IMPACT OF TRANSACTION COSTS ON SASKATCHEWAN'S BEEF FINISHING SECTOR

A Thesis Submitted to the Faculty of

Graduate Studies and Research

In Partial Fulfillment of the Requirements

For the Degree of Masters of Science

In the

Department of Agricultural Economics

University of Saskatchewan

Saskatoon, Saskatchewan

By

Morley Bryce Ayars

Permission to Use

In presenting this thesis in partial fulfillment of the requirements for a Postgraduate degree from the University of Saskatchewan, I agree that the Libraries of this University may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by the professor or professors who supervised my thesis work or, in their absence, by the Head of the Department or the Dean of the College in which my thesis work was done. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of Saskatchewan in any scholarly use which may be made of any material in my thesis.

Requests for permission to copy or to make other use of material in this thesis in whole or part should be addressed to:

Department Head
Department of Agricultural Economics
University of Saskatchewan
Saskatoon, Saskatchewan
S7N 5A8

Abstract

Ayars, M.A., M.Sc., University of Saskatchewan, Saskatoon, Saskatchewan, June 2003. Impact of Transaction Costs on Saskatchewan's Beef Finishing Sector, Supervisor: Andrew Schmitz.

The removal of the transportation subsidy on western Canadian grain has resulted in a relative shift in competitiveness from grain to livestock production in Saskatchewan. Feedlot managers indicated that they fed cattle at a lower cost than their Alberta competitors. They suggested their feeding advantage is in the range of $45 to $75 per animal. Yet this supposed feeding advantage has not resulted in an increase in cattle being finished in the province. In fact statistics show that there has been a decrease in the number of cattle finished in Saskatchewan since the removal of the transportation subsidy.

This thesis investigated potential hindrances to developing feedlots in Saskatchewan. Interviews with 17 Saskatchewan feedlot managers were conducted in 2001. These feedlot managers suggested that lack of financing was a hindrance to feedlot development in Saskatchewan. They sited provincial land and labour laws, a grain production bias and feeding risk as potential reasons for lack of investment in the feedlot sector.

The interviews with these 17 feedlot managers led to an investigation of transaction costs in buying and selling cattle. A theoretical framework was developed in this thesis to measure transaction costs. Then some empirical evidence was calculated from transaction cost estimates provided by five finishing feedlots that indicated larger feedlots have lower transaction costs in buying and selling cattle than smaller feedlots.

Acknowledgements

The author would like to express thanks to Andrew Schmitz, supervisor of this thesis, for valuable insight and extreme patience. Further, the author expresses gratitude to Richard Gray and Jill Hobbs, whom served on the committee and offered much needed support and guidance.

This thesis would not have been possible except for the support of the author's employer, Saskatchewan Agriculture, Food and Rural Revitalization. The author expresses appreciation towards his immediate managers throughout the M. Sc. process, Paul Shukin and Lyle Stavness, whom made significant allowances in work schedule so the author could attend classes and do the research necessary for this thesis.

Special thanks are extended to the many feedlot managers, cow-calf producers and packing plant personnel for their willingness to share information that was essential to this thesis.

The support of my wife, Kim and my sons, Scott and Dwayne made this thesis possible. Thank you for your encouragement and patience.

M.B.A.

Table of Contents

Section Page

List of Tables

Table **Page**

Table **Page**

List of Figures

Figure **Page**

Figure **Page**

Chapter 1

Introduction

1.1 Background

Vernon Fowke in his book "The National Policy and the Wheat Economy" outlines the development of the Canadian national policy towards wheat production. No other province bought into the "wheat vision" like Saskatchewan which has millions of acres of fertile land that is well suited for wheat production. Figure 1.1 shows the percent of total farm cash receipts of Saskatchewan farms. In 1970 about half of Saskatchewan's farm cash receipts came from the sale of wheat and durum. This increased to 65 percent by 1981 and has since decreased to less than 30 percent of farm cash receipts.

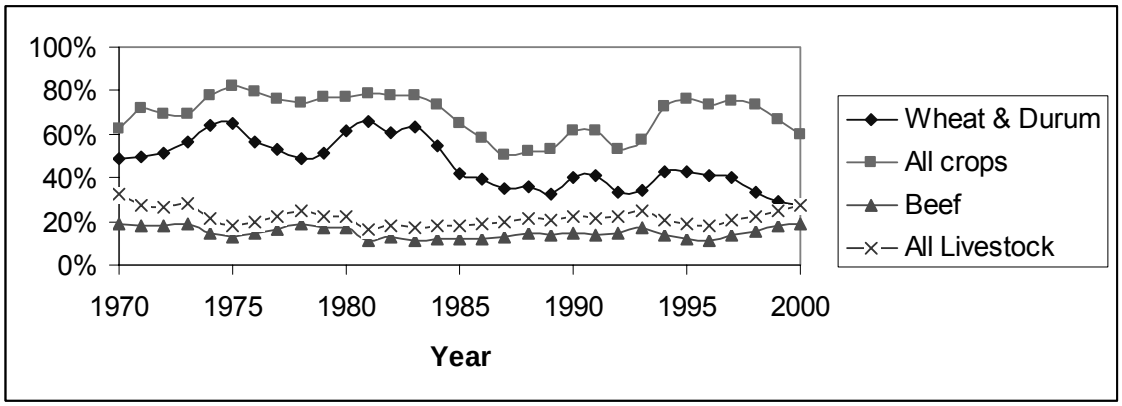


Figure 1.1: Percentage of Saskatchewan's Total Farm Cash Receipts (1970-2000)

Source: Saskatchewan Agriculture, Food and Rural Revitalization Statistical Handbook for various years

Although wheat and durum has become less important to Saskatchewan's farm cash receipts total crop receipts are still important. Total crop receipts have remained relatively constant between 60 and 80 percent of farm cash receipts. But income from beef animal sales dropped from about 20 percent in 1970 to 11 percent in 1983. Since 1983 cash receipts from beef animals has gradually returned to 1970 levels. Cash receipts from all livestock dropped from about one-third of cash receipts to less than 20 percent in the 1980s and have returned to about one-quarter of farm cash receipts. Much of the latest increase in livestock receipts has offset the reduction in government program payments that occurred during the late 1980s and early 1990s.

Figure 1.2 shows a much different story for Alberta. In 1970 cash receipts from sales of livestock were about equal to those from crop sales. However, cash receipts from livestock have gradually increased until they account for nearly two-thirds of Alberta's farm cash receipts.

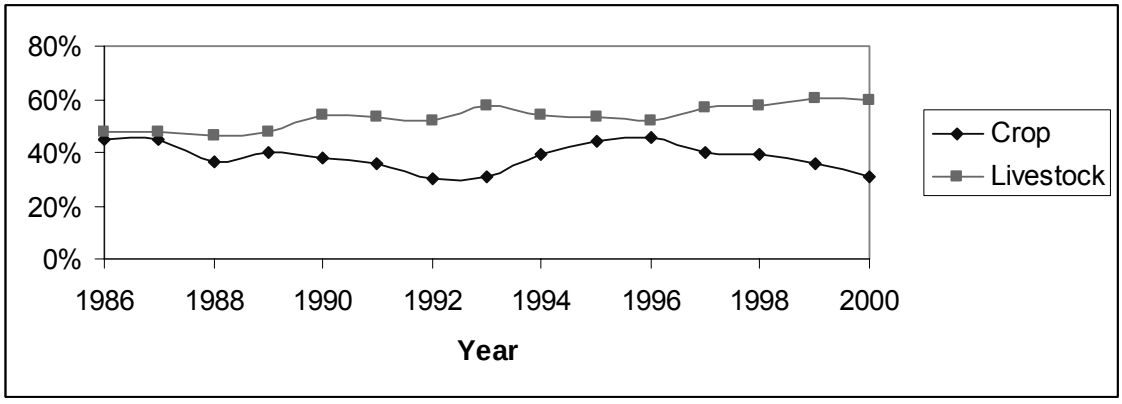


Figure 1.2: Percentage of Alberta's Total Farm Cash Receipts (1986-2000)
Source: Saskatchewan Agriculture, Food and Rural Revitalization Statistical Handbook for various years

In 1970 Alberta's farm cash receipts were less than Saskatchewan's. Figure 1.3 shows the percentage of Alberta's and Saskatchewan's farm cash receipts as a percentage of Canadian farm cash receipts. Alberta gradually has increased its farm

cash receipts relative to Saskatchewan such that it now has significantly higher farm cash receipts. If one was to take into account value added from livestock processing in Alberta compared to Saskatchewan's grain exports the impact on the provincial economy would probably be more dramatic.

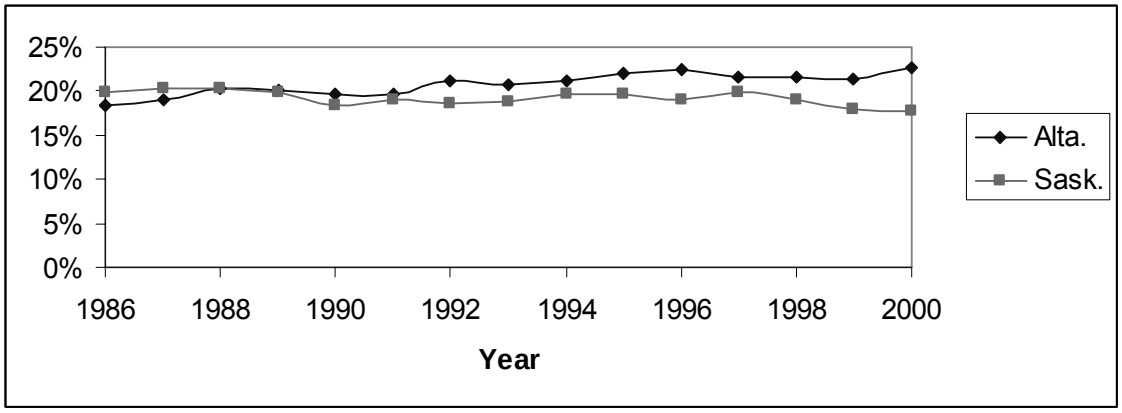


Figure 1.3: Alberta & Saskatchewan Farm Cash Receipts as a Percentage of Canadian Farm Cash Receipts (1986-2000)

Source: Saskatchewan Agriculture, Food and Rural Revitalization Statistical Handbook for various years

Saskatchewan Agriculture, Food and Rural Revitalization[1] is now encouraging greater livestock production. The thrust is towards developing both the hog and beef industries within the province in order to add value to grain production. In terms of beef production the department is now encouraging feedlot development.

1.2 Problem Statement

In 1995 the federal government removed the transportation subsidy on grain in western Canada. This resulted in a shift in the competitiveness of the grain industry

[1] Saskatchewan Agriculture was renamed to Saskatchewan Agriculture and Food because the department was given responsibility to develop added value industries in food processing. Later the department was renamed to Saskatchewan, Agriculture, Food and Rural Revitalization to reflect its added role in economic development in rural Saskatchewan.

relative to the livestock industry. It also resulted in a shift in the relative competitiveness of Saskatchewan's livestock industry with that of Alberta's. Since 1995, Saskatchewan has had a cost of feeding advantage over Alberta. The U.S International Trade Commission (1999) examined the cost of feeding cattle in western Canadian feedlots in the R-Calf antidumping challenge to Canadian live cattle exports into the United States. The Commission found that Pound-Maker feedlot, the only Saskatchewan feedlot in the study, would not have been countervailed because it was not selling into the U.S. market below its cost of production. All other Alberta feedlots were found to be selling below their cost of production. The Commission estimated that Pound-Maker had about $50 per animal lower cost of production than the other feedlots in the study. Saskatchewan feedlot managers suggest that their feeding advantage is between $45 and $75 per animal. Yet there has not been a shift in the number of beef animals finished in Saskatchewan. In fact there has been a slight decline in the number of beef animals finished in Saskatchewan since 1995. So why are less than 200,000 slaughter steers and heifers finished in Saskatchewan when the province produces over a million head of beef cattle calves? Saskatchewan has fewer large feedlots than Alberta. Does the lack of large feedlots result in lower prices being paid to Saskatchewan feedlots thereby making them less economical? Could transaction cost analysis provide part of the answer to these questions?

1.3 Hypothesis

The primary hypothesis is that large finishing feedlots have an economic advantage in the purchase and sale of cattle due to transaction costs compared to smaller

feedlots. This hypothesis implies that large finishing feedlots receive an economically significant higher price for their slaughter cattle than small finishing feedlots and that they have an economically significant lower cost in purchasing feeder cattle than smaller finishing feedlots.

1.4 Objective of the Thesis

The objective of this thesis is three fold. The first goal is to provide an understanding of how feeder cattle are marketed in Saskatchewan. The second is to analyze the impact of transaction costs on the potential expansion of the feedlot sector and in particular the finishing feedlot sector. A theoretical model will be developed that combines neoclassical economic theory with transaction cost economic theory. This theoretical model will provide the backbone for the analysis of the hypothesis. The final objective is to provide a quantitative analysis of the hypothesized transaction cost advantage of larger finishing feedlots in the purchase of feeder cattle and sale of slaughter cattle.

1.5 Outline of the Thesis

Chapter 2 will give an overview of the Saskatchewan feeding sector. It will outline the physical structure of the beef industry followed by its market structure. This chapter will also summarize the results of a survey of 17 feedlot managers in order to gain their opinions regarding the expansion of the feedlot sector.

The literature review is outlined in chapter 3. Here an overview of the literature that describes the development of the western Canadian beef industry will be provided. The theoretical literature on transaction cost economics will be outlined followed by an overview of the literature on measuring transaction costs.

The theoretical framework will be developed in chapter 4. Here the thesis will show that through transaction cost theory it is possible for large feedlots to receive higher prices for the cattle they sell and pay lower prices for the cattle they purchase without the existence of market power.

Chapters 5 and 6 are the empirical methodology and conclusion respectively. The empirical framework will outline the method of data collection and its subsequent analysis.

Chapter 2

Background

This chapter will provide an overview of the Saskatchewan beef industry with particular attention given to Saskatchewan's beef feeding sector. In addition the vertical physical structure of the Saskatchewan beef industry will be described along with a description of its vertical market structure. The demographics of Saskatchewan feedlots will be given as well as the results of a survey of 17 Saskatchewan feedlot managers in regards to their opinions on expanding Saskatchewan's feedlot sector. The information gained in these interviews led to the decision to examine the impact of transaction costs on buying and selling cattle.

2.1 Overview of Saskatchewan's Beef Industry

This section is to provide an overview on Saskatchewan beef cattle industry. This section will include comparisons between the beef cattle industries in Alberta and Saskatchewan. It will further provide the destinations of Saskatchewan's beef cattle production. Saskatchewan had 1.13 million beef cows as of July 1, 2002. This is an increase from 1986 but slightly below the 1997 high of 1.15 million head. Figure 2.1 gives the Saskatchewan beef cow numbers from 1986 to 2000.

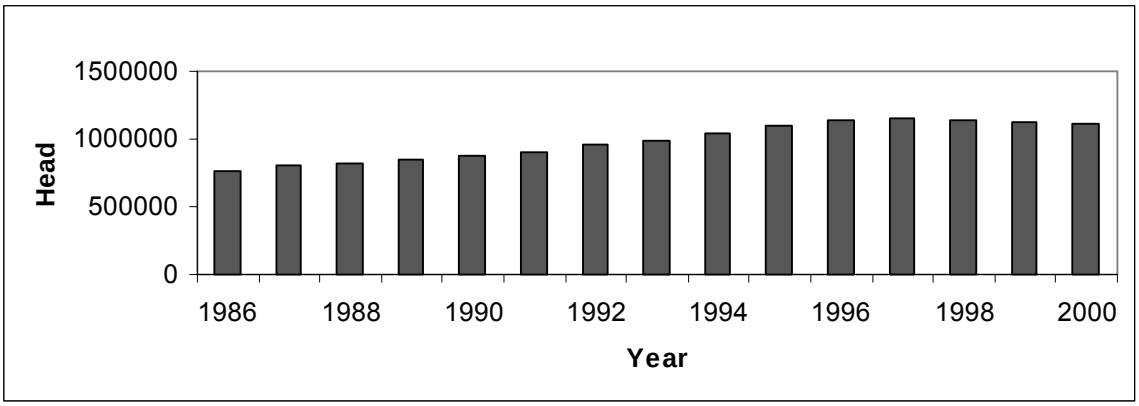


Figure 2.1 Saskatchewan Beef Cow Numbers (1986-2000)
Source: Saskatchewan Agriculture and Food's Agriculture Statistics Handbook, 2000

Table 2.1 shows that Saskatchewan had 26 percent of Canada's beef calf production, in 2001, second only to Alberta's 40 percent. However, in 1999, Saskatchewan had only six percent of the Canadian fed cattle production compared to Alberta's 69 percent as shown in Table 2.2. Yet Saskatchewan produced 5.5 million tonnes of barley in 2000, much of which went to Alberta feedlots.

Table 2.1 Beef Cow Numbers in Saskatchewan and Alberta Relative to Canada (1999-2001)

		% of Can.		% of Can.	
	Sask.		Alta.		Canada
	Million Head		Million Head		Million Head
Jan 1 1999	1.122	27%	1.657	40%	4.189
Jan 1 2000	1.064	26%	1.655	40%	4.137
Jan 1 2001	1.090	26%	1.673	40%	4.206

Source: Mike Pylypchuk (2000), SAF, originally from Statistics Canada

Table 2.2: Fed Cattle Production in Saskatchewan and Alberta in Relation to Canadian Production (1986 – 1999)

YEAR	SASK.	% of Can.	ALBERTA	% of Can.	CANADA
			1000 head		
1986	288	12%	1052.1	44%	2394.9
1987	307	14%	1066.9	48%	2240.0
1988	309	13%	1163.8	49%	2355.0
1989	279	12%	1229.1	51%	2395.0
1990	269	11%	1316.9	56%	2366.8
1991	254	12%	1254.2	58%	2170.5
1992	217	8%	1526.5	59%	2586.6
1993	225	9%	1619.2	62%	2612.2
1994	253	9%	1725.2	64%	2707.4
1995	357	12%	1838.2	64%	2877.7
1996	297	9%	2113.5	66%	3184.7
1997	280	9%	2179.8	67%	3265.0
1998	219	6%	2392.3	69%	3474.4
1999	196	6%	2409.8	69%	3478.1

Source: Mike Pylypchuck (2000), SAF, originally compiled form Statistics Canada, CBGA, AAFC, CanFax

Figure 2.2 shows that Saskatchewan retained about 29 percent of its feeder steers and heifers in 2001 compared to 1987 when the province retained nearly 55 percent of its feeder steers and heifers. In 2001, Saskatchewan retained 27 percent of its

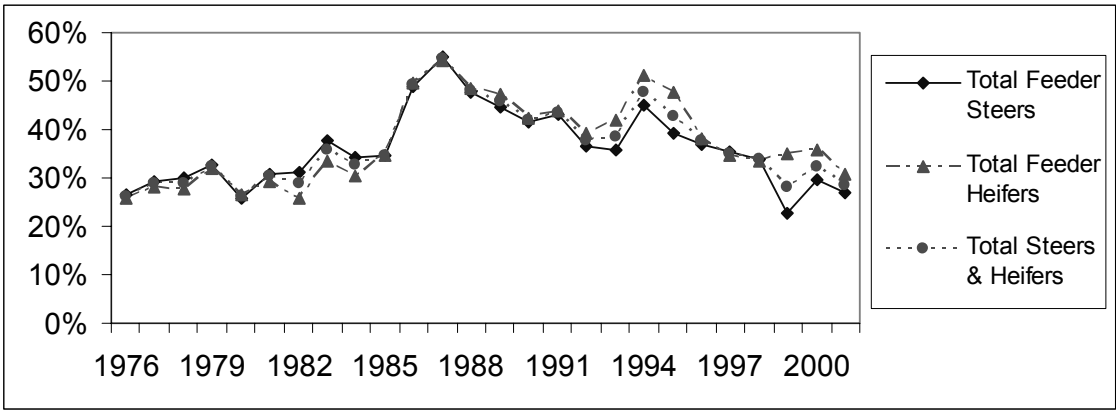


Figure 2.2: Saskatchewan's Feeder Cattle Retention Rate (1976-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

feeder steers and 31 percent of its feeder heifers. The trend toward decreasing retention began in 1988 and continued throughout the 1990s.

In 2001, Saskatchewan marketed 1.118 million feeder steers and heifers. Provincial marketings of feeder steers totaled 629,550 head and 488,850 feeder heifers. Marketing of feeder steers consisted of 239,570 under 600 pound calves, 218,560 animals that were 600 to 800 pounds and 171,420 over 800 pound animals. There were 181,540 head of over 700 pounds feeder heifers sold, 199,310 feeder heifers sold that were between 500 and 700 pounds and 108,000 under 500 pounds feeder heifers marketed.

Figures 2.3 and 2.4 show the retention rate of Saskatchewan feeder steer and heifer marketings by weight category. The remaining animals were exported out of the province. In 2001, Saskatchewan kept 91,190 steer calves and 45,470 feeder heifer

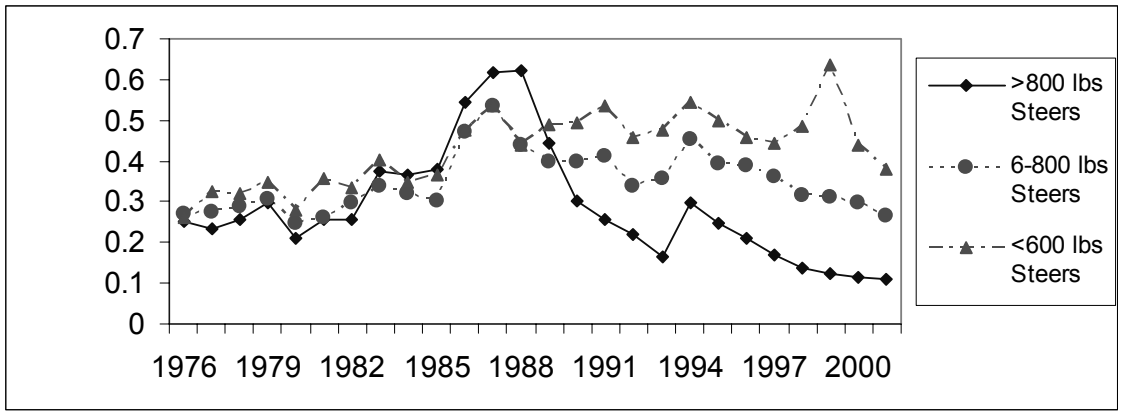


Figure 2.3: Saskatchewan's Feeder Steer Retention Rate (1976-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

calves. The province retained 58,350 of the 600 to 800 pound steers and 69,150 of the 500 to 700 pound feeder heifers. Only 18,840 over 800 pound steers and 35,970 over 700 pound feeder heifers were fed in the province. There has been a gradual decline in the number of animals kept for feeding in Saskatchewan since 1987.

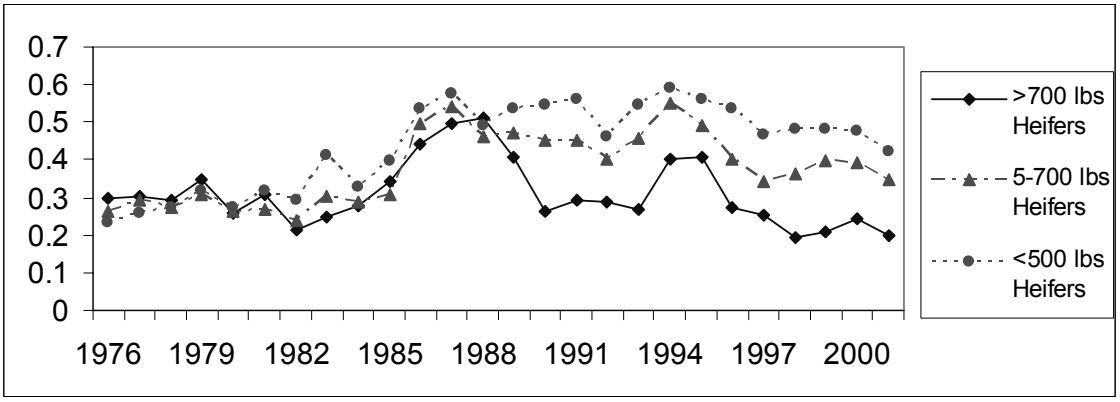


Figure 2.4: Saskatchewan's Feeder Heifer Retention Rate (1976-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

Figure 2.5 shows Saskatchewan feeder cattle exports. Exports to the United States started to decline in the early 1980s and continued to decline throughout the period from1980 to 2001. However, Saskatchewan exports of feeder cattle increased into Alberta during the same period. Alberta replaced the United States as the primary destination of Saskatchewan feeder cattle in the early 1980s. Saskatchewan feeder

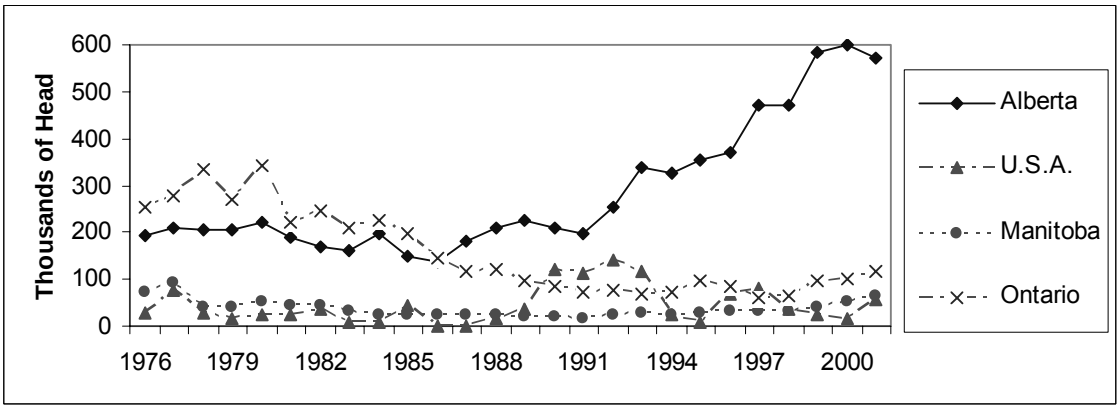


Figure 2.5: Destinations of Saskatchewan Feeder Cattle Exports (1976-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report.

cattle exports continued to increase into Alberta throughout the 1990s. In 2001, Saskatchewan exported 570,420 feeder cattle into Alberta, while it exported 56,500 feeder cattle into the United States. Ontario replaced the United States as the second

largest importer of Saskatchewan feeder cattle in the late 1990s with Ontario receiving 115,490 head in 2001.

