head (table 8). The model estimated that 95.69% of the variation in price could be explained by the independent variables (R^2 value). The boxed beef, lag price, and byproduct value variables are significant at the 5% level, and the signs are as expected.

Colorado Model

The average price for fed steers in Colorado increased by about 4 $US/100 lbs between the two periods, while the average weekly slaughter only decreased about 0.5 thousand head (table 8). The Colorado model had the highest R^2 of the group, at 0.959. The boxed beef price, lag price, byproduct value, and seasonal parameters were significant with the expected signs (table 9). The plant closing estimate was positive, but was not significant. The calculated duration of the effects on the Colorado fed cattle market was 3.7 weeks.

Iowa/Minnesota Model

The Omaha price for fed steers was used for both the Nebraska and Iowa models. Thus, the change in average price for the Iowa model is the same as the Nebraska model. Average weekly slaughter only declined approximately 0.5 thousand head between the two periods (table 8). The R^2 value is at 0.957, which is comparable to the other models. The boxed beef price, lag price, byproduct value, and season3 parameters are significant at the 10% level. They also have the expected signs. The plant close dummy variable shows that the price dropped 0.13 $US/100 lbs, but it was not significant. The duration of the market impacts (95% of the total) was estimated to be 5.3 weeks.

Table 8. ConAgra Partial Adjustment Model Means

Variable	Mean before closing	Mean after closing	Mean 110 wks
KS price	69.467	72.128	70.773
TX price	69.659	71.831	70.745
NE price	69.306	72.225	70.752
CO price	69.365	73.469	71.093
KS slaughter	155.773	138.131	146.952
TX slaughter	109.211	106.271	107.741
NE slaughter	130.875	130.447	130.661
CO slaughter	50.044	49.445	49.745
IA/MN slaughter	15.260	15.558	15.409
Boxed Beef price	108.566	114.373	111.469
Weight	1265.970	1257.790	1261.880
Byproduct price	7.955	8.454	8.205

Table 9. ConAgra Partial Adjustment Model Results

Independent Variable	Kansas Estimate	Texas Estimate	Nebraska Estimate	Colorado Estimate	IA/MN Estimate
Intercept	50.392**	7.187	16.933	25.731*	14.618
	(18.129)	(15.783)	(15.003)	(14.473)	(14.330)
Meat Value	0.314**	0.252**	0.248**	0.129**	0.237**
	(0.066)	(0.063)	(0.061)	(0.056)	(0.061)
Number	0.006	-0.028*	-0.008	-0.022	-0.074
	(0.011)	(0.015)	(0.012)	(0.026)	(0.088)
Weight	-0.009	-0.000	-0.007	-0.012	-0.006
	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)
Plant Close	0.070	-0.917**	-0.147	0.099	-0.132
	(1.192)	(0.455)	(0.468)	(0.392)	(0.449)
Lag Price	-0.112	0.462**	0.398**	0.557**	0.431**
	(0.106)	(0.104)	(0.101)	(0.102)	(0.101)
ByPr Price	0.331	0.853**	0.962**	0.985**	0.938**
	(0.818)	(0.347)	(0.369)	(0.303)	(0.355)
Season 2	0.857	0.696	0.814	0.820*	0.788
	(0.765)	(0.582)	(0.576)	(0.482)	(0.565)
Season 3	1.038	0.361	0.212	-0.106**	0.059
	(0.898)	(0.615)	(0.594)	(0.532)	(0.572)
Season 4	-0.892	-0.726	-0.797	-1.347**	-0.861*
	(0.757)	(0.518)	(0.545)	(0.483)	(0.510)
Duration (weeks)	-28.12	4.84	5.90	3.68	5.32
Observations	105	98	107	92	107

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Maple Leaf Study

The mean values for each variable within each model are presented in table 10. The average price for each region (U.S. and Canada) showed large increases between the 55 weeks prior to the closing and the 55 weeks after the closing. Changes in average weekly slaughter varied depending on the market. The specific market changes in price and slaughter are discussed individually below. The same cutout value, byproduct value, and weight data are used in each model. The average cutout price increased from 165.5 to 203.4 $CAN/100 kg between the two periods. Average weight remained fairly constant, only increasing about 1 kg. Average byproduct value was also stable, increasing a little over 1 $CAN/100 kg.

The results for the models are presented in table 11. The results for the Maple Leaf study show more consistency than the ConAgra study. The cutout parameter is significant and carries the expected sign in all cases. The plant opening dummy parameter is not significant in all models, but does have the appropriate sign. Using the lagged price variable the duration of the plant opening is calculated using equation (9). The duration of such effects ranges from 3 to 58 weeks, depending upon the market. Each model is discussed in more detail in the following sections.

Manitoba Model

Manitoba was the location of the plant opening. The average price for slaughter hogs changed from 111 to 160.3 $CAN/100 kg over the course of the two periods. The opening of a plant should increase slaughter in that market. This was the case in Manitoba. Average weekly slaughter increased about 14 thousand head (table 10). The

R^2 of the model was quite high, at 0.9664. The meat value (cutout), plant open, and lag price parameters are significant with the expected signs (table 11). Season2 was significant and positive, while Season4 was significant and had an expected negative sign. After the plant opened the price increased 11.3 $CAN/100 kg. The duration of the plant opening on the Manitoba market was 3.2 weeks.

Ontario Model

The average price for hogs in Ontario saw a large increase between the two periods, 112.5 to 155.4 $CAN/100 kg (table 10). Average weekly slaughter only saw a small change of 3.6 thousand head per week. The R^2 of the model was 0.985. The cutout value, lag price, Season3, and Season4 are significant and have the expected signs (table 11). The plant open parameter shows a 2.6 $CAN/100 kg increase in price, but was not significant. Using the lag price the duration of the market opening was 5.2 weeks.

Table 10. Maple Leaf Partial Adjustment Model Means

Variable	Mean before opening	Mean after opening	Mean 110 wks
Man price	111.041	160.258	135.650
Ont Price	112.541	155.384	133.962
Sas price	103.335	149.367	126.351
Alb price	102.825	147.587	125.206
St. Paul price	93.322	133.053	112.820
SxFalls price	94.263	134.672	114.094
IA/MN price	92.084	131.951	111.831
Man slaughter	55.757	69.692	62.788
Ont slaughter	75.087	78.664	76.892
Sas slaughter	18.893	17.450	18.165
Alb slaughter	10.265	9.701	9.980
St. Paul slaughter	159.116	155.711	157.414
SxFalls slaughter	76.342	70.545	73.444
IA/MN slaughter	556.573	531.589	544.081
Cutout price	165.535	203.367	184.451
Weight	117.068	118.363	117.715
Byproduct price	33.437	34.786	34.112

Saskatchewan Model

The average price for barrows and gilts in Saskatchewan increased about 46 $CAN/100 kg between the two periods. While the average weekly slaughter decrease by about 1 thousand head (table 10). The R^2 for the model was high, at 0.981. The cutout

value, plant open, lag price, season3, and season4 are significant and have the expected signs. The slaughter number, and byproduct value are significant, but don't have the expected sign (table 11). The slaughter estimate is positive, which would mean that as slaughter increases so does price. Byproduct values is negative, which would mean as the price in byproducts increase the price of hogs would decrease. Market forces that are not measured in this model must be driving these trends. In the weeks following the plant opening the price of hogs increased 7.7 $CAN/100 kg. The effect of the plant opening on the Saskatchewan market lasted 6.3 weeks.

Alberta Model

The average price for hogs in Alberta also increased about 45 $CAN/100 kg, over the two periods. Average weekly slaughter remained stable, only dropping 0.3 thousand head (table 10). The R^2 of the model was estimated at 0.983. The cutout value, lag price, and season3, season 4 parameters are significant with expected signs (table 11). The byproduct value was significant, but had a negative sign. The plant open parameter was positive, as expected and measured 4.7. The duration of 95% of the impacts on the Alberta market was 5.0 weeks. This is comparable to the Ontario model.

St. Paul Model

Average price for hogs in this market went from 93.3 to 132.1 $CAN/100 kg. The average weekly hog slaughter in the St. Paul market dropped about 3.4 thousand head, between the two periods (table 10). The R^2 for the model was also high, at 0.970. The cutout value carried the expected sign and was significant (table 11). The plant open

parameter shows a 6.4 $CAN/100 kg increase in price. The duration of the plant opening on the St. Paul market was 58.5 weeks. The lag price variable in the model is not significant. Thus, the duration of 58.5 weeks in the St. Paul market was not reliable.

Sioux Falls Model

The average price in the Sioux Falls market also saw a large increase, from 94.3 to 134.7 $CAN/100 kg. Average weekly slaughter dropped about 6 thousand head between the two periods (table 10). The R^2 of the model was estimated at 0.977. The cutout value, plant open, lag price, season2, season3, and season4 parameters are significant and have the expected signs. Weeks following the plant opening saw an increase of price of 8.2 $CAN/100 kg (table 11). The duration of the plant opening on the Sioux Falls market was 24.3 weeks.

Iowa/Minnesota Model

The average interior Iowa/southern Minnesota price increased from 92.1 to 132 $CAN/100 kg over the periods. Average weekly slaughter in Iowa saw a large decrease during the two 55 week periods. During the first 55 weeks the average was at 556.6 thousand head. In the following 55 weeks the weekly average dropped to 531.6 thousand head (table 10). The R^2 of the model was high, at 0.980. The cutout value, plant open, lag price, season2, and season4 parameters are significant with the expected signs. The weeks after the plant opening saw a 6.6 $CAN/100 kg increase in hog prices (table 11). It took 10.7 weeks for 95% of the impacts on the Iowa market to subside.

Table 11. Maple Leaf Partial Adjustment Model Results

Independent Variable	Manitoba Estimate	Ontario Estimate	Saskatchewan Estimate	Alberta Estimate	St. Paul Estimate	Sioux Falls Estimate	IA/MN Estimate
Intercept	60.316	106.142	87.191	47.699	47.536	96.269	123.704
	(131.868)	(81.025)	(98.046)	(90.806)	(122.488)	(109.025)	(92.404)
Meat Value	0.233**	0.611**	0.641**	0.553**	0.842**	0.745**	0.669**
	(0.115)	(0.050)	(0.056)	(0.051)	(0.067)	(0.062)	(0.057)
Number	0.113	0.043	0.531**	-0.726	-0.006	-0.043	0.001
	(0.108)	(0.058)	(0.228)	(0.559)	(0.042)	(0.054)	(0.012)
Weight	-0.041	-1.013	-0.647	-0.257	-0.702	-0.978	-1.240
	(1.084)	(0.680)	(0.800)	(0.741)	(1.016)	(0.893)	(0.771)
Plant Open	11.259**	2.615	7.656**	4.676**	6.401**	8.172**	6.576**
	(3.295)	(1.914)	(2.483)	(2.274)	(3.050)	(2.733)	(2.254)
Lag Price	0.613**	0.441**	0.377**	0.449**	0.050	0.116*	0.244**
	(0.107)	(0.047)	(0.053)	(0.051)	(0.070)	(0.066)	(0.061)
ByPr Price	-1.675**	-0.803	-1.807**	-1.265**	-0.420	-0.512	-0.600
	(0.809)	(0.536)	(0.642)	(0.577)	(0.858)	(0.758)	(0.579)
Season 2	4.281*	1.811	1.208	0.767	4.840*	5.653**	6.497**
	(2.456)	(1.581)	(1.904)	(1.740)	(2.492)	(2.163)	(1.847)
Season 3	-2.058	-5.323**	-5.435**	-4.985**	-3.610	-4.363*	-3.143
	(3.011)	(1.859)	(2.286)	(2.080)	(2.870)	(2.501)	(2.137)
Season 4	-8.263**	-4.072**	-4.724**	-5.120**	-4.013	-4.642**	-3.079*
	(2.639)	(1.650)	(2.027)	(1.828)	(2.557)	(2.228)	(1.816)
Duration (weeks)	3.155	5.154	6.329	5.026	58.524	24.274	10.705
Observations	108	108	108	108	105	105	103

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Chow Tests

Chow tests were used to determine if a difference in price existed between the 55 weeks prior and the 55 weeks after the plant events. These tests were conducted on the 5 ConAgra and 7 Maple Leaf partial adjustment models. The data were split into two groups, before and after the event. The results from the model and equation (10) were used to get the SSE unrestricted. Using this and the restricted SSE, F-tests at the 5% level were conducted. The results of the Chow tests can be found in table 13. Chow tests on all the partial adjustment models, confirm that there was a change in price.

Table 12. Chow Test Results

Model	SSE before	SSE After	SSE_u	SSE_r	Price Change?
Kansas	37.55	74.70	112.25	130.24	Yes
Texas	35.52	66.00	101.52	107.59	Yes
Nebraska	32.00	62.80	94.79	104.76	Yes
Colorado	29.83	36.77	66.61	73.84	Yes
Iowa (cattle)	31.95	63.15	95.10	104.65	Yes
Manitoba	1758.34	1587.59	3345.93	3885.36	Yes
Ontario	716.20	550.06	1266.26	1576.32	Yes
Saskatchewan	909.39	783.08	1692.47	2152.56	Yes
Alberta	865.32	612.48	1477.80	1798.10	Yes
St. Paul	1166.94	1010.25	2177.19	2753.29	Yes
Sioux Falls	922.39	887.62	1810.02	2114.14	Yes
Iowa (hogs)	830.89	509.33	1340.22	1653.33	Yes

Summary

Analyzing the secondary data using price differences models and partial adjustment models shows the changes in market impacts. With the ConAgra plant closing the price differences model presents a price decrease of $0.37 to $0.49 in the Kansas versus Nebraska and Iowa markets. While the price difference in the Kansas versus Texas market increased by $0.30. Using a partial adjustment model, the price in the Texas market decreased $0.92 after the plant closing. The impacts from the closing lasted from 3 to 6 weeks. Estimating the effects of the Maple Leaf plant opening with a price difference model shows a price increase of $4 to $10. Using the partial adjustment model, after the plant opening the price increased from $2 to $11 in the Canadian and U.S. markets. The effects of this increase only lasted from 3 to 59 weeks.

CHAPTER 5

PRIMARY DATA PROCEDURES

In contrast to the secondary data used in previous chapters to analyze the impacts of the plant events, primary data were used to determine the perceived impacts. The secondary data used in this study are aggregated data from the U.S. and Canadian governments. Collecting and analyzing primary data may show impacts not observed in the other data. This chapter discusses some of the issues with aggregated data. It also reviews some previous studies on the comparison of primary and secondary data in economic analysis. The development and distribution of the surveys used for this study (one for ConAgra plant and one for Maple Leaf plant) are explained. Finally, an ordered logit model was used to analyze the primary data gathered from the surveys. The methodology and model specification used for both the ConAgra and Maple Leaf studies are presented.

Primary versus Secondary Data

Primary data generally refers to data that were gathered by the publisher or author. Normally, secondary data are collected from an alternative source other than the original publisher or author (McClave, Benson, and Sincich). Research comparing the results of models using primary and secondary data has been limited. Radtke, Detering, and Brokken estimated the income impacts from increasing the federal grazing fee. They

used data from the U.S. Forest Service as secondary data. Business and households were surveyed to get primary data. The impacts from raising the fee were analyzed with both data sets. They found that the secondary data showed impacts higher than determined by the primary data.

Boster compared the use of primary and secondary data for water resource planning using input-output models. The primary data came from Colorado based study on water resources. For a source of secondary data he used an Arizona based study that used national coefficients. The results from the two input-output models were compared. He found that the results were similar using either primary or secondary data. This is somewhat contrary to what some may believe. Economists tend to believe primary data results are superior, ceteris paribus. However, primary data cannot always be used because of the high cost of obtaining the information.

Secondary Data

The majority of the secondary data used in this study were complied and gathered by the USDA (some through LMIC) or the Canadian government. The analysis of plant event impacts using secondary data was discussed in Chapters 3 and 4. The author considers the secondary data used in this study, as the best available. While this may be true, the secondary data could create concerns. The data gathered by the U.S. and Canadian governments are highly aggregated. For example, in the ConAgra study the Kansas price variable represents an average price paid for live fed steers, weighing 1100-1300 lbs., and grading 35-65% choice. On a daily basis, there are numerous transactions involving cattle that fit this description. If the number of transactions for a particular type

of livestock is not great enough, then the USDA does not report data for confidentiality reasons. Due to this aggregation, secondary data may not display all the impacts from a market shock.

The ability of secondary data to show these impacts will depend upon the size of the event and the level of data aggregation. Closing the ConAgra plant may only affect fed cattle prices for certain areas or certain individuals. The same could be said for the Maple Leaf opening. If the data are aggregated enough, these effects may not be picked up. To ease some of the concerns about these impacts on the results of the study, surveys are used to collect primary data. It is intended that the results from both data sources will confirm the market impacts.

Survey Development

The primary data for this study were collected with the use of surveys. Two surveys were developed, one for the ConAgra plant closing and another for the Maple Leaf study. The purpose of the surveys is two measure the perceptions of cattle and hog producers.

ConAgra Survey

Feedlot managers (fed cattle producers) in areas surrounding Garden City were targeted for the survey. A copy of the survey can be found in Appendix II. The number of respondents to each question is in **bold** type beside each question. These results will be discussed further in Chapter 6. The survey was designed to be as short as possible, while still allowing the collection of the necessary information about the market impacts.

There are six questions in the survey, some with multiple parts. Question 1 considers the distance and direction of responding feedlots from Garden City. Question 2 relates to the feedlot size of the responding manager. The percentage of a feedlot's cattle that were sold to each of the four major packers, the year before and the year after the plant closing is asked in question 3. The fourth question asks about the percentage of a feedlot's cattle that were sold on the cash market or through a contract, alliance or marketing agreement in the year before and the year after the plant closing. The next question has many parts. This series of questions asks respondents to rate on a scale if they agree or disagree with a statement. Question 5 asks specific questions about how the closing of the ConAgra plant affected the manager's feedlot and the cattle industry in general. The last question asks managers to explain the most noticeable effect from the plant closing.

In addition to the survey, a cover letter was included in the mailing to inform the recipient about the study and ask for their cooperation. A copy of the letter can be found in Appendix II. The materials (survey and cover letter) mailed to survey participants were first approved by the Institutional Review Board (IRB). A copy of IRB acceptance is also found in the Appendix II.

Participants

The survey was targeted at feedlot managers that may have been affected by the event. To ensure that the majority of the impacted feedlots were surveyed, feedlots within 200 miles of Garden City were surveyed. It is unlikely that the contacts of every feedlot manager in this area could be obtained. Every feedlot manager that was asked to participate in the survey was a member of the Kansas Livestock Association (KLA), the

Colorado Livestock Association (CLA), or the Texas Cattle Feeders Association (TCFA). These organizations helped to obtain the contact information of feedlot managers. To ensure the confidentiality of this information, the KLA and CLA required that a sealed envelope, containing survey and letter, be sent to their offices and they attached the mailing address.

The ConAgra survey was sent to 186 feedlot managers throughout Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas. From the total number of feedlot managers that received a survey, 95 were members of KLA, 44 are members of CLA, and 47 are members of TCFA. The majority of these feedlots have a one time capacity of more than 1,000 head. The feedlots from KLA chosen for the survey are from the western half of the state, this included a few from southwestern Nebraska. The CLA participants came from the eastern part of the state. The TCFA members that were chosen are from the panhandle of Oklahoma, panhandle of Texas, and northeastern New Mexico.

The first mailing occurred during the first week in July, 2003. It was decided to conduct a second mailing, because the summer months are busy for feedlot managers so they may have forgotten about completing the questionnaire. The second mailing to the 186 feedlot managers occurred during the first week in August, 2003.

Maple Leaf Study

The survey created for the Maple Leaf study is similar to the one used in the ConAgra study. Producers that raised market hogs in western Manitoba were the target of the survey. This survey consists of six questions, with multiple parts. A copy of this

survey can be found in Appendix II. The first question deals with the distance and direction of the finishing barns that the producer manages from Brandon. The second question asked about the number of hogs that were marketed from their barns in 2000. This is the year following the plant opening. Question three has two parts. The percentage of their hogs that were marketed to different packers, in 1999 and 2000 was asked. The four main pork processors are listed, as well as, the option of other Canadian packers or U.S. packers. For the fourth question, the interest was in how producers marketed their hogs. This question asked for the percentage of a manager's hogs were sold on the cash market or contracted in the year prior and the year after the plant opening. The next question asked managers if they agreed or disagreed with various statements. The statements ranged from asking about direct impacts from the plant opening to effects of exports to the U.S. The final question, number six, asked producers what the biggest impact was from the plant opening.

In addition to the survey a cover letter from the survey administrators was included in the mailing to inform the recipient about the study and ask for their cooperation. The Manitoba Pork Council assisted with conducting this survey. They included a letter to inform producers of their support in this study. A copy of both letters can be found in Appendix II. The materials (survey and letters) mailed to survey participants was first approved by the Institutional Review Board (IRB). A copy of IRB acceptance is also found in Appendix II.

Participants

The survey was intended to survey producers that may have been impacted by the opening of the Maple Leaf plant. The authors also wanted the results from ConAgra and Maple Leaf studies to be comparable. Thus, care was taken to keep the survey structure and participants as comparable as possible. Market hog producers within 400 kilometers (slightly over 200 miles) of Brandon, Manitoba, were targeted for the survey. The survey participants were members of the 1st, 2nd, or 3rd districts of the Manitoba Pork Council. These districts are in the western half of Manitoba, which includes Brandon. These participants had to own and market their slaughter hogs and not just own the finishing barns. There are 273 hog producers that fit in the above mentioned categories.

This survey involved only one mailing. The Manitoba Pork Council and the University of Manitoba assisted with the mailing. The confidentiality of hog producers contact information was also a concern in this study. The materials were assembled by the authors then sent to the University of Manitoba. Officials at the university handled the necessary Canadian postage. Then the Manitoba Pork Council handled the mailing addresses for the surveys. The questionnaires were then sent out to producers during the beginning of November, 2003.

Ordered Logit Model

The responses to question 5, in both surveys, have ordinal rank. Thus, the data collected by the surveys can be analyzed using an ordered logit model to examine the relationship between managers' perceptions and the characteristics of their operation.

More specifically, the managers' perceptions of the impacts on the marketing of their livestock and regional market impacts are of interest.

Ordered logit models have been used to analyze survey data, with ranked dependent variables (Grunewald, Schroeder, and Ward; Misra, Huang, and Ott). The model can be represented in linear form (Allison)

(11) $$z_i = \alpha^* + \beta^* x_i + e_i$$

where z_i is linearly dependent upon x_i (explanatory variables) and random error e_i. In the case of this survey work the value of z_i cannot be observed directly. The logit model uses threshold values, such that the z_i can be transformed into the observed variable. Thus, y_i is the observed survey response that is transformed from z_i based on the following (Allison)

(12) $$y=1 \text{ if } \eta_1 < z$$
$$y=2 \text{ if } \eta_2 < z \leq \eta_1$$
$$\vdots$$
$$y=9 \text{ if } z \leq \eta_8$$

where the unknown thresholds are η's and the other variables are as previously defined. The values of these thresholds could be estimated, but is not necessary because they do not affect the coefficient estimates (Allison).

The ordered logit model calculates a cumulative probability of being in a defined category or lower. Allison expressed cumulative probabilities as

(13) $$F_{ij} = \sum_{m=1}^{j} P_{im}$$

where F_{ij} is the probability that i is in the jth category or lower, P_{im} is the probability of i for each level, up to category j. With cumulative probabilities defined, the logit model can be expressed as (Allison)

$$\ln\left(\frac{F_{ij}}{1-F_{ij}}\right) = \alpha_j + \beta x_i \tag{14}$$

where F_{ij} is as defined, α_j is an intercept term for each category, and β is a set of coefficients for each explanatory variable (x_i) that is constant for each category. The number of categories is one less than the number of rank. In the case of this study the response questions are ranked from 1 to 9, thus the models will have 8 intercepts.

The interpretation of coefficients in a logit model is different than a linear model. However, probabilities can be calculated to determine how different independent variables affect the likelihood that an individual is in a specific category. Transforming the model, the cumulative probabilities can be expressed as

$$p_1 = \frac{1}{1+e^{-(\alpha_1+\beta x_i)}} \tag{15}$$

$$p_1 + p_2 = \frac{1}{1+e^{-(\alpha_2+\beta x_i)}}$$

$$\vdots$$

$$p_1 + p_2 + \ldots + p_j = \frac{1}{1+e^{-(\alpha_j+\beta x_i)}}$$

where p's are cumulative probabilities, α's are intercept terms for specific categories, β's are coefficient estimates for specific explanatory variables, and j is one less the number of categories in the response variable.

The probability of a certain response level can be found from the difference in cumulative probabilities. For example if a person wanted to know the probability of a

"3". The answer is the difference between the cumulative probability of less than a "3" minus the cumulative probability of less than a "2". The probability of the highest category can be found by taking 1 minus the cumulative probability of $P_1+P_2+\ldots+P_j$. This is possible because the model finds a cumulative probability which must also equal 1.

Marginal probabilities can be found from the derivative of the cumulative probability equation. The derivative is

$$\frac{\partial P_i}{\partial x_n} = \frac{\beta_n (e^{-(\alpha_i+\beta_j \bar{x}_j)})}{(1+e^{-(\alpha_i+\beta_j \bar{x}_j)})^2} \tag{16}$$

where P_i is the derivative below level i, x_n is the independent variable for which the marginal probability is calculated, β_n is the coefficient for that variable, x_j is the mean of each variable j, and β_j is the coefficient estimate for each independent variable. To find the marginal probability for a certain response level subject to x_n the difference between cumulative levels can be used. For example if a person wanted to know the marginal probability of a "3" subject to x_n. The answer is the difference between the cumulative marginal probability of less than a "3" minus the cumulative marginal probability of less than a "2". The marginal probability of the highest category can be found by taking 0 minus the cumulative marginal probability of $\partial P_1 / \partial x_n + \partial P_2 / \partial x_n .... + \partial P_j / \partial x_n$. This process is similar to the one used in the cumulative probabilities.

ConAgra Model

Two ordered logit models were developed using the survey data from fed cattle producers. One method to estimate the perceived market impacts from the plant closing

was with an ordered logit model analyzing a feedlot manager's level of agreement of the following statements: *O) the plant closing had NO noticeable effect on marketing or pricing fed cattle from my feedlot (Opinion O), B) the loss of the ConAgra plant caused lower fed cattle prices in the region (Opinion B).* The use of these statements as dependent variables helped to answer the main objectives of the study. *Opinion O* asked for the level of agreement that the closure had no affect on the market and prices for the manager's feedlot(s). *Opinion B* asked for the level of agreement that the closure affected the regional market and prices

Using an ordered logit model, similar to equation 11, the probability of each level of agreement of each dependent variable was explained by a series of respondent's feedlot characteristics and perceptions. The two ordered logit models for this study are

$$(17)\quad \begin{aligned} OpinionO = {} & \alpha_j + \beta_1 Distance + \beta_2 Size + \beta_3 ConAgraMKT + \beta_4 CashMKT \\ & + \beta_5 OpinionA + \beta_6 OpinionE + \beta_7 OpinionI + \beta_8 OpinionM + e \end{aligned}$$

$$(18)\quad \begin{aligned} OpinionB = {} & \alpha_j + \beta_1 Distance + \beta_2 Size + \beta_3 ConAgraMKT + \beta_4 CashMKT \\ & + \beta_5 OpinionA + \beta_6 OpinionE + \beta_7 OpinionI + \beta_8 OpinionM + e \end{aligned}$$

where *Opinion O* and *Opinion B* are as previously defined, α_j is a set of 8 intercepts that are needed in an ordered logit model, *e* is an error term, and all others are defined in table 13. While the variables are defined in table 13, it should be pointed out how some were calculated. The *distance*, *size*, *ConAgraMKT*, and *CashMKT* had to be altered from the survey data into a usable form for the ordered logit model. The ConAgra survey asked respondents to indicate the range that their feedlot was operating in with respect to distance, size, percentage sold to ConAgra, and percentage sold on the cash market (see survey in Appendix II). These variables were transformed into a continuous form such that they could be used in the logit model. If a respondent marked a particular category,

it was assumed they were at the middle of the category. For example, if a manager indicated being between 0 and 50 miles from Garden City, it was assumed the feedlot was 25 miles away. This assumption is not ideal, but it has to suffice if continuous variables are to be used.

The expected sign of each coefficient is difficult to predict. The sign of the parameter would explain how the natural log of the probability (see equation 14) changes with respect to the variable. However, the relevance of the independent variables and their suspected impacts on *Opinion O* and *Opinion B* can be discussed.

The distance a feedlot is from Garden City should influence the amount of impacts experienced. Producers on the boundaries of two markets might not have noticed much of an impact. These producers would be more susceptible to changes in packers' willingness and aggressiveness of bidding. It is expected that producers that are farther away from Garden City will be less likely to notice or experience changes in prices.

The size of a feedlot might also influence how the manager felt the closure affected the market. Larger feedlots might have the resources to adjust more rapidly to market changes than smaller producers. Smaller producers are expected to more likely experience price changes because they do not have the means to adjust rapidly to a changing market.

The percentage of a manager's cattle that were sold to ConAgra in the year leading up to the closing was expected to influence their perceptions. Producers that sold to the Garden City plant might have had their cattle shipped to other ConAgra plants or had to sell them to a different company. The producers that sold to the other ConAgra plants might have lost their buyer and be forced to market to a different packer.

Producers that sold a larger percentage of cattle to ConAgra are expected to more likely agree that the closing influenced the market.

Producers that sold a large percentage of fed cattle on the cash market during 2000 might have been at a greater risk to market changes. The plant closing might have forced them to find alternative cash markets. Producers that had a lower percentage of fed cattle in the cash market might have been able to avoid some impacts with their marketing agreements. Producers that sold more of their cattle on the cash market are expected to more likely think the closure impacted prices and the market.

A manager's level of agreement with the *Opinion A, E, I, and M* will influence their response to the two dependent variables. It is difficult to predict how producers think about a range of different issues. However, the opinion variables used in the model describe a negative impact on the market from a producer's point of view. Thus, it is expected that producers who agree with the opinion variables will be more likely to think there was a market impact and that prices decreased.

