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AN EMPIRICAL ANALYSIS OF REPUTATION EFFECTS AND NETWORK CENTRALITY IN A MULTI-AGENCY CONTEXT

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ABSTRACT OF DISSERTATION

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ABSTRACT OF DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements of the degree of Doctor of Philosophy in the
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at the University of Kentucky

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Lexington, KY

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Signals convey information to marketplace participants regarding the unobservable quality of a product. Whenever product quality if unobservable prior to purchase, there is the risk of adverse selection. Problems of hidden information also occur in the consumer marketplace when the consumer is unable to verify the quality of a good prior to purchase. The sending, receiving, and interpretation or signals are potential ways to overcome the problem of adverse selection. In general, there is a lack of empirical evidence for signaling hypothesis, particularly that which links signaling to business performance outcomes. This research proposes that reputation serves as a marketplace signal to convey unobservable information about products offered for sale.

Signaling hypotheses are tested in a network context, examining the influence of signals throughout a network of buyers and sellers in a marketplace. There are many situations where a signal does not affect just one sender and one receiver; multiple constituencies may be aware of and react to a given signal. This study incorporates the actions of seller side principals, seller side agents, and buyer side agents when examining marketplace signals and provides a new perspective and better vantage point from which to test signaling theory.

The research setting for this study is the world's largest individual marketplace for Thoroughbred yearlings. Several sources of secondary data are employed. These openly available published sources of information were selected as representative of the information that would typically be available to marketplace principals and agents to use in planning interactions in this unique live auction marketplace. The findings from his study indicate that the reputation of seller side principals and agents affect the eventual business performance outcomes as measured by final price brought at auction for goods. Specifically, seller side principals and agents who have developed a reputation for producing or selling high-priced or high-performing goods will be rewarded in the marketplace with relatively higher prices for their goods. Buyer side agents who are more central in the marketplace will pay relatively higher prices for goods. Evidence suggests that more central seller side agents will receive relatively higher prices for their goods.

KEYWORDS: Agency Theory, Signaling, Reputation, Auctions, Network Centrality

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For everyone who believed in me.

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CHAPTER ONE:
INTRODUCTION

At the Keeneland September Thoroughbred Yearling sale, hundreds of buyers convene on the sales grounds hoping to find a special yearling that can go on to become a great racehorse. Buyers have limited information, but must decide among thousands of potential race horses brought to market. Fortunately, sellers and other buyers, along with their agents, offer multiple signals to indicate their belief of each horse's potential.

This research will examine the manner by which sellers, buyers, and their third-party agents signal to the marketplace regarding their opinions of which horses for sale offer the highest potential.

Background

Signaling is a successful method marketers use to overcome the problem of information asymmetry in a marketplace. Information asymmetry occurs when a buyer in a marketplace lacks necessary information to determine the quality of a product offered for sale (Williamson 1985). Some examples of signaling include advertising, brand names, reputation, coupons, high price, warranties, and money-back guarantee (Kirmani and Rao 2000).

General support has been found for signaling predictions for both low-price consumer goods and consumer durables, but there is limited knowledge of signaling in markets with variable prices and multiple parties to transactions. Questions to be explored in this research project include:

- How do market participants use signals to indicate unobservable quality in a market where goods are not offered at a fixed price? Most literature on signaling considers only fixed price consumer goods. There are many examples of where goods are not sold at a fixed price. Consider for example any good that is sold at auction, the stock market, the market for real-estate, and markets for commodities such as agricultural goods and natural resources.
- What is the influence of third-party agents in this marketplace (for variable price goods)? The vast majority of marketing literature considers marketplace transactions between two parties only. Employing network logic to study this problem allows for a contrasting vantage point and a new perspective of the problem. In situations where

the buyer and seller in a transaction never meet, one must consider the network in which the transaction takes place.

Importance of Research

There are many situations where goods are not offered for sale at a fixed price. Consider any market where goods are offered for auction, including the markets for wine, art, classic cars, and the increasingly widespread use of internet auctions. Houses and used cars are generally offered at non-fixed prices. Sellers wish to obtain the highest possible price for their goods, while buyers want to pay fair prices. Signals can be used by *both* buyer and seller to indicate their value of the product offered.

When neither seller nor buyer are able to assess the true quality of a product prior to purchase, it is difficult to assess whether consumers have made satisfactory transactions. From the buyer's point of view, it may have paid a higher-than or lower-than fair price for their good, but it will not be aware of the fairness until it has fully experienced the good. Signaling literature assumes that the sellers will experience negative repercussions if they offer low-quality goods for sale at high-quality prices, but how does this dynamic change if even the seller is not aware of the true quality prior to selling the good?

Most marketplaces do not involve situations where one seller is transacting with one buyer without any other parties involved. By considering the marketplace beyond the singular dyad of seller→buyer, this research will contribute to a more complete understanding of how signals operate in marketing channels. The influence and actions of third-party agents- i.e., consignors, bloodstock agents, and veterinarians- will be considered in the signaling model of this marketplace.

This research will use secondary data from a marketplace where producers' goods are sold through the channel of distribution via multiple sellers. Hypotheses will be developed which can empirically examine economic logic underlying signaling. The theoretical model represents an important contribution, linking marketing hypotheses with business performance outcomes (Lehmann 2004).

Theoretical Base for Research

Agency relationships are widespread in marketing. An agency relationship is present when one party (known as the principal) is dependent on another party (known as the agent) to complete some task on behalf of the principal. Whenever a principal contracts with an agent

with the goal of achieving some outcome, problems may arise (Eisenhardt 1989). Within this agency problem, there is the problem of adverse selection. Adverse selection, also known as the problem of hidden information, occurs pre-contractually when the principal is unable to verify ahead of time that the agent actually has the skills and qualities that they desire.

This research will focus on the problem of hidden information, as this is the relevant problem when buyers and sellers are contracting in a marketplace to buy and sell goods. In the marketplace studied here, there are several groups of principals and agents. Briefly, there are buyer-side and seller-side principals and agents. On the seller side, the principals are the producers of the Thoroughbred, the people who breed the horses. Their agent is the consignor, a person who consigns the yearlings for sale at the Keeneland September Yearling sale. On the buyer side, the principals are the buyers who wish to purchase yearlings at the Keeneland auction. They enlist agents including veterinarians to assess the health and soundness of the animal and bloodstock agents to make an expert judgment on the suitability and athletic potential of the Thoroughbred yearlings under consideration.

The Problem of Hidden Information

Whenever there is incomplete information, there is the potential for agency problems. Adverse selection is used to describe the absence of information before a decision is made. This lack of information could lead to an adverse, or less than ideal, decision (Eisenhardt 1989). One such example is when the principal cannot verify the agent's skills or abilities at the time of hiring. The agents may interview very well and claim that they have the needed skills to be a top performer, but it is very difficult or even impossible for the principal to verify in advance that the candidates will actually perform up to expectations. Problems of hidden information also occur in the consumer marketplace where the consumer is unable to verify the quality of a good before purchase (Akerlof 1970; Eisenhardt 1989). Consumers may use information in the marketplace to help overcome this problem of adverse selection (Akerlof 1970). Adverse selection occurs when the consumers purchase goods which do not meet their needs.

Signaling to Overcome the Problem of Adverse Selection

A marketing signal is a marketing activity which provides information beyond the activity itself and reveals insights into the unobservable, such as the intention, motives, goals, or internal situation (Porter 1980; Herbig and Milewicz 1996). One focus of signaling in the

marketing literature has been to explain how one party can communicate to another about unobservable product quality and help to overcome the problem of adverse selection.

Signals are actions that parties can take to reveal their true qualities. Quality signals can be transmitted in many forms, including brand name, price, warranties, and advertising expenditure (Kirmani and Rao 2000). Signaling considers a rational consumer who expects a firm to honor the implicit commitment expressed through a signal. Not honoring the commitment is economically unwise, as firms who cheat and offer a low-quality product at a high-quality price will be penalized in the marketplace by a lack of repeat purchases (Rao, Lu et al. 1999).

Research Gap

Agency literature focuses almost entirely on dyadic relationships, finding the best contract to govern a relationship between a principal and their agent. This perspective leaves questions regarding relationships that take place beyond a dyadic level. While there are a limited number of studies to consider agency beyond the dyadic level (e.g., Anderson, Hakansson et al. 1994; Mishra, Heide et al. 1998; Antia and Frazier 2001; Rindfleisch and Moorman 2001; Dahlstrom and Ingram 2003; Wathne and Heide 2004), the marketing research to consider signaling in a network context is even more limited. Considering that it is quite difficult to pinpoint circumstances where signaling takes place exclusively within a dyad, examining signaling in the context of a network of marketplace participants will shed light on how these signals are sent, received, and interpreted within a network. In more general terms, there is a lack of empirical evidence linking signaling to business performance outcomes.

Research Approach/Methodology

This research will use a variety of different approaches to examine this marketplace. In the largest single marketplace in the world for the good (Keeneland Association 2009), buyers and sellers come together at a single location where over $327 million of goods are bought and sold in a three-week period. This design effectively controls for time, location, and economic conditions, as all goods are transacted within the same time frame, in the same location, and with the same facilities available to all sellers.

A combination of qualitative and quantitative approaches will be used. Qualitative approaches include: interviews with marketplace participants to get a preliminary perspective on the important issues in the marketplace; extensive observation of the process of buying and

selling in the marketplace; and integration into the marketplace as a participant by working during a product sale. This integration into the marketplace in question allows the researcher to get a unique insider's perspective into the market. Secondary data of the economic results of the marketplace sales will be used to link signaling hypotheses to business performance outcomes.

Proposed Study

To address this gap, the current research proposes and examines empirically a research model of marketplace effects of third-party agents on business performance outcomes. Hypotheses examine the signaling actions of these agents and how they affect the final dollar value brought for the product at auction. In this marketplace, the quality of the good is not observable prior to purchase, so marketplace participants must use signals to determine the quality of the goods offered for sale. The reputational effects of the marketplace participants are studied along with the physical actions they undertake. Reputation is developed by fulfilling signaling promises over time (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996). The marketplace is a social process where participants look to the actions of others to determine what actions they should subsequently take (e.g., White 1981; White 1981; Granovetter 1985; Podolny 1993). The participants are constantly observing the actions of others, so network position variables are included to examine the effect that these positions may have on the marketplace participants' performance outcomes. Participants with higher levels of measured centrality should have access to and control over more information (Freeman 1978/79; Wasserman and Faust 1994) and should subsequently be able to leverage this information advantage to their own benefit. There are considerable questions to be answered regarding the bottom line effect that network properties may have on a business's balance sheet.

This study will utilize a combination of qualitative and quantitative data. At present, there are a total of 31 depth interviews with industry participants, 186 hours of participant observation, and 156 hours spent in the field as a participant in a sale. Approximately 1,000 pictures and 20 hours of video have been captured for study. Data from 3,605 individual transactions were cataloged for quantitative analysis. Variables relating to the reputation and centrality of marketplace participants including seller side principals, seller side agents, and buyer side agents were collected from a variety of published sources.

Research Findings

Hypotheses H1a and H1b relate seller side principal reputation to the dependent variable of price brought at auction. H1a, relating seller side principal performance reputation (SSP_PERF_REP) and PRICE is supported, with a significant path coefficient in the expected direction ($\beta = .152$, $p < .000$). H1b is supported as evidenced by a statistically significant path coefficient between seller side price reputation (SSP_$REP) and PRICE ($\beta = .071$, $p < .000$).

Hypotheses H2a and H2b posit a relation between seller side agent price and performance reputation and price. Support was found for H1c which predicated seller side agent performance reputation (SSA_PERF_REP) would positively affect PRICE ($\beta = .044$, $p < .000$). Likewise, H2b was also supported, which predicted a positive relationship between seller side agent price reputation (SSA_$REP) and PRICE ($\beta = .100$, $p < .000$).

Centrality of seller side agent (SSA_CENT) and buyer side agent (BSA_CENT) were hypothesized to positively affect price. H3a, relating seller side agent centrality to PRICE was not supported, with an insignificant path coefficient in a negative direction ($\beta = -.018$, $p < .238$). H3b was supported, showing a positive significant relation between buyer side agent centrality and PRICE ($\beta = .121$, $p < .000$).

Contribution to Practice

Managers should consider the reputation of the companies with which they enter into partnership and look beyond the dyad to the broader network of companies with which they are transacting. Buyers read marketplace signals to determine their willingness to pay for goods, and this includes signals from both the retailer itself and the manufacturer of the good. Likewise, manufacturers must also be aware of the reputation of the retailer through which they are selling their goods. Consumers read marketplace signals to provide evidence of unobservable quality, and this perceived quality can affect overall revenues for a firm.

Second, managers should be aware of their relative position in the marketplace and take this position into consideration when making decisions. This study suggests that those on the buying side must be cautious when displaying their intentions to purchase as this could lead to negative consequences in the form of higher prices. As other buyers find out what products a more central buyer is interested in, they too will become interested in that product. Seller side agents can potentially leverage information of buyer side interest to foster interest from

other participants on the buyer side. Competition when attempting to make a purchase can drive up prices as more people compete for the same resource.

Contribution to Theory

This research provides empirical evidence for signaling hypotheses, demonstrating that reputation serves as a marketplace signal to convey unobservable information about products offered for sale. Buyers in a marketplace look to the price and performance reputation of seller side principals and agents for signals to indicate which products are most desirable. Those seller side principals and agents who can send credible signals will be rewarded in the marketplace with higher prices for their goods.

Evidence indicates that participants on the buyer side of the marketplace will look to the reputation of both the seller (seller side agent) and manufacturer (seller side principal) of the good. Seller side principals who have a reputation for producing products with a higher average price and seller side agents who have a reputation for selling products with a higher average price are both associated with higher prices brought at auction. Seller side agent reputation for selling high performing goods also shows a positive association with price. This supports previous findings that reputation is seen by consumers as a signal of product quality, and that manufacturers can signal product quality by selling through a reputable retailer (e.g., Chu and Chu 1994; Dawar and Parker 1994).

This research examines signaling beyond the dyad, examining the influence of signals throughout the entire network of buyers and sellers in the marketplace. There are many situations where a signal does not affect just one sender and one receiver; multiple constituencies may be aware of and react to a given signal. A limited number of studies have considered agency relationships beyond the dyadic level (e.g., Anderson, Hakansson et al. 1994; Rindfleisch and Moorman 2001; Dahlstrom and Ingram 2003). This study incorporates the actions of seller side principals, seller side agents, and buyer side agents when examining the marketplace signals and provides a new perspective and better vantage point from which to test signaling theory. In a marketplace where buyer and seller do not actually meet, it is impossible to hypothesize about their relationship without considering it in a network context.

A key tenent of this network approach is that it allows for the testing of the effect of network positioning on business performance outcomes. Markets are a social process where observation of the actions of other participants is critical in determining interest. More interested parties indicates that a product carries a higher valuation (Rothkopf 1969). The seller

side agent is posited to use their position in the marketplace to gather and utilize information about buyer side interest in order to obtain the highest possible price for their goods. These agents can look to records of past marketplaces to determine the past behavior of the buyer side participants and infer possible future behavior (Milgrom 1981; Ashenfelter 1989). In addition, buyer side agents look to the actions of others to determine what actions they should take (White 1981; White 1981; Granovetter 1985; Podolny 1993). Those buyer side agents that are more central will have more access to information and will be more visible in the marketplace. They will be conducting many transactions with many different parties, and their actions will serve as a visible signal to the other agents. Buyer side agents will use the bidding action of others in consideration of their willingness to pay for a good. More bidders willing to bid more money indicates positive information regarding the quality of the good (Milgrom and Weber 1982). The more central buyer side agents are more active and prominent in the marketplace, and their actions will thus be the most visible. Likewise, seller side agents will be more aware of the actions of these more central buyer side agents and can use information regarding which products they are interested in to possibly foster interest from other buyer side agents. This theory is supported in this research as buyer side agents with relatively higher centrality measures are associated with relatively higher prices paid for goods at auction.

Limitations

The limitations of this research should be noted. First, this study is limited in data available for constructing reputation variables. Reputation is established by fulfilling signaling promises over time (Herbig and Milewicz 1994; Herbig and Milewicz 1996), which implies a long-term measurement time frame. Ideally, long term measures tracing back multiple years would be utilized for the study. However this information is limited by the fact that complete information is not available prior to the year 2007. The researcher had to manually gather much of the data, and so the data is limited to the year when the researcher began to collect this data. Additionally, some information is not available through any published means, forcing reliance on limited information contained in published sources. For example, data on principal performance reputation was limited to the top 300 seller side principals for the year, limiting the number of principals for which complete data is available. This presents an opportunity for future research, as the researcher can continue to collect the relevant data moving forward from 2007 and revisit the study hypotheses with more complete data.

Second, the data is limited by the hidden nature of some parties transacting in the marketplace. The true identity of the buyer side principal is unknown, so the network is calculated based on the seller side principal, the seller side agent, and the buyer side agent. This is not entirely limiting as the buyer side agent is the entity actually transacting visibly in the marketplace, so it is their actions and not the actions of the buyer side agent that will serve as signals to the rest of the marketplace. Likewise, the data only records the network of completed transactions. This does not capture other parties that were interested in an item or who was actually involved in bidding- only the final details of who won the auction. Items which were offered for sale but did not meet the minimum price for a sale (reserve not attained) are also not included.