The increase in exports of feeder cattle into Alberta came mainly through increased exports of feeder heifers and steers as indicated in Figure 2.6. In 2001, Saskatchewan exported 565,370 feeder heifers and steers into Alberta of which 307,080 were steers. Saskatchewan's increase in feeder cattle exports into Alberta coincided with the increase in the Alberta feeding industry, which began in the 1960s and continued to grow throughout the 1990s. Ramsay (2000) states that by 1987, Alberta produced 1.1 million head of slaughter cattle or about 48 percent of Canadian

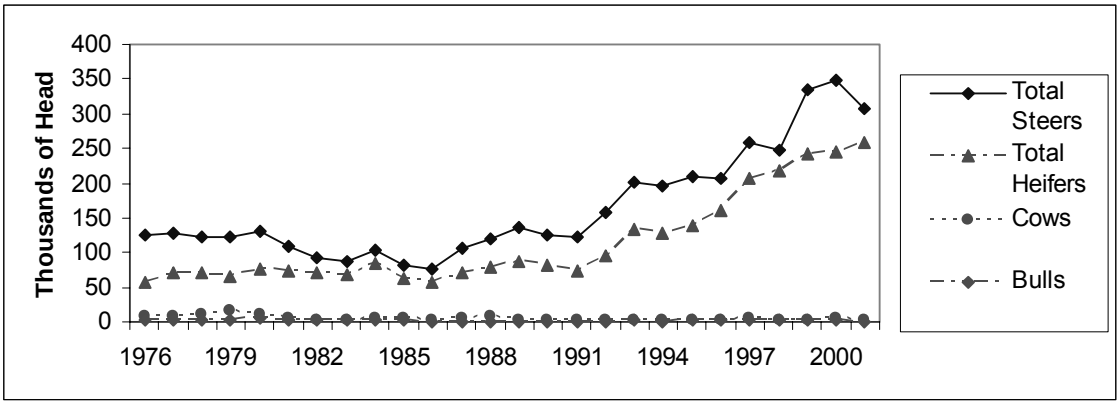


Figure 2.6: Saskatchewan Feeder Exports to Alberta (1976-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

production. Alberta continued to increase fed cattle production to where it produced 2.4 million head of slaughter cattle by 1999.

Alberta's increase in slaughter cattle production has occurred simultaneously with its increase in slaughtering capacity. Alberta slaughtered 1.796 million head in 1996 or about 46 percent of Canadian capacity. Canfax (2002) reported that Alberta slaughtered 2.534 million head in 2001 and had about 63 percent of the Canadian slaughter capacity. Alberta's increase in slaughter capacity coincides with the

development of two world-class slaughter facilities at High River and Brooks. These plants each slaughtered about 4,000 head per day.

In contrast, Saskatchewan's slaughter cattle production has decreased from a high of 721,700 head in 1984 to 279,100 head in 2000 and increased slightly to 342,560 in 2001 as illustrated in Figure 2.7. Decreased slaughter cattle production resulted in decreased slaughter cattle exports. Saskatchewan exports of slaughter cattle decreased from a high of 449,940 in 1984 to 129,270 in 2000 and increased slightly to 183,590 in

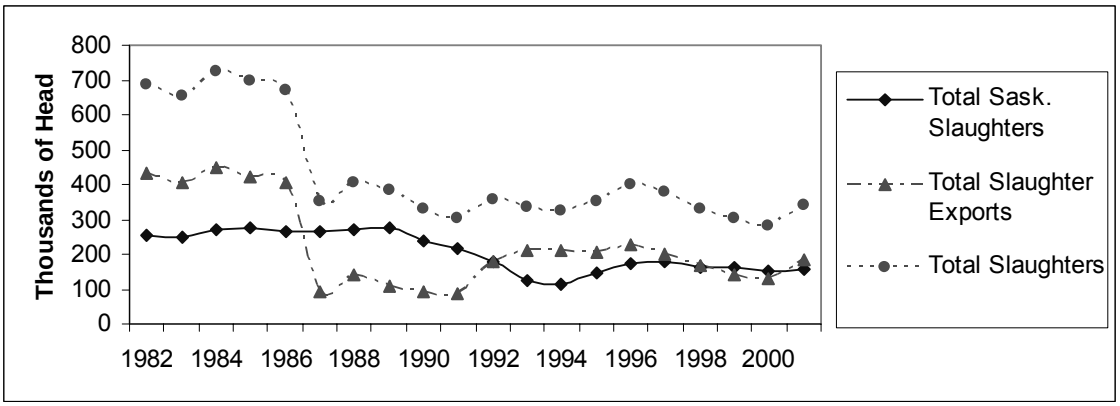


Figure 2.7: Destination of Saskatchewan Slaughter Cattle (1982-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

2001. Domestic slaughter cattle use dropped from a high of 274,440 in 1984 to 149,830 in 2000 and in 2001 increased to 158,970. By 2001, Saskatchewan slaughtered about 46 percent of the provincial slaughter cattle production.

In 2000, the majority of cattle slaughtered in Saskatchewan took place at the XL Beef plant in Moose Jaw. This plant went through an expansion that brought its capacity to 725 animals per day. The kill is constrained by the cooling capacity of the plant. They have sufficient labour to kill more animals during the one shift they run at the plant. Therefore, this plant could easily more than double its killing capacity by

increasing its cooling capacity. The Moose Jaw plant kills about 55 percent cows and about 45 percent "fat cattle[1]."

Figure 2.8 provides Saskatchewan cattle slaughters from 1987 to 2001. The decrease in the number of cattle slaughtered in Saskatchewan is primarily due to the decrease in the number of steers slaughtered. By 2001, Saskatchewan slaughtered 51,450 steers, 25,170 heifers, 78,460 cows and 3,830 bulls.

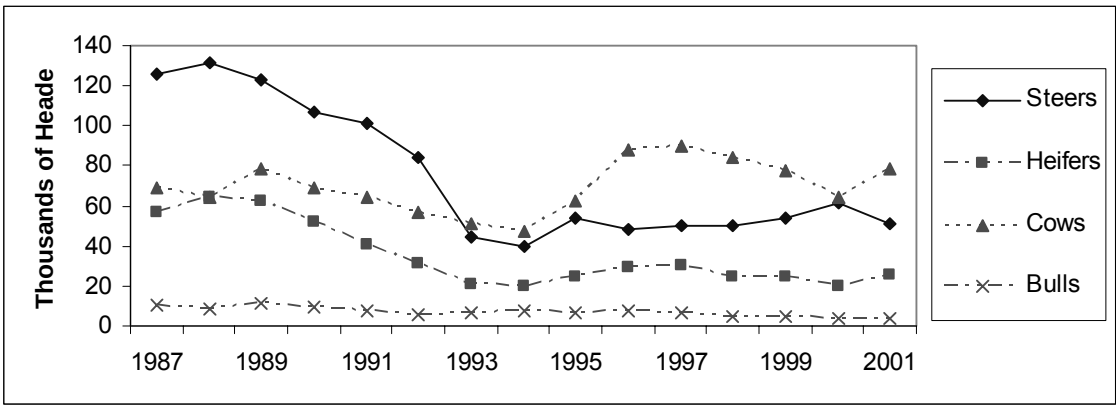


Figure 2.8: Saskatchewan Cattle Slaughters (1987-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

The United States was the primary destination for slaughter cattle exports during the 1990s. Manitoba was the primary destination of Saskatchewan slaughter cattle exports during the 1980s until the United States took over in 1990 as Figure 2.9 illustrates. In the early 1990s Manitoba was replaced by Alberta as the second most common destination for Saskatchewan slaughter cattle exports.

[1] "Fat cattle" is an industry term for slaughter steers and heifers that generally weigh between 1,300 and 1,400 pounds live weight.

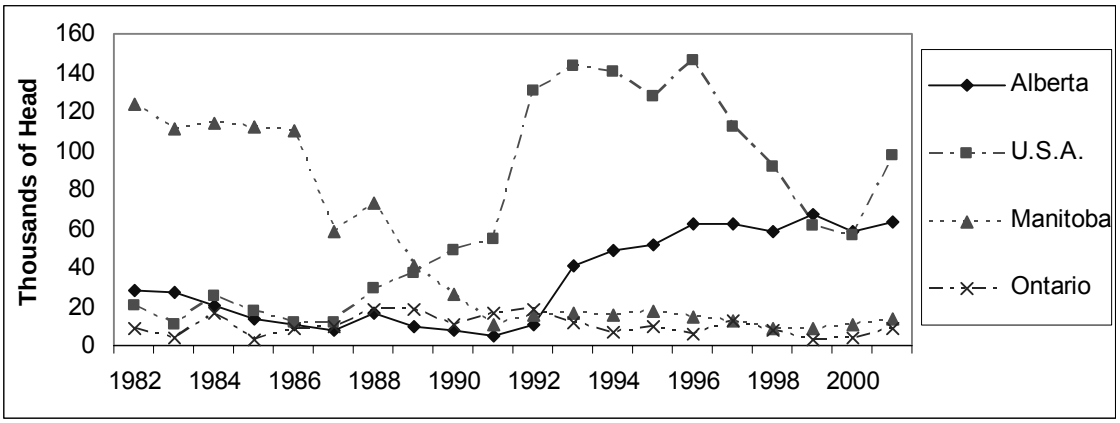


Figure 2.9: Saskatchewan Slaughter Cattle Export Destinations (1982-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

In 1982, Saskatchewan exported 123,770 slaughter animals to Manitoba by 2001 exports had dropped to 13,920 head. Exports of slaughter animals to the United States reached a high of 143,490 head in 1993 and have dropped until exports into the United States and Alberta were virtually equal in 1999 and 2000. By 2001, the United States once again became Saskatchewan's primary market for slaughter cattle. That year Saskatchewan exported 63,530 slaughter cattle into Alberta and 97,450 into the United States.

Figures 2.10 and 2.11 illustrate the composition of slaughter cattle exports into Alberta and the United States respectively. Exports of slaughter steers, heifers and cows have generally increased into Alberta from 1992. The main difference in the composition of cattle exported to Alberta and the United States was that the United States imports significantly more slaughter bulls. In 2001, the United States imported 18,060 slaughter bulls while Alberta took only 1,110 slaughter bulls from Saskatchewan. Provincial exports into the United States during 2001 were further comprised of 30,560 slaughter steers, 10,480 slaughter heifers and 38,350 slaughter

cows, while Alberta received 23,980 slaughter steers, 16,490 slaughter heifers and 21,390 slaughter cows.

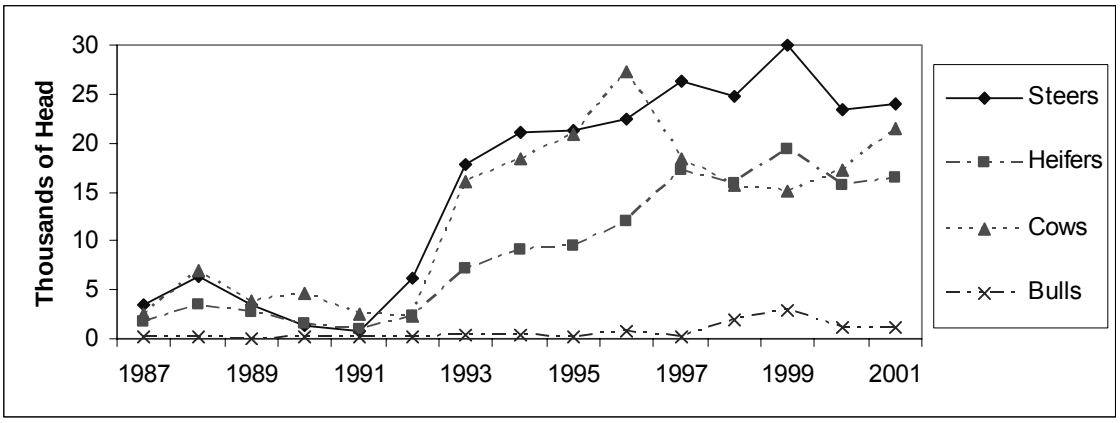


Figure 2.10: Saskatchewan Slaughter Cattle Exports to Alberta (1987-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

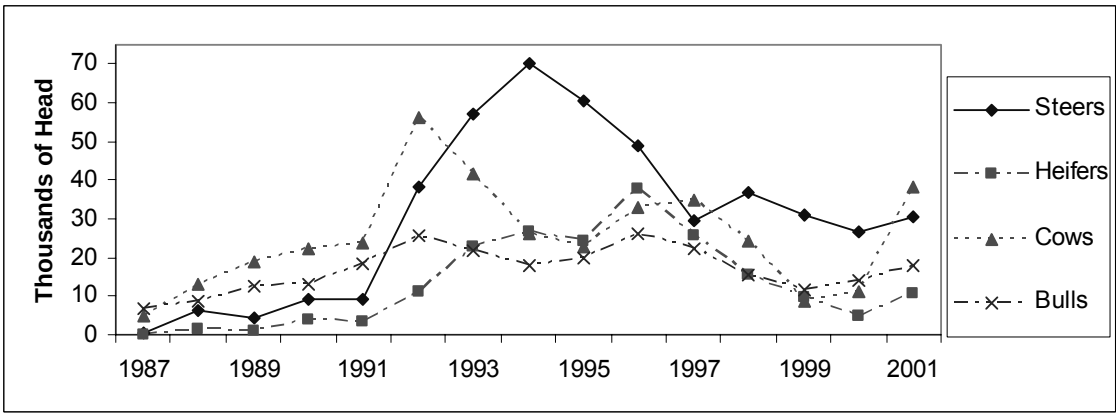


Figure2.11: Saskatchewan Slaughter Cattle Exports to US. (1987-2001)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

Saskatchewan produces both barley and beef cattle calves. Yet it has continued to lose ground to Alberta in fed cattle production.

2.2 Beef Industry Physical Structure

The physical flow and transformation of cattle in the Saskatchewan beef industry, as illustrated in Figure 2.12, consists of several stages, beginning with cow-calf production and ending at the consumer's plate. The intermediate stages include backgrounding operations, finishing feedlots, packing plants (slaughter houses), processors, wholesalers, and retailers.

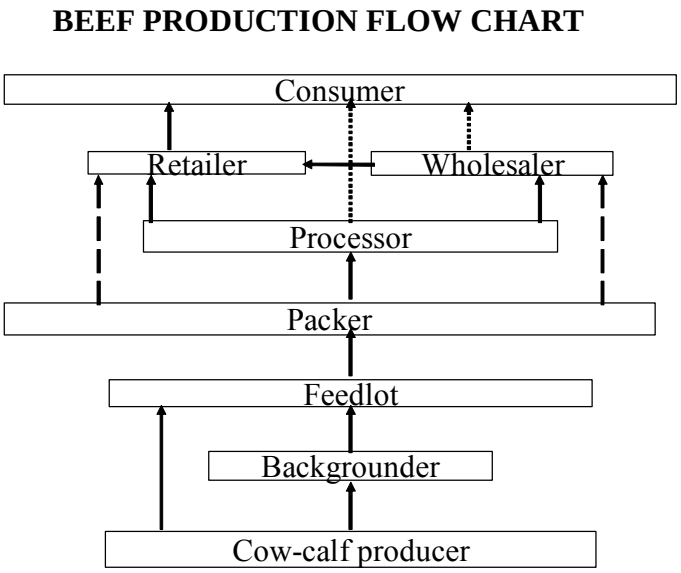


Figure 2.12 Vertical Physical Structure of the Beef Industry

The cow-calf producer supplies calves for either the backgrounder or finishing feedlot. Generally, calves are born between early January and mid-June and then weaned in late September to early November. Weaned calves typically vary in weight from 150 kg to 375 kg live weight. The larger framed calves enter directly into the

feedlot where they receive a high-energy diet until they are slaughtered, usually at 12 to 14 months. The remaining calves are backgrounded during the winter. These calves are usually put in a dry lot and fed a high roughage ration. Those calves that are not ready for finishing in the spring are usually placed on grass until they are ready for the finishing feedlot. The backgrounding process takes between 100 to 150 days. After backgrounding, the animals that are about 370 kg (800 lbs.) enter into a finishing feedlot where they receive a high-energy ration and are soon ready for slaughter. Smaller framed calves require 18 to 24 months from birth to slaughter while medium framed calves require 14 to 18 months. Finishing feedlots are able to feed weaned calves through to slaughter, but prefer to purchase backgrounded animals that already have a frame size that enables them to quickly gain weight. Purchasing backgrounded animals reduces the number of sick animals, reduces the amount of rations required, and increases the number of "turnovers" in a year, thereby increasing the efficiency of the finishing feedlot.

Feedlots supply fat cattle to the packing plant where they are slaughtered. Carcasses are then graded and processed, usually into a boxed beef form. This beef is then sold to the final consumer, processor, wholesaler or retailer. Packing plants may be vertically integrated into secondary processing and/or sell to firms who do secondary processing. Secondary processing is referred to as processors in figure 2.12. Secondary processing includes making products such as sausage, beef jerky and ready-to-eat meals. Processors may sell to the final consumer, wholesaler, or retailer. For example many sausage makers sell their product directly to the final consumer. Wholesalers

usually perform a search-and-gather function for small retail outlets such as small restaurants and stores, while retailers sell meat products directly to final consumers.

To this point the physical structure of the beef industry has been outlined. The interaction in the market place between each phase remains to be discussed.

2.3 Structure of the Beef Marketing System

This section outlines the interaction between feedlots, cow-calf producers and packing plants. Figure 2.13 below is a schematic of this interaction.

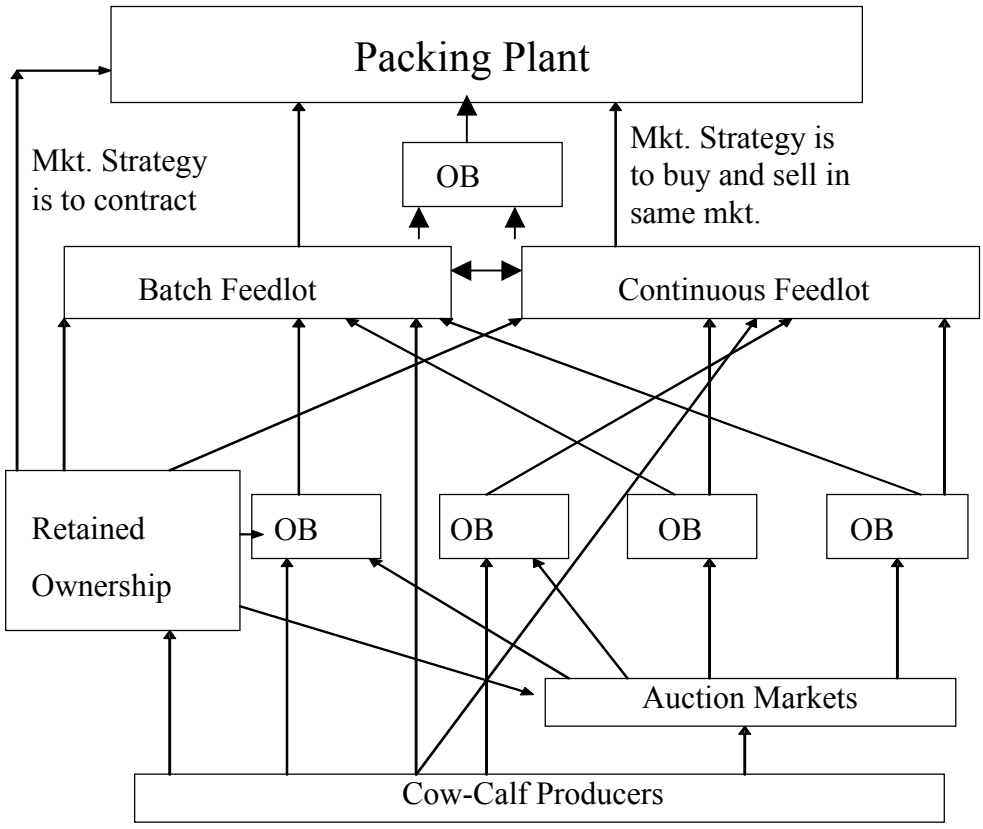


Figure 2.13: Vertical Market Structure of the Beef Industry

Order Buyers (depicted as OB in figure 2.13) are key middlemen in marketing beef cattle. Order buyers or cattle brokers provide many services to the beef industry. They buy and sell cattle on behalf of customers, provide financing for the purchase of cattle, act as an impartial evaluator in direct sales and provide a source of information on local markets. They are required under the regulations of Saskatchewan's "The Animal Products Act" to be licensed and bonded. Bonding and licensing costs about $700 annually.

Feedlots either contact the order buyer or the order buyer contacts the feedlot regarding cattle markets. Order Buyers purchase cattle for specific orders or may buy on speculation.

Generally, an order is placed with the order buyer specifying the type of animal the feedlot wants and the amount of money they are willing to pay. The buyer tries to fill the order and charges the current commission of $1.00 per hundred-weight for this service.

The order buyer is liable for paying for the animals that they purchase at the auction markets. They have a window of three days before payment is required. During this three-day period they normally ship the cattle to their client and receive payment.

There are a number of cattle broker firms in Saskatchewan. Some firms specialize in specific auction markets while others have buyers at all auction markets in the province. Firms may employ as few as one buyer or have a large number of employees buying cattle.

Order buyers usually charge a lower commission when dealing among themselves. They deal with each other when one cattle brokerage firm may have a large contract that can not be filled by themselves and have other order buyers help fill this order. Another situation may be when they find themselves with a number of cattle that do not divide evenly into trucks. In this case they may deal the cattle to other order buyers that need a few more cattle to fill their trucks.

Reputation is a critical part of an order buyer's business. They need a reputation in judging the quality of cattle they are purchasing and a reputation of dealing fairly with their clients. Gaining a reputation is a long process usually by working for a cattle brokerage firm. Once a reputation is gained then it is possible for order buyers to set up their own businesses assuming they are able to obtain sufficient financing. Reputation is difficult to gain but easily lost.

However it is becoming more difficult for small cattle brokerage firms to compete with large cattle brokerage firms. The large firms are able to provide more services than smaller ones. Larger firms are able to develop a larger network so they can often get better contracts with packing plants or with other feedlots, they are able to attend more auction markets meaning they have a wider range of cattle to access. They also often can provide better financing because they are able to obtain money at a lower cost. Perillat, Ayars, Highmoor and Schmitz (2002) reported that four large cattle brokerage firms that operate in Saskatchewan obtain favourable financing through Farm Credit Canada, a federal crown corporation. Smaller cattle brokerage firms would find it

difficult to find similar financing through other financial institutions in order to compete.

Cow-calf producers have the option to sell their weaned calves to an auction market sell direct to the feedlots or retain ownership of their calves. The auction is usually pre-sort sale where animals of similar genetics, age and size are moved through an auction ring in combined lots. The cattle are priced on the spot through "a 'live' interaction between buyer and seller."[2] Discussions with personnel at Saskatchewan Agriculture, Food and Rural Revitalization and cow-calf producers suggest that between 75 and 90 percent of the calves marketed in Saskatchewan go through the auction market. The remaining calves are sold through some form of direct sales including satellite sales, e-mail and internet auction. Cow-calf producers can sell their calves directly to feedlots themselves or go through an order buyer. In the case of retained ownership, cow-calf producers may either sell backgrounded animals to the finishing feedlot directly, through an order buyer or through the auction market. Further they can sell finished animals directly to the packing plant or through an order buyer.

Discussions with a large Saskatchewan cow-calf producer that sells calves directly to feedlots suggest that with a little time and effort a cow-calf producer could gain $20 to $25 per animal through direct sales to a feedlot. The primary costs incurred would be opportunity costs in time spent searching out potential buyers and price discovery as well as negotiating delivery and price options. One method cow-calf producers could search out potential buyers is by finding out who purchased their calves at the auction market. Then they could contact the buyers to see if any of the buyers wanted more of their cattle and if these buyers would buy directly from them. Cow-calf

[2] Unterschultz (2000) page 36.

producers could also use beef cattle magazines to find other potential buyers. Cow-calf producers could use order buyers as impartial sorters and evaluators and pay them a flat wage for their services. Any sales into the United States would also require the assistance of an order buyer because they are bonded. Direct marketers suggest the key to direct sales is never send bad cattle.

Discussions with 17 Saskatchewan feedlot managers suggest they purchase about 80 percent of their feeder calves through auction markets. The remaining calves are either purchased directly from cow-calf producers or produced as part of the feedlot operations.

There are two types of feedlot operations in Saskatchewan, those that primarily background calves and those who primarily finish cattle for slaughter. About 18 percent of the 210 feedlots in Saskatchewan are primarily finishing feedlots that account for about 38 percent of the 201,000 head capacity in Saskatchewan. The following section will provide a more detailed analysis of Saskatchewan's feedlot sector.

The type of marketing arrangement that feedlots have is determined by the frequency with which they buy and sell their animals. Batch feedlots are defined in this thesis as those feedlots that fill their feedlot with the same type of animals during a three to six week period then sell all their animals as they become ready for sale until the feedlot is empty. Then they start the cycle over with a maximum of two cycles per year. The majority of backgrounding feedlots fit in this category along with smaller finishing feedlots. Generally, this type of feedlot is more likely to have forward selling contracts either with finishing feedlots, order buyers or packing plants.

Continuous feedlots are defined in this thesis as those feedlots that buy and sell on a daily, weekly or monthly basis. This type of feedlot is seldom empty. Their market strategy is to buy and sell during the same daily, weekly or monthly period and they do not usually forward contract the sales of their cattle. Large finishing feedlots generally fit in this category.

The marketing strategy chosen by the feedlot is based on the size of feedlot, willingness to take risk and the ability of the feedlot to access capital and conditions placed on the acquisition of this capital. These conditions and ability to access capital is based upon the relative wealth of the feedlot and its management of the marketing process. The feedlots wealth refers to its financial strength in terms of ownership of assets and the amount of financial backing it can access through shareholders.

Backgrounding feedlots either custom feed for customers or take ownership of the calves during the backgrounding process. Custom feeders include finishing feedlots, order buyers, cow-calf producers (usually through a feeder association), or other private investors. Backgrounding feedlot managers generally forward contract their animals with finishing feedlots or order buyers who have forward contracts with finishing feedlots.