Table 13 ConAgra. Ordered Logit Model, Variable Definitions

Dependent Variables	Variable Definition	Mean
Opinion O	Response to *the plant closing had NO noticeable effect on marketing or pricing fed cattle from my feedlot* (1=strongly disagree to 9=strongly agree)	4.07 (2.88)
Opinion B	Response to *the loss of the ConAgra plant caused lower fed cattle prices in the region* (1=strongly disagree to 9=strongly agree)	6.18 (2.52)
Independent Variables	**Variable Definition**	**Mean**
Distance	Number of miles the feedlot is located from Garden City	119.00 (66.85)
Size	Number of fed cattle marketed from their feedlot in 2001	51700.00 (39901)
ConAgraMKT	The % of fed cattle sold to ConAgra in 2000	25.40 (26.79)
CashMKT	The % of fed cattle sold on the cash market in 2000 (includes live weight and dressed weight sales)	56.00 (35.86)
Opinion A	Response to *the number of buyers regularly bidding for cash market cattle from my feedlot decreased* (1=strongly disagree to 9=strongly agree)	4.95 (3.13)
Opinion E	Response to *the effects of captive supplies increased* (1=strongly disagree to 9=strongly agree)	6.19 (2.65)
Opinion I	Response to *fed cattle slaughter capacity in western Kansas became more of a problem* (1=strongly disagree to 9=strongly agree)	7.06 (2.13)
Opinion M	Response to *other packers gained a psychological advantage from having one fewer packer in the region* (1=strongly disagree to 9=strongly agree)	7.22 (2.13)

Numbers in parentheses are standard errors

Maple Leaf Model

Similar to the ConAgra study, two ordered logit models were used to measure managers' perceptions about the market impacts from the Maple Leaf plant opening. This was done using their level of agreement to the following statements: *F) the plant opening had NO noticeable effect on marketing or pricing hogs from my finishing barns (Opinion F), B) the addition of the Maple Leaf plant caused higher hog prices in the region (Opinion B).* Using *Opinion F* and *Opinion B* as dependent variables assisted in completing the objectives of the study.

Using an ordered logit model, similar to equation 11, the probability of each level of agreement of each dependent variable was explained by a series of respondent's finishing barn characteristics and perceptions. The two ordered logit models for this study are

$$OpinionF = \alpha_j + \beta_1 Distance + \beta_2 Size + \beta_3 MapleLeafMKT + \beta_4 CashMKT + \beta_5 OpinionA + \beta_6 OpinionH + \beta_7 OpinionK + e \quad (19)$$

$$OpinionB = \alpha_j + \beta_1 Distance + \beta_2 Size + \beta_3 MapleLeafMKT + \beta_4 CashMKT + \beta_5 OpinionA + \beta_6 OpinionH + \beta_7 OpinionK + e \quad (20)$$

where *Opinion F* and *Opinion B* are as previously defined, α_j is a set of 8 intercepts that are needed in an ordered logit model, *e* is an error term, and all others are defined in table 14. The *distance*, *size*, *MapleLeafMKT*, and *CashMKT* variables are continuous variables and calculated in the same manner as the ConAgra study. The main difference in these variables from the ConAgra to Maple Leaf model is the year involved in the variables. Managers were asked the size of their operation in 2000. They were asked for the percentage of hogs sold to Maple Leaf and on the cash market during the year after the

plant opening, 2000. In the ConAgra study, the variables used were for the year prior to the plant opening. The prior year was used for the ConAgra study because it is assumed that a manager's market interaction and its corresponding impacts would be most prevalent in the year leading up to the closing. With the Maple Leaf study, a manager's involvement in the market would most likely influence their perceptions.

The impacts of the independent variables are expected to be similar to the ConAgra study. The distance of a manager's finishing barns from Brandon, would influence their perceived impacts. Finishing barns that were close to opening plant might have more of an impact than producers on the fringes of the market. It is expected that producers that are farther away from Brandon will be less likely to think that there was a market impact and prices were higher.

Size could also be important. Smaller finishing barns might not have been able to adjust to the market changes. The larger firms might be able to adjust their marketing or production to meet the standards so that they could sell their hogs to Maple Leaf. Larger producers are expected to be more likely to think prices increased because of their ability to adjust to capture a greater margin.

The percentage of hogs that were sold to Maple Leaf during the year after the closing might determine how they felt about the market. If managers wanted to sell hogs to Maple Leaf they would be required to meet their requirements, which might have affected manager's perceptions. Producers that sold more of their hogs to Maple Leaf are expected to more likely think there was a market impact and prices increased.

The percentage of hogs sold on the cash market would impact a manager's vulnerability to price changes. Producers that sold more of their hogs on the cash market are expected to be more likely to think the market changed and prices increased.

A manager's response to *Opinion A, H, and K* might affect they way they would respond to the dependent variables. The expectations of the opinion variables are the same. If a producer thinks that there were more buyers, less of a capacity problem, and/or the loss of a competitive advantage they are expected to also agree that there was a market impact and higher prices followed.

Table 14. Maple Leaf. Ordered Logit Model, Variable Definitions

Dependent Variables	Variable Definition	Mean
Opinion F	Response to *the plant opening had NO noticeable effect on marketing or pricing hogs from my finishing barns* (1=strongly disagree to 9=strongly agree)	5.01 (3.11)
Opinion B	Response to *the addition of the Maple Leaf Foods plant caused higher hog prices in the region* (1=strongly disagree to 9=strongly agree)	2.84 (2.46)
Independent Variables	**Variable Definition**	**Mean**
Distance	Number of kilometers their finishing barn(s) are located from Brandon, Manitoba	126.00 (55.15)
Size	Number of slaughter hogs marketed from their finishing barns in 2000	2346.15 (3117.10)
MapleLeafMKT	The % of hogs sold to Maple Leaf Foods in 2000	24.13 (36.65)
CashMKT	The % of hogs sold on the cash market in 2000 (includes live weight and dressed weight sales)	32.38 (41.53)
Opinion A	Response to *the number of buyers regularly bidding for cash market hogs from my feedlot increased* (1=strongly disagree to 9=strongly agree)	2.34 (2.04)
Opinion H	Response to *hog slaughter capacity in Manitoba became less of a problem* (1=strongly disagree to 9=strongly agree)	5.09 (2.88)
Opinion K	Response to *other packers lost their competitive advantage from having one additional plant in the region* (1=strongly disagree to 9=strongly agree)	5.50 (2.69)

Numbers in parentheses are standard errors

CHAPTER 6

PRIMARY DATA RESULTS

This chapter presents the results from analyzing the primary data (survey data). First, the results of both surveys are discussed. The distribution of the size, direction from the plant, and distance of the respondents are covered. How the survey participants changed sales to packers and marketing methods after the plant events are shown. Next, the responses to managers' perceptions about the market impacts (question 5, in both surveys) are analyzed. Finally, the results from the ordered logit model are discussed. These results may give a slightly different view of the market and should aid in understanding the impacts.

ConAgra Survey Results

The response from feedlot managers to the ConAgra survey was better than expected. As previously mentioned, 186 surveys were mailed to fed cattle producers throughout the Great Plains. A total of 100 managers completed the survey. This was a response rate of 53.8%, which is high considering the survey and participants.

A copy of the ConAgra survey with number of respondents to each question (typed in **bold**) can be found in Appendix II. The first three questions dealt with the geographical location and size of the feedlots. These three factors may influence the type

and intensity of impacts absorbed from the plant closing. The respondents were diverse in their size and location.

Distance, Direction, and Size

The manager's feedlot distance from Garden City ranged from less than 50 miles to more than 200 miles. Twenty-three of the respondents are within 50 miles of the plant. From the total respondents, twenty-eight are between 100 and 149 miles of Garden City, while thirteen of the participants are more than 200 miles away. Manager's direction from Garden City varied, but there is more concentration to the south. There were fifty-five respondents that are located southwest, south, or southeast of Garden City. The majority are located southwest of the plant (31). Fifteen of the feedlots are east, while twelve are located northwest of the plant. The size of the feedlots also had a good distribution. The sizes ranged from less than 5,000 to more than 100,000 head marketed in 2001. Twenty-four of the participants market between 5,000 and 19,999 head, while twenty-five marketed between 20,000 and 49,999 head during that year. The largest group of respondents (28) marketed between 50,000 and 99,999 head during 2001. The remaining participants were in the two extreme categories.

An additional means to examine the distribution of survey respondents is to compare the size of marketing to distance or direction from Garden City. Figure 5, shows the size of feedlots and their direction from Garden City. Overall there is variation among sizes and directions. However, it shows that more of the larger feedlots that participated are southwest to southeast of the plant. Figure 6, compares the size of feedlots and their distance from Garden City.

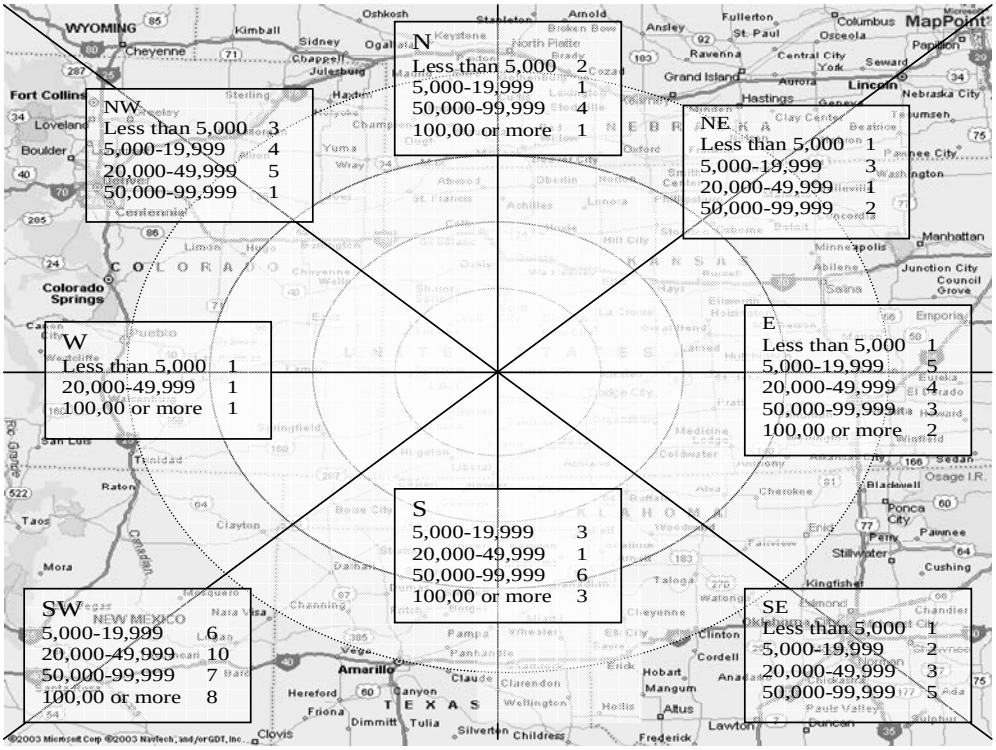

Figure 5. ConAgra. Size and Direction of Survey Participants

Source: Microsoft MapPoint

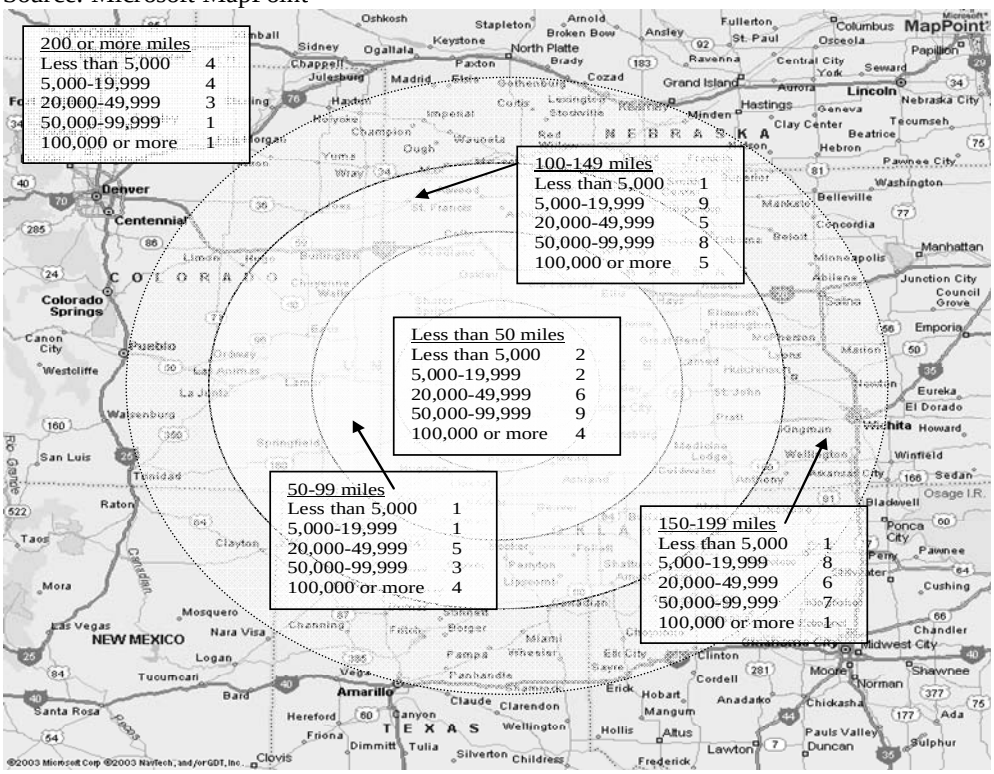

Figure 6. ConAgra. Size and Distance of Survey Participants

Source: Microsoft MapPoint

Sales to Packers

Feedlot managers changed the percentage of cattle sold to each packer from 2000 to 2001 (survey question 3). During the year leading up to the plant closing[3], thirty-eight respondents sold less than 20% of their cattle to ConAgra. At the same time, ten managers sold more than 80% of their cattle to ConAgra. As could be expected with the loss of a large plant, during 2001 ConAgra's market share decreased. In 2001, fifty-four feedlots sold less than 20%, while only six sold more than 80% of their fed cattle to ConAgra. Overall, managers increased the percentage of their cattle sold to Excel (Cargill Meat Solutions). In 2000, forty-nine feedlots marketed less than 40%, while twelve marketed more than 60% of their cattle to Excel. At the end of 2001, forty-six feedlots marketed less than 40%, and sixteen marketed more than 60% to Excel. IBP (Tyson Foods) experienced similar changes. From 2000 to 2001, the number of feedlot managers that marketed less than 40% of their cattle to IBP fell from sixty-two to fifty-four. Over the same time period, the number of managers that sold more then 60% of their cattle to IBP increased from fourteen to nineteen. The fourth largest packer, Farmland National Beef (U.S. Premium Beef), followed the path of Excel and IBP. From 2000 to 2001, the number of feedlots that sold less than 40% of their cattle to National Beef fell from forty-seven to forty-two. The number of feedlots that sold more than 60% of their cattle increased from nineteen to twenty-one.

[3] The Garden City/ConAgra plant caught fire at the end of the year, December 25, 2000.

Marketing Methods

The method feedlot managers used to market their cattle changed over the two years. In 2000, nineteen managers sold less than 40% of their cattle on the cash market, while fifty-five sold more than 60% using this method. At the end of the next year, twenty-eight sold less than 40% and forty-four sold more than 60% on the cash market. An alternative to selling cattle on the cash market is to use a contract, alliance, or marketing agreement. The number of managers selling less than 40% of their cattle with some type of agreement was forty-two in 2000. At the end of 2001, the 40% and fewer group included thirty-four feedlots. The number of feedlots selling more than 60% of their cattle with an agreement went from thirty-three in 2000, to forty-four in 2001. It appears that the majority of feedlot managers decreased the percentage of cattle sold on the cash market by the end of 2001. This corresponds to an increase in the percentage of cattle sold with a contract, alliance, or marketing agreement by the end of 2001.

Manager Perceptions

The fifth question asks producers a series of questions about the market impacts after the ConAgra plant burned. They responded on a scale of 1 to 9 if they strongly disagree to strongly agree. The number of responses at each level to each question is shown with histograms, figures 7 though 22. The average response can be found (typed in **bold**) in the copy of the survey, Appendix I. The level of agreement or disagreement varied between questions. With some questions, producers on average are uncertain or have no opinion. This discussion will focus on the questions that generated some level of disagreement or agreement and not on questions that producers are neutral on.

The average response to the question if the plant closing influenced the number of bidders for an individual's cattle (part A) is 4.95. Graphing the responses, figure 7, shows an even split between both extremes, 23 responses for strongly disagree and strongly agree. Closing the plant did not affect the number of cattle buyers at each feedlot in the same manner. While the effect on the number of bidders varied, producers tend to believe the packers were not more interested in their cattle. The average response for part F is 4.08, managers slightly disagree with the statement that packers became more interested in cattle, figure 12.

The number of bidders and packer interest may or may not influence competition and/or price. However, a majority of producers felt that the event caused lower fed cattle price, figure 8. The average response for part B was 6.18. This is confirmed when managers were asked if the event had no noticeable impact on pricing or marketing (part O), figure 21. Most tended to disagree with this statement, that had an average of 4.07.

Producers slightly disagreed that the event caused cattle from their feedlot to be shipped to a closer packer (part D), figure 10. With an average of 4.63, producers are close to being split on this question. A feedlot's cattle may have been shipped to a packer farther away, but the capacity in the area became an issue. Producers were asked if cattle slaughter capacity in western Kansas became more of a problem (part I), figure 15. The average response was 7.06, with 38 people strongly agreeing with this statement.

It is perceived that the plant closing caused the other packers to have a psychological advantage in the market. The average response from producers is 7.22 to part M, figure 19. Over 80% of the participants agreed at some level to this question, with 40 producers strongly agreeing. The results from this question are similar to

questions G and H. The average response to part G is 6.17. A greater number of producers agreed that the closing allowed the other packers to know which ones were in the cash market, figure 13. The average response to part H is 6.36. Producers tended to agree that fewer packers helped the remaining packers know the number of cattle committed to other packers. These three questions show that producers believe that packers in the region experienced several benefits from the loss of the plant.

Producers also believed that the event increased the effects of captive supplies (part E), figure 11. The average response is 6.19 to this question. More managers agreed that the plant closing increased the effects of captive supplies.

The remaining questions (parts C, J, K, L, N, and P) had responses where the majority of producers were uncertain or had no opinion on the subject. These are shown graphically in figures 9, 16, 17, 18, 20, and 22. Overall, feedlot managers tended to think the plant closing decreased prices for fed cattle, caused slaughter capacity problems, and gave packers some sort of advantage in the market. The correlations between questions are presented in table 29, Appendix II.

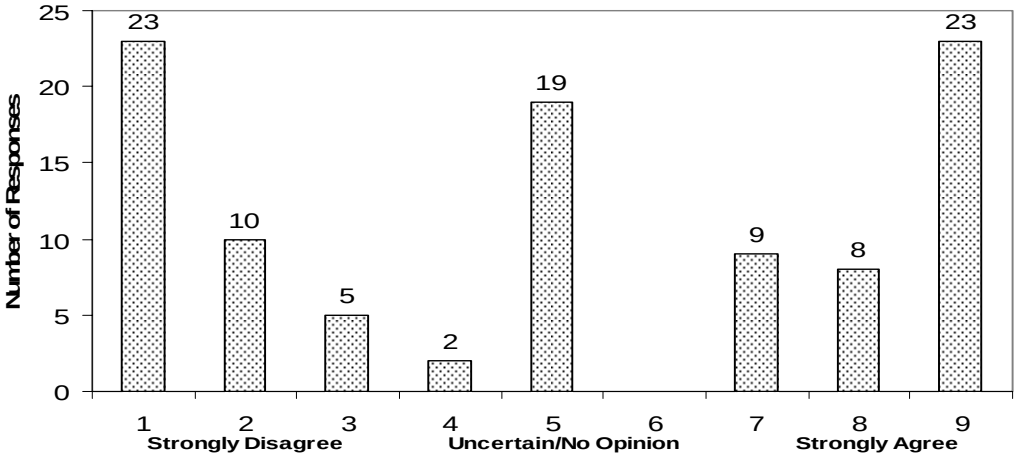

Figure 7. ConAgra A. The number of buyers regularly bidding for cash market cattle from my feedlot decreased.

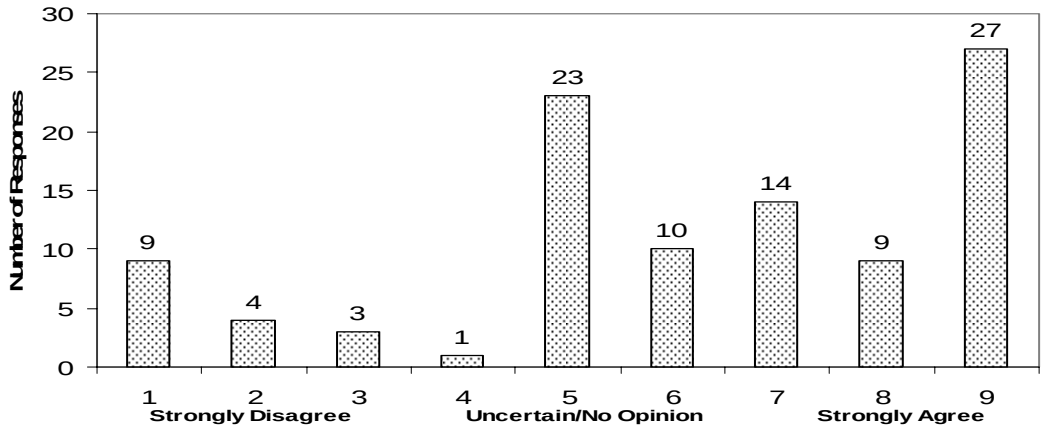

Figure 8. ConAgra B. The loss of the ConAgra plant caused lower fed cattle prices in the region.

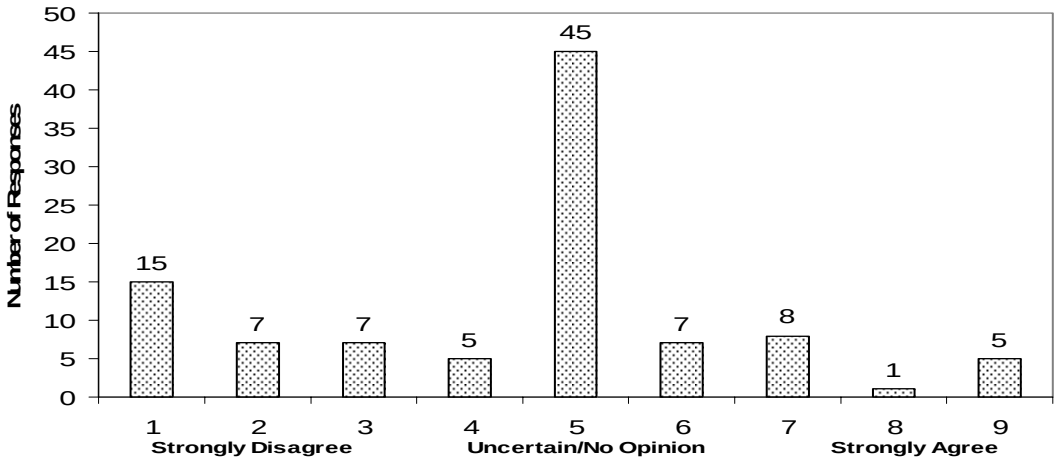

Figure 9. ConAgra C. Other packers were more interested in purchasing my cattle on a formula basis.

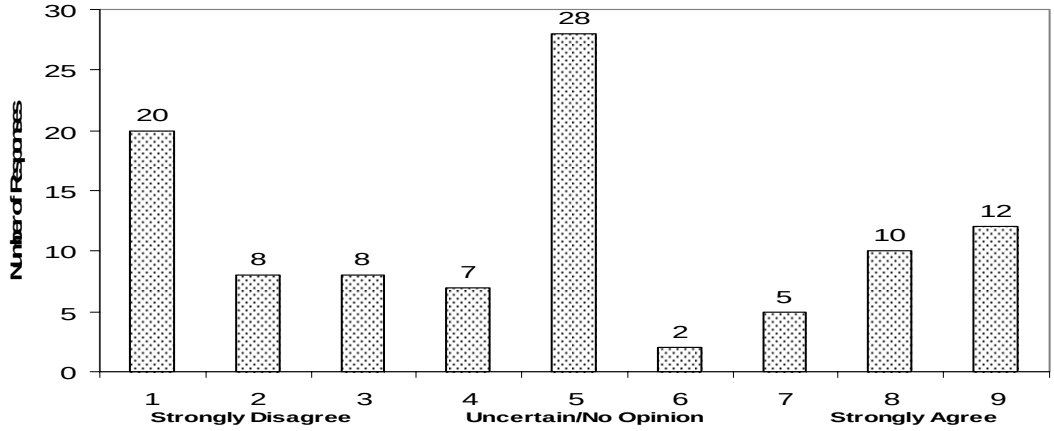

Figure 10. ConAgra D. Cattle from my feedlot were more frequently shipped to a closer packer.

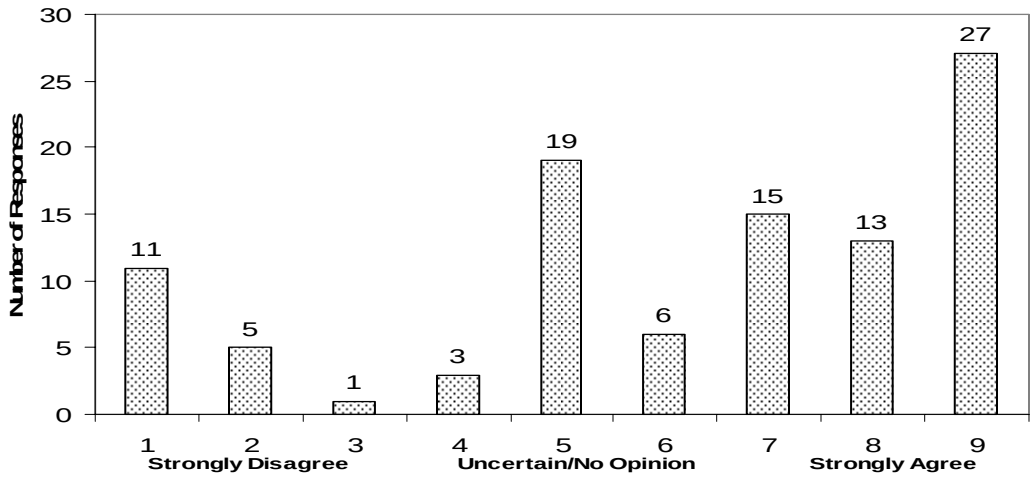

Figure 11. ConAgra E. The effects from captive supplies increased.

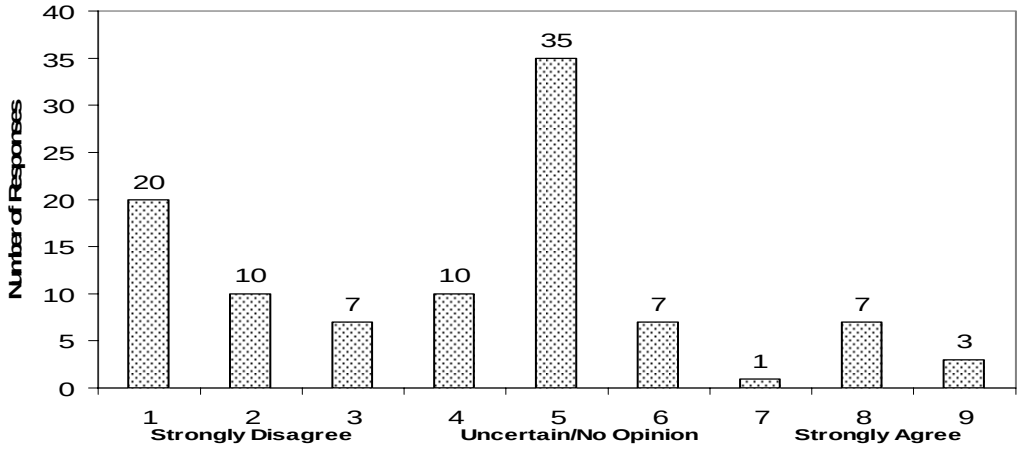

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Figure 12. ConAgra F. Other packers were more interested in contracting cattle from my feedlot.

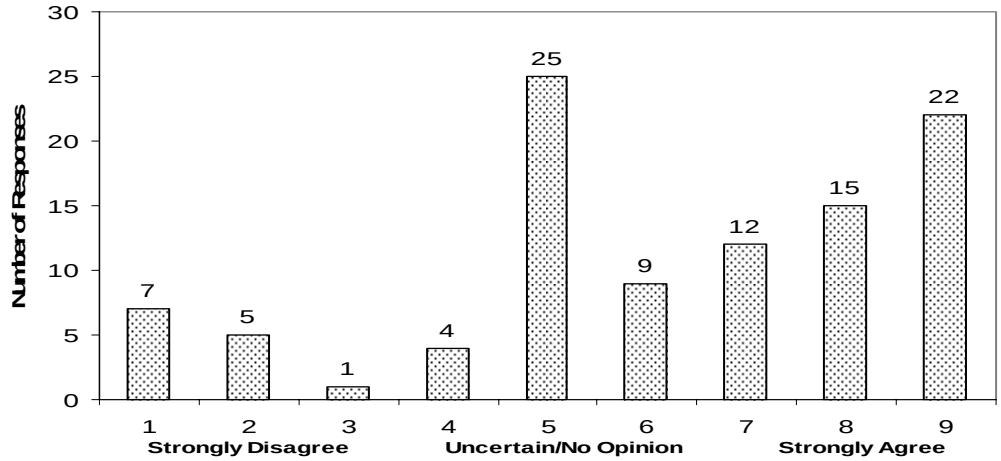

Figure 13. ConAgra G. Fewer plants made it easier for packers to know which ones were in the cash market.

