DETERMINANTS OF SELLER CHOICE BETWEEN AUCTION AND

NEGOTIATION: AN EMPIRICAL APPLICATION TO CATTLE MARKETS

by

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v

TABLE OF CONTENTS

TABLE OF CONTENTS - CONTINUED

vii

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Persistent diversity of selling mechanisms is well known to economists, but not well understood. A very interesting (but also very difficult) question of what determines seller choice between mechanisms has received relatively little attention in economic literature. I extend the applied empirical research in this area by quantifying factors that influence whether livestock producers choose to sell cattle using auctions and negotiated sales. Two major factors identified from the existing literature are expected to influence choice of selling method for cattle: 1) relative selling costs of each method, and 2) dispersion of buyer values for the sale good. Sellers will more likely prefer auctions or negotiations when one method involves relatively lower per-unit costs than the other. If buyers have truly different valuations for a sale item, sellers will tend to use auctions more when buyer values are highly dispersed. On the other hand, sellers will be less likely to use auctions when higher value dispersion results from uncertainty among buyers with similar underlying valuations for a sale item. I use three primary data sets collected directly from cattle producers to empirically test these theories.

My empirical analysis of the determinants of seller choice between auctions and negotiated sales in cattle markets provides empirical support for several theoretical predictions and yields several interesting results. I find that sellers of seedstock bulls are more likely to use private auctions as the total number of bulls sold increases and that sellers of commercial calves are less likely to use public auctions as the number of calves sold increases. Indirect bargaining costs seem to negatively influence choices of seedstock sellers to host private auctions. I find that sellers of high quality bulls are more likely to host private auctions and that high quality bulls are more likely to be sold by private auction than by private treaty negotiations. My results also suggest that sellers of high quality commercial calves prefer selling methods other than public auctions.

CHAPTER 1

INTRODUCTION

Goods are sold by a variety of methods. Non-negotiable prices are most frequently used by retailers to sell many common items. Some markets, however, are dominated by the use of auctions and negotiated sales – methods in which the sale price is discovered during the transaction. In markets with flexible selling prices we often observe substantial variation in choice of method. Antiques, artwork, standing timber, real estate, and used cars are examples of goods sold either by auction or negotiation. Used cars, for example, are typically sold to individuals through negotiated sales and to car dealerships through auto auctions. The simultaneous use of different selling methods raises several questions: Why does the choice of selling method vary across markets, across sellers within a given market, and even across goods sold by a given seller? What are the determinants of seller choice between alternative selling mechanisms?

Persistent diversity of selling mechanisms is well known to economists, but not well understood. A very interesting (but also very difficult) question of what determines seller choice between mechanisms has received relatively little attention in economic literature. Most research has developed theoretical bidding models to explain this complex phenomenon. Many simplifying assumptions seem to be required to obtain tractable solutions from these models, however. Hence, most of the previous efforts are not amenable to applied research. Obtaining primary data and identifying suitable proxies for key variables (such as the dispersion of potential bid values) are daunting

empirical challenges. Therefore, it is not surprising that hypothesis testing of "real world" applications about determinants of producer choice has been limited.

The objective of this thesis is to quantify the factors that influence whether livestock producers choose to sell cattle using auctions or negotiated sales. Three primary data sets collected from producers of seedstock bulls and commercial calves are used to test specific predictions developed from general hypotheses.[1] These data are unique in the level of detail they contain about individual selling decisions. Application of general hypotheses from bidding literature to market data requires specific assumptions about market organization (such as whether animals are sold individually or in groups, the expected number of buyers for a given seller, and the nature of transportation costs) and buyer valuations (such as whether or not the underlying value of the good is the same for all buyers). Distinct assumptions are discussed and applied to the markets for seedstock bulls and commercial calves.

The first data set was collected through a survey of seedstock cattle operations. It includes information about seller characteristics and methods used to sell bulls. These data are used to examine three hypotheses about the relative costs of using auctions and one hypothesis about value dispersion. The first hypothesis is that seedstock sellers will be more likely to choose auctions as the number of units sold increases. The second is that sellers are more likely to auction when indirect costs of bargaining are higher. The

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[1] Throughout this thesis, predictions refer to the implied observable events that are used to test theories. This usage is consistent with Silberberg's (1990) discussion of the structure of theories and refutable propositions. In this context, predictions are to be distinguished from general hypotheses or postulates, which are not testable. Predictions are synonymous with testable hypotheses and testable propositions.

third hypothesis is that seedstock sellers are more likely to choose auctions as the dispersion of valuations held by prospective bidders for seedstock bulls increases. Proxy measures to test specific predictions are developed from information gathered through the survey about the seller and seedstock production.

A second data set consists of survey data from commercial cattle producers. These data are used to test three hypotheses specific to selling choices for commercial calves. The first is that commercial sellers will use public auctions less as the number of calves sold increases. The second is that sellers will be more likely to use auctions when indirect costs of bargaining are higher. The third hypothesis is that sellers of commercial calves will use public auctions less as the dispersion of bid valuations is increased by buyer uncertainty about the underlying value of the animals. Specific predictions from these hypotheses are tested using proxy measures developed from information gathered through a survey of commercial cattle producers.

The third data set was collected from a large seller of seedstock bulls who uses both auctions and negotiated sales. These data contain information about selling decisions for individual seedstock bulls and facilitate research into how specific animal characteristics influence the seller's choice between auction and negotiated sale. Proxy measures are identified from these data to test the hypothesis that increased dispersion in bidder valuations for seedstock leads to increased likelihood of auction sale.

In summary, two major factors from the existing literature are expected to affect the choice to auction or negotiate cattle sales: 1) relative selling costs of each method, and 2) dispersion of buyer values for the sale good. Sellers will more likely prefer

auctions or negotiations when one method involves relatively lower per-unit costs than the other. If buyers have truly different valuations for a sale item, sellers will tend to use auctions more when buyer values are highly dispersed. On the other hand, sellers will be less likely to use auctions when higher value dispersion results from uncertainty among buyers with similar underlying valuations for the sale item. I use primary data collected from cattle producers to empirically test these theories.

The paper is organized as follows. In chapter 2, I review findings and conclusions from the economics literature that suggest factors expected to influence choice of selling method. I develop hypotheses with testable implications based on results from the literature concerning the relative costs of using auctions versus negotiations and the dispersion of bidder valuations. My objective here is to test the applicability of these general hypotheses in specific markets that use both auctions and negotiations. Chapter 3 provides a background for understanding choice of selling methods in the markets for seedstock and commercial cattle. It includes a discussion of relevant characteristics of cattle and of buyers and sellers in both markets. Chapter 4 relates the general hypotheses from chapter 2 to specific predictions in the markets for seedstock bulls and commercial calves. I construct empirical proxies for factors that are expected to influence choices of methods for selling these cattle. The empirical proxies are used to test predictions in chapters 5, 6, and 7. These three chapters contain separate discussions of the data, variables, empirical tests, and results for the seedstock survey data, commercial survey data, and producer transaction data, respectively. I present conclusions in chapter 8.

CHAPTER 2

LITERATURE AND GENERAL HYPOTHESES

In this chapter I discuss general results from the existing literature on selling institutions and bidding mechanisms. From these results I develop general hypotheses that will be related to functioning cattle markets in chapter 4.

Literature

Economists have long been interested in the design of selling mechanisms that allow sellers to sort prospective buyers according to individual buyer valuations for a good. Auctions and sequential search are two important types of bidding models that have received considerable attention in the literature.

There have been many important contributions to our understanding of auctions, their various formats, and how they perform under specific circumstances since Vickrey's (1961) seminal paper. Cassady's (1967) comprehensive study of the use of auctions in the marketplace, although generally descriptive and non-quantitative, has been recognized as important in early auction literature.[2] Englebrecht-Wiggans (1983) and McAfee and McMillan (1987) provide excellent overviews of the literature on auction models. Other important works on auction theory include Bulow and Roberts (1989), Maskin and Riley (1984), McAfee and McMillan (1986), Milgrom (1989), Milgrom and Weber (1982), Myerson (1981), Riley and Samuelson (1981), and Wilson (1977).

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[2] Another lesser known manuscript by Cassady (1974) gives a similarly styled description of the use of private treaty negotiations in various markets.

The study of sequential search regimes began with the pioneering work of Stigler (1961, 1962), who used this concept to explain the market for job search where an individual elicits bids from potential employers. A survey of search literature can be found in Lippman and McCall (1976). Much of the work on this topic has modeled the search problem from a buyer's perspective. However, the results are just as easily applied to the problem of a seller entertaining offers from several buyers. Sequential search mechanisms have been the most common framework used to study bargaining and posted price selling. The seller in these models is assumed to entertain sequential offers from prospective buyers having valuations for the good that are drawn randomly from an underlying probability distribution. Search models can either be constructed such that the seller bargains or offers a take-it-or-leave-it fixed price to each buyer. Examples of sequential search theoretical models are found in Ehrman and Peters (1994), McAfee and McMillan (1988), and Wang (1993).

In contrast to the substantial attention paid to normative theories of optimal bidding models in the economic literature, there has been considerably less focus on explaining why a seller might choose one selling method over another. Intuitive discussions of this topic are found in Allen (1993), Cassady (1967, 1974), Goldberg (1977), Leffler, Rucker, and Munn (2000, 2004), and Milgrom (1989). More formal models for considering the problem of choice between selling mechanisms have been developed by Arnold and Lippman (1995), Bajari, McMillan, and Tadelis (2003), Bulow and Klemperer (1996), De Vany (1987), Lu and McAfee (1996), Manelli and Vincent (1995), McAfee and McMillan (1988), and Wang (1993, 1995, 1998). A common

theoretical approach used to compare auctions and negotiations used in these models has been to compare results from auction bidding models and sequential search regimes. These models abstract from distinctions between posted price and negotiation by choosing an optimal sequential mechanism in which a seller offers a fixed price that can change with each sequential buyer. The practical interpretation of this selling strategy is comparable to a series of negotiations between a seller and prospective buyers.[3]

The foregoing theoretical work on bidding models is based primarily on mathematical models. Such models generally require restrictive assumptions about bidding formats, participant behavior, and bidder valuations. These assumptions often make it difficult to apply these models to observed market settings.[4] It can also be difficult to interpret and compare results from the variety of bidding formats, auction models, and assumptions used in these theoretical examinations of selling institutions. This difficulty helps explain the sparseness of applied empirical research in matters of choice between selling methods. There have, in fact, been very few attempts to extend the application of these theoretical models to real-world situations and observed markets. Bulow and Klemperer assert that their findings support the choice of auctions exclusively by companies entertaining offers from prospective buyers. Manelli and Vincent suggest that their model provides a general methodology for determining when alternative procurement methods may be optimal for a purchaser buying goods from a supplier.

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[3] Arnold and Lippman (1995, p. 15), explain that this type of sequential search model can be used to describe private treaty cattle transactions where a producer (or his agent) sequentially searches for customers.

[4] For example, these models often assume a frictionless environment (i.e., the absence of transaction costs). The basic auction model also assumes that each bidder knows the number of bidders, their risk attributes, and the probability distributions of valuations.

Neither claim, however, is supported by substantial discussion of how relaxing model restrictions will affect the predictions.

Arnold and Lippman offer a more detailed practical application of their theoretical findings. After developing and exploring the properties of a model of seller choice between auction and sequential search, they use these results to provide a theoretical basis for understanding the evolution of livestock marketing in the United States. In particular, they argue that their model explains decentralization of livestock markets since the turn of the 20th century, the relative increase in the use of direct marketing of stocker cattle, and the consolidation of local auction markets. They specifically note that technological advances in transportation (e.g., refrigeration and trucking) and communication (such as the increased use of telephones), and the adoption of grading standards have led to a decline in transaction costs of sequential (direct) selling methods relative to auctions. Although they provide no empirical evidence, their discussion describes practical implications of theoretical bidding models.

Leffler, Rucker, and Munn (2004) have contributed some of the first empirical work in this area by examining the determinants of choice between auction and negotiated sale for timber tracts. They develop several empirical proxies and test predictions based on results from theoretical literature using data related to timber tracts offered for sale by private landowners. These predictions consider the distribution of buyer valuations, complexity of the sale arrangement, seller costs of using the method, and number of potential buyers. This study appears to be the first to provide strong support for a spectrum of predictions from the theoretical literature.

Bajari, McMillan, and Tadelis (2003) investigate the relative use of auctions and negotiations in procurement by analyzing a data set of building contracts awarded in Northern California over a period of several years. They present evidence to support that both auctions and negotiated selling methods will be used depending on circumstances. Specifically, auctions perform best when little communication between buyer and seller is required and when the transaction is less complex.

An empirical inquiry into the importance of various transaction costs expected to influence seller choice in the market for cattle was conducted by Hobbs (1997). Her analysis is based on data collected from a survey of 100 cattle producers in the United Kingdom. These survey data contain information about the operation, methods used to market cattle, reasons for choosing those methods, and opinions about the importance of a variety of transaction costs. Hobbs uses a tobit model to analyze the importance of producer characteristics and transaction cost variables for explaining the proportion of animals sold by auction. She does not attempt to link the variables in the model directly to the theoretical literature, opting instead to include a multitude of potentially important transaction costs variables. Her empirical research identifies four transaction costs and three producer characteristic variables that she believes may be important in these choices.[5] She explicitly notes both the importance and difficulty of constructing

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[5] Hobbs reported seven variables that "satisfied theoretical expectations and yielded significant results." Four of these were classified by the author as transaction cost variables: 1) the degree of uncertainty expressed by the seller about how cattle grade in direct transactions, 2) the seller's perceived risk that cattle would not sell at the auction, 3) the time spent at auctions, and 4) the adequacy of packer procurement staff. Another three were classified as producer characteristic variables: 1) the average number of cattle sold in a marketing, 2) whether bulls were being sold, and 3) whether the seller participated in a program to raise the cattle in accordance with certain animal welfare codes.

appropriate proxy measures for the transaction cost factors that are expected to influence seller choice.

More recently, Schmitz, Moss, and Schmitz (2003) have examined producer choice of marketing methods for stocker cattle (commercial calves sold to feedlots) in the United States. They consider the accessibility and use of marketing alternatives by cattle producers of various sizes and argue that selling costs are an important determinant of marketing choice for producers of stocker cattle. Data regarding the share of stocker cattle marketed by various methods in 15 cow-calf producing states are gathered from interviews with state experts. Empirical results of their study suggest that the share of stocker cattle that are sold through local public auctions decreases as the share of cow-calf operations with large herd sizes increases.

<div align="center">General Results and Hypotheses</div>

In this study I focus on two general results from the existing theoretical and applied literature. The first is the importance of seller costs in the choice among alternative selling methods. The second considers the impact of dispersion of bidder valuations and the level of uncertainty regarding the value of the good being sold.

Seller Costs of Using the Method

In one of the more widely cited works on auctions and negotiations, Bulow and Klemperer find that a seller will always generate higher expected revenue from an auction than from a negotiated sale in the absence of selling costs. This result implies that sellers will only choose to negotiate when they face high relative costs of using

auctions. The fact that we routinely observe use of both methods in the marketplace suggests, however, that these relative costs are important. Therefore, an increase in the relative costs of using an auction should decrease the use of auctions.

In contrast to Bulow and Klemperer, Arnold and Lippman explicitly model selling costs for both auctions and negotiations.[6] Two types of costs are recognized. The first is the per-bid cost of attracting additional offers. This type of cost has distinct counterparts in both auctions (e.g., advertising costs to attract bidders) and negotiations (e.g., search costs of soliciting and evaluating negotiated offers from individual buyers). Per-bid costs for auctions and negotiations are not required to be equal. The second type of cost is equivalent to a discount rate that is applied in each time period as the sale of a good is delayed. Intuitively, all units offered by a seller are sold in a single time period if an auction is employed. Conversely, negotiations result in the sales of multiple units over several time periods. Multiple time periods occur because sellers engage in negotiations with individual buyers in separate time periods. In addition, some negotiations do not result in successful sales. The authors use this model to demonstrate that auctions will more likely be preferred as the number of goods to be sold increases. They also predict that sellers will be more likely to use auctions to sell higher value goods because the cost of delayed sale for such goods will be proportionally greater.

Schmitz, et al. consider the importance of transaction costs in their study of marketing choices for stocker cattle. They predict that large cow-calf producers will be

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[6] As noted earlier, Arnold and Lippman model private treaty cattle sales negotiations using a sequential search regime.

less likely to use public local auctions than small producers. Large producers realize

scale economies in transportation costs that facilitate direct shipment of calves to the

buyer and enable them to use selling methods other than public auction.

The first two general hypotheses originate from the notion that selling methods

will be influenced by the relative cost of using a given method of sale. In particular, one

hypothesis is that auctions will more likely be used as the number of separate units to be

sold increases. Another hypothesis is that an increase (decrease) in transportation or

other selling costs for auctions relative to other sales methods will decrease (increase) the

likelihood that a seller will choose an auction.

Value Dispersion and Uncertainty

The dispersion of buyer valuations for a good may also influence sales methods.

To understand these effects, we must first consider two classes of bidding models –

independent private value (IPV) and common value (CV). Each is built on

fundamentally different assumptions about the valuations held by prospective bidders.

IPV models assume that a good is valued differently by each buyer. Such

differences may be a matter of tastes and preferences (as in the case of antiques or

artwork), or the result of differences in underlying buyer production functions. In either

case, differences in valuation among bidders are real and not simply perceived. CV

models, on the other hand, assume that the underlying value of a good is equal for all

prospective buyers. Buyers differ, however, in their information base regarding valuation

estimates. The difference in information possessed by prospective bidders represents

uncertainty about the true nature of the good. As in the case of standing timber sold for

harvest, the true value is not known with certainty to any bidder prior to purchase, but its ultimate value is the same for all bidders.

IPV and CV models generate substantially different hypotheses regarding the impact of bid value dispersion on the likelihood of auction. Wang develops an IPV model to compare auctions (with a fixed auctioning cost) to a sequential search selling method. He shows that sellers will more likely prefer to use auctions as dispersion of buyer valuations for the good increases. Leffler, Rucker, and Munn (2004) provide plausible intuition for this result. Expected revenue to the seller from negotiating with a single buyer will be near the maximum possible revenue when all buyers have similar values. In this case, negotiating is likely to be less costly than holding an auction with fixed costs. Auctions, on the other hand, assemble a number of bidders, and expected seller revenue is the equal to the valuation held by the second highest bidder. When buyer valuations are more dispersed, the value of obtaining additional bids is greater and sellers are more likely to prefer auctions.

The nature and implications of dispersion are quite different when underlying bidder valuations are modeled according to the CV framework. Dispersion in this class of models is equivalent to buyer uncertainty about the true underlying value of the sale item. Barzel's (1982) pioneering work on measurement costs demonstrated that buyers will engage in costly presale measurement activity to reduce uncertainty regarding the value of a good and that sellers will ultimately bear the costs of buyer efforts. French and McCormick (1984) analyze the effect of buyer presale measurement costs in the context of a CV auction with bidder participation determined endogenously. They show that

these costs play an important role in determining the equilibrium number of auction bidders. Buyers recover total costs of measurement (on average) because additional bidders enter the auction only to the point at which the expected gains from participation are equal to the costs. Further, the winning bid received by the seller is equal to the true value of the good minus the total cost of measurement for all participating buyers. In other words, the auction seller bears the total cost of all buyer presale measurement in the form of a reduced selling price.

Leffler, Rucker, and Munn (2000) build upon Barzel's discussion of presale measurement to extend the conclusion by French and McCormick. They show that total presale measurement will always increase with an increase in uncertainty in a CV framework. Uncertainty about the underlying value (or quality) of the good being sold is costly to the seller in the CV model because it creates an incentive for buyers to engage in costly presale measurement activity. This activity is socially wasteful because it must be duplicated by several bidders, and the true value is later revealed to the winner at a lower cost. The seller has incentives to minimize buyer costs because he ultimately bears the total amount of these costs. Leffler, Rucker, and Munn (2000) discuss two primary means of reducing presale measurement that are available to sellers. The first is to reduce uncertainty by providing information about the underlying value of a good. For example, a seller of mineral rights might provide detailed data and estimates of the value of the minerals to all prospective buyers. The seller economizes by incurring the cost of collecting these data only once (rather than having it collected by each buyer). The other option available to sellers is to restrict the number of bidders, which reduces duplicative

measurements. The seller in a CV framework, therefore, will be more likely to negotiate (where the number of bidders can be controlled) as the level of uncertainty about the true value of the good increases.