Finally, there is no way to control for the non-phenotypic qualities of the items offered for sale. These are living creatures who are assessed for quality based not only on the variables which can be quantified but also those that are impossible to measure. A product may be comprised of expensive and highly desirable inputs, but if it is flawed in physical structure this will affect the sale price. Controlling for these qualities is extremely difficult if not impossible. Every marketplace participant has different guidelines for what physical traits they consider desirable. Likewise, they all have different limitations on physical flaws that are undesirable. Future research may attempt to control for these qualities by drawing on the researcher experience in the marketplace to make expert judgment regarding the overall physical qualities of the item in question.

Future research should employ samples from other auction marketplaces to assess if these results are generalizable to other populations. Although this study uses the sample of the largest marketplace in the world for this item so as to get a robust sample, other smaller markets for this good may operate through different mechanisms. There are multiple other marketplaces for this same good operating throughout the United States and abroad, and these marketplaces could be tested for replication. Additionally, a sample could be drawn from a similar open marketplace for another type of good.

Future research should also explore the unexpected results in this study. Seller side principal price reputation did not have the expected positive relation with price brought at auction. This finding could support previous research which posited an adverse selection hypothesis for seller side principals in the marketplace. Chezum and Wimmer (1997; Chezum and Wimmer 2000) demonstrated that the purpose a principal has for producing a good could have an influence on price brought at auction. Specifically, those principals who bred

thoroughbreds to race received relatively lower prices for their yearlings. They predicted that the breeders who also raced were perceived to keep the best stock for themselves and sell the rest at auction. This adverse selection hypothesis was not supported in a later study by Vickner and Koch (2001). This discrepant finding provides an opportunity for future research to revisit this hypothesis.

Overview

Chapter two reviews agency theory, signaling, and social networks research in marketing. The purpose of this chapter is to synthesize these research streams and identify avenues for future research. Chapter three develops a research model to address the relationship between marketplace signaling phenomena and business performance outcomes. Chapter four presents the research methodology—including the research setting, research design, operationalization and measurement of research variables—employed to test the proposed research model. Chapter five reports the research results. Chapter six outlines the implications of the research findings and addresses future research directions, along with the limitations of this study.

CHAPTER TWO:
LITERATURE REVIEW

Introduction

The purpose of this chapter is to synthesize agency theory, signaling, and social networks research in marketing and to provide a basis for integrating these research streams. This review is organized as follows: first, agency theory literature will be reviewed. Next, signaling theory will be covered. This signaling review covers the following topics: signaling in the marketing literature; signaling in other literatures outside of marketing including finance and economics; and signaling at auction. Finally, literature covering social networks topics in marketing will be surveyed.

Agency Theory

Agency relationships are widespread in marketing. An agency relationship is said to be present whenever one party (known as the principal) is dependent on another party (known as the agent) to complete some task on behalf of the principal (Eisenhardt 1989). While the most widely recognized agency relationship is the employer-employee relationship, there are many other examples of agency relationships. For example, the relationship between a retailer and its customers is an agency relationship, as is the relationship between a firm and its advertising agency or a franchiser and franchisee.

Whenever a principal contracts with an agent with the goal of achieving some outcome, problems may arise. Cooperating parties (i.e. the principal and agent) are assumed to have different attitudes towards risk and different goals and divisions of labor. There is the "problem of risk sharing" and the "agency problem" (Eisenhardt 1989). The agency problem encompasses the problem of adverse selection and the problem of moral hazard. Adverse selection, also known as the problem of hidden information, occurs pre-contractually when the principal is unable to verify ahead of time that agents actually have the desired skills and qualities. Moral hazard, also known as the problem of hidden action, occurs post-contractually when the principal is unable to evaluate the agent's level of output relative to level of input.

The Problem of Hidden Action

The problem of hidden action, also known as moral hazard, occurs when the principal is unable to evaluate exactly how good of a job the agent is doing. The principal must make a

decision regarding how it will compensate employees for the work they have performed. The basic decision lies in the extent to which the agent will be paid with an outcome or behavior-based control system (Eisenhardt 1985; Anderson and Oliver 1987; Eisenhardt 1989). At its most basic level this is the decision between a salary (behavior) versus a commission (outcome) pay structure. With an outcome-based control system, there is very little monitoring of action or managerial direction for the agents. The principal uses objective measures of the agent's work output to evaluate performance. With a behavior-based control system, the principal more closely monitors the agent and directs their activities. The agent is evaluated via less objective means.

Agency theory attempts to find the best contract to govern a relationship, given certain assumptions. These assumptions include those about: people, who are self-interest seeking, have bounded rationality, and are risk averse; organizations, where there is goal conflict among members; and information, which is a commodity that can be purchased (Eisenhardt 1989). Basically, people and organizations are motivated and bounded by different goals and risk tolerances. People will seek options that will deliver the best outcome for themselves- they are motivated to undertake actions that will bring us benefit. People are also bounded in the fact that there are limits upon the ability of humans to adapt to complex environments. People are considered more risk averse than are organizations because they are unable to diversify their employment whereas an organization is capable of diversifying their investments (Eisenhardt 1989). Organizations are assumed to have goal conflict among members when individuals with different preferences must come together in a cooperative effort. If an organization wishes to obtain more information they must be willing to purchase this commodity through investment in time or resources to do so. These assumptions about people and organizations must be considered any time a principal and agent contract in a relationship.

Overcoming the Problem of Hidden Action

Much of the literature on agency theory has been devoted to resolving the problem of which type of contract to use between a principal and its agent. The decision between an outcome or a behavior-based pay structure must consider the risk tolerance of the parties involved (Eisenhardt 1989). Whenever there is an agency situation in which individuals or groups are cooperating for some goal, those involved will have different attitudes towards risk. These different attitudes can lead to different divisions of labor, based on individual risk tolerance (Jensen and Meckling 1976).

If the agent is compensated via outcome-based means, it will be paid based on verifiable output such as the dollar amount of sales contracts closed. On one hand, the agent is incentivized to deliver more output so that it may make more money, but on the other hand, it must accept more risk. The risk is inherent in the notion that its level of output is at least partially dependent on external factors such as the quality of the product it is selling, the amount of advertising done by the company, or even economic conditions. With a behavior-based contract, the agent is evaluated based on their actual behavior, not on their verifiable output. Behaviors monitored could include the number sales presentations given, aptitude, or product knowledge (Anderson and Oliver 1987). This contracting option represents less risk to agents, because their pay is dependent on the things they attempt to perform well, not on the actual outcomes achieved. The agent is shielded from the risk of external factors influencing their pay (Bergen, Dutta et al. 1992).

The risk tolerance of the principal must also be considered. If the agent is to be compensated via an outcome-based contract, the principal assumes less risk because it will only have to pay the agent for work outcomes actually achieved. If they compensate the agent through behavior-based contact, they risk the problem of "shirking", where the agents do not put forth full effort because they know that their pay is not dependent on their performance outcomes (Eisenhardt 1989).

There are some examples of empirical tests of agency propositions in recent literature that focus on choices between the types of control systems firms may employ to govern relationships. Murry and Heide (1998) study what affects retailer participation in manufacturer-sponsored promotion programs. They look at both interpersonal relationships between the boundary personnel in retailer and manufacturer firms, and also at organizational level variables including incentive premiums and monitoring efforts. Support was found for the hypothesis that the use of performance-based contracts provided an opportunity for self-selection into relationships, in that fewer retailers chose to participate in promotions governed by those types of contracts. Bloom and Milkovich (1998) study the relationship between risk, incentive pay, and organizational performance. They find that firms facing higher risk will not place more emphasis on incentive pay and that these firms that relied on incentive pay performed more poorly than those firms that faced high risk who did not emphasize incentive pay. These results are contrary to what agency theory risk-reward tradeoff would predict. On the other hand, Krafft's empirical study of sales force control systems (1999) found many predictions based on agency theory including those based on the risk faced by the firm. Other

predictions supported by his tests included those based on the measurability of outcomes and cost of that measurement as a determinant of control system, along with the measurability of the sales force behavior, and the complexity of products. Ghosh and John (2000) find that the basic agency theory prediction of incentive-insurance trade-off holds to some degree under specific circumstances where risk-neutral principals deal with risk-averse agents whose actions are non-verifiable. When a job involves a higher level of output uncertainty, principals tend to use more salary weighted compensation plans, but Ghosh and John find no support beyond this. Sarin and Mahajan (2001) follow this line of research and examine how the different options for control systems (outcome versus behavior based) affect team performance as measured both on internal (i.e. self-rated performance and team member satisfaction) and external (i.e. speed to market, innovation, adherence to budget and schedule, product quality, and market performance) dimensions. Overall, they found that when it is possible to evaluate performance individually, it is better to use an outcome based control system. Heide (2003) looks specifically at situations where there is plural governance which is the use of both internal and external contracting for the same basic transaction. When firms choose to supplement external contracting with an internal relationship they have an internal structure from which to monitor the market-based governance.

Other empirical tests of the problem of hidden action focus not necessarily on choices between different contracts, but more on how the mechanisms within the contracts may affect the performance of those contracts. For example, one study found that both principals and agents derive less benefit (as measured the level of conflict or harmony experienced and the profit achieved) when they believe that the relationship is asymmetric in favor of the other party (Ross, Anderson et al. 1997). Similar to the Ross et al. study (1997), Nygaard and Dahlstrom (2002) studied agent relationships in firms involved in a horizontal alliance. When boundary-spanning agents put forth effort into learning a new system, and discover the parts of the control systems that favor the principal, they will experience higher levels of conflict in their relationship with management, decreasing performance. This is just one example of role stress boundary spanners may face- the study found overall role stress is a negative antecedent to organizational outcomes (Nygaard and Dahlstrom 2002). Mishra, Heide, and Cort (1998) conduct an analysis of the ways that agency problems can be resolved via different control systems. Results support the idea that incentives including price premiums and compensation can alleviate problems of hidden action. Joseph and Richardson (2002) provide further evidence that compensation via managerial ownership may alleviate hidden action by aligning

managerial goals with those of the company. Jap and Anderson (2003) look at how different types of relationship safeguards affect both exchange performance outcomes and also the future expectations of that relationship. Relationship safeguards studied include bilateral idiosyncratic investments, goal congruence, and interpersonal trust. The effectiveness of these safeguards depends on the level of opportunism inherent in the relationship. When there are relatively lower levels of opportunism, interpersonal trust positively impacts the relationship. In higher levels of opportunism, goal congruence is a better safeguard than interpersonal trust. At both high and low levels of opportunism bilateral idiosyncratic investments are an effective relationship safeguard.

In a look at agency relationships beyond a dyadic perspective, Wathne and Heide (2004) study how the governance structure that a firm chooses to employ with its upstream suppliers may affect their downstream customer relationships. The firm's ability to show flexibility toward their customers is dependent on the governance mechanisms that are in place with their suppliers, specifically the type of incentive structure they have in place.

Problem of Hidden Information

Whenever there is incomplete information, there is the problem of agency (Eisenhardt 1989). Adverse selection occurs when an adverse, or less than ideal, decision is made. One such example is that the principal cannot verify the agents' skills or abilities at the time of hiring. The agent may interview very well and claim that it has the needed skills to be a top performer, but it is very difficult or even impossible for the principal to verify in advance that the candidate will actually perform up to expectations. Problems of hidden information also occur in the consumer marketplace when the consumer is unable to verify the quality of a good before purchase. By definition, the consumer cannot know the true quality of an experience good until after he or she has purchased and used the good (Nelson 1970). Adverse selection occurs when the consumer purchases a good which does not meet their needs.

Overcoming the Problem of Hidden Information

As in the literature regarding the problem of hidden action, much of the literature on the topic of the problem of hidden information is devoted to overcoming the problem and finding the best possible outcome. According to Bergen, Dhutta, and Walker (1992), the problem of hidden information can be overcome in at least three ways: screening, signaling, or providing opportunities for self-selection. A principal may screen an agent to establish their true characteristics by collecting additional information over and above the signals sent by the

agent. Screening can include observing agent behavior, administering aptitude tests, or interviewing personal references among other activities. Screening is generally conceptualized as actions undertaken by the principal to gather information about the agent. It is most effective when it is relatively easy for the principal to obtain information about a potential agent. Signaling occurs when an agent engages in actions that are intended to "signal" to the principal that they are the type of agent that the principal is seeking. This would occur when the agent knows that it has certain desirable characteristics that would be beneficial for the principal. For example, obtaining an MBA is a signal that a candidate has a high level of mental ability and motivation. Generally, screening is thought of as actions that the principal takes to find out information about the agent, while signaling is when the agent undertakes an action to transmit information to the principal. Opportunities for self-selection occur when the principal constructs a situation that will enable potential agents to put themselves in situations that will let the principal know that they have the ability and willingness to expend the effort required to perform the task at hand. An example of this could be when a firm requires a lengthy and difficult training program for new recruits in order to find an agent with the technical competency the firm requires (Bergen, Dutta et al. 1992).

Recent empirical research into the problem of hidden information includes studies of how firms may use relationship building activities to overcome agency problems. For example, several studies have examined how firms may build relationships with customers in order to give them assurances of their motives and guide customer perceptions of the relationship between firm and consumer. Retailers can use various methods including direct mail, preferential treatment, interpersonal communication, and rewards to guide consumer perception of the relationship (De Wulf, Odekerken-Schroder et al. 2001). This investment in relationship increases relationship quality and leads to behavioral loyalty on the part of the consumer. Palmatier, Gopalakrishna, and Houston (2006) also look at the return that a firm might see on their marketing activities. Building relationships with consumers through social program, financial rewards, and idiosyncratic investments helps overcome the problem of hidden information by assuring customers of the company motives. The same notion that relationship building can overcome doubts can also be extended beyond the relationship between firm and consumer. Commitment to building social connections to be leveraged for organizational purposes was shown to increase market performance as measured by sales growth and market share (Gu, Hung et al. 2008). In a similar vein, credible commitment of a retailer to a manufacturer can impact the distribution intensity for goods (Frazier and Lassar

1996). The credible commitments (as measured by contractual restrictiveness and retailer investments) can overcome doubt of motives and intentions and encourage contracting parties to intensify a relationship.

Efforts to overcome problems of hidden information may take place at one level of the organization and may affect agency problems at other levels of the organization. For example, because customers interact with front line employees directly, they see those employees as the window to what management policies and procedures are. Customer trust of the front line employees impacts trust of management and the company as a whole. Front line employee actions must overcome problems of hidden information for consumers, and transmit information about the company motives. This trust will have the end effect of increasing customer value and customer loyalty (Sirdeshmukh, Singh et al. 2002). Wathne and Heide (2004) demonstrate that upstream supplier qualification programs, which overcome problems of information asymmetry by providing opportunities for self selection, can affect a company's ability to show flexibility toward a downstream channel partner.

Some recent empirical studies have demonstrated that signaling can effectively overcome the problem of hidden information. For instance, by making preannouncements to the marketplace about new product releases, firms can alleviate the lack of information about future plans of the firm. Sorescu, Shankar, and Kushwaha (2007) found that in general, pre-announcing generates positive long term financial rewards. Empirical agency research also shows that firms can signal to consumers through the use of bonds (Mishra, Heide et al. 1998), brand name affiliation (Ingram and Baum 1997), and through pre-qualifying products as conforming to a certain quality standard (Wimmer and Chezum 2003). The fact that a company chooses to supplement an external governance system with an internal one in a plural governance situation serves as a signal in itself and provides an opportunity for self-selection for those external firms considering entrance into the relationship (Heide 2003). External firms considering contracting with the firm who already employs an internal governance system are aware that they must comply with the limitations of the internal governance structure if they wish to do business with that company.

Gap in literature

Agency literature focuses almost entirely on dyadic relationships, finding the best contract to govern a relationship between a principal and their agent. This leaves a significant gap to be filled regarding agency relationships beyond the dyad. A general shift has been occurring in the marketing literature such that researchers are examining not only one-to-one

dyadic relationships within firms but also relationships within their greater network context (e.g. Achrol 1997; Achrol and Kotler 1999; Möller and Halinen 1999). A limited number of studies have considered agency relationships beyond the dyadic level, including Anderson, Hakansson, and Johanson (1994), Antia and Frazier (2001), Dahlstrom and Ingram (2003), Mishra, Heide, and Cort (1998), Rindfleisch and Moorman (2001), (Sirdeshmukh, Singh et al. 2002) and Wathne and Heide (2004). Employing network logic to study this problem allows for a better vantage point and a new perspective on the problem. There are many situations where the buyer and the seller in a transaction never actually meet. For example, think of the market for real estate where transactions are conducted via third-party agents, where the buyer and seller may never actually meet. Other examples include situations where goods are sold at auction, where the identity of the buyer or seller may never be disclosed. In order to examine these situations it is imperative that the network in which the transaction takes place is considered. Even if we cannot identify the buyer and the seller in a transaction, we can still study their behavior and the outcomes of the marketplace by looking at the network in which the transaction takes place.

This literature review will focus on the signaling method as a way of overcoming the problem of adverse selection. Of the three ways to overcome the problem of adverse selection, signaling perhaps provides the most versatility. Signals can be conceptualized in many types of relationships, and can go both from principal to agent and from agent to principal. Signals can be present in multi-level agency relationships, and can be seen by multiple parties at the same time. Specifically, the marketing community has found the theory of signaling to be particularly effective in explaining how marketers can use signals to communicate to consumers regarding unobservable product quality (e.g. Rao and Bergen 1992; Rao and Monroe 1996; Kirmani and Rao 2000).