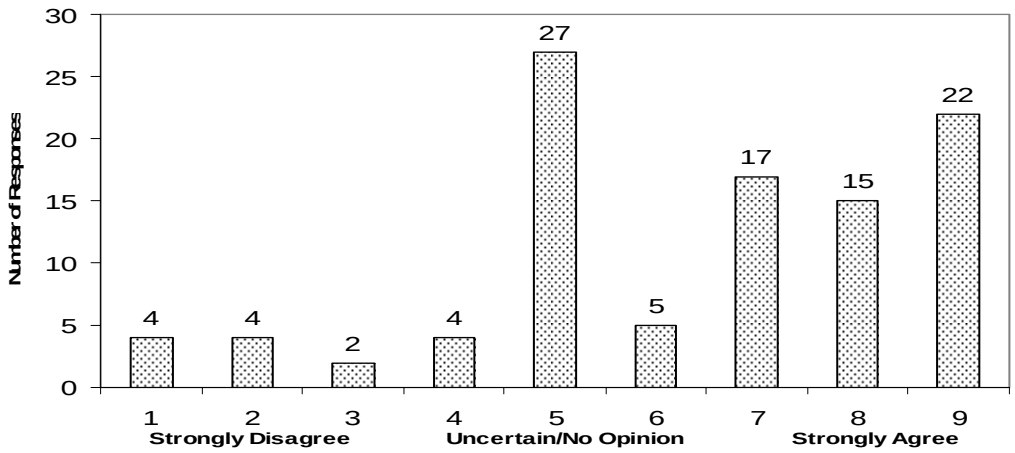

Figure 14. ConAgra H. Fewer plants made it easier for packers to know how many cattle were committed to each packer.

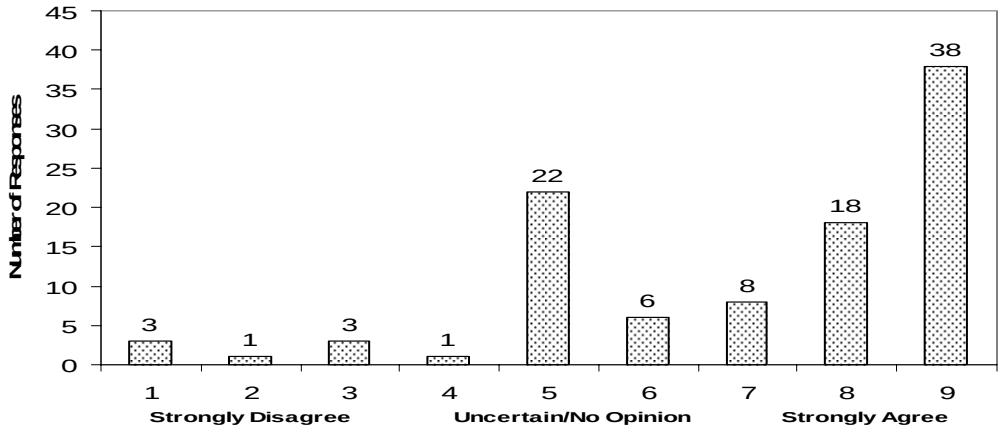

Figure 15. ConAgra I. Fed cattle slaughter capacity in western Kansas became more of a problem.

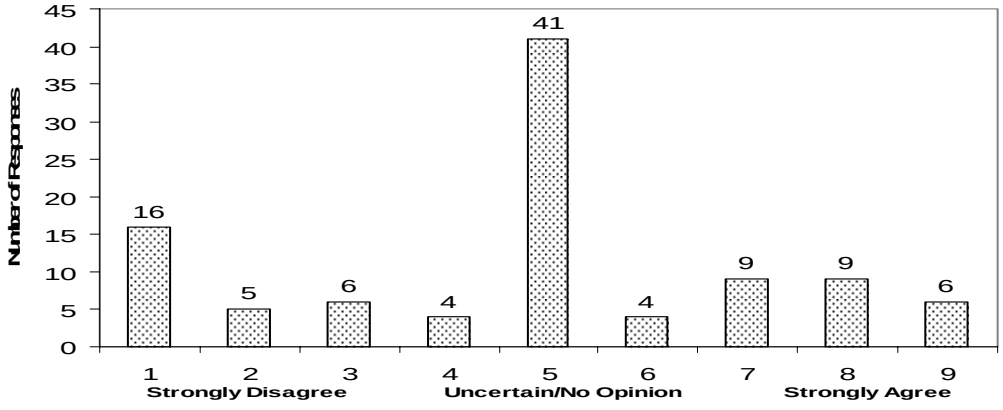

Figure 16. ConAgra J. Feedlots closer to Garden City were less affected than those farther away.

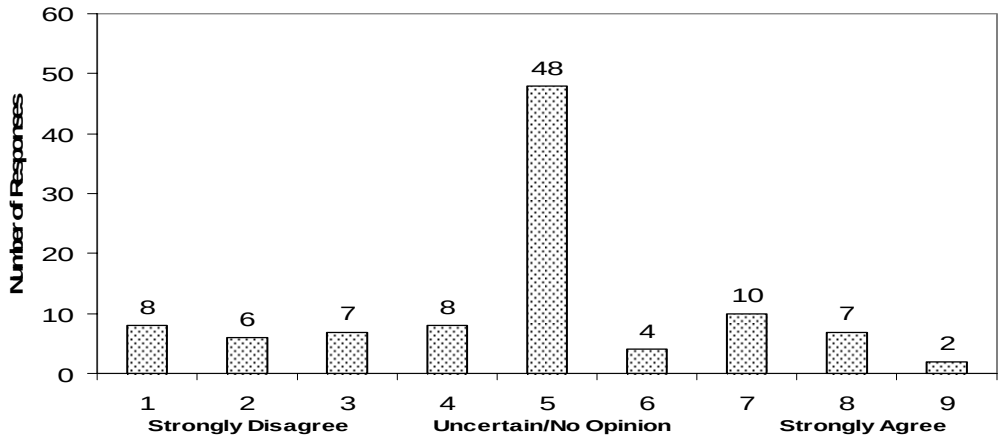

Figure 17. ConAgra K. Other packers were more interested in negotiating base prices on grids.

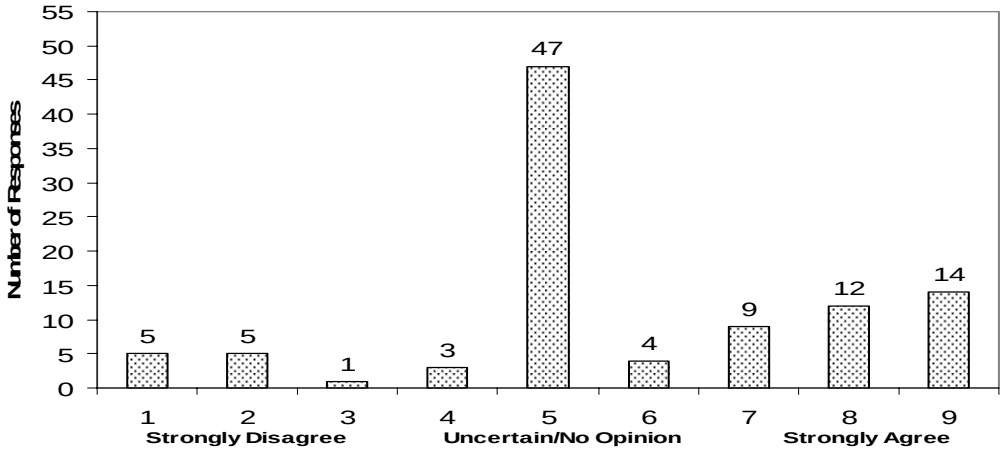

Figure 18. ConAgra L. Fewer plants increased the frequency of special agreements by packers with feedlots.

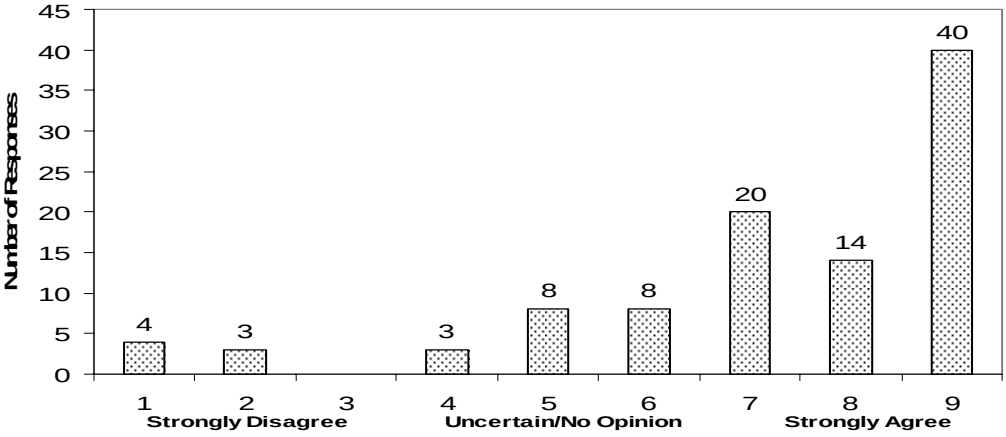

Figure 19. ConAgra M. Other packers gained a psychological advantage from having one fewer plant in the region.

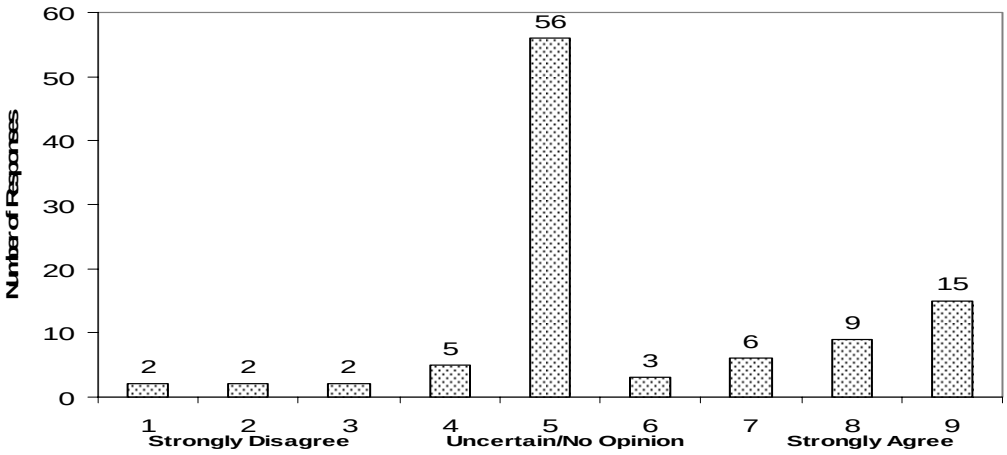

Figure 20. ConAgra N. Feedlots having marketing agreements with ConAgra switched them to another packer.

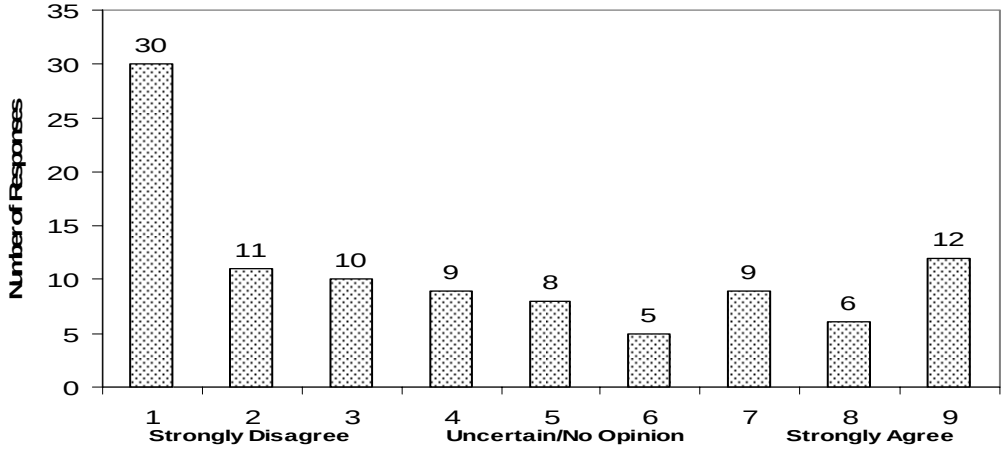

Figure 21. ConAgra O. The plant closing had no noticeable effect on marketing or pricing fed cattle from my feedlot.

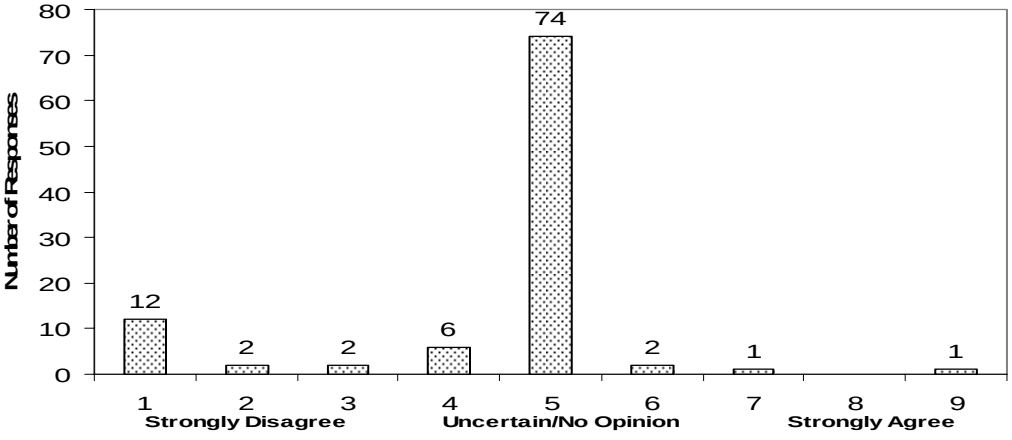

Figure 22. ConAgra P. Feedlots having marketing agreements with ConAgra dropped the agreement in favor of the cash market.

The final question of the survey was an open-ended question asking managers what the most noticeable change was after the plant burned. As could be expected with this type of question, the responses varied. It would be difficult to report these answers. However, the most common response will be summarized. A majority of those responding to this question felt the event decreased the aggressiveness of the ConAgra cattle buyers. This along with the drop in slaughter capacity had a depressing effect on cattle prices.

Maple Leaf Survey Results

The response to the Maple Leaf study was not as high as desired. Part of this could be attributed to the lack of a second mailing. A second mailing was done for the ConAgra study, but could not be completed for the Maple Leaf study due to the costs involved. From the 273 surveys that were mailed to Canadian hog produces, only 80 useable surveys were returned. This is a response rate of 29.3%, which is comparable to other surveys conducted in the livestock industry.

A copy of the Maple Leaf survey with number of respondents to each question (typed in **bold**) can be found in Appendix II. The first three questions dealt with the geographical location and size of the finishing barns. These three factors may influence the type and intensity of impacts absorbed from the plant opening.

Distance, Direction, and Size

Managers within 400 km of Brandon were surveyed. However, the maximum distances from Brandon of all the respondents were in the 240 to 319 km category (three hog producers). No survey participant is located more than 320 km from Brandon. Thirteen respondents are less than 80 km, and the same number are between 160 and 239 km of the plant. The largest groups of participants in this question, fifty-one, are located between 80 and 159 km. The distribution of hog producers is skewed towards barns closer to Brandon. This may lead to slightly more biased results, but the variation is still enough to allow for analysis.

Finishing barn managers that choose to participate in the survey are located in all directions of Brandon. The tendencies are for barns to be located from the south to the east. The majority of survey participants (thirty-seven) are located southeast of Brandon. Six producers are located south of the plant, while seven are east of Brandon. Some of the respondents are north of Brandon, with twelve northwest and eleven located northeast. This distribution should also suffice for this study.

The size of the barns of managers participating tended to be smaller. In 2000, fifty-six respondents said they marketed less than 1,999 hogs from their barns that year. Only seventeen said they marketed between 2,000 and 9,999 head during 2000. The largest category, more than 10,000 head, accounted for five of the survey participants. The 80 producers that completed the survey tended to be smaller in size, closer to Brandon and located south to east of the plant.

A method to examine the distribution of survey respondents is to compare the size of marketing to distance or direction from Brandon. Figure 23, shows the size of

finishing barns and their direction from Brandon. Overall there is variation among sizes and directions. However, it shows that more of the larger finishing barns that participated are northeast to southeast of the plant. Figure 24, compares the size of finishing barns and their distance from Brandon.

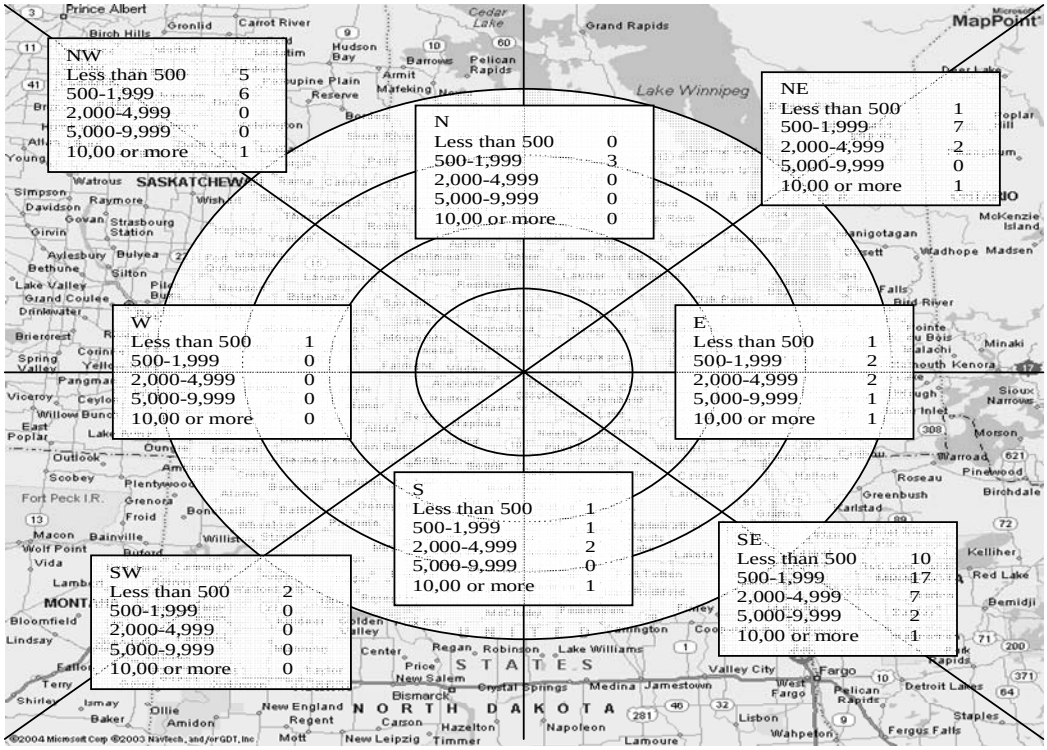

Figure 23. Maple Leaf. Size and Direction of Survey Participants

Source: Microsoft MapPoint

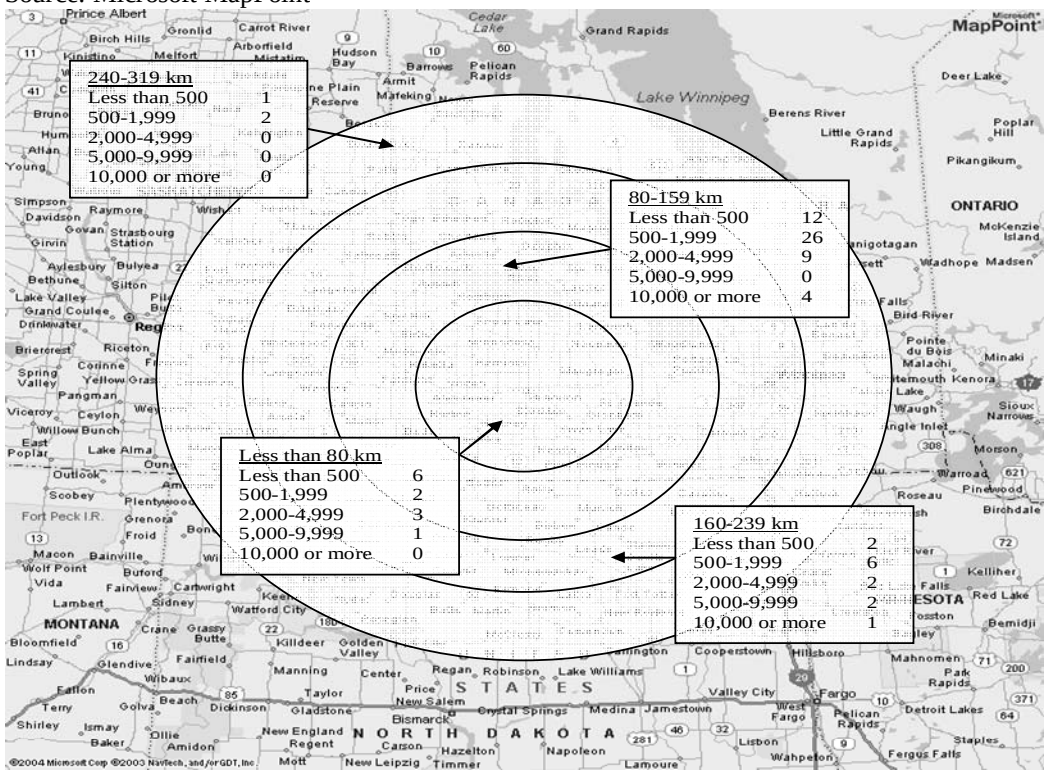

Figure 24. Maple Leaf. Size and Distance of Survey Participants

Source: Microsoft MapPoint

Sales to Packers

Maple Leaf opening a large plant influenced the percentage of hogs that producers sold to different packers. The survey asked producers to indicate the percentage of hogs sold to four packers, other Canadian packers, or U.S. packers in 1999 and 2000 (question 3). During the year of the plant opening[4] eight producers sold less than 40% and two sold more than 60% of their hogs to Maple Leaf. In the next year, nine sold less than 40% and eighteen sold more than 60% to Maple Leaf. Thus, the plant opening increased Maple Leaf's market share in western Manitoba. Schneider and Springhill Farms appeared to lose some of the market in 2000. In 1999, thirty-nine producers sold more than 60% to Schneider and twenty sold more than 60% to Springhill Farms. At the end of the next year this number had dropped to twenty-five producers for Schneider and nineteen producers for Springhill Farms. Best Brand Meats (Forgan) and other Canadian packers only experienced slight changes over the two years. The U.S. packers saw similar changes. The number of producers that sold more than 60% of their hogs to U.S. packers went from four to five during the two years. Overall, Maple Leaf saw an increase in the number and percentage of hogs going to their plant. At this same time, Schneider and Springhill Farms saw fewer producers and a lower percentage of manager's hogs after the event.

Marketing Methods

After the plant opening there was little change in the marketing method used by hog producers. Producers seemed to increase their use of contracts or marketing

[4] The Brandon/Maple Leaf plant opened on August 30, 1999.

agreements compared to the cash or spot market. Thirty-five producers said they marketed over 60% of their hogs on the cash market in 1999. At the end of the next year, only twenty-eight said they marketed more than 60% on this market. The number of managers marketing more than 60% of their hogs with a contract or marketing agreement went from thirty-nine to forty-seven. From 1999 to 2000 producers seemed to decrease the percentage of hogs on the cash market, while increasing the percentage sold with some sort of agreement.

Manager Perceptions

Similar to the ConAgra study, the fifth question of the Maple Leaf survey has several parts. Participants were asked, on a scale from 1 to 9, if they disagree or agree with a statement. If a producer was unsure or did not have an opinion they marked 5. The questions that had a majority of responses that centered around uncertain/no opinion will not be discussed. The numbers of responses to each part are shown graphically in figures 25 through 37. The average response can be found (typed in **bold**) in the copy of the survey, Appendix I.

Producers were asked if the plant opening caused higher prices in the region (part B). The majority of respondents disagreed with this statement, with 39 strongly disagreeing with this statement, figure 26. The average response to this question is 2.84. While producers believe that higher prices did not occur in the region, there is some discrepancy when asked if there were any changes to pricing and marketing of their hogs (part F). The average response is neutral (5.01), but 19 producers strongly disagreed and 18 producers strongly agreed, figure 30. With the responses to these questions, the

majority of managers either believe that the event caused lower prices or there was no noticeable effect.

When asked if the plant opening caused more bidding on the cash market for hogs from their barns (part A), the average response was 2.34. Producers overwhelming disagreed with this statement, with 51 strongly disagreeing, figure 25. Managers also felt that other packers were not more interested in their hogs (part E), figure 29. The average response to this question is 3.84. Hog producers did not see an increase in the number of bidders and did not believe other packers became more interested in their hogs.

Producers were asked if their hogs were shipped to a closer packer in part C. On average producers response was 3.95. They tended to disagree with this statement, with 21 strongly disagreeing, figure 27. While the distance to a packer did not seem to decrease, producers are divided when asked about the effects on slaughter capacity (part H). The average response was 5.09. However, 15 strongly disagreed and 10 strongly agreed that slaughter capacity in Manitoba became less of a problem. The plant opening did not decrease the distance to a packer, but the effects on slaughter capacity vary between producers.

When asked if other packers lost their competitive advantage from the introduction of the Maple Leaf plant (part K), the average response was 5.50. The majority of producers agreed with this statement, figure 35. Producers believed that the other packers lost their competitive advantage and did not believe that it became harder to know how many hogs were committed to each packer (part G). Managers disagreed with this statement (figure 31), which had an average response of 4.00.

Managers were also asked if the plant opening was a catalyst for hog producers to expand their operations (part J). With an average of 5.31, there is a slight agreement with this statement. However, 16 producers strongly disagreed and 12 strongly agreed, figure 34. There appears to be a division in producers if the plant opening caused expansion in hog operations.

The remaining questions (Figures 28, 33, 36, and 37) received responses where the majority of producers were uncertain or had no opinion. Overall, producers think the Maple Leaf plant opening depressed hog prices, other packers may not have been more interested in their hogs, other packers lost their competitive advantage, and their hogs were not shipped to a closer packer. The correlations between questions are presented in table 30, Appendix II.

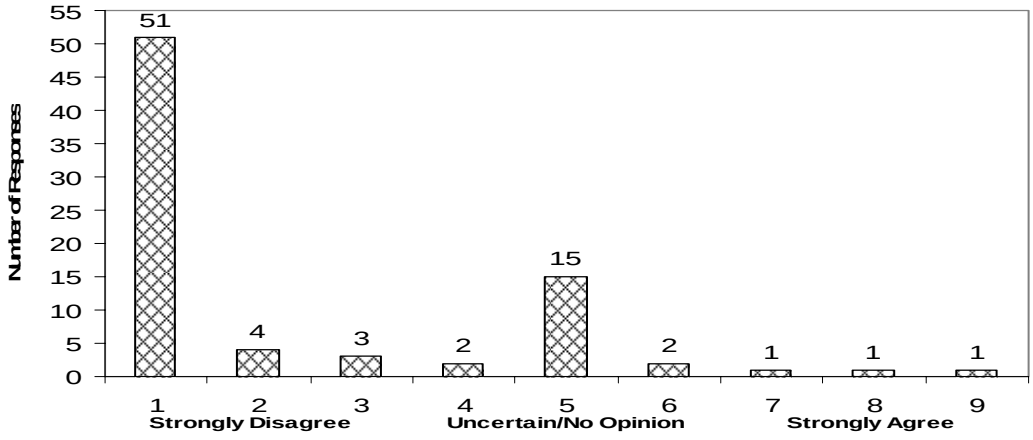

Figure 25. Maple Leaf A. The number of buyers bidding for cash market hogs from my finishing barns increased.

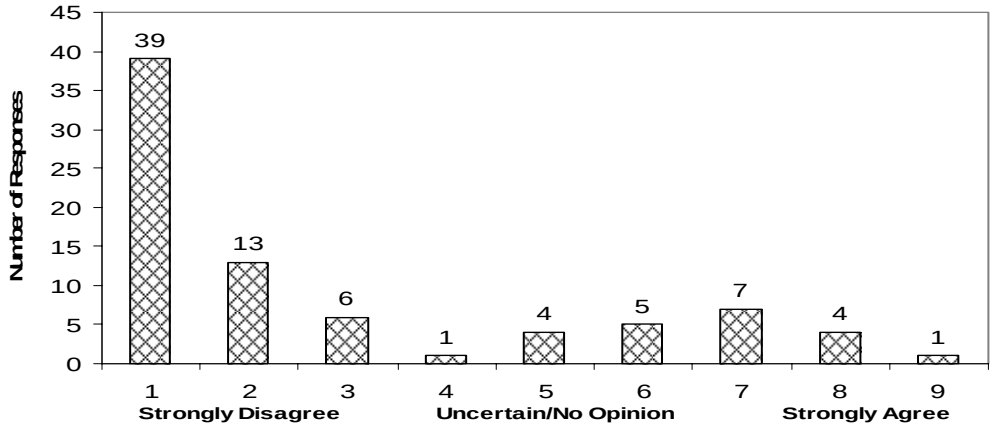

Figure 26. Maple Leaf B. The addition of the Maple Leaf Foods plant caused higher hog prices in the region.