The remainder of this thesis considers two hypotheses regarding the effects of dispersion in bidder valuations on selling methods. First, if the market for a good is best explained by IPV assumptions (buyers have truly different valuations), an increase in the dispersion of buyers' valuations will increase the likelihood that a seller will choose to hold an auction. Second, if the nature of a good is best characterized by CV assumptions, a seller will be more likely to choose negotiated sales as uncertainty about the good's true value increases. Characteristics of the seller and the nature of the good being sold are important in determining whether IPV or CV model assumptions apply.

CHAPTER 3

AUCTIONS AND NEGOTIATED SALES IN THE MARKET FOR SEEDSTOCK

AND COMMERCIAL CATTLE

I identify measurable proxy variables from market data to empirically test

hypotheses described in chapter 2. The abstract models of producer choice described in

the previous chapter have economic relevance only insofar as they can provide insights

into decisions made by sellers in observable market situations. I will test the extent to

which the theoretical predictions can help explain the choice between auctions and

negotiations as alternative methods for selling cattle.

Businesses that raise and sell cattle for beef production make up a substantial

component of the U.S. agricultural economy. Table 1 presents numbers, sizes, and values

of sales for U.S. beef cow operations from the 2002 Census of Agriculture.

Table 1. U.S. Total Cow Herd Size by Inventory and Sale from the 2002 Census of
Agriculture.

| Farms with cow herd size of | Cows and heifers calved | | | | | | Value of Cattle and Calves Sold |
| | Farms | | | Head | | | |
	Number	Percent of All	Cumulative Percent	Number	Percent of All	Cumulative Percent	Millions of dollars
1 to 9	242,961	28.1	28.1	1,188,410	2.8	2.8	713.7
10 to 19	181,093	20.9	49.0	2,441,353	5.7	8.5	1,007.4
20 to 49	233,923	27.0	76.1	7,164,148	16.9	25.4	2,954.3
50 to 99	114,073	13.2	89.3	7,662,487	18.0	43.4	3,638.4
100 to 199	56,546	6.5	95.8	7,423,403	17.5	60.9	4,033.0
200 to 499	27,991	3.2	99.0	7,974,686	18.8	79.7	4,391.6
500 to 999	5,696	0.7	99.7	3,729,848	8.8	88.4	2,000.8
1,000 to 2,499	2,081	0.2	99.9	2,993,763	7.0	95.5	1,490.1
2,500 or more	459	0.1	100.0	1,924,132	4.5	100.0	764.8
ALL SIZES	**864,823**	**100.0**		**42,502,230**	**100.0**		**20,994.1**

U.S. average
cow herd size   *49*

Cow herd includes beef cows, milk cows, and heifers that had calved.

Table 1 shows that in 2002, over 850,000 U.S. beef cow operations sold cattle and calves valued at over $20 billion, and the total U.S. inventory of "beef cows and heifers calved" was over 40 million. Developing a better understanding of the factors that influence marketing decisions in this industry has important implications for cattle producers and policy makers, as well as for economists.

To test the theories for seller choice of selling method, I have assembled primary data from producers of commercial calves and seedstock bulls in Montana.[7] Montana ranks seventh among all states in number of beef cows. Table 2 displays numbers, sizes, and values of sales for Montana beef cow operations.

Table 2. Montana Cow Herd Size by Inventory and Sale from the 2002 Census of Agriculture.

| | Cows and heifers calved | | | | | | Value of Cattle and Calves Sold |
| | Farms | | | Head | | | |
Farms with cow herd size of	Number	Percent of All	Cumulative Percent	Number	Percent of All	Cumulative Percent	Millions of dollars
1 to 9	2,052	17.1	17.1	8,897	0.6	0.6	15.2
10 to 19	1,232	10.3	27.4	16,746	1.1	1.7	11.9
20 to 49	2,404	20.0	47.4	76,142	5.0	6.7	48.6
50 to 99	1,931	16.1	63.5	136,414	9.0	15.7	80.4
100 to 199	2,013	16.8	80.3	278,403	18.4	34.1	145.1
200 to 499	1,850	15.4	95.7	546,835	36.1	70.2	311.7
500 to 999	392	3.3	99.0	252,836	16.7	86.8	166.2
1,000 to 2,499	117	1.0	99.9	171,701	11.3	98.2	107.4
2,500 or more	7	0.1	100.0	27,893	1.8	100.0	13.7
ALL SIZES	**11,998**	**100.0**		**1,515,867**	**100.0**		**900.1**
U.S. average cow herd size	*126*						

Cow herd includes beef cows, milk cows, and heifers that had calved.

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[7] The terms "commercial" and "seedstock" are used throughout to distinguish two distinct cattle production practices. Commercial cattle are intended for slaughter and beef production, and seedstock cattle are raised to become breeding stock.

Table 2 shows that Montana has nearly 12,000 operations with just over 1.5 million beef cows and $900 million in annual cattle and calf sales.

The markets for commercial calves and seedstock bulls are similar in the sense that sellers regularly use both auctions and negotiated sales. But,important differences in the nature of production and the selling institutions between these two markets lead to different theoretical predictions with respect to choice of sale method. Before discussing specific testable propositions and variables in chapter 4, it is useful to provide background information about the production and marketing of commercial calves and seedstock bulls in Montana.

<u>The Market for Commercial Calves</u>

The beef industry consists of many firms of various sizes that play diverse roles in producing live cattle to be slaughtered for food consumption. "Cow-calf" operations raise commercial calves for the beef market. These operations vary in herd size from fewer than ten to several thousand cows. Figure 1 shows the distribution and percentages of beef operations by cow herd size for Montana and the U.S. The figure illustrates that beef cow herd sizes in Montana tend to be large relative to the average for the U.S. The average herd size in Montana is 126 cows, which is more than 250% of the national average of 49.[8]

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[8] Reasons for the large average cow herd size in Montana relative to other states are likely to include that there are few alternative agricultural uses for much of the land in cattle producing areas of Montana, and public grazing lands are widely available. Whereas cattle production is often a secondary or tertiary activity for agricultural operations in other states, it is the primary focus for many operations in Montana.

Figure 1. Percent of Farms by Cow Herd Size, MT and U.S.
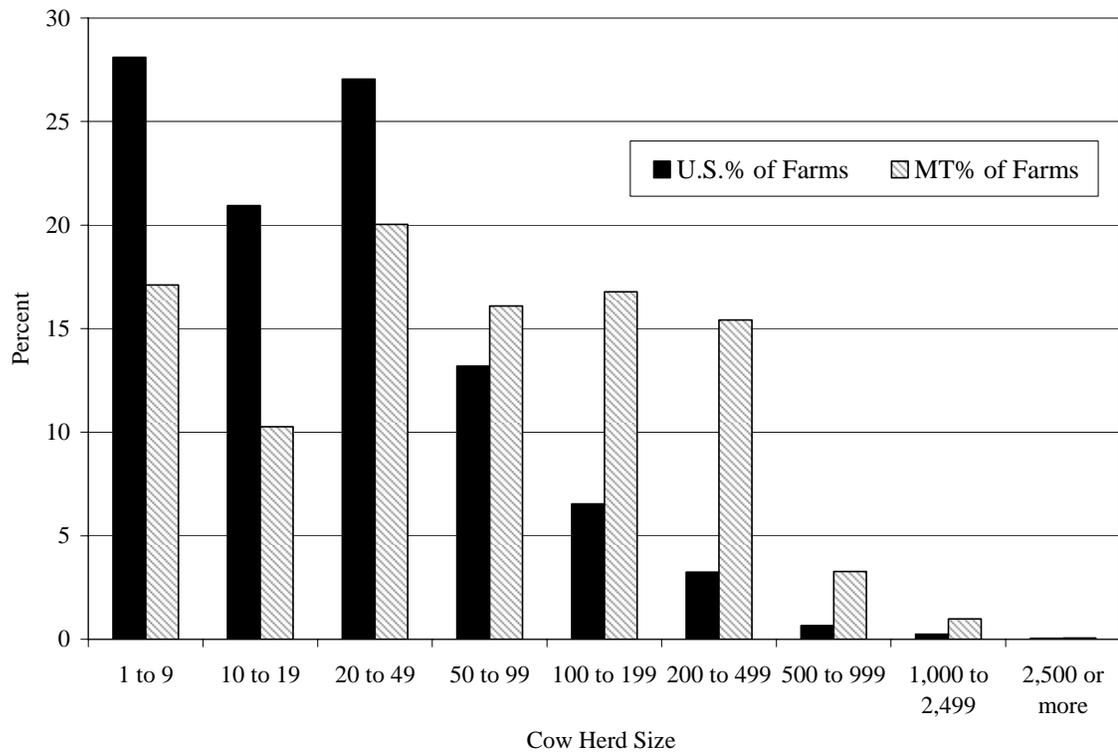
Calves born in the spring are raised with their mothers on summer pasture. Steer (castrated bull) and heifer calves are weaned from the cow in the fall (typically around November 1). Most weaned calves are placed into backgrounding operations where cattle between 400 and 800 lbs. are fed mostly forages targeted to produce gains in size and weight. Backgrounding can take place entirely within a feedlot (where the animals will develop more quickly) or it may involve pasture grazing. Some operations purchase calves in the fall, background them over the winter, and sell them in the spring. Some backgrounders purchase "yearling" calves and further graze them on summer pasture. Whether fed in a feedlot or on grass, backgrounded cattle are almost always placed in a feedlot when they have reached a weight of about 900 lbs. Here they are fed primarily

grain ration until "finished," or ready for slaughter at 1,000-1,400 lbs. (and usually just less than two years of age).[9] Feedlots typically sell finished animals to packing facilities that slaughter animals and produce beef and various by-products.

Varying degrees of vertical integration and coordination are common among beef production operations. Instead of selling their calves in the fall, some commercial operations retain ownership throughout the entire process, contracting for intermediate feeding services and, finally, being paid for the slaughtered carcass by a packer.[10] On the other hand, some commercial cattle change ownership five times or more between birth and slaughter. Transaction costs associated with transferring complex property rights seem to be important in explaining the similarities and differences among pricing institutions at various stages of ownership. However, the scope of the present inquiry is limited to factors affecting the selling decisions of Montana cow-calf producers that market calves at or near weaning.[11]

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[9] "Finishing" is a term of art among feeders. The time and weight at which an animal is considered to be finished depends on its skeletal frame and genetic composition. Experienced feeders are able to recognize subtle differences in optimal finishing weights for different animals.

[10] Producers retaining ownership of their calves either feed the animals themselves or pay backgrounders and feeders for both feed and yardage (space and services provided). This requires financial flexibility on the part of the producer to defer income and assume added price and production risk. Most operations that retain ownership choose a subset of total production (usually the highest quality) to retain and sell the remaining animals at weaning. Some feedlot operations will purchase a partial ownership share in animals placed in their lot, thereby sharing risks of ownership and feedlot performance with the seller. These arrangements, wherein the producer and feedlot share performance risk, would seem to be a means of dealing with transaction costs associated with incomplete information about the exact performance characteristics of the calves.

[11] There exists a substantial body of literature dealing with pricing and marketing institutions in the market for fed cattle. Studies by Feuz, Fausti, and Wagner (1993) and Schroeder and Graff (1999) have analyzed the efficiency of various fed/slaughter cattle pricing methods (live weight, dressed weight, and grid based) and the extent to which these pricing methods transmit appropriate market signals by rewarding high quality and penalizing low quality. Ward, Feuz, and Schroeder (1999) suggest that sellers in the fed cattle market must have knowledge of the carcass quality of animals being sold to evaluate and benefit

Methods Used to Sell Commercial Calves

A survey of Montana ranch production practices found that 80% of calves are sold within 45 days of weaning (King, Paterson, Funston, and Anderson 1999). Weaning represents the point in time when calves are separated from their mothers and can be either backgrounded or placed in feedlots. Sellers of weaned calves sometimes implement preconditioning programs, which prepare calves for the transition to a feedlot and help to reduce subsequent mortality, morbidity, and weight loss (shrink) caused by the stress of weaning and health problems. Preconditioning typically includes dehorning, castrating, vaccinating, and starting calves on dry feed prior to shipping.

Sellers typically pre-sort commercial calves to create more uniform lots for marketing purposes.[12] Most operations separate "off-sorts" that exhibit defects or are dissimilar in size or color from first quality calves.[13] Some large sellers may further sort to create groups to fit more stringent size, breed, and/or sex requirements in an attempt to target specific types of buyers. Lot sizes can range from less than ten to several hundred animals.

Public auctions are a widely used method for selling commercial calves. In addition to being frequently held and generally accessible, public auctions offer several

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from value-based pricing. McNew and Brester (2002) investigate the value of this knowledge to Montana producers participating in a program that facilitates collection of such information.

[12] The terms "lot" and "bunch" are typically used to describe cattle that are grouped together for sale.

[13] Buyers sometimes use color as an indicator of whether calves meet specifications for the Certified Angus Beef program, which provides premiums for beef carcasses meeting specific quality requirements. Animals must be at least 50% black Angus to qualify for the program. A prerequisite sometimes used for animals to qualify for premiums in this program is that they be black in color. As a result, black colored calves sometimes bring a premium over other colors.

advantages to sellers, including immediate sale, prompt payment, minimal requirements

on the seller, and little or no direct contact with buyers. Sellers deliver animals to a

central auction location prior to the sale, where they are then sold to the highest bidder.[14]

Buyers then ship the calves from the auction yard to a backgrounding or feedlot facility.

A percentage auction commission fee is typically withheld from the proceeds paid to the

seller.[15]

Many sellers market commercial calves through direct transactions with buyers

(these are also known as "private treaty sales"). In a private treaty transaction, sellers

negotiate price and contract terms directly with buyers. This direct communication with

buyers may enhance a seller's ability to provide information and build reputation through

repeat transactions over time. Sellers often entertain offers from several buyers each

year. Calves sold by private treaty are shipped directly from a seller's ranch to a buyer's

destination, thereby reducing transportation and handling relative to public auctions.

Other selling methods for cow-calf operations include forward contracting, video

or Internet auctions, retained ownership, and direct marketing. To sell on a forward

contract, a producer promises to deliver a group of cattle meeting a certain set of criteria

for weight, vaccinations, number of calves, sex, etc. at a certain price per pound at a

future date. Contracts set forth price discounts to be applied if cattle do not meet

specifications.[16] Video and Internet auctions are similar to forward contracts except that

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[14] The identity of the seller may or may not be publicized to buyers at public auction.

[15] Commissions for large local auction yards in Billings, MT are about 2.5% of sale price.

[16] According to Brorsen, Coulibaly, Richter, and Bailey (2001), the four essential variables of a contract are contract price, price slide (difference in the per pound price between cattle of different sexes and weight ranges), allowable weight difference, and estimated cattle average delivery weight. Other

buyers view video footage of animals and contract price is determined by competitive bid.[17] Ranchers that use direct marketing retain ownership through slaughter and packing and sell animals as processed beef to wholesalers, distributors, and/or retailers.

The majority of commercial calves are sold through either public auctions or private treaty sales. According to a 1997 national survey of cow-calf producers in 23 leading cow-calf states, 84.9% of operations that sold steer calves used public auctions, 10.4% used private treaty, and less than five percent used other methods.[18] However, the relative use of selling methods appears to be changing over time. In particular, it seems that the use of public auction sales continues to decline relative to private treaty and other selling methods.[19] Schmitz, et al. (2003) interviewed livestock marketing experts in the top fifteen cow-calf producing states.[20] They estimate that 60.8% of calves are marketed using public auctions, 22.7% using private treaty, and just over 16.5% using video sales. Their estimates also suggest that Montana operations are much more likely to choose direct sales over public auctions than other states surveyed. They estimate that only

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important elements cited are time to delivery, cattle weight variability, breed, sex, lot size, condition, location, and frame size.

[17] Hereafter, both video and Internet methods will be referenced simply as "video" methods.

[18] National Animal Health Monitoring System (NAHMS) Beef '97 Study.

[19] This recent trend is consistent with the historical decline in use of public auctions. Discussions of the historical evolution of livestock markets are found in Arnold and Lippman (1995) and Kohls (1961).

[20] Schmitz, et al. specifically report results for "stocker cattle," which are generally defined as weaned calves for placement in feedlots. Their results are therefore comparable to those for commercial calves in the present study.

12.5% of calves are sold by Montana beef operations using public auctions, while 67.5% are sold through private treaty and 20% are sold through video sales.[21]

Buyers of Commercial Calves and Determinants of Value

The majority of Montana calves are placed in feedlots shortly after weaning. Similar to a manufacturing plant, feedlots seek to purchase enough cattle (inputs) to fill their production capacity. Capacities range from a few thousand to over 100,000 animals. The calves required to fill a single feedlot usually originate from many ranches. Feedlot owners may purchase calves either directly or through an intermediary "order buyer."[22] Buyers generally use multiple methods to purchase cattle, including direct contact with sellers, visiting ranches, and attending auctions. A single order buyer will often work at filling orders for several different feedlots at the same time.

Feedlots profit by efficiently transforming calves into finished cattle for slaughter. They purchase commercial calves as inputs and add value by combining these animals with feed inputs (such as grain and forage). Their outputs, finished slaughter cattle, are then processed into beef and various by-products. The quality of commercial calves depends primarily on two types of characteristics: 1) those that influence carcass performance and meat quality, and 2) those that affect feedlot production costs.

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[21] Schmitz, et al. attribute the predominance of private treaty sales in Montana to larger herd sizes (51% of cattle are from herds of 500 head or greater). They also suggest that geographic dispersion of livestock auctions might be a contributing factor.

[22] As the term implies, order buyers purchase animals to fill an order from a feedlot for a prescribed number and description of cattle.

Cattle carcasses are graded for both quality and yield according to USDA standards. Quality grades primarily reflect differences in marbling and maturity.[23] Yield grades measure hanging carcass weight as a percent of live weight.[24] Higher yielding animals are more valuable on a per pound basis because they produce more meat than lower yielding animals. Both aspects of carcass performance (quality and yield grade) are heavily influenced by genetic characteristics, although environmental factors such as feeding regimen, health, and finishing age are also important.

Buyers value other characteristics of commercial cattle for production efficiency and because they lead to improved feedlot performance. For example, buyers value calves that have been preconditioned because they adapt more quickly to feedlot environments with improved weight gain and less illness. Many buyers require documentation of vaccination programs to reduce the risk of health problems among new feeder cattle placements that can be very costly to feedlots. Heavy discounts are applied to animals in poor condition, and many buyers simply refuse to purchase animals exhibiting health problems. Heifer calves sell at a per pound price discount relative to steer calves, owing to their lower feed conversion rate and the costs of managing pregnant heifers.[25] Other characteristics discounted by buyers include horns, which can

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[23] Carcass grades provide a standardized measure of meat quality. Grades include, in descending quality, prime, choice, select, standard, and "dark cutter" (extremely poor meat quality). Higher marbling (defined as flecks of fat within the lean) contributes to meat tenderness and positively affects quality grade (to a point). Maturity, or age, negatively affects quality grade.

[24] USDA yield grades are rated numerically with 1 being the highest and 5 the lowest.

[25] Buhman, Hungerford, and Smith (2003) list several options available to feedlots for dealing with heifer pregnancy risk. These include "shipping heifers to slaughter prior to calving, palpating all new heifers for pregnancy and aborting pregnant heifers, giving abortifacients to all incoming heifers, and palpating a percentage of the lot and basing the decision for the lot on the palpation results." They also

cause injury among cattle in confinement, and bulls that have not been castrated, because late castration causes additional stress.