Signaling

In many situations, one party may lack information that the other party has. The party that lacks information may make inferences about the situation based on information provided by the other party. A marketing signal is defined as "a marketing activity which provides information beyond the activity itself and which reveals insights into the unobservable, the message within the message" (Herbig and Milewicz 1994, p. 19). A signal provides a direct or indirect indication of intentions, motives, goals, or even internal situation and these signals convey information to other actors in the marketplace (Spence 1974; Porter 1980). The

marketing literature has particularly focused on the theory of signaling to explain how one party can communicate to another about unobservable product quality, and help to overcome the problem of adverse selection.

Kirmani and Rao (2000) identify a typology of marketing signals. The main classification is based on whether the firm incurs the monetary loss due to signaling, and if this loss occurs whether or not they default on their product quality claims, or if they only incur the loss if they default on their quality claims. Default on a quality claim occurs when a firm promotes that their product is of high quality, but the customer finds that the product is not actually of high quality. Signals which cause the firm to incur loss with or without default are known as "default-independent claims", while signals which only incur monetary loss if default occurs are known as "default-contingent claims". These categories are further broken down based upon the type of costs that the company must risk in proving the signal. While the costs of the default-independent signal are incurred whether or not the firm defaults on its quality claims, costs for signals which are only incurred during an actual sale are known as "sale-contingent", while signals which cost the firm no matter if a sale is made or not are known as "sale-independent". Examples of sale-contingent signals include low introductory prices, coupons, or slotting allowances. Examples of sale-independent signals include advertising, brand name, or retailer investment in reputation. For default-contingent signals, the bond for the firm is based on the potential for future consequences. If the firm stakes its future revenues on offering a default-contingent signal, that signal is known as "revenue-risking". If the firm stakes its costs on offering a default-contingent signal, that signal is known as "cost-risking". An example of a revenue-risking signal is a high price, while warranties and money-back guarantees are examples of cost-risking signal (Kirmani and Rao 2000).

Following on the theoretical base and the strong pedagogical development as outlined by Kirmani and Rao, the rest of this section will be organized around their Typology of Marketing Signals classification method. Their 2000 paper provides a comprehensive and efficient structural review of signaling.

TABLE 2.1		
Typology of Marketing Signals		
		Notes
Default-Independent	Sale-Independent	Firm incurs costs if they default on quality claim or not, if they make a sale or not.
	Sale-Contingent	Firm incurs costs if they default on quality claim or not, but only if they make a sale.
Default-Contingent	Revenue-Risking	Firm incurs costs only if they default on quality claim, firm stakes future revenues.
	Cost-Risking	Firm incurs costs only if they default on quality claim, firm stakes future costs.
**adapted from Kirmani and Rao, 2000, p 69*		

Default-Independent Signals

When a firm chooses to send a signal that will result in monetary loss no matter if they default on their quality claims or not, they are sending a default-independent signal. These default-independent signals can be further broken down into two types: sale-independent and sale-contingent. With sale-independent signals, firms will incur the cost of signaling whether or not an actual sale is made or not. The cost of sale-contingent signals are only incurred if an actual sale is made.

Sale-Independent

Even if no one actually buys the firms' products, the costs of sale-independent signals are incurred. Much of the existing literature on signaling focuses on the effects of the sale-independent signals of advertising, brand name, and retailer investment in reputation (e. g. Kirmani and Wright 1993; Chu and Chu 1994; Dawar and Parker 1994; Erdem and Swait 1998; Rao, Lu et al. 1999; Zhao 2000; Aiken and Boush 2006). The findings in these studies will be elaborated upon in the following sections.

Advertising. When a firm makes a monetary outlay into advertising, it is taking steps to inform the marketplace about its product. They may be trying to increase awareness, project a certain image of their product, or persuade consumers that their product is better than competitors' offerings. Regardless of the type of message that the advertising is sending, the very act of spending money on advertising sends a signal to the marketplace. Marketing literature focuses mostly on the signal that this advertising expenditure sends to the consumer. Consumers are aware that advertising campaigns cost firms money. Kirmani and Wright (1989) examine how perceived advertising campaign expense may influence consumer expectations about product

quality. They find that in some situations there is a positive relationship between advertising expense and perceived quality. A recent study by Aiken and Boush (2006) found a positive relationship between implied investment in advertising and consumer trust in a web-based retailer. In general, there is support for low-priced consumer goods (Rotfeld and Rotzoll 1976) and consumer durables (Phillips, Chang et al. 1983), but not all studies support the predicted relationship between advertising expense and perceived quality. For example, Caves and Greene (1996) do find support for this relationship, concluding that advertising expenditure does not serve as a quality signal. The findings of Zhao (2000) might shed some light on the disparate conclusions. They claim that previous findings of positive relationships between advertising expenditures and quality perceptions are due to the fact that only high-quality firms can afford to invest heavily in advertising. Basically, these firms had high quality product offerings, which was the real driver of the positive quality perceptions, not just the fact that they spent money on advertising.

Brand name. Consumers have been shown to react more favorably to some element of the marketing mix for a name branded product versus an unnamed or fictitiously named product (Keller 1993). This increased benefit to the company for the name brand product is known as brand equity- the increased price that a consumer is willing to pay for the features inherent in that product beyond what the features are worth themselves. Brand names must credibly convey unobservable quality, because false claims can result in economic consequences for the brand. For example, if a consumer purchases a product that it believes will be high quality based on the brand name, and the consumer finds that the product is actually low quality (the company defaults on their quality claim), its perception of the brand will decrease and that consumer will be less likely to purchase that brand in the future (Rao, Lu et al. 1999).

Consumers use simplifying heuristics when they have limited time and resources (Tversky and Kahneman 1974). They will look for signals in the marketplace to help them make decisions. Brand name can serve as a signal to consumers regarding the quality of the product being considered for purchase. In fact, brand name has been found to be a more important signal of quality than price Rao (Rao and Monroe 1989; Dawar and Parker 1994).

Studies such as Erdem and Swait (1998) and Erdem, Swait, and Valenzuela (2006) examine brand equity as a signaling phenomenon, but take an information economics approach to the theory. They find correlational evidence that brand name does communicate unobservable quality, even in multiple countries around the world (Erdem, Swait et al. 2006), but that this effect is actually found because of increased credibility given to brand name sellers

due to their investments in brand equity such as advertising, product design, and special packaging modification. These investments build brand equity, and as such brand names can convey unobservable quality credibly. It would not be economically wise for a low quality retailer to invest in brand name, because consumers would soon discover that the quality claims are false and not make repeat purchases of the brand (Erdem and Swait 1998). This includes an empirical test by Rao, Qu, Ruekert (1999) which finds support for the prediction that brand name can signal unobservable product quality. Ingram and Baum (1997) examine the effect of chain (brand name) affiliation on the survival changes of hotels in Manhattan. They find that in general, the use of the brand name does improve the performance of the hotel in that they have a higher chance of survival on the whole. Overall, experimental work in brand as a signal of quality has been consistent with signaling predictions (Kirmani and Rao 2000).

Retailer investment in reputation. Similar to the idea that firm investments in a brand can increase brand credibility, which will increase consumer perceptions of quality, firm investments in reputation can send a signal to consumers that their product is high quality. Reputable retailers are less likely to default on their reputation of offering high quality products, as they will experience monetary consequences if they offer products which do not meet consumer expectations. As such, consumers use retailer reputation as a signal of product quality offered (Chu and Chu 1994; San Martin and Camarero 2005; Aiken and Boush 2006; Li, Srinivasan et al. 2009). Dawar and Parker (1994) find that while retailer reputation is less important in signaling quality than brand name or price, reputation is seen by consumers as a signal of product quality. Herbig and Milewicz (1994a, b, 1996) believe that retailer reputation is actually the element which determines if communication via signaling will be effective. Reputation is established by fulfilling signaling promises over time, which implies a long-term investment in maintaining the perception of a high quality product.

Sale-Contingent

The cost of sale-contingent signals are only incurred if an actual sale is made. One example of a sale-contingent signal includes offering a low introductory price. By offering a low introductory price the firm is sending the signal that they are willing to give up immediate income for the first sale in hopes that they will recover the profits via future sales (Schmalensee 1978). The firm is charging a price lower than actually justified by the quality of the product, giving up short-term profit in the hopes of long-term future profits. Only a firm offering a high-quality product can rely on this method of being effective (Wathne, Biong et al. 2001). A firm

offering low quality products cannot rely on future purchases by consumers because consumers will discover that the product is not of high quality and they will not purchase again.

There is little empirical evidence regarding sale-contingent signals such as low introductory prices. Dawar and Sarvay (1997) find no support for the ability of low introductory prices to convey the signal that the product is high quality. In fact, there is some evidence that price can exercise an unconscious influence on expectancies about product quality, and these expectancies can influence actual quality perceptions (Rao 2005; Shiv, Carmon et al. 2005). This suggests that lower prices signal lower quality, although the specific context of a low *introductory* price to induce trial was not considered.

Default-Contingent Signals

When a firm chooses to send a signal that only results in a monetary loss if they default on their quality claims, they are sending a default-contingent signal. Default-contingent signals can be further broken down into two types: revenue-risking and cost-risking. With revenue-risking signals the firm is risking future revenues if they default on their quality claims. With cost-risking the firm is risking increases in costs if they default on their quality claims.

Revenue-Risking

The monetary losses of a revenue-risking signal are only incurred if a firm defaults on its quality claim. One example of a revenue-risking signal is when a firm charges a high price to signal quality. The firm is risking future profits if it defaults on its quality claim. If consumers discover that the product is not of the quality to justify the price, they will not purchase again, and the firm will not receive future revenues (Mishra, Heide et al. 1998; San Martin and Camarero 2005). The price-perceived quality relationship has been well established in the literature, but empirical evidence of the relationship is relatively sparse.

Consumers have been shown to use price to make attributions about product quality. Higher prices signal higher quality, while lower prices signal lower quality (e.g. Rao and Monroe 1988; Rao and Monroe 1989; Lichtenstein, Ridgway et al. 1993), including some empirical evidence (Gerstner 1985; Tellis and Wernerfelt 1987). While Gerstner (1985) does find some support for the relationship between price and quality, his overall findings are very weak. The findings are not robust across product categories, and nonfrequently purchased items had somewhat stronger relationships than those that are frequently purchased. This could be because nonfrequently purchased items are generally more expensive, and products with

higher prices may have a stronger price-quality relationship (Gerstner 1985). Evidence from Tellis and Wenerfelt (1987) also shows that the price-quality relationship is not stable across product categories. They show that price is a better indicator of quality for durable goods which should be useful for a longer period of time and for goods such as packaged goods where the quality is not able to be determined through inspection. Mishra, Heide, and Cort (1998) find empirical support for the hypothesis that consumers who make purchasing decisions under conditions of quality uncertainty will pay a premium price to ensure quality. Consumers use simplifying heuristics when they have limited time and resources to make judgments about products (Tversky and Kahneman 1974). They read the signals in the marketplace, and one such signal is that of price. The relationship of price to perceived quality has been found to be robust even across many countries (Dawar and Parker 1994). The same authors also found that price was more important than retailer reputation, store name, or physical appearance in signaling quality, but less important than brand name.

A few studies have not found support for the overall proposition of price as a quality signal. Caves and Greene (1996) find evidence for price as a quality signal only for frequent but unimportant purchases. Shiv, Carmon, and Ariely (2005) do find that the anticipated relationship of price to quality holds in an experimental setting but find that it is due at least in part to a placebo effect. This placebo effect is where price can exert an unconscious influence on expectancies about product quality, and these expectancies can then have an impact on perceived product performance.

Cost-Risking

The monetary loss of a cost-risking signal is only incurred if the firm defaults on their quality claim. While defaulting on a revenue-risking signal will cause a firm to forgo future revenues, defaulting on a cost-risking signal will cause the firm to incur higher future costs. One example of a cost-risking signal is to offer a product warranty or a money-back guarantee. The firm is offering a promise to the marketplace that its product is of high quality, and if it does not offer the expected high quality it will incur higher costs. It is only wise for a high quality firm to offer cost-risking signals. A low quality firm would find too high of a default rate and incur high costs related to repairs and refunds when it is discovered by consumers that the product is not of high quality. As such, a cost-risking signal can communicate to consumers that the product being offered is of high quality (Kirmani and Rao 2000).

The offer of a guarantee signals quality by taking advantage of the higher probability of returns for a lower quality product (Moorthy and Srinivasan 1995). In an experimental study, Boulding and Kirmani (1993) find that warranties are a successful signal only for reputable firms. San Martin and Camarero (2005) find that by offering a warranty, a firm can engender consumer trust in the quality of the service. On specific example is in the context of a service where quality is not immediately evident after the service is rendered- such as an automotive service department. Evidence supports the notion that low-price guarantees do increase consumer purchase intentions, consumers must find the signal credible (Biswas, Dutta et al. 2006).

Signaling- Business to Business

While most of the literature on signaling focuses solely on the concept of a firm signaling to a consumer, there are some examples of signaling used in a business to business context. These signals are different than the signals conceptualized in the business to consumer context. Signals in the business to business context are actions such as competitors announcements to the marketplace regarding its position or future actions. This market signaling may influence competitive behavior. Competitive reactions are often based on signals which come before actual actions in the marketplace (Herbig and Milewicz 1994; Robertson, Eliashberg et al. 1995; Zhao 2000). Competitors must make inferences about the intentions behind the signal and make predictions about the future actions of the signaling firm. The firm sending the signal must also consider how the signal will be interpreted by competitors. For example, a firm announcing to the marketplace that its are going to release a new product must consider how this signal will be received by their competitors and anticipate how those competitors will react. Manufacturers can also use signals such as advertising, slotting allowances, and wholesale prices to signal high product demand to retailers, in order to encourage them to stock their products (Desai 2000). Wathne, Biong, and Heide (2001) provide experimental evidence that price is used as a signal to potential new channel partners of a high quality product. In a market simulation, Herbig and Milewicz (1994) show that in order for business communication to be effective via signaling, the firm must be reputable.

Heide (2003) proposes and tests empirically the notion that when a firm employs a hierarchical governance structure this decision itself is a signal to outside suppliers. The existence of the hierarchical arrangement serves as a self selection device for suppliers in that the presence of the relationship signals to the external suppliers about what they could expect

in a contact- specifically an increase in centralization and formalization. Tested empirically in the context of retail store managers, Murry and Heide (1998) demonstrate that using performance-based incentives for promotional program participation can provide an opportunity for risk-averse retailers to opt-out of a performance based program. The utilization of the performance-based incentive program served as a signal to channel members that their reward would be based on performance, so those who were not willing to commit to performance would choose not to enter into such contract.

Gap in Literature

There is very little literature on signaling in marketing that considers signals beyond a dyadic relationship. There are many situations where the signal does not just affect just one sender and one receiver- multiple constituencies may be aware of and react to a given signal. For example, Chu and Chu (1994) consider a distribution channel where a manufacturer is able to signal that its product is of high quality through choosing to sell it through a reputable retailer. The end consumer is receiving the signal that the product is of high quality because it is being offered by a reputable retailer; the manufacturer is also signaling to the retailer that it believes the retailer is reputable by choosing to sell their product through that channel. Similarly, Rao, Qu, and Ruekert (1999) show that a brand can enhance claims of quality by co-branding with a second reputable brand. Consumers will perceive the claims of this co-branded product to be more credible because of the tie with the reputable brand. Both firms are signaling jointly to the consumer that they believe one another to be of high quality, if either party believed the partner brand would default on its quality claims, it would not take the risk of putting their brand name at stake. Some literature discussed earlier which consider business to business signaling also consider what the competitor reaction to the signals will be, along with the effect the signals have on the end consumer (Zhao 2000; Prabhu and Stewart 2001). In this way, they are considering the effects of signaling beyond the traditional view of one firm signaling to one consumer.

In addition, there is a general lack of empirical evidence for signaling hypotheses (Rao, Lu et al. 1999). While some studies (e.g. Boulding and Kirmani 1993; Caves and Greene 1996; Erdem and Swait 1998; San Martin and Camarero 2005; Biswas, Dutta et al. 2006; Erdem, Swait et al. 2006) have offered empirical evidence where signals are shown to affect consumer purchasing outcomes, it is certainly limited. A few studies (Murry and Heide 1998; Heide 2003) have provided empirical evidence of signaling hypotheses in a business to business context,

where the type of governance contract offered to channel members serves as a signal and opportunity for self selection into the relationship. In particular, there is a lack of empirical evidence linking signaling hypotheses with business performance outcomes.

Beyond the marketing literature, we can find many examples of signaling. In particular, signaling is used extensively in the finance and economics literature.

Signaling in Other Contexts: Finance and Economics

The concept of market signals has been discussed at length in the finance literature. In general, the literature considers situations where buyers and sellers are interacting in a market for some good, and they must use signals to infer information about the true quality of that good. Individual consumers may have different pieces of private and imperfect information, with different consumers receiving different signals from the marketplace. This private information influences the decisions that consumers make. By looking at aggregate data regarding market sales, it is possible to get a clearer picture of the signaling mechanisms operating (Caminal and Vives 1996).

In the stock market, like many goods markets in general, buyers are unable to accurately determine the quality of a good before purchase. Akerlof's (1970) paper on the problems inherent in a market with goods of different qualities discusses signals as a way to counteract quality uncertainty. Since buyers do not know the quality of their potential a priori, they must look to signals such as market statistics of past sales to judge the quality of the good.

Signaling literature in finance and economics can be broadly divided into auction and non-auction contexts. First, I will discuss the non-auction context.