Finishing feedlots either custom feed for their customers or take ownership of the animals during the feeding process. They either contract their calves out to backgrounding dry lot, contract to be "grassed" during the summer or background and finish in their own lot. Finishing feedlots have a similar custom feeder base as does backgrounding feedlots with the addition of packing plants. The majority of finishing feedlots in Saskatchewan market their slaughter cattle directly to the packing plants but

a few prefer to go through order buyers. Figure 2.14 shows that over 90 percent of slaughter steers are marketed directly to Saskatchewan packing plants while nearly 90 percent of slaughter heifers are marketed in this manner in 2001.

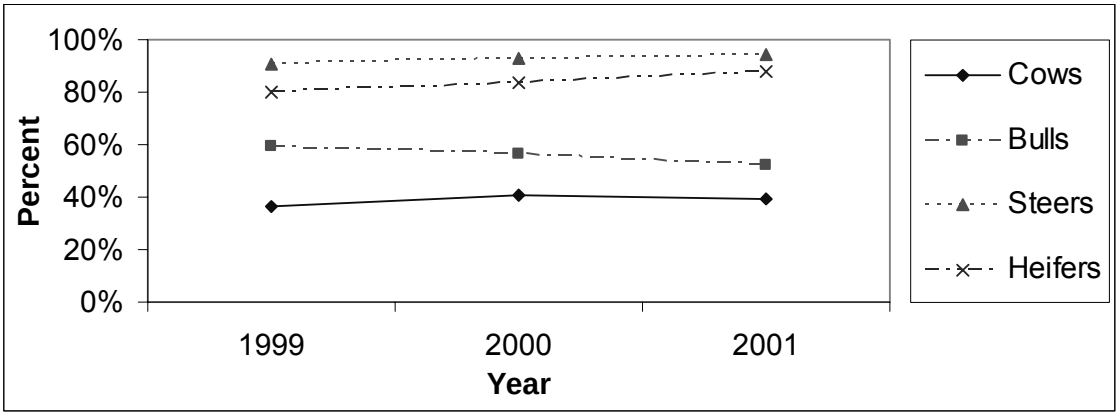


Figure 2.14: Percentage of Direct to Plant Marketings (Saskatchewan)
Source: Saskatchewan Agriculture, Food and Rural Revitalization's Cattle Marketing Report

The majority of feedlot managers prefer to buy and sell during the same daily, weekly or monthly period. They argue that feeding margins are small so custom feeding is relatively low risk with low profit margins. They contend that it is more profitable buying and selling cattle than feeding cattle. However, the feedlot needs to have sufficient financial strength to ride though the "down" market in order to take advantage of an "up" market.

Saskatchewan finishing feedlots sell slaughter cattle primarily to four Canadian packing plants and a few U.S. packing plants. Unterschultz (2000) indicates that in 1997 *Excel* (Cargill Foods) in High River (Alberta), *X-L Foods Ltd.* in Calgary (Alberta), *IBP* (Lakeside Packers) in Brooks (Alberta) and *Better Beef Limited* in Guelph (Ontario) accounted for about 70 percent of federally inspected cattle slaughters in Canada. Since then *X-L Foods Ltd.* bought and expanded the packing plant in Moose Jaw (Saskatchewan).

Many of the 17 feedlot managers indicated that they prefer to sell to Canadian packing plants rather than to U.S. packing plants. They indicate that the U.S. grid system is more severe than the one offered by Canadian plants. The U.S. grid has weight ranges built into the grid. The discounts are severe if the animal weighs outside these ranges. Those feedlots that sell into the United States prefer to sell based on live weight.

Saskatchewan slaughter cattle marketed in Canada are priced either on live weight bases, rail grade or a formula price often referred to as the grid. Live bid is based on the seller's description of the cattle and packers bid with the highest bid getting the animals. Some feedlots prefer to sell using the list system where the seller describes the animal and the price requested. Usually packers will give a live or rail bid if they are not willing to take the price. The feedlot then has the option to either take the highest bid or re-list at a lower price. Feedlot managers that use a list system indicate that the decision to take the highest packers bid or re-list is dependent on market conditions.

Rail grade means that the price is based on the carcass weight and the grade[3] of the animal. Packers bid based on a certain grade usually at the top Canadian grade. Animals that grade lower will receive a discounted price based on the market. There may be further discounts if the animal is too large or too small.

Formula or the grid system is a system of incentives and discounts and is generally offered to feedlots with which the packing plant has a strong business

[3] Grading is done by the Canadian Beef Grading Agency, which provides third party grading of beef at federally and provincially inspected packing plants. The packing plants pay for their services by negotiating a contract with the agency. The agency then hires the graders to do the grading. The Canadian Beef Grading Agency is audited by the Canadian Food Inspection Agency at two levels. First each grader is audited. If they grade less than 95% accuracy but greater than 90% accuracy then they must go through retraining. If they grade less than 90% accuracy then they are disqualified from grading. The Canadian Beef Grading Agency is also audited by Canadian Food Inspection Agency regarding its business practices.

relationship. The feedlot is required to provide a certain percentage of cattle in the top grades. The packing plant determines if the animals reach that packing plant's top grades. These grades are higher than the top Canadian grade. Usually, if the animal does not meet the highest Canadian grade then the feedlot is paid on the rail grade method. If the feedlot does not meet the percentage of cattle at the required grade then there are severe discounts. The feedlot would also probably have higher costs in obtaining the premium prices offered.

Unterschultz (2000) further indicates that the three Alberta plants purchased about two-thirds of their cattle, in 1998, through the spot market, 22 percent through contract or packer-owned fed cattle and 10 percent through formula or grid pricing. Discussions with Alberta packing plants suggest that little has changed since Unterschultz's study. They also indicated that they prefer to purchase rail grade on the spot market. Purchasing through a contract means the packing plant and feedlot negotiate the price for delivery at some future date. Usually the price is based on live or rail grade. Rail grade is the most common method of pricing under contract.

2.4 Saskatchewan Feedlot Sector

This section outlines the number, type and size of feedlots found throughout Saskatchewan. The Saskatchewan Agriculture and Food's "2000 Feedlot Survey" indicated there were nearly 210 feedlots in Saskatchewan with a total one time feeding capacity of about 201,500 head. About 22 percent of the feeding capacity existed in 159 feedlots that have a one-time capacity of less than one thousand head. It is

probable that most of these feedlots feed only during the winter. About 64 percent of these small feedlots backgrounded. Backgrounding represented about two-thirds of the one-time capacity in this size range. About 23 percent did not indicate if they backgrounded or finished, which represented about 19 percent of the small feedlot category's capacity. The remainder either finished or backgrounded and finished.

In 2000, there were 41 feedlots that had a capacity from 1,000 head to 3,000 head representing about 31 percent of Saskatchewan's feeding capacity. Within this category about 39 percent backgrounded, 22 percent finished, 32 percent both backgrounded and finished and the remainder did not indicate whether they backgrounded or finished. Backgrounding feedlots made up about 36 percent of the one-time capacity at this level, finishing feedlots made up about 26 percent and those who did both made up about 31 percent.

The over 3,000 to 5,000 head one-time capacity category included 8 feedlots, which accounted for about 15 percent of provincial capacity. Two of these feedlots exclusively backgrounded, one exclusively finished while the rest did both. About 44 percent of this level's capacity was used for backgrounding and 56 percent for finishing.

There were 6 feedlots that had a one-time capacity of greater than 5,000 head. This group accounted for 38 percent of provincial capacity. Two feedlots exclusively finished while the rest backgrounded and finished. About 70 percent of this category's capacity was used for finishing and 30 percent for backgrounding.

The "big 6" feedlots made up over 55 percent of the provinces one-time finishing capacity and the top two categories accounted for over 75 percent of the finishing capacity. Assuming the feedlots that had a one-time capacity of less than

3,000 head filled their lots only once a year further shows the dominance of the large feedlots in terms of finishing. Under this assumption the top two categories accounted for nearly 85 percent of the animals finished with the "big 6" accounting for about 65 percent.

Figure 2.15 illustrates the percentage of feedlots, total one-time capacity and one-time finishing capacity by feedlot category.

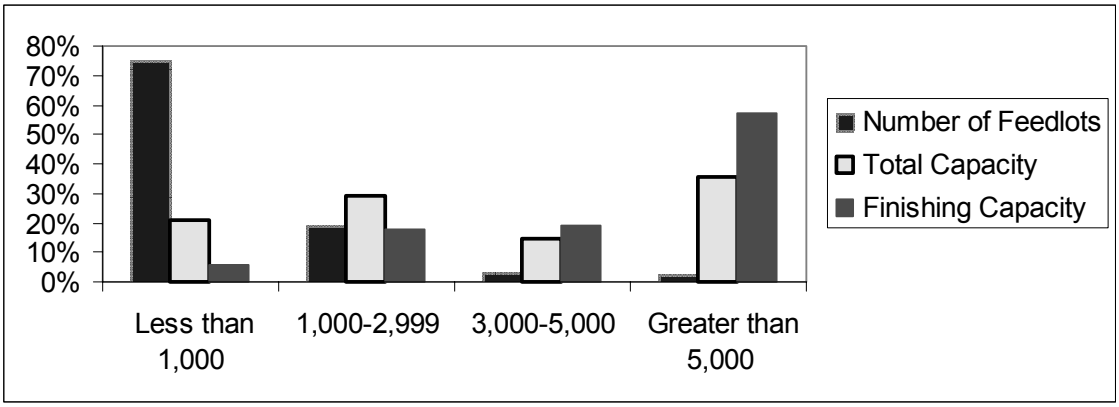


Figure 2.15: Percent Feedlots, Total Capacity and Finishing Capacity by Category (2000)

Source: Compiled from Saskatchewan Agriculture & Food's "2000 Feedlot Survey"

Figure 2.16 gives the feeding capacity by crop district compiled from the "2000 Feedlot Survey." Crop districts 6A and 6B had 25 percent and 10 percent of the provincial feeding capacity respectively. A close examination of the locations of the feedlots revealed that there were five major feedlots that were within 10 kilometres of the Yellow Head highway with a combined one-time capacity of about 63,000 head or about 31 percent of the provincial capacity. There were 8 major feedlots within 110 kilometres of the City of Saskatoon with a combined one-time capacity of 70,000 or about 35 percent of Saskatchewan's capacity.

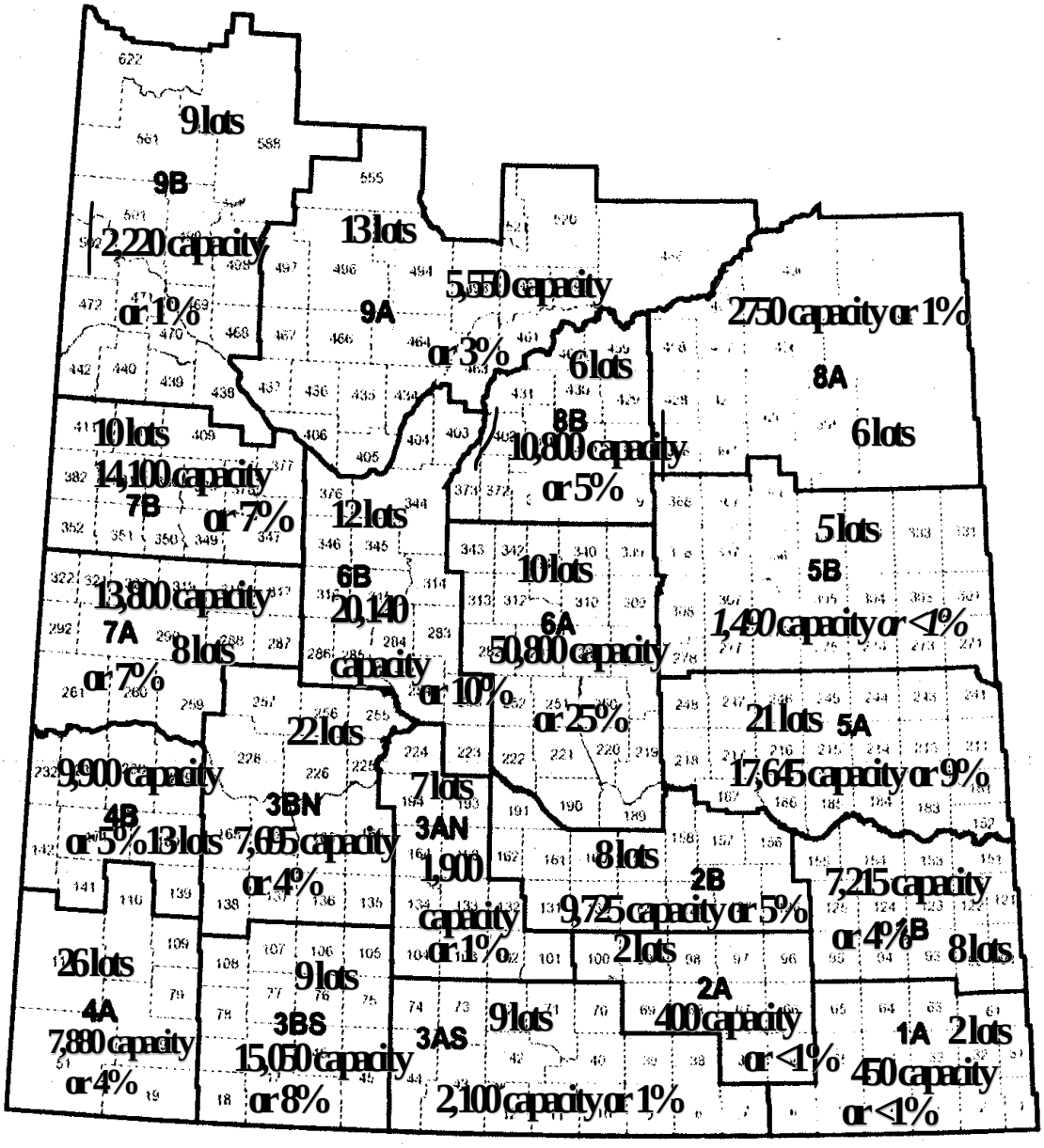


Figure 2.16: Saskatchewan Feeding Capacity by Crop District - 2000
Source: Compiled from Saskatchewan Agriculture & Food's "2000 Feedlot Survey."

2.5 Saskatchewan Feedlot Managers Reponses to Feedlot Development

This section will provide a snap shot of the issues facing the feedlot sector in Saskatchewan and its possible expansion. A survey of 17 Saskatchewan feedlots was done in 2001 as part of the "Assessment of Western Canadian Beef Development[4]" project. These feedlots included backgrounding and finishing operations and included all feedlots with one-time capacities greater than 3,000 head. Only two feedlots below 3,000 head one-time capacity were surveyed with the smallest feedlot having a one-time capacity of 1,800 head.

These feedlots accounted for about 57% of the total one-time capacity. One feedlot expanded by 2,500 head in 2001. These 17 feedlots dedicated about 70,000 head of their total one-time capacity to finishing animals. Saskatchewan Agriculture and Food's "Cattle Marketing Report" indicated that in the year 2000 Saskatchewan finished about 160,000 slaughter steers and heifers. Therefore, these 17 feedlots accounted for nearly 90% of total provincial finishing capacity, assuming two turns per year. Backgrounding accounted for about 46,000 head of the capacity of the 17 feedlots. This represents about 30% to 50% of the provincial backgrounding capacity depending on the number of turns the surveyed and non-surveyed lots had. The 17 feedlots were about evenly divided on the number of head that were owned compared to custom fed, with a slight edge to ownership.

Feedlot managers were asked how they bought and sold cattle, how they obtained their feed requirement, how they dealt with risk, human resources,

[4] A forthcoming report to Saskatchewan Agriculture, Food and Rural Revitalization. [Andrew Schmitz et al. (2003)] This study also relies on information gained from the Perillat et al. (2002) study.

management experience, and to identify hindrances to investment into the cattle feeding sector in Saskatchewan, the extent of entrepreneurial spirit in Rural Saskatchewan, community attitude towards intensive livestock operations, provincial infrastructure, perceptions of provincial government attitude towards the cattle feeding sector and the role of the provincial government in the beef industry. Appendix "A" provides the "seed" questions asked in the survey. Participants provide many responses to each question.

Table 2.3 indicates the surveyed feedlots preferred method of obtaining their feeder cattle. Ninety-four percent of the feedlots surveyed bought feeder cattle through order buyers at auction markets. In total over 80 percent of the animals were purchased through auction markets and about 17 percent were purchased through direct sales.

Table 2.3: Feedlot Preference in Acquiring Feeder Cattle: Saskatchewan

	Percentage of Feedlots
Auction Market	94.1%
Direct Sales (local)	58.8%
Own farm	5.9%
Satellite auction	5.9%

Source: Compiled from data provided by participants surveyed.

Table 2.4 shows how these feedlots obtain the grain that goes into their feed rations. This grain is mainly composed of barley but includes, distilled grain and screening pellets. The feedlots were about evenly split in buying grain from grain brokers and local farmers, about 95 percent of the feedlots purchased grain in this manner. Other methods of obtaining grain include from the local elevator, from their own grain farm and from their shareholders. About 7% of the grain used came from the feedlot's grain enterprise. Some feedlot managers did not have any trouble acquiring grain from local grain farmers while others complained that they were unable to

contract with farmers because the local grain farmers were unwilling to commit their grain.

Table 2.4: Feedlot Grain Acquisition Preference: Saskatchewan

	Percentage of Feedlots
Local farmer or customer	47.1
Grain Broker	47.1
Own	29.4
Elevator Company	23.5
Shareholder	5.7

Source: Compiled from data provided by participants surveyed.

Table 2.5 indicates that most feedlots prefer to grow their own roughage. This preference could be due to quality risk in obtaining roughage from other sources. Roughage consists mainly of silage with hay and straw supplemented occasionally. About 55 percent of the roughage used is grown on the feedlot's own land and about 95 percent of the remaining roughage is grown on land that is under contract to the feedlot either through shareholders or from local grain farmers.

Table 2.5: How Feedlots Obtain Their Roughage: Saskatchewan

	Percentage of Feedlots
Own	70.6
Buy from local farmers	17.6
Shareholders	11.8

Source: Compiled from data provided by participants surveyed.

Table 2.6 shows that nearly 30 percent of the 17 feedlots marketed at least some of their backgrounded cattle by contract. About 18 percent of these feedlots marketed their backgrounded cattle at cost of gain plus a negotiated return to each feedlot's fixed and management costs, through a bid system or on a straight price per pound of gain. Marketing through the auction market was not a method of choice for most feedlots. About 27 percent of the backgrounded cattle were sold by contract compared to 19

percent cost plus, 15 percent price per pound gain, 14 percent bid and 2 percent through the auction.

Table 2.6: Feedlot Method of Marketing Backgrounders: Saskatchewan

	Percentage of Feedlots
Contract	29.4
Cost Plus	17.6
Bid	17.6
$/pound of gain	17.6
Auction market	5.9

Source: Compiled from data provided by participants surveyed.

Table 2.7 indicates that over half of the 17 feedlots marketed fat cattle through rail bid. About 53 percent of the fat cattle were sold on the rail bid method, 30 percent sold on the live bid method, 24 percent sold either through contracts or by the feedlot listing the animals they had for sale and only about 12 percent were sold on the grid. Only about 1 percent of the animals sold went on the U.S. grid system.

Table 2.7: Feedlot Preference in Marketing Fat Cattle: Saskatchewan

	Percentage of Feedlots
Rail bid	52.9
Live bid	29.4
Contract	23.5
List	23.5
Grid	11.8

Source: Compiled from data provided by participants surveyed.

Table 2.8 outlines that nearly half the feedlots surveyed did not have a strategy to reduce price risk on their feed supplies this accounted for over 30 percent of the animals marketed. Hedging barley was the preferred method of reducing price risk on feed supplies. Feedlots hedged barley both to offset silage costs and grain costs. Generally, a ton of silage is priced at 10 to 12 time the price of a bushel of barley.

Table 2.8: Feedlot Risk Strategy for Feed Supply: Saskatchewan

	Percentage of Feedlots
No strategy	47.1
Hedge	29.4
Forward contract	23.5
Pre-buy	5.9

Source: Compiled from data provided by participants surveyed.

The feedlots that hedged barley accounted for more than half of the cattle marketed by the feedlots surveyed. Forward contracting was the second most popular method of reducing price risk on feed supplies. Those feedlots that forward contracted accounted for about 15 percent of the cattle marketed by surveyed feedlots. Only one feedlot bought barley in advance and this feedlot manager only did this when he felt barley prices were extremely low such that adding the cost of storage still made the barley low cost.

Over 80 percent of the feedlots surveyed did not have a drought strategy in place. One feedlot's drought strategy was to keep sufficient silage to meet 9 months feeding requirements and hedged barley prices. The feedlots that did not have a drought strategy accounted for nearly 70 percent of the cattle sold.

Table 2.9: Feedlot Drought Strategy: Saskatchewan

	Percentage of Feedlots
No strategy	82.4
Some strategy	17.6

Source: Compiled from data provided by participants surveyed.

Only 17.6 percent of the feedlots surveyed had difficulty in obtaining employees[5]. These feedlots were generally located a long distance from a major population centre. These feedlots accounted for over 10 percent of the animals marketed. The feedlots that did not comment on availability of employees probably did not have difficulty in getting workers.

Table 2.10: Availability of Feedlot Employees: Saskatchewan

	Percentage of Feedlots
Did not say	47.1
No problem	35.3
Problem in getting employees	17.6

Source: Compiled from data provided by participants surveyed.

The majority of managers gained their feedlot management experience by starting their own feedlot and learned as they progressed in the business. All these managers started small and gradually expanded. The next most common experience was for the manager to grow up in the business. In this case their father likely managed the feedlot prior to them. These two methods of obtaining management experience each accounted for more than 40 percent of the cattle marketed.

Table 2.11: Obtaining Feedlot Management Skills: Saskatchewan

	Percentage of Feedlots
Started the business and learned as the business grew	58.8
Grew up in the business	23.5
Worked on other feedlots	17.6

Source: Compiled from data provided by participants surveyed.

Table 2.12 provides some of the feedlot managers' reasons for lack of local investment in the cattle feeding business in Saskatchewan. Here local investment is

[5] Industry sources indicate that feedlot labour requirements are about one person per thousand feeder cattle.

defined as investment from within the province and specifically within the local community. All feedlot managers believed that there are hindrances to local investment but not necessarily for their feedlot's situation. The main hindrance provided was the provincial mentality[6] towards grain production however about a quarter of the feedlots felt that they were getting sufficient local investment. About a quarter of the feedlot managers felt that poor relationships between grain farmers and feedlots[7], lack of people in the province who are familiar with feeding cattle, lack of local money available for investment and the high risk nature of feeding cattle were also major hindrances to local investment. Other reasons provided by only one or two feedlot managers for lack of local investment were: the loss of the Beef Stabilization program[8], lack of experience by feedlot managers in accessing venture capital, local people are low risk takers, negative attitude towards intensive livestock operations, order buyers

[6] This is often referred to as the "grain mentality" which means that land should be used for grain production rather than forage production for livestock. One feedlot manager explained that he had a barley crop that had a yield potential of over 30 bushels per acre during a drought year. This crops expected yield was about 50% greater that the district average. When the feedlot manager cut the crop for silage his neighbours thought this was the wrong strategy because barley prices would be high. They thought he would gross over $90 per acre if he had not cut the crop. The feedlot manager indicated that the silage yielded 5 tons per acre at a value of $30 per ton thus the crop grossed over $150 per acre with lower inputs because he did not have to use as many herbicides. The feedlot manager reported that his grain neighbours could not believe him.

[7] Some feedlot managers complained that grain producers would rather sell their barley to an elevator than make a contract to supply barley to the feedlot. So feedlot managers had to purchase barley through an elevator company rather than the local grain producer. The feedlot manager said that he could have bought the grain at a lower price from the grain producer and the grain producer could have still received a higher price than at the elevator because of the transaction costs associated with selling the grain to the elevator company then buying it from the elevator. Discussions with some grain producers suggest that trust is an issue. They hear of situations where barley producers did not get paid for the barley they sold to the feedlot. So to some barley producers the transaction costs are higher in their view with feedlots than with elevator companies. Buyers at grain elevator companies are required to be bonded. It should be noted however that there are reported cases of barley producers not getting paid from grain brokers who are also bonded and purchased grain on behalf of Alberta feedlots. Yet this has not stopped barley producers from selling barley to grain brokers.

[8] The Beef Stabilization Program was a provincial program designed to encourage feedlot development in the late 1970s and early 1980s. It tried to provide price stability to the feedlot sector. It was a popular program among beef producers and feedlot managers.

dominated the business, Alberta's industry is to strong too compete with, lack of provincial economic momentum and the beef industry is an "old boys club".

Table 2.12: Hindrances to Local Investment into Cattle Feeding: Saskatchewan

	Percentage of Feedlots		Percentage of Feedlots
Grain mentality	41.2	Hard to Exit	17.6
Not a problem for them	23.5	Hard to Start	17.6
No money to invest	23.5	Lack of Gov. support	17.6
High risk business	23.5	Bad feedlot investment experience	17.6
Not familiar with feeding	23.5	Community ownership bad	17.6
Feedlots vs. grain farmers	23.5	Lack of Management Resources	17.6

Source: Compiled from data provided by participants surveyed.

Table 2.13 gives the opinions of 17 feedlot managers on hindrances to foreign investment. Here foreign investment refers to out of province investment. One feedlot manager felt he was not qualified to comment on foreign investment. Some managers felt it was a good thing not to have foreign investment. These managers did not elaborate if competition or some other reasons they did not want foreign investment in the feedlot sector. But most of the managers felt foreign investment was desirable because it would increase access to capital. However over half of the managers felt that

Table 2.13: Hindrances to Foreign Investment into Cattle Feeding: Saskatchewan

	Percentage of Feedlots
Yes – it is a problem	58.8
Not a problem	35.3
Land and labour laws	35.3
No government support	17.6
Lack of packing and processing	11.8
Don't want foreign investment	11.8
Exiting problem	11.8
No comment	5.9

Source: Compiled from data provided by participants surveyed.

lack of foreign investment was a problem and that the provincial land[9] and labour laws[10] were the major reason for this lack of investment. Other reasons given by two or more feedlots included lack of government support for the cattle industry, lack of beef processing and packing facilities and difficulty in finding a buyer for their feedlot. It was felt that the fact that feedlots were spread out and were expensive to buy made it difficult for feedlot owners to sell their feedlot. Here it was thought that there was economic synergy developed around a cluster of feedlots. This was viewed as not a problem in Alberta where feedlots are concentrated so there is more competition to buy an existing feedlot. The fact that it may be difficult to get environmental approval to build new feedlots further increases the value of existing feedlots in Alberta. Other opinions given for lack of foreign investment include: high property taxes, Outlook irrigation area does not want intensive livestock operations, there is already excess capacity in western Canada, feeding cattle is a risky business, old money likes to stay where it is and feedlot managers do not have experience in accessing equity capital.