The nature of the cattle feeding process also puts a premium on uniformity. Animals of different sizes, body frames, genetic predispositions, and stages of development require different feed rations. As cattle develop through backgrounding and toward finishing, their rations may change several times. Genetic factors will determine the efficiency with which an animal converts feed to beef and the rate at which it gains weight and progresses through the feedlot. Such differences can be costly to feedlots, because cattle with different feed requirements must be sorted, moved, and separated by pens. Feedlots attempt to minimize these costs by grouping cattle that will develop and finish in a similar manner. For this reason, feedlots value large lots from single cow-calf operations in which the calves share many genetic similarities and are uniform with respect to weight.

Lot size also affects buyer costs of transporting calves. Commercial calves raised in Montana are generally shipped hundreds of miles to buyers in Midwestern states where feed and feedlots are abundant. Over-the-road trucks with 40,000 pounds of capacity offer the most efficient method of transporting cattle over long distances. Since wasted truck space is costly, buyers seek to purchase calves in "truckload quantities," or groups

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note that some feedlots follow a strategy of feeding only heifers that are guaranteed not to be pregnant or do not feed heifers at all.

large enough to fill one or more trucks.[26] When calves purchased from one seller are insufficient to fill a truckload, buyers combine them with calves from other sellers.

<p align="center">The Market for Seedstock Cattle</p>

Seedstock cattle operations supply genetics that are used as inputs by the commercial cattle industry. A "Montana Seedstock Survey" conducted by the Montana Agricultural Statistics Service in 1994 estimated that producers received over $100 million from annual seedstock sales. This market is characterized by a large number of producers with between 50 and 300 breeding cows. These producers sell directly to a large number of both small and large commercial cattle producers. Although seedstock producers sell genetics in many forms, including breeding females (mature cows, bred heifers, and heifer calves), semen, and embryos, over one-half of income received by Montana seedstock producers was from sale of breeding bulls.

Methods Used to Sell Seedstock Cattle

Most seedstock operations sell one-year-old breeding bulls in the spring of the year. The most common methods of selling seedstock bulls are private treaty sales (negotiations) and private auctions.

Private treaty sales involve direct negotiations between seedstock sellers and buyers. Producers advertise their intention to sell bulls by private treaty (or "at the ranch") using word of mouth, industry newspapers, breed registries, signs, etc. Buyers

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[26] For example, a standard truck with 40,000 lb. weight capacity will be filled with approximately 80 calves that average 500 lbs. each.

usually visit a seller's ranch operation to view a herd and animals being offered for sale. Buyers and sellers often spend several hours negotiating a sale. They first identify animals a buyer wants, and then negotiate prices and transaction terms. Sellers usually provide buyers detailed pedigree records and other performance data. Sellers continue to negotiate with additional buyers until all production is sold. In addition to one-year-old bulls, sellers will also generally offer older animals that were not sold during the previous year.

Private auctions are another common method of selling seedstock bulls. As an alternative to bargaining with individual buyers, an auction format allows sellers to gather many potential buyers at a single time and place. A seller advertises extensively, often publishing and distributing a sale catalog containing information about their animals prior to the auction. Most sellers hire a professional auctioneer who also typically helps promote, coordinate, and conduct the auction. Some sellers also hire marketing specialists, such as a sale manager and/or professional livestock photographers, to assist in sale promotion. Animals are assembled and groomed prior to being made available for viewing on sale day. Sellers often host buyers by providing free food and sometimes entertainment. With some exceptions, all bulls are sold within a single day. Bulls that are sick or injured are usually withheld from the auction. In some cases, sellers may reject the maximum bid for a bull.

Some sellers use variations on private auction or private treaty selling methods. For example, multiple sellers sometimes combine their production and hold joint or "coalition" auctions. Although rare, seedstock bulls are sometimes sold at public

auctions. Facilities called "bull tests" feed bulls from several different seedstock

operations on a standard ration, score the animals according to relative weight gain

performance, and sell them on consignment (usually by auction). Many seedstock

operations also enter a few animals per year in livestock shows or expositions where they

are judged and then auctioned on consignment. The majority of animals marketed by

seedstock producers, however, are sold directly from ranches using either private treaty

or private auction methods.

The 1994 Montana Seedstock Survey reported that about 47% of seedstock bulls

sold to producers within the state of Montana were sold by private treaty. Another 34%

were sold through some form of production sale (private or joint auction), and the

remaining 19% were sold through test facilities or other consignment sales.

Buyers of Seedstock Cattle and Determinants of Value

Because seedstock purchases ultimately determine the genetic makeup of a

commercial cattle herd, they have a broad impact on production costs, revenue, and

profitability of commercial producers. A typical commercial seedstock buyer purchases

breeding bulls to replace those that have been culled from the herd in the previous year.

Most prefer to buy bulls in the spring of the year after winter feeding and calving are

finished and before bulls need to be "turned out" with cows in early June. As a general

rule, commercial producers expect a breeding bull to breed about 25 cows per year for

four years before replacement.[27] This means that a producer with 300 breeding females

will typically buy three bulls a year. A seedstock operation producing 100 bulls per year

could, therefore, expect to sell to around 25 different buyers. A typical seedstock

producer of this size manages and markets all of his own production.

Seedstock animals with exceptional quality potential may be purchased by other

seedstock operations to be used as "herd sires" (sires for other seedstock animals). Herd

sires generate substantial revenue from the sale of their progeny and of semen to be used

for artificial insemination. This greater value potential expands the market appeal of the

highest quality seedstock bulls. While these bulls obviously appeal to both commercial

and seedstock users, the economic returns from commercial use cannot compete with the

much higher expected revenue potential of seedstock use. The commercial bull

replacement benchmarks discussed previously suggest that the genetic impact of a bull in

a commercial operation will be constrained to around 100 calves (25/yr. for four years).

A seedstock sire collected for artificial insemination (AI) could potentially produce

thousands of progeny which could pass genetics to their own progeny. The most sought

after bulls can generate hundreds of thousands of dollars in revenues from sales of

genetics through semen and offspring.

The most important characteristics of breeding bulls to commercial producers

may be divided into four groups: 1) breeding ability; 2) genetic influence on feeder calves

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[27] Artificial insemination is sometimes used to breed commercial cows, but it is much less
common than the use of pasture bulls due to the substantial time and expertise required to implement a
successful breeding program.

from birth to weaning; 3) genetic influence on feeder calves from weaning to slaughter; and 4) genetic influence on calves kept as breeding cow replacements.

Genetic potential is irrelevant if a bull is unable to breed effectively. Characteristics such as scrotal circumference provide some indication of a bull's breeding ability. Other characteristics may be important depending on the buyer's pasture conditions. For example, a short-legged bull may have difficulties in areas with high brush. And, in general, smaller frame animals perform better in large pasture conditions than very large animals because they are able to cover space more easily. A bull that is unable to "keep up" with the herd will lead to a greater number of "open," or unbred cows that are costly to commercial producers. In some cases, buyers may require that a bull pass a breeding soundness examination to prove that he is able to breed.

Because commercial calves are the primary product sold by commercial cattle producers, a bull's expected influence on these animals is particularly important to buyers. Birth weight is an important characteristic because large calves often cause birthing difficulties (especially for heifers having their first calf), increased death loss, and lost income to calf producers. Because commercial calves are often sold at weaning on a per pound basis, weaning weight provides a measure of the total pounds that can be expected to be marketed. Calves that efficiently convert grass into pounds of beef and weigh more than their counterparts at weaning will produce more total revenue. Because high weaning weights and high birth weights are positively correlated, these traits tend to be antagonistic.

Although a typical "cow-calf" commercial operation may sell calves at weaning, genetic characteristics of the breeding bull continue to be important throughout the beef production process. Yearling weight (weight at 12 months of age) and average daily gain provide measures of how well an animal performs (converts feed to weight gain) in feedlots. Carcass quality is another genetic characteristic that creates value in downstream markets. Ultrasonic measurements of ribeye area, fat thickness, and fitness serve as indicators of expected quality.

Commercial cattle producers often retain and raise a portion of their female calf crop to replace culled or dead cows. By siring replacement heifers, breeding bulls genetically impact the future herd of breeding females. Not only do breeding females sired by the bull pass on the genetic traits described above, they also inherit certain other maternal traits. In particular, breeding cows inherit, from the bull sire, maternal characteristics such as an ability to produce milk and foster healthy calf growth.

CHAPTER 4

FACTORS THAT INFLUENCE THE CHOICE OF CATTLE SALES METHOD

In chapter 2, hypotheses related to two general areas of influence on choice of selling method were identified. One influence is the cost of using auctions relative to negotiations. The other is dispersion of bidder valuations. I now apply the hypotheses developed in chapter 2 to choice of selling method by seedstock and commercial cattle sellers and discuss empirical counterparts that will be used to test specific predictions.

Relative Costs of Using Auctions

My first testable proposition considers the costs of using auctions relative to negotiated sales. I will consider two specific cost relationships: costs related to number of units sold and costs related to the bargaining process.

Number of units sold is expected to affect the relative costs of using auctions. Arnold and Lippman (1995) indicate that auctions are more likely to be preferred to methods involving direct negotiations as the number of units sold increases. Plausible intuition for this result is that auctions are a relatively more efficient means of handling a large number of bids. As the number of units to be sold increases, the total number of bids that must be solicited to sell all units also increases. As the number of units to be sold increases, the process of meeting with each bidder individually leads to continuing increases in the amount of time required to sell all units. However, auctions facilitate the sale of all units in one time period.

This intuition is well-suited for describing factors that may influence a seller of

seedstock in choosing between auctions and negotiated private treaty sales. A strategy of

selling all seedstock bulls by private treaty sales necessitates negotiating individually

with many buyers. Sellers are generally unable to negotiate simultaneously with more

than one buyer. Each negotiation costs a seller additional time and other bargaining

costs, regardless of whether it results in a successful sale. Revenues from subsequent bull

sales are delayed until sequential negotiations for those sales can be completed.[28] The

total number of negotiations increases as the total number of bulls to be sold increases.

In contrast, a seedstock seller who chooses to host a private auction gathers many

potential buyers in one location and sells the majority of bulls at a single event. The

auction method is time efficient in receiving and selecting among bids from several

prospective buyers simultaneously. In most cases the entire seedstock bull offering can

be sold by private auction in less than a day.[29]

The preceding discussion suggests that it is reasonable to apply the Arnold and

Lippman model to the market for seedstock bulls. Average net returns per bull from

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[28] A seller might choose to decrease the time required to sell all bulls by employing one or more agents to negotiate on his behalf instead of handling all transactions personally. This strategy simply involves trading costs of delayed sale for new principal-agent transaction costs. Employing such a strategy would not be expected to change the fundamental relationship that average net returns to auction will exceed average net returns to sequential selling as the number of animals sold increases.

[29] There is reason to believe that the cost of delayed sale will be particularly important to seedstock sellers because of the short marketing window for one-year-old breeding bulls. Bulls reach a minimum level of maturity at about one year of age when they can be adequately evaluated by buyers. Typically bull calves are born in the spring. These calves are weaned in the fall, and reach yearling age the following spring. If yearling bulls are to be used for breeding cows in the summer, the yearling bulls must be sold within a few months after reaching yearling age. Yearling bulls not sold in time to breed at one year of age will be of little value to commercial buyers until breeding season of the following year. Carrying costs (for feed and care) must be incurred for another year before these bulls will produce offspring. As a result, a seller may also be forced to forego sale proceeds for several more months.

auctions are expected to increase relative to the average net returns per bull from negotiated sales as the number of bulls sold increases. My empirical prediction, then, is that seedstock operations will be more likely to host private auctions as the number of bulls they sell increases.

Although this result from Arnold and Lippman's model does not assume different average direct selling cost schedules associated with the two methods, there is reason to suspect such cost differentials may also be important. We might expect auctions to have a greater fixed selling cost component than negotiated sales. Auctioneers, for example, are often hired for private auction on a lump sum basis. It also seems quite reasonable to suspect that the seller will realize economies of size in costs of hosting banquets, entertaining guests, preparing animals for sale, and providing information to buyers (by means of a sale catalog). Large fixed selling costs of auction could result in some threshold minimum number of bulls sold at which auctions become cost effective. This argument that average costs of hosting a private auction are decreasing relative to average costs of private treaty sales strengthens the previous prediction based on Arnold and Lippman – that sellers will host private auctions as the number of bulls sold increases.

An increase in the total number of animals to be sold affects the costs of using an auction for commercial sellers quite differently than seedstock sellers. Commercial calves are sold in groups (called lots). Larger sellers generally market their calves in larger lots rather than in an increased number of small lots. The number of sales transactions required for a commercial seller to market his calves may not increase with the number of animals sold as lot sizes increase. The model employed above to explain

the choice between using auctions or negotiations to sell individual seedstock bulls

cannot, therefore, be directly applied to commercial calves.

Transportation costs and the ability to economically use truck capacities are

important for private treaty sales and video auctions because calves are shipped directly

from a ranch to a buyer's desired location. Private treaty transactions also require buyers

to engage in negotiations with each seller. Public auctions, on the other hand, allow

buyers at a single location to purchase calves from several buyers. Buyers are able to

combine small lots into truckload quantities for shipping and reduce the time needed for

each purchase. But auctions also involve costs to sellers that are not incurred with private

treaty sales. Whereas calves sold by private treaty or video auction are shipped directly

to a buyer, public auction sales involve the extra step of first shipping calves to an

auction site. This causes sellers to incur additional transportation expense. Another less

obvious cost of shipping calves to an auction site is that such transportation increases

stress, which leads to weight loss and, sometimes, to health problems. Weight loss

directly reduces seller revenues because calves are priced by the pound. In addition,

buyers discount per pound bids if they see evidence of poor condition or suspect health

problems.

Buyers and sellers have incentives to use selling methods that minimize the sum

of total transaction costs incurred by both parties. Transportation and negotiation costs

are two important components of the total costs of using selling methods for commercial

calves. Costs associated with under-utilized truck capacity and time-consuming

individual negotiations with multiple sellers discourage buyers from negotiating private

treaty transactions involving small lots. Larger numbers of calves give sellers increased volume and flexibility to assemble truckload lots that meet buyer specifications. As the number of calves to be sold increases, sellers more likely choose direct sales or video auctions – selling methods that facilitate direct shipment from ranches and avoid additional transport, handling, and commission costs of public auctions. The proportion of calves sold using public auction is expected to decrease as the total number of calves sold by an operation increases.

A second potential cost factor relates to a seller's disutility or disadvantage of negotiating with buyers. Such disutility is avoided by the use of auctions. Sellers who dislike bargaining or negotiating are expected to be more likely to avoid this interaction by choosing auctions. Because successful bargaining requires a producer to be both skilled and informed, a seller's level of involvement in an operation is also expected to be important. Holding other factors constant, sellers whose primary occupation is something other than ranching are expected to be less likely to use private treaty sales or video auctions and more likely to use public auctions.

Dispersion of Buyer Values

In chapter 2, I discussed two bidding models, IPV and CV, based on quite different assumptions about the relationship between the valuations of prospective buyers. These two models provide opposing predictions about the effects of dispersion of buyer valuations on the seller's choice of selling method. As I develop testable hypotheses about the influence of dispersion on choice of method used to sell cattle, it is important to identify which model best describes each cattle market (i.e., seedstock bulls

and commercial calves). Substantial differences between types of buyers of seedstock bulls suggest that the market is best described by the IPV framework in which buyers have different underlying valuations of sale items. In contrast, buyers of commercial calves tend to be more homogeneous with regard to their intended use for the animals. This suggests the CV assumption, that all buyers have the same underling value, may be more appropriate for describing this market.

IPV Dispersion in the Market for Seedstock Bulls

Within an IPV bidding framework, sellers are expected to be more likely to choose auctions as the dispersion of bidder valuations increases. IPV dispersion describes situations when the value of a good being sold is different for prospective buyers.[30] Buyers of seedstock bulls have heterogeneous uses for bulls (e.g., commercial production, purebred production, and seedstock production, younger versus older breeding cows, and breed differences, management focused on quality versus cost goals) that often lead to dissimilar valuations for seedstock bulls. These differences likely increase the dispersion of bidder valuations as the perceived quality and potential value of a bull increases.[31]

Consider the following example of the expected relationship between quality and dispersion. Two bulls, Ordinary Joe and King Bob, are to be offered for sale. Ordinary

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[30] Dispersion in this context is equivalent to the variance of the distribution of buyer valuations for the sale good.

[31] I make a distinction here between revenue (to the seller) and value (to buyers). Revenue refers to the proceeds received by the seller when the bull is sold. Value is specific to an individual buyer. Prospective buyers form their valuations for the bull based on their own expectations and information available prior to sale. The actual value of a bull to the ultimate buyer is only revealed through time. In most bidding formats, the seller's expected revenue is equal to the second highest buyer valuation.

Joe exhibits slightly below average performance scores and genetic potential. King Bob

shows exceptional promise as a top performer within his breed. The seller's expected

revenue from the sale of Ordinary Joe can be estimated with a high degree of confidence

to lie somewhere between slaughter price (which we assume to be $800), and the average

price of a breeding bull in that year (which is, say, $1,800).

The seller's expected revenue from King Bob is much more difficult to ascertain.

Certainly the lower bound that could be realized if the bull is found to be unsound is the

same as Ordinary Joe, which is slaughter value. But, the maximum value of King Bob to

a prospective buyer depends upon his future performance and how a buyer intends to use

him. The maximum value of any bull to a typical commercial cattle operation that

intends to use it solely as a range bull for the production of commercial calves is limited

by the number of cows the bull can breed throughout his breeding life and the value of

calves. Another buyer may market superior genetics in the form of semen and breed

seedstock females of high genetic quality to produce seedstock progeny. If King Bob

fulfills his genetic promise, his value to the commercial buyer may greatly exceed that of

an average bull (perhaps $3,600 or twice the average).[32] However, the value realized for

the same bull to a seedstock breeder with an aggressive marketing strategy and

complementary herd genetics could be many tens of thousands of dollars. Herd genetics,

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[32] For reference on commercial breeding bull values, a series of articles in *Drovers* (a well-recognized beef industry publication) dealt with ways to estimate the value of breeding bulls for commercial operations. Hypothetical comparisons were based on reasonable estimates of bull price and performance and typical management practices. The low-end commercial breeding bull in these comparisons was valued at $1,500, and the high-end commercial breeding bull (with much better expected performance) was valued at $4,500. (Knopf 2004a, 2004b, and 2005)

management practices, and marketing strategy determine the actual value of the bull to potential buyers.

Although these two bulls share a common minimum value, Ordinary Joe has a much lower expected maximum value and, thus, a more narrow distribution of possible bidder valuations. The seller gains little by offering Ordinary Joe to many potential bidders whose valuations for the bull will be quite similar. But, the seller's likelihood of finding buyers with high valuations increases much more rapidly as additional bids are elicited for King Bob.

Holding the dispersion of buyer valuations constant, an increase in the quality or value of a bull would not alone be expected to impact the seller's preference for auction versus negotiation. I have used the previous example to suggest that when the quality and potential value of a seedstock bull is higher, buyer valuations for the bull will be more dispersed.[33] Quality measures are therefore used as proxies for dispersion of bidder valuations in empirical analysis of selling choices for seedstock cattle.

Proxies for perceived quality can be constructed from the seedstock survey data and the seedstock producer transaction data. The preceding discussion suggests that producers of high value seedstock are expected to be more likely to host private auctions. Two possible proxies for higher quality seedstock operations have been identified: the

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[33] The expected relationship between mean value and dispersion of buyer valuations can be illustrated as follows. Assume the average buyer valuation is $1,800 for Ordinary Joe and $20,000 for King Bob. The expected percentage of buyer valuations between $800 and $2,800 for Ordinary Joe is much greater than the expected percentage of King Bob valuations between $19,000 and $21,000.

number of bulls from which semen is collected and the number of herd sires produced.[34]

These two proxies are expected to signal operations that produce seedstock with high potential value. This higher potential value is expected to result in greater dispersion of bid valuations and increase the likelihood that these sellers will choose to host private auctions.