Market Statistics as Signals

One demonstration of the use of market statistics as signals is presented by Akerlof (1970) in the used car market. Although a consumer does not know ahead of time if the used car that it wishes to purchase will be a good car or a 'lemon', it can look to market statistics to help with their purchasing decision. They can find out the probability that a certain make of used car is a good car- think of Consumer Reports magazine, which publishes ratings that assess the relative reliability of used cars. Buyers can use this information to judge options of available used cars and increase their chances of buying a high quality product. One other market statistic identified is information on past market share. Market share provides an additional source of information about relative quality differences, as they aggregate dispersed

information on the actions of previous customers. Firms actively compete for market share in an attempt to manipulate consumers' learning. They will cut prices in the hopes of increasing sales and market share. Consumers use market share as a signal of quality- the higher the market share, the more other consumers are buying the product and the higher the perception of quality (Caminal and Vives 1996).

Companies' Role in Signaling

From the marketing literature we know that companies use signals such as advertising, guarantees, branding, and reputation to influence perceived quality. In finance we find that companies also purposefully drive quality perception through the use of signals. A firm can use its reputation to signal quality in a market where there is imperfect information (Shapiro 1982; Rosenman and Wilson 1991). Rosenman and Wilson (1991) consider a market for cherries in which the goods are sold in lots. Firms can make the decision to sort their cherries by size prior to sale, or sell them in mixed lots. They find that the firms that do not sort receive a more premium price for their heterogeneous lots of cherries than do sorting firms for the same product. Rosenman and Wilson posit that the very act of sorting sends a signal to the market. The firms that do sort are pre-examining their merchandise, and are believed to be removing the largest, highest quality cherries from the population of cherries for sale in homogenous lots of large cherries. By not sorting, consumers infer that the non-sorting firms are leaving the large, high quality cherries in and making them available to the buyer in the heterogeneous lots. The very act of not sorting is a signal to consumers that they will find a better quality assortment in their lot.

Firms can influence trading volume of their stocks via the public announcements that they make, with the market reacting either positively or negatively depending on the information in the announcement. The public announcements serve as signals of the current state of health of the company (Kandel and Pearson 1995). Some firm-level decisions can affect stock market returns, such as the decision to call or not on an outstanding convertible bond (Acharya 1988). Similarly, the trades of company directors signal to the market, depending on whether the directors buy or sell stock. Director purchases serve as a way for managers to communicate private information. They can use purchases to signal positive information, such as that the stock is undervalued, and it will result in positive abnormal market returns. Stock sales by managers, on the other hand, signal negative information and result in negative abnormal returns (Gregory, Matatko et al. 1997; Louis and Robinson 2005; Louis and White

2007). Even the actions of the central bank are posited as signals to the market as a whole that inform about the relative health of the economy and affect the general price level, output, and employment (Friedman and Maier 1999). It is clear that signals at the firm level are used to communicate unobservable quality information, which has been empirically shown to affect business performance outcomes in the form of stock market returns. Signals regarding company quality can also be sent to the market by agents outside the company. This occurs when the signal is not sent between the company and a buyer, but rather through an agent in the middle of the transaction. The next section will explore further these situations where signals are transmitted through third party agents.

Third Parties' Role in Signaling

In many markets third party agents are relied on to evaluate company quality. The actions of these agents serve as signals to the market which can affect business performance. Subjective information from experts is widely used to make predictions in situations of uncertainty in a variety of contexts ranging from horse races, the stock market, and markets for art and wine. The expert opinions of race track handicappers are widely used as a signal of the probability that a certain horse will win a race (Figlewski 1979). Bond market investors are unable to directly observe the default probability of any borrower, so they must use the associated observable insurance coverage of a third party insurance company to determine the interest yield on a debt issue (Thakor 1982). Third party agents such as stock brokers interpret signals of company public announcements, and their interpretation of the message, positive or negative, drives stock trading(Kandel and Pearson 1995).

Zuckerman (1999) presents a concept of markets as a social process where the third party experts, not the buyers themselves, are the market drivers. This follows on White's (1981; White 1981) work on production markets where he asserts that the "central dynamic in production markets consists of mutual monitoring among sellers rather than reaction to an amorphous mass of buyers (p. 1400)". Zuckerman explains that here, third party experts are responsible for giving market participants and products legitimacy. They shape market patterns through their product recommendations and endorsements. In industries such as the stock market where theses experts have significant influence, they actually replace end consumers as the primary audience that can determine the success or failure of a product. If a seller fails to get a review from these market experts, their product will not be recognized as being a "legitimate" product. If the product does not gain such recognition, there will be a lower

chance of success. Zuckerman recommends that companies must actively work to garner recognition by these experts because those firms that are reviewed by the experts are more highly valued than those that are not. Hilger, Rafert, and Villas-Boas (2007) find general empirical support for the notion that expert opinion can increase consumer demand. Even the way that experts classify stocks can affect financial returns. For example, being classified consistently into a specific industry classification system can affect stock market returns. Different experts use different methods and interpretive models to analyze market performance. If a stock is placed into multiple different classifications at different times by analysts, it stands a better chance of getting incorporated into more market models. This inclusion into more models will lead to higher levels of trade than those stocks that are not classified into multiple industry classifications (Zuckerman 2004).

Signaling at Auction

Auctions are widely used mechanisms for selling goods. Klemperer (1999) gives an overview of the basic premises and assumptions regarding auctions which are summarized here. Governments use auctions to sell treasury bills, foreign exchange, mineral rights (including oil fields), and other assets. Klemperer cites houses, cars, agricultural produce and livestock, and art and antiques as examples of items commonly sold by auction. The auction represents an efficient method of determining the public value of a good. There are four basic types of auctions that are often employed in practice and studied. There is the ascending-bid auction, also known as the oral, open, or English auction. In these auctions, the price is successively raised until only one bidder remains. The highest bidder wins the item. The descending-bid auction, also called the Dutch auction, is used in the sale of flowers in the Netherlands. Here the auction starts at a high price, and the price is lowered successively until someone agrees to accept that price. There is also the first-price sealed-bid auction and the second-price (or Vickery) sealed-bid auction. In both of these types, bidders independently submit a bid without knowing the price others have bid. In the first-price version, the highest (or lowest) price wins, in the second-price version the highest bid wins, but the price paid is the second-highest bid. Asymmetric information is a key feature of any auction.

There are situations where the seller is bidding at auction, not the buyer. Examples could include where sellers are bidding on a construction contract, or a supplier bidding on a contract to provide a manufacturer with raw goods. Often, in situations where sellers are

bidding, they will be trying to bid the lowest or most competitive price. This is contrasted where buyers typically must bid the highest price to win an auction.

There are two basic auction models, representing differing levels of information availability. In the private-value model, each bidder knows only how much he values the object, and this information is private. The common-value model differs in that the actual value of the item is identical for all bidders, but individual bidders have different amounts of private information regarding what that value actually is. In Klemperers' (1999) example, the value of an oil-lease depends on how much oil is actually contained under the ground of a particular plot of land. Bidders may have access to different geological signals about how much oil there actually is, and this private information may cause them to have differing valuations.

There is also a general-model which combines characteristics of both the private and common-value models. Here each bidder receives a private information signal, but each bidder's value is based on all of the signals in the marketplace, both public and private. A key feature of bidding in any auction with a common-value component is the 'winner's curse'. This is the notion that whoever wins the auction is willing to pay a price higher than anyone else and the winner pays more, on average, than the item is actually worth. The winner is the bidder who has overestimated the value of the item to the greatest degree (Klemperer 2002).

One key idea in the literature surrounding auctions is the premise that market participants look to signals in the market to determine their estimate of the value of an item (White 1981). Typically, this involves bidders looking to other bidders, market statistics about the goods for sale, and the item sellers.

Role of Other Market Participants in Signaling at Auction

Markets are social processes (White 1981; White 1981; Granovetter 1985; Podolny 1993). Bidders look to the actions of other consumers in the marketplace for signals to indicate unobservable quality to help them determine the price they are willing to pay. Rothkopf (1969) examines how a buyer values a product when the true value is unknown. He finds that bidders look to the number of other bidders bidding on the same object when determining their valuation. The more bidders, the higher the value they place on the item. Market traders look to past auction results for information to determine the value of the object at hand. Higher past equilibrium prices convey more favorable information about the quality of the objects being sold than lower prices (Milgrom 1981; Ashenfelter 1989). Traders also use current bidding prices in determining value. Bidders use the bidding action of others in consideration of

their willingness to pay for a good. More bidders willing to bid more money indicates positive information regarding the quality of the good (Milgrom and Weber 1982). This evidence carries into auctions where suppliers are the bidders.

While each participant may look to individual others to help themselves in making a determination of the value of the object for sale, this sharing of information can affect the accuracy of the auction price as true determination of the value of the object. If there are many participants in an auction, the market aggregates information into a collective evaluation. As the market grows, each individual participant pays less and less attention to his own private information and considers the aggregate behavior more and more. This aggregation of many pieces of private information results in a sale that reflects the true value of the item (Pesendorfer and Swinkels 2000). For this reason, auctions are often seen as the best way of determining the value of an item that is unique, rare, or of undetermined quality (Ashenfelter 1989; Klemperer 1999).

Role of Sellers in Signaling at Auction

While market participants look to other buyers in the market to help determine the value of an item offered at auction, there are also circumstances where potential bidders may look to the seller of the item for signals of worth. For instance, Milgrom and Weber (1982) found that a seller can raise the expected price of their item by adopting a policy of providing expert appraisals of quality of the object it wishes to sell. Overtly offering market participants a dollar value upon which to base their valuation can serve as a powerful, credible signal of quality. Sellers can provide information on past sales of similar objects to help buyers determine value, and in some circumstances, the auction house will publish an estimate of the price it expects an item to bring. If the auction house does a good job in setting an estimate (not so high that bidders are discouraged from entering the bidding, not so low that sellers feel they will not get a fair price), this estimated price can be a very efficient means for signaling the value of an item, just as past auction results are useful in predicting sale price (Ashenfelter 1989; Louargand and McDaniel 1991).

In recent years, online electronic auctions have yielded insights into the role the item seller has in affecting buyer valuation. In most auction scenarios, an auction house is used to sell items collectively on behalf of many individual sellers. An auctioneer works to obtain the highest price possible for the good being sold. The auctioneer coordinates bids from various sources and actively works to establish competition between parties. By encouraging this

competition, the auctioneer himself has a role in driving prices (Heath and Luff 2007). In an online auction, there is no physical auctioneer, and bidders simply submit their bids electronically and try to win the auction by having the highest bid at the designated close of the auction. The seller in the online auction is directly selling to the bidders, so the bidders will look to that seller for signals of the quality of the good. Sellers can increase the price for which their item sells for at auction by signaling about both the quality of the good they are offering and the reputation of themselves as sellers. Li, Srinivasan, and Sun (2004) found that by offering quality indicators such as detailed pictures, the acceptance of third party secure payment systems, and offering a money-back guarantee, sellers will obtain higher prices for their goods. In a similar vein Melnik and Alm (2005) and Houser and Wooders (2006) found that a positive reputation as determined by amount of positive feedback on the online auction site eBay had a positive and statistically significant effect on price. In particular, these reputational effects were more important for heterogeneous goods where buyers could not simply look to past auction results of identical items in determining value. Sellers can also influence the final price they receive for their goods via the reserve, or minimum acceptable price, that they set for their items. This reserve price can serve as a reference price for the consumer to judge the ultimate worth of the item. In general, the literature (e.g. Ariely and Simonson 2003; Kamins, Dreze et al. 2004; Suter and Hardesty 2005) finds that a higher reserve price will result in a higher final auction price, while a lower reserve price will lead to a lower final price. In addition, Suter and Hardesty (2005) and Kamins, Dreze, and Folkes (2004) found that a greater number of bidders participating in the auction was associated with higher final prices.

Gap in Literature

While some tenents of auction theory are well established, there are questions to be answered in the marketing literature. While the idea that auction participants are affected by the other auction participants is well established (e.g. Milgrom and Weber 1982), and the notion that auctions are often seen as the best way of determining the value of an item that is unique, rare, or of undetermined quality (e.g. Ashenfelter 1989; Klemperer 1999), most research on auctions ignores the mediators of auction outcomes. There is some evidence of the role of seller reputation at auction including empirical evidence from online auctions (e.g. Melnik and Alm 2005; Houser and Wooders 2006). Other empirical evidence from electronic auctions includes evidence of an increased final price by those auctions which offering quality indicators (Li, Srinivasan et al. 2004; Li, Srinivasan et al. 2009). Many questions exist regarding

these mediators of auction performance, particularly in situations outside of controlled online electronic auctions.

Social Networks

Social Networks Perspective on the Marketplace

The network conceptualization in markets shed insight on the behavior, attitudes, and perceptions of those involved (Burt 1992; Wasserman and Faust 1994). Harrison White's work (1981; White 1981; White 2002) on markets focused on explaining what, exactly, a market is, why markets come into existence, and why they persist. The market is a social process, where actions are based on "perceptions that are shared and public" (White 1981). The market structure is originated from feedback between producers and buyers in the market on the terms of trade offered. The market is sustained via the choices that the individual actors make regarding the purchases they make. These choices are seen by other market participants, and these other participants use the actions of others as signals of the choices they should make. This networks perspective lies somewhere between the structuralist and individualist conceptualizations of the market (Mayhew 1980). Structuralists see individuals as "mere puppets" whose actions are dictated by the social structure they are in (Degenne and Forse 1999). The Individualists' idea is grounded in economic theory and sees the actions of individuals as autonomous behaviors undertaken to maximize their own personal utility function (Hunt and Morgan 1995). White's theory of the market (1981; White 1981; White 2002) fills the void as an intermediate point between looking at society as a whole and looking at individual interaction only. Behavior of participants cannot be determined solely by position or solely by individual goal seeking (Kilduff and Krackhardt 1994). The market is seen as a role structure of firms that are linked together through interacting observations of trade. Producers see the decisions that other producers make regarding production of goods and base their own decisions at least in part on these observations. The market structure is maintained through this feedback, not through a third-party authority dictating how the producers should behave. Producers decide what to output by observing the outcomes of other producers in the market, not by speculating on how buyers will react to products. Firms don't use the preferences of buyers to make decisions; they base their actions on what other producers are doing. Firms try to find a place in the market where they can succeed- a certain niche level of output that they can maintain. The producer production levels also signal to other market participants. For example, consumers assess producer production levels as signals of quality (White 2002).

Granovetter (1985) shared White's basic conceptualization of the market as a social structure. His focus was on examining the difference between the networks perspective and the economic perspective as promoted by Williamson (1975; Williamson 1979; Williamson 1981). Williamson's New Institutional Economics view places less emphasis on the effect of legal, political, or social forces on social institutions, and places more weight on economic forces as drivers. Firms contract hierarchically within the firm when it can be done most efficiently in terms of the cost of economic transactions, but they will contract in the market if this cannot be done. Opportunism, according to this view, is constrained by the authority and structure of the institutions. Granovetters' idea, known as embeddedness, builds on the notion of markets as networks, as presented in White (White 1981). He sees economic action as embedded in the structures of social relations. It is impossible to analyze behavior and institutions separately because they so constrained by social relations. These social relations play a central role in the market process. The relations and structure of the market generate trust and discourage opportunistic behavior since business relationships are embedded in social relationships. These social relationships are viewed as more important in bringing order to economic life than the authority mechanisms as highlighted by Williamson's conceptualization (Granovetter 1985).

Podolny (1993) built on the idea of the market structure as being derived from trade among market participants by introducing the role of producer status as a determinant of market structure. While White (1981a,b) focused on the producer's role in the market in dictating their production decisions, Podolny focused on status. A producer's status is defined as "the perceived quality of that producer's products in relation to the perceived quality of that producer's competitors' products" (Podolny 1993, p. 830). Status is seen as a significant determinant in generating and producing hierarchy among producers in the market. The producer's status position affects the opportunities that it may have in comparison to those opportunities available to its competitors. Market status is a signal of the underlying quality of a firm's offerings, and higher status producers are able to command higher prices in the market. According to Podolny (1993, p. 833), status is affected by the exchange relations that producer has with consumers, the ties to third parties associated with the market in the distribution channel, and ties to other producers. When market participants exchange with one another, they are linked to, or identified with one another. Status is based on the quality of that producer's past offerings and their interactions with past high status individuals. In the case of a market participant who sells the goods of other producers, higher status participants will be able to obtain higher quality goods to sell from producers. The higher status sellers will be able

to command higher prices, so producers will be incentivized to sell via their channel. The firms' status influences the attention that market participants pay to quality, their assessment of that quality, and their regard for the product in general. Reputation is modeled as a part of status- status ordering helps determine which firms will develop reputations for quality and which won't (Podolny 1993). In general, this implies that reputation differences may be due in part to affiliations the participants have, and not just their capabilities (Benjamin and Podolny 1999).

Networks are the "plumbing" of the market. They are the channels or conduits through which "market stuff" flows (Podolny 2001). This includes information along with actual goods, services, or payments. But networks are not just pipes- we don't just send and receive information between market participants. The network ties act as signals to others in the marketplace, prisms reflecting the relationships in the market (Podolny 2001). Market participants see these relationships and make inferences about the underlying quality of the individuals or firms involved. The networks approach acknowledges that relationships cannot be defined solely by their collection of attributes (Knoke and Kuklinski 1982; Wasserman and Faust 1994; Scott 2000). Network-based measurement provides a complementary methodological approach to help explain the behavior, attitudes, and perceptions of market participants. This approach has been advocated both for marketing in general (Iacobucci 1996) and for distribution channel research specifically (Knoke and Kuklinski 1982; Burt 1992).