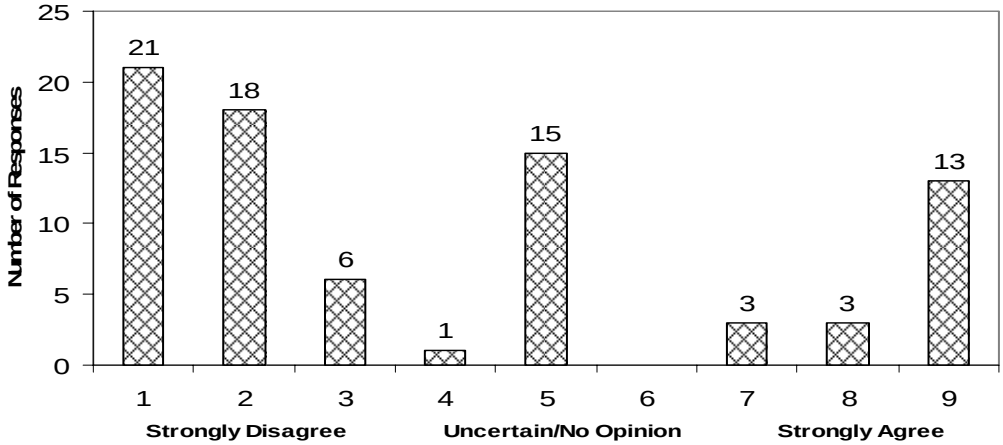

Figure 27. Maple Leaf C. Hogs from my finishing barns were more frequently shipped to a closer packer.

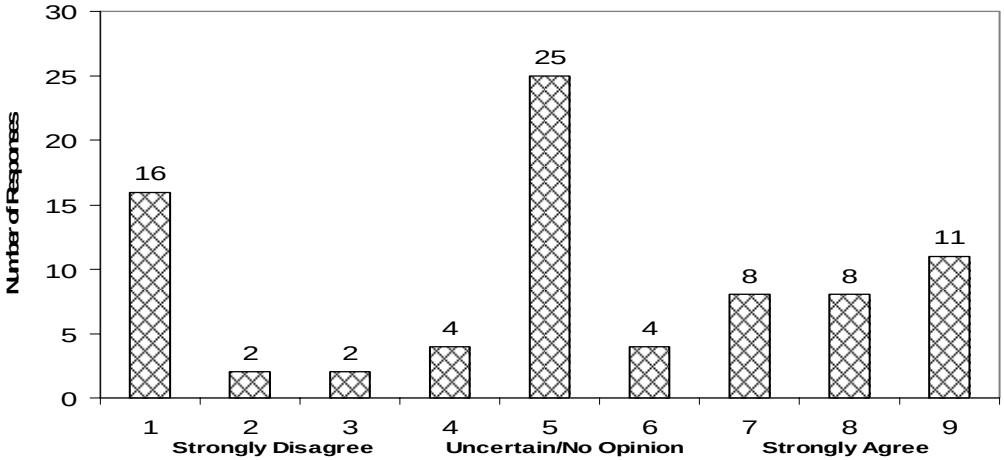

Figure 28. Maple Leaf D. The opening of the Maple Leaf Foods plant decreased the number of finished hogs shipped to the United States.

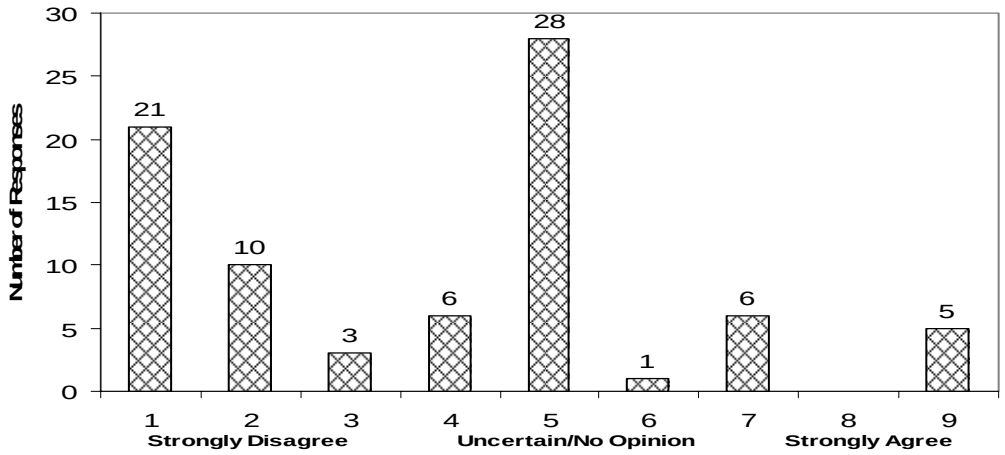

Figure 29. Maple Leaf E. Other packers were more interested in contracting hogs from my finishing barns.

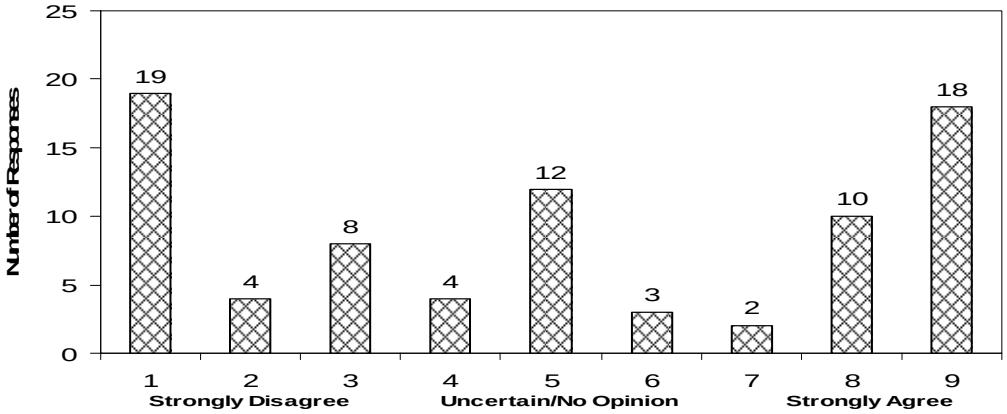

Figure 30. Maple Leaf F. The plant opening had no noticeable effect on marketing or pricing hogs from my finishing barns.

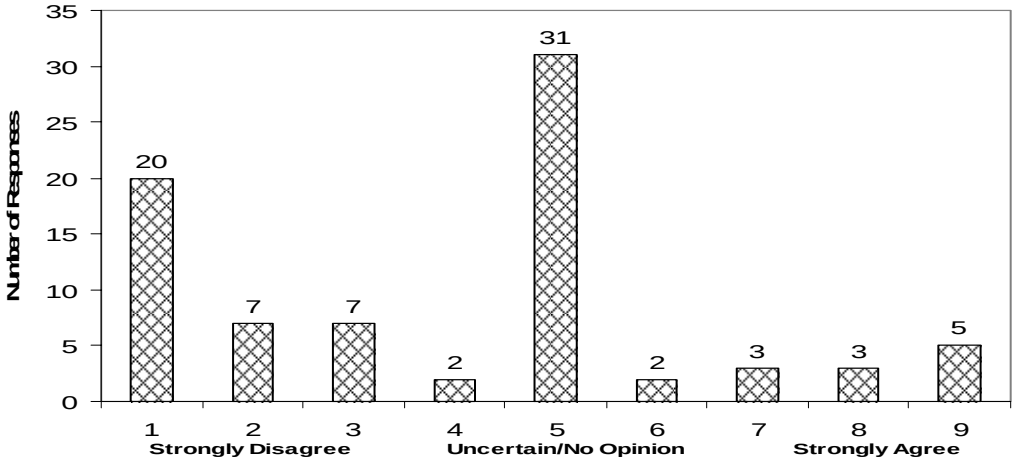

Figure 31. Maple Leaf G. More plants made it more difficult for packers to know how many hogs were committed to each packer.

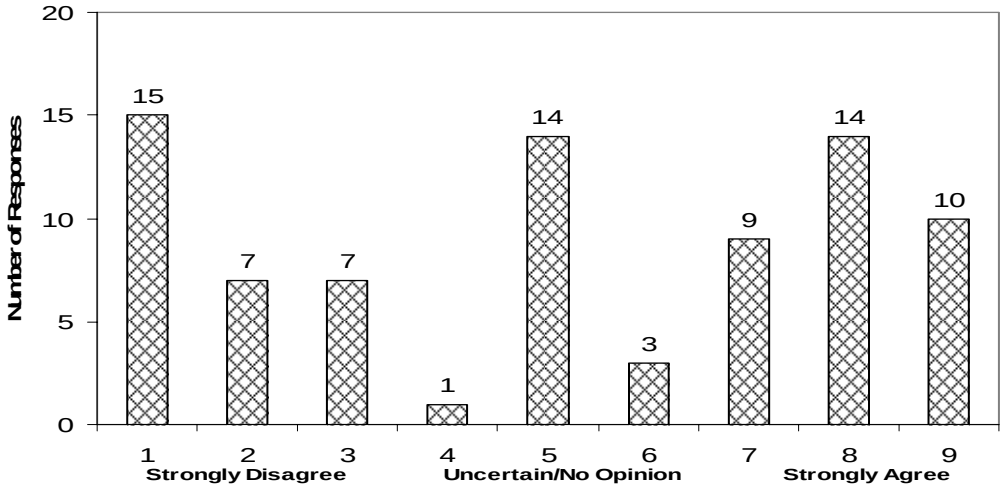

Figure 32. Maple Leaf H. Hog slaughter capacity in Manitoba became less of a problem.

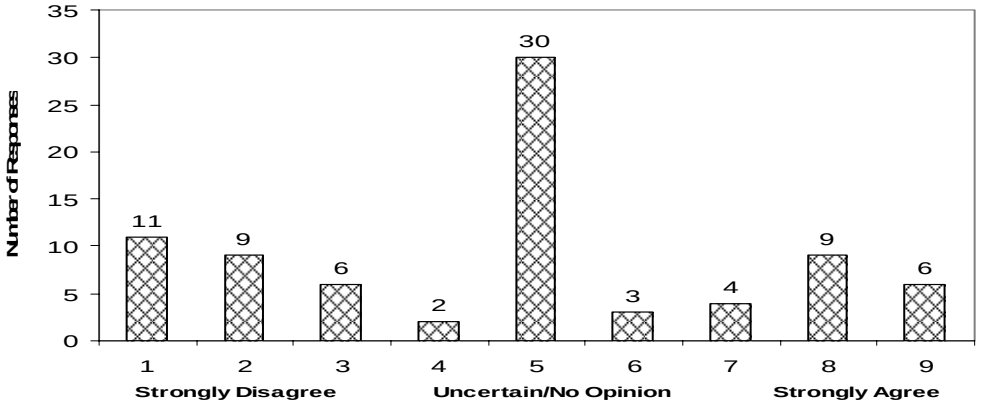

Figure 33. Maple Leaf I. Finishing barns closer to Brandon were more affected than those farther away.

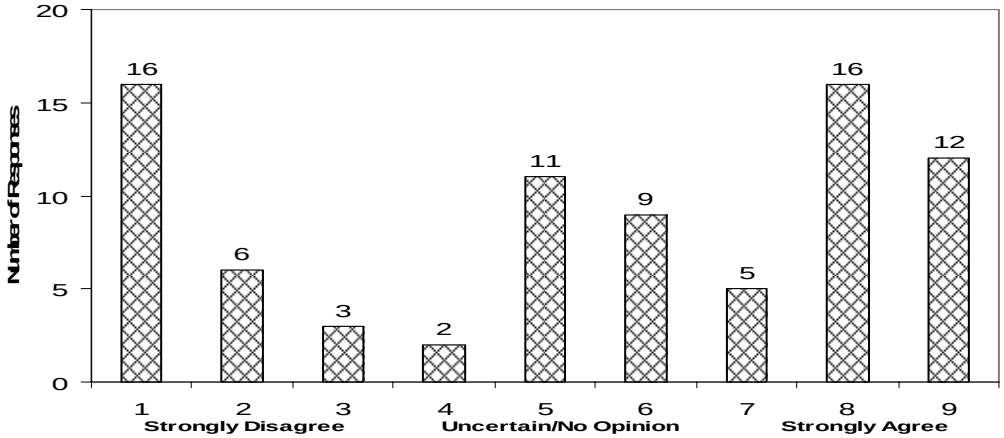

Figure 34. Maple Leaf J. Hog producers expanded their hog operations due to the opening of the Maple Leaf Foods plant in Brandon.

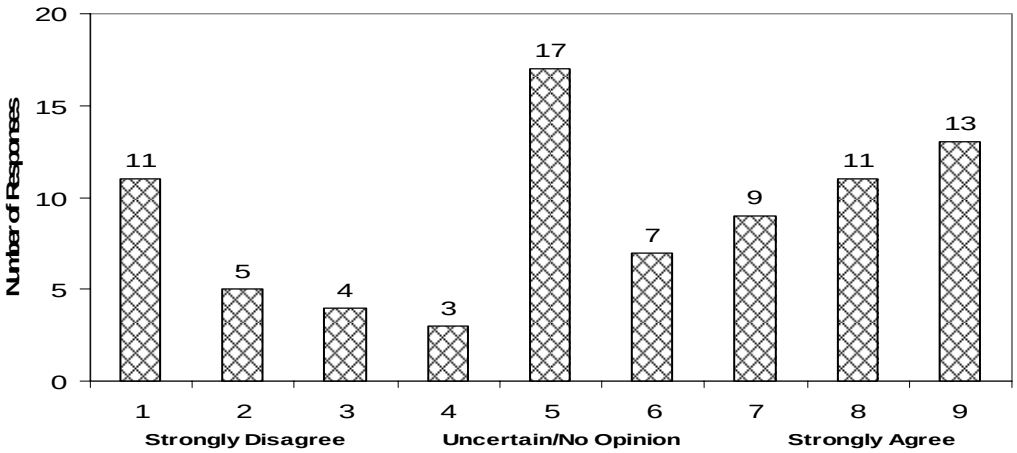

Figure 35. Maple Leaf K. Other packers lost their competitive advantage from having one additional plant in the region.

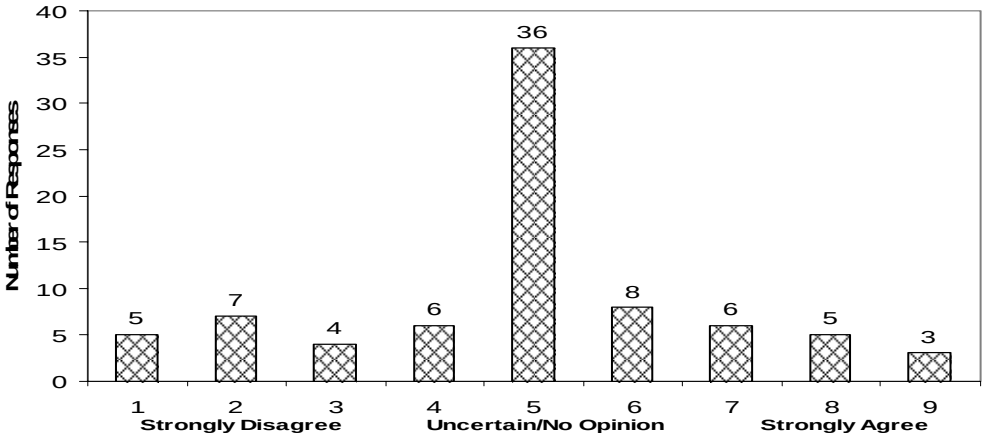

Figure 36. Maple Leaf L. Finishing barns having marketing agreements with another packer switched them to Maple Leaf Foods.

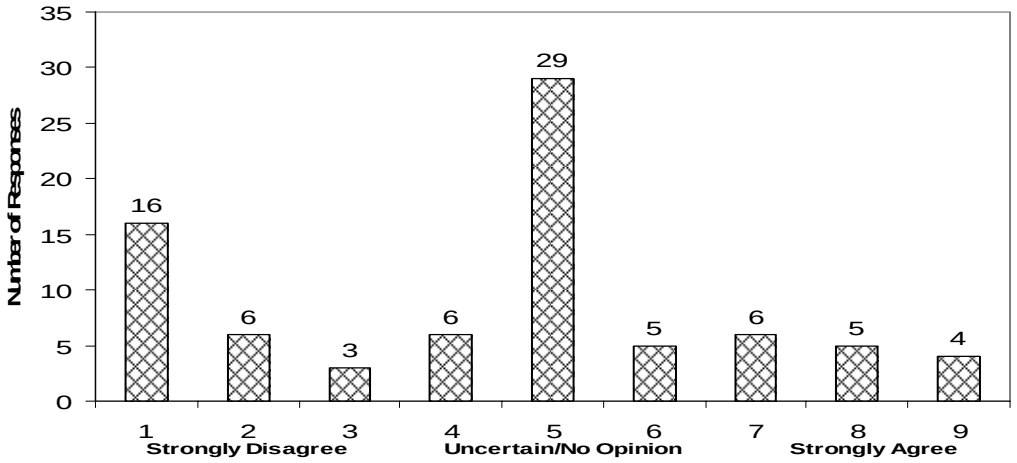

Figure 37. Maple Leaf M. Opening the Maple Leaf Foods plant reduced feeder pig exports to the United States.

The final question of the survey asked hog producers what was the most noticeable change to their operations after the plant opening. With this type of open-ended question, the responses varied widely. Some producers have a strong resentment to Maple Leaf, while others were satisfied with the addition of a plant in western Manitoba. The positive responses included producers that believed prices increased and the Manitoba hog industry became less dependent on the U.S. hog packing industry.

The negative responses were in regards to the rules and regulations instated on grids by Maple Leaf. Some producers also felt that bidders became less aggressive. The lack of aggressiveness in the market could be from the fact that Maple Leaf Foods owns Elite Swine and Landmark. Elite Swine is the largest hog producer in Canada. While the percentage of Elite Swine entering the Brandon plant is unknown, if the estimated yearly Elite Swine production of 1 million hogs were processed at Brandon, this would be about 40% of its yearly slaughter. Landmark contracts hogs with producers. While Maple Leaf Foods does not own the Landmark hogs themselves, it is estimated that 50% of the hogs entering the plant are contracted through Landmark. The combination of these factors might have caused producers to not see large price increases with the additional plant.

Surveying producers several years after the plant opening affects the results. If producers were surveyed in 2000 and 2001, right after the plant opening, their perceptions might have been different. Waiting several years allowed the more recent actions of Maple Leaf Foods to influence manager's attitudes and perceptions of the company and their position in the porkpacking industry.

ConAgra Ordered Logit Results

Using the ordered logit model discussed in Chapter 5, the producers market perceptions were modeled with feedlot characteristics and manager's opinions (equations 17 and 18). The results of these models are shown in tables 16 through 21. Due to the structure, ordered logit models tend to have problems with multicollinearity. Both models were tested and while some multicollinearity was found, it was not at levels requiring model adjustments. The numbers of respondents to the control variables (distance, size, % sold to ConAgra, and % sold on the cash market) are presented in table 15.

The impacts on the dependent variables from the addition and/or deletion of the four independent opinion variables (*Opinion A, E, I, and M*) are expressed in tables 16 and 17. Ordered logit models for each dependent variable were estimated in several ways: without any opinion variables, with each opinion separately, and with all the opinion variables.

Interpreting the parameter estimates shown in table 16 is difficult. The parameter estimates do not have the same interpretation as linear regressions. The estimates show the change in the natural log of the cumulative probabilities of the dependent variable. While value is difficult to interpret and may not be useful, the significance is relevant. The distance that a feedlot manager is from Garden City influences their opinion that the plant closing had no noticeable effect. This was true with all the models. The percentage of cattle sold to ConAgra, as well as the percentage of cattle sold on the cash market, during the year prior to the plant closing were significant in all models. When the

independent opinion variables were used by themselves, they were significant in all cases. However, when all four are used, A, I, and M were significant.

The likelihood ratio can be used to measure the fit of the model. Care must be taken when comparing these values. Similar to a R^2 value, adding independent variables will increase the likelihood ratio. Thus comparison between likelihood ratios must be done between models with comparable independent variables. With *Opinion O* as the dependent variable, the likelihood ratio is 39.2 with no additional independent variables (table 16). Adding one of the opinion variables increases the ratio to the fifties. Using all four opinion variables, the likelihood ratio is at the highest level of 72.28.

The second model asked if the plant closing caused lower fed cattle prices in the region (*Opinion B*). This model used the same independent variables. It was estimated using none of the independent opinion variables, with each one separately, and all variables (table 17). As with the other model, the parameter significance is more important than the sign. The distance parameter is significant in all models, except when all the variables are in the model. The *Size* and *ConAgraMKT* variables are not significant in any model. The *CashMKT* parameter is only significant in the model with no opinion variables. The opinion variables are significant in the models with just one of these variables. When all of them are used in the model, only *Opinion A*, *Opinion E*, and *Opinion I* are significant.

The likelihood ratios with *Opinion B* are lower than the other model. The ratio with no additional variables is 17.3. These ratios increase when including one of the four opinion variables and ranges from 32 to 47. These ratios are smaller than the ones

calculated in table 16. The likelihood ratio when all the opinion variables are added is 71.8, which is comparable to the other model.

The odds ratios for both models are presented in tables 18 and 19. The models are arranged so that they predict the odds of being in a lower category. The odds ratios show the odds of an individual being in a lower dependent variable category for each 1 unit increase in the independent variable. Most of the ratios are almost 1. This would mean that the odds of being in a lower category do not change much with an increase in the independent variable. The odds ratios for each of the models, with and without the opinion variables are in tables 18 and 19. A few of the ratios when including all the opinion variables will be discussed. For *Opinion M*, for every 1 unit increase in this variable, the odds of being in a lower category of *Opinion O* would increase the odds of being in a lower category by 1.22. In the other model, for every 1 unit increase in *Opinion M* the odds of being in a lower category of *Opinion B* would increases 0.855.

The marginal probabilities of each independent variable were calculated using equation 16. This value shows how the probability of a particular agreement level will change as the independent variable increases from its mean. The mean values for each variable were used to calculated marginal probabilities (means can be found in tables 13 and 14). The marginal probabilities of the model with *Opinion O* as the dependent variable are presented in table 20. In *Opinion A*, producers were asked if the number of buyers decreased. The marginal probabilities are positive for this independent variable when the disagreement equals 1, 2, or 3. The remaining marginal probabilities are negative. This means as the level of agreement that number of buyers decreased, the probability that producers disagreed there was no impact (*Opinion I*) increased and the

probability that producers agreed there was no impact decreased. This also is the case with the question regarding the effects of captive supplies increased (*Opinion E*). As the level of agreement that captive supplies became more of a problem, the probability that producers disagreed that the closing had no impact increased and the probability that they agreed decreased. Producers were questioned if slaughter capacity became more of a problem in *Opinion I*. This variable had positive marginal probabilities over the lower ranges. As the level of agreement with *Opinion I* increased the probability that producers disagreed that the closing had no impact increased and the probability that they agreed decreased. The fourth opinion (*Opinion M*) question asked producers if they thought the closing gave the remaining packers a psychological advantage. As the level of agreement that packers had an advantage increased, the probability that producers disagreed with *Opinion O* increased and the probability that they agreed decreased.

The marginal probabilities for the distance variable are negative with levels of disagreement and positive for levels of agreement to *Opinion O*. This means as the distance of feedlots from Garden City increases, the level of disagreement that there was no impact decreases and the level of agreement of no impact increases. Producers closer to Garden City were more likely to think that the plant closing did impact the market, than managers that were farther away. The marginal probabilities for the size parameter are almost zero. Thus, no interpretation can be made on the influence of size on the level of agreement to *Opinion O*. If the percentage of cattle sold to ConAgra in 2000 increases from the mean the probability that producers disagreed that the plant closing had no impact increases and the probability of agreement decreases. This means that producers that sold more cattle to ConAgra are more likely to think the closing affected the market.

This is also the case with the cash market variable. If the percentage of cattle sold on the cash market increases, the probability that producers disagreed there was no impact increases and the probability that they agreed decreases. This means that if producers sold more cattle on the cash market, they were more likely to think the closing impacted the market.

The marginal probabilities with *Opinion B* as the dependent variable are presented in table 21. If a producer had a higher level of agreement with the statement that the number of buyers decreased, the probability that they disagreed that the prices dropped decreased and the probability that they agreed increased. This means if they felt the number of buyers decreased, they would also tend to agree that prices decreased. The same is the case with *Opinion E*, *I*, and *M*. If producers' level of agreement to those statements increases, the probability of disagreement that the price dropped decreases and the probability that they agreed increases. With the distance variable, as the distance from Garden City increases, the probability that producers disagreed with *Opinion B* increased and the probability of agreement decreased. Feedlots closer to Garden City felt the closure decreased prices more than feedlot managers who were farther away. The *Size*, *ConAgra*, and *Cash* variables are almost zero and no interpretation can be made.

The ordered logit models developed for the ConAgra study show several important perceptions of cattle feeders. Managers that felt the closure had a negative impact on various market factors, for example captive supplies and slaughter capacity, and they also thought the closure decreased prices. Secondly, the farther a producer was from Garden City the less likely he/she was to agree that the closing affected the market and depressed prices. Producers that sold more cattle to ConAgra were also more likely

to agree that impacts occurred. Finally, the more a producer relied on the cash market the more likely he/she was to think that negative impacts occurred. These were expected because if a producer was selling a large percentage of cattle to ConAgra and/or on the cash market the more susceptible they would be to changes affecting a ConAgra plant. While these factors help to explain the levels of agreement of potential impacts, most feedlot managers felt that the closing did impact the fed cattle market and drove down prices.

Table 15. ConAgra. Number of Responses to Independent Control Variables

Question	Category	Number of Responses
Distance (miles)	Less than 50	23
	50 to 99	14
	100 to 149	28
	150 to 199	22
	200 or more	13
Size (head)	Less than 5,000	8
	5,000 to 19,999	24
	20,000 to 49,999	25
	50,000 to 99,999	28
	100,000 or more	15
ConAgraMKT *% sold to ConAgra before*	Less than 20%	38
	20% to 39%	24
	40% to 59%	8
	60% to 79%	2
	80% or more	10
CashMKT *% sold Cash Market before*	Less than 20%	9
	20% to 39%	10
	40% to 59%	10
	60% to 79%	12
	80% or more	43

Table 16. ConAgra Logit Independent Variables Results. Opinion O

	Models with the addition of the following variables					
Independent Variable	None	A	E	I	M	A,E,I,M
Distance	-0.013**	-0.01**	-0.01**	-0.009**	-0.011**	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Size	0.000004	0.000006	0.000004	0.000005	0.000004	0.000006
	(0.000005)	(0.000005)	(0.000005)	(0.000005)	(0.000005)	(0.000005)
ConAgraMKT	0.022**	0.024**	0.018**	0.017**	0.018**	0.016**
% sold to ConAgra before	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)
CashMKT	0.02**	0.02**	0.0164**	0.018**	0.018**	0.016**
% sold Cash Market before	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Opinion A	---	0.269**	---	---	---	0.169**
		(0.065)				(0.068)
Opinion E	---	---	0.296**	---	---	0.128
			(0.076)			(0.086)
Opinion I	---	---	---	0.387**	---	0.206**
				(0.098)		(0.110)
Opinion M	---	---	---	---	0.353**	0.201**
					(0.095)	(0.101)
Likelihood Ratio	39.20	57.23	52.84	55.00	53.72	72.28

Numbers in parentheses are standard errors.

Significance levels are **=0.05, *=0.10.