When prompted nearly fifty percent of the feedlot managers thought lack of entrepreneurial spirit in the province hindered feedlot development. They felt that unwillingness to take risk, lack of entrepreneurial experience, that no entrepreneurs were around to mentor would-be entrepreneurs, and that a production mentality compared to a marketing mentality were the main reasons for not having an entrepreneurial spirit. Other reasons given were: jealous of success, lack of capital, low

[9] At the time the survey was done the provincial land ownership laws restricted the amount of land non-Saskatchewan residents could own. Exemptions were provided where it was thought that the foreign investor required extra land for their enterprise. This law has since been changed such that there no longer are any land ownership restrictions to Canadian residents.

[10] There are discussions at Sask. Labour to remove feedlots and hog barns as being exempt from the labour laws. This means that holidays, minimum wages and other labour regulations would have to be adhered to by the feedlot which could increase their labour costs.

value put on irrigation land, reluctance to change, rural depopulation, livestock smell is no longer thought as part of rural life, and lack of feeding experience. However, some feedlot managers felt that the next generation had potential for developing a stronger entrepreneurial spirit. The education system was the reason given for the potential change in attitude of the next generation.

Table 2.14: Entrepreneurial Spirit and Feedlot Development: Saskatchewan

	Percentage of Feedlots
Yes, it is a problem	47.1
Not a problem	35.3
Low risk takers	35.3
No comment	17.6
Lack of expertise or confidence	17.6
Production mentality	11.8

Source: Compiled from data provided by participants surveyed.

Over 80 percent of the feedlot managers interviewed felt that they had community support for their feedlots and did not think it a problem for future development. Most of the feedlots near dense population centres did things to cultivate community support. This included planting trees around the feedlot to improve aesthetics and reduce smell, removing and spreading manure quickly to reduce the number of days with smell and grading and watering roads when the feedlot is heavily using them such as when they bring in silage or remove manure.

Table 2.15: Community Attitude towards ILOs: Saskatchewan

	Percentage of Feedlots
Not a problem	82.4
Yes it is a problem	17.6
Due to environmental concerns	17.6
Feedlots need to cultivate local support	5.9

Source: Compiled from data provided by participants surveyed.

The issue of infrastructure was evenly split among feedlot managers. Those who were located on good highways and had access to good schools, water and hospitals did not see it as an issue those who were not located as favourably saw it as a major hindrance to feedlot development. For example it was calculated that a 10,000

Table 2.16: Infrastructure and Feedlot Development: Saskatchewan

	Percentage of Feedlots
Not a problem	47.1
Yes, it is a problem	47.1
Lack of primary highways	35.3
Lack of water	17.6
Yes, but not for us	11.8
No comment	5.9
Lack of schools and hospitals	5.9

Source: Compiled from data provided by participants surveyed.

head feedlot located on a secondary highway would cost between $140,000 and $180,000 annually due to extra transportation costs in accessing barley. This calculation did not include the cost of shipping cattle into and out of the feedlot. Some commented that the lack of infrastructure is limiting economic growth in the province which in turn impacts the level of investment in feedlot development.

Table 2.17 shows that nearly 90 percent of the feedlot managers felt that the provincial government was not interested in developing the beef industry when prompted about the provincial government's promotion of the beef industry. They felt that provincial officials only give lip service towards the industry. They support their conclusion based on the lack of financial and other resources dedicated to the industry[11].

[11] This lack of confidence in the provincial government's desire to support the development of the beef industry could go back to the mid 1980s when some provincial upper management civil servants indicated that they thought that the feedlot sector was lost to Alberta and shifted staff resources away from beef production and towards hog production and specialized livestock production. This decision followed an attempt to promote the feedlot sector in the late 1970s and early 1980s through the Beef Stabilization Program which was phased out and replaced by a less lucrative federal stabilization

They indicated that the Alberta government viewed supporting the livestock industry as a high priority[12] during the drought while in Saskatchewan the discussion was around maintaining grain farmers. Other examples for lack of government support were the lack of significant expansion in the Livestock Loan Guarantee Program[13], Farm Land Security Act[14], the new labour laws, lack of drought support such as Crop Insurance[15] rules hindering cutting grain crops for green feed and no support for pasture and water development, as well as putting resources towards special livestock and herbs and spices rather than towards established agricultural industries such as beef.

Table 2.17: Saskatchewan Government's Promotion of the Feedlot Sector

	Percentage of Feedlots
Only lip service towards the beef industry	88.2
Does not support the industry	23.5
Does not support the industry like Alberta	17.6
Did not expand the Livestock Loan Guarantee Program	17.6
No comment	11.8
No Leadership	11.8

Source: Compiled from data provided by participants surveyed.

Most of the feedlot managers saw a role for government in supporting the feedlot sector. They mainly wanted government to aid them in obtaining financing. The fact that Saskatchewan does not have a strong cattle feeding sector makes it

program. This federal program was referred to as "The Tri-Partite Beef Stabilization Program" which is now discontinued.

[12] Alberta instituted a number of programs to keep their beef industry such as feed freight assistance and improved crop insurance for pastures and forage production. While Saskatchewan did not provide any drought programs to aid beef producers.

[13] In this program the Saskatchewan government guarantees a certain portion of bank loans that groups of cow-calf producers (called Feeder Associations or Breeder Associations) borrow to acquire feeder cattle or to retain ownership of their own calves to be custom fed in feedlots. Feedlot managers want this program expanded in two ways: to expand the money available to feeder associations and to expand the program so that feedlots can access loan guarantees. Most banks and credit unions participate in this program.

[14] This is the act that restricts non-Saskatchewan residents' ownership of land. This act has now been changed to only restrict land ownership of non-Canadian residents.

[15] A discussion with the Deputy Minister of Agriculture regarding this research has resulted in him promising to investigate ways that Saskatchewan Crop Insurance can address this issue.

difficult to get operating capital to purchase and feed cattle from financial institutions. They felt that many bank managers did not understand the feeding sector. Financial institutions prefer land for security rather than livestock, whereas in Alberta financial institutions are more willing to take livestock to secure loans. Feedlot managers also saw the government's role in increasing services such as extension either to themselves or cow-calf producers, financial assistance for water development and increasing livestock inspectors as activities the government should follow. Many felt strengthening the cow-calf sector would indirectly help feedlot development. Some feedlot managers expressed concern over the province promoting the development of the feedlot sector especially community owned feedlots. They felt there is not enough planning put into these developments which will increase their chance of failure. Feedlot failures reduce investment for future feedlots and existing feedlots because potential investors view failures as increasing investment risk. Improving infrastructure and streamlining regulations[16] were other areas they saw government should be involved. Feedlot managers indicated frustration with the numerous different departments they have to go through to get approval for expansion. They also felt that government policy is compartmentalized in that they have different objectives and create policies that meet department objective but are not friendly toward industry development. Other opinions

[16] Feedlot managers complained that they would have to speak to several government departments in order to expand their feedlot. For example Saskatchewan Agriculture, Food and Rural Revitalization provides permits to expand the capacity of the feedlot, SaskWater provides permits to expand water use for the feedlot, Saskatchewan Environment and Resource Management (SERM) for environmental permits and Saskatchewan Highways for transportation permits. Feedlot Mangers further express concern about the government being so compartmentalized that departments appear to be at cross purposes. For example one department may be charged with the responsibility of economic development while another is concerned with resource protection. These different objectives result in policies that do not necessarily mesh together. For example SaskWater may require a feedlot to obtain its water from a certain water source while SERM may require the feedlot to be located away from that water course because of soil constraints and Saskatchewan Highways might require secondary loads to be hauled because the site is not on a primary highway. The lack of streamlining combined with economic constraints reduces the number or sites available for development and increases site search costs.

were that the government should not take any equity positions in feedlots, help strengthen relationships between grain producers and feedlots and reduce taxes.

Table 2.18: Saskatchewan Government's Role in the Feedlot Sector

	Percentage of Feedlots
Help with financing	64.7
Increase services	29.4
Improve infrastructure	17.6
Help existing feedlots before encouraging new ones	17.6
Policy development is too compartmentalized	17.6
Streamline regulations	17.6
No comment	5.9

Source: Compiled from data provided by participants surveyed.

In summary the Saskatchewan beef cow herd has remained relatively stable while fed cattle production has continued to decline in the province. In order to turn this trend in fed cattle production Saskatchewan faces a number of challenges which include shifting from a predominately grain towards livestock production This shift requires developing the economic infrastructure for feeding cattle as well as developing the human skills throughout the beef cattle marketing chain.

Chapter 3

Literature Review

This chapter outlines economic research into the western Canadian beef industry and the potential for its expansion in Saskatchewan. This chapter also introduces the economic theory regarding transaction costs and lays the foundation for determining their impact on the feedlot sector. The literature review is in two parts. The first part will review some of the literature that describes the western Canadian feedlot sector. The second part will have two sections on transaction costs. The first section develops transaction cost economic (TCE) theory that is applicable to the theoretical model developed in chapter 4. The final section reviews some of the literature that measures transaction costs.

3.1 The Western Canadian Beef Industry

This section will examine research in the structure and potential expansion of the feedlot industry in Alberta and Saskatchewan.

Carter and Schmitz (1986) looked at the economics and location of cattle feeding in western Canada during the early 1980s. They theorized that the location of cattle feeding would be where there was a source of feed supplies in order to reduce the transformation costs from feeder animals to finished cattle. They observed that during

the decade prior to the 1980s the feedlot industry had shifted from throughout the prairies to southern Alberta. They noted that the shift not only was westerly across the prairies but from northern Alberta to southern Alberta as well.

In comparing Alberta to Saskatchewan they observed that during the period 1971-1982 Alberta's cash receipts from the sale of cattle averaged 36 percent of total farm cash receipts with a range from 30 percent to 42 percent. Conversely Saskatchewan's cash receipts from the sale of cattle dropped from 19.9 percent to 12.6 percent during the same period. They noted that the Alberta beef sector was strong and growing while Saskatchewan's was weak and declining.

Carter and Schmitz (1986) tried to determine the factors that led to the shift in the cattle-feeding (feedlot) sector to southern Alberta. They used personal interviews with feedlot operators in Saskatchewan and Alberta as their primary source of analysis. They determined that the key economic factors affecting the feedlot sector were feed supply and cost, marketing infrastructure, scale of operation, feedlot management, ownership of cattle and government support.

Roughage was the most restrictive feed because of the cost of transporting this bulky feed a long distance. Barley was relatively easy to obtain because at that time Alberta and Saskatchewan were both surplus producers. Carter and Schmitz (1986) did not find Alberta had an economic advantage in feeding over Saskatchewan in terms of feeding barley. However, they found a different situation when it came to the availability of roughage. Irrigation in southern Alberta was a major contributing factor to the supply of roughage in the form of cereal and corn silage. Silage production fitted well into the crop rotation of irrigated land. Alberta had 850,000 acres of irrigated land

while Saskatchewan had only 170,000 acres in 1981. They noted that the irrigated land in Alberta was concentrated in southern Alberta while Saskatchewan's was more spread out. They found that irrigation allowed Alberta feedlots to obtain their silage within a 10-mile radius of their feedlot thereby reducing transportation costs.

In terms of marketing structure Carter and Schmitz (1986) found that Alberta feedlots had an advantage over Saskatchewan feedlots. This advantage was due to Alberta feedlots having more packing plants bidding for their slaughter cattle thus a more competitive market. Another marketing advantage was Alberta had developed a weekly reserve bid system. This bid system essentially resulted in packing plants providing sealed bids independent of each other. Thus it was possible for five packers to bid against each other for one feedlot's slaughter cattle.

Carter and Schmitz (1986) found that the existence of feeder associations in Alberta aided in the ownership of cattle. They also observed that Alberta feedlots were much larger than those in Saskatchewan. This combined with significant economies of scale in the feedlot operations gave Alberta feedlots an advantage over Saskatchewan feedlots. They felt that the number of feedlots in Alberta created a stronger feeding infrastructure including development of feedlot managers. They did not observe managers moving into Saskatchewan although management skill should be easily transferable between provinces. One reason they speculated was that the stronger infrastructure in Alberta made managing a feedlot easier than it would be in Saskatchewan. Carter and Schmitz (1986) further found that the Alberta government[17]

[17] Some argue that the Alberta government enabled the development of its feedlot sector through its program on feed freight assistance. This program was designed to offset the impact of the federal transportation subsidy on feed grain. The Alberta government argued that the transportation subsidy

was more supportive of the beef industry compared to Saskatchewan's government, which was more crops oriented and in particular the production of wheat. They observed that Alberta had a strong history in feeding cattle compared to Saskatchewan. Carter and Schmitz (1986) examined the availability of feeder cattle and could not show Alberta having an advantage over Saskatchewan in this regard.

Ramsay (2002) investigated the potential for future feedlot expansion in Alberta. She found that the trends of increased beef production in Alberta and decreased beef production in Saskatchewan reported by Carter and Schmitz continued through to 2002. She reports that in 2002, about 60 percent of Alberta's farm cash receipts came from livestock and livestock products and 31 percent from crop sales. In contrast, she reports 62 percent of Saskatchewan's farm cash receipts came from crops sales and 25 percent came from livestock sales, of which 70 percent came from the sale of cattle and calves. She indicates that by 1999 Alberta's fed-cattle production increased to 2.4 million head while Saskatchewan's decreased to less than 200,000 head.

Ramsay (2002) could not find any evidence that lack of feed supplies would restrict the growth of Alberta's feedlot sector. However, she did find that water, manure disposal, and public resistance could act as restraints. She reports that Alberta consumes water at a higher rate than the natural recharge. Water quality and competing interests for water use were also issues. She found that Alberta's irrigation acreage increased to 1.2 million acres by 2000. Thus irrigation demand for water has increased along with residential and non-agricultural industries demand.

---

made feed grains too expensive for feedlots. Another program that helped feedlot development in southern Alberta was the Alberta government's investment in irrigation development.

Ramsay (2002) indicated that Albertans had growing environmental concerns with intensive livestock operations (ILOs) such as feedlots. Their concerns centre on smell and manure disposal. Improper spreading of manure can lead to poor water quality. The concentration of feedlots in southern Alberta intensifies these environmental issues. She found that social tension around ILOs stopped feedlot development even when the proponents met all the Alberta government's environmental regulations.

Perillat et al. (2002) investigated the potential of feedlot development in the irrigation areas around Outlook and Riverhurst, Saskatchewan. They conducted interviews with local residents. They found that the feedlot development in these irrigation areas was problematic. The irrigation area surrounding Riverhurst was too small to support a large feedlot. A large feedlot was defined as one that had 20,000 head capacity or larger. In addition the Riverhurst irrigation area was in a horseshoe shape making transportation of silage to a central location difficult. The Luck Lake irrigation development was also thought to be too small. Poor infrastructure in terms of highways, schools and hospitals were also thought to be restrictions to feedlot development in the Riverhurst and Luck Lake irrigation districts.

Perillat et al. (2002) found that the Outlook irrigation district was thought to be large enough to support a large feedlot. However, feedlot development here was also problematic. The Outlook area has many small acreage owners who are not farmers. These people are not interested in any smells that will negatively impact their rural lifestyle. Thus Outlook has social issues with ILO development. Many residents are unhappy with existing ILOs in the area and do not wish to see any more. Outlook

residents stated that lack of infrastructure in terms of primary haul highways and irrigation land are also restrictions. Residents felt that the competition for irrigation land made it difficult to produce silage for potential feedlots. Lack of capital and a non-livestock mentality[18] were also thought to be restrictions to feedlot development.

Infrastructure in terms of primary highway access was a concern expressed by both residents of Outlook and Riverhurst irrigation districts and potential feedlot developers. Transportation costs were thought to increase significantly where there are no primary haul highways. Extra transportation costs due to lack of a primary highway was reported as one reason that an out-of-province feedlot operator did not relocate his feedlot operation to the Riverhurst irrigation district. This was the only feedlot operator that had expressed interest recently in relocating his operation.

In summary, this research found that environmental concerns could be a limiting factor for feedlot development in southern Alberta. Feedlot development in Saskatchewan's irrigation districts is also unlikely. Lack of highway infrastructure was a concern in both irrigation districts studied. Growing public resistance to intensive livestock operations is another hindrance to feedlot development in the Outlook irrigation district. Thus any feedlot development in Saskatchewan will likely occur near primary highways, away from large population centres and on dry land that can produce silage yields comparable to irrigated land.

[18] This is compared to a grain mentality. For example some barley producers do not think of selling their barley to a feedlot as first choice. Rather they prefer to deliver to the elevator and sell it as malt. The probability of receiving malt is relatively low. Yet barley producers seed malt varieties rather than feed varieties. Feed varieties are usually better yielding and are better suited for feeding.

3.2 Theoretical Framework

The purpose of this section is to discuss the development of TCE theory. The discussion will begin with the standard neoclassical assumptions and develop the TCE theory pertinent for this thesis.

Neoclassical economic theory is the foundation of most of today's economist's tool kit. The perfectly competitive market is the starting point of most current economic theory because it provides a benchmark for assessing economic efficiency. The literature indicates six key assumptions for a perfectly competitive market. These assumptions are outlined as follows:

a. Large number of buyers and sellers such that neither is able to impact price which means both buyers and sellers are price takers.
b. The goods and services that are bought and sold within that market are homogeneous which means each supplier's product is identical.
c. Buyers and sellers have perfect information about the market price and attributes of goods and services as well as being able to use and process this information in order to always make fully rational decisions.
d. Free mobility of resources that implies free entry and exit within a market.
e. Individual persons and firms make rational decisions based on self-interest. Therefore the purpose of the firm is to maximize profit.
f. All firms producing a product face identical cost constraints. This implies that these firms are identical.

Many economists indicate that implicit within the perfectly competitive market is zero transaction costs. This frictionless market implies no externalities such that the actions of one will not hurt anyone else.

R.H. Coase indicated that in neoclassical theory the price mechanism or the market determines the allocation of resources in the production process. He argued in his famous essay, *The Nature of the Firm* (1937), that in the "real world" this is not necessarily true. In this paper Coase provides the reason for the existence of firms. He indicates there is a cost to doing business in the marketplace as well as a cost in transacting business within the firm and that the optimum sized firm would be where the marginal cost of transacting business within the firm equals the marginal cost of doing business in the marketplace. He gave an example of a workman changing jobs from one department to another within a firm not because of an increase in wage but because he is ordered to do so by managerial direction. He indicated that this was done because it was less costly to organize the labour resources within the firm than to have separate transactions in the market to obtain different workers for different tasks. Thus, the allocation of resources is either done in the marketplace by a series of transactions or coordinated within the firm. He argued that there would be no need for firms if the marketplace were solely able to regulate production.

In his 1937 paper Coase implies the existence of transaction costs. He argued that in the marketplace there is a cost to exchange because there is a cost in obtaining price information and negotiating contracts. He further argued that firms are limited in what they can organize efficiently. That is he theorized there are "diminishing returns

to management"[19]. Thus the size of a firm would depend on its organizing costs and the cost of transacting business in the market place. He stated:

> Inventions which tend to bring factors of production nearer together, by lessening spatial distribution tend to increase the size of the firm. Changes like the telephone and the telegraph, which tend to reduce the cost of organizing spatially, will tend to increase the size of the firm. All changes which improve managerial technique will tend to increase the size of the firm. [20]

Thus, the size of the firm is limited by its cost of organizing compared to another firm's cost of organizing, and that of the market place.

Ultimately Coase's paper on the theory of the firm outlined the importance of transaction costs and implied that by ignoring these costs economists are designing decision tools that are not relevant to the real economic world. Without the existence of transaction costs the production and exchange activities in the production and marketing of a product would be carried out through the guiding "invisible hand" of the market. The second major outcome of this paper is that Coase provides a theoretical framework to determine the size of the firm.

Economists did not immediately respond to Coase's observations until Coase wrote another famous paper in 1960 called *The Problem of Social Cost.* Out of this paper came the Coase Theorem. The theorem states that in the absence of transaction costs the social cost is equal to the private cost. Another important element of this paper is that Coase outlines three groups of transaction costs that can be measured. He states:

> In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up a contract, to undertake

[19] Coase (1937), page 395.
[20] Coase (1937), page 397.

> the inspection needed to make sure that the terms of the contract are being observed, and so on.[21]

Dahlman (1979) later states these costs more succinctly as search and information costs, bargaining (negotiating) and decision costs, policing (monitoring) and enforcement costs.[22] He then indicates that all these costs arise out of a single cost – resource losses due to lack of information. That is imperfect information results in the existence of transaction costs.

The following example helps illustrate Coase's contribution to TCE. A feedlot or packing plant can either contract their purchase of cattle through order buyers, hire their own people to inspect and purchase cattle or develop an arrangement between themselves and the supplier such that they receive the type of cattle they need (direct purchases compared to purchasing through the auction market). In the absence of transaction costs it would not make any difference which method the feedlot or packing plant chose. However, most feedlots use order buyers or buy directly from cow-calf producers because they are less costly than hiring an employee to scour the country side for cattle. Yet packing plants tend to use all three methods to source cattle depending on which one is of lowest cost. Thus transaction costs are important in determining the method of purchasing cattle.

Economists began to look at TCE after these two essays by Coase. Three streams of economic theory are discussed in this thesis, which are the development of the assumptions surrounding transaction cost theory; the development of organizational structure as explained by TCE and the impact of product attributes on transaction costs.

---

[21] Coase (1960) page 15.
[22] Dahlman (1979) page 148.

Oliver E. Williamson began writing about organizational structure and TCE in the 1970s and 1980s. He compiled much of his work in his book "Economic Organization: Firms, Markets and Policy Control" in 1986. All references to Williamson within this section will be from his 1986 book, beginning with his development of transaction cost assumptions and followed by his discussion of organizational structure.

Williamson defined a transaction as occurring when "a good or service is transferred across a technologically-separable interface. One stage of processing or assembly activity terminates and another begins."[23] The relative ease or complexity of this transfer is reflected in the cost. Thus, Williamson's definition of transaction costs includes costs incurred within the firm as well as inter-firm costs. Coase implied the same definition but did not formally define transaction costs.

Williamson further indicated three important elements of transaction cost economics. These are asset specificity, bounded rationality and opportunism. The latter two are referred to as behavioural assumptions underpinning transaction cost analysis. He argued that economic contracting problems would be trivial if there were no bounded rationality and opportunism.

Williamson describes bounded rationality as the situation in which human beings are unable to make rational decisions because of their finite capacity to absorb, process and obtain information (Simon [1961] was the first to use the term "bounded rationality"). That is, people may not make a rational decision based on the information that is available to them because the information is too complex for them. In addition in

[23] Williamson, 1986: page 139.

some cases it will be virtually impossible for the human mind to determine and analyze all the possible ramifications of a series of decisions. This implies any agreement between individuals will be incomplete because the parties involved cannot foresee all the economic factors that will impact that arrangement. Bounded rationality further implies that people could interpret the same information differently.

Opportunism is similar to the self-interest assumption in neoclassical economic theory, only with guile. That is individuals could use any means available to them to improve their position through misrepresentation of product attributes, behaviour, data and any other representation of facts. Opportunism with information asymmetry leads to moral hazard and adverse selection because it is not possible to determine which parties, if any, will act opportunistically.

Adverse selection and moral hazard occurs where buyers cannot distinguish between good or bad quality products. Adverse selection occurs because consumers know they cannot distinguish between products and choose not to buy for fear of buying a poor product or will only buy at a lower price that reflects their uncertainty over quality. This is Akerlof's (1970) argument in his famous paper "Market for Lemons". Moral hazard arises because the sellers could produce poorer quality products than they are capable of producing. Sellers know that buyers are unable to make the distinction between products and some sellers chose to produce a poor quality product. In the case of contracts, parties cannot fully discern the actions of another. Adverse selection occurs prior to contractual arrangement (*ex ante*) because parties may not choose to get into a good contract for fear of being taken advantage of by the other parties. Moral

hazard happens after a contractual arrangement has been made (*ex post*) because one or more of the parties may try not to meet their full contractual commitments.

The third element for transaction cost economics as defined by Williamson is asset specificity. Asset specificity refers to the degree of transaction specific investments and will be defined in greater detail later in this section.

Williamson indicated that asset specificity, bounded rationality and opportunism need to be present for transactions to be costly. Contracting becomes simple and less costly if any of these three conditions are absent. Without bounded rationality any contract can be written to deal with any situation. Without opportunism the agent's word would be sufficient and "the spirit" of the contract would overcome any missing elements in the contract. Without asset specificity the market would determine the outcome such that competition would overcome bounded rationality and opportunism.

According to Williamson firms will organize in a manner that will minimize both their production and transaction costs. He indicates there are three "critical dimensions" that determine organizational structure, thus minimizing their transaction costs. The degree of asset specificity, uncertainty and frequency of transactions all contribute to how a firm conducts its transactions either through a vertically integrated structure, contractual relationships or through spot markets.

Williamson describes asset specificity in terms of alternate uses for a particular investment. He indicates that asset specificity can arise in three forms, physical asset specificity, site specificity and human asset specificity. An example of physical asset specificity would be a company that makes auto bodies for an automobile manufacturing company. This company has to invest in building body molds in order to

build the auto bodies. These molds can not be used on any other vehicle so they are specific to that automobile company and type of automobile. Thus both the buyer and the seller of auto bodies in this example could be subject to opportunistic behaviour.

Site specificity refers to the location of the facility which limits the company's access to major buyers or sellers. For example a grain elevator built on a particular rail siding makes it a highly specific investment. The railroad company could act opportunistically in the freight rates it charges the elevator because the elevator does not have any alternative low cost carriers.

Human asset specificity refers to a person's skills and knowledge that are gained doing a particular job (Williamson 1986). If these skills and knowledge are not easily transferable or easily acquired then there is an opportunity for the employer or employee to act opportunistically towards the other. For example train engineers are highly skilled in how to drive and operate trains. This skill is not easily transferable to any other job. Thus train engineers and railroad companies can act opportunistically towards each other particularly if there is only one railroad company or only one supplier of train engineers.

Hobbs and Young (2000) discuss perishability of food and its impact on transaction costs. Perishability could be thought of as another form of asset specificity. For example finished cattle have a relatively small window in which they can be sold otherwise they begin to "lose finish". That is the animal gets overweight and begins to lose quality. The finishing feedlot also incurs additional feeding costs thus the feedlot wants to sell the animal as soon as it reaches finish. Perishability could allow for opportunistic behaviour by food processors.