For this research, the networks concept of centrality will be used to assess the relative position of actors in the marketplace to examine their influence. Centrality is an effective way to measure how active an actor is in a marketplace, and inform us of that actors access to and control over information flows. Actors with greater access to and control over information will be able to leverage more influence over the marketplace.

Centrality

At the most basic level, centrality is a measure of how active an actor is in a network. A more active actor will have a higher degree of centrality, a less active actor a lower degree. In a circle where no actor is more active than any other, all will have the same centrality index. This degree centrality focuses only on direct and adjacent choices. Prominence in degree centrality is relatively equivalent to activity (Wasserman and Faust 1994). In 1977, Linton Freeman introduced a new set of centrality measures called betweenness centrality. These measures of centrality expanded beyond the existing centrality measures (Bavelas 1951; Beauchamp 1965; Sabidussi 1966) which measured centrality as a function of the sum of the minimum distance

between that point and all others. The limitation of these measures was that they could not be used in unconnected networks, such as those found in natural settings. Freemans' 1977 measure defines centrality in terms of the degree to which a point falls on the shortest path between others, giving them the potential for control of communication. This betweenness measure of centrality should be used when there is potential for control of communication by individuals who may be substantially relevant.

A point with a relatively high degree of betweenness centrality is somehow "in the thick of things" (Freeman 1978/79). It may have more interpersonal influence on the other actors in the network, and should have greater access to more information. The person who is in direct contact with many others should see himself as a major channel of information, and others will see him that way as well by observing his behavior in the network. Being involved in the many flows of information allows a market participant to keep aware of new developments, and control the flow of information, money, and other resources (Van Den Bulte and Wuyts 2007). On the other hand, a person with low degree is peripheral to the network, and will be isolated from involvement with many others (Freeman 1978/79).

Networks Studies in Marketing

A general shift has been occurring in the marketing literature to view market organizations as not just sets of independent organizations operating independently but as networks of specialized firms tied together in cooperative exchange relationships (Achrol and Kotler 1999; Kothandaraman and Wilson 2001). In the modern era, there has been a great deal of industrial restructuring which has changed the setting of markets and organizations. As companies downsize, outsource, and specialize, they must become more flexible and learn new ways of doing business. One of the fundamental changes is to realize the importance of other firms operating in the same environment and build relationships, or networks, with partners, suppliers, distributors, and even competitors. While relational exchange may seem at first to be an issue that simply takes place between two firms that are involved in some sort of exchange, the true nature of the relationship is defined by the long-term makeup of the greater institutional framework, including the individual people who work for and buy from the organizations. As such, marketing must look at the relationships which define firms not just on a one-to-one level, but must view these relationships in their greater network context. For this literature review I will categorize the networks marketing literature into three general camps of

study, following along the same general division as Van Den Bulte (2007). These three divisions are as follows: consumers, organizations, and channels of distribution.

Consumers

People are influenced by the other people they come into contact with. Social psychology has long known that individual behavior is influenced by the groups with which we surround ourselves with, that people change their behavior based on the people they are around (Asch 1953; Merton and Rossi 1953). More specifically, consumer purchase decisions are influenced both by the networks of individuals that we are a part of, along with those groups that we are not directly a part of but we watch or admire (Bearden and Etzel 1982). This social influence can be used to explain brand and product choice. So while club members may make decisions based on the purchases of other club members, they may also look to other reference groups such as celebrities for signals of the brands and products they should consume. Similarly, Sirsi, Ward, and Reingen (1996) demonstrate that the culture to which an individual belongs can shape consumption behaviors. The culture in which an individual is embedded in may restrict the opportunities available for learning different beliefs, and so individuals who are members of the same culture will tend to make similar purchasing decisions.

While some consumers may have different levels of susceptibility to interpersonal influence (Bearden, Netemeyer et al. 1989), the nature of the relationship can also affect the influence one individual or group may have on another. For example, Reingen et al. (1984) studied brand and product choice in a sorority. They found that different levels of social relationships (roommate, friend, someone with whom you study, play sports, or eat with, etc.) can affect the level of brand congruence across these relations. In addition, those relations with multiple levels of ties (individuals or groups that have more than one level of social relationships) had even more brand congruence. While this research has focused on how a network influences the purchasing decisions of an individual consumer, an interesting application of the network approach is on the way that groups make decisions- specifically, how a group which consists of several subgroups makes decisions which have both group and individual level implications. Ward and Reingen (1990) studied how opinions and beliefs about the optimal decision are influenced by the social structure of the group. The social structure affects the interaction patterns of the group participants, which in turn influences the shared knowledge structures affecting the decision that group ultimately decides on.

Some types of goods exercise more significant social influence over people. Goffman (1951) outlined the notion that some purchases we make can be used specifically to symbolize or signal our status in the world. These status objects can then influence others in their purchasing decisions and affect the way the possessor of that symbolic good is viewed (Richins 1994). Think of a Rolex watch, a Porsche sports car, or some other special possession and its role in symbolizing something about the individual that possesses this item. We can send a powerful signal about ourselves and our values by the items that we choose to own. Consumers who desire these unique, status-laden goods can even affect the pricing decisions that companies make. For example, Amaldoss and Jain (2005) found that sometimes a consumer's desire for uniqueness can increase demand for some goods as the price increases. The higher price signals to the purchasing consumer and to those that observe the consumer displaying this purchase that the good is even more desirable. As such, the desire for uniqueness and status can actually lead to higher prices and higher profits for the firm.

While consumer goods purchases have proved a fertile area of research for the study of social networks in marketing, another major trend that has emerged is the study of word-of-mouth referral networks. Reingen and Kernan (1986) and Reingen (1987) examined the network of a piano tuner and studied the way that word-of-mouth referrals transmit through the network. They found evidence for key network opinion leaders, individuals who have influence on the decisions of multiple people. These opinion leaders are key links in the network, disseminating opinion through multiple channels. In addition, membership in multiple groups was found to be instrumental in the spread of word-of-mouth referrals. Brown and Reingen (1987) examined the differing roles of strong versus weak ties in this referral network. While weak ties act to 'bridge' information, allowing it to travel between different social groups, strong ties are more likely to be activated for broadcasting referral information. Overall, strong ties were thought to be more influential in the word-of-mouth referral network. Frenzen and Nakamoto (1993) also found support for the notion that strong ties are more important in the spread of a word-of-mouth referral. Recent empirical work (Van Den Bulte and Joshi 2007) has supported theory that some customers are more valuable for marketers to target with new innovations, as these consumers are more likely to both adopt new developments and also influence others in their network to purchase the innovation (Gladwell 2002).

Recent networks work in the area of consumer behavior have explored the specific mechanism that might be at play in consumer brand choice. Henderson, Iacobucci, and Calder (1998; Henderson, Iacobucci et al. 2002) have examined consumer associative networks to

explore the brand constructs of positioning, complementarity, and substitutability. The use of networks analysis methods can provide insight into how consumers view brands and how brands are associated or not associated with each other. This could have important implications for marketers who must make decisions about product positioning. Hill, Provost, and Volinksy (2006) looked at the problem of identifying likely adopters of a product based on their network. They found support for the idea that network linkage can affect product or service adoption. For example, some ties were found to significantly predict adoption. People who were linked with someone who already uses the product or service were shown to be three to five times as likely to adopt that product or service.

Organizations

Changes in the way that companies conduct business has led to a shift in the way that researchers examine relationships within the organization. Business has moved away from the adversarial buyer-seller relationship described by Porter (1985) towards a cooperative relationship paradigm where there is mutual benefit for both parties (Kothandaraman and Wilson 2001). Just as consumer researchers are interested in exploring the effects that an individual's network may have on its purchasing decision, organizational researchers hope to reveal insight into how networks affect decisions within organizations. The networks approach views the organization as "a set of roles linked by several networks that can transmit information, influence, and affect" (Hutt, Reingen et al. 1988, p. 9). With this approach, it is possible to investigate individuals and groups by focusing not on their attributes, but on their interrelationships. Within the organizational networks literature, two main themes can be identified. One main focus is on the ways that the network affects organizational purchasing decisions; the other on the implications for networks in strategy formulation and implementation.

In an early work on networks in the organizational literature, Bristor and Ryan (1987) advocated to move away from thinking of organizational purchasing being conducted by a "buying group" to viewing these decisions as being made by a "buying network". The buying network is defined as "the set of individuals involved in a purchase process, over a specified time frame, and the set of one or more relationships that link (or fail to link) each dyad" (p. 256). This shift toward looking at this process as a network process reflects the more general shift in the modern business environment towards assessing an organization or group not just as an independent entity but seeing them in their greater context of the other organizations and groups with which they are in contact. The network approach examines the relationships

between these groups of individuals, not just the attributes of those groups of individuals. Bristor (1988) advocates a networks approach to investigating coalitions in organizational purchasing. She hypothesized that coalition members' social ties affected the resources available to them, which in turn affected their strength and ability to influence organizational buying decisions. It has been proposed that through these ties and the resources that can be obtained through them, that organizations can gain social capital (Leana and Van Buren 1999). A recent empirical study of "Guanxi"(Gu, Hung et al. 2008), which is defined as the "durable social connections and networks a firm uses to exchange favors for organizational purposes" examines how this phenomenon influences firm performance in china. Guanxi shares similar characteristics with the notion of social capital, as both deal with the resources that are gained and leveraged via social connections. This study found that guanxi does indeed have a positive effect on market performance, as measured by sales growth and market share.

An added benefit of the networks-based measurement approach allowed for empirically testing for the presence of these coalitions while learning about them. Ronchetto, Hutt and Reingen (1989) continued with the networks approach to studying organizational purchasing decisions. They found empirical support for the idea that organizational actors receive influence from the position they occupy in the buying system and structural position and influence in the buying system were positively related. This particular study examined the network within the organization, measuring the centrality, distance from the dominant reference group (i.e. top management or other main center of influence), and distance from the organizational boundary (boundary-spanning personnel). They combined analysis of these network structure variables with variables indicating formal rank and departmental membership of the organization. The dependent variable of influence was measured by how often the actors were sought out for advice and how often they were included in decision making discussions.

A networks approach has also been used to examine marketing strategy formulation. Hutt, Reingen, and Ronchetto (1988) traced emergent processes in marketing strategy formulation to identify key players in the organization. They were particularly interested in managers who engaged in autonomous strategic behavior, where an individual acts as a change agent for promoting a new strategy. They traced the communications patterns that emerged during the marketing strategy formulation process for a set of new products and analyzed the effect that certain roles played in developing and implementing the strategy through time. Certain roles, such as the managers who engaged in autonomous strategic behavior, were

found to be fundamental in implementing a new marketing strategy. Houston et al. (2001) presented a case study where they followed a firm's efforts to enter a new technology market. They found that the manager's social structure influenced the marketing strategy independently of the organizations formal structure, providing more evidence that just examining people based on their attributes (i.e., title according to an organizational chart) cannot convey the true nature of that individual's influence within the organization.

The literature has also explored network effects on marketing strategy in a more general sense. Corporations must be aware that they do not conduct business in a vacuum; they must pay close attention to other companies operating in their same market. Ritter (1999) examined how firms should use their networks to get a competitive advantage by identifying the antecedents to a concept called "network competence". This network competence is basically the ability of the firm to leverage its network resources. He proposes that some companies are better at doing this than others due to their: availability of resources, network orientation of human resource management, integration of intraorganizational communication, and openness of corporate culture (p. 471). Organizations that operate in markets with network externalities must also be aware of the effect that this phenomenon has on their strategic decisions. A network externality exists when a customer's utility for a product increases as the number of customers who use identical or compatible products increases (Gupta, Jain et al. 1999; Srinivasan, Lilien et al. 2004). These externalities can have real implications for business. For example Srinivasan, Lilien, and Rangaswamy (2004) found that network externalities significantly decrease the survival duration of marketplace first entry pioneers. This is especially relevant for high technology products. For example if you are the only person you know with a computer and access to the internet, your utility will be much lower than if you know many other people with that same technology. If you have no one else to email and share links to interesting websites with, your enjoyment and value will be derived only from what you experience. Likewise, if you are the only person with a fax machine, there will be no one else to send or receive faxes from. When high definition televisions were released, consumers who owned these televisions could only experience the high definition feature on the limited number of channels that offered that technology. Network externalities alter consumer behavior, as it is rational for a consumer to wait for a critical mass of others to adopt the technology before they make the purchase. A good example of this can be seen in the recent battle for high-definition video format between Blu-Ray and HD DVD (Block 2005). Consumers were offered a choice of both in the marketplace, but both formats required

different DVD players. Early-adopting consumers who wanted a high definition option were forced to make a choice between the two technologies, knowing that there was a risk that their chosen format might not be the one to survive. The survival of the technologies depended not only on the production and purchase of the hardware, but also on the movie production companies' adoption of a given format for release of their movies. While many consumers risk their chosen technology becoming outdated, á la the VHS vs. Beta war of the late 1970's and 1980's, others rationally waited until the market declared an eventual winner. The Blu Ray and HD DVD manufacturers were at least partially at the mercy of the network externalities.

Distribution Channels

While the organizational literature focuses on the networks relationships within and between firms with the level of analysis on the individual, distribution channels literature looks at these relationships on the level of the group. The application of networks theory to the study of distribution channels makes logical sense. These relationships often have a profound effect on the ability of the company to deliver a valuable product or service to the end consumer. Instead of studying these relationships at the attribute level, networks theory allows researchers to examine these transactions on a relationship level. Even going back to the 1970's, we find that channels researchers were exploring the effect of the greater relational network on channel behavior. For example, Czepiel (1974) studied the behavioral process of word-of-mouth diffusion of major technological innovations in industrial markets. A significant finding of the study was the confirmation that an informal social community linking the marketplace firms did in fact exist. Participants in the marketplace leveraged their friendship relationships to seek information regarding the market. It is worth noting that this may be the first identified use of sociometric techniques in the marketing literature.

Because business moved away from the adversarial buyer-seller relationship described by Porter (1985) towards a cooperative networked relationship where there is mutual benefit for both parties, including more advanced information professing, knowledge creation, and adaptation capabilities (Achrol and Kotler 1999; Kothandaraman and Wilson 2001). With this revolution, distribution channels researchers became interested in exactly how these relationships with outside parties affected the business environment. Early researchers (Achrol, Reve et al. 1983) presented the argument that it was necessary to supplement the political economy approach to studying marketing channel dyads (Stern and Reve 1980) by incorporating factors external to the dyad. These researchers looked at the context in which dyadic relationships took place, where companies were working together to manage the flow of

goods and services through the supply chain. When researchers looked beyond the dyadic relationship, they realized that the initial, dyadic relationship was dependent on the relationship that those firms had with other firms, the relationships of those ancillary firms, and so on throughout the environment (Anderson, Hakansson et al. 1994). Skinner and Guiltinan (1985) studied the determinants of control within a distribution channel. They looked at the mechanisms managers in a manufacturer-distributor channel might use to affect dyadic control by influencing the power-dependence relationship between the parties. Their main finding was that the distributors could affect their dependence on the upstream manufacturers by utilizing resources in their network environment. By acquiring information and resources from others in their environment, such as trade associations, or by purchasing from a secondary supplier, the dealers were able to reduce their dependence on the manufacturer.

Rindfleisch and Moorman (2001) used network theory to examine how different forms of alliances, and the ties within those relationships, may affect customers. Specifically, they looked at how firms get and use information in new product alliances within horizontal (with competitors) versus vertical (channel partner) relationships. They found that these relationships differed in both the structure of relationship between the parties and the motivations of the individuals involved in those relationships. These differences affected cooperation between the parties, along with the way that information was acquired and used. This finding is rooted in the fact that relationships between competitors and relationships between vertical channel partners are fundamentally different. At the core of the matter, companies are more reluctant to share information with competitors. The same authors explored this topic again in 2003 with a longitudinal study on interfirm cooperation. Though firms must sometimes look to other to fill needs for providing value to end consumers and partner to offset the risks and costs of new product development, there is the possibility that this cooperation between competitors could have a detrimental effect on end consumers. Rindfleisch and Moorman (2003) found that firms which cooperate horizontally with competitors became less consumer oriented over time, whereas this effect was not found for firms that cooperate vertically with channel members. The behavioral and structural mechanisms affect this relationship between alliance type and customer orientation. Specifically, firms with weak ties to competitors with which they collaborate had a greater decrease in customer orientation than those with strong ties to competitors. The loss of customer orientation was moderated by the presence of a third party monitor, such as a

government agency. Firms that collaborate with competitors where these monitors are present had a smaller decrease in customer orientation than those without.

Wathne and Heide (2004) also explored the effect on end consumers of firms' upstream relationships. They found that a firm's strategy towards its downstream relationships is contingent on how the upstream relationships are organized. The ability of a firm to show flexibility towards its downstream customers under conditions of uncertainty in the final end consumer market was shown to be dependent on the governance mechanisms (supplier qualification programs and incentive structures based on hostages) that had been used in the firm's upstream supplier relationship. Similarly, Wuyts et al. (2004) examined how buyers in a supply chain consider the network of ties between the vendor, supplier, and buyer, looking beyond their direct dyadic interaction with a vendor. These findings support the value of assessing the distribution channel from a network perspective. Mishra, Heide, and Cort (1998) found that the strategies a firm uses to manage its relationships with end consumers influences how a firm manages its employee relations.