In the seedstock producer transaction data, information gathered by the seller is used to measure the quality of individual bulls. Bulls with more favorable performance measures, EPDs, and subjective phenotypic scores are expected to be offered in auction sales more frequently. Bulls from popular sires are also expected to be more likely to be offered by auctions.

CV Dispersion in the Market for Commercial Calves

As described in chapter 3, commercial calves are used as inputs by feedlot operators, all of whom produce fed cattle for slaughter. Buyers are, therefore, expected to be relatively homogeneous with regard to their intended use of these animals. Some differentiation among buyers may occur for those who prefer certain breeds and weight classes. Nonetheless, the market for calves is generally characterized by buyers with similar, if not identical, underlying valuations. Differences in the amounts buyers are willing to pay for a given group of calves is due to differences in buyer estimates of value. Dispersion of buyer valuations in the CV bidding framework reflects this uncertainty.

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[34] Herd sires are seedstock bulls that have demonstrated the most exceptional performance and are used to sire other seedstock.

Commercial calf quality is also expected to be closely related to dispersion in the CV framework. Recall from chapter 3 that the quality of a group of commercial calves is determined by many factors that cannot be thoroughly evaluated through brief observation of animals. Some value characteristics, such as feedlot performance and finished carcass traits, are determined by herd genetics, weather, and management practices. Other elements of value depend on credible information from sellers, including the nature of preconditioning programs and animal health.

Uncertainty about underlying value resulting from quality characteristics introduces incentives for presale measurement. Buyers can gather information to improve the expected accuracy of their value estimates. Buyers of commercial calves might, for example, ask to review seller records of past performance or preconditioning programs. They might also visit ranches to visually inspect herd genetics, and they might learn more about a seller's reputation. These presale measurement efforts increase a buyer's purchase costs.

The hypothesis from chapter 2 is that an increase in CV dispersion will lead to increased presale measurement. Certain quality attributes of commercial calves are expected to increase CV dispersion. For example, dispersion may be greater for calves whose sellers emphasize genetic quality, provide information about past performance of their calves, or provide information about preconditioning programs. These attributes suggest that a seller will be more likely to receive a premium for high quality calves. Buyers of high quality calves will have greater incentive to engage in presale measurement as means of reducing uncertainty about their higher value. From the

discussion in chapter 2, a seller will, in turn, choose the method of sale that minimizes the total of presale measurement costs incurred by all participating buyers.

Sellers of high quality calves are expected reduce total buyer measurement by, for example, choosing selling methods that limit buyer opportunities to engage in costly collection of additional information. Public auctions involve little or no interaction between buyers and sellers and provide very little information to prospective buyers about quality attributes. Due to their close regional proximity to the seller, buyers at local public auctions may have opportunities to engage in the type of presale measurement activity described above. A seller cannot control the number of bidders or the amount of presale measurement in a public auction setting. Alternatively, a seller may limit the number of participating bidders using private treaty negotiation and, thus, reduce the total amount of presale measurement.

Video auctions represent a third alternative available to sellers of commercial calves. Buyer measurement is expected to be more limited in a video auction than in a public auction even though the seller cannot limit buyer participation. Opportunities for duplicative buyer measurement are substantially reduced because video auction buyers bid from remote locations. Video auction buyers instead receive additional information from the auction company. Bailey, Peterson, and Brorsen (1991) compare and describe video auctions and local public auctions. Video auction presentations include a brief video and sales catalogue information. The value of this information depends on the reputation of the video auction company and its regional representatives. They note that video auction catalogues contain important information about the quality of animals sold

that is not usually available to buyers in public auctions. Total presale measurement is reduced in a video auction to the extent that information collected (once) by the seller and then provided to all buyers rather than being separately collected by each buyer.

Proxy measures constructed from the survey data collected for this study identify commercial operations that emphasize genetic quality or provide information and documentation for performance and preconditioning. These operations are expected to be less likely to use public auctions and more likely to use either negotiated sales or video auctions.

Data were collected from three distinct sources to test predictions for seller choice between sales mechanisms in cattle transactions: 1) a survey of seedstock cattle producers, 2) a survey of commercial cattle producers, and 3) sales transaction data from a large Montana seedstock producer. The next three chapters describe empirical tests for these predictions using each of three data sets.

CHAPTER 5

EMPIRICAL TESTS USING SEEDSTOCK SURVEY DATA

Cross-sectional data were collected through a survey of Montana seedstock operations. Each observation contains information about a single seedstock operation including details of the method used to market cattle. The data are used to empirically test predictions about which characteristics of the seller and his operation influence the choice of whether to host a private auction.

The seedstock survey was conducted in two stages, and substantial efforts were made to maximize response rate, avoid bias, and obtain meaningful results. A mailing list for approximately 750 seedstock producers was assembled from several cattle association and breed directories. An initial version of the seedstock survey was sent to the first 250 producers in the database in alphabetical order and was followed by a postcard to non-respondents. This preliminary survey yielded 65 valid survey responses. Based upon analysis of surveys received, some questions in the survey were modified to improve usefulness of the data. Some questions were added to the survey, and others were modified to improve response quality. The revised survey was sent to the approximately 500 remaining seedstock producers. After sending follow-up postcards, 121 completed surveys were obtained. A completed copy of the final seedstock survey is included as Appendix A. The 186 combined responses to both survey mailings were

further sorted and evaluated for data anomalies and omissions, and 153 surveys were

used for the final analysis.[35]

<u>The Dependent Variable</u>

Predictions discussed in chapter 4 focus on factors that influence a seedstock

seller's choice of whether or not to host a private seedstock bull auction. Regression

analysis is used to test these predictions with data from the seedstock survey. The

dependent variable is constructed from information about the number and types of

animals sold by the operation using various methods.

Table 3 displays information about methods used by respondents to sell one- and

two-year-old seedstock bulls.

Table 3. Methods of Sale for Seedstock Bulls.

				Bulls Sold						Operations Using the Method	
				Number				*Average Percent*			
								Percent of Bulls	*Simple Average*		
Method of Sale	N	*Mean*	*Median*	*StDev*	*Min*	*Max*	*Sum*			*Number*	*Percent*
Private Treaty	153	19.2	10	29.4	0	280	2,932	34.4	47.4	120	78.4
Private Auction	153	29.3	0	56.5	0	320	4,490	52.7	29.4	57	37.3
Joint Auction	153	4.5	0	13.3	0	80	688	8.1	13.3	37	24.2
Public Auction	153	1.1	0	3.3	0	20	162	1.9	3.3	27	17.6
Bull Test or Exposition	153	1.1	0	3.5	0	35	170	2.0	5.9	34	22.2
Other Methods	153	0.5	0	3.5	0	38	81	1.0	0.7	7	4.6
Total	153	55.7	35	72.4	1	580	8,523	100.0	100.0		

Casual inspection reveals several important features of the data. The variation in

sizes of operations as measured by number of bulls sold is substantial. The survey

[35] Surveys were excluded from the analysis for the following reasons: thirty-one surveys lacked adequate information to determine sales methods for the operation, one survey was attributed to a commercial (rather than seedstock) producer, and one survey was a duplicate (i.e., separate copies were received from two members of the same operation).

responses account for over 8,500 total bulls sold, and the number sold by individual

respondents ranges from 1 to 580 bulls. The mean of 55.7 bulls sold per operation far

exceeds the median of 35 bulls, and the standard deviation is 72.4. Figure 2 shows a

histogram of total bulls sold for the 153 sample respondents.

Figure 2. Histogram of total bulls sold for 153 seedstock operations.

The distribution of total bulls sold in figure 2 is clearly positively skewed, with

67% of observations below the mean. The third moment (calculated as $E[(X-u)^3]$), and

the skewness statistic (calculated as $E[(X-u)^3]/\sigma^3$, and equal to 3.7) are both positive.

Average use of the various selling methods was calculated in two ways: first, as a

percentage of the total number of bulls in the sample and, second, as a simple average of

the percentages sold by individual operations.[36] Differences between these two averages

highlight contrasting selling choices of large and small seedstock producers. The first

average represents the share of total bulls sold through each method and will be heavily

influenced by the marketing decisions of large operations. The second average indicates

the frequency of each sales method by operations of all sizes.

A vast majority (87.1%) of total bulls in the sample were sold by either private

treaty (34.4%) or private auctions (52.7%). The remaining 13% of bulls were sold using

joint auctions (8.1%), bull tests and exposition sales (2.0%), public auctions (1.9%), and

other methods (1.0%). Private treaty and private auction sales are also the most

commonly used methods as measured by a simple average across operations. The simple

average across operations is 47.4% for private treaty and 29.4% for private auction.

Therefore, the average operation sold 76.8% of its bulls using one of these two methods.

Given that private auctions account for over one-half of total bulls sold, but are less

commonly used across operations, private auctions are apparently more commonly used

by large operations. Overall, the dominance of private treaty and private auctions among

seedstock operations in the sample supports modeling producer selection of selling

method as a dichotomous choice between auctions and negotiations.

A dichotomous variable, *Private Auction,* takes a value of 1 if a respondent sold

some or all of his bulls through a private auction and 0 otherwise. Approximately 37% of

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[36] To illustrate these calculations, consider a data sample consisting of the following three operations: producer A sells 40 bulls by private treaty out of a total of 400 bulls sold; producer B sells 45 out of 50 total bulls by private treaty; and producer C sells 40 of 50 total bulls by private treaty. The percent of all bulls in the sample sold by private treaty is calculated as (40 + 45 + 40) / (400 + 50 + 50) = 25%. The simple average of percent private treaty across operations is calculated as (40/400 + 45/50 + 40/50) ÷ 3 = 60%.

seedstock operations in the sample (57 of 153) used a private auction to sell at least some of their bulls. Dichotomous specification of the dependent variable appropriately captures a seller's choice of method by separating sellers into two groups: those that hosted a private auction to sell bulls and those that did not.

The percentage of total bulls sold by private auction was also considered as an alternative specification of the dependent variable. However, this specification is less consistent with the nature of the data and the theoretical basis for predictions. The focus is more appropriately placed on a seller's choice to host an auction than on the percentage of bulls sold through auction. Decisions about the percentage of animals to sell in an auction depend less upon characteristics of the seller than upon *ex post* temporal factors. A seller may choose to hold one or more animals out of a private auction due to unacceptable condition of the animal (e.g., injury, insufficient development, or "poor quality"), poor sale day market conditions, low bidder turnout, or an acceptable private treaty offer received prior to the auction. Information about these events would be needed to appropriately analyze the many reasons why some sellers might choose to market greater or lesser percentages of their production by private auction. The survey did not include questions that would permit considering these reasons.

A seller's choice to host a private auction is appropriately viewed as an *ex ante* choice of selling mechanism. The survey elicits information about seller characteristics, and the predictions suggest that certain of these characteristics increase the likelihood that the seller will choose to host a private auction. The dichotomous choice variable

specification, *Private Auction*, therefore aligns more closely with the predictions and the survey data.

<div align="center">Independent Variables</div>

Independent regression variables were developed from survey responses as empirical proxies for relative selling cost and quality to test predictions discussed in chapter 4.

Relative Selling Cost Variables

The likelihood of a seedstock operation hosting a private auction should increase with the number of animals sold. *Total Bulls Sold* is the number of one- and two-year-old bulls that were sold by the operation for the reported year. Because seedstock bulls are the primary product of seedstock operations, other forms of production (such as bred heifers and cows) are excluded from this variable.

Sellers who enjoy bargaining are expected to be less likely to host private auctions. *Enjoy Negotiation* measures the degree to which a seller enjoys bargaining with prospective buyers. Sellers were asked to indicate their preference on a scale from 1 (very much dislike bargaining) to 5 (very much enjoy bargaining). The choice to host a private auction represents an alternative for sellers who do not enjoy bargaining with prospective buyers. *Enjoy Negotiation* is, therefore, expected to be negatively correlated with *Private Auction*.

Quality Variables

As discussed in chapter 4, seedstock operations that produce animals of higher

genetic quality are expected to attract buyers with more dispersed bid valuations. Thus,

the valuations for prospective buyers of seedstock bulls from these operations will likely

be more dispersed (using the IPV bidding assumptions). As a result, these operations will

be more likely to host private auctions. Two variables that have been identified as

indirect measures of genetic quality produced by the seedstock operation – *Sire Summary*

and *Semen Bulls* – are expected to be positively correlated with *Private Auction*.

Sire Summary represents the number of bulls an operation has historically

produced that appear in sire summaries. Sire summaries published by breed associations

list the top herd sires in the breed as an industry resource and genetic quality guide.

These animals supply genetics to other seedstock operations and, therefore, have greater

genetic influence and value than animals sold strictly as commercial breeding bulls. For

at least two reasons, the historical number of herd sires produced by an operation is an

indication that the operation is more likely to sell some highly valued bulls each year.

First, an operation that has demonstrated the ability to produce high quality bulls is likely

to produce more high quality bulls. Second, larger numbers of herd sires enhance an

operation's reputation for quality among potential buyers.

The genetic influence of superior bulls is substantially expanded through the use

of artificial insemination. Using this practice, a single bull can be used to breed

thousands of cows. Semen for AI is generally only collected from the highest quality

bulls. It is a common practice for sellers of seedstock bulls to retain an ownership share

of any semen that may be collected from a bull in the future. Respondents were asked to

report how many bulls they owned (or had an ownership interest in) that had semen

collected for AI. The variable *Semen Bulls* was developed from this number and used as

a proxy for the capacity of the operation to produce and market high quality seedstock

bulls. Historically large numbers of high quality bulls are used as an indication of future

quality. *Semen Bulls* is expected to be positively correlated with *Private Auction*.

Empirical Tests and Results

Certain characteristics of a seller and seedstock operation may affect the

probability that a seller will choose to host a private auction. A logit model is used to

estimate the likelihood of a private auction (*Private Auction* = 1) given certain

characteristics of the seller as measured by the independent variables.

Nine of the 153 surveys were deemed usable for analysis due to missing values

for at least one of the independent variables. Results are reported for regressions using

the remaining 144 observations. Summary statistics and pairwise correlations for the

dependent variable and the four explanatory variables are displayed in tables 4 and 5,

respectively.

Table 4. Seedstock Survey Data Descriptive Statistics.

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
Private Auction	144	0.35	0.0	0.48	0	1
Total Bulls Sold	144	55.7	35.0	73.8	1	580
Enjoy Negotiating	144	3.11	3.0	1.1	1	5
Semen Bulls	144	4.7	2.0	7.4	0	45
Sire Summary	144	7.7	3.0	15.3	0	100

Table 5. Pairwise Correlations for Seedstock Survey Data Regression Variables.

Variable	Auction	Semen Bulls	Sire Summary	Enjoy Negotiating	Total Bulls Sold	Proportion Bulls Auction
Auction	1.00					
Semen Bulls	0.46	1.00				
Sire Summary	0.41	**0.55**	1.00			
Enjoy Negotiating	-0.15	-0.08	0.03	1.00		
Total Bulls Sold	**0.52**	**0.66**	**0.72**	-0.01	1.00	
Proportion Bulls Auction	**0.95**	0.40	0.39	-0.14	0.46	1.00

Pairwise correlations greater than 0.50 are highlighted in bold type.

Logit Model Specification

The following basic regression equation was estimated using the seedstock survey data:

logit[*Private Auction*] = b_0 + b_1 *Total Bulls Sold* + b_2 *Enjoy Negotiating*

$\qquad$ + b_3 *Semen Bulls* + b_4 *Sire Summary* + *e*

The variables *Semen Bulls* and *Sire Summary* are both included as proxy measures for the inherent quality of bulls sold. Nonetheless, they are only moderately correlated (with a Pearson correlation coefficient of 0.55). The two variables are included together in model 1, and separately in models 2 and 3.

The logit model is a well-accepted method of analyzing binary choice data. It is superior to a linear model because it is constrained to the 0-1 interval. Mathematical properties of the logistic distribution also make computation of marginal effects from the logit model more convenient than the probit model (which is based on the normal distribution). As shown in Greene (2000), the probability, using the logistic distribution, that an observation of the dependent variable is equal to one can be written as:

$$\Pr(Y = 1) = \frac{e^{\beta'x}}{1 + e^{\beta'x}} = \Lambda(\beta'x),$$

where Y is the binary dependent variable, β' is a row-vector of coefficients for the

independent variables, x is a column-vector of independent variables, and Λ is the logistic

cumulative distribution.

Empirical Results

The results of the logit regressions for models 1 through 3 using the seedstock

survey data are presented in table 6. One-tailed hypothesis tests are appropriate when

there is a clear prediction for the sign of the independent variable. Because this is the

case for all four independent variables, one-tailed p-values are reported. Marginal effects

are computed at the sample means of the data where coefficients are statistically

significant at the 10% level for a one-tailed test. Reported marginal effects represent the

change in probability that a private auction is used resulting from a one standard

deviation change in the independent variable, x_i. Large changes in x_i can result in

extreme estimates of change in the linear approximation of the probability.

The coefficients for all the independent variables reported in table 6 have the

expected signs. Specifically, *Total Bulls Sold*, *Semen Bulls*, and *Sire Summary* all show a

positive relationship with the probability of auction, while *Enjoy Negotiating* exhibits the

expected negative sign in all three models.

Total Bulls Sold is strongly significant in all models. In addition, the marginal

effects show a very large impact of a one standard deviation change in the variable on the

probability of auction (the smallest change in Model 3 is 0.63). This is attributed, in part,

to the substantial variance in numbers of bulls sold discussed earlier. *Total Bulls Sold* has

a standard deviation of 74, or 130% of its mean of 56 bulls per operation. The strong and

statistically important effect of differences in the numbers of bulls sold on the likelihood

of auction is nonetheless quite clear.

Table 6. Logit Estimates and Marginal Effects for Seedstock Bulls.

<u>Dependent Variable</u>: Private Auction (=1 if hosted private auction, 0 otherwise)

Variable	Model 1 Coefficient	Marginal Effect	Model 2 Coefficient	Marginal Effect	Model 3 Coefficient	Marginal Effect
Intercept[1]	*-1.99*		*-1.75*		*-1.97*	
	(<0.01)		*(0.01)*		*(<0.01)*	
Total Bulls Sold	*0.04*	*0.71*	*0.04*	*0.67*	*0.04*	*0.63*
	(<0.01)		*(<0.01)*		*(<0.01)*	
Enjoy Negotiating	**-0.33**	**-0.09**	*-0.39*	*-0.11*	**-0.34**	**-0.09**
	(0.06)		*(0.03)*		**(0.05)**	
Semen Bulls	**0.07**	**0.13**			**0.06**	**0.11**
	(0.06)				**(0.08)**	
Sire Summary			**0.06**	**0.21**	0.05	
			(0.08)		(0.12)	
Log-Likelihood	-56.4		-56.5		-55.4	
Likelihood Ratio	*73.2*		*73.0*		*75.2*	
	(<0.01)		*(<0.01)*		*(<0.01)*	
Number of Observations	144		144		144	
Private Auction = 1	50		50		50	

P-values for a one-tailed test for significance shown in parentheses unless otherwise noted.
Marginal effects reported for a one standard deviation change in the independent variable.
[1] All p-values reported for the variable indicated are for a two-tailed test for significance.

Figure 3 shows a graphical illustration of marginal effects for *Total Bulls Sold*.

For values of *Total Bulls Sold* from 1 to 200, figure 3 displays marginal effects from

model 1, the predicted probability that a seedstock seller hosted a private auction,

Pr(*Private Auction*=1), and actual (0 or 1) values of *Private Auction*.