Table 17. ConAgra Logit Independent Variables Results. Opinion B

	Models with the addition of the following variables					
Independent Variable	None	A	E	I	M	A,E,I,M
Distance	0.009**	0.007**	0.009**	0.006**	0.008**	0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Size	-0.0000003	-0.000002	0.000002	-0.0000005	-0.00000001	0.000001
	(0.000005)	(0.000005)	(0.000005)	(0.000005)	(0.000005)	(0.000005)
ConAgraMKT	-0.008	-0.010	-0.001	0.0005	-0.005	0.00002
% sold to ConAgra before	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
CashMKT	-0.010*	-0.008	-0.002	-0.005	-0.006	-0.0008
% sold Cash Market before	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Opinion A	---	-0.292**	---	---	---	-0.212**
		(0.065)				(0.068)
Opinion E	---	---	-0.461**	---	---	-0.310**
			(0.083)			(0.088)
Opinion I	---	---	---	-0.521**	---	-0.277**
				(0.104)		(0.113)
Opinion M	---	---	---	---	-0.356**	-0.156
					(0.094)	(0.101)
Likelihood Ratio	17.32	38.46	46.99	45.25	32.36	71.82

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Table 18. ConAgra Odds Ratio Estimates. O Dependent Variable

	Models with the addition of the following variables					
Effect	None	A	E	I	M	A,E,I,M
Distance	0.989	0.990	0.989	0.991	0.989	0.992
Size	1.000	1.000	1.000	1.000	1.000	1.000
ConAgraMKT	1.022	1.024	1.018	1.017	1.018	1.016
CashMKT	1.020	1.020	1.017	1.018	1.018	1.016
Opinion A	---	1.309	---	---	---	1.185
Opinion E	---	---	1.345	---	---	1.136
Opinion I	---	---	---	1.472	---	1.228
Opinion M	---	---	---	---	1.423	1.223

Table 19. ConAgra Odds Ratio Estimates. B Dependent Variable

	Models with the addition of the following variables					
Effect	None	A	E	I	M	A,E,I,M
Distance	1.009	1.007	1.009	1.006	1.008	1.005
Size	1.000	1.000	1.000	1.000	1.000	1.000
ConAgraMKT	0.992	0.990	0.999	1.001	0.995	1.000
CashMKT	0.991	0.992	0.998	0.995	0.994	0.999
Opinion A	---	0.747	---	---	---	0.809
Opinion E	---	---	0.631	---	---	0.733
Opinion I	---	---	---	0.594	---	0.758
Opinion M	---	---	---	---	0.701	0.855

Table 20. ConAgra. Opinion O Results and Marginal Probabilities

Variable	Parameter Estimate	Std. Error	P-Value	1	2	3	4	5	6	7	8	9
intercept 1	-6.6559	1.2218	0.0001									
intercept 2	-5.8127	1.1884	0.0001									
intercept 3	-5.0430	1.1580	0.0001									
intercept 4	-4.3607	1.1325	0.0001									
intercept 5	-3.7961	1.1127	0.0006									
intercept 6	-3.4507	1.1013	0.0017									
intercept 7	-2.7212	1.0800	0.0117									
intercept 8	-2.1052	1.0697	0.0491	**Marginal Probabilities**								
Opinion A	0.1694	0.0676	0.0122	0.0258	0.0127	0.0037	-0.0063	-0.0088	-0.0055	-0.0093	-0.0051	-0.0071
Opinion E	0.1277	0.0862	0.1385	0.0194	0.0096	0.0028	-0.0047	-0.0067	-0.0041	-0.0070	-0.0039	-0.0054
Opinion I	0.2055	0.1099	0.0615	0.0313	0.0154	0.0044	-0.0076	-0.0107	-0.0066	-0.0113	-0.0062	-0.0086
Opinion M	0.2014	0.1013	0.0467	0.0306	0.0151	0.0043	-0.0075	-0.0105	-0.0065	-0.0111	-0.0061	-0.0084
Distance	-0.0081	0.0031	0.0100	-0.0012	-0.0006	-0.0002	0.0003	0.0004	0.0003	0.0004	0.0002	0.0003
Size	0.0000	0.0000	0.2243	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ConAgra	0.0156	0.0075	0.0383	0.0024	0.0012	0.0003	-0.0006	-0.0008	-0.0005	-0.0009	-0.0005	-0.0007
CashMKT	0.0159	0.0056	0.0047	0.0024	0.0012	0.0003	-0.0006	-0.0008	-0.0005	-0.0009	-0.0005	-0.0007

Table 21. ConAgra. Opinion B and Marginal Probabilities

Variable	Parameter Estimate	Std. Error	P-Value	1	2	3	4	5	6	7	8	9
intercept 1	1.9082	0.3783	0.0001									
intercept 2	2.4823	0.3814	0.0001									
intercept 3	2.8377	0.3852	0.0001									
intercept 4	2.9530	0.3866	0.0001									
intercept 5	4.8598	0.4170	0.0001									
intercept 6	5.5491	0.4256	0.0001									
intercept 7	6.5384	0.4380	0.0001									
intercept 8	7.1853	0.4456	0.0001	**Marginal Probabilities**								
Opinion A	-0.2120	0.0239	0.0001	-0.0058	-0.0040	-0.0036	-0.0014	-0.0337	-0.0044	0.0128	0.0129	0.0272
Opinion E	-0.3104	0.0312	0.0001	-0.0084	-0.0059	-0.0053	-0.0020	-0.0494	-0.0064	0.0187	0.0190	0.0398
Opinion I	-0.2766	0.0400	0.0001	-0.0075	-0.0053	-0.0047	-0.0018	-0.0440	-0.0057	0.0167	0.0169	0.0355
Opinion M	-0.1562	0.0355	0.0001	-0.0042	-0.0030	-0.0027	-0.0010	-0.0249	-0.0032	0.0094	0.0095	0.0200
Distance	0.0048	0.0011	0.0001	0.0001	0.0001	0.0001	0.0000	0.0008	0.0001	-0.0003	-0.0003	-0.0006
Size	0.0000	0.0000	0.4369	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ConAgra	0.0000	0.0026	0.9946	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CashMKT	-0.0008	0.0019	0.6713	-0.0000	-0.0000	-0.0000	-0.0000	-0.0001	-0.0000	0.0000	0.0001	0.0001

Maple Leaf Ordered Logit Results

Using the ordered logit model discussed in Chapter 5, hog producers' market perceptions were modeled with finishing barn characteristics and manager's opinions (equations 19 and 20). The results of these models are shown in tables 23 through 28. Due to the structure, ordered logit models tend to have problems with multicollinearity. Both models were tested and while some multicollinearity was found, it was not at levels requiring model adjustments. The numbers of respondents to the control variables (distance, size, % sold to Maple Leaf, and % sold on the cash market) are presented in table 22.

The impacts on the dependent variables from the addition and/or deletion of the three independent opinion variables (*Opinion A, H,* and *K*) are expressed in tables 23 and 24. Ordered logit models for each dependent variable were estimated in several ways: without any opinion variables, with each opinion separately, and with all the opinion variables.

The first model asked producers if the addition of the Maple Leaf plant caused higher prices in the region, *Opinion B.* The significance of the parameters from running the various models is shown in table 23. As previously discussed, significance is the most important factor, while the parameter estimate is difficult to interpret. The *Distance* parameter was important in all models. The *Size, MapleLeafMKT,* and *CashMKT* parameters were not significant in any case. When one of the opinion variables was added to the model, *Opinion A* and *Opinion H* were significant. Finally, when all the parameters were added, only *Distance, Opinion A,* and *Opinion H* were important in the model.

The likelihood ratios for this model were small. This is expected because few of the parameters are significant. The ratios range from 8 with no opinion variables to 38 with all of the opinion variables.

The second model, *Opinion F*, asked producers if the opening had no noticeable impacts on the market. The parameter estimates and significance are presented in table 24. The variables in this model did little to explain hog producers' agreement or disagreement to *Opinion F*. The *Opinion K* variable was significant when it was added to the model. It was also the only significant parameter when all the opinion variables were added. The likelihood ratios are the smallest in this model than any other. The ratios range from 1.8 to 4.7. When compared to the other models, they are the significantly smaller. Thus, these variables do little to explain producers' perceptions.

The odds ratios for these models are in tables 25 and 26. Most of the ratios in this case are also close to 1. Thus it is difficult to make interpretations of great significance. For example, when all the opinion variables are included in the *Opinion F* model, for every 1 unit increase in *Opinion K* the odds of being a lower category of the dependent variable are 1.149.

The marginal probabilities of each independent variable were calculated using equation 16. This value shows how the probability of a particular agreement level will change as the independent variable increases from its mean. The marginal probabilities of the model with *Opinion B* as the dependent variable are presented in table 27. The marginal probabilities with *Opinion B* need to be interpreted carefully. In most cases the marginal probability at a disagreement level of 1 have either a positive or negative sign, while the remaining levels possess the opposite sign. This is of concern because a level

of 2 or 3 can still be considered disagreement. One would expect the sign to change at some level of uncertainty. A possible explanation in this case could be the limited number of survey participants and the fact that producers' responses may be influenced by events occurring several years after the opening.

In *Opinion A*, producers were asked if the number of buyers increased. The marginal probability for this variable is negative for a disagreement level of 1 and positive in the other levels. As more producers agree that the number of buyers in the market increased, the probability that they disagreed that prices were higher would decrease and the probability that they would agree would increase. This would mean that if a producer agreed that the number of buyers increased, they would also tend to agree that prices increased. Whether or not slaughter capacity in Manitoba became less of a problem was the focus of *Opinion H*. The marginal probabilities show that if a producer's level of agreement with *Opinion H* increased, their level of disagreement would decrease and their level of agreement to higher prices would increase. If producers agreed that slaughter capacity was less of a problem, they would be more likely to agree that the opening caused higher prices. If packers lost their competitive advantage from the addition of the Maple Leaf plant was asked in *Opinion K*. These probabilities show that as the level of agreement to *Opinion K* increased, the probability that producers would disagree to higher prices would increase while the probability of agreement would decrease. As producers tend to agree that other packers lost their advantage they are more likely think that the market did not have higher prices.

The marginal probabilities of the distance variables show that as the distance from Brandon increased, the probability that producers would disagree that prices were higher

decreased and the probability that producers would agree increased. Producers closer to Brandon would tend to disagree that prices were higher, while those farther away would think prices were higher. The marginal probabilities of the *Size* variables are almost zero and no interpretation can be made. The remaining marginal probabilities demonstrate that as producers sold more hogs to Maple Leaf and on the cash market during the year after the opening, the probability that they would disagree that prices were higher would increase and the probability of agreement would decreases. Producers that sold a larger percentage of hogs to Maple Leaf and on the cash market tend to think the opening did not cause higher prices. This is not the expected result. It was expected that as producers sold more hogs to Maple Leaf, they would think there were higher prices in the region.

The second model asked if the opening had no noticeable effect on prices or marketing. The *Opinion A* and *Opinion K* had positive marginal probabilities over levels of disagreement and negative values in levels of agreement (table 28). This would mean that as level of agreement that there were more buyers and that the other packers lost their advantage increased, the probability that producers would disagree to no noticeable effect would increase and the probability of agreement would decrease. Thus, producers that thought that more buyers were in the market and that packers lost their competitive advantage would be more likely to think that prices were not higher. Producers that agreed that slaughter capacity became less of a problem would be more likely to agree that there was no noticeable effect from the plant opening.

The marginal probabilities for the *Distance* parameter show that as distance from Brandon increases, the probability of disagreement increases and the probability of agreement decreases. This would mean that producers that were farther away from the

plant would tend to think that there was a noticeable effect on the market. Producers that sold a large percentage of hogs to Maple Leaf would be more likely to think that there was no noticeable effect on marketing or pricing of hogs. Producers who sold a large percentage on the cash market would me more likely to think there was a noticeable effect on marketing and pricing.

The results from the two models show some conflicting conclusions. This can be partly attributed to the low likelihood ratios and lack of significant variables. Producers that responded to this survey may not have considered the market impacts that occurred in the months immediately after the opening. In the years after the opening Maple Leaf acquired several other packers in the market. This may explain some of the negative attitudes towards the company and why some producers felt the market experienced depressed prices. Most hog producers, responding to this survey, thought Maple Leaf's entering the porkpacking market had impacts on the market and pricing of hogs. They also tended to think that after the opening prices decreased, instead of price increase as was expected.

Table 22. Maple Leaf. Number of Responses to Independent Control Variables

Question	Category	Number of Responses
Distance (kilometers)	Less than 80	13
	80 to 159	51
	160 to 239	13
	240 to 319	3
	320 to 399	0
	400 or more	0
Size (head)	Less than 500	21
	500 to 1,999	35
	2,000 to 4,999	14
	5,000 to 9,999	3
	10,000 or more	5
MapleLeafMKT *% sold to Maple Leaf after*	Less than 20%	6
	20% to 39%	3
	40% to 59%	4
	60% to 79%	2
	80% or more	16
CashMKT *% sold Cash Market after*	Less than 20%	2
	20% to 39%	1
	40% to 59%	2
	60% to 79%	4
	80% or more	24

Table 23. Maple Leaf Logit Model Independent Variables Results. Opinion B

	Models with the addition of the following variables				
Independent Variable	None	A	H	K	A, H, K
Distance	-0.0084*	-0.0074*	-0.0078*	-0.0084*	-0.0075*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Size	-0.0001	-0.00004	-0.0001	-0.0001	-0.00005
	(0.00007)	(0.00007)	(0.00007)	(0.00007)	(0.00007)
MapleLeafMKT	-0.0016	-0.0035	0.0057	-0.0017	0.0028
% sold to Maple Leaf after	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)
CashMKT	0.0032	0.0052	0.001	0.0032	0.0036
% sold Cash Market after	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
Opinion A	---	-0.4537**	---	---	-0.413**
		(0.114)			(0.118)
Opinion H	---	---	-0.335**	---	-0.319**
			(0.091)		(0.095)
Opinion K	---	---	---	0.012	0.099
				(0.084)	(0.095)
Likelihood Ratio	8.40	25.57	23.24	8.4163	37.94

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Table 24. Maple Leaf Logit Model Independent Variables Results. Opinion F

	Models with the addition of the following variables				
Independent Variable	None	A	H	K	A, H, K
Distance	0.002	0.002	0.002	0.0009	0.0009
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Size	0.00007	0.00006	0.00007	0.00007	0.00007
	(0.00007)	(0.00007)	(0.00007)	(0.00007)	(0.00007)
MapleLeafMKT	-0.022	-0.021	-0.003	-0.004	-0.004
% sold to Maple Leaf after	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
CashMKT	0.0034	0.0033	0.004	0.004	0.0036
% sold Cash Market after	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Opinion A	---	0.021	---	---	0.006
		(0.101)			(0.104)
Opinion H	---	---	0.025	---	-0.004
			(0.074)		(0.076)
Opinion K	---	---	---	0.139*	0.139*
				(0.080)	(0.081)
Likelihood Ratio	1.88	1.93	1.98	4.70	4.70

Numbers in parentheses are standard errors.
Significance levels are **=0.05, *=0.10.

Table 25 Maple Leaf Odds Ratio Estimates. B Dependent Variable

	Models with the addition of the following variables				
Effect	None	A	H	K	A, H, K
Distance	0.992	0.993	0.992	0.992	0.993
Size	1.000	1.000	1.000	1.000	1.000
MapleLeafMKT	0.998	0.997	1.006	0.998	1.003
CashMKTr	1.003	1.005	1.001	1.003	1.004
Opinion A	---	0.635	---	---	0.662
Opinion H	---	---	0.715	---	0.727
Opinion K	---	---	---	1.012	1.104

Table 26 Maple Leaf Odds Ratio Estimates. F Dependent Variable

	Models with the addition of the following variables				
Effect	None	A	H	K	A, H, K
Distance	1.002	1.002	1.002	1.001	1.001
Size	1.000	1.000	1.000	1.000	1.000
MapleLeafMKT	0.998	0.998	0.999	0.996	0.996
CashMKTr	1.003	1.003	1.004	1.004	1.004
Opinion A	---	1.021	---	---	1.006
Opinion H	---	---	1.025	---	0.996
Opinion K	---	---	---	1.149	1.149

Table 27. Maple Leaf. Opinion B Results and Marginal Probabilities

Variable	Parameter Estimate	Std. Error	P-Value	1	2	3	4	5	6	7	8	9
intercept 1	2.8582	0.8854	0.0012									
intercept 2	3.8888	0.9410	0.0001									
intercept 3	4.4450	0.9751	0.0001									
intercept 4	4.5490	0.9816	0.0001									
intercept 5	4.9991	1.0104	0.0001									
intercept 6	5.5128	1.0446	0.0001									
intercept 7	6.6744	1.1397	0.0001									
intercept 8	8.3506	1.4630	0.0001	**Marginal Probabilities**								
Opinion A	-0.4130	0.1176	0.0004	-0.1031	0.0207	0.0217	0.0040	0.0158	0.0141	0.0175	0.0075	0.0018
Opinion H	-0.3188	0.0949	0.0008	-0.0796	0.0160	0.0168	0.0031	0.0122	0.0109	0.0135	0.0058	0.0014
Opinion K	0.0993	0.0946	0.2941	0.0248	-0.0050	-0.0052	-0.0010	-0.0038	-0.0034	-0.0042	-0.0018	-0.0004
Distance	-0.0075	0.0045	0.0969	-0.0019	0.0004	0.0004	0.0001	0.0003	0.0003	0.0003	0.0001	0.0000
Size	-0.0001	0.0001	0.4969	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maple Leaf	0.0028	0.0069	0.6820	0.0007	-0.0001	-0.0001	-0.0000	-0.0001	-0.0001	-0.0001	-0.0001	-0.0000
CashMKT	0.0036	0.0058	0.5355	0.0009	-0.0002	-0.0002	-0.0000	-0.0001	-0.0001	-0.0002	-0.0001	-0.0000

Table 28. Maple Leaf. Opinion F Results and Marginal Probabilities

Variable	Parameter Estimate	Std. Error	P-Value	1	2	3	4	5	6	7	8	9
intercept 1	-2.3311	0.7540	0.0020									
intercept 2	-2.1220	0.7465	0.0045									
intercept 3	-1.6400	0.7321	0.0251									
intercept 4	-1.4225	0.7266	0.0503									
intercept 5	-0.7807	0.7141	0.2742									
intercept 6	-0.6095	0.7120	0.3919									
intercept 7	-0.4914	0.7109	0.4894									
intercept 8	0.1718	0.7115	0.8092	**Marginal Probabilities**								
Opinion A	0.0059	0.1041	0.9552	0.0010	0.0001	0.0002	0.0001	0.0000	-0.0000	-0.0000	-0.0003	-0.0010
Opinion H	-0.0037	0.0756	0.9611	-0.0006	-0.0001	-0.0001	-0.0000	-0.0000	0.0000	0.0000	0.0002	0.0006
Opinion K	0.1389	0.0809	0.0858	0.0238	0.0028	0.0054	0.0016	0.0005	-0.0010	-0.0010	-0.0078	-0.0243
Distance	0.0009	0.0040	0.8210	0.0002	0.0000	0.0000	0.0000	0.0000	-0.0000	-0.0000	-0.0001	-0.0002
Size	0.0001	0.0001	0.3187	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Maple Leaf	-0.0040	0.0061	0.5083	-0.0007	-0.0001	-0.0002	-0.0000	-0.0000	0.0000	0.0000	0.0002	0.0007
CashMKT	0.0036	0.0051	0.4788	0.0006	0.0001	0.0001	0.0000	0.0000	-0.0000	-0.0000	-0.0002	-0.0006

CHAPTER 7

SUMMARY AND CONCLUSIONS

This chapter presents a summary and conclusions from studying the ConAgra plant closing and the Maple Leaf Foods plant opening. This study occurred during a period of high concentration and consolidation in the meatpacking industry. The 4 firm concentration ratio is at historically high levels. With this, the remaining firms are combining or closing their doors. The closure of the ConAgra plant increased the already high levels of concentration. The Maple Leaf Foods plant opening helped relieve some of the present concentration. These issues have caused some concern related to market efficiency and price transparency. Producers in the U.S. and Canada have been more dependent on each other. Livestock trade between the two countries has become more prevalent, making the meatpacking industry influential to all producers. Given these concerns, this research found what happens to livestock markets when plants open or close. Specifically, what happens to the fed cattle market when a ConAgra plant closed and to the hog market when a Maple Leaf plant opened? The amount of price change was measured and the duration of the effects were calculated.

This chapter is divided into three sections. First, the ConAgra study results are discussed. The market impacts in Kansas and surrounding states are summarized. Conclusions concerning the objectives of the study are reached. The second section concerns the Maple Leaf Foods plant opening. Hog market impacts in Manitoba and

surrounding areas are discussed. The objectives of this study are discussed. Finally, a summary of the both plant event cases and the potential concerns for the future of the livestock and meat industries are presented.

ConAgra Study

The ConAgra plant in Garden City burned at the end of December 2000. The specific market impacts were analyzed using price differences, partial adjustment, and ordered logit models. The price differences and partial adjustment models were not only analyzed for the Kansas fed cattle market, but for the markets in surrounding states. While the impacts are not perfectly consistent across every state market, the results do show a drop in prices from the loss of the packer. However, this drop only occurred for a short time.

The developed price differences model was similar to one used by Hayenga, Deiter, and Montoya. The mean price differences in the 55 weeks prior to and the 55 weeks after the closing changed. The difference between the Kansas market and Nebraska, Colorado, and Iowa markets decreased. With the case of the Kansas versus Nebraska or Iowa the difference became negative. This would mean that the Nebraska price (which is the same price used in the Iowa model) was larger than the Kansas price during the 55 weeks after the closing. The average slaughter difference between Kansas and the other states decreased between the two periods. This is expected with the loss of a large plant in Kansas. The average weekly slaughter, in Kansas, decreased in the period after the closure. This would make the slaughter difference decrease.

The price differences model produced some interesting results. The model included a dummy variable for the weeks after the closing. The parameter estimate indicates how much the price difference changes in the 55 weeks after. For the Colorado model, the value was $-0.19, but was not significant. For the Nebraska and Iowa model, the price difference decreased $-0.37 and $-0.49 respectively. Price differences between Kansas and Texas increased $0.30 during the 55 weeks after the closing.

The model also included a set of 6 two week variables for the weeks after the closing. Week 1 and 2 estimate was significant and positive for the Texas model. This would mean that the price difference increased during those two weeks. The Nebraska model had one significant variable for weeks 5 and 6, which had a positive value. With only two significant variables, this model failed to determine the length of the market effects. It was expected, that after the closure, price would at first decrease and then gradually return to previous levels.

A partial adjustment model was also used to determine if price impacts occurred, and if so, the duration of such impacts. The Kansas, Nebraska, Texas, Colorado, and Iowa/Minnesota markets were analyzed using this model. This model used fed steer prices, from the mentioned markets, as the dependent variables. In all the markets, the mean price for fed steers increased $2 to $3 from the first 55 weeks to the 55 weeks after the closing. The mean weekly slaughter in Kansas, Colorado, and Texas, decreased over the two periods. While the mean Nebraska slaughter remained constant and the Iowa/Minnesota slaughter saw a slight increase between the two 55 week periods. The mean reported value of boxed beef increased about $6 in the weeks after the closing. Reported byproduct value also increased $0.5. At the same time, the mean weight of

slaughter cattle decreased 8 lbs in the 55 weeks after the closing. This is an expected pattern with increases in prices. If the reported value of boxed beef and byproducts are increasing with decreasing slaughter, prices paid for fed cattle should increase and weights should drop.

The boxed beef value has a significant impact on fed steer prices in all markets. For every $1 increase in boxed beef, fed steers prices increased from $0.13 to $0.31. Byproduct values also influenced fed steer prices in all markets, except Kansas. The plant closing variable in this case was only significant in the Texas market, with a value of $-0.92. This value conflicts with the value found in the price difference model, which had a positive value.

The advantage of a partial adjustment model is it can be used to determine how long it took prices to return to previously comparable levels. In this study, the number of weeks it took for 95% of the effects to elapse was calculated. Unfortunately, an estimate of the duration in the Kansas market cannot be calculated. The lag price estimate was negative, which makes the market duration -28 weeks. Reasoning for this could not be found. The duration of the impacts in the Texas, Colorado, Nebraska, and Iowa/Minnesota markets was 3.7 to 5.9 weeks.

Surveying feedlot managers in areas surrounding Garden City helped to confirm the results of the secondary data analysis. Most producers did think the closing affected the market and depressed prices. Most also felt that the other packers in the market had a psychological advantage, slaughter capacity become more of a problem, and the effects from captive supplies increased.

Modeling the survey data using an ordered logit model showed some correlations. Producers that felt that the effect of captive supplies increased and/or slaughter capacity became more of a problem were more likely to think that prices dropped. It was determined that the farther a producer was from Garden City , the less likely he/she would be to think that there was a market effect and prices decreased. This is important to the spatial aspects of the market. Producers closer to Garden City perceived more damage to the market than those on the outer fringes. The farther out managers are, the more likely that other packers in different markets could compete for their cattle. Producers that sold more of their cattle to ConAgra and/or on the cash market were more likely to think prices decreased. Managers in these situations would be more vulnerable to the sudden market change. Producers selling to the Garden City plant would have to ship their cattle elsewhere or find an alternative packer. The loss of the large plant made it more difficult to process all the fed cattle. Producers selling a large percentage on the cash market would be more susceptible to any price swings that occurred from the plant closing.

Did the ConAgra plant closing influence the market and prices? If so, how long did these effects last? The simple answers to these questions are yes and only a few weeks. Prices did decrease if you compare the Kansas market to Nebraska, Colorado, and Iowa/Minnesota. The duration of these effects were only a few weeks. The duration on the Kansas market cannot be directly determined. Surveying producers concluded that prices decreased and the market adjusted.

Maple Leaf Study

The Maple Leaf Foods plant in Brandon, Manitoba opened at the end of August 1999. The impacts to the hog markets in Canada and the northern United States were analyzed using price differences, partial adjustment, and ordered logit models. Impacts from the opening seem to be more consistent across markets than the ConAgra study. The results show that after the plant opening slaughter hog prices did increase. The duration of these impacts were short lived. However, the market appears to take a little longer to adjust than in the beefpacking case.

The price differences model was conducted, comparing the Manitoba market to three Canadian and three U.S. markets. The mean price differences increased from $3 to $10 in all the models, between the two periods. The Manitoba versus Ontario average price difference was negative in the 55 weeks prior to the opening, and in the second 55 weeks the price difference became positive. This means that prior to the plant opening; the average Ontario price was greater than the Manitoba price. After the opening the average Manitoba price was larger. The slaughter differences between the two periods increased from 10 to 40 thousand head between the periods, in all models. This would mean the average weekly slaughter in Manitoba was larger in the second period, when compared to the first. An increase in the slaughter difference would be expected with the opening of a large plant in Manitoba.

The results of the model are consistent across different regions. The plant opening parameter estimate, intended to capture changes in prices, ranged from $4 to $10. This parameter was significant in all models, except the Manitoba versus Saskatchewan model. The parameter shows that the price difference increased in the

period after the opening. The two week dummy variables were significant in some cases. The parameters for weeks 1-2, 5-6, and 9-10 were significant and negative in Alberta, Saskatchewan, Sioux Falls, and Iowa markets. The negative sign would indicate that after the initial price difference increase, it was slowly decreasing to previous levels.

Partial adjustment models were used to determine if price changes occurred and their duration. The average prices for hogs increased about $30 to $50 between the two periods. All of this increase cannot be directly attributed to the plant opening. Part of the increase is due to the hog market climbing out of record low prices in late 1998. Average slaughter in Manitoba and Ontario increased. The increase in Manitoba was expected with the plant opening. Average slaughter decreased in the other markets between the two periods. The reported cutout value increased about $40 between the two periods. Again, some of this could be attributed to the market recovery from 1998. The average weight only increased 1 kg between the two periods. The average byproduct value saw a slight increase over the two periods, $1. With cutout prices increasing, it would be expected that the hog prices would increase. The increase in weight is not the normal expectation. However, it is possible that producers were purposely holding hogs to higher weights. In the case of a rising market, this would allow them to sell more weight for higher prices.

The results of the partial adjustment model point out some interesting trends. The parameter estimate for the cutout value is significant in all models. For every $1 increase in the cutout value, the hog price increased from $0.20 to $0.80. No apparent pattern could be found with the weight, slaughter, and byproduct variables. The plant opening variable was significant in all models except the Ontario model. Hog prices in Manitoba

increased $11.30 after the opening. The price in Alberta and Saskatchewan increased $5 and $7 respectively, in the 55 weeks after the opening. The hog prices in the three U.S. markets increased from $6 to $8 during the year after the opening.

The advantage of the partial adjustment model is its ability to estimate the duration of market impacts. Similar to the other model, an estimate was calculated for the number of weeks it took for 95% of the effects to elapse. This would mean that only 5% of the impacts are left in the market at the calculated week. The duration in the Manitoba market only lasted 3 weeks. Effects in Ontario, Saskatchewan, and Alberta lasted only 5 or 6 weeks. The effects on the Iowa and Sioux Falls markets were 11 and 24 weeks, respectively. The calculation of the market impacts on the St. Paul market was 59 weeks. This is a longer time period than other studies. There does not appear to be any apparent reasoning for this market to have the greatest length of impacts.

Surveying producers around Brandon created some conflicting viewpoints of the impacts from the plant opening. The majority of producers think that the plant opening did not increase the number of buyers in the market. They also think the opening did not cause higher prices for their hogs. However, they seem to be split when asked if the plant opening had no noticeable effect on marketing or pricing.

The survey data were analyzed using an ordered logit model. This allows for the comparison of producers' agreement or disagreement to several different questions. Producers that think the number of buyers in the market increased would tend to think that prices increased. Producers that tended to think that slaughter capacity in Manitoba became less of a problem would be more likely to think prices increased. The survey participants that felt that the other packers lost their competitive advantage due to the

opening would tend to think hog prices dropped. The distance producers were from Brandon influenced how they felt about the market impacts. Producers that were farther away from Brandon were more likely to think prices increased and there was more of a noticeable market effect. Participants that sold more of their hogs to Maple Leaf were more likely to think prices did not increase. This was not the expected result. If the addition of the Maple Leaf plant did increase the aggressiveness of bidding, producers selling to them should see price increase. Also, producers that had more hogs in the cash market would be in a better position to capture any sudden price increase. This may be caused from the negative view of Maple Leaf's acquisitions of several hog plants a couple of years after their opening.

Did the Maple Leaf plant opening influence the market and prices? If so, how long did these effects last? The simple answers to these questions are yes and only a few weeks. Prices did increase in all the Canadian and U.S. markets studied. However, part of this increase has to be attributed to the market recovery. The duration of these impacts lasted only a few weeks. The primary data collected from the survey presented a slightly different picture. Producers felt the Maple Leaf plant opening did not increase competition and prices. These beliefs may be the result of the timing of the survey. Conducting the survey several years after the opening might have caused different results than if conducted closer to the plant opening date.

Conclusions

While the opening and closing had impacts on the market, the state of excess capacity in the markets influenced the outcome. The closing of the ConAgra plant

affected the market demand for fed cattle. The decrease in market demand did decrease fed cattle prices in the region. However, the excess capacity, that was present at the time, helped to lessen such impacts. The excess capacity allowed the remaining packers to process additional cattle. The Maple Leaf plant opening also had an affect on the market. The lack of excess capacity in both the U.S. and Canadian pork processor, allowed the new plant to relieve some of the pressure on the market.

The spatial aspects of the slaughter hog and fed cattle market played a role in the impacts. While the specific impacts to the Kansas market could not be determined, there were impacts on the price differences. The closing did influence the markets in Colorado, Texas, Nebraska, and Iowa. The opening did increase prices in Manitoba and the surrounding markets. In this case, it appears that more of the impacts occurred in Manitoba and the closer markets. The farther a market was from Brandon, the less apparent were the impacts. The spatial aspect was also confirmed by surveying producers. The ConAgra case showed that most producers felt that the farther they were from the plant the less likely they would be to experience a price decrease. Producers in the Maple Leaf study thought the farther managers were from Brandon the more likely they would experience a price increase.

In the weeks following the ConAgra plant closing, fed cattle prices did decrease. The primary data collected from the surveys also demonstrated this point. According to the secondary data analysis after the Maple Leaf Foods plant opened, slaughter hog prices increased. However, the primary data showed that producers felt prices did not increase. Maple Leaf's acquired Schneider's processing plants a few years after the opening. Maple Leaf also had has a portion of the hogs they need contracted through companies

they own. Producers' beliefs may be influenced by these issues, and not a reflection of the market conditions in 1999 and 2000.

With the current levels of concentration and consolidation, the opening and closing of plants is a concern to some. When the large plants opened and closed the market did react. This reaction consisted of lower prices in the ConAgra case, thus a reason for concern, and higher prices in the Maple Leaf case. However, these situations were short-lived. The current fed cattle and slaughter hog market had sufficient levels of price transparency to adjust prices back to previous levels in a matter of weeks.

The ConAgra plant has helped to show that part of the reason for high levels of concentration is related to efficiency. The Maple Leaf plant has shown that in the right situation, there is room for expansion in slaughter industry. Policy makers and market participants should realize that while the industry is oligopsonistic in nature, the market reacted as expected in the case of these two plant events. The lack of long-term price impacts on both markets from the opening and closing of large plants demonstrates that the market was able to adjust.