Antia and Frazier (2001) explored the network factors that affected the severity of the enforcement response to explicit contract violations. They found that density of the network was negatively related to contract enforcement, and the centrality of the agent was inversely related to contract enforcement. Principals judge how agents and their networks will react to the enforcement response and they fear retaliation when enforcing in dense networks or when dealing with very central agents. However, this fear of retaliation is tempered by the positive signaling effects to the network as a whole when the principal decided to make 'an example' out of a prominent agent by punishing them. Overall, principals need to balance the needs of the network as a whole, while also working to maintain key relationships.

While Antia and Frazier (2001) focused on violations by agents, the possibility of violations by the principals must also be considered. Heide and John (1988) found that the actions agents engage in with end consumers can affect the actions of their principals. In particular, an agent's bonding efforts with customers can discourage opportunism by principals, as the principal would be risking the relationship with the end consumer if they acted opportunistically against their agent. Dahlstrom and Ingram (2003) took a conceptual approach to analyzing how an agent's relationships may affect the possibility of adverse selection by a principal. Adverse selection arises when a principal makes a less than ideal selection of an agent. Before contracting with an agent, the principal desires to gather as much information about an agent as it can to alleviate the information asymmetry problem. The information

asymmetry problem is inherent in the principal agent relationship because, before contracting, the principal must rely on information provided by the agent to make their assessment of the ability of the agent to perform the necessary task. Principals can evaluate the agent's abilities, but Dahlstrom and Ingram (2003) present an argument that the principal can also use network theory to help in decision making. They identified that principals can screen an agent's social network, along with evaluating their abilities, as a method of evaluating potential agents. The network properties of that agent's network affect the cost of the search that a principal must incur. For example, a principal will incur lower costs to search the network of an agent with a very dense network. The greater density means that the principal will be able to access a greater proportion of the agent's network with fewer steps. A denser network means that the agent's connections are more closely intertwined with one another. In addition, if that agent has a network with relatively stronger ties, the principal will be able to get better information about that agent. The same holds if the agent has many multiplex ties, or ties between people on several different levels. An example of a multiplex tie is if the agent had a tie that they both took classes with, socialized outside of work with, an0d with whom they ate lunch. These multiplex ties will be a more valuable source of information for the principal because multiple ties will know more about the agent than someone with just one type of connection to them. This work indicates an interaction between the structure of the agent's network and the process and influence on costs that a principal incurs to reduce pre-contractual information asymmetry.

Gap in the Literature

Networks based consumer studies have mostly focused on exploring the networks properties that may influence consumer choices (e.g. Bearden and Etzel 1982; Reingen, Foster et al. 1984; Reingen and Kernan 1986; Frenzen and Nakamoto 1993; Henderson, Iacobucci et al. 2002; Amaldoss and Jain 2005; Hill, Provost et al. 2006). Organizational studies explore the role of the network in both organizational purchasing (e.g. Bristor 1988; Ronchetto Jr, Hutt et al. 1989) and marketing strategy (e.g. Hutt, Reingen et al. 1988; Gupta, Jain et al. 1999; Ritter 1999; Srinivasan, Lilien et al. 2004). Channels literature considers both communication within the networks (e.g. Czepiel 1974; Money, Gilly et al. 1998) and relations (e.g. Skinner and Guiltinan 1985; Anderson, Hakansson et al. 1994; Mishra, Heide et al. 1998; Antia and Frazier 2001) within the marketing channels of distribution. Research has shown that the sociometric structure of the network may influence the decisions that you make (e.g. Reingen, Foster et al.

1984; Bristor 1988; Ronchetto, Hutt et al. 1989; Ward and Reingen 1990; Rindfleisch and Moorman 2001; Rindfleisch and Moorman 2003; Hill, Provost et al. 2006; Van Den Bulte and Joshi 2007). Studies have also demonstrated that individual psychometric characteristics may influence network outcomes (e.g. Hutt, Reingen et al. 1988; Sirsi, Ward et al. 1996; Amaldoss and Jain 2005). More research that combines several techniques, including incorporating qualitative methods to support quantitative methods (e.g. Anderson, Hakansson et al. 1994; Rindfleisch and Moorman 2003) would add value by providing convergent validation (Campbell and Fiske 1959). However, there is a lack of evidence relating networks measures to business performance outcomes, with just a few rare exceptions (Gu, Hung et al. 2008). This gap leaves considerable questions to be answered regarding the bottom line effect that network properties may have on a business's balance sheet. This follows the general call in the marketing literature to link marketing activities to bottom line business performance outcomes (Lehmann 2004).

Thoroughbred Pricing Studies

A common method for selling young Thoroughbreds is the use of public auction. Each year, approximately 27% of the foal crop produced are sold at auction as yearlings, including 16% at the Keeneland September Sale (The Jockey Club 2009). A yearling is a one-year-old horse. Thoroughbred buyers come to the sales in the hopes of selecting a winning racehorse. In order to do this, they enlist the help of expert third-party agents, along with gathering as much pertinent information they can from industry publications. However, there are no guarantees when making purchases. There is no way to determine with certainty if a particular yearling will go on to be a great (or even decent!) racehorse. Recent research suggests that approximately 10-20% of speed is heritable, and handicap and earnings measures are approximately 30-40% heritable (Richard, Bruns et al. 2000; Thiruvenkadan, Kandasamy et al. 2009). A horse with an outstanding pedigree and impeccable confirmation (physical structure) may not win any races. Look to the example of 'The Green Monkey', who boasts the world record for the highest price paid for a racehorse at public auction. In 2006, John Magnier paid $16 million dollars for the horse at the Fasig-Tipton Florida Select sale of two-year-olds in training at Calder Race Course. In his lifetime, 'The Green Monkey' earned only $10,440 on the track and placed in only one race (Biles 2008). Only about 40% of yearlings sold at auction earn more in racetrack earnings than their initial purchase price, with approximately 5-6% winning any type of stakes race (Heckerman 1996). Higher priced horses do earn more money on the

track relative to lower priced horses and are far more likely to win a stakes race. Even so, these higher priced horses are less likely to earn more than their purchase price. In fact, less than 10% of yearlings that sold for $100,000 or more earn more than their purchase price (Heckerman 1996).

Buyers and their third-party expert agents use available information to assist in overcoming adverse selection and choose a horse that they believe will have a promising chance of winning. Information is available via free published 'catalog books' provided by the auction house, along with supplemental auction guides available for purchase, in addition to information provided by industry experts. Third party experts, known as bloodstock agents and veterinarians, are often hired to assist the buyer in their purchasing decisions. Yearlings are at a limited stage of physical development, so their assessment is thought of as more of an art than a science. Purchasers must use the characteristics of the yearling's sire (father) and dam (mother), the performance of his siblings and half siblings, along with other characteristics such as month of birth or sex of the yearling to make their best determination of the quality of the yearling.

Pedigree has long been used to determine the relative potential of a young horse as a racehorse. According to Donald Lesh (1978), of all Thoroughbreds born in North America, Ireland, Great Britain, and France, there is a ratio of one top-class winner per 1,000 foals and five pattern race winners per 1,000 foals. A top-class race is defined as a "Group 1" or "Grade 1" race, the highest caliber of racing competition. A pattern race is defined as a Group or Grade 2 or 3 race- not quite as intense competition as a Grade or Group 1, but still elite level competition. Since the end of World War II, 75% of top-class winners have been sired by horses who also won a top-class race. If sires who didn't win a top-class race themselves but who have already sired a top-class winner are added to this group, we can identify a set which accounts for 98% of the top-class winners and 80% of all pattern race winners. Among this group of sires who have themselves won a top class race or have already produced a top class winner, the odds of producing a top class or pattern winner go up significantly. This group shows a significantly higher performance rate than the general population, with 27 pattern winners per 1,000 foals and 7 top class winners per 1,000 foals (Lesh 1978). This is evidence of the power of selective breeding- earnings and speed have been shown to be an inherited trait (Bowling 1996).

Most of the literature identifying antecedents to auction sales price of thoroughbreds utilizes a hedonic price regression as the standard econometric methodology. In general,

yearling price is determined through a combination of phenotypic (physical build/confirmation and movement) and non-phenotypic variables. While conformation and movement surely influence price, there is no generally accepted system for measuring phenotypic variation, and as such this variable is absent in the literature (Commer 1991). Non-phenotypic variables include a combination of variables including the pedigree, sex, age, stakes nominations, day of sale when horse is sold (book placement), yearling veterinary records, and seller type (Commer 1991; Buzby and Jessup 1994; Chezum and Wimmer 1997; Chezum and Wimmer 2000; Robbins and Kennedy 2001; Vickner and Koch 2001; Kane, McIlwraith et al. 2003; Kane, Park et al. 2003). Macroeconomic factors have also been found to influence sale price (Commer 1991; Karungu, Reed et al. 1993; Buzby and Jessup 1994; Neibergs and Thalheimer 1997).

The discussion of control variables will be broken up into three sections. First, individual level yearling specific variables will be discussed. Then, macroeconomic factors, followed by seller side effects, will be considered.

Yearling Variables

Commer (1991) examined the price determination factors in the mid-Atlantic market for Thoroughbred yearlings. His sample includes 812 yearlings sold by the Fasig-Tipton midatlantic sale from 1987-1989. He found that on the sire's side, the number of black type progeny positively influenced price. On the female side of the pedigree, the dam's racing earnings, the number of black type horses she has produced, and the number of black type horses from the second dam also positively influence price. In addition, male horses, foals born in January or February, horses who were nominated to the Breeders Cup or Maryland Millions Stakes races, horses who were registered Maryland bred, and horses sold in the Select portion of the sale all commanded relatively higher prices. Buzby and Jessup (1994) constructed a model testing for the effects of macroeconomic variables on yearling sale prices, but they also performed analysis on yearling specific variables. Using only these yearling variables, they found that the yearlings' sex, the number of dams' black type offspring, sire stud fee in year sold, and sire racing history were significant influencers. Interestingly, they found that the month in which the yearling was born was not significant, in contrast to Commer (1991). When a log-linear regression was utilized instead of a linear regression, yearling sex and sire's racing history were not significant, indicating a lack of stability for these variables. When combining macroeconomic factors with yearling specific variables, interest rate, dollars in gross foreign purchase, sire stud fee in year

yearling is sold, month yearling foaled, and dam black type offspring were found to be significant.

Chezum and Wimmer (1997) were mostly concerned with testing for adverse selection in the yearling market, and they included yearling specific variables in their model. They found that dams' offspring average earnings, sire stud fee in year bred, the presence of other successful crosses of the sire and dams' families, and age were all significant. In addition, they found that colts, horses who are "Derby Eligible" based on their dosage index and center of distribution, and yearlings who represent their sires' first crop of yearlings also brought significantly higher prices. (The dosage index is a technique for classifying Thoroughbred pedigrees by type. It reflects the ratio of speed-to-stamina in a pedigree. Center of distribution is another number assigned to each yearling that is an indication of the distance that a horse should be able to run. The term "Derby Eligible" is based on the notion that horses with a dosage index of more than 4.00 are not believed capable of running well at the distance of the Kentucky Derby, or 1.25 miles.) The yearling being the dam's first foal was not significant, and yearlings born out of state received a significant premium in relation to Kentucky-foaled horses.

Robbins and Kennedy (2001) utilize a smaller, regional market for yearlings, the British Columbia market. They use data from 1985-1997 and find evidence in line with previous studies. They found that relatively older yearlings bring higher prices and colts bring more than fillies. Sire stud fee was found to be the best variable to capture the influence of the sire on sale price, while dam progeny performance and not the performance of the dam herself influences price. The dam's black type offspring were more influential than the extended family black type.

Neibergs (2001) looked specifically at broodmare characteristics in three categories-breeding, racing, and genetics (pedigree). Overall, breeding characteristics (the mare's ability to produce high quality horses) had the strongest effect, followed by racing characteristics (her abilities as a racehorse) and, finally, genetic characteristics (her sire, dam, and siblings). Unproven mares were found to command a premium.

Vickner and Koch (2001) found positive significant effects for if the yearling was sold in the "Select" portion of the sale, sire's stud fee (composite of year yearling was bred and year yearling sold), racing success of the yearling's half siblings, the number of stakes winners based on the same cross of sire and dam's families, and if the foal was born in Kentucky. Relatively older yearlings brought higher prices, while a greater number of progeny offered in the sale by the same sire had a negative effect on price. They also found that the number of repository

visits was positively and significantly related to price. In a study of all Thoroughbred Yearlings sold in Britain in 2004, Parsons and Smith (2008) found the expected positive relationship between stud fee and yearling sales price at auction. Yearlings who represented the first crop of foals by a sire received a price premium. Consistent with Robbins and Kennedy (2001), they founds that the dam's influence on price is due to her progeny's performance and not her own performance. This result is consistent with the results of other studies discussed above. The black type performance of the extended family was shown to affect price, supporting the overall notion that the past performance of the family is valued in predicting future performance of the yearling in question. Colts were shown to sell for more than fillies, as were relatively older yearlings.

The repository is the location on the sale grounds where x-rays and any other pertinent medical records information are housed. A licensed veterinarian must do the actual inspection of the information in the repository, a service for which the buyer pays a price. This variable on number of repository visits is an attempt to quantify the amount of information to which the buyer has access regarding the yearling's health. X-rays are examined for any physical defects, some of which have been shown empirically to affect eventual racing outcomes (Kane, McIlwraith et al. 2003). As the buyer expends more cost and effort to collect information, it is willing to bid more money. Kane et al. (2003) provide further evidence of the relationship between the gathering of additional medical information and price. They find that the median sale price was $20,000 higher for those horses subjected to radiography in their sample of yearlings from the 1993-1996 Keeneland and Saratoga yearling sales. This result is confounded by the notion that the more fashionably bred and therefore more expensive horses are more likely to be x-rayed in the first place. Van Hoogmoed et al. (2003) also found support for the idea that pre-purchase radiographic findings can significantly affect sale price.

The results are summarized in Table 2.2 below. The results for the relative effects of yearling specific variables are mostly consistent across studies, with limited irregularities. There are inconsistent findings for the effect of a foal being born in Kentucky. Buzby and Jessup (1994) found non-significance, while Chezum and Wimmer (1997) found that foals born outside of Kentucky received a premium, and Vickner and Koch (2001) found foals born in Kentucky received a premium. There is limited support for the hypothesis that foals that are "Derby Eligible", as based on their Dosage Index and Center of Distribution receive a premium. Significance for a premium for a dam's first foal has not been found, and, in general, results for the dam variables are limited due to the difference in measurement by different scholars. The

overall consensus seems to be that it is the performance of the dam's offspring and not her own performance that influences the price of her yearling offspring at auction.

TABLE 2.2

Summary of Yearling Pricing Studies

	Commer (1991)	Buzby and Jessup (1994)	Chezum and Wimmer (1997)	Vickner and Koch (2001)	Robbins and Kennedy (2001)	Parsons and Smith (2008)
Sire Stud Fee		+	+	+	+	+
Sire Racing History	n/s	+				
Sire Black Type Progeny	+					
Sire Progeny Earnings	n/s					
Sire # Progeny in Sale				-		-
Sire # Progeny Wins	n/s					
Freshman Sire			+	n/s		+
Dam Racing Earnings	+				n/s	n/s
Dam # winners	n/s					
Dam Black Type Progeny	+	+				
Dam Progeny Earnings			+	+	+	+
Dam Extended Family Black Type	+				+	+
Dams First Foal			n/s			
Colt	+	+	+	n/s	+	+
Month Foaled	+	n/s	+	+	+	+
Stakes Nominations	+					
Select Portion of Sale	+			+		
"Derby Eligible"			+	n/s		
Foal born in KY		n/s	-	+		
Prior successful "nicks"			+	+		
Number of repository visits				+		

Macroeconomic Factors

Lawrence (1970) appears to be the first work in the literature examining factors affecting auction prices of equines. His findings suggested that racing purses available, quantity of yearlings auctioned, and national income had a significant impact on price brought at auction. Karangu, Reed, and Tvedt (1993) examined the macroeconomic factors that may influence sale price at yearling auctions and found that the overall racing purse rate, the exchange rate, and the nominal interest rate all significantly influenced price. It is important to

consider such macroeconomic factors since a significant portion (35%) of yearlings sold at the largest yearling sales in the United States (Saratoga and Keeneland) were purchased by foreign investors. In fact, this foreign investment represented 53% of the total gross at those sales (Karungu, Reed et al. 1993). Using a sample of 3,027 yearlings sold at the Keeneland "Select" sales between 1980 and 1990, Buzby and Jessup (1994) combined the study of yearling specific and macroeconomic variables to examine the total effect on the market. They performed three separate regressions: one using only macroeconomic factors, one using only yearling specific variables, and one using both macroeconomic and yearling specific variables. For the macroeconomic regression, they found that the year of the sale, a variable representing yearly gross purchase in dollars at the Keeneland Select sales from foreign investors (Ireland, England, Japan, France, and Canada), and the interest rate all significantly influence sales prices. In the third regression, which combined macroeconomic factors with yearling specific variables, interest rate, dollars in gross foreign purchase, sire stud fee in year yearling is sold, month yearling foaled, and dam black type offspring were found to be significant.