Figure 3. Predicted probability (*Private Auction* =1), marginal effects and actual values of *Private Auction* by *Total Bulls Sold.*
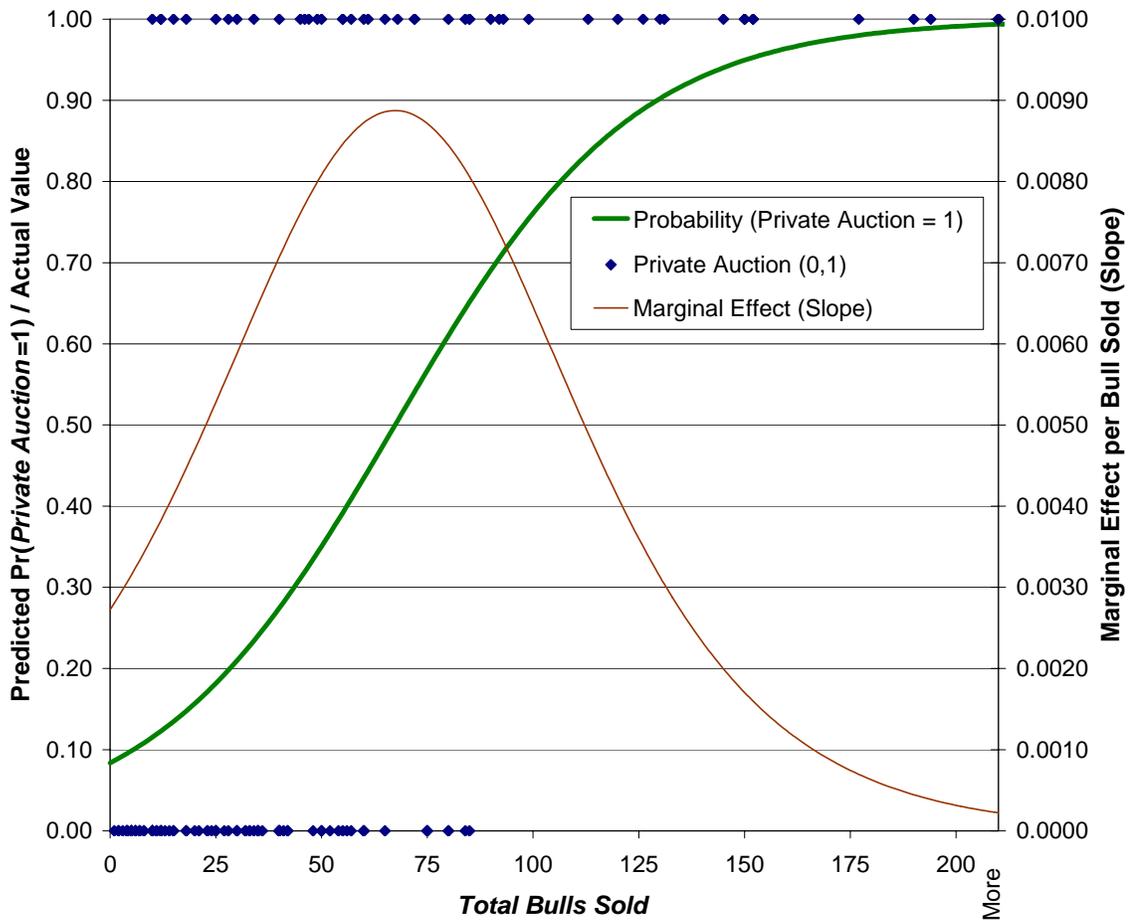
The graph in figure 3 displays the expected sigmoid shape for the cumulative logistic function as *Total Bulls Sold* increases. The slope of this function is equal to the marginal effect shown for a one unit change in *Total Bulls Sold* on Pr(*Private Auction*=1). The marginal effect is greatest when the function is evaluated near the mean of *Total Bulls Sold*. At its maximum, the marginal effect of an increase in one bull sold results in a 0.9% increase in the likelihood of private auction.

Enjoy Negotiating is also significant at the 10% level in all three models and at the 5% level in Model 2. The proxy variables for quality, *Semen Bulls* and *Sire*

Summary, both show statistical significance at the 10% level when considered separately in Models 1 and 2. However, *Sire Summary* becomes marginally insignificant in the combined model. This suggests that there is more independent information contributed by *Semen Bulls* than *Sire Summary*.

The empirical results strongly support the importance of number of bulls sold as a factor determining the seller's decision to host an auction. The results also support the notion that operations with high quality bulls are more likely to use private auctions.

CHAPTER 6

EMPIRICAL TESTS USING COMMERCIAL SURVEY DATA

A separate survey was used to collect information regarding characteristics and

selling choices of commercial cattle operations. As with the seedstock survey, each

observation in the empirical analysis reported below corresponds to a single operation.

These data are used to test predictions about factors that influence the choice of method

used to sell commercial calves.

The initial commercial cattle survey was mailed to 500 Montana cattle producers,

and 124 surveys were completed and returned. Responses to each question were

generally complete. Therefore, the same survey was sent to an additional 860

respondents with only minor revisions. The second mailing resulted in 177 returned

surveys. A completed copy of the revised commercial cattle survey is included as

Appendix B. Follow-up postcards were not sent because of the relatively high response

rates. Surveys containing reporting errors were discarded, resulting in 250 usable

surveys.

The Dependent Variable

Detailed information from commercial producers regarding sales methods for

commercial calves was used to develop the dependent regression variable. The first

survey question included a reporting matrix where producers categorized the number of

commercial cattle their operation had sold in the most recent year according to type of

animal and marketing (or selling) method. The three separate types included under the

general category of "calves sold at, near, or before weaning" were 1) steer/bull calves

(not off-sorts), 2) heifer calves (not off-sorts), and 3) off-sort calves. Off-sort calves

were defined on the survey to be "calves that were sorted out from another group for any

reason (i.e.,color, size, health, breed, defect, etc.) and sold in a separate bunch." Calves

that are off-sorted are often of lower quality. To distinguish between the two types, I will

henceforth refer to calves that were classified by the producer as not being off-sorts as

"first quality" calves. Numbers of calves for each type were separately listed in the

survey reporting matrix as having been sold through one of four marketing methods:

public auction, direct sale (private treaty/negotiation), video auction, or other method.

Table 7 displays a summary of methods used to sell commercial calves of all

types. It shows the number of calves sold by method, two distinct averages measuring

percentage use of each method, and the number and percent of operations that used the

method to sell any calves.

Table 7. Methods of Sale for Commercial Calves, All Types Combined.

| | | Number of Calves Sold | | | | | | | | Operations Using the Method | |
| | | *Number* | | | | | | *Average Percent* | | | |
Method of Sale	N	*Mean*	*Median*	*StDev*	*Min*	*Max*	*Sum*	*Percent of Calves*	*Simple Average*	*Number*	*Percent*
Public Auction	250	29.3	10.0	60.0	0	530	7,336	11.1	19.4	151	60.4
Direct Sale	250	181.0	110.0	267.6	0	2,400	45,241	68.3	66.7	192	76.8
Video Auction	250	54.8	0.0	279.9	0	4,050	13,705	20.7	13.9	43	17.2
Other Methods	250	0.0	0.0	0.1	0	2	2	0.0	0.0	1	0.4
Total Calves		265.1	184.5	408.3	2	5,135	66,284	100.0	100.0		

Two averages for use of selling method are computed – first, as a percentage of

total calves and, second, as a simple average of percentages across operations. The most

striking feature of this summary is the prevalence of direct sales. The percentage of

calves sold by direct methods and the simple average of percentages sold by direct

methods across operations both exceeded 65%. Moreover, about 77% of operations reported selling some calves using the direct sale method.

Another notable feature of the data is the relatively low percentage of calves sold by public auction. The difference between the two averages for use of public auction is also more pronounced: about 11% of all calves were sold by public auction, and the simple average across operations was about 19%. This relationship suggests that smaller operations tend to sell a higher percentage of calves through public auction than larger operations. Although the percentage of all calves sold through public auctions is relatively small, over 60% of the sample respondents reported using auctions to sell some calves. The share of calves sold through video auctions, 21%, was greater than the share sold through public auctions. However, the average of calves sold using video auctions across operations, 14%, was much smaller. Video auctions tend to market calves in truckload quantities. Thus, one would expect larger operations to use these methods more frequently than smaller operations.

The number of calves sold by methods other than public auction, direct sale, or video auction was negligible.[37] Overall, the data summarized in table 7 are consistent with estimates reported by Schmitz, et al. for the share of commercial calves sold using the various methods. The data indicate that Montana operations sell a much higher

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[37] This was partly due to data validation procedures. Respondents were asked to describe "other methods" to ensure that animals reported here were not more appropriately classified under one of the three major categories. Survey observations were excluded if descriptions were not included or not clear. It is nevertheless the case that public auctions, direct sales, and video/internet auctions account for all but a handful of sales of commercial calves reported in the sample.

percentage of calves through direct sales and a much lower percentage through public

auctions than most other cattle producing states.

Table 8. Methods of Sale for Commercial Calves by Type.

				Number of Calves Sold						Operations Using the Method	
Type:				*Number*				*Average Percent*			
								Percent of	*Simple*		
Method of Sale	N	*Mean*	*Median*	*StDev*	*Min*	*Max*	*Sum*	*Calves*	*Average*	*Number*	*Percent*
Steer Calves:											
Public Auction	248	11.6	0.0	36.2	0	385	2,884	7.2	15.5	64	25.8
Direct Sale	248	112.9	70.0	177.2	0	1,500	28,009	69.6	69.5	182	73.4
Video Auction	248	37.7	0.0	239.8	0	3,650	9,357	23.2	15.0	40	16.1
Other Methods	248	0.0	0.0	0.0	0	0	0	0.0	0.0	0	0.0
Total Steer Calves	248	162.3	100.0	282.1	2	3,650	40,250	100.0	100.0		
Heifer Calves:											
Public Auction	224	12.2	0.0	31.3	0	260	2,741	11.6	21.3	67	29.9
Direct Sale	224	74.3	45.5	123.5	0	1,050	16,634	70.3	66.4	156	69.6
Video Auction	224	19.1	0.0	64.5	0	549	4,278	18.1	12.3	30	13.4
Other Methods	224	0.0	0.0	0.0	0	0	0	0.0	0.0	0	0.0
Total Heifer Calves	224	105.6	73.5	140.2	2	1,450	23,653	100.0	100.0		
Off-sort Calves:											
Public Auction	126	13.6	10.0	16.7	0	100	1,711	71.9	79.1	102	81.0
Direct Sale	126	4.7	0.0	18.0	0	167	598	25.1	18.5	25	19.8
Video Auction	126	0.6	0.0	3.7	0	30	70	2.9	2.4	3	2.4
Other Methods	126	0.0	0.0	0.2	0	2	2	0.1	0.1	1	0.8
Total Off-sort Calves	126	18.9	12.0	22.7	1	167	2,381	100.0	100.0		

Summaries of methods used to sell commercial calves are displayed by type in

table 8. These summaries reveal a dramatic difference between the use of public auctions

to sell off-sort calves versus first quality steers and heifers. Over 70% of off-sort calves

were sold at public auction and the average was almost 80% when taken across

operations. About 50% of the 250 operations in the sample of usable surveys reported

selling off-sorts, and 81% of these reported selling some or all off-sorts through public

auctions. A third summary, shown in table 9, reports method of sale for first quality

calves.

Table 9. Methods of Sale for Commercial Calves, First Quality.

Method of Sale	N	Number						Average Percent		Operations Using the Method	
		Mean	Median	StDev	Min	Max	Sum	Percent of Calves	Simple Average	Number	Percent
Public Auction	250	22.5	0.0	60.0	0	530	5,625	8.8	17.1	76	30.4
Direct Sale	250	178.6	110.0	265.3	0	2,400	44,643	69.9	68.5	190	76.0
Video Auction	250	54.5	0.0	279.3	0	4,050	13,635	21.3	14.4	43	17.2
Other Methods	250	0.0	0.0	0.0	0	0	0	0.0	0.0	0	0.0
Total First Quality Calves	250	255.6	174.5	402.2	2	5,100	63,903	100.0	100.0		

The most notable difference between this subgroup and all calves (table 7) is a lower use of public auctions. With off-sort lots excluded, only about 30% of operations in the sample used public auctions to sell first quality calves. Figure 4 shows a histogram of the total number of calves sold by commercial operations in the sample population.

Figure 4. Histogram of total calves sold for 250 commercial operations.
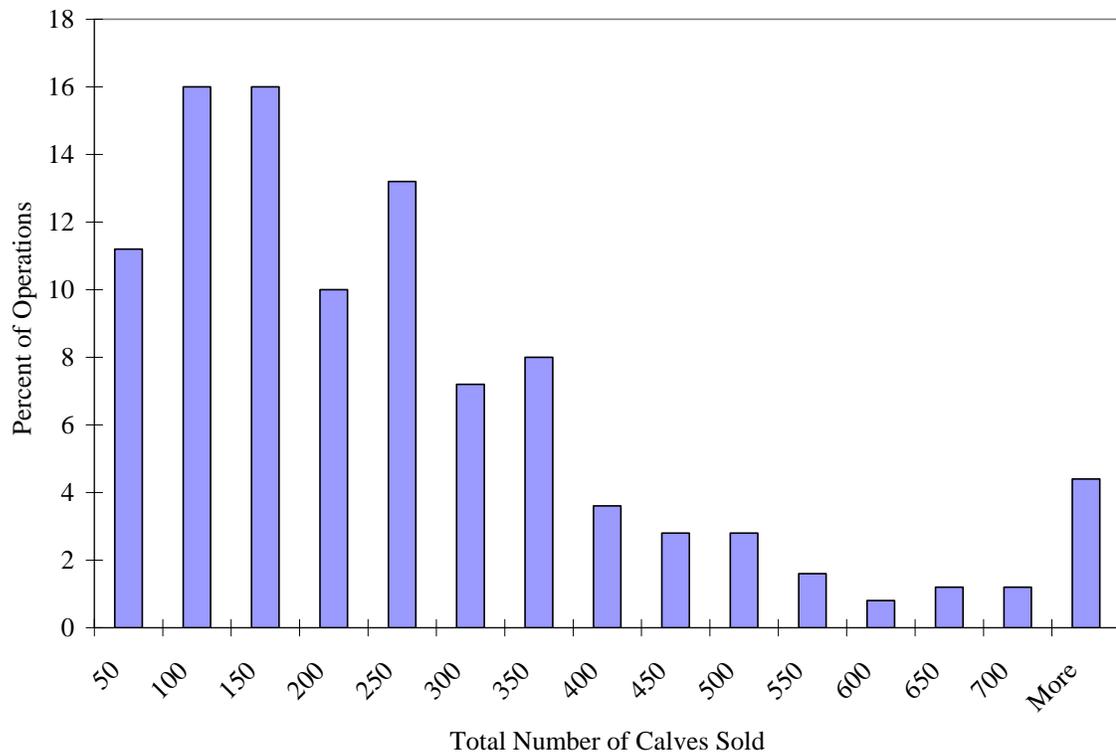
The distribution of operations by number of calves sold shown in figure 4 is positively skewed. The third moment and the skewness statistic (equal to 7.9) are both positive. Over one-half of operations sold 200 or fewer calves and over 90% sold 500 or fewer. Less than 4% of operations sold more than 700 total calves.

The dependent regression variable is specified as the percent of commercial calves sold by public auction. This specification of the dependent variable is more appropriate than the dichotomous specification used for the seedstock data. This is due in large part to important differences in seller costs of using public auctions to sell commercial calves and hosting private auctions to sell seedstock bulls. Specifically, a commercial producer can choose to sell animals at several regularly scheduled public auction sales, whereas private auctions are the result of organization, planning, and advertising initiated by a seller. As discussed in chapter 3, the direct costs to the commercial seller of using a public auction include a commission paid on gross sales revenue and the cost of transporting calves to the sale yard. Total costs of using public auctions are expected to increase roughly in proportion to the number of calves sold; there is no large fixed component of cost to be spread across the number of animals.

Because sellers face relatively constant marginal costs per animal of using public auctions (rather than large fixed costs), they are able to use public auctions to sell a selected portion of their calves even if they choose to market most of their calves using direct sales. Therefore, the proportion of animals sold using public auction is relevant to my analysis. Factors discussed in chapter 4 are expected to influence the proportion of a seller's animals that are sold at auction.

Some evidence suggests that public auctions are often used to sell "odd lots" of off-sort calves in groups that are too small to fill a truckload. Marginal costs of shipping additional calves from a ranch (in a private treaty or video auction sale) increase substantially once the last truck has been filled and the remaining calves will not fill another truck. In this case, a seller may sort those calves for which lower marginal revenues are expected (e.g., those that don't fit into a uniform group) to be sold at public auction where marginal selling costs are lower. This notion is supported by the data. Over 70% of calves classified as off-sorts were sold by public auction.

Percent Public Auction is calculated as the percentage of first quality commercial calves sold by public auction. Limiting the dependent variable to first quality calves focuses on the seller's primary marketing strategy. Selling alternatives for off-sort calves are expected to be limited by the relatively small number of calves that are generally included in this group and by the fact that they are not uniform (by definition). The seller's decision criteria for off-sorts are, therefore, different than the decision criteria for first quality calves. Excluding off-sorts from the proportion sold by auction limits the analysis to choice of selling method for primary production.

Percent Public Auction appropriately divides the proportion of first quality calves into two parts – those sold by public auction and those sold using negotiated direct sales or video auctions. As noted in chapter 4, direct sales and video auctions are similar to one another and different from public auctions in two important respects as related to variable predictions. Both methods involve direct shipment of calves from the ranch to the buyer and eliminate the additional cost of intermediate transportation to a sale yard

that is incurred when using public auctions. Direct and video auction sales are also similar in the sense that both selling methods limit buyer presale measurement opportunities relative to public auctions.

Independent Variables

The commercial cattle survey data contain information about the characteristics of each surveyed operation. Variables developed from these survey responses are used to test the predictions discussed in chapter 4 as they pertain to a commercial producer's choice of marketing method. I am interested in the influence of selling costs, bargaining, and quality characteristics on sales method selection.

Relative Selling Cost Variables

Total Calves Sold includes the total number of first quality and off-sort calves sold by the operation. Larger cattle operations enjoy more marketing options due to scale economies of shipping truckload lots directly from a ranch. This variable is predicted to have a negative relationship with the percent of first quality calves sold through public auction.

The distance that cattle must be transported from a ranch will affect transportation costs of using both public auctions and other selling methods that involve direct shipments. The variable *Location* represents the number of miles that calves must be transported from an operation to reach the nearest public auction facility. There is no predicted sign for this variable. Because a large proportion of calves raised in Montana will be shipped to feedlots in another state, it is unlikely that a direct shipment destination

would be closer than the auction yard. Indeed, *Location* may act as a proxy for the degree to which operations are remote from central locations where auctions are located. A significant sign may provide information about the relative influence this added transportation cost has on public auctions versus other methods.

Producers for whom ranching is a full-time occupation may be more likely to educate themselves about available marketing opportunities and establish contacts necessary to participate in direct negotiations with cattle buyers. For "hobby farmers," whose primary focus is other than cattle production, public auctions represent a fast and easily accessible marketing method. *Primary Occupation* is a dichotomous variable taking a value of 1 if a respondent considers cattle production or ranching to be his primary occupation and 0 if he does not. This variable is expected to have a negative relationship with the percent of first quality calves sold by public auction.

Quality Variables

Three proxies are used to measure quality characteristics of commercial calves sold by each operation. An increase in calf quality is likely to increase uncertainty about underlying values (i.e., CV dispersion of bid valuations). Buyers will attempt to reduce uncertainty through increased presale measurement. Sellers are, therefore, expected to use negotiations or video auctions rather than public auctions to sell higher quality calves as a means of limiting presale measurement activity.

The first proxy for quality is the percentage of a seller's commercial calf crop produced using artificial insemination. *Percent AI Calves* is developed from information reported by the operation in response to question 12 of the commercial survey. Artificial

insemination reduces the costs of siring higher quality commercial calves from higher quality bulls.

Question 23 of the survey asked each respondent to rank the degree that his operation emphasized "genetic management targeted specifically toward marketing your commercial cattle at a premium for yield, grade, and/or performance." *Premium Genetics* can take values from 0, indicating no emphasis on genetic management for marketing purposes, to 10, indicating strong emphasis. This variable is more subjective than other proxy measures used in this research, and the variable is potentially vulnerable to reporting bias. However, this measure identifies producers who are attempting to differentiate their calves through genetic quality.

The third proxy for quality considers information provided by the seller regarding past performance of calves. *Calf Performance Data* is developed from question 7 of the commercial survey. It is a dichotomous variable taking a value of 1 if the seller either orally represented or provided documentation about past feedlot or carcass performance data. This variable indicates the capability of the seller to provide information about quality attributes.