Williamson defined the degree of asset specificity as being non-specific, mixed and idiosyncratic. An idiosyncratic asset would be highly specific such as the automobile body building company described earlier in this section where the output is specialized to the needs of only one buyer. He further defined the frequency of transactions in three broad categories. The categories are one-time, occasional and recurrent. Williamson then dropped the one-time category because it rarely happens. Further more the one-time category does not have any interesting implications in terms of effect on supply chain relationships.

Williamson further indicated that non-specific asset specificity refers to the absence of asset specificity and results in the market place working normally regardless of the level of uncertainty or frequency of transactions. He referred to this as "market governance" or "classical contracting". In this case market alternatives protect entities from opportunism. Mixed and highly idiosyncratic asset specificity with occasional frequency results in a governance structure that allows for third party assistance or arbitration. He referred to this type as "trilateral governance" or "neoclassical contracting". In this situation the transacting entities rely on a third party to resolve disputes before going to litigation. Often government agencies act as the third party. Williamson indicated that recurring transactions with mixed asset specificity results in bilateral governance. Here parties recognize they need each other and rely on this need to maintain the relationship to guide the contract. They want flexible contracts that allow for adjustment as situations change and rely on trust and mutual need to overcome the hazard of opportunism. In this case the two parties negotiate a suitable agreement. Recurrent transactions with highly idiosyncratic assets lead to unified governance or

vertical integration. Here the transactions are internalized into the firm or in other words they become vertically integrated.

Williamson further stated that uncertainty moves the above governance structures further towards vertical integration. For example an occasional transaction with mixed asset specificity combined with a high degree of risk such as quality risk can lead to bilateral governance or unified governance. As explained earlier, quality risk leads to opportunistic behaviour in the form of adverse selection or moral hazard. This increases search and information costs as well as monitoring and enforcement costs. In order to reduce these costs a firm would move towards higher levels of vertical co-ordination.

Hobbs and Young (2000) break down uncertainty into four components. Both buyers and sellers may face price uncertainty. Buyers also face product quality uncertainty and uncertainty in terms of reliability of supply. And finally, sellers face uncertainty in terms of reliability of demand. They point out that each type of uncertainty raises transaction costs. Price uncertainty increases negotiating and decision making costs, demand and supply uncertainty raises search and information costs and quality uncertainty increases monitoring and enforcement costs.

Hobbs and Young (2000) discuss a fourth dimension to asset specificity, frequency of transactions and uncertainty – that is transaction complexity. Transaction complexity refers to the variety of outcomes a transaction may have. Thus as transaction complexity increases so does the number of possible outcomes. For example if a commodity is highly perishable then the transactions pertaining to that commodity become more complex. Transaction complexity increases because of the potential

deterioration of the commodity. Increased monitoring costs are incurred because the commodity's quality must continue to be monitored as time progresses. Negotiation costs increase as buyers and sellers try to determine who is responsible for loss in value of the commodity as it deteriorates or to what degree they share this loss. Transaction complexity moves Williamson's governance structures further towards vertical integration. Thus bilateral governance or unified governance between firms would be expected if there is a high degree of transaction complexity, combined with an occasional transaction, mixed asset specificity and a low degree of risk.

Hobbs and Young (2000) further argued that regulatory conditions, social-economic factors and technology impact both the commodity characteristics and transactions cost. For example technology can impact transactions cost directly by reducing the cost and increasing the accuracy of product quality measurements. Technology could impact the commodity directly, which in turn impacts transaction costs. For example a new technology could reduce commodity perishability by changing the product itself or by changing how the product is preserved. It may be possible to increase the shelf life of tomatoes by changing their genetic composition. Or it may be possible to improve the shelf life and safety of poultry by reducing the risk of salmonella. Socio-economic factors can also impact transactions cost directly or indirectly through commodity characteristics. For example a negative consumer reaction against a technology such as irradiation of poultry products results in increasing product perishability, which in turn increases monitoring costs. Finally regulation can impact transactions cost directly or indirectly through the characteristics of the commodity. For example regulation could require tracing an animal for disease

control and identification. This increases transactions cost directly in terms of recording each stage in the production process where the animal changes hands as well as increasing uncertainty in determining who is responsible for the cost of the sick animal (e.g. Chronic wasting decease in elk and deer) and demand uncertainty due to consumer reaction.

Trust reduces transactions cost because it acts as a counterbalance to opportunistic behaviour. For example if there is trust developed between contracting entities then any unforeseen circumstance will be resolved within the spirit of the arrangement. Williamson indicated that as frequency of transactions increase so does the trust between the buyers and sellers. He states:

> Additional transaction-specific savings can accrue at the interface between supplier and buyer as contracts are successively adapted to unfolding events, and as periodic contract renewal agreements are reached. Familiarity here permits communication economics to be realized: specialized language develops as experience accumulates and nuances are signalled and received in a sensitive way. Both institutional and personal trust relations evolve. Thus the individuals who are responsible for adapting the interfaces have a personal as well as an organizational stake in what transpires. Where personal integrity is believed to be operative, individuals located at the interfaces may refuse to be a part of opportunistic effects to take advantage of (rely on) the letter of the contract when the spirit of the exchange is emasculated. Such refusals can serve as a check upon organizational proclivities to behave opportunistically. Other things being equal, idiosyncratic exchange relations which feature personal trust will survive greater stress and display greater adaptability.[24]

Daniel Klein in his article "Trust for Hire: Voluntary Remedies for Quality and Safety" which he reprinted in his 1997 book "Reputation: Studies in the Voluntary Elicitation of Good conduct" expanded on the idea of trust. He indicated that trust is the combination of honesty and competence. He argues that acting opportunistically

[24] Williamson (1986), Page 106.

can be bad for business because it hurts one's reputation. Therefore being trustworthy is good for business. He states in his article that a

> …habit of deceit is a mark of a bad character, and bad character has a way of revealing itself no matter how cunning the individual. Deceit is both bad karma and bad business.[25]

So in Klein's view building trust is an important part of business relationships. Similar to Barzel (1989), Klein argues that the characteristics of a product are not fully known by consumers. For example how do consumers know if there are residual antibiotics in the meat they purchase. As discussed earlier, opportunistic behaviour can arise if one cannot easily determine if a product is good or bad. Once consumers are aware that they can not distinguish between a good of bad product they may be reluctant to buy. Therefore Klein (1997) argues suppliers will try to build trust in their product's quality in order to encourage its consumption.

Suppliers may build trust by self-disclosing information about their product either from their own research or from an independent source. They can gain trust, respect or reputation by offering guarantees, warranties, advertising, brand names, providing samples and having extended dealings with customers. Klein (1997) views guarantees, warranties and brand names as methods of purchasing trust when it does not exist.

For example order buyers need strong reputations in order to stay in the business of buying and selling cattle. They need a reputation of fair dealing and ability in acquiring cattle within the requested quality and price guidelines. They gain this

[25] Klein (1997), Page. 105.

reputation by extended dealings with a feedlot. Once they have gained a reputation with one feedlot they can use this feedlot as a reference to begin dealings with other feedlots. Thus their good reputation grows within the industry. So a good reputation can be hard to get but relatively easily lost. Feedlots may tolerate some mistakes depending on the length of dealings with the order buyer but continued poor service would result in a loss of trust and severing of the relationship. Klein (1997) points out consumers will inform other consumers about their experiences. Just as a feedlot can act as a good reference they can also act as negative publicity to the order buyer once trust is lost.

The example of an order buyer would be viewed as a good or service that has experience characteristics. Klein (1997) argues that this type of product and those that have search characteristics are less "vexing" than products that have credence characteristics. Quality of products that have experience characteristics can be determined by experience. The quality of the product can be determined either by experiencing by oneself or by asking someone who has experienced the product. Products that have search characteristics can be determined prior to purchase such as the style of a house. Products that exhibit credence characteristics cannot be determined even after using the product. For example did the doctor give the correct diagnoses for an ailment or did he/she give a convenient answer in order to make room for the next patient.

Klein (1997) indicates that suppliers or sellers will encourage extended dealings because they know satisfied customers or buyers will spread a positive report of their product. The fact that a seller has been around for an extended period of time provides a

level of trust to buyers. He argues that buyers know that a business will not survive if it provides a poor quality product. A growing business or a franchise also signals trustworthiness to buyers. Here they know that a business can only grow if it has satisfied customers. Thus size and length of time a seller has been in business translates into a level of trust to buyers that have not dealt with that seller before. Therefore it would be expected that a new small feedlot would need to expend more resources to gain trust with a packing plant than a larger established feedlot.

To summarize this section, transaction costs are important in determining the organizational structure of a supply chain. Firms will choose organizational structures that minimize both production and transaction costs. Transaction costs are impacted by uncertainty, asset specificity and frequency of transactions as well as human behavioural characteristics such as opportunism and bounded rationality. Transaction costs take on the form of search and information costs, negotiating and decision making costs, as well as monitoring and enforcement costs. Building trust within a business relationship reduces transaction costs. Methods of measuring transactions costs will be discussed later in this chapter.

3.3 Measuring Transaction Costs

Hobbs (1996c) points out that TCE theory has developed faster than methods of measuring transaction costs. She suggests that the inherent difficulty in separating transaction costs from other costs and lack of data are two reasons economists are reluctance to attempt to measure transaction costs. Transaction costs are not normally

recorded as part of a firms standard accounting practices neither are they tracked by government agencies. She argues that "an accounting approach to empiricizing the transaction cost approach is impractical."[26]

Hobbs (1996c) summarizes the literature in measuring transaction costs in three broad categories; evaluating the impact of transaction costs on vertical co-ordination across industries using secondary data, investigating industry specific impacts of transaction costs on vertical co-ordination using secondary data, and investigating industry specific impacts of transaction costs on vertical co-ordination using primary data. She points out the use of primary data is preferred but is costly since it often requires the researcher to survey participants within the industry being studied. A review of the following studies is intended to provide some of the approaches to transaction cost analysis within the food industry and specifically within the beef industry.

Frank and Henderson (1992) use secondary data in their examination of the effect of transaction costs on determining vertical co-ordination in the United States food industry. They used 1982 data from 42 four-digit SIC food manufacturing industries. From this data they developed up-stream and down-stream matrices. The up-stream matrix represented the percentage of value that a particular industry's output had on all the industries it supplied. The down-stream matrix represented the percentage of value of a particular industry's demand had on the output of supplying industries. From this information they developed a vertical co-ordination index where zero represented spot markets and 1 represented vertical integration. They then looked at four categories of transaction costs; uncertainty, concentration of buyers and sellers,

[26] Hobbs (1996c), page 20.

asset specificity and cost of administration of vertical co-ordination. Their vertical co-ordination index then was regressed against proxies of these four transaction cost categories. They concluded that transaction costs were the primary motivation for vertical co-ordination and that uncertainty, input supplier concentration, asset specificity and scale economies were the most influential transaction costs.

Hobbs (1997) used survey data to determine the importance of transaction costs in United Kingdom producer decisions to market their cattle through auction markets or directly to packing plants. Participants were asked to rate if they knew the value of their cattle before they went to auction (1-5), how much time they spent in finding which auction gave the best price, time spent in price discovery for direct sales and were they able to meet the quality specifications of the packing plant. This information was used to measure the importance of search and information transaction costs in the vertical coordination decision.

Hobbs asked the following questions in order to measure the importance of negotiating and decision making transaction costs on vertical coordination decisions. The degree of difficulty in organizing the delivery of cattle directly to the packing plant compared to the auction market (1-5). The difference in transportation cost per animal between selling directly to the packing plant in contrast to marketing through the auction market. The difference in commissions paid by marketing through the auction market compared to selling directly to the plant. The difference in the number of days in receiving payment from selling through the auction market compared to direct to packing plant sales. The impact of not having control over which order the cattle are sold in the auction market (1-5) since the order may impact the price received. The risk

of the cattle not getting sold in the auction because they did not reach the reserve bid price resulting in the cattle being transported back to the farm (1-5). The risk having to take the price the packer offers because they may be at a bargaining disadvantage (1-5). The frequency of auction sales held during the week so that cattle can be sold when they are ready for market. The time spent by farmers at auction markets. Were there sufficient numbers of buyers at the auction to allow for better competition (yes, no)? And did the farmer have a good relationship with the packing plant buyer (1-5).

Hobbs then asked participants about the difference in shrink and carcass damage between selling to the auction market and directly to the packing plant (1-5). Finally she asked if grade uncertainty and grade information asymmetry had an impact on selling directly to the packing plant (1-5). These questions were used to determine the importance of monitoring and enforcement transaction costs had on the vertical coordination decision.

Hobbs then used a two-limit Tobit model to measure the impact of these transaction costs on the decision to sell to the auction market or directly to the packing plant. She found that the greater the grade uncertainty the more likely the producer would sell through the auction market. She further found that the more reliable the relationship with the packing plant buyer, the more time spent at the auction market, the greater the size of the lot being marketed, marketing bulls, the greater the degree that the producer followed animal welfare codes and the greater the risk of not getting a reserved price at the auction market made it more likely the producer would sell directly to the packing plant. Hobbs did not find that price uncertainty had significant impact on the decision to sell through the auction market or directly to the packing plant.

Hobbs (1996 b) investigated the impact of transaction costs on beef processors method of procurement. Here she uses a conjoint analysis to examine bundles of supply chain attributes where the processor is assumed be able to assess implicitly each attribute within the bundle in order to determine which supply chain has the greatest value. The transaction cost attributes examined were supply continuity, degree of animal handling during transportation, degree of traceability of animals and method of payment. Payment was based on live weight versus dressed weight; traceability was described as either being easy or difficult; handling was determined as either handled once or more than once from farm to packing plants; and supply continuity was accessed at either occasional or regular. Respondents were asked to evaluate ten supply chain bundles consisting of combinations of these attributes by scoring them from 1 to 9 with 9 being the more preferred supply chain bundle. Hobbs found that the most important attribute in determining the marketing channel for United Kingdom processors was traceability. Traceability affects monitoring and enforcement costs. Supply consistency was the least important attribute. Method of payment and handling were preferred about the same with a slight preference given to method of payment.

T. Schmitz et al. (2003) examined the impact of transaction costs on the marketing of stocker cattle in the United States. They theorized that transaction costs may impact the choice of marketing channel. Schmitz et al. interviewed two livestock marketing experts from the top 15 beef-cow producing states. These experts were asked to provide an opinion on the share of stocker cattle marketed in their state through auction sales, private sales, video auctions and internet auctions. They then compared the share of each marketing method using ordinary least squares with the share of

producers in each state that had herds over 500 cows. They observed that the states with a larger share of large herds had a lower share of stocker cattle sold through the auction market. That is, they found a positive correlation between herd size and the choice of marketing through private sales and video and internet auctions. Schmitz et al. concluded that relatively larger producers were able to take advantage of new marketing innovations such as internet auctions because their transaction costs were lower. Smaller producers were restricted to using auction markets because their transaction costs were higher if they were to use other marketing channels.

None of these studies attempted to estimate the actual transaction costs. Rather they looked to see if transaction costs had an impact on decisions that firms made and what transaction costs were important in making these decisions. The following chapter outlines a theoretical model to quantify transaction costs.

Chapter 4

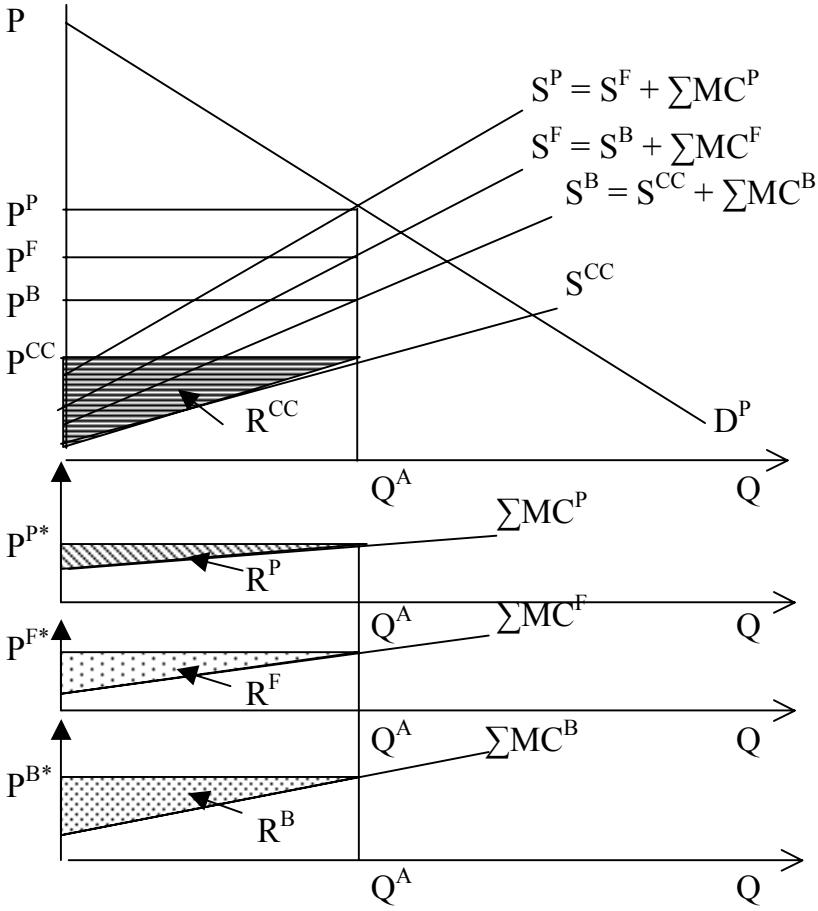
Theoretical Model

In this chapter, transaction cost economic (TCE) theory will be combined with neoclassical economic theory to show the impact transaction costs have on the beef marketing chain relating to feedlots. A method of defining fixed transaction costs and variable transaction costs will be developed in order to measure this impact. The final section of this chapter will provide a method for placing a value on fixed and variable transaction costs.

4.1 The Neoclassical Approach to the Vertical Beef Marketing Chain

Figure 4.1 provides an example of the neoclassical approach to explain the beef marketing chain for Saskatchewan cattle by using a simple fixed proportion model. It includes sectors from cow-calf production through to the slaughtering and processing sectors. Q represents the number of live cattle at various weight ranges for each stage of the beef marketing chain. S^{CC} depicts the cow-calf supply curve, which is the sum of all the marginal cost curves of the cow-calf producers. The supply curve S^{CC} is upward sloping because it reflects some scarcity of resources in the production process. For example, land used for pasture, hay, and silage in cow-calf production becomes scarce

over the long term. Good quality land is used first and as production increases poorer quality land is brought into use. Good quality land produces more output per unit



Q *is the quantity of live cattle from birth to slaughter*

Superscript Key

CC *refers to cow-calf production* B *refers to backgrounding*

F *refers to Finishing* P *refers to packers*

Figure 4.1: The Vertical Beef Marketing Chain

of input; thus it has a higher value or "rent" than poorer quality land. Cow-calf production must compete with other land uses, such as grain production. Grain is often at a competitive disadvantage with cow-calf production on lower quality land. Hence

the tradition of Saskatchewan has been to use lower quality land for cow-calf production and higher quality land for grain production.

As cow-calf production increases it must begin to use more expensive, higher quality land. This results in an upward sloping supply curve for cow-calf production over the long run. In a competitive situation, cow-calf producers receive price P^{CC} for their calves and they receive the shaded area R^{CC} (the area below P^{CC} and above S^{CC}) in the form of economic rents in terms of producer surplus. These economic rents accrue to the owners of the fixed factors of production such as land, breeding stock, and equipment over the short run and land over the long run. Thus, over the long run, R^{CC} represents the economic rents realized to land used in cow-calf production.

In the lower panel of Figure 4.1, ΣMC^{B}, ΣMC^{F}, and ΣMC^{P} depict the sum of marginal cost curves for the backgrounding sector, finishing feedlot sector, and beef meat packing sector respectively. These marginal cost curves are constructed such that they do not include the cost of supplying the input below them in the marketing chain. That is, the marginal cost for a firm in the backgrounding sector does not include the cost of buying calves from cow-calf producers, and the marginal cost for a firm in the meat packing sector does not include the cost of buying slaughter animals from the finishing feedlots. In addition, the marginal cost curves become increasingly more elastic as one moves up the supply chain, thereby reflecting constant or increasing returns to size. Finally, the marginal cost curves remain upward sloping in the backgrounding, finishing, and meat packing sectors to reflect the scarcity of resources that exist in these sectors. For example, the backgrounding feedlots have marginal cost curves that slope upward because of the scarcity of land for pasture**.** Finishing feedlots

have upward sloping marginal cost curves due to increasing transportation cost to access silage and manure removal as the feedlot gets larger as well as due to pollution regulations. Packing plants have upward sloping marginal cost curves because scarcity of labour. Packing plants compete with other industries for labour. Therefore they would have to increase wage rates in order to attract increased labour resources from other industries.

Each supply curve above S^{CC} (in Figure 4.1) is the summation of that sector's marginal cost curves and its supplying sector's supply curve. For example, the supply curve for the backgrounding sector would be the sum of marginal cost curves for backgrounding ($\sum MC^{B}$) plus the supply of calves (S^{CC}). The intersection of the demand curve facing the packing plants (D^{P}) and the packing plants' supply curve (S^{P}) gives rise to the quantity of beef demanded (Q^{A}) and the packing plants' price (P^{P}). Assuming there is no death loss through the chain, at quantity demand Q^{A} each sector's supply curve gives rise to that sector's price (P^{B}, P^{F} and P^{CC}). The marketing margin for each level of the supply chain (P^{B*}, P^{F*} and P^{P*}) is simply that sector's price, less the price paid by that sector for live cattle. For example, the marketing margin for the meat packing sector (P^{P*}) is the packers' average price received for all the products it produces from the live animals (P^{P}) less the price it pays for slaughtered animals (P^{F}). Therefore R^{B}, R^{F}, and R^{P} reflect the additional rents accruing to firms in that respective sector. For example, the additional economic rents accruing to firms in the meat packing sector (R^{P}) is the area below (P^{P*}) and above that sectors sum of marginal cost curves (ΣMC^{P}). The total economic rents accruing to the beef industry are the sum of

the economic rents for the meat packing, finishing and backgrounding sectors (R^P, R^F, and R^B) plus R^{CC}, which is equal to the area under P^P and above S^P.

In a competitive situation there is a derived demand curve for each sector below the meat packing sector that is not shown in figure 4.1. Each sector's demand curve would intersect that sector's supply curve at Q^A. These derived demand curves would be the demand curve faced by the packing sector less the sum of marginal cost curves of the sectors above the sector in question. For example the derived demand for finished animals would be the packing plants demand curve (D^P) less the sum of the meat packing sector's marginal cost curves (ΣMC^P). Or to view it another way, the derived demand for finished animals would be the packing plant's demand curve (D^P) less the vertical difference between the packing sector's supply curve (S^P) and the finishing sector's supply curve (S^F).

The model shown in Figure 4.1 can be used to describe a competitive market where the various segments of the industry are under different ownership. However, Figure 4.1 can also depict the decomposition of rents within an integrated market or sub-market. For example, in the US sugar industry, some of the large producers are integrated from production through the selling of refined sugar (Moss and Schmitz, 2002). With reference to figure 4.1, if packing plants were integrated with finishing feedlots either through contractual arrangements or ownership, then R^P would represent the economic rents accruing to the packing plant enterprise and R^F would be the economic rents accruing to the finishing feedlot enterprise.

Under neoclassical economic theory, once economic rents are identified it is possible to determine if a rent seeking activity such as exercising market power is

occurring either in the input or output markets or both. Neoclassical economic theory further indicates when price is greater than marginal cost there is an inefficient economic solution. That is there no longer is a competitive situation and at least one firm within a sector is rent seeking through exercising its market power. Any rent seeking activities by firms within a sector could impact the ability for future expansion in that sector from outside investors because these firms would try to drive out other firms in order to further increase their market share and thus their market power.

4.2 Transaction Costs within the Vertical Beef Marketing Chain

Coase (1937 and 1960), Williamson (1986) and others indicate that the exclusion of transaction costs in neoclassical economic theory could lead to an erroneous conclusion about market efficiency. That is one may conclude that market power is being exercised when it is not.

This can be shown by again returning to a simple fixed proportion model only with one sector of the vertical beef market chain with transactions costs. This is illustrated in figure 4.2. Here the neoclassical supply curve is shown as S^N which gives rise to price and quantity P^N and Q^N respectively. The economic rents accruing to the supplier (producer surplus) are then equal to the triangle *abc*. However once transaction costs are taken into consideration the supply curve shifts upward to S^T. Now the competitive solution with the transaction cost supply curve S^T gives rise to price P^T and quantity Q^T. The economic rents accruing to the supplier are the triangle *deg*.

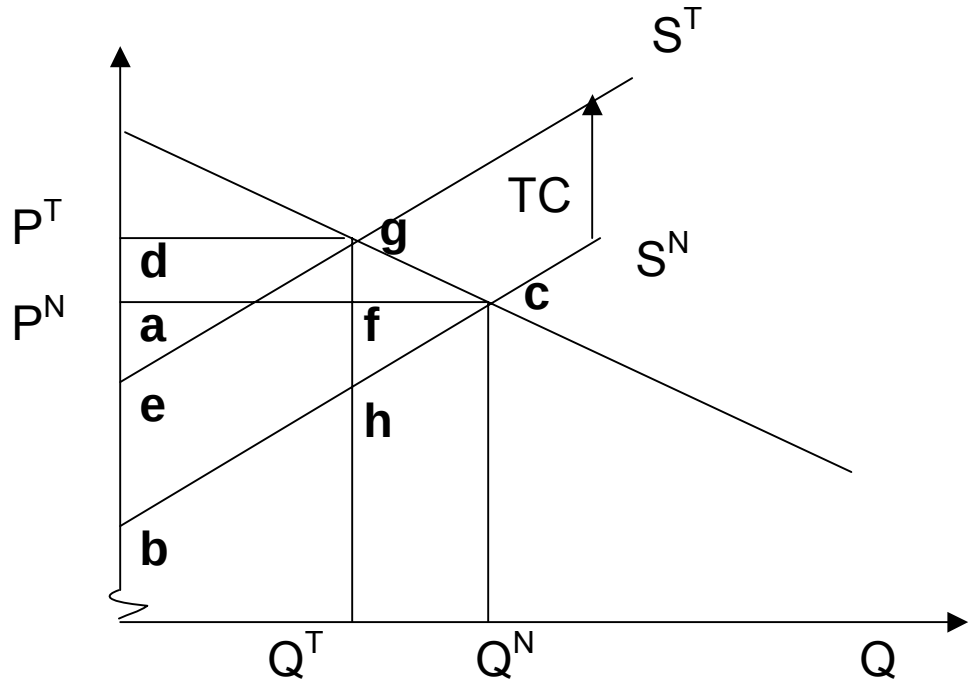


Figure 4.2 A Beef Sector with Transaction Costs

If transaction costs were not taken into account and the observed price and quantity are P^T and Q^T respectively, then the neoclassical economist would conclude that the market is not economically efficient. This economist would note a loss of efficiency equal to the triangle *ghc* and the supplier would accrue extra economic rents equal to the rectangle *dafg* less the triangle *fhc*. In other words this economist would conclude that there is rent seeking behaviour when in fact there is not.