Neibergs and Thalheimer (1997) also examined macroeconomic variables using data from yearling sales from 1960-1994 and found that, on the supply side, the number of foals, the average price of a yearling at auction, and tax benefits from investments in broodmares all positively affected the supply of yearlings. The farm production cost index negatively affected yearling supply. On the demand side, the tax benefits from investment in yearlings, the average purse per race in North America, the gross foreign purchase, and gross domestic product were all positive and significant influencers on demand. The total number of yearlings had a negative relationship to demand.

Seller-Side Effects

Chezum and Wimmer (1997) examined the effect that the breeder of the horse may have on yearling sales price. They test for the presence of adverse selection in the Thoroughbred yearling market by looking at sale price differences for breeders of Thoroughbreds who race horses themselves versus breeders who do not race. It is posited that breeders who also race will keep the best horses for themselves and sell the inferior stock at auction. This is thought to be because the breeders have an information advantage, as they are intimately aware of the qualities of the yearling from the time of its birth and are therefore believed to be better equipped to determine which yearlings will be better racehorses. The adverse selection hypothesis is expected to hold because, if breeders are retaining their best

animals, then the buyers who buy their produce at auction are thought to get lower quality stock. Adverse selection would suggest that buyers will be aware of this, so breeders who race will receive lower prices relative to breeders who do not race.

Using data from the 1994 Keeneland September yearling sale, Chezum and Wimmer (1997) found evidence for adverse selection, finding that breeders who race do in fact get relatively less money for their stock. In 2000, Chezum and Wimmer (Chezum and Wimmer 2000) revisited their adverse selection hypothesis, this time looking at the problem in relation to betting on Thoroughbred races. They found that homebreds, horses that are kept by their breeder for racing, are favored over non-homebreds in races where bettors have very little information upon which to base their predictions- namely, races for two year old maidens. These are young horses that are just beginning their racing careers and have never won a race. As such, bettors must look to other information upon which to base their decisions, including the fact that the breeder of the horse has retained that animal for racing. This is thought to add evidence to the hypothesis that breeders keep their best stock for racing, as the bettors are posited to be aware of this idea and thus use this information for making their bets.

Vickner and Koch (2001) construct a hedonic hammer price model using a sample of 212 horses from the 1999 Keeneland September sale. They wished to reexamine the adverse selection hypothesis of Chezum and Wimmer (1997; Chezum and Wimmer 2000). They found no evidence for adverse selection- the racing intensity of the breeder was an insignificant influence on price brought at auction. Wimmer and Chezum (2003) extended their research on adverse selection in the auction market by taking a random sample of 10% of all Thoroughbreds born in the United States in 1993. They examined the effect of third-party certification via inclusion into a "Select" sale in alleviating problems of adverse selection. In order to be offered for sale in a Select sale, yearlings must be chosen for inclusion by the auction company. The auction company first makes a selection based on the pedigree of the yearlings and then physically examines each animal to ensure that they meet the quality criteria for inclusion. The act of being offered in a Select sale will indicate to buyers that the horse in question meets certain criteria and should offer the potential buyer evidence that this animal is not being offered for sale by the breeder because it is not of high enough quality to be retained for racing by the breeder. The buyer is assured that this animal is not a "cull" of the breeder's stock. They found evidence for adverse selection in non-Select sales, with no evidence of adverse selection in Select sales by looking at the sales data for breeders who race vs. breeders who do not race and comparing the dollars brought at auction. They confirmed these results by looking

at the racetrack performance of this cohort of yearlings. This further evidence confirmed that third-party certification via inclusion into a Select sale alleviates the problems of adverse selection.

Gap in the Literature

There are multiple examples of Thoroughbred pricing variables that have not consistently found support in the literature. For example, while Buzby and Jessup (1994) found that sire racing history was associated with yearling sale price, Commer (1991) found that variable to be non-significant. The dam's racing earnings were shown to have an effect on yearling sale price by Commer (1991) both Robbins and Kennedy (2001) and Parsons and Smith (Parsons and Smith 2008) did not find this effect. Another disparate finding involves the state of the yearlings' birth. Buzby and Jessup (1994) found that being born in Kentucky was not a predictor of yearling sale price, while Chezum and Wimmer (1997) found this variable to have a negative effect on price and Vickner and Koch (2001) found this variable had a positive effect on price. These are just a few examples of studies that have not found consistent results. This study will revisit these variables studied in prior literature and provide further evidence for the significance or non significance of these variables as predictors of yearling auction price. This research uses a sample from the largest Thoroughbred marketplace for yearlings in the world. With a sample size of 3,605, representing approximately 65% of the total transactions in the marketplace, this study will revisit the conflicting findings in the Thoroughbred pricing literature thus far.

Chapter Summary

The purpose of this chapter is to synthesize agency theory, signaling, and social networks research in marketing and to provide a basis for integrating these research streams. Chapter three develops a series of empirically testable hypotheses related to market signaling and network relationships to business performance outcomes.

CHAPTER THREE:
RESEARCH MODEL AND HYPOTHESES

Introduction

The marketing literature is currently undergoing a general shift towards viewing relationships beyond the one-to-one dyadic perspective. Scholars view market organizations not just as singular organizations operating independently but as networks of specialized firms tied together in cooperative exchange relationships (e.g. Achrol 1997; Achrol and Kotler 1999; Möller and Halinen 1999). Viewing a firm as a link in a greater network of firms operating in a given environment can provide a unique perspective for examining questions, particularly in the context of channels of distribution where firms must necessarily connect in order to move a product from the point of initial production to the final end user.

The particular phenomenon of interest here is the concept of market signaling. Signals convey a direct or indirect indication of intentions, motives, goals, or even internal situation and convey information to other actors in the marketplace (Spence 1974; Porter 1980). The marketing literature has focused research on the theory of signaling to explain how one party can communicate to another about unobservable product quality and help to overcome the problem of adverse selection (Kirmani and Rao 2000). This research will focus on the role of third-party agents in marketplace signaling phenomena. These agents act as liaisons between buyers and sellers in the marketplace, and their role in signaling and subsequent effect on business performance outcomes has been scarcely considered in the marketing literature.

Building on the discussion of market signaling as a network phenomenon involving third-party agents acting as links between buyers and sellers, this chapter will develop a series of empirically testable hypotheses relating market signaling and network relationships to business performance outcomes. This discussion is developed in three steps. First, the qualitative approach to theory development will be discussed. Then, the theoretical model will be developed and clarified. Finally, the set of hypotheses to be tested will be specified. In addition, the set of control variables will be presented that will help isolate the effects of market signaling and network variables on business performance outcomes.

Qualitative Approach

Beginning a quantitative study with a qualitative study can yield insight beyond what is traditionally known about the problem. By conducting a qualitative study prior to collecting the

quantitative data, it is possible to get a grounded theory of the phenomena of interest. The grounded theory approach (Glaser and Strauss 1967) is a technique for discovering the concepts and hypotheses relevant to a problem and developing a theory which accurately fits the data. While traditional research works to verify theories, this grounded theory approach emphasizes the generation of new theory which is intimately linked with the data and hopefully perfectly fits the question at hand (Glaser and Strauss 1967). While many theories currently exist seeking to explain market signaling and networks phenomena, none have been specifically designed to relate signaling processes and network relationships.

The grounded theory approach is a set of techniques for identifying categories and concepts that emerge from text and linking those concepts into formal theories (Glaser and Strauss 1967; Bernard 2006). Interview transcripts are examined for analytic categories, or *themes.* The data from those categories are compared and contrasted with other information obtained in the interviews. Traditionally, the results of the analysis are presented using exemplars, or quotes from the interviews, which clarify the theory.

In the context of a specialized professional world such as the one of interest in this study, it is important to be able to see the market from an "insider's" point of view. Industry professionals tend to use specific and highly specialized vocabulary to describe the world in which they work. Goodwin (1994) advocates the use of anthropological field study to investigate the practices of members of a professional field. Using this approach, one can find the "theories, artifacts and bodies of expertise that are its special domain of competence and set it apart from other groups" (Goodwin, p. 1). In short, Goodwin advocates integration into one's field of interest in order to get an insider's point of view, allowing the researcher to perceive and define the events that take place within a professional's world. My approach involved: extensive qualitative observation and documentation of industry professionals in the marketplace; widespread reading of the most popular industry publications; recorded interviews; and direct participation in the marketplace as a hired member of a professional group.

Qualitative Findings

The first approach involved observation, documentation, and interviewing of industry professionals as they participated in the marketplace. Nineteen interviews were conducted, ranging in time from 5 minutes to 47 minutes. Along with verbal interviews, photographs and video were collected to document the processes that took place at the sale. These pictures

were then reviewed and used as evidence to observe the phenomena that emerged from the verbal interviews. These interviews were recorded and transcribed, and the grounded theory approach was followed for analyzing the findings. Three main themes were identified by categorizing key statements made in interviews into broad categories:

1. Information is king. The gathering of information about the happenings in the marketplace is of paramount importance to professionals. Many of them described this information gathering as a main duty of their job. They watch the goings on to make determinations of who they think is interested in their products, and how interested. Knowing this information allows them to make determinations of, for example, the reserve price they should put on their goods since all goods in this marketplace are sold at auction. One seller summarized this phenomenon whereby the actions of market participants can be used by other market participants to drive demand for a certain good:

   > *"The trainer, agent, owner, and vet may all come and take a look. You have to watch the action at your barn. Once a few big time people see your horse, the buzz gets out and all of the sudden everyone wants to see them."*

   While this quote provides evidence of the positive effects that participant action can have in signaling market demand, there can also be negative signaling effects.

   > *"If one vet gives your horse the rejection decision, then the word gets out and you're screwed."*

   This theme captures the concept of market signaling as a way of disseminating and gathering information. Hypotheses for testing signaling hypotheses will be explicated in the overall model of the impact of market signaling phenomena on business performance outcomes.

2. There is a general denial of the notion that one can quantitatively explicate what is going on in the marketplace. Professionals reiterated that while the base price for a product is partially determined by the quality of its inputs, it is the phenotypic qualities of the product that truly determine price. For example, one professional noted,

   > *"You can have the page (catalog page, pedigree), but if you don't have the goods (phenotypic qualities, physical build) you aren't going to get the price."*

This statement was echoed by others:

> *"Pedigree will bring them in, but when you get the pedigree plus the conformation, well that's when fireworks happen."*

These phenotypic qualities, such as physical confirmation, are impossible to measure quantitatively. Each animal is unique in its structure and qualities, and furthermore every person has their own notion of what is "ideal". Since these things cannot be measured and quantified, professionals believed that little of the variance in business performance outcomes could be deduced quantitatively.

However, it should be noted that many interviewees acknowledged the existence of trends and fashionability in the marketplace, the aforementioned "page" that can build the base price. For example:

> *"The market is willing to pay a lot for the hot goods."*

One goal of this research is to attempt to construct a model of the marketplace in question that can explain auction prices based on quantitative variables. Results from the model could provide evidence for the relative impact of the quantitative variables versus the non-quantitative (phenotypic) variables.

3. Some professionals believed that the seller of the product did not matter much. They believed that, overall, buyers will find the products that they want, no matter where they are located.

> *"It doesn't matter where it is, the buyers will find it. You could put it across the street, outside of the sale grounds, and they would still find the nice ones."*

Additionally:

> *"While you always have the seller in the back of your mind, the individual [product] trumps all."*

They believed that some sellers will get higher prices overall for their goods not because they can leverage the brand equity of their name, but because their past performance in the market will allow them to obtain better quality stock to sell in the first place.

> *"The big guys can publish that they had top sales, etc. last year. That way, they end up with better stock."*

While they do not believe that the seller makes much of a difference, they do believe that a seller with a bad reputation will be punished in the market.

> *"While I don't pay attention to the seller much, there are some of them that I know to stay away from. They've burned me in the past, and I'm not going to make that mistake again."*

The question of the relative impact of the seller in the marketplace will be assessed in this research. Hypotheses regarding the impact of third-party agents, which include the sellers as mentioned above, will be tested.

As a final qualitative approach, a way to integrate myself into the professional world of this marketplace, I obtained a job working for a seller in the marketplace. Becoming a participant allowed a unique perspective that is unknown to most researchers. Building upon my past experience of interviewing and observing marketplace participants, I was able to put these observations into action and integrate myself into the daily life of the marketplace participants. Working in the marketplace provided the unique opportunity to interact with other participants and allowed for a level of trust to be built beyond what could be gained simply as an outside researcher. I was invited to participate in daily activities which included: appraisal of the goods (Thoroughbred Yearlings) upon arrival to the marketplace, showing the goods and answering questions about them to potential purchasers, and participating in company meetings to discuss market strategy and findings. Only by seeing a professional world from the inside can you gain true professional vision and the ability to obtain the proper perception and understanding of the structure of a specific profession (Goodwin 1994).

Model of Marketplace Signaling

Building upon the theoretical framework presented in Chapter Two and following on the qualitative research presented above, a model of marketplace signaling will first be presented. Signals convey information to marketplace participants regarding the unobservable quality of a product. Whenever quality is unobservable prior to purchase, there is the risk of adverse selection. Adverse selection, which is also known as the problem of hidden information, occurs pre-contractually when the principal is unable to verify ahead of time that the agent has the desired skills and qualities. Problems of hidden information also occur in the

consumer marketplace when the consumer is unable to verify the quality of a good prior to purchase. The sending, receiving, and interpretation of signals is one potential way to overcome the problem of adverse selection.

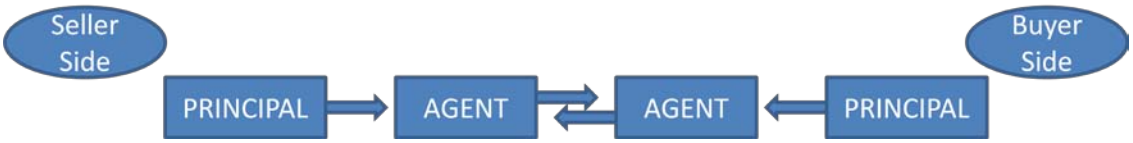
However, there is a general lack of empirical evidence for signaling hypotheses. While some studies (e.g. Boulding and Kirmani 1993; Caves and Greene 1996; Erdem and Swait 1998; San Martin and Camarero 2005; Biswas, Dutta et al. 2006; Erdem, Swait et al. 2006) have offered empirical evidence where signals are shown to affect consumer purchasing outcomes, it is certainly limited. In particular, there is a lack of empirical evidence linking signaling to business performance outcomes.

Additionally, there is little literature on signaling that considers signals beyond a dyadic relationship (e.g. Zhao 2000; Prabhu and Stewart 2001). There are many situations where a signal does not affect just one sender and one receiver. This lack of evidence is particularly relevant for this research setting, as this market represents a situation where buyer and seller are not transacting directly to buy and sell goods. It is impossible to assess this marketplace without considering the greater network context in which the transactions take place. In addition to the condition that buyer and seller do not transact directly, the goods are also not sold at a fixed price. There are several other examples of marketplaces with these conditions, such as the stock market, the market for real estate, and markets for commodities such as agricultural goods and natural resources.

In a marketplace where goods are not transacted between buyer and seller directly, goods are not sold at a fixed price, and the quality of the goods is impossible to determine prior to purchase there lies a great potential for adverse selection to occur. As such, buyers rely on the advice of third-party agents to help in their decision making. Agents are called upon to make evaluations of their opinion of the quality of the goods, and advise on the price they believe should be paid. Agents interact with each other, and their opinions are influenced by the actions of other agents. This model will provide the necessary framework upon which to build an integrated model of marketplace effects of third-party agents on business performance outcomes.

FIGURE 3.1

Model of Marketplace Signaling



In this marketplace, multiple signals are being sent by multiple parties. The seller side principal first makes the decision about the signal it will send to the marketplace (both buyer and seller side principals and agents) regarding the quality of the product it is offering in the marketplace. This seller side principal makes a choice about the inputs it will combine to make the final product that will be sold on the market. As in many markets, higher quality inputs typically carry a higher price. Consumers have been shown to use price to make attributions about product quality, where higher prices signal higher quality and lower prices signal lower quality (e.g.,Gerstner 1985; Rao and Monroe 1988; Rao and Monroe 1989; Lichtenstein, Ridgway et al. 1993). This signal from the seller side principal is also dependent on its reputation. The seller side principals' reputation signals to the marketplace that it is a trustworthy firm that can be relied upon to provide high quality goods. Consumers depend on retailer reputation as a signal of product quality offered (Chu and Chu 1994; San Martin and Camarero 2005; Aiken and Boush 2006; Li, Srinivasan et al. 2009).

The next signal in the marketplace takes place between the seller side principal and its agent, known here as the seller side agent. The seller side agent signals to the seller side principal regarding its quality as a seller side agent. The seller side principal reads marketplace signals to determine which seller side agent will best be able to sell its product on the market, based on the past performance of that seller side agent. The seller side principal will look to the reputation of the seller side agent, determining if that seller side agent has been able to fulfill their quality promises over time. Just as consumers depend on reputation as a signal of product quality, upstream channel members look to the reputation of their downstream agents to determine if they wish to transact with them. These reputable channel members are less likely to default on their reputation of providing a high quality service for their channel partners since they will experience monetary consequences through loss of business in the future if they do not meet their partners' expectations (Kirmani and Rao 2000). While reputation may be less

important in signaling quality than brand name or price (Dawar and Parker 1994), reputation may be the element that determines if communication via signaling will be effective (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996).