Increasing values for all three variables are expected to correspond to increasing quality of a respondent's calves. As proxies for CV value dispersion, they are expected to exhibit negative signs in regressions with *Percent Public Auction*.

Other Variables

Two variables, *Uniform* and *Percent Off-sorts*, are included in the regression model because they measure characteristics that are relevant to marketing commercial

calves. Cattle producers were asked the degree to which a buyer would consider their

calf crop to be uniform in terms of size, color, breed, and any other characteristics they

might consider to be important. The variable *Uniform* takes a value from 1, if the calves

are considered very mixed, to 10, if the calves are nearly identical. As discussed in

chapter 3, uniformity of a group of calves is a valuable characteristic for which buyers

may pay a premium. Because it is achieved through genetic management, uniformity

may also suggest the presence of other genetic quality attributes (such as better feedlot

and carcass performance). I predicted in chapter 4 that sellers will sell higher quality

calves using negotiations to limit duplicative buyer presale measurement. Presale

measurement may not increase, however, if buyers quickly assess uniformity using visual

inspection exclusively. If buyers interpret uniformity as a signal of genetic quality, total

measurement could even be reduced, and sellers may be more likely to sell uniform

calves using public auctions. As a result, the expected coefficient on *Uniformity* is

ambiguous.

Percent Off-sorts measures the proportion of total calves that were classified as

off-sorts. This variable is included in the regressions to test whether or not the percent of

off-sorts calves that are sold influences the method used to sell the first quality calves.

The *a priori* sign for the coefficient on *Percent Off-sorts* is also ambiguous.

Empirical Tests and Results

The commercial data set is used to investigate the influence of certain seller

characteristics on the proportion of calves that are sold through public auction. Because

the dependent variable is a percentage censored at 0 and 100, a two-limit tobit regression

model is used. The general two-limit Tobit model is specified as follows (Greene 2000):

$$y^* = \beta'x + e$$

and

$y\quad = L_1 \quad$ if $y^* \le L_1$

$\quad = y^* \quad$ if $L_1 < y^* < L_2$

$\quad = L_2 \quad$ if $y^* \ge L_2,$

where y^* is the index (or latent) variable, x is a vector of independent variables, L_1 is the

lower limit, and L_2 is the upper limit. In this case, $L_1 = 0$ and $L_2 = 100$.

The data used for this regression were limited to 209 observations with no

missing values of the independent variables. Tables 10 and 11 present descriptive

statistics for the usable data set of 250 observations and the regression data set of 209

observations, respectively. Pairwise correlations for the commercial survey regression

data are displayed in table 12.

Table 10. Commercial Survey Data Descriptive Statistics, All Usable Observations.

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
Percent Public Auction	250	17.1	0	33.7	0	100
Percent Off-sorts	250	3.5	0.6	5.5	0	39
Total Calves Sold	250	265	185	408	2	5,135
Location	243	67.2	52	83.3	0	1,150
Primary Occupation	246	0.76	1	0.43	0	1
Uniform	238	7.2	7	1.5	3	10
Percent AI Calves	243	7.2	0	15.2	0	100
Premium Genetics	243	6.6	7	2.3	0	10
Calf Performance Data	250	0.33	0	0.47	0	1

Table 11. Commercial Survey Data Descriptive Statistics, No Missing Observations.

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
Percent Public Auction	209	17.1	0	33.3	0	100
Percent Off-sorts	209	3.5	0.0	5.6	0	39
Total Calves Sold	209	283	185	440	2	5,135
Location	209	69.0	52	89.1	0	1,150
Primary Occupation	209	0.78	1	0.42	0	1
Uniform	209	7.2	7	1.5	3	10
Percent AI Calves	209	6.0	0	12.8	0	75
Premium Genetics	209	6.6	7	2.3	0	10
Calf Performance Data	209	0.32	0	0.47	0	1

Table 12. Pairwise Correlations for Seedstock Survey Data Regression Variables.

Variable	Percent Public Auction	Percent Offsorts	Total Calves Sold	Location	Primary Occupation	Uniform	Percent AI Calves	Premium Genetics	Calf Performance Data
Percent Public Auction	1.00								
Percent Offsorts	-0.16	1.00							
Total Calves Sold	-0.16	0.00	1.00						
Location	0.23	-0.04	-0.02	1.00					
Primary Occupation	-0.10	0.04	0.21	0.06	1.00				
Uniform	-0.10	0.10	0.06	-0.06	0.03	1.00			
Percent AI Calves	-0.13	0.05	0.08	-0.04	0.05	0.04	1.00		
Premium Genetics	-0.19	0.02	0.14	0.01	0.09	0.27	0.15	1.00	
Calf Performance Data	-0.13	0.02	0.23	0.05	0.08	0.07	0.16	0.32	1.00

<u>Tobit Model Specification</u>

The basic regression equation for the commercial survey data estimated in model 1 is,

Percent Public Auction* = b_0 + b_1 Percent Off-sorts

> *+ b_2 Total Calves Sold + b_3 Location + b_4 Primary Occupation*

> *+ b_5 Uniform + b_6 Percent AI Calves + b_7 Premium Genetics*

> *+ b_8 Calf Performance Data + e*

where the latent variable, *Percent Public Auction**, is the percentage of commercial

calves sold by public auction for each group (taking values from 0 to 100). Just over

80% of the dependent variable observations in the first model are limit observations
where the operation reported selling all (11% of observations) or none (70% of
observations) of their first quality commercial calves by public auction.

Empirical Results

Results from the tobit regressions using commercial survey data are reported in
table 13. The table shows tobit coefficents and one-tailed p-values where there is a
predicted sign for the coefficient. Marginal effects from the tobit model are calculated
where the coefficients were significant at the 10% level. These show the estimated
percentage change in calves sold using public auctions caused by a one standard
deviation change in the explanatory variable at the mean of all explanatory variables. For
example, a marginal effect of 5 would represent a 5% change in *Percent Public Auction*
resulting from a one standard deviation change in the independent variable.

The tobit marginal effect has two parts. The first is the change in the dependent
variable for observations where the dependent variable is between the limits. This effect
is weighted by the probability of being between the limits. The second effect is the
change in the probability of being between the limits weighted by the expected value of
the dependent variable when between the limits. Hobbs (1997) presents a useful
derivation of the mathematical formulae used to compute these marginal effects for the
two-limit tobit model where a proportional dependent variable is censored at 0 and 1. To
calculate the marginal effect, the slope (calculated as the estimated coefficient multiplied
by the mean value of the variable) is scaled by the probability that the dependent variable
falls between the limits (is not censored).

Table 13. Tobit Estimates and Marginal Effects for Commercial Calves.

Dependent Variable: Percent Public Auction (0-100)

Variable	Model 1 Coefficient	Marginal Effect	Model 2 Coefficient	Marginal Effect	Model 3 Coefficient	Marginal Effect
Intercept[1]	43.09		42.57		16.33	
	(0.42)		(0.43)		(0.76)	
Percent Off-sorts[1]	-2.74		-2.88		**-3.14**	**-3.64**
	(0.14)		(0.12)		**(0.10)**	
Total Calves Sold	*-0.12*	*-10.61*	*-0.13*	*-11.56*	*-0.12*	*-10.92*
	(0.02)		*(0.01)*		*(0.02)*	
Location[1]	*0.32*	*5.93*	*0.32*	*6.05*	*0.33*	*6.09*
	(0.02)		*(0.02)*		*(0.02)*	
Primary Occupation	-10.40		-9.75		-13.04	
	(0.33)		(0.34)		(0.30)	
Uniform[1]	-2.47		-1.88		-5.17	
	(0.72)		(0.78)		(0.44)	
Percent AI Calves	**-1.56**	**-4.11**				
	(0.06)					
Premium Genetics	**-6.89**	**-3.21**	*-9.71*	*-4.59*		
	(0.07)		*(0.02)*			
Calf Performance Data	-29.25				*-44.31*	*-4.28*
	(0.12)				*(0.03)*	
Log-Likelihood	-337.5		-339.8		-340.3	
Number of Observations	209		209		209	
Left Censored	146		146		146	
Right Censored	22		22		22	

P-values for a one-tailed test for significance shown in parentheses unless otherwise noted.
Marginal effects reported for a one standard deviation change in the independent variable.
[1] All p-values reported for the variable indicated are for a two-tailed test for significance.

The coefficient on *Total Calves Sold* in model 1 has the expected sign (negative) and is significant. The estimated marginal effect suggests that producers will sell 10.61% fewer first-quality calves by public auction as the total number of calves increases by one standard deviation (440 calves). There were no predicted signs for either *Percent Off-sorts* or *Uniform*, and the estimated regression coefficients for these variables are not

significant using two-tailed tests. The variable *Primary Occupation* is also not significantly different from zero.

There was not a clear predicted sign for the variable *Location*. However, this variable is statistically significant a positive coefficient. The interpretation for this estimate is that sellers located farther from the nearest public auction facility are more likely to sell their calves by public auction. An increase in distance clearly increases the absolute cost of selling through public auction, but the positive regression sign suggests that the relative cost of using public auctions may decrease with distance. If *Location* serves as a proxy for geographically remote operations, the positive sign may suggest that buyers are less willing to ship directly from these remote locations. Increased use of public auctions may be the result of sellers in remote areas responding to lack of buyer interest by transporting their calves to a central location.

All three of the quality variables exhibit the expected negative sign in Model 1. Both *Percent AI Calves* and *Premium Genetics* are also highly significant. Two alternative equations (models 2 and 3) were estimated to further examine the effects of the quality variables. Results from these models are also shown in table 13. In model 2, *Premium Genetics* is included as the only quality variable. Its estimated coefficient is again negative and even more strongly significant, with a one-tailed p-value of 0.02 as compared to 0.07 in model 1. The estimated marginal effect of a one standard deviation increase in *Premium Genetics* in model 2 is a 4.59% decrease in *Percent Public Auction*. *Calf Performance Data* is the only quality variable in model 3. Its estimated sign is negative and highly significant. Estimated coefficients for all other model variables

remain qualitatively unchanged in models 2 and 3. The results of all three models are

consistent with the hypothesis that higher quality calves are more likely to be sold by

direct sale or video auction rather than public auction.

As discussed previously, the dependent variable *Percent Public Auction* compares

the percent of calves sold using public auctions to the percent of calves sold using either

direct or video auctions. I have suggested that this specification is appropriate because

direct sales and video auctions are similar in two senses – both methods facilitate

shipment directly from the ranch to the buyer and both methods limit buyer measurement

opportunities. To isolate comparison between public auctions and direct sales, models 1

through 3 were re-estimated using an alternative specification of the dependent variable

in which calves sold by video auction were excluded. The alternative dependent variable

was the number of calves sold by public auction as a percent of total number of calves

sold by either public auction or direct sale. Results from all three models estimated using

the alternative dependent variable were qualitatively the same as the results presented

previously. This finding supports the original dependent variable specification.

In summary, the empirical analysis of commercial survey data presented in this

chapter yields several interesting results. The bargaining cost predictions for sellers

whose primary occupation is ranching are not supported. However, my results suggest

that commercial cattle operations in remote locations may be more likely to use auctions.

Overall, the empirical analysis provides support for my two major hypotheses. First,

sellers appear likely to choose direct sales and video auctions instead of public auction as

the total number of calves sold increases. Second, high quality calves tend to be sold by

private treaty or video auction rather than by public auctions.

CHAPTER 7

EMPIRICAL TESTS USING SEEDSTOCK TRANSACTION DATA

The analysis to this point has considered the influence of operational and herd

characteristics on a seller's choice to use auctions versus negotiations or other selling

methods. In chapter 4, I also suggested that certain characteristics of sale items

themselves may influence the likelihood that they will be sold by auction. Empirical

testing for predictions related to characteristics of individual sale goods requires detailed

transaction data.

Primary data containing sales transaction information for individual animals were

collected from a large Montana seedstock producer. These data are used to investigate

the influence of individual bull characteristics on a seller's decision to market bulls using

a private auction or private treaty negotiations. This seller uses both methods to market a

large number of bulls each year by both methods.

The data include information for 4,845 bulls from a single marketing year. Of

these, 2,853 bulls were pre-selected for sale as seedstock and the rest were not marketed

as seedstock. Only bulls designated for sale as seedstock are considered in subsequent

analysis.

The Dependent Variable

A 0-1 dichotomous variable indicating whether or not a bull was actually sold

through auction seems at first to be an appealing specification of the dependent

regression variable. However, these data do not contain information about specific

reasons that may have caused the seller to change the intended method of sale for a specific bull. For example, injury or illness as auction time nears might cause certain animals to be withdrawn. Such information was not available from the seller. Specifying the dependent variable based on actual selling method would result in the omission of this important information from the explanatory model. This may or may not result in bias depending on the extent to which the omitted variables are correlated with other model variables (e.g., does presale illness or injury correlate with performance measures or age in days?). The problem is avoided by specifying the dependent variable based on the seller's original intended choice of sales method.

The data contain substantial information used by the seller to determine whether an animal should be sold by auction or by private treaty. Bulls that had been initially selected for an auction sale were identified by gathering information from the seller's auction catalog.[38] The dependent variable, *Auction Select* takes a value of one if the animal appeared in the auction catalog or was sold by auction and zero otherwise.[39] About 51% of bulls in the data set were selected for auction and the remaining 49% were designated for private treaty sale.

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[38] The auction catalog was prepared and distributed to buyers well in advance of the auction. Bulls appearing in the catalog are therefore expected to have been initially designated by the seller for auction based on information available in advance of the sale.

[39] A total of 4 bulls were not listed in the sale catalog but sold in the auction. Based on conversations with the producer, these animals were thought to have been originally selected but were simply omitted from the catalog in error.

<u>Independent Variables</u>

Explanatory variables were developed from information provided by the seller for each bull. Many of these measure aspects of bull quality. Higher bull quality is expected to increase the likelihood of auction sale as described in chapter 4. There are no predictions suggesting that bull attributes will impact the average costs of using auctions relative to private treaty negotiations. However, some additional variables of possible importance in determining method of sale for these animals are discussed.

<u>Quality Variables</u>

Phenotypic scores were assigned by visual inspection (conducted by the seller or his employees) approximately two months prior to the April auction. These scores represent a subjective measure of the degree to which certain desirable qualities were physically manifest in the animal. The animals were scored separately for a variety of traits including muscling (light to heavy), condition (little flesh to fleshy), length (short to long), depth (shallow to deep bodied), hair color (light red to black), hair coat (long and curly to slick), eye appeal (ugly to very attractive), and disposition (wild to quiet). Additionally, each bull was given a score for overall phenotype that graded the bull from marginal to outstanding on a scale of one to nine. Phenotypic scores were recorded for 2,241 (78.5%) of the bulls in the dataset (this represents 97% of animals selected for auction and 59% of those not selected). Only *Overall Phenotype* is used in the regression analysis because it is a composite measure of all the other phenotypic scores described above. Animals that express desirable genetic traits are expected to be of higher quality. The sign on *Overall Phenotype* is expected to be positive.

The seller recorded measurements of the animal at various stages of development and provided them to buyers. These "simple performance measures" (SPMs) provide buyers with information about an individual animal's weight and growth characteristics. These include birth, weaning, and yearling weights. According to industry standards and to facilitate comparison between animals, weaning and yearling weights were adjusted by the seller to account for differences in days of age at time of measurement. Other measurements in the data include frame score (a measure of skeletal frame size), average daily weight gain in the feedlot, and weight per day of age.[40]

Weight Per Day of Age is used as a proxy for the many simple performance measures related to growth and weight. It is calculated by dividing each animal's weight by its age in days. The weight gain exhibited by a seedstock bull is considered an important indication of genetic potential that may be inherited by his calves. Because commercial beef cattle are largely valued by the pound, greater weight corresponds to higher quality. *Weight Per Day of Age* is expected to be positively correlated with likelihood of auction sale. Any of several measures described above could have been used with similar predicted response. However, *Weight Per Day of Age* was chosen

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[40] In addition to SPMs, the data contain expected progeny difference (EPD) statistics for 1,289 (45%) of the bulls. EPDs measure a bull's expected performance relative to its peer group based on its own performance and that of its ancestors and siblings. EPDs were developed by the seedstock industry to estimate the expected heritability of important traits. SPMs were used in my analysis instead of EPDs as independent variable proxies for weight and growth for several reasons. Because all of the bulls in the data set are less than two years of age, their EPDs are heavily influenced by their own SPMs. Chvosta, Rucker, and Watts (2001) have shown that SPMs contain more information to explain prices paid by buyers for bulls within a herd than EPDs. SPMs were also available for a much greater percentage of bulls in the data. Availability of EPD statistics depends on the registration of the bull with a breed association. Because EPD statistics are reported by breed associations, bulls not registered in a breed association did not have EPD scores available. Bulls of mixed breed composition are less likely to meet breed registry requirements, and so were less likely to have reported EPDs. It is likely that missing EPDs for some other bulls may have been due to record keeping errors.

because it is a measure of development and growth taken relatively near the sale date, and it is inherently standardized for animals of different ages.

Maternal traits describe genetics that a seedstock bull passes on to its female offspring, which, in turn, affect the performance of calves produced by that female. These traits are important for buyers hoping to produce breeding females from the bull. Because the value of maternal traits to a buyer is theoretically independent of a bull's own growth and weight characteristics, these are considered separately. *EPD Maternal* represents the expected heritability of maternal traits through the bull. Higher quality bulls will have higher values of this measure and the sign is expected to be positive.

In addition to phenotypic and weight measures, the seedstock sale data include other information of possible importance in determining quality and whether an animal was offered in the auction. Two additional variables were created using this information. The first, *Scrotal Circumference*, is a measure used to help determine breeding capacity. As a proxy for quality, it is expected to have a positive correlation with likelihood of auction. The second variable contains information about pedigree, which buyers often use to evaluate quality. Certain bulls develop exceptional reputations because they have sired other top breed performers. Two sires were chosen because they had the highest average selling price for their progeny among sires with a minimum of 50 seedstock bulls sold that year. Both of these bulls were also among the most prominently featured in the seller's marketing literature. The 0-1 dichotomous variable *Top Sire* was developed to

identify bulls having either of these two bulls in their pedigree.[41] *Top Sire* is used as a

proxy for quality reputation and is expected to be positively correlated with the likelihood

that a bull was selected for auction.

Other Variables

Date of birth was used to calculate the age in days of each bull at the time of the

private auction (*Sale Age*). The age of a bull at time of auction determines current stage

development. Older animals are expected to be more likely sold by auction for two

reasons. First, they are more likely to be ready to breed in the breeding season

immediately following the auction than younger bulls. Second, they may be more easily

evaluated and compared by buyers because they are more fully developed.

Although the seller marketed many breeds of seedstock bulls, the operation's

reputation was built mainly on producing high quality Red Angus seedstock. A variable

was developed to measure whether Red Angus bulls were more or less likely to be

selected for the auction. The dummy variable *Red Angus 97%* is equal to one if the

animal's reported breed composition is at least 97% Red Angus, and zero otherwise. The

expected sign for this variable is ambiguous. However, because the seller's reputation

was primarily founded on the sale of Red Angus bulls, it seems reasonable that the bull

auction may draw more Red Angus buyers. If this is the case, then Red Angus bulls may

be more likely to sell by auction to satisfy the greater demand.

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[41] There is no single, clear set of criteria to identify sires with the best reputation. The selection of bulls that comprise the variable *Top Sire* is therefore somewhat subjective. However, the quality reputations of the two sires selected for development of the variable are expected to be among the best, if not the best, of all sires in the sample group.

Empirical Tests and Results

The data are used to test for attributes that influence whether or not a given

seedstock bull was selected for auction sale. I use a logit model to estimate the

probability that a bull was selected for auction (*Auction Select* = 1) given values of the

independent variables that measure characteristics of the animal.

Table 14 shows summary statistics for the dependent and independent variables in

the complete data set of 2,853 bulls selected for sale as seedstock. This table reveals that

observations for some independent variables are missing, as mentioned previously.