The remainder of this section will be dedicated to developing the theoretical optimum output for firms in the packing plant, order buyer and feedlot sectors incorporating transaction costs. The perfect knowledge and homogeneous output assumptions are being relaxed here in order to incorporate transaction costs into the competitive model. This implies that the buyers or sellers are not fully aware of the

attributes of the animals they purchase and market. The price paid will reflect quality differences to the extent these attributes can be identified. However these quality differences can allow for some opportunistic behaviour for both buyers and sellers. Therefore transaction costs represent the cost of transacting business in purchasing and selling live cattle.

Equation 4.1 gives the profit function of a firm in the meat packing sector for period *t*, which shows the market relationship between the meat packing sector and the finishing feedlot sector by including transaction costs. For the purposes of this discussion period *t* is defined as one year.

$$\pi_t = P_t Q_t - n_{it}(w_{it} + T_{it})x_{it} - n_{jt}(w_{jt} + T_{jt})x_{jt} - w_{Zt}Z_t - FPC_t - FTC_t \quad (4.1)$$

The packing plant receives finished cattle from two finishing feedlots, *i* and *j* during the year. One could also look at these as two types of feedlots, large and small feedlots. In this case, feedlot *i* represents larger feedlots while feedlot *j* represents smaller feedlots. Q_t is the packing plant's output during the year that includes beef, offal, hide and other by-products in processing a finished animal. P_t is the combined per animal annual average value for the packing plant's output Q_t. Inputs x_{it} and x_{jt} are finished animals purchased annually from feedlots *i* and *j* respectively. The packing plant purchases n_{it} and n_{jt} number of finished animals during the year at an average annual purchase price of w_{it} and w_{jt} per animal from the respective feedlots. The terms T_{it} and T_{jt} are the marginal transaction costs that the packing plant incurs annually with the respective feedlots. Thus, the actual cost to the packing plant for obtaining each animal is its purchase price plus the marginal transaction costs associated with obtaining that animal from a particular feedlot. The packing plant purchases all other inputs Z_t at a

cost of w_{zt}. The packing plant also experiences annual fixed production costs (FPC_t) and fixed transaction costs (FTC_t).

Equation 4.2 is the assumed production function of the packing plant. Here the output of the packing plant, in terms of weight, is equal to the total weight of the live cattle purchased by the plant. This simplifying assumption means the plant uses all the animals purchased with out any loss and that the plant adds nothing to the product other than the service of killing, separating and packaging of live cattle into beef carcasses, boxed beef, hide, offal etc.

$$Q_t = n_{it} x_{it} + n_{jt} x_{jt} \tag{4.2}$$

Packing plants will only buy live cattle from the feedlots thus by combining equations 4.1 and 4.2 with a non-negative constraint on inputs x_{it} and x_{jt} results in the following Lagrange function:

$$\ell_{\pi t} = P_t(n_{it} x_{it} + n_{jt} x_{jt}) - n_{it}(w_{it} + T_{it}) x_{it} - n_{jt}(w_{jt} + T_{jt}) x_{jt} - w_{Zt} Z_t$$

$$- FPC_t - FTC_t + \lambda_i(0 - x_{it}) + \lambda_j(0 - x_{jt})$$

The first order conditions with respect to output are as follows:

$$P_t = w_{it} + T_{it} + \lambda_i$$

$$P_t = w_{jt} + T_{jt} + \lambda_j$$

$$\lambda_i = x_{it} = 0$$

$$\lambda_j = x_{jt} = 0$$

And the Kuhn-Tucker conditions are:

$$x_{it}^{*}[P - (w_{it} + T_{it})] = 0$$

$$x_{jt}^{*}[P-(w_{jt}+T_{jt})]=0$$

$$\lambda_{i}^{*}[0-x_{it}]=0$$

$$\lambda_{j}^{*}[0-x_{jt}]=0$$

Since, the packing plants take cattle from both feedlots as a result of the non-negative constraint then x_{it} and x_{jt} are positive, λ_i and λ_j are zero, and the following equations hold:

$$P_t = w_{it} + T_{it} \tag{4.3}$$

$$P_t = w_{jt} + T_{jt} \tag{4.4}$$

Thus, the optimum number of cattle purchased from each feedlot is when the combined price per animal of the plant's output equals the purchase price per animal and the marginal transaction costs for that respective feedlot. The purchase price per animal is the marginal production cost from a particular feedlot. The marginal value product is equal to P_t, which implies that the marginal physical product is one for both feedlots. This result is not surprising because equation 4.2 indicates that any change in the number of animals purchased from either feedlot will result in an equal change in the amount of output produced by the packing plant. Finally, the difference between the prices paid for cattle from the feedlots is the difference between their respective marginal transaction costs as expressed in equation 4.5.

$$w_{it} - w_{jt} = T_{it} - T_{jt} \tag{4.5}$$

The second level of business relationships that a finishing feedlot has in the beef marketing chain is with order buyers or cattle brokers. As described earlier in chapter 2, order buyers play an important role in the interface between feedlots and cow-calf producers. They act as purchasing agents at auction markets and market reporters for the feedlot owners. The annual profit function for the order buyer is provided in equation 4.6.

$$\pi_t^{OB} = n_{it}^{OB} r_{it} x_{it}^{OB} + n_{jt}^{OB} r_{tj} x_{tj}^{OB} - n_{it}^{OB} (c_{it}^{OB} + T_{it}^{OB}) x_{it}^{OB}$$
$$- n_{jt}^{OB} (c_{jt}^{OB} + T_{jt}^{OB}) x_{jt}^{OB} - FPC_t^{OB} - FTC_t^{OB} \quad (4.6)$$

Where:

π_t^{OB} is an order buyer's annual profit function.

x_{it}^{OB} is the live animal bought for and sold to feedlot *i* during the year.

x_{jt}^{OB} is the live animal bought for and sold to feedlot *j* during the year,

n_{it}^{OB} is the number of animals bought for and sold annually to feedlot *i*.

n_{jt}^{OB} is the number of animals bought for and sold annually to feedlot *j*.

r_{it} is the price charged to feedlot *i* for x_{it}^{OB} during the year.

r_{jt} is the price charged to feedlot *j* for x_{jt}^{OB} during the year.

c_{it}^{OB} is the annual average variable production cost of the order buyer that is the same as the annual marginal production cost for acquiring x_{it}^{OB} that includes the purchase price of the animal, auction market commissions, feeding and transportation costs on the cattle, wages paid to buyers and other operating

expenses incurred by the order buyer. The order buyer's commission usually is intended to cover wages and operating expenses.

$\mathbf{c}_{jt}^{OB}$ is the annual average variable production cost of the order buyer that is the same as the annual marginal production cost for acquiring $\mathbf{x}_{jt}^{OB}$. The annual marginal production cost is similar to that described for $\mathbf{c}_{it}^{OB}$.

T_{it}^{OB} is the annual marginal transaction costs that the order buyer has with feedlot *i*,.

T_{jt}^{OB} is the annual marginal transaction costs that the order buyer has with feedlot *j* and

FPC_t^{OB} and FTC_t^{OB} are the annual fixed production and transaction costs of the order buyer.

Here the initial assumptions are the same as those for packing plants with an additional assumption that the order buyer only purchases enough animals to fill the orders of feedlots *i* and *j*.

The first order conditions with respect to output are:

$$r_{it} = c_{it}^{OB} + T_{it}^{OB} \tag{4.7}$$

$$r_{jt} = c_{jt}^{OB} + T_{jt}^{OB} \tag{4.8}$$

Thus, the optimum price for the order buyer to charge to a feedlot is the marginal production cost for acquiring the cattle plus the marginal transaction costs with that feedlot. Therefore, the difference between the prices charged to the feedlots would be the difference between the respective marginal production cost of acquiring

the cattle and the marginal transaction costs the order buyer has with that respective feedlot as outlined in equation 4.9.

$$r_{it} - r_{jt} = c_{it}^{OB} - c_{jt}^{OB} - T_{it}^{OB} - T_{jt}^{OB} \tag{4.9}$$

If the marginal production costs are assumed to be the same, then the difference between the prices charged to the feedlots is the difference in their respective marginal transaction costs.

The finishing feedlots' profit functions are the only remaining profit functions that need to be defined in order to explain the beef marketing chain around feedlots. Equation 4.10 is a generic feedlot annual profit function.

$$\pi_t^F = \sum_{a=1}^{a} n_{at}^P (w_{at}^P - T_{at}^P) x_t - \sum_{b=1}^{b} n_{bt}^{OB} (r_{bt}^{OB} + T_{bt}^{OB}) x_t - C_{t(n_{bt} x_t)} \tag{4.10}$$

Where:

π_t^F is an annual finishing feedlot profit.

$\sum_{a=1}^{a}$ is the sum of all the packing plants the feedlot sells to where a=1,…,a.

$\sum_{b=1}^{b}$ is the sum of all the order buyers the feedlot buys from where b=1,…,b.

n_{at}^P is the number of slaughter animals sold annually to packing plant *a*.

n_{bt}^{OB} is the number of feeder animals bought annually from order buyer *b*.

x_t is the feeder animal purchased then sold as a slaughter animal during the year.

$C_{t(n_{bt} x_t)}$ are all the annual production costs incurred by the feedlot in changing a feeder animal into a finished one. These costs are a function of the size of the

feedlot and include costs such as feed, facilities, equipment, animal health and labour.

w_{at}^{P} is the price received by the feedlot for its slaughter animals that were sold to packing plant *a* during the year.

r_{bt}^{OB} is the price paid by the feedlot for its feeder cattle that were bought from order buyer *b* during the year.

T_{at}^{P} is the annual marginal transaction costs that the feedlot has with packing plant *a* and

T_{bt}^{OB} is the annual marginal transaction costs that the feedlot has with order buyer *b*.

Note that the transaction costs for selling the animals to the packing plant are kept on the revenue side of equation 4.10, which is contrary to convention. This was done to illustrate that the net revenue the feedlot receives from the packing plant is the price the feedlot receives for the animal less the marginal transaction costs with the packing plant.

Again the assumptions for the finishing feedlot profit function are the same as those for the packing plants with the additional assumption that the number of animals sold are equal to the number of animals purchased. That is $\sum_{a=1}^{a} n_{at}^{P} = \sum_{b=1}^{b} n_{bt}^{OB}$, which means any death loss incurred is included in $C_{t(n_{bt}x_t)}$. Therefore equation 4.10 can be rewritten as shown in equation 4.11 by substituting $\sum_{b=1}^{b} n_{bt}^{OB}$ for $\sum_{a=1}^{a} n_{at}^{P}$.

$$\pi_t^F = \sum_{b=1}^{b} n_{bt}^{OB}(w_{at}^P - T_{at}^P)x_t - \sum_{b=1}^{b} n_{bt}^{OB}(r_{bt}^{OB} + T_{bt}^{OB})x_t - C_{t(n_{bt}x_t)} \quad (4.11)$$

Then the first order condition with respect to x_t is:

$$(w_{at}^P - T_{at}^P) = (r_{bt}^{OB} + T_{bt}^{OB}) + c_t$$

Here c_t is the annual marginal cost of production. Equation 4.12 is the result of rearranging the costs so that they are on the right hand side.

$$w_{at}^P = r_{bt}^{OB} + c_t + T_{bt}^{OB} + T_{at}^P \quad (4.12)$$

Thus the optimum level of output for the feedlot is where the feedlot's total marginal costs of production plus its total marginal transaction costs equals the price paid by the packing plant for an animal. Here the total marginal costs of production are equal to the price paid for the feeder animal plus the marginal cost of getting that animal to a finished weight ($r_{bt}^{OB} + c_t$) and the total marginal transaction costs are the sum of the marginal transaction costs for buying and selling the animal ($T_{bt}^{OB} + T_{at}^P$).

Figure 4.3 illustrates one element of the vertical market chain, namely the feedlot cost structure. The bottom panel shows the average transaction cost (ATC) and marginal transaction cost (MTC) curves for the feedlot. It is assumed that the transaction costs have increasing returns to size. The middle panel illustrates the average production cost (APC) and marginal production cost (MPC) curves. The production curves are drawn to show all three cost phases, increasing returns to size that is to the left of Q^A, constant returns to size that is the flat portion to the right of Q^A and decreasing returns to size that is the upward sloping portion of the average production

cost curve and includes Q^*. The top panel is the vertical sum of the bottom two panels resulting in the total average cost (TAC) and total marginal cost (TMC) curves.

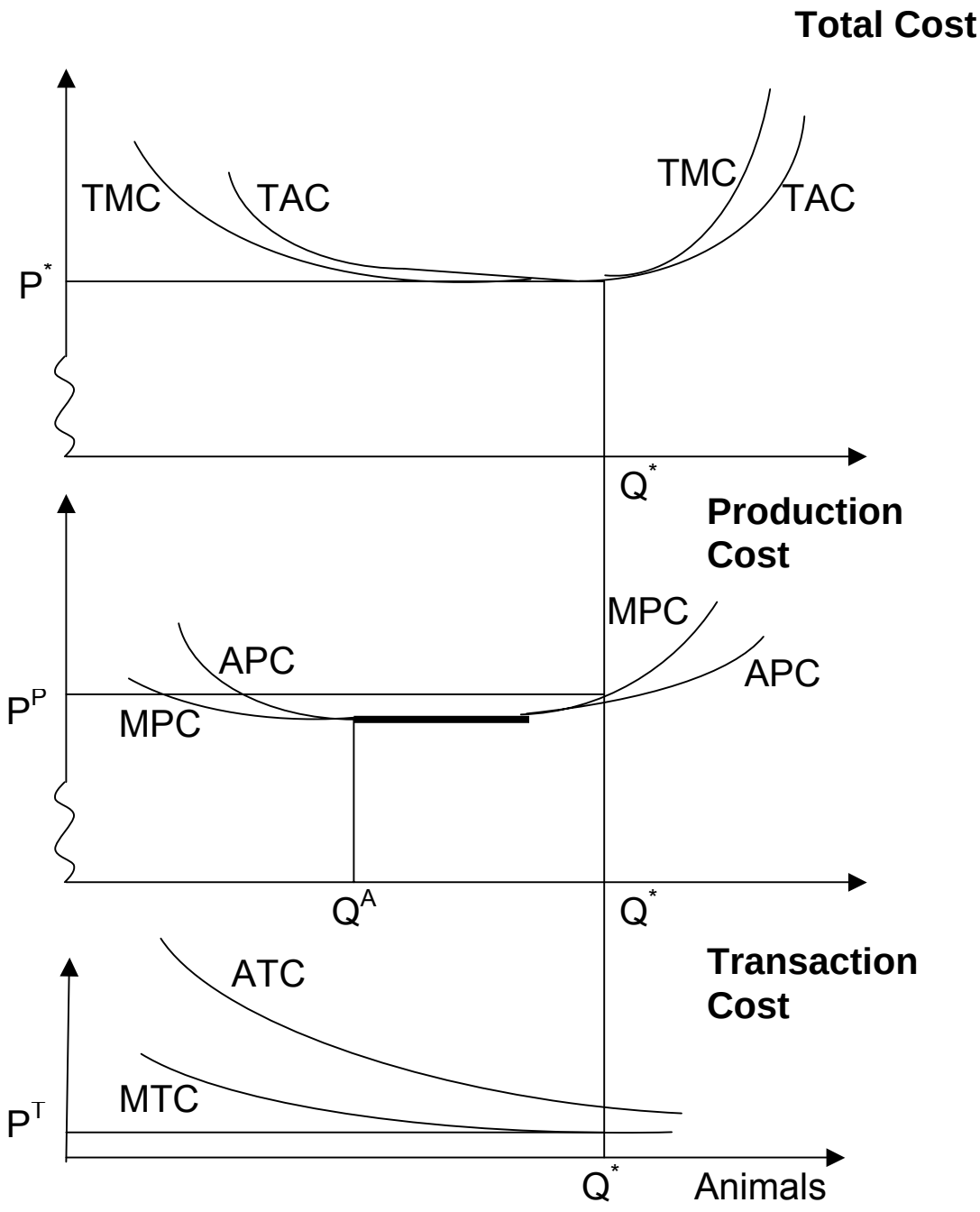


Figure 4.3: Feedlot Cost Structure

The optimum output under neoclassical competitive economic theory would be where price equals marginal cost and the optimum level of production occurs where the average cost curve is minimized. Here the marginal production cost equals the average production cost and economic profits are zero. Thus optimum production is anywhere along the flat portion of the average cost and marginal cost curves. If production were to the left of Q^A then the feedlot would experience an economic loss because the marginal cost is below the average cost. So the feedlot would be encouraged to increase its size in order to eliminate this economic loss. Where marginal production cost is greater than average production cost the feedlot experiences an economic profit, however an economic profit encourages other firms to enter into the feedlot sector resulting in increased production and lower prices. The resulting long run optimum level of production occurs when the marginal cost equals to average cost. Anecdotal evidence from discussion with feedlot managers indicate that the majority of economies of size have already occurred when feedlots are between 10,000 and 15,000 head one time capacity. Discussions with the manager of the largest single feedlot in Alberta that has a one time capacity of 75,000 head suggest that it is unclear if further expansion would result in inefficiencies. He suggested that any inefficiency would not be to production issues but due to environmental regulations and public displeasure with intensive livestock operations.

There is a different optimum when transaction costs are taken into account. Here the marginal transaction cost (MTC) curve is below the average transaction costs (ATC) curve at all quantities due to increasing returns to size. The optimum level of production would occur where the increase in efficiency due to size in transaction costs

is just offset by the decrease in production efficiency due to size. That is the decrease in average transaction costs is equal to the increase in average production costs. In figure 4.3 this point is reached at Q^* where the sum of average transaction costs and average production costs are minimized. Here the change in total average cost is zero ($\frac{\partial APC}{\partial Q} + \frac{\partial ATC}{\partial Q} = \frac{\partial TAC}{\partial Q} = 0$) and total marginal cost equals the total average cost ($TMC = TAC$) which means that their sums are equal (i.e. $APC + ATC = MPC + MTC$). Therefore at quantity Q^* the marginal transaction cost is below the average transaction cost curve and the marginal production cost is above the average production curve. Also at quantity Q^* the respective marginal cost curves give rise to price P^T and P^P and their sum equals to the optimum price P^* (i.e. $P^* = P^P + P^T$).

It is clear that any calculation based on only production cost analysis would suggest that feedlots would be exercising market power or rent seeking because they are experiencing economic profits since the price they receive would be great than the optimum production price ($P^* \succ P^P$) or in other words the price they receive would be greater than marginal cost ($P^* \succ MPC$). The same argument can be made for firms in the meat packing sector and order buyer firms.

Therefore the difference between the profits of a large and a small feedlot is the difference between the prices each feedlot receives for is animals and the price paid for these animal, the cost of finishing and total transaction costs for selling and acquiring the animals. Equation 4.13 gives the difference in profits between feedlots *i* and *j* operating at optimum capacity.

$$\pi_{it} - \pi_{jt} = n_{it}(P - APC_{it} - ATC_{it}) - n_{jt}(P - APC_{jt} - ATC_{jt}) \quad (4.13)$$

4.3 Calculating Transaction Costs

To this point total transaction costs has not been fully defined other than to indicate that feedlots have two sets of transaction costs, one set on the demand side and the other set on the supply side. This section will define transaction costs for a finishing feedlot. Transaction cost theory indicates that there are search and information costs, monitoring and enforcement costs as well as negotiating and decision making costs. These costs are impacted by the level of trust between the participants, uncertainty and the frequency of transactions transacted by the participants. The frequency of transactions is based on the marketing strategy of the feedlot. The marketing strategy chosen by the feedlot is based on the size of feedlot, willingness to take risk and the ability of the feedlot to access capital and conditions placed on the acquisition of this capital. These conditions and ability to access capital are based upon the relative wealth of the feedlot and its management's skills in accessing capital.

Annual total transaction costs (TTC_t) would have both a fixed transaction costs (FTC_t) component and a variable transaction costs (VTC_t) component (equation 4.14). Any investment into establishing a business relationship with an order buyer and packing plant prior to the current year would be the fixed cost component and any current annual cost regarding the transacting of business would be the variable cost.

$$TTC_t = FTC_t + VTC_t \quad (4.14)$$

There are two elements in recognizing the fixed cost in the business relationship; the cost of losing the existing business relationship and the cost of strengthening the existing business relationship. The cost of losing the existing business relationship is similar to an opportunity cost while the cost of strengthening the existing business relationship is similar to good will.

The first element is the cost of losing the business relationship (α). That is the cost of not being able to sell or buy because one of the partners in the business relationship has chosen to discontinue the business relationship. For example if feedlot "X" no longer has a business relationship with a certain packing plant, then there is the cost of establishing a new business relationship with another packing plant as well as the actual cost of losing the business relationship with the old plant. The actual cost of losing a business relationship could include the inability to meet the quality requirements of another packing plant or at least extra costs to meet these requirements and reduced prices because it is now placing extra supplies into that packing plant.

$$\alpha = S_I + N_I + M_I + f\left(\sum_{u=1}^{u} \rho_t m_t L_u\right) \text{ where u=1,2,…,u} \quad (4.15)$$

In equation 4.15 the cost of losing a business relationship (α) is equal to the cost of establishing a new business relationship which includes initial search and information costs (S_I), negotiation and decision making costs (N_I) and monitoring and enforcement costs (M_I). Plus the actual cost of losing the business relationship that is a function of the sum of periods (u) and the product of the opportunity cost of replacing the business relationship per transaction (ρ_t), the number of transactions per year (m_t),

and the number of years in each period (L_u). Thus, the cost of losing a business relations (α) is accumulated over the lifetime of the business relationship.

$$K_t = f\left(\sum_{V=0}^{V} \frac{\beta_{t-V} m_{t-V}}{(1+D)^V}\right) \quad \text{where V=0,1,…,V.} \tag{4.16}$$

Equation 4.16 defines the second element to the fixed cost component. It is the cost of strengthening the business relationship which shall be defined as the current year's stock of capital trust (K_t). In equation 4.16 the stock of capital trust is a function of the accumulated discounted trust components over the life of the business relationship. The trust component is the product of the value of trust placed on each transaction (β_{t-v}) and the annual frequency of transactions (m_{t-v}). The trust component is discounted by *D* percent over *V* years. Here *V* is the number of years from the current year throughout the length of the business relationship. The trust component is discounted to reflect that recent experience is more valuable than trust gained in the distant past. However, the discount rate, *D*, could be relatively low. The size of β_{t-v} and the discount factor *D* will determine the relative importance of the annual trust component in the stock of capital trust (K_t). The inclusion of the discount factor results in the stock of capital trust reaching an optimum at some point in the future. The stock of capital trust is expressed in functional form because it is not clear to what degree the level of trust is adjusted by the frequency of transactions. That is if there are twice as many transactions will the trust double or will the increase in trust exhibit decreasing or increasing returns to frequency of transactions? The stock of capital trust (K_t) is accumulated throughout the life of the business relationship similarly to the cost of losing the business relationship (α).

Beef animals have a greater degree of asset specificity (sometimes referred to time specificity) as they go up the market chain. That is the cow-calf producer can always choose to retain ownership of his/her calves if the price is not acceptable, however once the animals are finished the older they get before slaughter the less valuable they become. So once the animals are finished there is a relatively short window of time to dispose of this asset. The packing plant also has a degree of supply risk. If they are unable to get sufficient supplies of the right quality, they face inefficiencies or shut down costs. So in the case of the packing plant, management will either take animals that do not meet their quality requirements, get more aggressive in the market or both. This degree of asset specificity and risk allow for opportunistic behaviour, thus transaction costs.

Transaction cost theory indicates that transaction costs are inversely related to trust. So as trust increases the cost of doing business decreases. This theory also indicates that transaction costs are directly related to uncertainty. That is not being able to meet supplies is costly. So the ability to develop a trustworthy relationship reduces that risk. Thus total fixed transaction costs are the cost of losing the business relationship discounted by the stock of capital trust as shown in equation 4.17.

$$FTC_t = \frac{\alpha_t}{1+K_t} \tag{4.17}$$

Equation 4.18 outlines the variable transaction costs. The variable transaction costs are the sum of the search and information costs (S_t), negotiating and decision making costs (N_t) and monitoring and enforcement costs (M_t) throughout the year. The total negotiating and decision making cost is related to the frequency (m_t) of

transactions during the year. If there is more than one contract per year then these costs are adjusted accordingly.

$$VTC_t = S_t + m_t N_t + M_t \tag{4.18}$$

Here the search and information costs will probably be zero unless the partners wish to improve their contractual relationship. The negotiation and decision making costs may include price discovery, time of delivery, quality and method and timing of payment. The monitoring and enforcement costs will have an annual cost element for monitoring the contract σ^c_t and a cost element of monitoring each animal σ^n_t throughout the year as expressed in equation 4.19. Here recall that n_t is the number of animals purchased and sold during the year.

$$M_t = \sigma_t^C + n_t \sigma_t^n \tag{4.19}$$

Now substitute equation 4.19 into 4.18 results in equation 4.20.

$$VTC_t = S_t + m_t N_t + \sigma_t^C + n_t \sigma_t^n \tag{4.20}$$

Equation 4.21 is the result of substituting equations 4.17 and 4.20 into equation 4.14.

$$TTC_t = S_t + m_t N_t + \sigma_t^C + n_t \sigma_t^n + \frac{\alpha_t}{1+K_t} \tag{4.21}$$

Now it is possible to calculate the average transaction costs and marginal transaction costs as outlined in equations 4.22 and 4.23 respectively.

$$ATC_t = \frac{TTC_t}{n_t} \tag{4.22}$$

and $$MTC_t = \frac{\partial TTC_t}{\partial n_t} \tag{4.23}$$

Equations 4.21 and 4.23 provide the mathematical structure to test the hypothesis as outlined earlier that transaction costs result in large feedlots paying less for their feeder animals and receiving a higher price for their slaughter animals.