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APPENDIX I

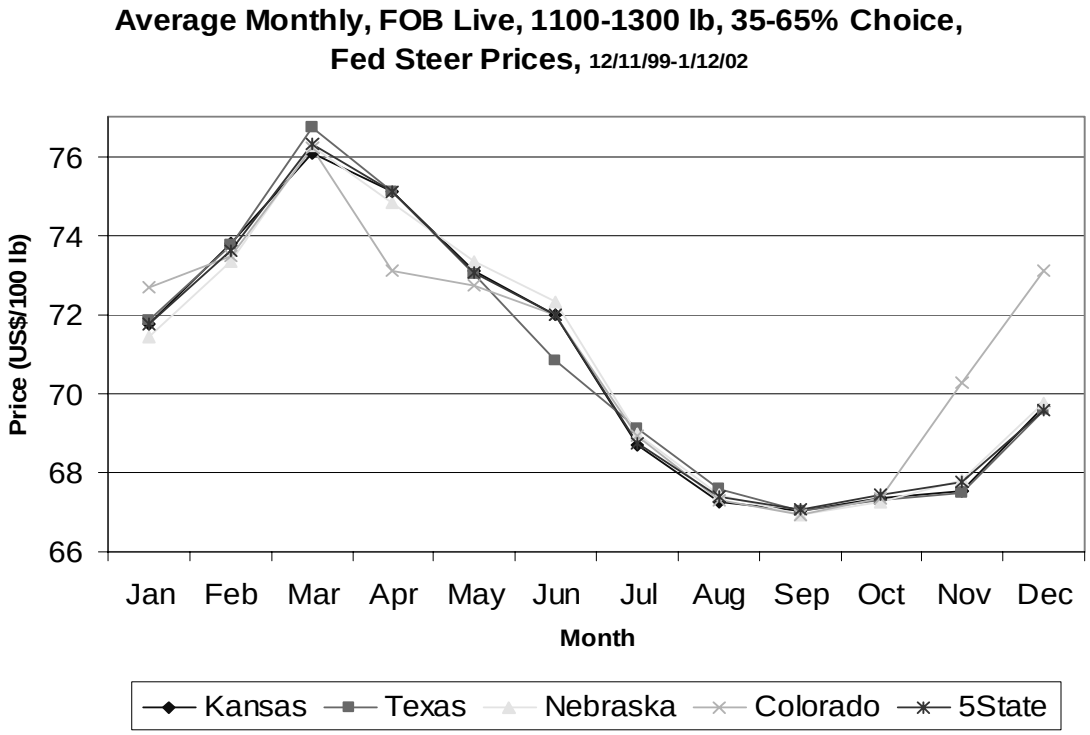

Figure 38. Average Monthly Fed Cattle Prices

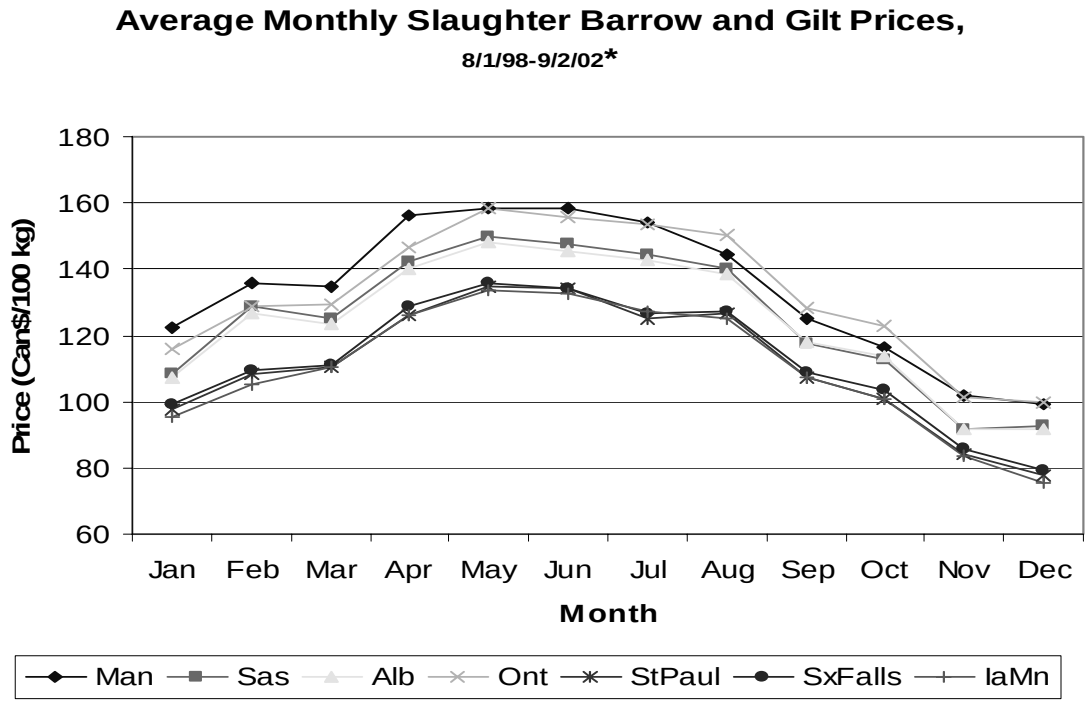

Figure 39. Average Monthly Barrow and Gilt Prices

*US prices are in live weight, Canadian prices are dressed

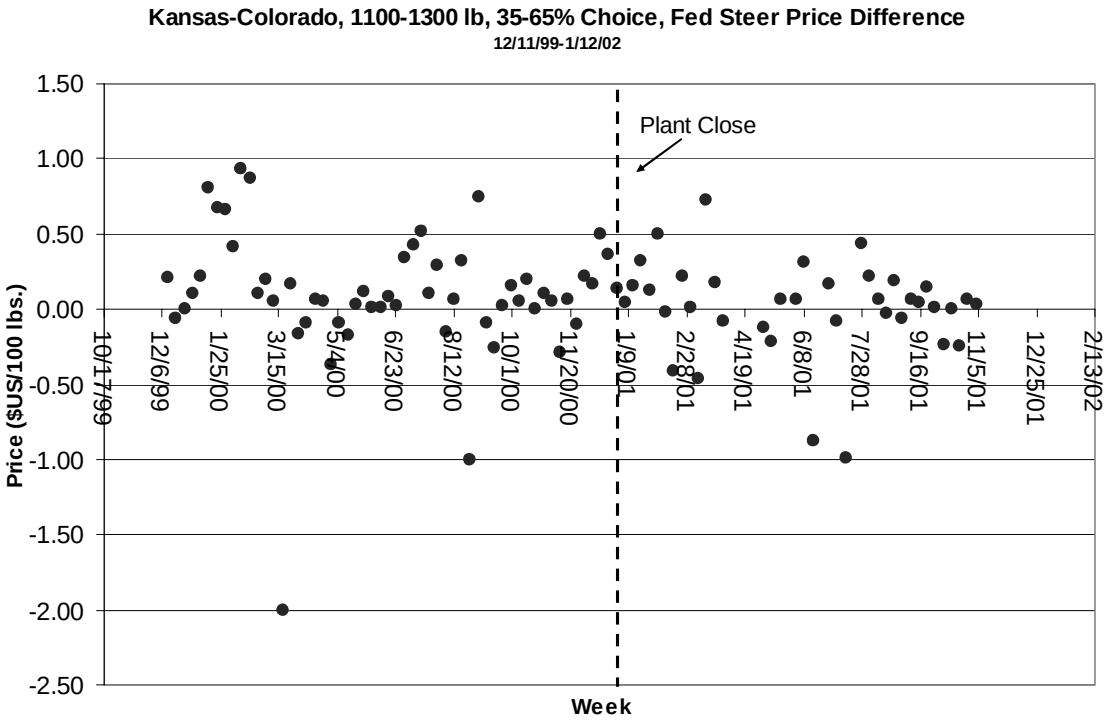

Figure 40. Kansas-Colorado Price Difference

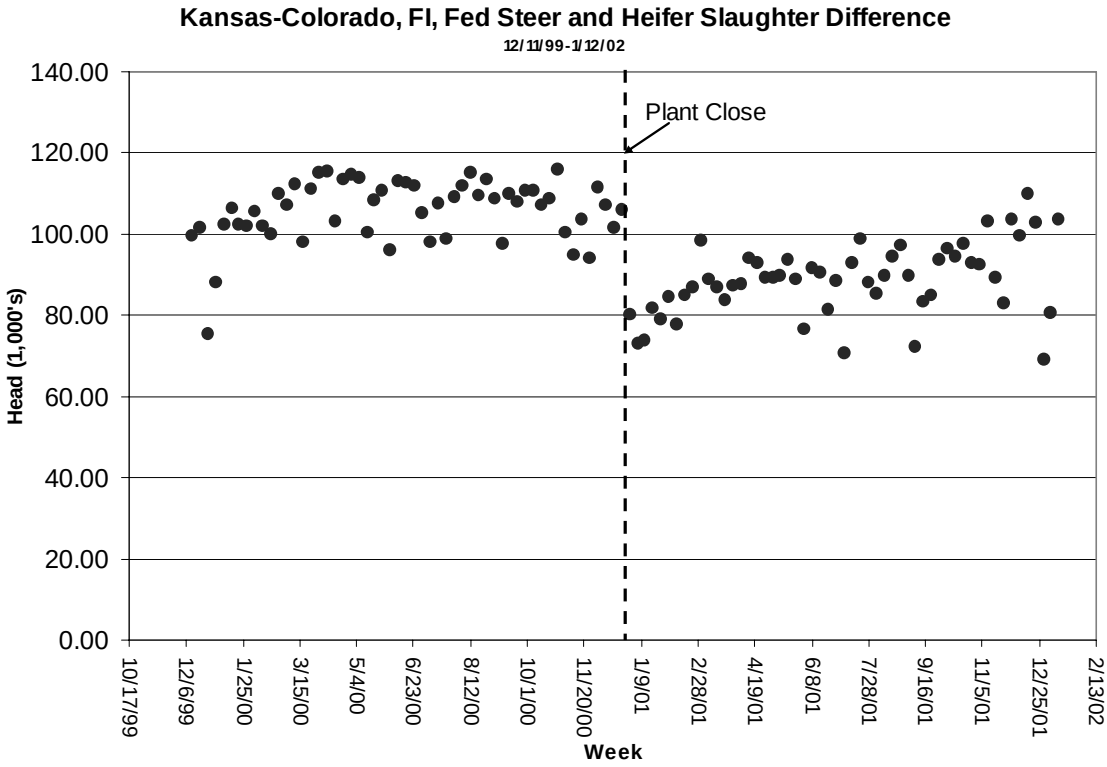

Figure 41. Kansas-Colorado Slaughter Difference

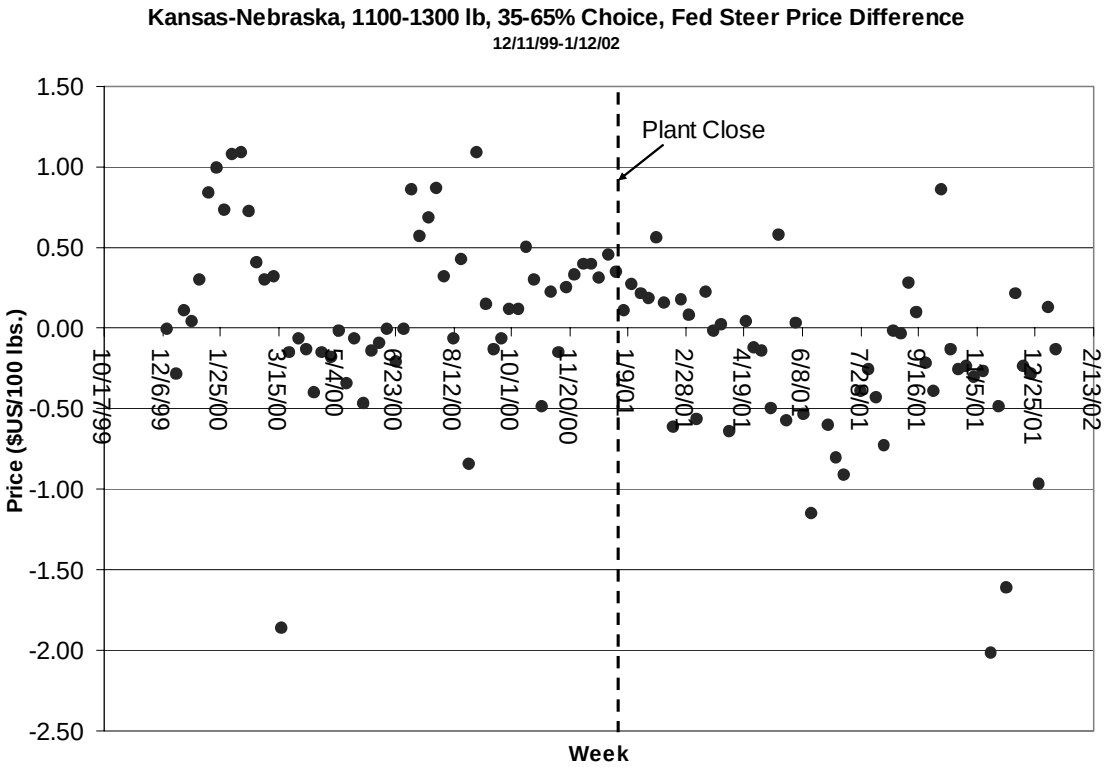

Figure 42. Kansas-Nebraska Price Difference

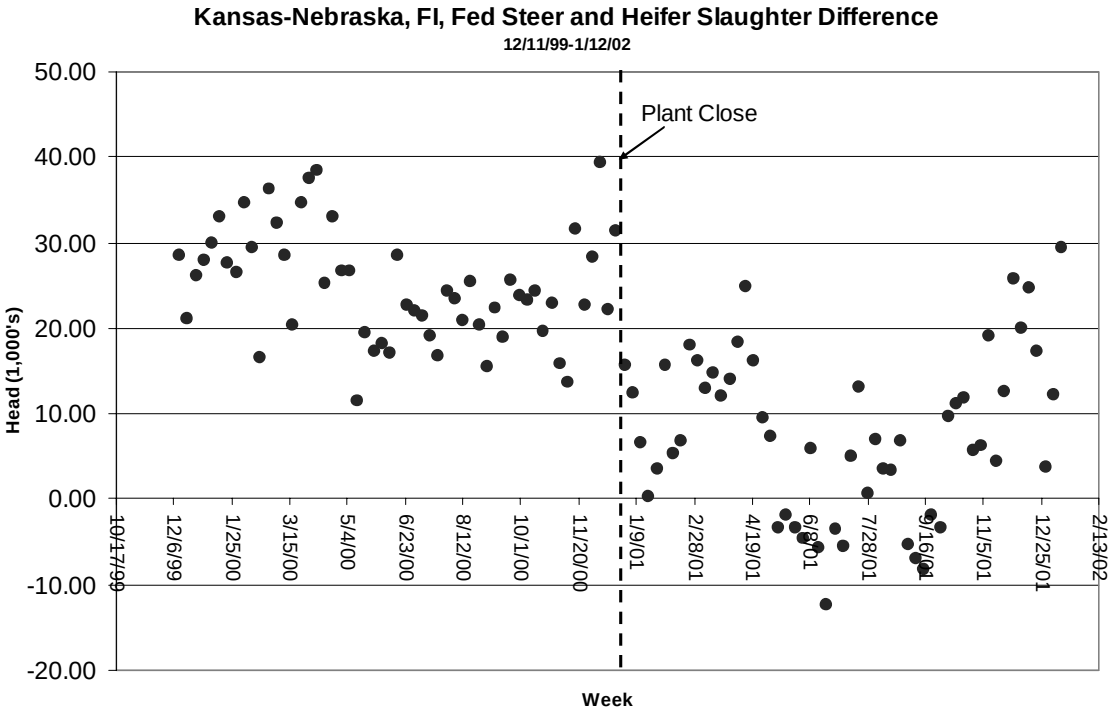

Figure 43. Kansas-Nebraska Slaughter Difference

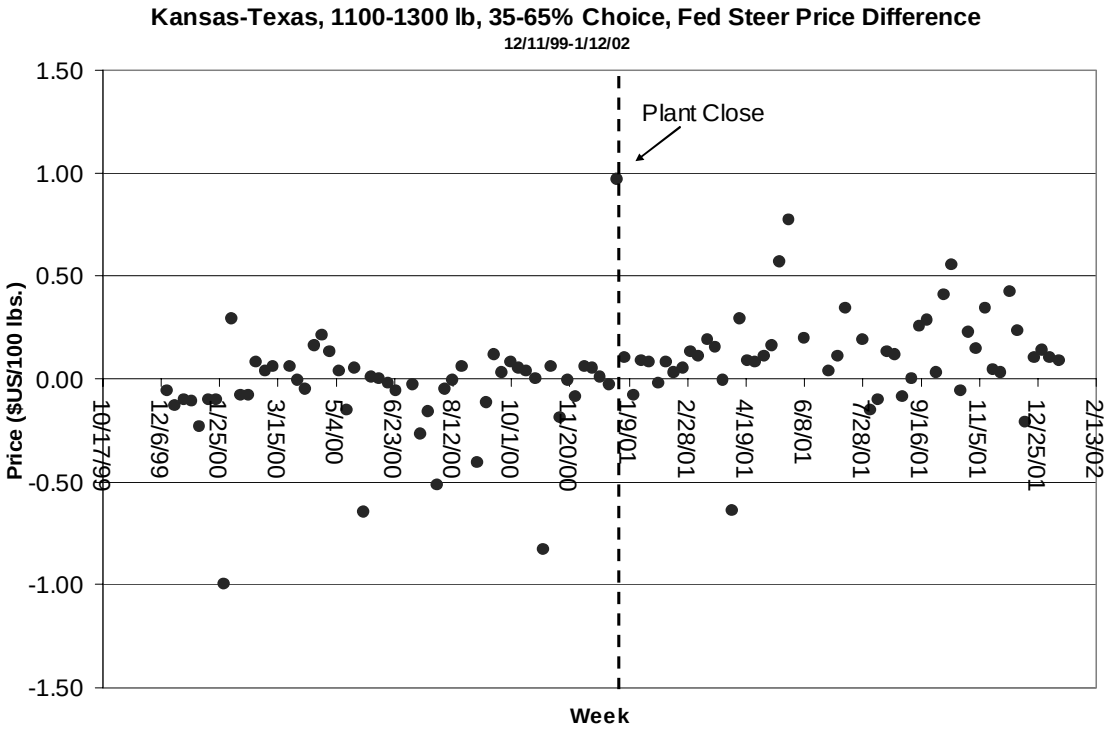

Figure 44. Kansas-Texas Price Difference

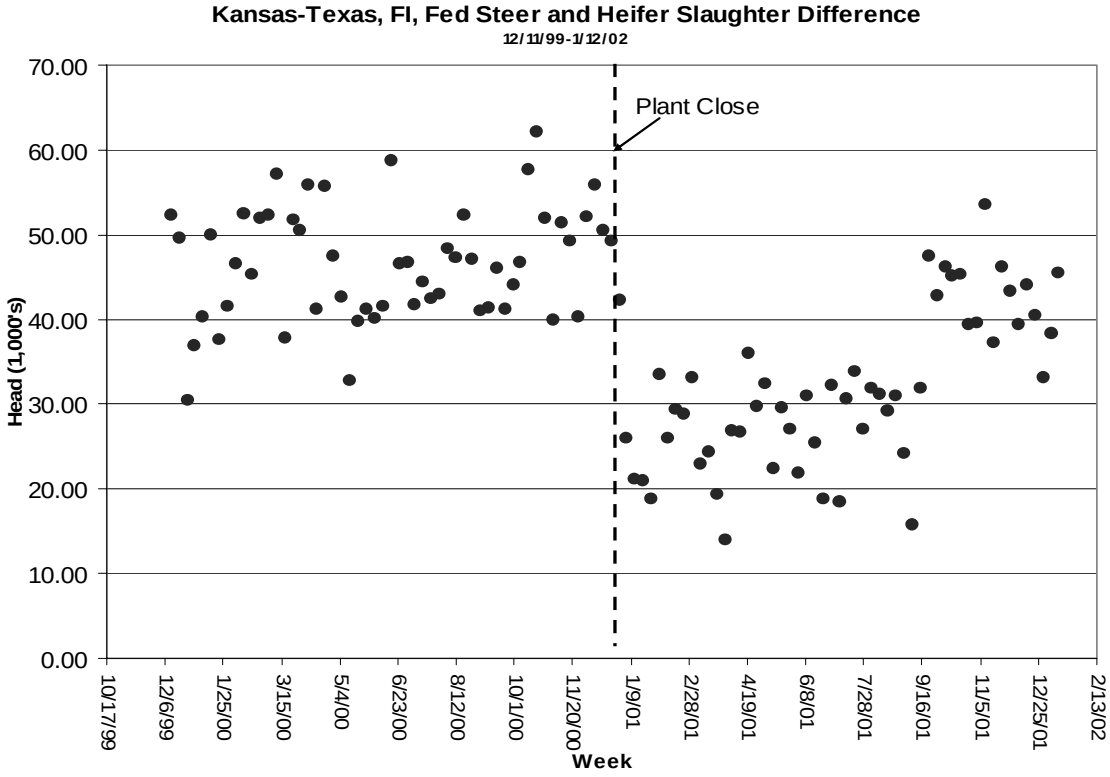

Figure 45. Kansas-Texas Slaughter Difference

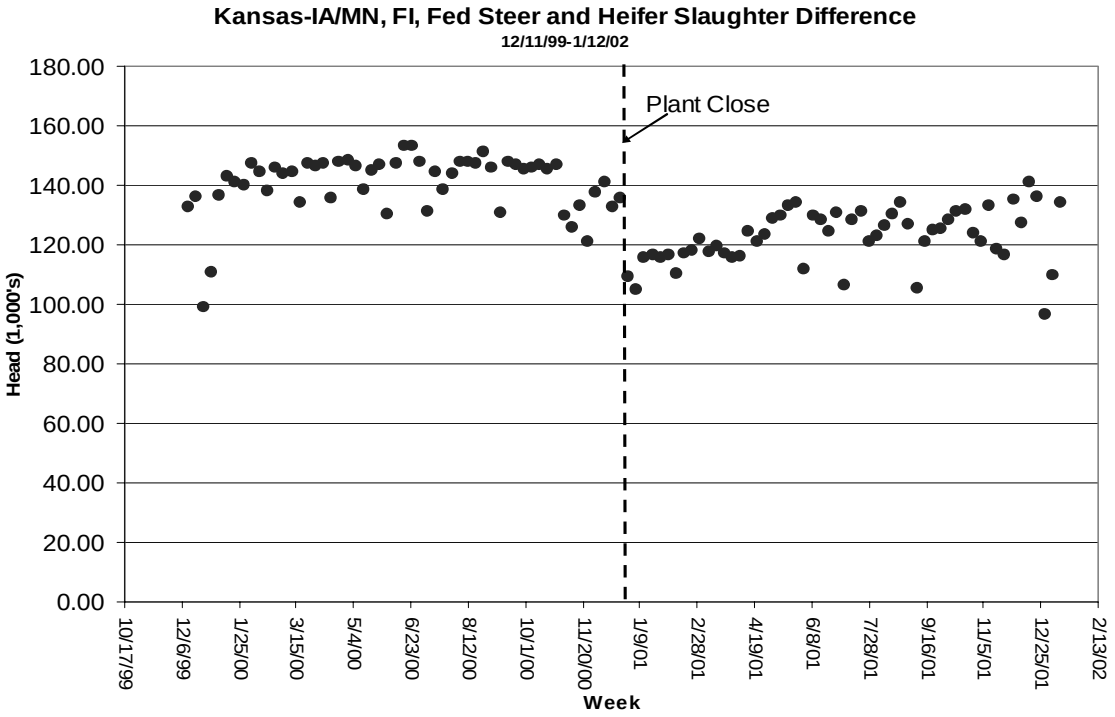

Figure 46. Kansas-IA/MN Slaughter Difference

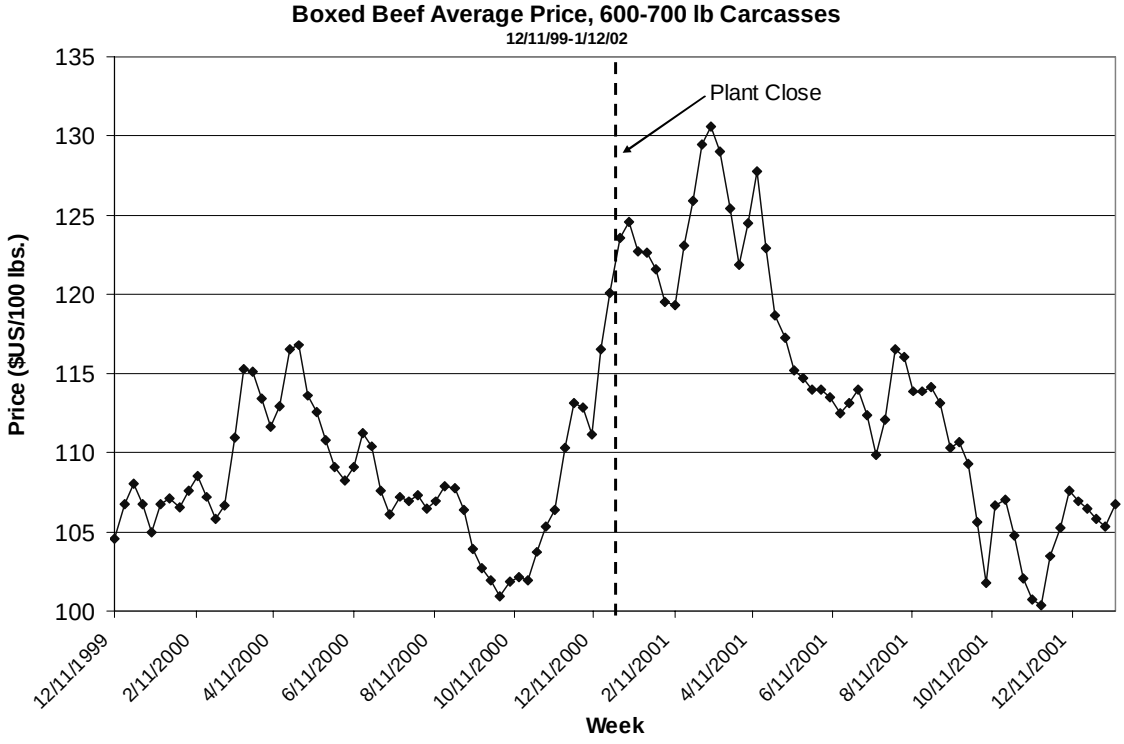

Figure 47. Average Boxed Beef Price

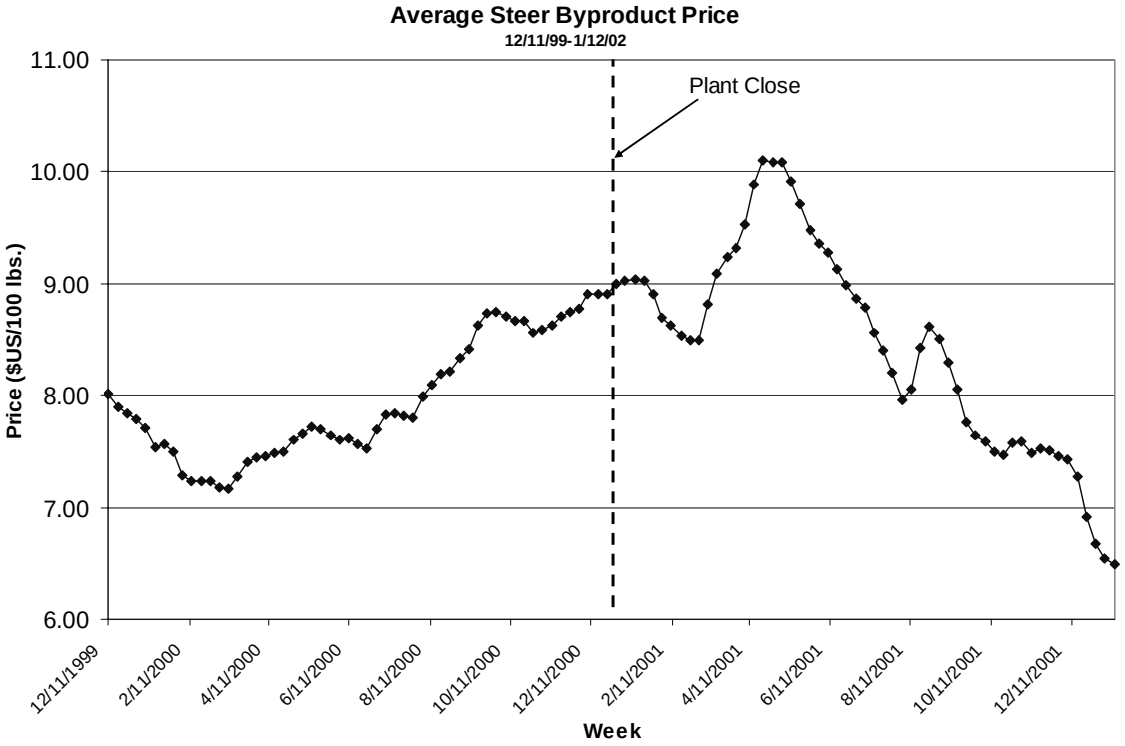

Figure 48. Average Steer ByProduct Price

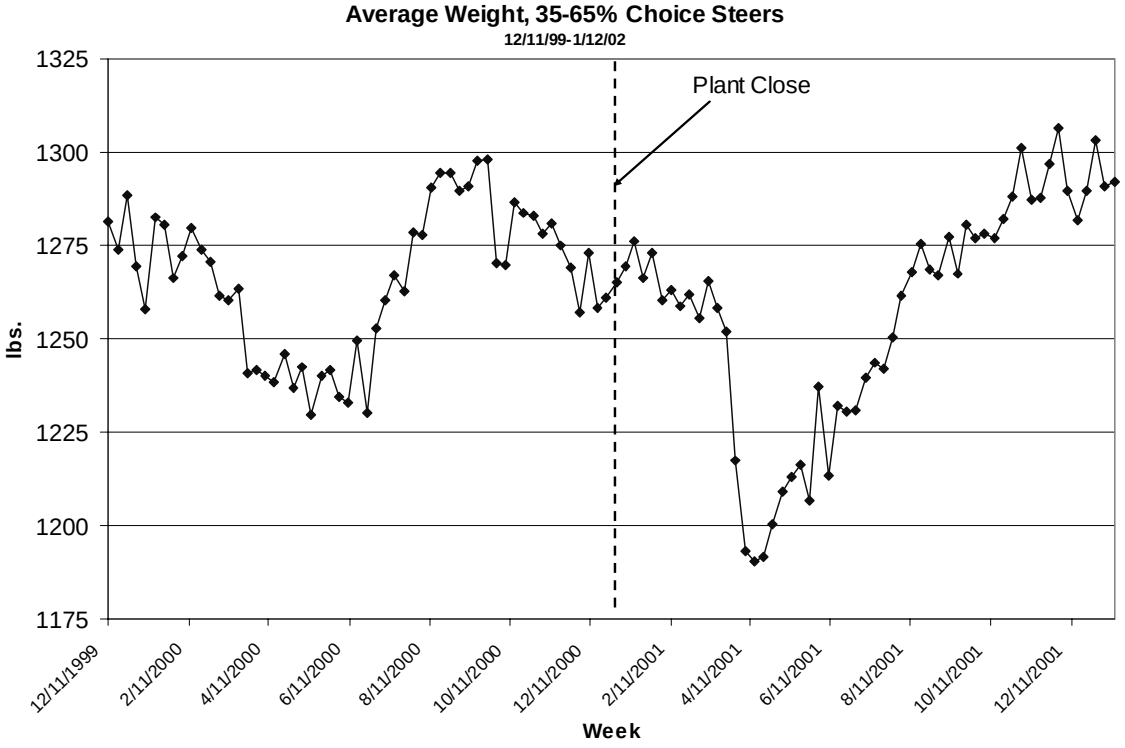

Figure 49. Average Steer Weight

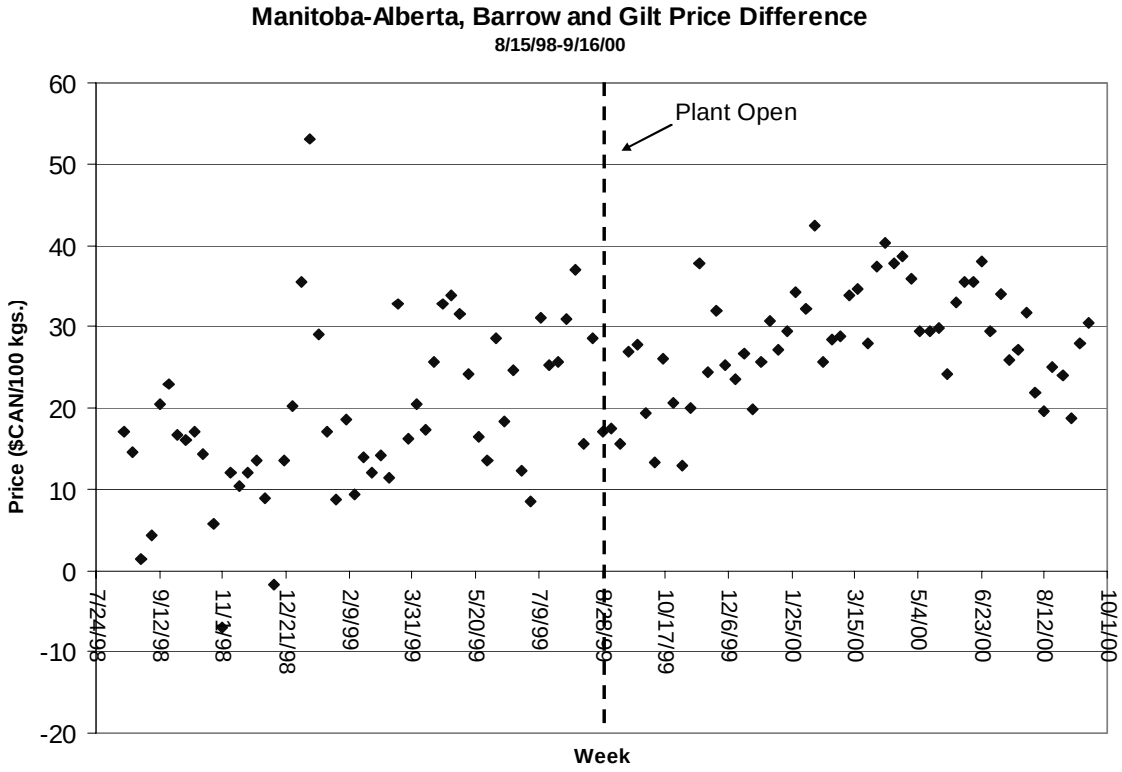

Figure 50. Manitoba-Alberta Price Difference

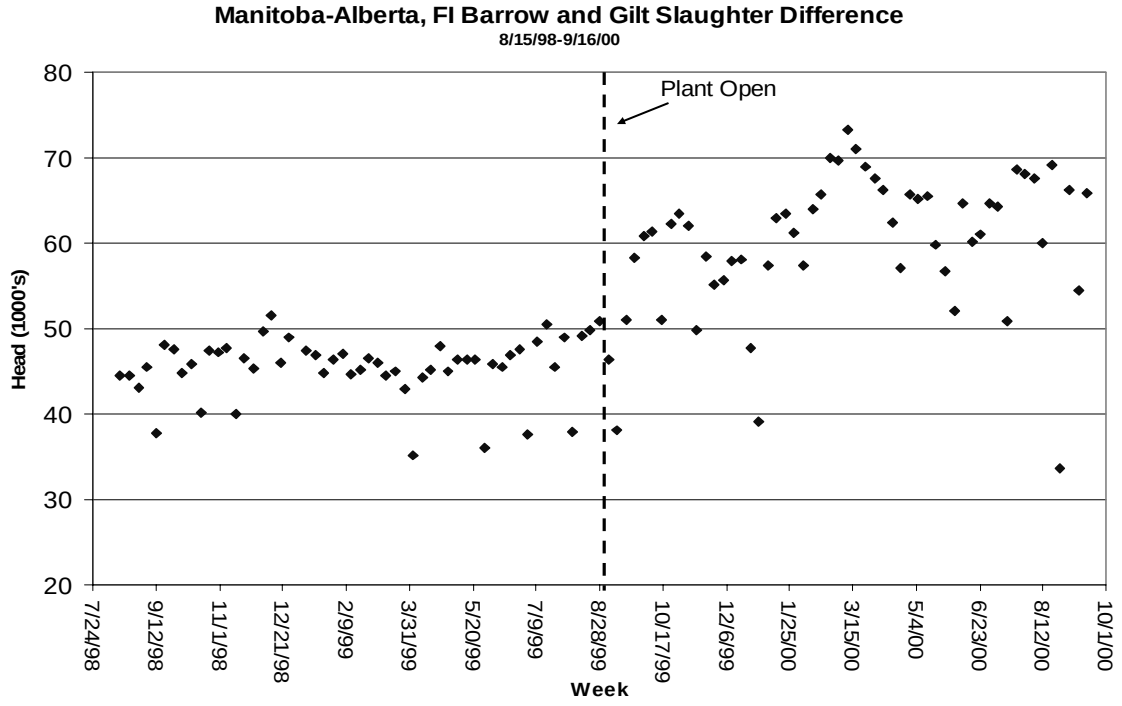

Figure 51. Manitoba-Alberta Slaughter Difference

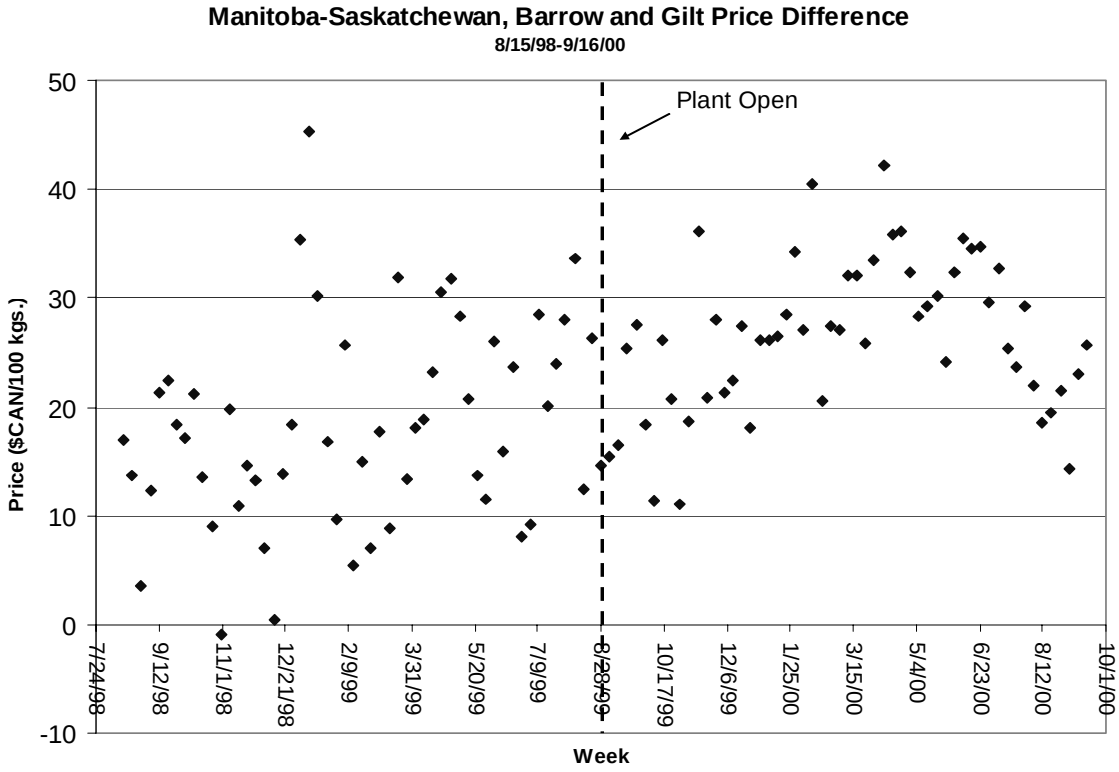

Figure 52. Manitoba-Saskatchewan Price Difference

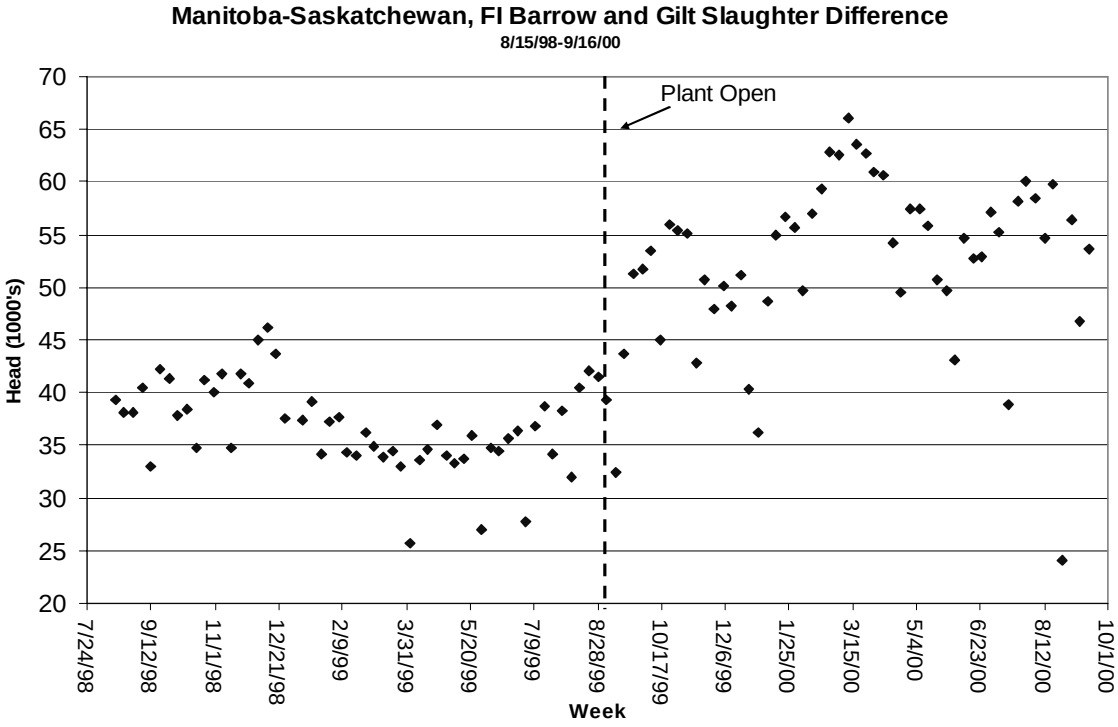

Figure 53. Manitoba-Saskatchewan Slaughter Difference

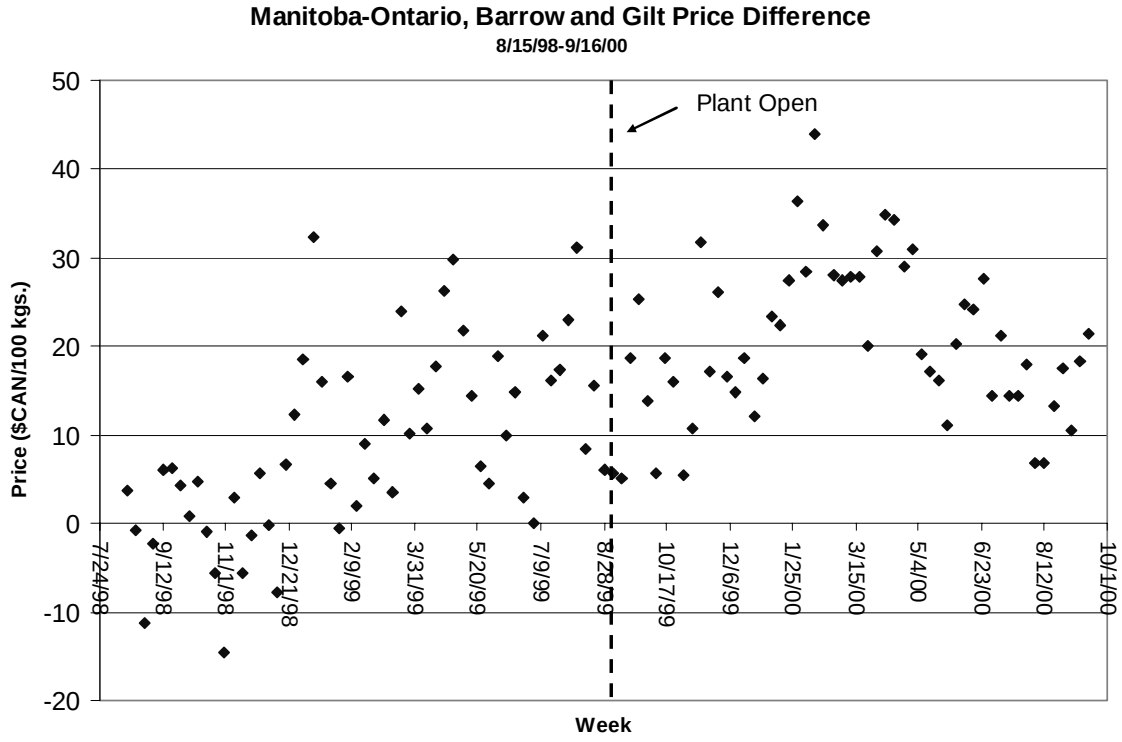

Figure 54. Manitoba-Ontario Price Difference

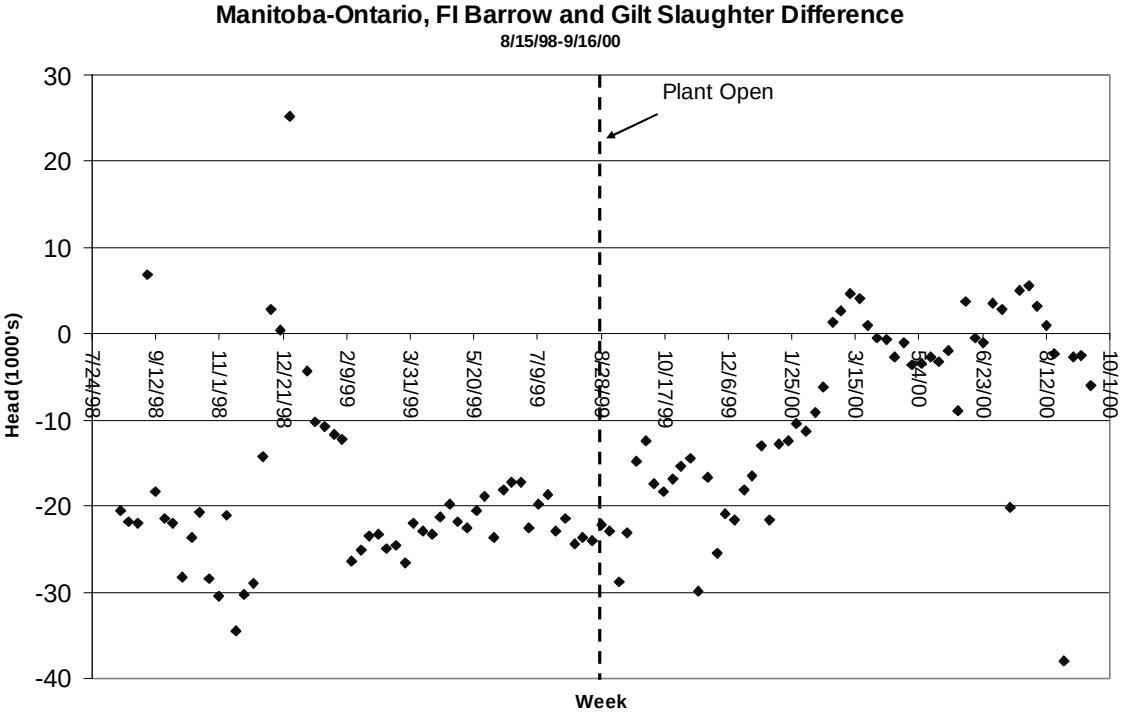

Figure 55. Manitoba-Ontario Slaughter Difference

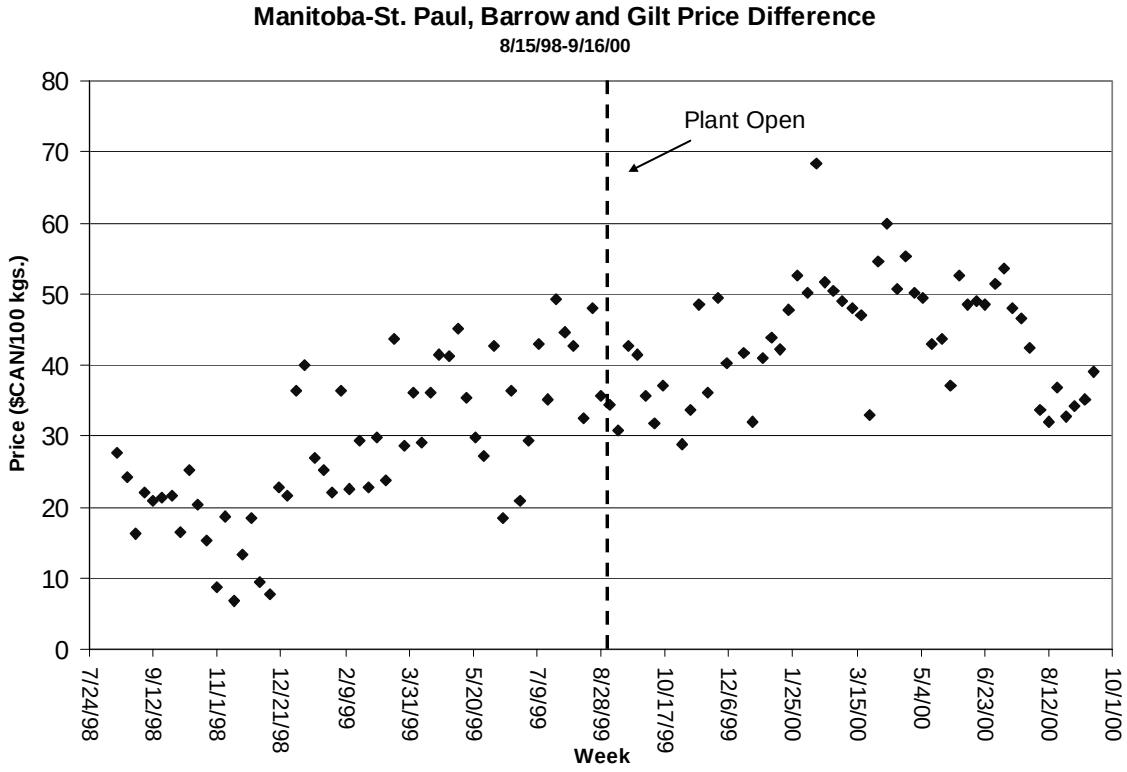

Figure 56. Manitoba-St. Paul Price Difference

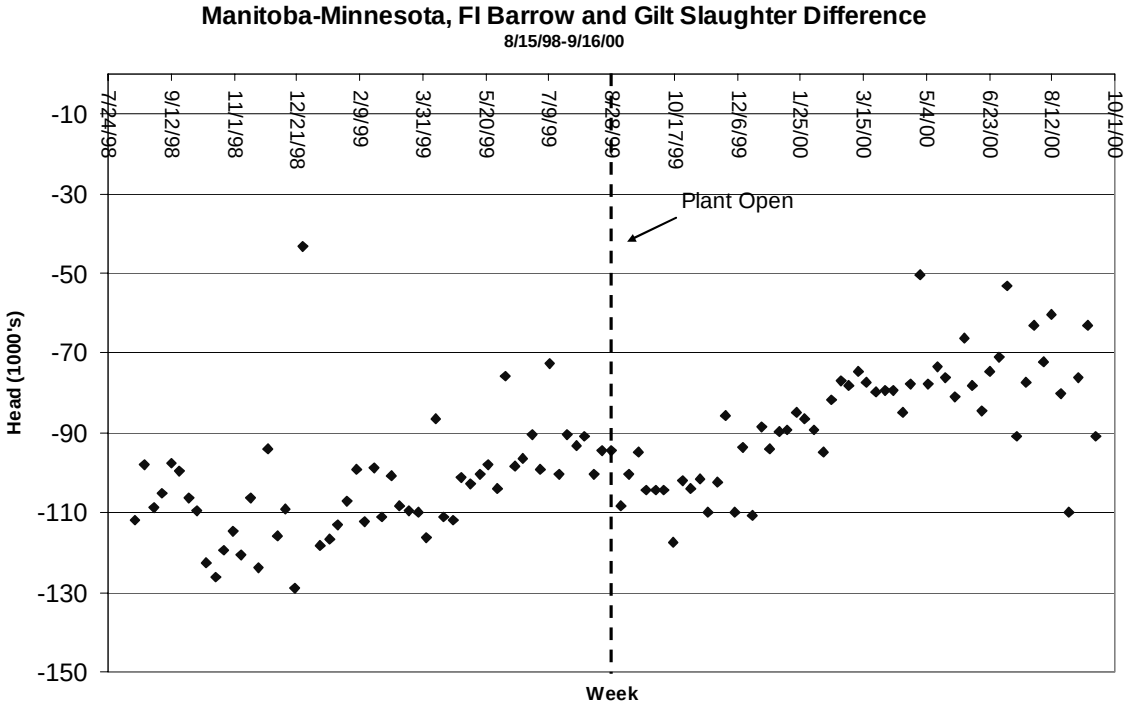

Figure 57. Manitoba-Minnesota Slaughter Difference

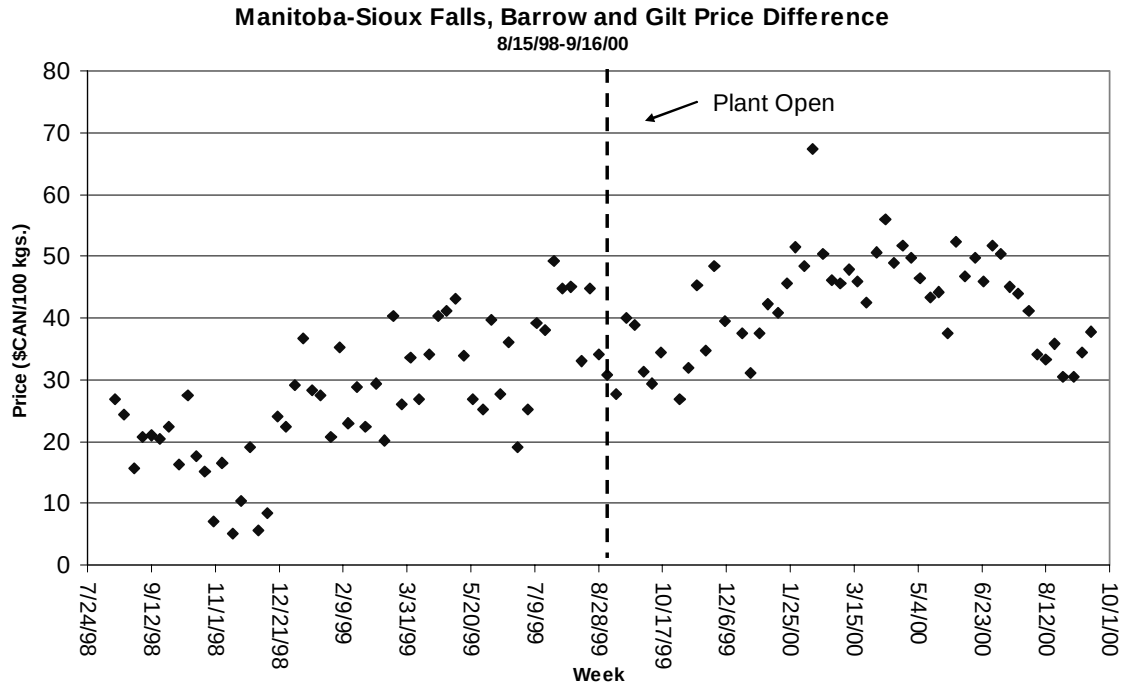

Figure 58. Manitoba-Sioux Falls Price Difference

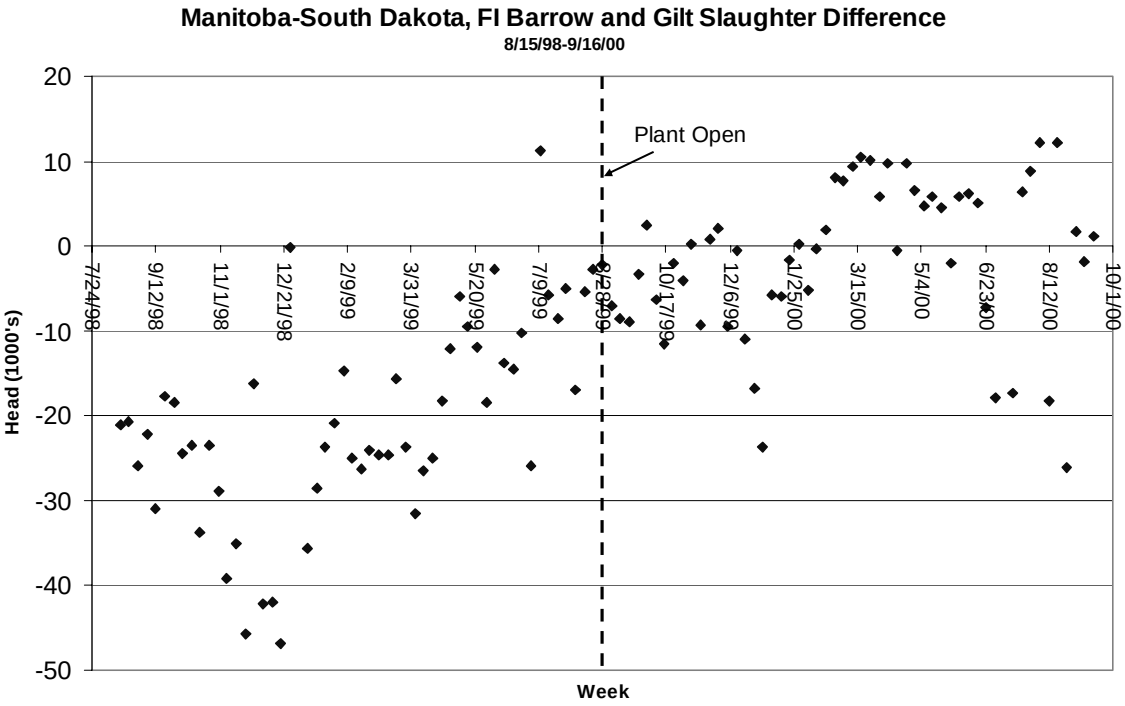

Figure 59. Manitoba-South Dakota Slaughter Difference

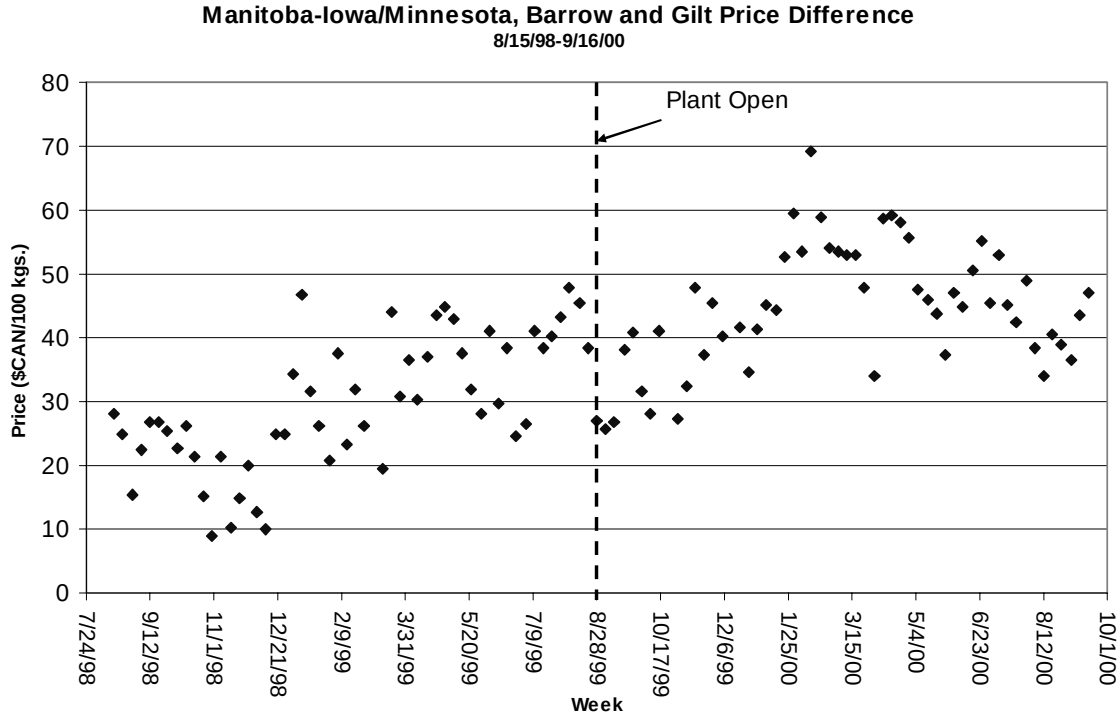

Figure 60. Manitoba-IA/MN Price Difference

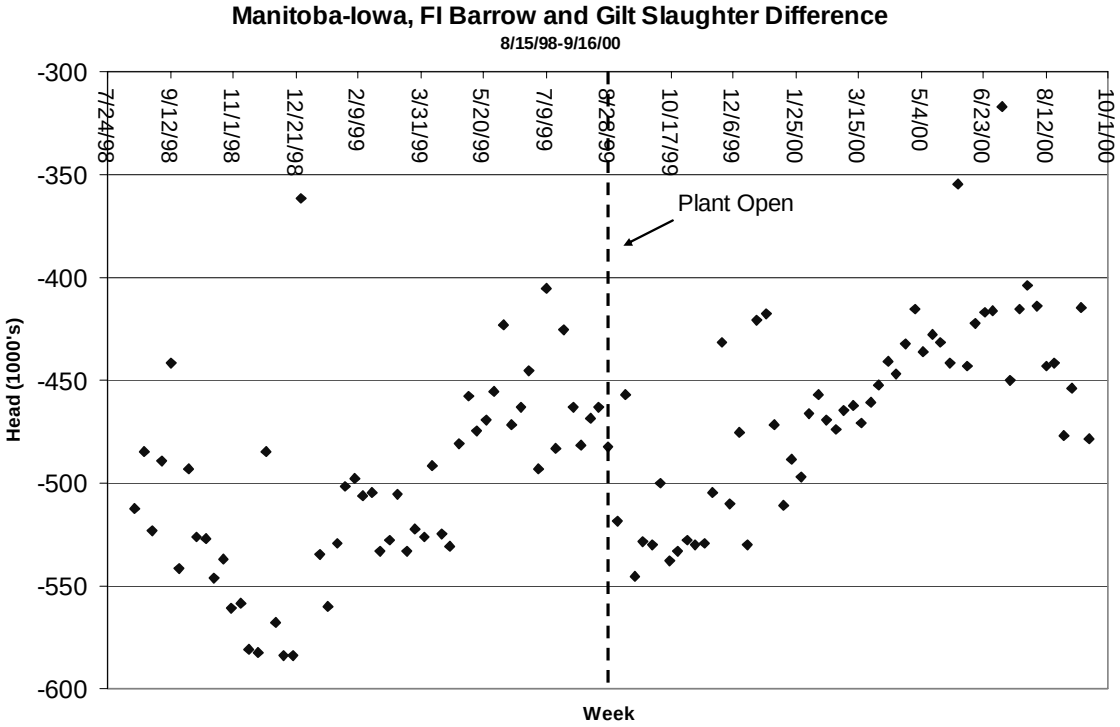

Figure 61. Manitoba-Iowa Slaughter Difference

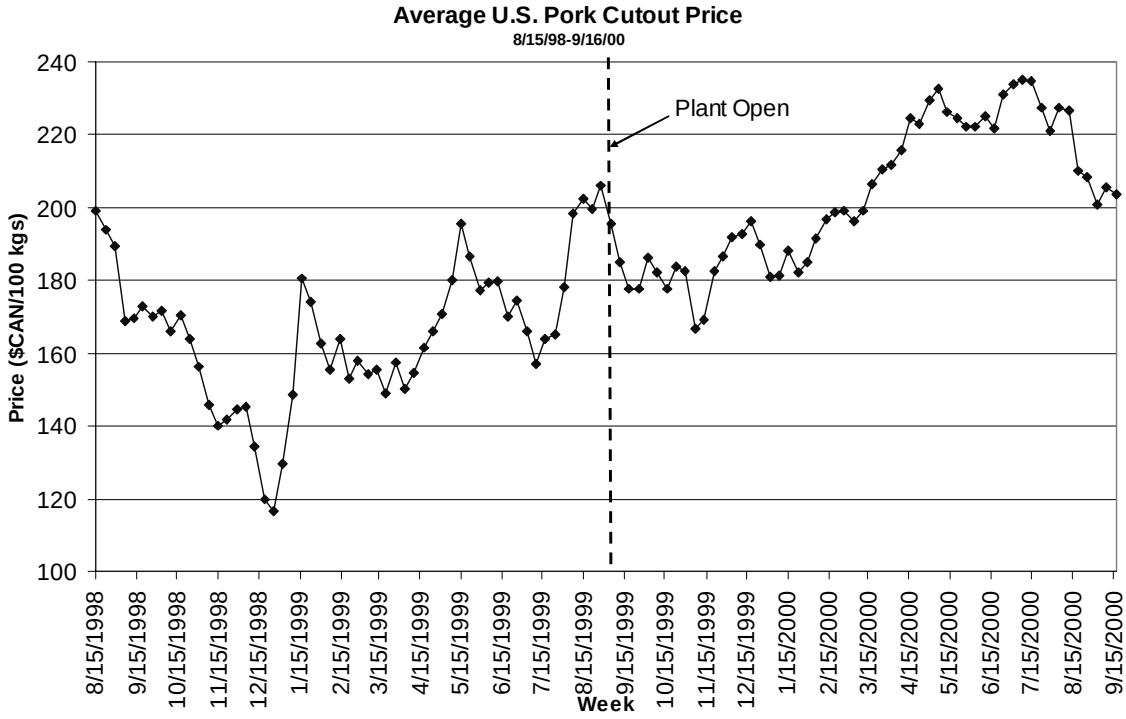

Figure 62. U.S. Pork Cutout Price

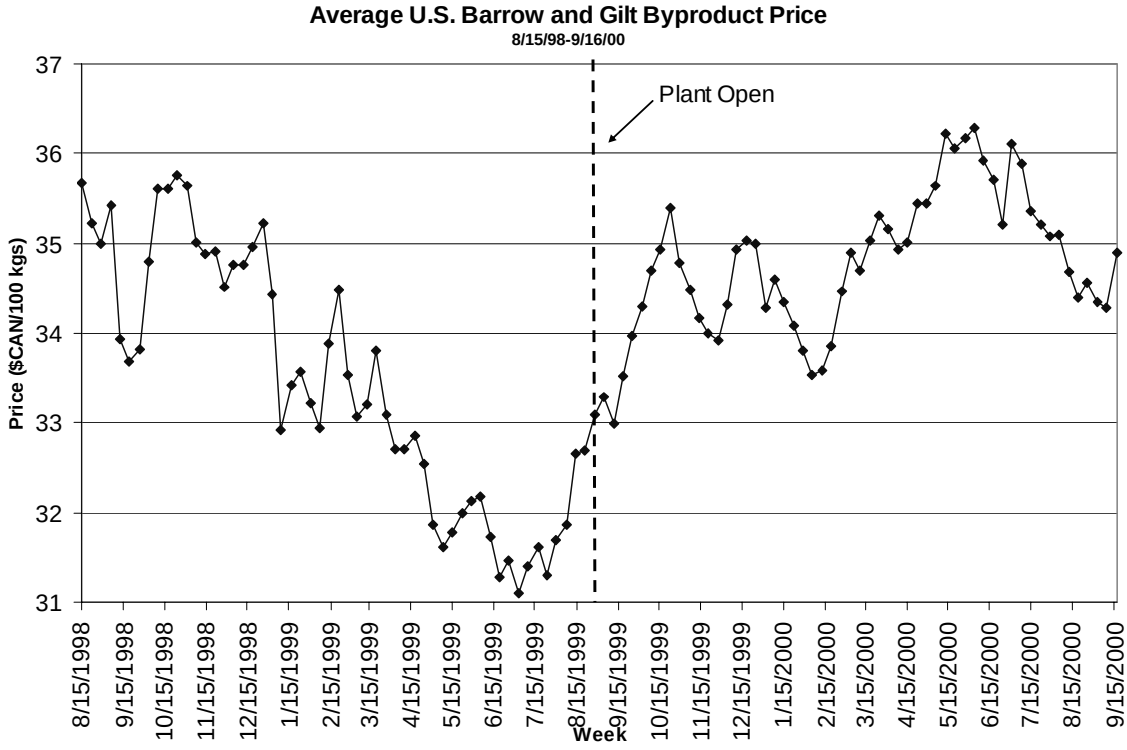

Figure 63. U.S. Hog ByProduct Price

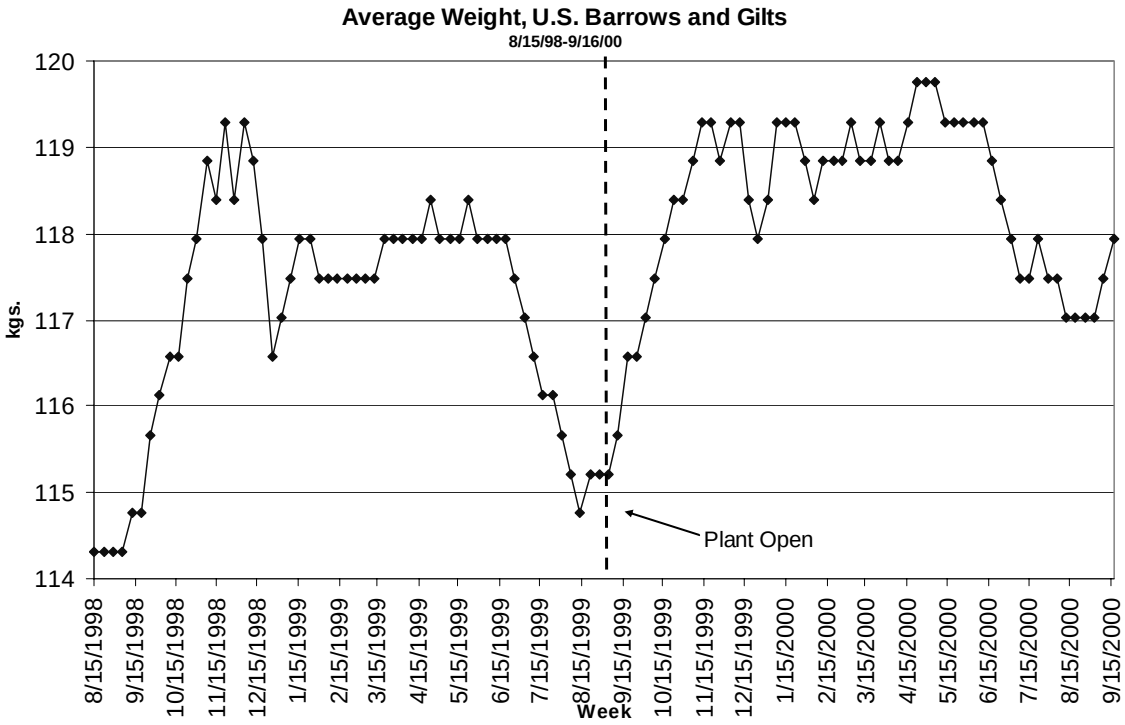

Figure 64. U.S. Barrow and Gilt Weight

APPENDIX II

Confidential **Confidential**

ConAgra Plant Closing Impacts

Please answer the following questions. Your best estimates are acceptable.

1. a. How many miles is the feedlot you manage from Garden City, Kansas? (Check one)

Less than 50 □ **23** 50-99 □ **14** 100-149 □ **28**
150-199 □ **22** 200 or more □ **13**

b. What general direction is the feedlot you manage from Garden City, Kansas? (Circle one)

NW **12** N **8** NE **7**
W **3** E **15**
SW **31** S **13** SE **11**

2. How many fed cattle were marketed in 2001 from this feedlot? (Check one)

Less than 5,000 head □ **8** 5,000-19,999 □ **24**
20,000-49,999 □ **25** 50,000-99,999 □ **28**
100,000 or more □ **15**

3. Check the appropriate box to indicate which packers bought fed cattle marketed from this feedlot the year before and after the ConAgra plant closing? Cattle shipments could be to any plants owned by the listed packer.

Estimated percent of marketings

Prior to the ConAgra plant closing (2000)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
ConAgra	□**38**	□**24**	□**8**	□**2**	□**10**
Excel	□**31**	□**18**	□**19**	□**4**	□**8**
IBP	□**38**	□**24**	□**7**	□**6**	□**8**
Farmland National Beef	□**23**	□**24**	□**11**	□**5**	□**14**

Following the ConAgra plant closing (2001)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
ConAgra	□**54**	□**11**	□**1**	□**1**	□**6**
Excel	□**25**	□**21**	□**19**	□**7**	□**9**
IBP	□**28**	□**26**	□**11**	□**9**	□**10**
Farmland National Beef	□**19**	□**23**	□**16**	□**9**	□**12**

4. Check the appropriate blanks to indicate how fed cattle marketed from this feedlot were sold the year before and after the ConAgra plant closing?

Estimated percent of marketings

Prior to the ConAgra plant closing (2000)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
Cash Market	□**9**	□**10**	□**10**	□**12**	□**43**
Contract, Alliance, or Marketing Agreement	□**30**	□**12**	□**10**	□**8**	□**25**

Following the ConAgra plant closing (2001)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
Cash Market	□**11**	□**17**	□**10**	□**11**	□**33**
Contract, Alliance, or Marketing Agreement	□**24**	□**10**	□**10**	□**16**	□**28**

5. On a scale of 1 to 9, rate how strongly you agree or disagree with the following items?

If you are uncertain or do not have an opinion about an item, please answer with 5. The following scale is to assist you.

1	2	3	4	**5**	6	7	8	**9**
Strongly Disagree				Uncertain/ No opinion				Strongly Agree

After the ConAgra plant burned, …

		Average Mark 1 to 9
a.	the number of buyers regularly bidding for cash market cattle from my feedlot decreased	**4.95**
b.	the loss of the ConAgra plant caused lower fed cattle prices in the region	**6.18**
c.	other packers were more interested in purchasing my cattle on a formula basis	**4.46**
d.	cattle from my feedlot were more frequently shipped to a closer packer	**4.63**
e.	the effects from captive supplies increased	**6.19**
f.	other packers were more interested in contracting cattle from my feedlot	**4.08**
g.	fewer plants made it easier for packers to know which ones were in the cash market	**6.17**
h.	fewer plants made it easier for packers to know how many cattle were committed to each packer	**6.36**
i.	fed cattle slaughter capacity in western Kansas became more of a problem	**7.06**
j.	feedlots closer to Garden City were less affected than those farther away	**4.78**
k.	other packers were more interested in negotiating base prices on grids	**4.81**
l.	fewer plants increased the frequency of special agreements by packers with feedlots	**5.74**
m.	other packers gained a psychological advantage from having one fewer plant in the region	**7.22**
n.	feedlots having marketing agreements with ConAgra switched them to another packer	**5.79**
o.	the plant closing had no noticeable effect on marketing or pricing fed cattle from my feedlot	**4.07**
p.	feedlots having marketing agreements with ConAgra dropped the agreement in favor of the cash market	**4.44**

6. What was the most noticeable change (if any) to you after the ConAgra plant burned?

_____

_____

Thank you for your assistance.
Please return your completed survey to:

Clement Ward
Department of Agricultural Economics
515 Ag. Hall, Oklahoma State University
Stillwater, OK 74078

July 2, 2003

Dear Mr. __

As you recall, the ConAgra beef processing plant in Garden City, Kansas caught fire on December 25, 2000, and was later permanently closed. How the marketplace adjusts to such events is a concern to some and simply of interest to others. We are interested in the market impacts (if any) from the plant closing. Enclosed is a short questionnaire we would like you to complete and return to us in the return envelope we have provided you. If you prefer, you can fax your completed questionnaire to us at (405) 744-8210. If faxing, please remember to send both sides of the questionnaire.

The questionnaire is designed to determine the market impacts *you think* occurred following the closing of the plant, and how it affected your feedlot and the regional fed cattle market. Pretests indicate the questionnaire should take no more than 10-15 minutes to complete. **Your responses to the questionnaire will be kept confidential and will not be identified with you or your feedlot when the results of the survey are reported.**

We believe the results of this survey will help us understand markets and market adjustments to significant events or shocks. If you have any questions or concerns about this questionnaire, please do not hesitate to contact one of us at (405) 744-9834, or by email (hornung@okstate.edu or ceward@okstate.edu).

Thank you very much for your time. If you would like a copy of the survey summary, simply put a business card in the envelope along with your completed questionnaire or write your name and address on the questionnaire and we will send you a summary when it is finished.

Sincerely,

Jon Hornung
Research Assistant

Clement Ward
Professor and Extension Economist

Table 29. ConAgra. Correlations of Survey Opinion Questions

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
A	1.00	0.49	0.53	0.21	0.28	0.25	0.35	0.32	0.38	-0.08	0.26	0.29	0.29	0.20	-0.44	-0.07
B		1.00	0.34	0.20	0.57	0.17	0.49	0.50	0.56	-0.18	0.29	0.47	0.44	0.19	-0.61	-0.22
C			1.00	0.32	0.33	0.38	0.44	0.45	0.19	0.09	0.44	0.40	0.24	0.16	-0.25	0.01
D				1.00	0.20	0.31	0.20	0.20	0.03	0.19	0.43	0.34	0.18	-0.08	-0.09	-0.06
E					1.00	0.30	0.51	0.50	0.52	-0.03	0.35	0.44	0.41	0.17	-0.45	-0.16
F						1.00	0.33	0.26	0.17	0.06	0.45	0.40	0.19	0.14	-0.20	0.02
G							1.00	0.78	0.46	-0.03	0.41	0.51	0.48	0.17	-0.35	-0.15
H								1.00	0.51	-0.05	0.34	0.43	0.44	0.21	-0.35	-0.13
I									1.00	-0.19	0.27	0.35	0.40	0.28	-0.50	-0.24
J										1.00	0.25	0.06	0.01	0.06	0.16	0.19
K											1.00	0.50	0.15	0.13	-0.06	0.01
L												1.00	0.46	0.12	-0.42	-0.03
M													1.00	0.15	-0.46	-0.09
N														1.00	-0.19	-0.11
O															1.00	0.13
P																1.00

Maple Leaf Plant Opening Impacts

Please answer the following questions. Your best estimates are acceptable.

1. a. How many kilometers are the finishing barns you manage from Brandon, Manitoba? (Check one)

Less than 80 □ **13**	80-159 □ **51**	160-239 □ **13**
240-319 □ **3**	320-399 □ **0**	400 or more □ **0**

b. What general direction are the finishing barns you manage from Brandon, Manitoba? (Circle one)

NW **12**	N **3**	NE **11**
W **1**	Brandon	E **7**
SW **2**	S **6**	SE **37**

2. How many hogs were marketed in 2000 from the finishing barns you manage? (Check one)

Less than 500 head	□ **21**	500-1,999	□ **35**
2,000-4,999	□ **14**	5,000-9,999	□ **3**
10,000 or more	□ **5**		

3. Check the appropriate box to indicate which packers bought hogs marketed from your finishing barns the year before and after the Maple Leaf Foods plant opening? Hog shipments could be to any plants owned by the listed packer.

***Estimated* percent of marketings**

Prior to the Maple Leaf Foods plant opening (1999)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
Maple Leaf Foods	□**6**	□**2**	□**1**	□**0**	□**2**
Schneider	□**1**	□**4**	□**4**	□**6**	□**33**
Springhill Farms	□**8**	□**5**	□**4**	□**1**	□**19**
Best Brand Meats (Forgan)	□**3**	□**0**	□**1**	□**0**	□**0**
Other Canadian packer	□**3**	□**0**	□**0**	□**0**	□**1**
A U.S. packer	□**8**	□**3**	□**2**	□**0**	□**4**

Following the Maple Leaf Foods plant opening (2000)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
Maple Leaf Foods	□**6**	□**3**	□**4**	□**2**	□**16**
Schneider	□**6**	□**2**	□**3**	□**5**	□**20**
Springhill Farms	□**8**	□**2**	□**4**	□**6**	□**13**
Best Brand Meats (Forgan)	□**4**	□**1**	□**0**	□**0**	□**0**
Other Canadian Packer	□**4**	□**0**	□**0**	□**1**	□**0**
A U.S.packer	□**5**	□**1**	□**2**	□**1**	□**4**

4. Check the appropriate blanks to indicate how hogs marketed from your finishing barns were sold the year before and after the Maple Leaf Foods plant opening?

***Estimated* percent of marketings**

Prior to the Maple Leaf Foods plant opening (1999)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
Cash or Spot Market	□**0**	□**0**	□**3**	□**3**	□**32**
Contract or Marketing Agreement	□**3**	□**2**	□**4**	□**0**	□**39**

Following the Maple Leaf Foods plant opening (2000)

	Less than 20%	20-39%	40-59%	60-79%	80% or more
Cash or Spot Market	□**2**	□**1**	□**2**	□**4**	□**24**
Contract or Marketing Agreement	□**3**	□**3**	□**3**	□**3**	□**43**

5. On a scale of 1 to 9, rate how strongly you agree or disagree with the following items?
If you are uncertain or do not have an opinion about an item, please answer with 5. The following scale is to assist you.

1	2	3	4	**5**	6	7	8	**9**
Strongly Disagree				Uncertain/ No opinion				Strongly Agree

After the Maple Leaf Foods plant opened, …		Mark 1 to 9
a. the number of buyers regularly bidding for cash market hogs from my finishing barns increased	**a.**	**2.34**
b. the addition of the Maple Leaf Foods plant caused higher hog prices in the region	**b.**	**2.84**
c. hogs from my finishing barns were more frequently shipped to a closer packer	**c.**	**3.95**
d. the opening of the Maple Leaf Foods plant decreased the number of finished hogs shipped to the United States	**d.**	**5.13**
e. other packers were more interested in contracting hogs from my finishing barns	**e.**	**3.84**
f. the plant opening had no noticeable effect on marketing or pricing hogs from my finishing barns	**f.**	**5.01**
g. more plants made it more difficult for packers to know how many hogs were committed to each packer	**g.**	**4.00**
h. hog slaughter capacity in Manitoba became less of a problem	**h.**	**5.09**
i. finishing barns closer to Brandon were more affected than those farther away	**i.**	**4.71**