Table 14. Seedstock Transaction Data Descriptive Statistics, All Observations.

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
Auction Select	2,853	0.51	1	0.50	0	1
Sale Age	2,853	398	397	26	285	475
Weight Per Day of Age	2,824	2.81	2.83	0.30	1.46	3.83
Overall Phenotype	2,241	6.49	6	1.34	4	9
Scrotal Circumference	2,697	34.8	34.8	2.9	1.9	45.5
EPD Maternal	1,254	30.4	31	8.1	-2	54
Red Angus 97%	2,853	0.23	0	0.42	0	1
Top Sire	2,853	0.04	0	0.20	0	1

Regression analysis was only possible for subsets of observations that included

values for all model variables. Table 15 displays summary statistics only for those

observations that did not have missing values for any of variables used in regression

analysis (the limited data set).

Table 15. Seedstock Transaction Data Descriptive Statistics, No Missing Observations.

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
Auction Select	972	0.64	1	0.48	0	1
Sale Age	972	403	398	25	338	475
Weight Per Day of Age	972	2.87	2.86	0.25	2.15	3.83
Overall Phenotype	972	6.55	6	1.36	4	9
Scrotal Circumference	972	35.2	35.1	2.3	29.5	45.5
EPD Maternal	972	30.6	31	8.2	0	54
Red Angus 97%	972	0.51	1	0.50	0	1
Top Sire	972	0.10	0	0.31	0	1

A comparison of the two tables reveals that share of bulls sold by auction is higher in the limited data set (64%) than in the complete data set (51%). Table 15 excludes the largest share of observations for missing values of *Overall Phenotype* and *EPD Maternal*. This implies that bulls sold by auction were slightly more likely to have had breed EPD information and to have been scored for phenotype than bulls designated for private treaty. However, the numbers of 0 and 1 values of the dependent variable are still fairly balanced in the limited data.

Mean values for the independent variables were largely the same between the complete and limited data sets with the exception of the two dummy variables, *Red Angus 97%* and *Top Sire*. The share of predominately Red Angus bulls, as measured by the mean of *Red Angus 97%*, increased from 23% of all bulls selected for seedstock sale to 51% of bulls selected for seedstock when observations with missing values for phenotype or EPD were excluded. The share of bulls from the top two sires also more than doubled with this data limitation; the mean of *Top Sire* increased from 4% to 10%.

Logit Model Specification

The following general equation was estimated as model 1 using the seedstock

producer transaction data:

logit[*Auction Select*] = b_0 + b_1 *Sale Age* + b_2 *Weight Per Day of Age*

$+ b_3$ *Overall Phenotype* + b_4 *Scrotal Circumference*

$+ b_5$ *EPD Maternal* + b_6 *Red Angus 97%* + b_7 *Top Sire* + *e*

Table 16 displays simple pairwise correlations between model variables for the

data set of 972 observations with no missing values for any of the independent variables.

Table 16. Pairwise Correlations for Seedstock Transaction Data Regression Variables.

Variable	Auction Select	Sale Age	Weight Per Day of Age	Overall Phenotype	Scrotal Circumference	EPD Maternal	Red Angus 97%	Top Sire
Auction Select	1.00							
Sale Age	0.24	1.00						
Weight Per Day of Age	0.43	-0.12	1.00					
Overall Phenotype	**0.70**	0.29	**0.57**	1.00				
Scrotal Circumference	0.23	0.09	0.35	0.27	1.00			
EPD Maternal	0.21	0.04	0.15	0.23	0.05	1.00		
Red Angus 97%	-0.11	0.09	-0.09	-0.05	0.05	0.12	1.00	
Top Sire	0.09	0.05	0.07	0.13	-0.01	0.09	0.28	1.00

Pairwise correlations greater than 0.50 are highlighted in bold type.

Correlations between the independent variables are relatively low, with the

exception of *Overall Phenotype* and *Weight Per Day of Age*, which equals 0.57.

Empirical Results

Table 17 displays the logit regression results from the seedstock producer

transaction data. P-values are reported for one-tailed significance tests on all coefficients

except *Red Angus 97%*, for which a two-tailed p-value is reported because the predicted

sign of the coefficient is ambiguous.

Table 17. Logit Estimates and Marginal Effects for Seedstock Transactions Data.

<u>Dependent Variable</u>: Auction Select (=1 if selected for private auction, 0 otherwise)

Variable	Model 1 Coefficient	Model 1 Marginal Effect	Model 2 Coefficient	Model 2 Marginal Effect	Model 3 Coefficient	Model 3 Marginal Effect	Model 4 Coefficient	Model 4 Marginal Effect	Model 5 Coefficient	Model 5 Marginal Effect
Intercept[1]	-20.13		-35.47		-17.95		-20.88		-31.95	
	(<0.01)		(<0.01)		(<0.01)		(<0.01)		(<0.01)	
Sale Age	0.01	0.05	0.04	0.20	0.01	0.04	0.01	0.07	0.03	0.18
	(<0.01)		(<0.01)		(0.01)		(<0.01)		(<0.01)	
Wt. Per Day of Age	1.15	0.05	5.52	0.28	1.04	0.04	2.04	0.10	5.05	0.30
	(0.03)		(<0.01)		(0.04)		(<0.01)		(<0.01)	
Overall Phenotype	1.49	0.32			1.56	0.34	1.04	0.28		
	(<0.01)				(<0.01)		(<0.01)			
Scrotal Circumference	0.08	0.03	0.10	0.04	0.06	0.02	0.10	0.04	0.17	0.09
	(0.05)		(<0.01)		(0.08)		(<0.01)		(<0.01)	
EPD Maternal	0.04	0.05	0.06	0.10						
	(<0.01)		(<0.01)							
Red Angus 97%[1]	-0.74	-0.12	-0.85	-0.17	-0.55	-0.09	-0.36	-0.07	-0.62	-0.15
	(<0.01)		(<0.01)		(<0.01)		(<0.01)		(<0.01)	
Top Sire	0.48		0.86	0.15					1.37	0.26
	(0.10)		(<0.01)						(<0.01)	
Log-Likelihood	-331.9		-442.5		-338.1		-949.7		-1,311.1	
Likelihood Ratio	607.7		386.5		595.3		1043.5		1097.2	
	(<0.01)		(<0.01)		(<0.01)		(<0.01)		(<0.01)	
Number of Observations	972		972		972		2,239		2,697	
Auction Select = 1	621		621		621		1,418		1,463	

P-values for a one-tailed test for significance shown in parentheses unless otherwise noted.

Marginal effects reported for a one standard deviation change in the independent variable.

[1] All p-values reported for the variable indicated are for a two-tailed test for significance.

Marginal effects are reported for coefficients that are found to be statistically significant at the 10% level. These marginal effects can be interpreted as the change in probability of a bull being selected for auction that results from a one standard deviation change in the independent variable, x_i, evaluated at its mean. For the two dichotomous variables, Red Angus 97% and Top Sire, the marginal effects are instead calculated as the result of a change from 0 to 1, with all other variables evaluated at their means.

Model 1 is estimated using only the 972 limited observations without missing values for any variables. All of the estimated coefficients for the independent variables have the expected signs. The coefficients are also all significantly different from zero, except for *Top Sire*, which is almost significant at the 10% level. There was no clear prediction for *Red Angus 97%*, but its coefficient has a negative sign and is statistically significant (two-tailed p-value of <0.01). This finding is somewhat surprising. It suggests that, holding other quality characteristics constant, purebred or nearly purebred Red Angus bulls were less likely to be selected for auction than other breeds. One possible explanation for this result may be that the seller was able to identify private treaty buyers for these animals more easily as a result of greater familiarity with buyers in this market. Such familiarity may reduce the relative cost of using private treaty by increasing the frequency with which bids for these animals are received.

To analyze its effect on the model specification, the variable *Overall Phenotype* is omitted in model 2. This causes a large decrease in the joint significance of the model variables as measured by the likelihood ratio test statistic (from 607.7 for model 1 to

386.5 for model 2).[42] Although the estimated coefficients are highly jointly significant in

both models (p-values <0.01), *Overall Phenotype* clearly has an important and significant

effect. *Top Sire* becomes strongly significant (one-tail p-value of <0.01) without *Overall*

Phenotype in the model. Interestingly, the correlation between *Top Sire* and *Overall*

Phenotype is only 0.13. Nonetheless, it would seem that information contributed to the

model by *Top Sire* is captured by other variables, including *Overall Phenotype*.

Models 3 through 5 explore the effects of limiting the data set to observations

without missing values of *EPD Maternal* and *Overall Phenotype*. In models 3 and 4,

both *Top Sire* and *EPD Maternal* are excluded. The likelihood ratio test statistic of 595.3

for model 3 is only moderately lower than for model 1. The equation for model 4 is

identical to model 3, but it is estimated using a larger data set, with observations not

required to have values for *EPD Maternal*. Coefficients estimates in model 4 are all

significantly different from zero and have expected signs. There is no evidence to

suggest that the difference in the number of observations between the two data sets has an

important effect on regression results.

Model 5 eliminates the restriction on available observations imposed by the use of

phenotypic scores. It is estimated without either *EPD Maternal* or *Overall Phenotype*,

but *Top Sire* is added back into the model. With only these variables included, the model

can be estimated using 2,697 observations from the original data. Estimated coefficients

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[42] The likelihood ratio test statistic is calculated from the likelihood ratio, L as a test of joint
significance for logit model variables (similar to an F-test). The likelihood ratio test statistic calculated as -
$2*[Ln(L_r) – Ln(L_u)]$, where $Ln(L_r)$ is the log-likelihood from the restricted model and $Ln(L_u)$ is the log of
the unrestricted likelihood. The likelihood ratio is distributed chi-square with degrees of freedom equal to
the number of restricted model variables.

for the right-hand-side variables in this model were once again all of the expected signs and significantly different from zero.

The marginal effects for both *Sale Age* and *Weight Per Day of Age* increase substantially when *Overall Phenotype* is omitted in both models 2 and 5. For example, the estimated change in probability of an auction sale corresponding to a change of one standard deviation in *Weight Per Day of Age* increases from 0.05 in model 1 to 0.28 in model 2. Estimates are clearly biased by omission of *Overall Phenotype* in these model specifications.

Empirical results using the seedstock producer transaction data provide evidence that higher quality seedstock bulls are more likely to be selected for sale by private auction. The proxy variables used to measure quality were strongly significant in several model specifications. *Top Sire,* the only quality measure that was insignificant in some specifications, appeared to have been overpowered by a better indicator in *Overall Phenotype.*

CHAPTER 8

CONCLUSIONS

Economists have primarily used theoretical models to understand factors influencing seller choices between methods such as auctions and negotiated sales. This thesis extends our collective empirical understanding of these choices. My objective was to empirically test theories from the existing literature that suggest the importance of two major factors: 1) relative costs of using alternative selling methods, and 2) dispersion of buyer values. The results of my empirical analysis using data from the markets for seedstock bulls and commercial calves support several predictions.

I find that sellers of seedstock bulls are more likely to use private auctions as the total number of bulls sold increases, and that sellers of commercial calves are less likely to use public auctions as the number of calves sold increases. Both of these findings are consistent with predictions about the expected relationship between the number of animals sold and per-unit costs relative to alternative selling methods. Indirect bargaining costs are also found to negatively influence choices of seedstock sellers to host private auctions.

This empirical research supports hypotheses that dispersions of buyer values (as measured by quality characteristics of sale animals) have an important effect on seller choice between auction and negotiated sale. I predict that sellers are more likely choose private auctions to sell high quality seedstock bulls because buyer values for these animals are expected to be more highly dispersed. Sellers of high quality bulls in the

seedstock survey data are found to be more likely to host private auctions. In addition, empirical results of the seedstock transaction data show that high quality bulls are more likely to be sold by private auction than by private treaty negotiations. In contrast to seedstock bulls, dispersion of buyer values for commercial calves is expected to represent buyer uncertainty about the actual value of the animals. Consistent with my predictions based on the theoretical literature, I find that sellers of high quality calves prefer selling methods other than public auctions.

This research demonstrates that predictions can be derived and empirically tested based on hypotheses from theoretical bidding literature. It further confirms that the challenges of identifying appropriate proxy variables and obtaining primary data to test these sorts of hypotheses are surmountable. The scope of this inquiry was limited to choices between auctions and negotiated sales, and the empirical research was restricted to seedstock bulls and commercial calves. Many interesting questions remain regarding the variety of methods used to sell goods and how sellers choose between them.

One logical extension of this research would be to investigate methods used to sell other types of cattle. The survey data used for this empirical analysis contain substantial additional information about commercial and seedstock cattle operations. Commercial operations in the sample sold yearling steers and heifers, finished cattle, bred heifers, and cull cattle. Seedstock operations sold mature females, bred heifers, heifer calves, cull cattle, and even commercial calves. Empirical examination of the use of auction and negotiated methods to sell other types of cattle may yield further interesting results. This examination may explore, for example, the reasons why cull cattle from

seedstock operations are generally sold by public auction, why finished cattle are often sold through negotiations or "grid pricing" methods, and why bred female seedstock are often sold through private treaty.

The empirical analysis presented here could be extended by investigating qualitative information in survey responses. Producers were asked in some survey questions for general comments about their choice of selling method. In response to these questions, producers often made observations that were consistent with the predictions. For example, commercial respondents commented about the "hassles" associated with private treaty negotiations, stress associated with shipping to the auction yard, sorting for uniformity, and using auctions to sell calves that do not fill a truckload. Other factors not addressed by the predictions and empirical analysis included concerns about the uncertainty of auction prices relative to negotiations. Seedstock producers also made comments that were consistent with model predictions (and results), including that higher quality animals are sold using private auctions or not having enough animals to host an auction.

Further exploration of the many similarities and differences between selling methods presents another interesting area of inquiry. For example, there are many types of auctions. I considered differences between public and private auctions. But other auction methods used to sell cattle include joint auctions for seedstock hosted by several sellers and video auctions for commercial calves. The reasons for the existence of these many complex selling methods remain largely unexplained. Further study that combines empirical analysis with qualitative research (in the vein of Cassady) may be helpful in

understanding the complicated, but very interesting, nature of selling institutions and seller choices.

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APPENDICES

<u>APPENDIX A</u>

SEEDSTOCK CATTLE PRODUCER SURVEY INSTRUMENT

SEEDSTOCK Producer Marketing Survey   **CONFIDENTIAL**

NOTE: If your operation <u>does not</u> raise cattle for SEEDSTOCK, please complete and return the <u>Alternative Response Form</u>. These questionnaires will remain strictly confidential. Information from this survey will be reported in aggregate form. No information about your specific operation will be shared without your explicit consent.

1. a. Approximately how many head of **breeding females** are in your <u>seedstock</u> herd? _7 00_ hd.

    b. Approximately how many head of **breeding females** are in your <u>commercial</u> herd? _400_ hd.

    c. Excluding the bulls that you intend to sell as production, approximately how many **bulls** do you own or own an interest in? _50_ hd.

2. Was last year fairly typical year in terms of how you usually market your production? (YES) NO

    If NO, please explain why last year was different. _____

3. What breed(s) of cattle does your operation raise? (Please indicate what percentage of your herd is represented by each breed and, if applicable, describe composites or cross-breeds.)

Breed	Percentage of Your Herd (%)	Breed	Percentage of Your Herd (%)
Black Angus	70	Hereford	
Red Angus	10	Polled Hereford	
Gelbvieh	20	Simmental	
Salers		Charolais	
Limousin		South Devon	
Composite breeds (*Please Describe*):			
Cross-bred *(Please Describe)*:			
Others: *(Please Describe)*			

4. Approximately how many miles does (would) your average seedstock buyer need to travel in order to visit your ranch? _250_ miles

5. For how many years has your registered operation been producing and marketing cattle under your current family name or brand? _30_ years

6. a. On <u>approximately</u> how many bulls in which you have an ownership interest do you collect semen (have semen collected)? _10_ bulls

    b. <u>Approximately</u> how many bulls has your operation produced that currently appear in a sire summary report for their breed? _4_ bulls

    c. On <u>approximately</u> how many cows that you own do you collect embryos for embryo transplant? _15_ cows

7. a. <u>Approximately</u> what percentage of animals you sell as seedstock are sired using artificial insemination?

      None (0%)   1 - 20 %   20 - 40%   40 - 60%   (60 – 80%)   80-100%

    b. <u>Approximately</u> what percentage of animals you sell as seedstock do you produce by transplanting embryos from registered dams into commercial quality cows?

      None (0%)   1 – 5 %   (5 - 10%)   10 - 20%   20 – 40%   40-100%

PRIVATE SEEDSTOCK AUCTION

8. **a.** If you hosted **your own auction** last year, where was it held?

> X At your ranch location.
>
> ___ At the public sale yard in_____
>
> ___ Other place (describe):_____

b. Please describe how frequently you host **your own auction** sale(s)?

> *(Examples: annual spring bull sale, fall female sale every other year, etc.)* every year

c. Do you ever use a "reserve price" in your auction? (Minimum bid required for sale of animal) **(YES)** NO

d. If you do use a "reserve price," is it made known to buyers in advance at your auction sale? **(YES)** NO

PRIVATE TREATY SALES   Do you sell any animals using private treaty sales? **(YES)** NO

9. **a.** Approximately how many BULLS do you typically sell to a single buyer in a typical private treaty BULL transaction for your operation? __2__ bulls

b. Approximately how many FEMALES do you typically sell to a single buyer in a typical private treaty FEMALE transaction for your operation? __10__ cows

c. Approximately what percentage of your PRIVATE TREATY animals are sold "sight unseen" (the buyer does not come to the ranch and view the animals prior to shipping)?

None (0%)   **(1 – 5%)**   5 – 10%   10 – 20%   20 – 40%   40 – 100%

JOINT (COALITION) AUCTION   Do you sell any animals using joint auctions?   YES   NO

10. **a.** Using the scale below, please indicate the **extent to which animals in joint seedstock auction sales are similar** in terms of breed, age, and genetic traits emphasized (**Please CIRCLE ONE**):

1	2	**(3)**	4
Not the same	Mostly not the same	Somewhat the same	Almost all the same

b. For the last joint or coalition sale in which you participated, whose brand appeared in the advertising for the sale? **(Please CHECK ONE.)**

> ___ Your brand along with others'
>
> ___ Only (an)other operation(s)' brand(s)
>
> ___ Other: _____

c. How did you select the animals that you decided to sell in the joint auction? **(Please check ONE.)**

> ___ Your most marketable/ highest quality animals.
>
> ___ Your least marketable/lowest quality animals.
>
> ___ A group of your animals selected by someone else.
>
> ___ Other selection criteria :_____

d. Consider the most recent year in which you sold animals through a joint or coalition seedstock auction. What percentage of all the animals that you wished to market in that year did you choose to market through the sale?

> _____ %

SEEDSTOCK Producer Marketing Survey **CONFIDENTIAL**

11. **FOR YOUR SEEDSTOCK PRODUCTION ONLY.** From the types of production listed below, please indicate approximately how many of *your animals* you sold **LAST YEAR** by various marketing alternatives. *If possible*, list the *approximate* average sales price per head that you received for each marketing channel.

Definitions:

Private treaty – any marketing method that involves directly negotiating sales with buyers, including sales of animals at the ranch.

Your auction – any seedstock auction sale hosted, organized, & advertised by your operation (even if you sell animals for other, unadvertised producers in **your auction**).

Joint auction – a seedstock auction sale hosted by another producer or by a group of producers (coalition auction).

Public auction – an open, public consignment auction sale where *any producer may sell animals* (i.e. PAYS, BLS).

Bull Test / Expo. – animals sold either through a *bull test facility* (i.e. Midland, Treasure) or through an *exposition auction* (such as the NILE, or the Denver Stock Show).

SEEDSTOCK PRODUCTION [If exact numbers are not easily accessible, please use best estimates.]