4.4 Measuring Transaction Costs

This section provides a method of measuring transaction costs for the packing plant, feedlot and order buyer sectors.

Table 4.1 provides a list of potential search and information costs faced by a packing plant doing business with a finishing feedlot. The existence of a business relationship would suggest that there is a cost in not having that business relationship. The cost of not having a business relationship with a feedlot could include the cost of lower quality animals, the cost of getting aggressive in the market place to guarantee supplies, the cost of inefficiency if supplies are short and the cost of shutting down.

The packing plant incurs a cost to find a potential feedlot with which to develop a relationship in order to obtain a reliable supply. Initially, the packing plant would determine in advance what characteristics they are looking for in an "ideal" feedlot. These characteristics could include the ability to meet the quantity and quality requirements of the plant, proximity, whether the feedlot is trustworthy and can the business relationship be sustained for a long time.

Proximity to the plant could impact transportation cost and quality. The feedlot needs to be trustworthy to reduce future monitoring and enforcement costs. Finally, the business relationship has to have the potential to last a long time. This means the

feedlot needs to be able to face future changes and still be able to survive. Factors that could impact the sustainability of the relationship may be the management structure, financial strength of the feedlot and its business structure.

Table 4.1: Packing Plant's Search and Information Costs with a Feedlot

Identified Cost	Method of measuring
A) Fixed Cost	
i) Cost of not having a major supplier	
• Potential loss in quality of animals supplied, extra cost of going into the market place to obtain supplies, cost of inability to obtain supplies.	Loss of opportunity cost. Find out cost of poor quality per animal. Find cost of shutting down. Find cost of loss of efficiency. Find cost of getting aggressive in the market.
ii) Determine characteristics of a good feedlot.	Personnel time and equipment
i) Able to meet supply requirements continuous and ample supply, able to meet quality requirements and adaptable	Personnel time and equipment
ii) Proximity	Extra transportation cost
iii) Able to sustain a relationship-management, business structure, and financial strength.	Personnel time and equipment
iv) Trustworthy	Personnel time and equipment
iii) Search for potential feedlot partner	Personnel time and equipment
iv) Search out incentives to encourage feedlot to be a partner such as in price, delivery and/or payment.	Personnel time and equipment
v) Value of trust gained by each transaction	Personnel time and equipment Constant, increasing or decreasing levels of trust per transaction
B) Variable Cost	
i) Ongoing search to improve the relationship.	Personnel time and equipment

Once the characteristics of the "ideal" feedlot are determined then the packing plant would search for feedlots that best meet these criteria. This may take time and effort, which implies there will be some cost attached to this search.

Once the number of candidates is narrowed down to a one or two potential partners then there will be a cost incurred in identifying ways to encourage that feedlot to enter into the business relationship. The business relationship must be mutually beneficial or it will not be sustainable. This may include pricing options, delivery options and payment schemes. At this stage the search is for a range of options.

Assuming each transaction increases the level of trust, then to what degree is this trust increased? That is, do increased transactions result in constant, increasing or decreasing returns to trust such that if transactions are doubled will the level of trust be doubled?

There may be an ongoing cost of searching for better alternatives to improve the contract such that both parties are not worse off and at least one is better off. This would be the variable cost component of information and search costs. It is expected that this cost will be relatively small and may be zero with mature relationships.

Table 4.2 outlines the packing plant's possible negotiating and decision making costs with a feedlot. Once a decision is made to pursue a potential partner then the next stage is to negotiate with them so that an agreement can be reached. Here they haggle on the price discovery mechanism, pricing and delivery and payment options. Is the price based on CanFax information or will it be adjusted to Chicago Board of Trade prices? How will quality be determined? Is the price based on live weight, rail grade or grid? Who is responsible for injury during transportation? The packing plant will need to spend resources on personnel and equipment to do the negotiations.

Table 4.2: Packing Plant's Negotiating and Decision Making Costs with a Feedlot

Identified Cost	Method of Measuring
A) Fixed cost – initial price discovery, haggling on price and delivery coordination.	Personnel time and equipment
B) Variable cost ongoing price discovery, and possible ongoing haggling on price and delivery coordination.	Personnel time and equipment

The potential monitoring and enforcement transaction costs that the packing plant may have with a feedlot are summarized in table 4.3. The packing plant may have an initial investment in personnel time and equipment to set up how they will monitor the progress of the arrangement with the feedlot as well as monitor contractual issues. Then there will be the ongoing cost of recording information on quality and delivery of animals and relay this information to the feedlot. Human resources and equipment such as computers, telephones and faxes will be needed to ensure that proper record keeping and communication takes place.

Table 4.3: Packing Plant's Monitoring and Enforcement Costs with a Feedlot

Identified Cost	Method of measuring
A) Fixed cost – Initial cost of setting up a monitoring system to track quality and delivery times of animals and contract obligations.	Personnel time and equipment
B) Variable cost – On going cost of monitoring deliveries and quality of animals as well as contract obligations	Personnel time and equipment

Table 4.4 gives the potential search and information costs the order buyer may have with a feedlot. Initially the order buyer must develop and maintain a good reputation in order to attract business. Order buyers have payment risk because after

they receive an order for cattle they then purchase these cattle before reselling them to the feedlot. Order buyers need to know they will get paid when they deliver the cattle and that the customer recognizes that market conditions may not allow the order buyer to meet the quality standards that the feedlot manager has requested. If the feedlot rejects the cattle then the order buyer has to take the cattle back to another location and incurs additional transportation costs. If the order buyer can not find another feedlot to take the cattle immediately then the order buyer will incur extra carrying and feed charges. A check on the feedlot's reputation for paying its suppliers and its management capabilities are required. Once the business relationship is established with a feedlot, how much trust is gained with each transaction?

Table 4.4: Order Buyer's Search and Information Costs with a Feedlot

Identified Cost	Method of Measuring
A) Fixed cost-	
i) Cost of not having a long term customer	Loss of opportunity
ii) Initial cost in finding a customer and informing them of the service.	Personnel time and equipment costs on background checks, ability to pay, reputation etc.
iii) Gain a reputation and develop trust with feedlot with each negotiation	Personnel time and equipment Constant, increasing or decreasing levels of trust per transaction
B) Variable cost	
i) Price discovery	Personnel time

The variable search and information costs faced by the order buyer would be determining if they are still competitive with other order buyers. Otherwise they would lose customers. Once they lose customers it would take a greater investment of time and effort to re-establish their reputation.

Table 4.5 outlines the order buyer's potential negotiating and decision making costs. The fixed negotiating and decision making costs are not likely to be significant because it would be simply determining the level of service required. The market generally establishes the commission fees. The variable costs are how many animals to order at what quality and price, negotiating when payment is made and when the cattle are delivered. The costs here would likely be communication costs such as phone, fax, e-mail and human resource time.

Table 4.5: Order Buyer's Negotiating and Decision Making Costs with a Feedlot

Identified Cost	Method of Measuring
A) Fixed cost – Initial communicate cost of service	Personnel time and equipment
B) Variable cost- haggling price ordering and delivery time	Personnel time and equipment

Table 4.6 gives the order buyer's potential monitoring and enforcement costs. The fixed cost portion would be the cost of setting up the monitoring system. The variable cost is monitoring how many cattle are rejected by the feedlot and if payments are made on time and in the proper way. The record keeping is part of the licensing, bonding requirements as well as requirements of U.S. customs officials for cattle sold into the U.S. The cost here would be human resource time, equipment and software for record keeping and communications.

Table 4.6: Order Buyer's Monitoring and Enforcement Costs with a Feedlot.

Identified Cost	Method of Measuring
A) Fixed Cost – Setting up monitoring system	Personnel time and equipment
B) Variable Cost -Monitoring payment and number of cattle rejected and maintaining records as part of licensing and bonding requirements	Personnel time and equipment

The finishing feedlot would have similar transaction cost as does the order buyer and the packing plant. Table 4.7 provides the information and search cost that the feedlot would have with the packing plant and order buyer. In terms of fixed information and search cost the feedlot may need to ensure a market for its finished animals with the packing plant and ensure a supply of quality animals from its order buyers. To do this the feedlot would search out the packing plants and order buyers that would best fit its needs. It is possible that the feedlot could acquire its cattle directly from the cow-calf producer thereby circumventing the auction market and order buyers. Direct purchases from the cow-calf producer would eliminate commission fees from the order buyer and auction market in addition to reducing the extra transportation cost associated with the auction market.

However, direct sales would have other transaction costs in terms of price-discovery, market information and searching for cattle. The order buyer provides the feedlot with market information and does the search for appropriate cattle for a fee. So does the services the order buyer provides the feedlot offset the extra cost? Anecdotal evidence would suggest they do. That is the very fact that order buyers are still part of the market place indicates that they are more efficient at acquiring cattle than the feedlot is. The feedlot's variable search and information costs may be the cost associated with searching for ways to improve the business arrangement.

Table 4.7: Feedlot's Search and Information Costs with a Packing Plant and Order Buyer

Identified Cost	Method of measuring
A) Fixed Cost	
i) Cost of not having a major market	
• Potential loss of recognized value of the quality of animals supplied, cost of going into the market place and receiving a lower price, cost of delayed sales.	Loss of opportunity cost.
ii) Cost of having to buy own cattle rather than going through and order buyer or cost of finding another order buyer, cost of not getting financing.	Personnel time and equipment
iii) Search for right packing plant that is able to take animals when they are ready at specific quality is close and is trustworthy.	Personnel time and equipment
iv) Search for order buyer that gives good advice on the market conditions, able to buy the animals desired at a reasonable price and is prompt in responding to the order and obtaining reasonable financing.	Personnel time and equipment
v) Search out incentives to encourage packing plant to become a partner such as in price, delivery and/or payment.	Personnel time and equipment
vi) Value of trust gained by each transaction	Constant, increasing or decreasing levels of trust per transaction
B) Variable Cost	
i) Ongoing search to improve the relationship.	Personnel time and equipment

Tables 4.8 and 4.9 give the negotiating and decision making costs and monitoring and enforcement costs that the feedlot may have with packing plants and order buyers. These costs are similar to those discussed regarding the packing plant's business relationship with a feedlot and the order buyer's business ties with a feedlot.

Table 4.8: Feedlot's Negotiating and Decision Making Costs with a Packing Plant and Order Buyer

Identified Cost	Method of Measuring
A) Fixed cost	
i) Initial price discovery, haggling on price and delivery coordination with feedlot.	Personnel time and equipment
ii) Initial price discovery with order buyer	Personnel time and equipment
B) Variable cost	
i) Ongoing price discovery, and possible ongoing haggling on price and delivery coordination with packing plant	Personnel time and equipment
ii) Ongoing price discovery, and haggling on price and delivery of cattle with order buyer	Personnel time and equipment

Table 4.9: Feedlot's Monitoring and Enforcement Costs with a Packing Plant and Order Buyer

Identified Cost	Method of measuring
A) Fixed cost – Initial cost of setting up a monitoring system to track quality and delivery times of animals and contract obligations.	Personnel time and equipment
B) Variable cost – On going cost of monitoring deliveries and quality of animals as well as contract obligations	Personnel time and equipment

This chapter has developed the theoretical framework to measure transaction costs of buying and selling cattle around the feedlot sector. Surveying personnel from feedlots, packing plants and order buyer firms will be the preferred method of obtaining these costs. The following chapter will outline how the survey will be conducted and the empirical results of this survey.

Chapter 5

Empirical Methodology

This chapter will outline how the transaction costs for buying and selling cattle were calculated for feedlots. These costs include fixed and variable transaction costs for the interface between feedlots and order buyers and between feedlots and packing plants. In addition there will be reference to the impact transaction costs have on the price that packing plants offer for cattle.

5.1 Survey Methodology

In 2003, eight Saskatchewan feedlot managers and personnel from three western Canadian packing plants were interviewed. The eight feedlots accounted for over 70 percent of the finishing capacity in Saskatchewan and the three packing plants had over 90 percent of the slaughtering capacity in western Canada.

Earlier interviews with an order buyer and 17 feedlot managers indicated that feedlots were charged the same price for the services of their order buyers. However, these earlier interviews also indicated that there was a difference in the type of service a feedlot received from its order buyer. Therefore it was decided that the feedlot

managers would best be able to assess the level of service they received from their order buyers so it was not necessary to interview order buyers[27].

Seven of the eight feedlots finished animals while the eighth exclusively backgrounded animals. The backgrounding feedlot was added to the feedlot interview list to see if they experienced different transaction costs with order buyers than feedlots that primarily finished cattle. The information gained from the backgrounding feedlot was not used in the final analysis because it did not finish cattle. However it was observed that the backgrounding lot received similar service from order buyers as did similar sized finishing feedlots.

Appendix B provides the initial feedlot "seed" questions developed prior to the interview process. The interviews were conducted under the University of Saskatchewan Ethics Committee guidelines. The questions were designed to determine the feedlot's average fixed transaction costs and average variable transaction costs with order buyers and packing plants. The order buyer transaction costs were adjusted to reflect differences in services. Services provided by some or all order buyers include the acquisition of cattle, marketing of cattle, financing of cattle purchases and price information. The value of these extra services was determined by asking feedlot managers that did not receive these services their costs of obtaining similar services. For example feedlot managers that did not receive significant marketing information from order buyers were asked their costs in obtaining similar information. Feedlot managers were asked to rate the quality of animals they received in order to determine quality differences. Then the feedlot managers were asked questions designed to address fixed

[27] One factor that was taken into account when making this decision was that other order buyers had been contacted to do interviews. Only one returned the message and was willing to be interviewed. Thus it was thought that getting a good cross-section of information would be difficult.

and variable search and information transaction costs for order buyers and packing plants as outlined in table 4.7. Similarly they were asked questions on fixed and variable negotiating and decision making transaction costs as well as monitoring and enforcement transaction costs as outlined in tables 4.8 and 4.9 respectively.

5.2 Feedlot Transaction Costs

Two of the seven finishing feedlots were not included in the final results. One feedlot did not have sufficient information to include it in the results while another feedlot had significantly higher transaction costs. This feedlot, hereafter referred to as feedlot "Z", had a unique business relationship with its order buyers. This business relationship resulted in low trust and lower services in terms of quality of animals and marketing information. The remaining five finishing feedlots accounted for about half of the finishing capacity in Saskatchewan.

Many feedlot managers indicated that strong business relationships resulted in good communication between the feedlot manger and the order buyer. They indicated that the order buyer needed to understand the type of cattle they want and that the feedlot manager could trust the order buyer to deliver these animals at a reasonable cost. So the feedlot manager's trust depended on the skill of the order buyer to select the correct animals at the appropriate price range. For example one feedlot manager said he did not care if he received poor quality animals as long as the price he paid reflected the quality. However another feedlot manager required cattle of a specific quality and could not accept animals of poor quality. An order buyer would have a good business

relationship with these two feedlots if he understood the different requirements of the two feedlot managers and delivered cattle accordingly.

Table 5.1 outlines the estimated transaction costs that the five feedlots incurred when purchasing cattle from order buyers. All feedlot managers had a good concept of what it would cost them if they were to lose their primary order buyer. This cost included initial search and information costs (S_I), negotiating and decision making costs (N_I), and monitoring and enforcement costs (M_I) plus any addition value the feedlot manger may put on their business relationship ($\rho m L_u$)[28] (See equation 4.15). Initial search and information costs varied from \$0.00009 to \$0.30 per animal with a mean of \$0.06. Initial negotiating and decision making costs varied between \$0.00009 and \$0.003 per animal with a mean of \$0.006. Some of the initial negotiating and decision making costs were captured in the initial search and information costs. The cost of setting up a monitoring system was between \$0 and \$0.02 per animal with a mean of \$0.006.

Many feedlots reported that it would take several months to develop or find another order buyer. These feedlots suggested the loss would be between \$3 to \$20 per head (true ρ) from 3 months and 2 years. The cost of losing the primary order buyer (α) accumulated throughout the life of the feedlot. It was assumed that the feedlot was the same size and made the same number of transactions throughout the period that the loss of business relationship (α) was calculated. Thus, the five feedlots accumulated cost of losing their primary order buyer varied from just under one dollar per animal to over \$30 per animal with a mean of \$8.94 per animal. That is the average feedlot would lose

[28] Table 5.1 reflects an average value for the loss of business relationship parameter (ρ) based on annual transactions. The true parameter varied throughout the life of the business and was based either on transactions or animals.

Table 5.1: Feedlot Transaction Costs: Buying Cattle from Order Buyers

Cost	Theoretical Model Symbol	Range[1]	Mean[1]
Fixed Cost			
Cost of losing buyer parameter – accumulated[3]	ρ [2]	$0.89 to $30.31	$8.88
Initial search	S_I	$0.00009 to $0.30	$0.06
Initial negotiating	N_I	$0.00009 to $0.003	$0.001
Initial monitoring	M_I	$0.000 to $0.020	$0.006
Cost of losing buyer[3] – accumulated	$\alpha=S_I+N_I+M_I+\rho$	$0.89 to $30	$8.94
Stock of capital trust[3] – accumulated	K	$7.20 to $140	$39.38
Average fixed trans. cost[4]	$[\alpha^* n^p_t /(1+K^* n^p_t)]/ n^p_t$	$0.0001 to $0.000001	$0.00006
Variable Cost			
Search[5]	S_t	$0 to $1.41	$0.28
Negotiating	N_{t1}	$0 to $0.30	$0.12
Commission/animal[6]	N_{t2}	$5.50	$5.50
Quality adjustment[7]	N_{t3}	$0 to 10.50	$2.66
Monitoring buyers	σ^c_t	$0 to $0.20	$0.07
Monitoring animal	σ^n_t	$0.09 to $1.33	$0.66
Ave. var. trans. cost[8]	$[S_t + N_{t1}+ N_{t2}+ N_{t3}+ \sigma^c_t + \sigma^n_t]$	$16.39 to $7.06	$9.30
Ave. trans. cost- order buyer	AFTC + AVTC[9]	$16.39 to $7.06	$9.30

Source: Calculated from survey information.

[1]Expressed in per animal terms based on the number of animals purchased during the current year in order to maintain confidentiality.

[2]This is not the true parameters used in equation 4.15 rather it is the value accumulated over the lifetime of the feedlot expressed in terms of the current year's animal purchases.

[3]This is accumulated over the lifetime of the feedlot. It was assumed that the same numbers of animals were purchased throughout the life of the feedlot because it was not possible to get the exact numbers.

[4]n^p_t is the number of cattle purchased during the current year.

[5]Search cost includes lack of market price discovery service from order buyers.

[6]Here it is assumed an animal weighs 550 pounds based on 500 pounds for heifers and 600 pounds for steers and a 50:50 split. This number is expressed per animal.

[7] This was based on the feedlot manager's opinion of the percentage of animals that were below his feedlot's standard. All but one feedlot estimated their percentage of below standard animals at 0% to 1.5% the other feedlot was adjusted down to 1.5% because it was thought its standards were too high. This percentage was then multiplied by the number of animals purchased annually at a cost of $70 per animal.

[8]The averages do not add up because of rounding off numbers.

[9]This refers to average fixed transaction costs plus average variable transaction costs with order buyers.

about $9 for each animal it purchased throughout the year if its primary buyer were to quit buying for them.

To offset the risk of losing their primary buyers feedlot managers develop a trust relationship referred to as the stock of capital trust (K_t) with their order buyers. The stock of capital trust was viewed by the feedlot managers either as a straight linear function or a multi-stage linear function with decreasing returns over time.[29] None of the feedlots felt the stock of capital trust should be discounted. There was no inflation adjustment because it was assumed that the feedlot managers gave their estimates in current dollars. In calculating the stock of capital trust it was assumed that the feedlot purchased the same number of animals annually and incurred the same number of transactions as it did during the time they were surveyed. Obviously feedlots grew over time, however many feedlots were over 20 years old and had gone through changes in management. So it was not possible to get an accurate number of animals sold annually throughout the life of the feedlot. The ongoing trust component parameter (β) varied from \$50 to \$1800 per transaction[30]. Thus the accumulated calculated stock of capital trust (K_t) varied from \$7.20 per animal to \$140 per animal with a mean of \$39.38 per animal (see equation 4.16).

The fixed cost then was the cost of losing the primary order buyer discounted by the stock of capital trust as outlined in equation 4.17. The average fixed cost was calculated by dividing the fixed cost by the annual animal purchases (similar to equation 4.22). The resulting average fixed costs relating to order buyers for the five feedlots were insignificant.

---

[29] Mathematically this would be expressed as $\beta_1 m_1 V_1 + \beta_2 m_2 V_2 + \ldots + \beta_v m_v V_v$ where β is the value ascribed to the number of transactions (m) for a number of years (V) in each period (1,2,…,v).

[30] These are the true parameters (β) not the ones listed in table 5.1 which are an average of the accumulated trust (Table 5.1 footnote 3) expressed in terms of annual transactions.

Ongoing search and information costs (S_t) were due to price discovery. Those feedlots with market information provided by order buyers did not incur any ongoing search costs. Thus ongoing search and information costs acted as one adjustment for services provided by order buyers and varied from \$0 to \$1.41 per animal with a mean cost of \$0.28 per animal per year.

Ongoing negotiating and decision making costs (N_{t1}) consisted of time spent determining price, quantity, type of cattle and delivery time. For some this time included market information but it was not possible to separate out the time spent on gaining market information because this time varied during negotiations. N_{t1} varied from \$0 to \$0.30 per animal annually with a mean annual expenditure of \$0.12. Commission charges (N_{t2}) and quality adjustment (N_{t3}) were separated out from the time spent on negotiating and decision making costs.

All feedlots paid \$1.00 per hundred-weight as order buyer commissions. It was assumed that the average animal weighed 550 pounds based on an average heifer weight of 500 pounds and an average steer weight of 600 pounds. Thus, the commission fee is assumed constant for all feedlots at \$5.50 per animal. But not all feedlots were able to obtain the quality of animals they wanted. The quality adjustment cost was calculated assuming that the below standard animals would cost an extra \$70 which included higher feeding costs and lower prices received for these animals when marketed. It became clear that feedlots had different quality standards. However, most of the feedlot managers felt the below standard animals they received were between zero and 1.5 percent. Feedlot "Z" and another feedlot were significantly outside this range. Further discussions with these two feedlots led the interviewer to conclude that

they had significantly higher standards. So it was decided to set these two feedlots at the top of the range or 1.5 percent quality adjustment. Feedlot "Z" was later excluded from the analysis.

Not all feedlots monitored their order buyers. Those that did not monitor their buyers already had developed a strong trust with them or felt that monitoring the order buyer was not practical. Two of these feedlots had extensive monitoring systems that enabled them to make decisions on a myriad of situations. For example one feedlot ranked its order buyers according to profitability. Clearly this extra information had a value but it was impossible to put a monetary value on it. So there was not any positive adjustment made in the calculations to offset these extra monitoring costs for these two feedlots. This would result in their transaction costs estimates being higher than they should be. The cost of setting up a monitoring system (σ^c_t) was between \$0 and \$0.20 per animal annually with a mean of \$0.07.

All feedlots monitored (σ^n_t) their animals when their cattle came to the feedlot. This monitoring included visual inspection, weighing, tagging and other activities. The monitoring cost was calculated based on the amount of time it took to do the monitoring multiplied by the wage rate. The cost of monitoring animals was from \$0.09 to \$1.33 per animal with a mean of \$0.66.

The sum of ongoing search and information costs, negotiating and decision making costs, monitoring and enforcement costs, order buyer commission of \$5.50 per animal and a quality adjustment accounted for the total variable transaction costs (S_t+ N_{t1}+ N_{t2}+ N_{t3}+σ^c_t +$n^p_t\sigma^n_t$ see equation 4.20) for order buyers. The average variable

transaction costs were calculated by dividing the total variable transaction costs by the number of animals purchased (similar to equation 4.21).

In a similar manner feedlot transaction costs for selling cattle were calculated for packing plants. These costs are outlined in table 5.2. Some feedlot managers viewed losing a packing plant to be more important than losing an order buyer while others had the opposite opinion. The accumulated cost of losing the business relationship with a packing plant varied from $3 per animal to $350 per animal with a mean of $83 per animal. The cost of losing access to the primary packing plant to most feedlots was more important than losing the primary buyer.

Many feedlot managers cultivated business relationships with packing plants in order to reduce the risk of losing their packing plant. They felt that it was important that the packing plant knew that the feedlot understood their quality requirements and that their feedlot could deliver cattle to meet these requirements. One feedlot manager took a tour of his primary packing plant and visited with the head buyer in order to improve relations. He said this visit increased the price he received for his animals significantly and that the packing plant purchased almost all his animals compared to about half prior to the visit. Another feedlot manager shipped cattle to a packing plant at low profits until he was able to develop a stronger business relationship. Most feedlot managers sold to the packing plant with the highest bid. So the packing plants that appreciated the quality of cattle which the feedlot supplied would offer the highest price. The stock of capital trust varied from below $1 to $3,260 per animal with a mean of $686 per animal.

Table 5.2: Feedlot Transaction Costs: Selling Cattle to Packing Plants

Cost	Theoretical Model Symbol	Range[1]	Mean[1]
Fixed Cost			
Cost of losing buyer parameter – accumulated[3]	ρ[2]	$3.25 to $50.00	$17.42
Initial search	S_I	$0.00 to $325.00	$65.41
Initial negotiating	N_I	$0.00 to $0.22	$0.45
Total cost of losing buyer[3] - accumulated	$\alpha=S_I+N_I+\rho$	$3.25 to $350	$82.88
Stock of capital trust[3] - accumulated	K	$0.71 to $3,260	$685.79
Average fixed trans. cost[4]	$[\alpha^* n^s_t /(1+K^* n^s_t)]/ n^s_t$	$0.002 to $0.00000004	$0.0008
Variable Cost			
Search	S_t	$0.00 to $0.18	$0.076
Negotiating	N_t	$0.00 to $6.50	$1.336
Monitoring[5]	$\sigma^c_t+ \sigma^n_t$	$0.00 to $0.29	$0.098
Ave. Var. trans. cost[4]	$[S_t + N_t+ \sigma^c_t+ \sigma^n_t]/ n^s_t$	$0.04 to $6.69	$1.51
Ave. trans. costs-packers	AFTC + AVTC[6]	$0.04 to $6.69	$1.51
Total Average Transaction Costs[7]	Order Buyer ATC +Packer ATC	$7.52 to $16.67	$10.80

Source: Calculated from survey information.

[1]Expressed in per animal terms based on the number of animals sold during the current year in order to maintain confidentiality.