j. hog producers expanded their hog operations due to the opening of the Maple Leaf Foods plant in Brandon	**j.**	**5.31**
k. other packers lost their competitive advantage from having one additional plant in the region	**k.**	**5.50**
l. finishing barns having marketing agreements with another packer switched them to Maple Leaf Foods	**l.**	**4.90**
m. opening the Maple Leaf Foods plant reduced feeder pig exports to the United States	**m.**	**4.43**

6. What was the most noticeable change (if any) to you after the Maple Leaf Foods plant opened?

_____

_____

Thank you for your assistance. Please return your completed survey to:

Jared Carlberg, Department of Agribusiness and Agricultural Economics
353-66 Dafoe Road, University of Manitoba
Winnipeg, MB R3T 2N2

October 10, 2003

Dear Pork Producer:

How the marketplace adjusts to major structural changes, such as packing plant closings and openings, is a concern and of interest to some. We are interested in the market impacts (if any) from opening the Maple Leaf Foods hog processing plant in Brandon in August 1999. Enclosed is a short questionnaire we would like you to complete and return in the return envelope we have provided.

The questionnaire is designed to determine the market impacts *you think* occurred following the opening of the plant, and how it affected the finishing barns you manage and the regional slaughter hog market. The survey pretest indicated the questionnaire should take no more than 10-15 minutes to complete. **Your responses to the questionnaire will be kept confidential and will not be identified with you or your farm/firm when the results of the survey are reported.**

We believe the results of this survey will help us understand markets and market adjustments to significant events or shocks. If you have any questions or concerns about this questionnaire, please do not hesitate to contact one of us at (405) 744-9834, or by email (hornung@okstate.edu or ceward@okstate.edu).

Thank you very much for your time.

Sincerely,

Jonathan Hornung
Research Assistant

Clement Ward
Professor and Extension Economist

Manitoba Pork Council
28 Terracon Place
Winnipeg, Manitoba
Canada, R2J 4G7
*Phone 204.**237.7447***
*Fax 204.**237.9831***

September 25, 2003

Dear Manitoba Hog Producer:

RE: Survey of the Impact of Maple Leaf Foods Brandon Plant Opening

The Oklahoma State University, Department of Agricultural Economics in conjunction with the University of Manitoba, Department of Agribusiness and Agricultural Economics is conducting a survey of Manitoba Pork Producers. The study is examining the market dynamics from the opening and closing of meat packing plants. One of the case studies being looked at is the impact of the 1999 opening of the Maple Leaf Foods processing plant in Brandon, Manitoba.

This letter is included in the survey package to inform you of Manitoba Pork Council's involvement and support for the attached producer survey and of our care in ensuring that confidentiality of producer contact information is being strictly maintained and protected. In this regard, only Pork Council staff is doing the addressing and mailing of the survey to you and other producers. We encourage you to complete the survey. Please do not include your name or return address on the completed survey form or enclosed self addressed stamped return envelope.

The results of the survey will be of interest to Manitoba Pork Council and to you. To maintain confidentiality, Manitoba Pork Council will send you a copy of the survey summary upon receiving it from the University researchers. There is no need to contact the University directly.

Thank you for your time. Call me at (204) 235-2309 should you have any questions.

Yours truly,

Peter Mah
Director,
Community Relations & Sustainable Development

Table 30. Maple Leaf. Correlations of Survey Opinion Questions

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	1.00	0.48	-0.01	0.20	0.13	0.00	0.15	0.27	0.12	0.35	0.23	0.11	0.29
B		1.00	-0.02	0.21	0.03	-0.06	0.09	0.46	0.13	0.30	0.05	0.13	0.28
C			1.00	-0.06	0.29	-0.15	-0.06	0.01	0.09	0.07	0.06	0.19	0.03
D				1.00	0.10	-0.10	0.18	0.60	0.16	0.24	0.31	0.26	0.54
E					1.00	0.03	0.23	0.14	0.16	0.10	0.14	0.16	0.06
F						1.00	0.21	0.04	0.06	-0.07	-0.05	0.15	0.05
G							1.00	0.27	0.17	0.04	0.20	0.03	0.07
H								1.00	0.28	0.23	0.26	0.18	0.50
I									1.00	0.37	0.15	0.29	0.26
J										1.00	0.12	0.28	0.12
K											1.00	0.55	0.35
L												1.00	0.35
M													1.00

Oklahoma State University
Institutional Review Board

Protocol Expires: 6/24/2004

Date: Wednesday, June 25, 2003 IRB Application No AG0328

Proposal Title: MARKET IMPACTS FROM THE CLOSING OF A BEEF PROCESSING PLANT

Principal
Investigator(s):

Jonathan Hornung
421 G Ag Hall
Stillwater, OK 74078

Clement E. Ward
513 Ag Hall
Stillwater, OK 74078

Reviewed and
Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 415 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson

Carol Olson, Chair
Institutional Review Board

Oklahoma State University
Institutional Review Board

Protocol Expires: 10/21/2004

Date: Wednesday, October 22, 2003 IRB Application No AG0410

Proposal Title: Market Impacts from the Opening of the Maple Leaf Foods Pork Processing Plant

Principal
Investigator(s):

Jonathan Hornung
421 G Ag Hall
Stillwater, OK 74078

Clement E. Ward
510 Ag Hall
Stillwater, OK 74078

Reviewed and
Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact me in 415 Whitehurst (phone: 405-744-5700, colson@okstate.edu).

Sincerely,

Carol Olson

Carol Olson, Chair
Institutional Review Board

VITA

Jonathan Thomas Hornung

Candidate for the Degree of

Master of Science

Thesis: MARKET EFFECTS FROM OPENING AND CLOSING MEAT PROCESSING FACILITIES

Major Field: Agricultural Economics

Biographical:

Personal Data: Born in Burlington, Colorado on March 12, 1980, the son of Terrence and Shelley Hornung.

Education: Graduated from Stratton High School, Stratton, Colorado in May of 1998; received Bachelor of Science degree in Agribusiness from Oklahoma State University, Stillwater, Oklahoma in May of 2002. Completed the requirements for the Master of Science degree with a Major in Agricultural Economics at Oklahoma State University in May, 2004.

Experience: Research Assistant, Department of Agricultural Economics, Oklahoma State University, January, 2000 to May, 2000; Research Assistant, Department of Plant and Soil Sciences, Oklahoma State University, September, 2000 to August, 2002; Assistant Economic Analyst, Foreign Agriculture Service, USDA, June, 2001 to August, 2001; Graduate Research Assistant, Department of Agricultural Economics, Oklahoma State University, August, 2002 to May, 2004.