Marketing Channel	TOTAL	Private Treaty	Your Auction	Joint Auction	Public Auction	Bull Test / Expo.	Other Marketing Methods * Auction Method	Direct Method
Type of Production	TOTAL # SOLD	# SOLD (Ave. $/hd.)	# SOLD (Ave. $/hd.)	# SOLD (Ave. $/hd.)	# SOLD (Ave. $/hd.)	# SOLD (Ave. $/hd.)	# SOLD ($/hd.)	# SOLD ($/hd.)
Bulls -- One year old (not culls)	#: 250	#: 50 $: 1500	#: 200 $: 2000	#: $:	#: $:	#: $:	#: $:	#: $:
Bulls –Two years or older (not culls)	#: 20	#: 20 $: 1500	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:
Mature Breeding Females (not culls)	#: 150	#: 150 $: 2500	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:
Bred Heifers (not culls)	#: 150	#: 150 $: 800	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:
Heifer calves	#: 150	#: $: 800	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:
Culls (both sexes)	#: 150	#: 150 $: 600	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:
Other (describe):	#:	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:	#: $:

*Please specify other marketing channels:_____

IF LAST YEAR WAS NOT TYPICAL in terms of numbers of animals marketed by the methods described above, please explain WHY it was different (attach extra page if necessary).

12. a. <u>Approximately</u> how many embryos did you sell last year? _/⟨₂₀⟩_ embryos

Please list the approximate average price that you received per embryo. _₂₅₀_ $/embryo

What pricing method do you generally use when selling embryos? (**Please circle one**)

If "Other", please describe_____

1)Fixed price	2)Auction
3)Negotiated Price	4)Other

b. <u>Approximately</u> how many total units (straws/vials) of semen were sold last year from bulls in which you held an ownership interest? _5000_ units

Please list the approximate average price that was paid per unit (straw or vial). _15_ $ / unit

What pricing method do you generally use when selling units of semen? (**Please circle one**)

If "Other", please describe_____

1)Fixed price	2)Auction
3)Negotiated Price	4)Other

13. a. Which of the following best describes your private treaty negotiating process for selling an animal? (**Please check one.**)

☒ I decide on a minimum price that I will accept for an animal and negotiate with each prospective buyer until I decide to accept or reject his highest offer.

☐ After I compare offers from several buyers for each animal, I return to the customer(s) with the best offer(s) and sell the animal(s) to them.

☐ I post a fixed price for the animal and do not negotiate.

☐ Other. Please describe:_____
_____

b. On the following scale, how well do you enjoy bargaining or negotiating with buyers? (**Circle ONE**)

1 = **Dislike** bargaining very much   4 = **Moderately enjoy** bargaining
(2) = Moderately **dislike** bargaining   5 = **Enjoy** bargaining very much.
3 = Neither **enjoy** nor **dislike** bargaining

c. A skilled negotiator or bargainer may be a seller who usually gets a buyer to offer his highest price or a buyer who regularly negotiates for a seller's lowest price. On the following scale, how do you rate your own bargaining or negotiating skill relative to prospective buyers and/or other producers? (**Circle ONE**)

1 = Well Below Average   4 = Slightly Above Average
2 = Below Average   5 = Well Above Average
(3) = Average

14. Among all of the bulls that you sold last year <u>by any selling mechanism</u>, what percentage were sold to buyers that you DID NOT expect to buy bulls from you? [For example, new customers or customers that you would not ordinarily have approached for **private treaty sale**.]

_10_ % of bulls

15. When you sell animals to your customers, do you also provide them with **specific** consultation and recommendations for their **individual** operations? (For example, advice on genetic management or recommending specific bulls for their herd.)   (YES)   NO

How much value do you think your customers place on such consultation, recommendations, and service? (**Please circle ONE**).

1 = No Value   2 = Very little value   (3) = Fairly significant value   4 = Essential

4

SEEDSTOCK Producer Marketing Survey   **CONFIDENTIAL**

16. a. On approximately how many *of the bulls that you sold last year* (of all ages) did you retain the rights to a share of the semen or revenue from semen sales?   _20_ bulls

Does this number of bulls vary significantly from year to year?   (YES)   NO

If **YES**, why does it vary?___*Quality*_____

---

b. What criteria do you use in selecting bulls in which you will retain an interest? (**Check all that apply.**)

☒ I retain an interest if I believe that a bull has a good chance of being a top performer in the breed and/or the industry.

☐ I retain an interest if I think a bull may sell for less than what I believe it is worth.

☒ I retain an interest in a bull that I intend to use in my own herd.

☐ Other (please describe):_____

c. On approximately what percent *of bulls that you sell and retain an interest* do you later *actually collect* semen, revenues, or something else?   _90_ %

Please indicate what you most commonly collect for your interest share in a bull (**Please check only ONE**).
If "other", please describe:_____

| _ Semen ✓ Revenue |
| _ Other (describe) |

d. **If you retain an interest** in a bull, would you expect its sale price in an **AUCTION to be less or more** than it would be **if you do not retain an interest** in the same bull (**Circle one**):

1	2	3	4	5
Significantly less	Slightly less	About the same	Slightly more	Significantly more

e. **If you retain an interest** in a bull, would you expect its sale price by **PRIVATE TREATY to be less or more** than it would be **if you do not retain an interest** in the same bull (**Circle one**):

1	2	3	4	5
Significantly less	Slightly less	About the same	Slightly more	Significantly more

Please answer Question # 17 if you sell some bulls in *your seedstock auction* or a *joint seedstock auction* **and** also sell some bulls by *private treaty*. IF NOT, please skip to Question # 18.

17. a. Are you more or less likely to retain an interest in a bull if you sell it in an **auction versus** if you market the same bull by **private treaty**? (**Circle ONE**.)

1 = **Much MORE likely** to retain an interest in a bull sold by *auction* (vs. private treaty).

(**2**) = **Somewhat MORE likely** to retain an interest in a bull sold by *auction* (vs. private treaty).

3 = **NO MORE or LESS likely** to retain an interest in a bull sold by *auction* (vs. private treaty).

4 = **Somewhat LESS likely** to retain an interest in a bull sold by *auction* (vs. private treaty).

5 = **Much LESS likely** to retain an interest in a bull sold by *auction* (vs. private treaty).

b. Please describe particular characteristics or attributes of a bull that will make you *MORE OR LESS LIKELY TO SELL it in your seedstock auction or a joint seedstock auction* rather than *by private treaty* (e.g. the bull is exceptional; is ill or hurt at sale time; will interest only a small group of buyers, etc.)?

i) **MORE LIKELY** to sell in seedstock auction: (attach extra sheet if necessary)
ii) **LESS LIKELY** to sell in seedstock auction: (attach extra sheet if necessary)

18. COMMERCIAL PRODUCTION – *For the calendar year1999 (Jan. 1 to Dec. 31, 1999)*, please list the approximate number of animals (by type of production) sold for <u>commercial production</u> using the various marketing channels listed in the table below.

Type of COMMERCIAL Production	TOTAL	Public Auction	Video Auction	Direct Sale to Cattle Buyers	Retained Ownership*	Other Marketing Channels**	
						Auction Method	Direct Method
	# SOLD	# SOLD	# SOLD	# SOLD	# SOLD	# SOLD	# SOLD
Commercial Steer Calves	#: 100	#:	#:	#: 100	#:	#:	#:
Commercial Heifer Calves	#: 100	#:	#:	#: 100	#:	#:	#:
Commercial Yearling Steers (not calves)	#:	#:	#:	#:	#:	#:	#:
Commercial Yearling Heifers (not calves)	#:	#:	#:	#:	#:	#:	#:
Commercial Bred Heifers	#: 150	#:	#:	#: 150	XXXXXXX XXXXXXX XXXXXXX	#:	#:
Cull Cows	#: 100	#: 100	#:	#:	XXXXXXX XXXXXXX	#:	#:
OTHER (Please specify)	#:	#:	#:	#:	#:	#:	#:
OTHER (Please specify)	#:	#:	#:	#:	#:	#:	#:

* Retained ownership here refers to any arrangement in which your compensation depended, at least in part, upon the animal's future performance. *Please do not include animals kept for herd replacement.*

**Please specify other marketing channels that you use:_____

Do you receive yield and grade reporting information on your finished commercial cattle?   **(YES)**   **NO**

Do you feel that you receive a yield and/or grade premium (over and above costs of ownership/feed) on commercial animals in which you DO NOT retain an ownership interest?   **YES**   **(NO)**

Do you feel that you receive a yield and/or grade premium (over and above costs of ownership/feed) on commercial animals in which you DO retain an ownership interest?   **(YES)**   **NO**

19. The questions in this survey have been designed to deal with some of the factors that may be important in your choice of marketing method. In the space provided below, please list and describe any other factors that <u>you</u> consider to be most important in your decision to market by auction or private treaty (direct sale).

_____General cattle Mkt._____

_____

_____

_____*[Please attach an extra sheet if necessary]*

Thank you for your time and cooperation in answering this survey. Your assistance has been extremely helpful and is *greatly* appreciated.

APPENDIX B

COMMERCIAL CATTLE PRODUCER SURVEY INSTRUMENT

COMMERCIAL PRODUCER SURVEY   *CONFIDENTIAL*

NOTE: These questionnaires will remain strictly confidential. Information from this survey will be reported in aggregate form. No information about your specific operation will be shared without your consent.

1. *FOR THIS MOST RECENT YEAR*, please list the *number (head)* of the following types of *commercial* production that you sold through the various marketing channels defined in the table below.

Public auction	A public sale yard in which animals are sold on consignment.
Direct sale	Any marketing method that involves directly negotiating sales with buyers, including private treaty dealings (with agents, feedlot owners, packers, etc.) and forward contracting.
Video / Internet auction	An auction in which buyers view video footage or information about your animals and bid for future delivery subject to a contract.

Marketing Channel	Public Auction	Direct Sale (Private Treaty / Negotiation)	Video / Internet Auction	OTHER Marketing Channels*		TOTAL # of Animals Sold This Year
				Auction Method	Direct Method	
a) Calves sold at, near, or before weaning						
i) Steer/bull calves (not off-sorts)		180				180
ii) Heifer calves (not off-sorts)		110				110
iii) Off-sort calves[1]	20					20
b) Yearling animals (not calves) that have been overwintered or backgrounded						
i) Steers/bulls (feeder)						0
ii) Heifers (feeder)						0
iii) Bred Heifers		4				4
c) Finished / fat cattle						
i) Steers						0
ii) Heifers						0
d) Other Types of Cattle Marketed (not listed above)						
i) Cull cattle	75					75
ii) Other1:						0
iii) Other2:						0

[1] "*Off-sort calves*" refers here to calves that were sorted out from another group for any reason (i.e. color, size, health, breed, defect, etc.) and sold in a separate bunch.

*Please describe other auction and direct method marketing channels: _Private Treaty with Agents_

_____ (please use extra space on last page if necessary)

General Questions

2. Approximately how many breeding females (i.e. bred heifers and cows to calve) are in your commercial cow herd?

400 hd.

3. Do you consider cattle production / ranching to be your primary occupation? (circle one)

(YES) NO

4. Please indicate the general breed composition of your herd by listing breed (e.g. angus, charolais, hereford, etc.) and percentage of your herd represented by that breed in the spaces provided below:

	Breed	% of Herd		Breed	% of Herd
☐	*angus*	*60* %	☐		%
☐	*angus X hereford*	*37* %	☐		%
☐	*hereford*	*3* %	☐		%

5. Do you feel that the commercial calves you market at, near, or before weaning earn a <u>premium</u> for yield, grade, or other qualities (above the average local auction price per pound for calves weaned at similar time and weight)? (circle one)

(YES) NO
UNSURE

6. Do your commercial cattle frequently meet Certified Angus Beef certification criteria? (circle one)

(YES) NO
UNSURE

Information Provided to Buyers

7. Please indicate whether or not you <u>orally represent</u> *and/or* <u>provide documentation</u> about any of the following characteristics of your commercial production to prospective buyers when marketing (<u>check</u> Y(es) or N(o) for each):

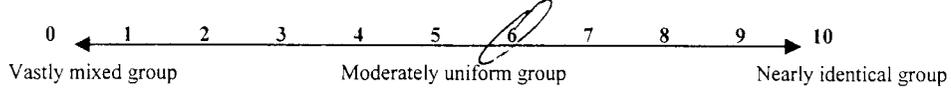|	Oral Representation		Documentation Provided	
	Y	N	Y	N
Information about your cow herd:				
a) Herd health information	✓		✓	
b) Herd genetics and pedigree	✓			✓
Information about your calves:				
d) Specific vaccination program information of certification	✓		✓	
e) Past performance data from feedlots that have fed your cattle		✓		✓
f) Past carcass performance data (i.e. yield, grade) from slaughter plants		✓		✓

Production Characteristics

8. For the *CALVES* that you sold at, near, or before weaning last year (from Question 1. a)), please indicate whether or not these animals met the following descriptions. (<u>check</u> Y(es) or N(o) for each of the three types of animals listed:

	Main Bunch(es)				OFF-SORTS	
	Steers		Heifers		Mixed	
	Y	N	Y	N	Y	N
a) Were these calves preconditioned prior to shipping?	✓		✓		✓	
b) Were these calves weaned at least 30 days prior to shipping?	✓		✓		✓	
c) Were all calves in this group without horns?	✓		✓		✓	
d) Were all bull calves castrated by time of sale?	✓				✓	
e) Were any of these calves exhibiting any health problems, physical impairments, or defects at time of sale?		✓		✓		✓

9. What was the average weaning weight for the calves that you sold last year (animals listed in Question 1.a))?

Steers	Heifers
625 #	*560* #

10. Please rate the degree to which a buyer would consider your calf crop to be **uniform** in terms of size, color, breed and any other characteristics that they might consider to be important. (circle one)

0   1   2   3   4   5   6   7   8   9   10

Vastly mixed group   Moderately uniform group   Nearly identical group

11. On average, approximately how much do you spend <u>per bull</u> that you purchase for breeding purposes?

$2400

12. Approximately what percentage of your commercial calf crop is produced using **artificial insemination** (A.I.)?

0 %

Marketing Practices

13. When selling calves by direct sale or video auction, **approximately what percentage** of your total calf crop is "off-sorted" (for any of several reasons such as size, color, condition, health, etc.) to be sold separately from the main bunch?

6 %

14. Do you presort your **commercial calves** prior to marketing in order to pursue different marketing channels for different types of animals?

YES / **NO**

Please briefly describe (in general terms) your strategy for sorting and marketing these various groups of animals:

The "off-sorted" calves are sorted to improve the main bunch

15. Do you regularly use futures contracts or options as tools for hedging your marketing risk?

YES / **NO**

16. How many miles do you (would you) transport your animals to market them at the nearest public cattle auction facility?

30 miles

17. Have you ever "pooled" or combined your calves with other producers in order to create larger lots for marketing?
NOTE: If your answer is **NO**, <u>please skip</u> to Question # 18.

YES / NO

    a) If so, please explain what motivated your decision to market this way: _____

To give the buyer larger lots —

    b) To what extent were you more or less likely to sell such combined lots directly to buyers through negotiated sales relative to auctions? (Please circle one.)

      1 = Much less likely to negotiate   4 = Somewhat more likely to negotiate
      2 = Somewhat less likely to negotiate   **5 = Much more likely to negotiate**
      3 = No more or less likely to negotiate

    c) Did you feel that you received a price premium on these pooled animals relative to similar animals sold in smaller lots? (Please circle one.)

YES / NO
UNSURE

Alliances and other Marketing Relationships

18. Do you participate in any kinds of cattle marketing alliances?

YES / **NO**

Please list and/or briefly describe any such alliances in which you participate:

19. Do you participate in any sort of relationship with a seedstock producer whereby they assist you in marketing your commercial cattle?

YES / **NO**

20. Do you participate in any sales held exclusively for producers with similar calves (for example, breed influence sales)?

YES / **NO**

Retained Ownership

21. *In the past,* have you ever retained an ownership interest in your calves <u>through the feeding and finishing stages</u> so that you were paid based on the price received from the packer?
    <u>NOTE</u>: If your answer is **NO**, <u>please skip</u> to Question # **22**

    YES ~~NO~~

    a) For all *commercial calves* you have raised and marketed in the last 5 years, *what percentage* have you marketed by retaining ownership through the feeding and finishing stages?

Steers	Heifers
%	%

    b) Do you typically *sell a <u>percentage of ownership</u>* in the cattle during the feeding phase?

    YES   NO

    c) In your own words, please explain why you have chosen to market some of your calves by retaining ownership?
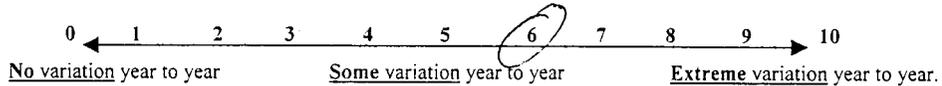
    _____

    _____

Other Causes of Variation in Marketing Practices

22. On the following scale, <u>to what degree</u> would you say that the marketing channels (i.e. public auction, direct sale, video auction, retained ownership) you use for selling your cattle production *vary* from year to year?
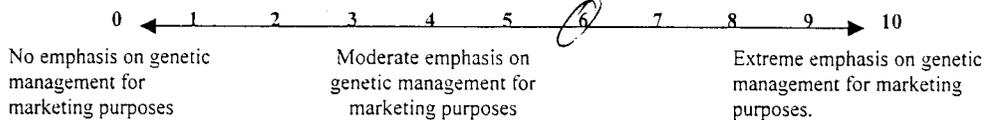
    0 ← 1   2   3   4   5   (6)   7   8   9   → 10

    <u>No variation</u> year to year   <u>Some variation</u> year to year   <u>Extreme variation</u> year to year.

    According to the following scale from 1 to 5 *please indicate the way in which the following situational factors are likely to impact your decision* to sell your production by <u>public auction versus using *other methods**</u>:

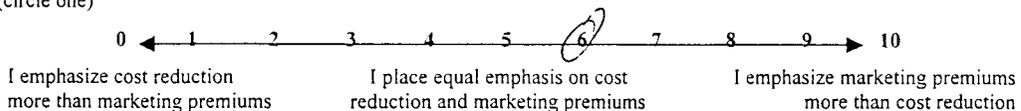 | | | Not a factor | More likely to sell cattle by public auction | Equally likely to sell cattle by public auction or using *other methods** | More likely to sell cattle using *other methods** |
    |---|---|---|---|---|---|
    | a) At times when cash cattle prices (compared with historical) are relatively: | **HIGH** | 0 | 1 | 2 | 3 | 4 | 5 |
    | | **LOW** | 0 | 1 | 2 | 3 | 4 | 5 |
    | b) At times of limited cashflow or unavailability of credit | | 0 | 1 | 2 | 3 | 4 | 5 |
    | c) At times when cattle price projections are trending. | **UP** | 0 | 1 | 2 | 3 | 4 | 5 |
    | | **DOWN** | 0 | 1 | 2 | 3 | 4 | 5 |

    * *Other methods* include direct sale to buyers, video/internet auctions, or any method of sale other than by public auction.

IN YOUR OPINION . . .

23. On the following scale, to what degree does your operation emphasize **genetic management targeted <u>specifically</u> toward MARKETING** your commercial cattle at a premium for yield, grade, and/or performance? (circle one.)

    0 ← 1   2   3   4   5   (6)   7   8   9   → 10

    No emphasis on genetic management for marketing purposes   Moderate emphasis on genetic management for marketing purposes   Extreme emphasis on genetic management for marketing purposes.

24. **Some producers** elect to incur additional expenses (pay more for genetics, herd health, information collection, management cost, etc.) with the goal of producing cattle that can earn market **premiums** for such things as improved carcass quality and feedlot performance. **Other producers** place less emphasis on market premiums and more emphasis on reducing costs of production. Please indicate where your own profit management strategy fits into the scale below. (circle one)

    0 ← 1   2   3   4   5   (6)   7   8   9   → 10

    I emphasize cost reduction more than marketing premiums   I place equal emphasis on cost reduction and marketing premiums   I emphasize marketing premiums more than cost reduction

4

25. Please describe in your own words any other factors that you consider to be important in your decision to market cattle by public auction, direct sale, video/internet auction, or any other marketing channel.

public auctions are used to market cull cows and bulls, also "off-sorted" feeders –