[2]This is not the true parameters used in equation 4.15 rather it is the value accumulated over the lifetime of the feedlot expressed in terms of the current year's animal sales. Here feedlot managers were specific on the loss so no assumptions over the life of the feedlot were necessary.

[3]This is accumulated over the lifetime of the feedlot.

[4]n^s_t is the number of cattle sold during the current year.

[5]Monitoring costs for packing plants were combined. The cost of setting up a monitoring system was included in the order buyer fixed monitoring costs (table 5.1) because it was not possible to separate them.

[6]This refers to average fixed transaction costs plus average variable transaction costs.

[7]Sum of average transaction costs of order buyers and packing plants.

In general feedlot managers who valued their packing plant or order buyer invested (in terms of lost opportunities or actual out of pocket expenses) in developing a business relationship with them. Those who did not value their packer or order buyer did not invest much into their business relationship.

The average fixed costs of the feedlots were calculated in the same manner as with the order buyers. The average fixed transaction costs for the five feedlots again proved to be insignificant.

The ongoing search and information costs (S_t) and negotiating and decision making costs (N_t) were calculated on the time spent doing these activities multiplied by the wage rate. These costs varied between feedlots depending on how they marketed their animals and the level of trust they had with their packing plant. Some feedlots paid a commission to sell their animals while others did not. The ongoing search and information costs were between \$0 and \$0.18 per animal with a mean of \$0.08. Negotiating and decision making costs varied from \$0 to \$6.50 per animal with a mean of \$1.34 per animal.

Feedlots that put a high value on monitoring order buyers put a high value on monitoring their packing plants. One feedlot ranked packing plants based on a combination of factors such as payment time, delivery of animals, strength of their business relationship and ease of doing business. The strength of business relationship here refers to the amount of time the feedlot and packing plant had been doing business. A long business relationship was viewed to be more important than a short one. Thus if both plants offered the same price the one who had a longer history with the feedlot would receive the cattle. The cost of setting up the monitoring system was included in the fixed monitoring costs of the order buyer (table 5.1) because it was not possible to distinguish between them. Therefore the monitoring and enforcement costs were related to entering information into the monitoring system and analyzing the results. These costs varied from \$0 to \$7.50 per transaction with a mean of \$4.95.

The average variable transaction costs for the packing plants were calculated in the same manner as the average variable transaction costs for order buyers. The average variable transaction costs for the packing plants were between $0.04 and $6.69 per animal with a mean of $1.51.

The average transaction costs for finishing feedlots were the sum of the average transaction costs for the packing plants and order buyers. Thus the average transaction costs for finishing feedlots varied from $7.52 to $16.67 per animal with a mean of $10.80 per animal.

Marginal transaction costs were calculated similar to the specifications in equation 4.23. The total transaction costs were calculated by taking the average transaction costs for the feedlot and multiplying them by the number of animals marketed annually (N^s_t). This was necessary because not all the animals purchased were marketed as slaughter cattle. The marginal cost was then calculated by taking the derivative of the total transaction costs with respect to the number of animals marketed annually (N^s_t).

These estimates can not be verified statistically. The low sample numbers combined with the subjective nature of data collection makes statistical analysis impractical. Therefore these estimates should not be used as absolutes rather they should be interpreted as indicators of the importance of feedlot size in the buying and selling of cattle.

The five feedlots were then placed into four categories. The costs were averaged for the category that had two feedlots. The categories were based on the annual sales of finished animals.

Figure 5.1 illustrates the calculated average and marginal transaction cost curves for buying and selling cattle. The estimates are consistent with theory regarding increasing returns to size. As size increases average costs decrease and marginal costs are below average costs. The survey results were unable to find where average costs were increasing or where marginal costs exceeded average costs.

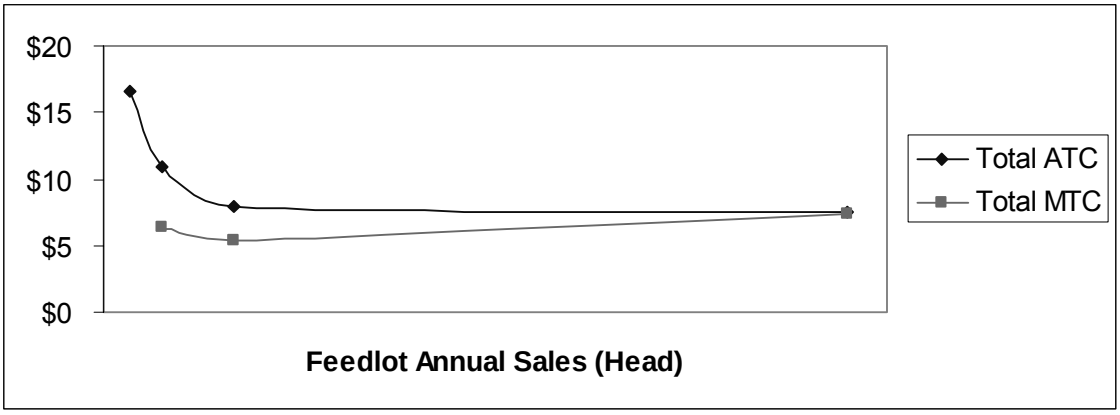


Figure 5.1: Feedlot Transaction Costs: Buying and Selling Cattle*

*Quantity units were not included in this graph in order to maintain confidentiality.

Source: Calculated from survey information.

Figures 5.2 and 5.3 show the average transaction costs for order buyers and packing plants respectively.

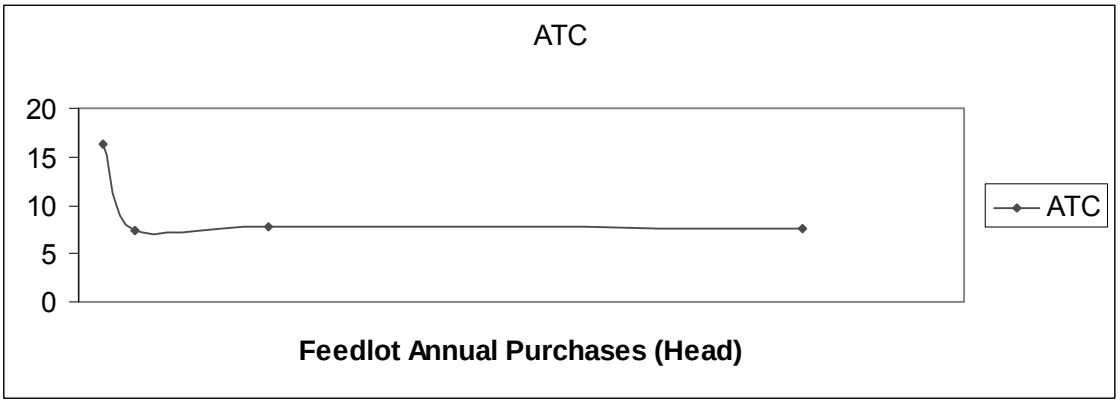


Figure 5.2: Feedlot Transaction Costs: Average Costs with Order Buyers*

*Quantity units were not included in this graph in order to maintain confidentiality.

Source: Calculated from survey information.

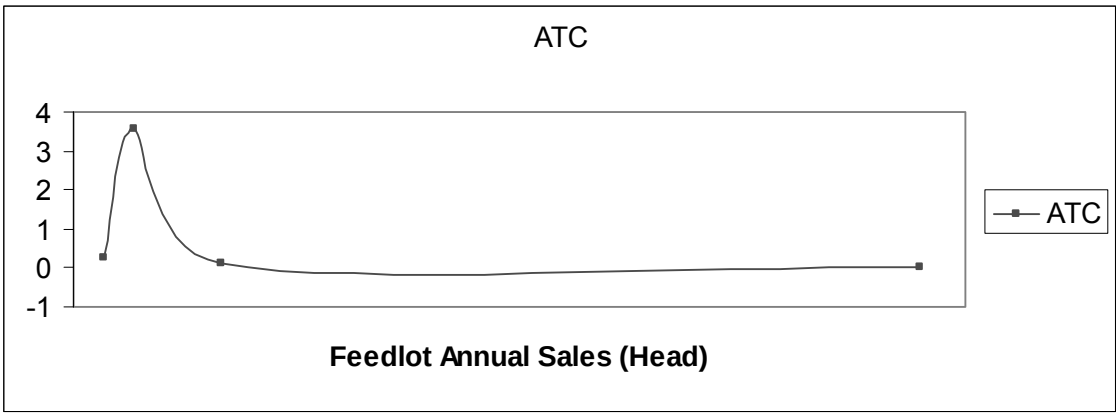


Figure **5.3: Feedlot Transaction Costs: Average Costs with Packing Plants***
*Quantity units were not included in this graph in order to maintain confidentiality.

Source: Calculated from survey information.

5.3 Packing Plant Transaction Costs

Interviews with the three packing plants resulted in some price information. In general the packing plant personnel agreed that business relationships and the size of the feedlot had an impact on the price paid to the feedlot. However it was not possible to determine if this price information was due to transaction costs or market power. In order to confirm this information it would have been necessary to determine the transaction costs each packing plant had with each of its supplying feedlots. In theory calculating these costs are possible but it would be a mammoth undertaking which is beyond the scope of this thesis.

Chapter 6

Summary and Conclusion

This chapter summarizes the main observations and findings in this thesis which is on transaction cost economics and its application to feedlot management and investment in Saskatchewan. The findings should be of value for those planning feedlot expansions in the province

6.1 Summary

The removal of the transportation subsidy on western Canadian grain has resulted in a relative shift in competitiveness from grain to livestock production in Saskatchewan. Saskatchewan feedlot managers indicated that they fed cattle at a lower cost than their Alberta competitors. They suggested their feeding advantage is in the range of $45 to $75 per animal. Yet this supposed feeding advantage has not resulted in an increase in cattle being finished in the province. In fact, statistics show that there has been a decrease in the number of cattle finished in Saskatchewan since the removal of the transportation subsidy.

Historically, Saskatchewan has maintained a beef herd of approximately one million head. However, from 1976 to 2001 the province exported over fifty percent of its feeder cattle to be fed elsewhere in North America. Saskatchewan has retained from

30 to 50 percent of its feeder cattle. The trend in the past fifteen years has been to export feeder cattle to Alberta then export barley to feed these cattle.

However, Ramsay (2002) found that environmental concerns could limit feedlot development in Alberta. She observed that water, manure disposal, and public resistance could act as restraints to feedlot development in that province. She did not find that lack of feed supplies would be a limiting factor.

Interviews with Saskatchewan feedlot managers suggested that lack of financing is a limiting factor to feedlot development in Saskatchewan. They suggested that there are hindrances to investment in cattle feeding operations both locally and outside the province. They indicated that one of the roles of the provincial government could be to facilitate better investment in the feeding sector. In the opinion of feedlot mangers, investment would come into the province once land and labour laws were changed. They further indicated that there is a bias towards grain production in Saskatchewan and that feeding cattle is a high risk business which limits investment into the feedlot sector. These feedlot managers did not think that environmental concerns were an issue. They did not feel that there was significant public resistance to feedlot development. However, there were mixed opinions among the feedlot mangers about the impact the provincial infrastructure had on feedlot development.

Issues were also raised about the costs involved in buying and selling cattle. The interviews with the feedlot managers led to an investigation of transaction costs in buying and selling cattle at five finishing feedlots. From this investigation, it appeared that the size of the finishing feedlot could influence feedlot development in Saskatchewan, where feedlots sell directly to their packing plants. Thus, the prices they

receive from packing plants are likely impacted by the size of the feedlot and its relationship with its packing plant. The prices that a new or developing feedlot receives for its slaughter cattle could also impact feedlot development.

6.2 Conclusions

Transaction costs are important in production economics. Not quantifying the impact of transaction costs in production economics is akin to not computing the impact of subsidies in trade economics. The results of the empirical work show that feedlot transaction costs impact the buying of feeder animals and selling of fat cattle. Evidence suggests that larger finishing feedlots pay lower prices for their animals and receive higher value for their fat cattle than smaller finishing feedlots.

This thesis shows that it is possible to quantitatively measure transaction costs. It provides both a theoretical methodology and gives empirical evidence of transaction costs for finishing feedlots in the purchase and sale of live cattle.

The empirical results suggest that large finishing feedlots incur about $10 per animal lower transaction costs associated with buying and selling cattle compared to the small ones. This implication is that a small feedlot pays a higher price for its business relationships with order buyers and packing plants. For example a feedlot that sells about 3,000 head annually would incur greater transaction costs of about $30,000 annually. They would experience this cost until they grow in size. These costs do not take into account any lost price opportunity due to lack of size and experience. This could offset all or part of the feeding advantage that Saskatchewan feeders now enjoy

over Alberta feeders. Thus the existence of transaction costs act as holdup costs for establishing new feedlots.

The empirical work indicated that the five feedlots examined had higher values for cumulative stock of capital trust in a business relationship than in the cumulative cost of losing that business relationship. All the feedlots had a higher value for cumulative stock of capital trust with their primary order buyers and two had a higher value with their primary packing plants. The two largest feedlots had higher cumulative stock of capital trust with their primary packing plants. It would appear that the feedlot managers intuitively[31] are developing strong trust relationships as an insurance policy against losing their business relationships. If this is the case, then feedlot managers are more concerned with losing their business relationship with their primary order buyer than with their primary packing plant. The exception is the larger feedlots which put an extremely high value on developing trust in their business relationship with their primary packing plant. Thus large feedlot managers would appear to place a higher value on their relationship with packing plants than smaller feedlot managers. This would suggest that larger feedlot managers feel that they are getting significantly better prices from their primary packing plant.

New feedlot investors need to be aware of the potential cost of developing a reputation. These costs may be alleviated by partnering with an established feedlot and by obtaining management that has a positive reputation within the cattle feeding marketing chain. The size of the prospective feedlot is also an important consideration.

[31] Intuitively in the sense that the feedlot mangers did not know their cumulative values for stock of capital trust and cost of losing their business relationship. Feedlot mangers only provided what they thought it would cost them per transaction to lose a business relationship and what value they put on each transaction in gaining trust with an order buyer or packing plant.

Economies of size exist both in production costs and in transaction costs in buying and selling cattle. These costs need to be compared with other transaction costs in establishing a feedlot such as feed supplies, environmental regulations and developing human resource skills in managing a large feedlot. The prospective feedlot should have sufficient financing to allow it to buy and sell cattle

6.3 Study Limitations

The theory of transaction costs economics was applied to the entire beef chain, from the cow/calf sector through to the retail sector. However, the empirical work only examined one component of the beef supply chain-the beef feedlot sector. In all likelihood, transaction costs impact other segments of the beef marketing chain as well. For example, to what extent do transaction costs impact the calf (stocker cattle) market in Saskatchewan?

The fact that the empirical analysis was limited to five feedlots made it impractical to do any statistical analysis. Thus, it is not possible to put any confidence levels on the transaction cost estimates which means that it is not possible to put any confidence level in the difference in transaction costs between large finishing feedlots and small ones.

Another problem with the empirical analysis is that nearly all the feedlots examined, had over ten years experience in the finishing business. Thus, it was almost impossible to determine to what extent reputation had on transaction costs. That is, what are the differences in transaction costs between new finishing feedlots and

established finishing feedlots of similar size? And if there are differences in transaction costs based on reputation, then how long does it take to develop sufficient reputation to offset these extra transaction costs and how rapidly does reputation develop?

One shortcoming of the methodology used to determine fixed transaction costs is the use of the concept of the cost of lost business relationships as a proxy for the opportunity cost of a strong business relationship. This concept applies well to large established feedlots. However new small feedlots could underestimate the potential of their business relationships because they could not know what they are missing if they have never experienced it. This would mean that they would underestimate their fixed costs which implies that they could have significant fixed costs and would incur transaction costs greater than the empirical results provided. A better estimate of fixed transaction costs could be determined if it were possible to fully delineate the price differences that finishing feedlots received based on size and experience.

Another problem with the method of calculating fixed transaction costs was with the calculation itself. Equation 4.17 discounts the cost of losing a business relationship by the stock of capital trust gained in that business relationship. This appeared to work well with established business relationships. However, reducing the fixed transaction costs for new business relationships is another matter. This method of calculating fixed transaction costs would likely underestimate the actual costs of newer feedlots.

6.4 Further Research Required

Further research is required in developing the theoretical foundation in measuring transaction costs. This thesis provides a starting point. However, there may be better mathematical formulations that can be developed to underlie transaction costs estimation. There are some difficulties, as pointed out earlier, on how, in this thesis, fixed transaction costs were calculated. But, the fact that calculating transaction costs is difficult should not hinder economists from attempting to calculate them. Dahlman (1979) points out that calculating fixed costs for assets such as land, buildings and equipment is difficult. Yet this has not stopped economists from publishing a plethora of material on production costs. When it comes to estimating transaction costs, unfortunately, as pointed out in the literature, there is an extreme shortage of studies, especially related to agriculture. (This appears to be the first study on transaction costs in the beef industry as it pertains to Canada.)

There needs to be further study into factors influencing the development of the beef sector in Saskatchewan. This thesis only investigated the impact of transaction costs in buying and selling live cattle as pertaining to feedlots. Transaction costs exist in many other areas of business relationships within the beef marketing chain. For example, further research into the impact of transaction costs in obtaining roughage and grain would be an important area of study. This could explain why feedlot managers prefer to own land to meet their forage requirements. Another area of study would be how transaction costs can be minimized in switching from grain to beef production.

Finally, how can government programs minimize transaction costs in the Saskatchewan beef industry?

The marketing channel approach developed in this study also raises the question of the competitiveness of markets and the choice of marketing outlets by various market participants. It is our hypotheses, consistent with the recent study by Schmitz, Moss, and Schmitz (2003) in studying the sale of stocker cattle in the U.S., that firm size plays a major role in marketing outlets chosen. For example, larger firms tend to shy away from public auctions in favor of private sales. In so doing, they minimize both direct and indirect transaction costs. They suggest that there is an urgent need to examine the efficiency of public auctions, not only from a direct transaction costs perspective but from an indirect cost viewpoint as well.

Referrences

Akerlof, George A. (1970) "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics* Vol. 84: Pp. 448-500.

Barzel, Y. (1989), "Economic Analysis of Property Rights", *Cambridge University Press*, Cambridge, New York, Port Chester, Melbourne and Sydney.

Carter, C. and A. Schmitz. (1986), "Cattle Feeding in Western Canada: The Economics of Its Location", *Agribusiness*, Vol. 2, No. 1, Pp.119-135.

Canfax Research. (2002), "Statistical Briefer", Calgary, http://www.cattle.ca/canfax.

Coase, R. H. (1937), "The Nature of the Firm", *Economica,* Vol. 4, Pp. 385-405

Coase, R. H. (1960) "The Problem of Social Cost", *The Journal of Law & Economics*, Vol. 3, Pp. 1-44.

Dahlman, Carl J. (April 1979) "The Problem of Externalities", *The Journal of Law and Economics,* Vol. 22, No. 1.

Fowke, Vernon C. (1957), "The National Policy and the Wheat Economy", *University of Toronto Press*, Toronto and Buffalo.

Frank, Stuart D. and Dennis R. Henderson. (1992) "Transaction Costs as Determinants of Vertical Coordination in the U.S. Food Industry", *American Journal of Agricultural Economics*, Vol. 74, No. 2, Pp. 941-950.

Hobbs, Jill E. (1996b), "Transaction Cost and Slaughter Cattle Procurement: Processors' Selection of Supply Channels", *Agribusiness,* Vol. 2, No. 6, Pp. 509-523.

Hobbs, Jill E. (1996c), "A Transaction Cost Approach to Supply Chain Management", *Supply Chain Management*, Vol. 1, No. 2, Pp. 15-27.

Hobbs, Jill E. (1997), "Measuring the Importance of Transaction Costs in Cattle Marketing", *American Journal of Agricultural Economics*, "Vol. 79, pp. 1083-1095.

Hobbs, Jill E. and Linda M. Young (2000), "Closer Vertical Co-ordination in Agri-food Supply Chains: A Conceptual Framework and Some Preliminary Evidence", *Supply Chain Management*, Vol. 5, No. 3, Pp. 131-142.

Klein, Daniel B. (1997), "Reputation – Studies in the Voluntary Elicitation of Good Conduct", *The University of Michigan Press*, Ann Arbor.

Moss, Charles B., and Andrew Schmitz. (2002) "Vertical Integration and Trade Policy: The Case of Sugar." *Agribusiness*: *An International Journal*. Vol. 18 (1) Pp. 49-60.

Perillat, Brian, Morley Ayars, Tim Highmore and Andrew Schmitz. (2002) "Feedlot Development In Saskatchewan: A Case Study of the Outlook and Riverhurst Irrigation Districts", Prepared for Saskatchewan Agriculture and Food under contract with Centre for the Study of Agriculture, Law, and the Environment, University of Saskatchewan, Saskatoon.

Pylypchuk, Mike (2000), Saskatchewan Agriculture and Food, information provided by him for this thesis.

Ramsay, L. (2002), "A Profile of Alberta's Beef Industry: Lessons for Saskatchewan?", Working paper, Centre for the Study of Agriculture, Law and the Environment. University of Saskatchewan, Saskatoon.

Saskatchewan Agriculture, food and rural revitalization.(1984-2001), "Agricultural Statistics", handbook, Regina, Saskatchewan

Saskatchewan Agriculture, food and rural revitalization. (1976-2001) "Cattle Marketing Report", http://www.agr.gov.sk.ca/apps/cattlemarket/CM_Report1.asp. Regina, Saskatchewan.

Saskatchewan Agriculture, food and rural revitalization. (2000) "2000 Feedlot Survey", confidential survey data, Regina, Saskatchewan

Schmitz, Andrew, Morley Ayars, Tim Highmoor, and Brian Perillat, (2003) "An Assessment of Western Canadian Beef Development", pending report to Saskatchewan Agriculture, Food and Rural Revitalization.

Schmitz, Troy G., Charles B. Moss, and Andrew Schmitz. (2003) "Marketing Channels for Stocker Cattle and the Use of E-Commerce", Working paper, Florida Agricultural Experiment Station Journal Series XXXX.

Simon, H. A. (1961), "Administrative Behaviour", 2nd ed., *Macmillan*, New York, NY.

United States Trade Commission. (1999), "Live Cattle from Canada", Publication 3255.

Unterschultz, James. (2000), "New Instruments for Co-ordination and Risk Sharing Within the Canadian Beef Industry", Project Report 00-04, AARI Project 96H070, Department of Rural Economy, University of Alberta, Edmonton.

Williamson, Oliver E. (1986), "Economic Organization: Firms, Markets and Policy Control", *Harvester Wheatsheaf*, Hertfordshire UK.

Appendix A

Assessment of Western Canadian Beef Development project Questionnaire

1) Please describe your operation in terms of size and anything else you would like to tell about your operation.
2) How do you acquire your feeder cattle and feed?
3) How do you market your animals?
4) How do you reduce risk in your operation?
5) What is your drought strategy?
6) What is your human resource complement?
7) In your mind, what are the reasons we have not seen significant feedlot or backgrounding development in Saskatchewan since the demise of the Crow?
8) Some suggest that lack of local investment is a possible reason. What is your opinion? And if local investment is an issue, then why do you think there is a lack of local investment?
9) Do you see hindrances for foreign investment (i.e. outside the local community)?
10) Some say there is a lack of entrepreneurial attitude in the area and in Saskatchewan. What do you think and if so why do think this is the case?
11) Some say that local communities do not want to see any change near them, that is, they resist developments such as feedlots in their area. Do you think this is correct and if so how do you think attitudes could be changed?

12) Some say there is a lack of infrastructure in the region (roads and irrigations area). Do you agree, if so how would you suggest changes be made recognizing provincial budget constraints and relatively low population base?
13) Some suggest that the provincial government talks livestock development such as feedlots but has a grain mentality. Do you see any provincial policies that restrict developments in feedlots? What about federal policy? What policies would you like changed or adopted and how would you like them to be changed?
14) What role, if any, do you see government having in livestock development?
15) Do you have anything else to add?

Appendix B

Feedlot Operators Interview Questionnaire to Determine Transaction Costs
(Eight of original seventeen re-interviewed)

For Order Buyers

1. What Order Buyers do you use?
2. What Characteristics make a good Order Buyer?
3. Why did you choose these Buyers?
4. If you did not use "X" order buyer what would it cost you? ($ per animal or cents per pound live wgt..)
5. How long did it take you to find the order buyers you liked (hours)?
6. Average number of animals bought from each order buyer per year?
7. Average number of animals bought each transaction with order buyers?
8. No of contracts (formal or informal) per year?
9. How did you settle on a price? (initially, on-going)
10. How much time does it take you to settle on a price? (initially, on-going)
11. How did you settle on how delivery is made? How long did it take to determine this?
12. What is the value you put on the time spent to determine price and delivery? (Cost per hour)
13. Do you track if the animals you purchase from each buyer to see if they are the ones you want?
14. What percentage do you send back to the order buyer?
15. What percentage of animals does not meet your requested standard but you keep anyway?
16. How do you keep track of what animals come from which order buyer?
17. How much time did it take to set up your tracking system?

18. Hourly cost for setting up tracking system?

19. How much time does it take to track each transaction with an order buyer?

20. Hourly cost to track each transaction?

21. Over time do you track the order buyer more or less? What percentage change?

22. Over time do you get better or worse cattle? What percentage change?

23. Did your service overall from the order buyer improve or get worse over time? Percentage change?

Reminder: Make sure you have determined some trust factor.

For Packing Plants

1) Who are your primary packing plants that you market to? (Give order of top two or three if available.)
2) Average number of finished animals sold per year by feedlot?
3) What would it cost you if "X" plant did not buy from you? ($ per animal or cents per pound)
4) How did you set up your relationship with the packing plant(s) (top one-three)
5) Average number of cattle sold each time/plant? (i.e. different lot sizes/plant?)
6) Number of contracts (formal or informal) per year per plant?
7) Total number or cattle marketed per year/plant?
8) What characteristics make a good packing plant to sell to?
9) How long did it take you to decide to sell to plant "X"?
10) How long does it take to determine price? (initially, on-going) Cost per hour?
11) How long does it take to determine payment? (initially, on-going) Cost per hour?
12) Do you monitor the price and grade you get?

13) Do you have a monitoring system set up to see which plants give you the best price? How about receiving payment?

14) How long did it take you to put together the monitoring system (hours)?

15) How long does it take to monitor each sale [transaction] (hours)?

16) Does your monitoring increase or decrease over time? What percentage?

17) Hourly cost to set up the monitoring system? Hourly cost to monitor each transaction?

Reminder: Make sure you have determined some trust factor.