The choice that the upstream channel member (seller side principal) makes then, in turn, signals to the marketplace about its opinion of the downstream agent (seller side agent) with whom it chooses to consign it's goods. This decision is very important to the seller side principal, as they are entrusting this downstream partner to be their link to the end consumer, and this seller side agent holds the responsibility of obtaining the highest price possible for the seller side principal's goods at auction. This relationship can be conceived as a co-branding relationship of sorts. The seller side principal is entering into a relationship where the downstream member will be selling the seller side principal's good, linking the brand of the seller side principal and the brand of the seller side agent. Prior research has provided evidence that manufacturers can signal that their product is high quality by choosing to sell it through a reputable retailer (Chu and Chu 1994).

The seller side agent, acting as a third-party agent between the producer and the marketplace of other principals and agents in general, must then signal to potential buyer side principals and agents both about its reputation as a product seller and about the quality of the goods it is offering for sale on behalf of seller side principals. Its reputation as a seller side agent is important in backing up the quality claims of the products that they offer. While the retailer reputation is less important in signaling quality than brand name or price, reputation is seen by consumers as a signal of product quality (Dawar and Parker 1994). The seller side principal's reputation is what determines if their communication via signaling will be effective (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996).

In this marketplace, buyer side principals enlist the help of multiple expert agents (termed here buyer side agents) to assist them in their purchase decisions. One example of agents of this type is a home buyer who enlists both a real estate agent and a home inspector to assist them in its purchase decisions. The home buyer lacks the necessary skills to evaluate the item for purchase, so it hires experts specifically trained to evaluate the purchase. In the marketplace under study, the seller side agent of the goods, who is acting on behalf of the seller side principal, must read the signals from these buyer side expert agents to determine marketplace interest and willingness to pay for the goods that they are consigning. If more agents are inspecting their goods, the consignor can infer that there is more marketplace interest in purchasing the goods. Markets are a social process, where observation of the actions

of other participants is critical in determining interest. More interested parties means that the product carries a higher valuation (Rothkopf 1969). One crucial role of the consignor is to have an intimate knowledge of the other marketplace participants, which involves knowing their past purchasing behavior. Marketplace traders can look to past published information to determine the past behavior of the participants, and then infer possible future behavior (Milgrom 1981; Ashenfelter 1989). Past high dollar purchases can signal the potential for future high dollar purchases.

Finally, the buyer side agents use the actions of other agents like themselves as signals of marketplace behavior. Markets are a social process, where participants look to the actions of other participants for signals to indicate unobservable quality (White 1981; White 1981; Granovetter 1985; Podolny 1993). In this marketplace, the quality of these credence goods is unobservable prior to purchase and cannot be determined for perhaps several years after purchase. As such, buyer side principals hire expert agents who attempt to read marketplace signals to infer the opinions of others when making their determination of the quality of the good and thus their opinion on what the buyer side principal should be willing to pay. It has been demonstrated that marketplace participants look to the number of other parties that are interested in a product when determining the price they are willing to pay. The more interested parties, the higher the value they place on the item (Rothkopf 1969).

It should be noted that while the buyer side principal is a participant in this market, it remains hidden. Typically, buyer side principals conduct all business through their agent(s), so the other marketplace participants may never know who will actually be purchasing the product. They know only what the buyer side agents are doing on behalf of this hidden buyer side principal. This marketplace, along with others such as the stock market, represents a situation where the third-party experts and not the buyers themselves are the market drivers. It is not the monitoring of the buyers themselves that is important, rather it is the monitoring of the experts who are enlisted to make decisions on behalf of the buyers (e.g. White 1981; Zuckerman 1999; Hilger, Rafert et al. 2007).

This model of marketplace signaling has been presented to provide the necessary framework upon which to build an integrated model of marketplace effects of third-party agents on business performance outcomes. Hypotheses will be developed which can empirically examine economic logic underlying signaling in a network context.

Research Model

The research model presented below (*Figure 3.2)* represents an integrated model of marketplace effects of third-party agents on business performance outcomes. This model represents an auction marketplace where multiple seller side principals consign their products for sale via downstream seller side agents. These seller side agents represent the products of the seller side principals for sale in the marketplace. Buyer side principals enlist the help of expert buyer side agents to assist in their purchase decisions.

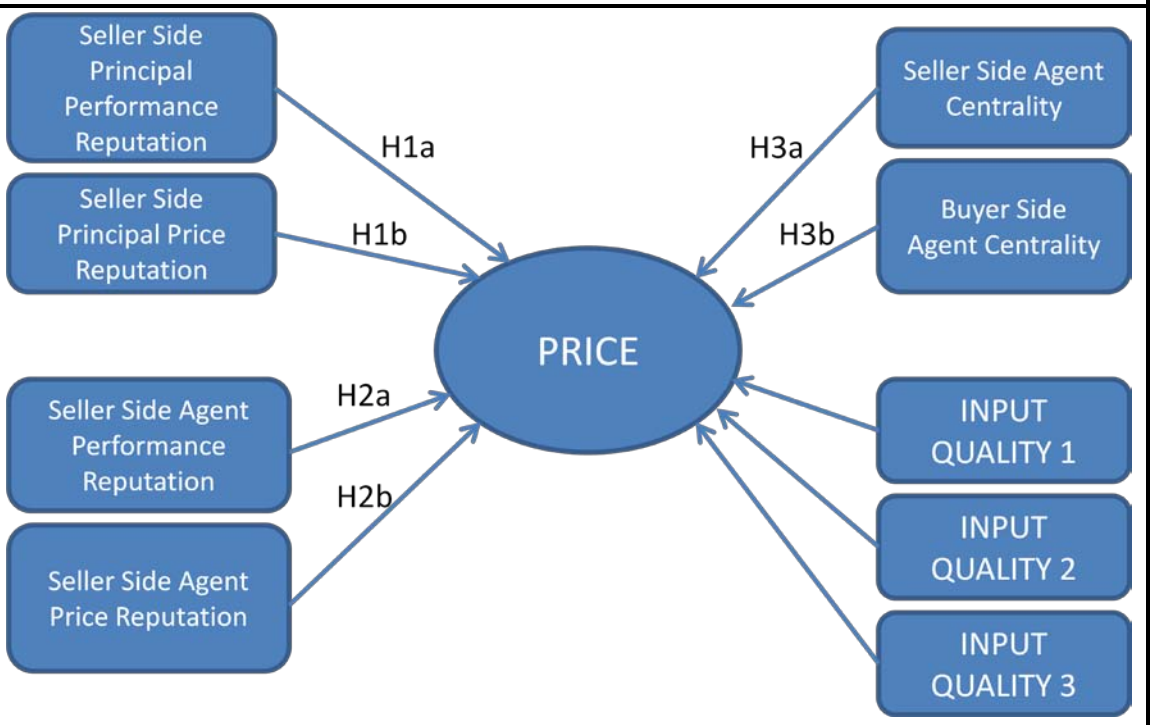
There are two main classes of third-party agents acting in this marketplace. The first is the seller side agent who is acting as the link between the seller side principal and the buyer side agents. The other are the buyer side agents who act as liaisons between seller side agents and the buyer side principals. While this research presents an overall integrative model of marketplace effects, it will particularly focus on the role of these third-party buyer and seller agents and their effect on business performance outcomes. The model and research hypotheses will first be described, followed by a discussion of the control variables enlisted.

First and foremost, the decision of input quality by the seller side principal will have a direct effect on the price brought in the marketplace at auction. Higher priced, higher quality inputs will have a higher base cost and should sell for more money. These price/quality control variables are discussed in the control variables section.

The seller side principal of the good must first make the decision concerning with whom to consign their goods. The choice by the seller side principal of which seller side agent to use is an important one. When entering into a consignment agreement, the seller side principal is signaling to the marketplace that it trusts the chosen seller side agent to make every effort to sell and promote their goods and obtain the highest price possible at auction.

FIGURE 3.2

Research Model



The seller side principal will look to the reputation of the seller side agent for being able to sell both high priced and high performing goods. Reputation is built over time by consistently delivering on quality promises made (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996). If a firm is able to demonstrate that the goods they offer can perform as expected, they will develop a positive reputation for providing high price and or high performing goods. This reputation will be gathered by those on the purchasing side by examining the market statistics or records of past performance(Akerlof 1970). Consumers use reputation as a signal of product quality offered (Chu and Chu 1994; Dawar and Parker 1994; San Martin and Camarero 2005; Aiken and Boush 2006; Li, Srinivasan et al. 2009). Seller side agent centrality will also be considered by the producer.

Those seller side agents who have demonstrated that they have the ability to market a good for a high auction price will be seen by seller side principals as more capable of handling high priced goods in the future. Information on past sales at auction of similar items is often used by those on the buying side as an indicator of past performance of those on the seller side(Ashenfelter 1989; Louargand and McDaniel 1991). Higher prices signal higher quality, while lower prices signal lower quality (Gerstner 1985; Rao and Monroe 1988; Rao and Monroe 1989;

Lichtenstein, Ridgway et al. 1993). The seller side agent who has developed a positive reputation by fulfilling the signaling promises of being able to consign high priced goods will subsequently be able to obtain goods on consignment from seller side principals with a higher base cost. These goods with a higher base cost will bring more money at auction, reaping benefit for both the producer and the consignor, who is paid on commission as percentage of final sale price (Blood-Horse Publications 2004).

While seller side principals will consider the consignor's reputation in their ability to sell high priced goods, they will also consider their reputation for selling high performing goods. While price is shown to be a signal of quality prior to purchase, true quality is determined after purchase and use of the good. High performance is determined once the product is in use. This particular market of study lends a unique situation to study. In this market, no one, including the seller side principal, seller side agent, buyer side agent, or buyer side principal can know to what quality standards the good will actually perform. Simply because a product is composed of high priced, high performing inputs, there are no guarantees that the product will actually perform to high standards. So, the seller side principal will consider the reputation of the seller side agent for selling high performing goods, not just high priced goods. Reputation is built over time by consistently delivering on quality promises made (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996). If a firm is able to demonstrate that the goods they offer can perform as expected, they will develop a positive reputation for providing high price and or high performing goods. This reputation will be gathered by those on the purchasing side by examining the market statistics, or records of past performance(Akerlof 1970). Information on past sales at auction of similar items is often used by those on the buying side as an indicator of past performance of those on the seller side(Ashenfelter 1989; Louargand and McDaniel 1991). Consumers use reputation as a signal of product quality offered (Chu and Chu 1994; Dawar and Parker 1994; San Martin and Camarero 2005; Aiken and Boush 2006; Li, Srinivasan et al. 2009). A seller side agent who can develop a reputation for selling high performing goods may signal that they have a good "eye", the ability to discern which products might actually be high quality performers, not just high priced sellers.

Since the marketplace is a social process, where participants look to the actions of others to determine what actions they should subsequently take (e.g. White 1981; White 1981; Granovetter 1985; Podolny 1993), seller side principals will want to consign their products with a seller side agent who is known to be an active and important participant in the marketplace. Centrality is one way of measuring the activity of an actor in the marketplace. Centrality is a

way of assessing which nodes have the most potential control of communication (Freeman 1978/79; Wasserman and Faust 1994). Seller side principals will want to consign their goods with a seller side agent who is deeply involved in the marketplace, in the "thick of things". These more central seller side agents will have more contact with more marketplace participants and will have access to more information about the actions taking place amongst the participants. Involvement in many flows of information will allow for these market participants to keep aware of new developments, and to control the flow of information, money, and other resources (Van Den Bulte and Wuyts 2007). On the other hand, those that are less central will be peripheral to the network and will be isolated from involvement with many others (Freeman 1978/79).

Seller side agents with relatively higher centrality will be able to use their knowledge of new developments and control the flow of information, money, and resources in the marketplace and be able to obtain goods with a higher base cost. These goods are more desirable, as goods with a higher base cost should sell for more money at auction. Seller side agents make a commission on each good that they sell, so it is desirable to obtain higher prices for goods at auction. These central agents will leverage their control and connections to obtain these goods which should sell for higher prices.

One of the buyer side agents, known as buyer side agent 1, serves as the buyer side principal's primary advisor in the selection of goods in the marketplace. This agent must make the choice of which goods to inspect and possibly bid on. Their choices are constrained primarily by the buyer side principal's budget of the total dollar amount they wish to spend and how many products they would like to purchase. Taking into account the budget of the buyer side principal, buyer side agent 1 will subsequently be influenced by the reputation of the seller side principal, the reputation of the seller side agent, and the centrality of the seller side agent.

Seller side principals send a signal to the marketplace when they choose which raw materials from which to construct a good. Higher performing goods, as measured by their eventual performance, will typically cost more. In markets characterized by the strict limitation that eventual performance quality of the product cannot be determined by anyone prior to purchase, market participants must read all available signals to help make their decisions. Buyer side principals want to avoid making an adverse selection, so they will choose products from seller side principals that have developed a reputation for successfully offering the type of goods that they wish to purchase- be they high priced goods that should have a higher residual value, or high quality goods that should perform to a high standard. Reputation is established

by fulfilling signaling promises over time, which implies a long-term investment in maintaining their perception in the marketplace (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996).

Market participants look to two main determinants of quality reputation when making their decisions. One component is the reputation for successfully offering and selling high priced goods. The second component is the reputation for successfully offering and selling high performing goods. Performance here is defined as eventual product performance, which cannot be determined by anyone prior to purchase. Market participants will use past market statistics as signals of the seller side principal's ability to offer high priced and/or high performing goods (Akerlof 1970; Milgrom 1981; Ashenfelter 1989). Over time, seller side principals increase the equity in their names, along with their reputations, by offering goods that successfully meet the needs of marketplace participants. Brand name has been shown to act as a signal of unobservable quality, with higher prices obtained for a name branded product versus an unnamed product (e.g. Rao and Monroe 1989; Keller 1993; Dawar and Parker 1994; Erdem and Swait 1998).

Those seller side principals that are able to signal that they have developed a reputation for providing the type of goods that buyers wish to purchase will attract the attention of more potential purchasers in the marketplace. More marketplace participants interested in an item will signal to others that this object is of greater value, and prices will be driven up (e.g. Milgrom and Weber 1982). Marketplace participants will perceive the performance quality claims as more credible if they are made by a producer with a strong brand name who has developed a positive reputation for fulfilling performance claims.

H1a. Seller side principals who have a reputation for producing high performing products will be associated with higher prices brought at auction.

H1b. Seller side principals who have a reputation for producing high priced products will be associated with higher prices brought at auction.

Marketplace participants will also look to the reputation of the seller side agents in considering which products to purchase. The seller side agent's ability to sell high priced and/or high performing goods successfully at auction will influence the marketplace participants in their choices. Here again, it is the reputation, or the long term ability to fulfill signaling

promises (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996), that matters. It is the reputation that signals to buyer side marketplace participants that they can trust the seller side agent's signals that the good is worth a high price, knowing that this seller side agent has successfully offered high quality or high performing goods in the past, and they can continue to do so in the future. Over time these seller side agents may develop equity in their brand name, and this brand equity will allow the seller side agent to leverage their name to provide marketplace participants with assurance that the product offered will live up to its performance quality claims. Again, the marketplace participants will look to the market statistics as indicators of the past ability of the consignor to live up to their claims (Akerlof 1970; Caminal and Vives 1996).

Those seller side agents that are able to signal that they have successfully developed a reputation for providing the type of goods that buyers wish to purchase will attract the attention of more potential buyers in the marketplace. More marketplace participants interested in purchasing an item will signal to others that this object is of greater value, and prices will be driven up (e.g. Milgrom and Weber 1982). Marketplace participants will perceive the performance and/or price claims as more credible if they are made by a seller side agent with a strong brand name who has developed a good reputation for fulfilling quality claims.

H2a. Seller side agents who have a reputation for consigning high performing products will be associated with higher prices brought at auction

H2b. Seller side agents who have a reputation for consigning high priced products will be associated with higher prices brought at auction

Seller side principals wish to consign their products with more central seller side agents. These central seller side agents will obtain higher priced goods to consign for sale in the marketplace, as seller side principals will perceive that these more central seller side agents will have the ability to obtain higher prices for their goods by being more "in the thick of things". These seller side agents are better able to leverage the social processes of the auction marketplace and will be more aware of the actions of others because they have more access to and control of information due to their centrality (e.g. Freeman 1978/79; Wasserman and Faust 1994). These more central seller side agents will have more contact with more marketplace participants and will have access to more information about the actions taking place amongst

the participants. The seller side agent is responsible for reading the market signals to make a determination of the interest and willingness to pay by buyer side principals, so being in a central position will help them make more accurate assessments. The access to more information will allow the seller side agent to predict what price the good will bring at auction.

A seller side agent can raise the expected price of an item at auction by providing an expert appraisal of its quality because offering market participants a dollar value upon which to base their valuation can serve as a powerful, credible signal of quality (Milgrom and Weber 1982). The seller side agent will have the ability to provide this appraisal by assessing the base cost of the item plus information about how many parties on the buyer side are interested in the item and what those parties might be interested in spending on the item. Centrality will indicate their ability to have access to and control over this information.

The ability to read and interpret marketplace signals is one of the main duties of the seller side agent. The seller side principal has contracted with the seller side agent to help them overcome the problem of adverse selection. In this marketplace, there is imperfect information. While the seller side principal does know what the base cost of their product is, they do not know what the product will be worth at auction. In order to know this, they need to know what the market is willing to pay. This is a case of incomplete information, and to overcome this problem the principal may purchase information by enlisting the help of an agent. This information is purchased in order to avoid adverse selection (Eisenhardt 1985; Eisenhardt 1989). This seller side agent must be an expert on the buyer side agents, knowing a great deal about what buyer side principals they might be working for and within what price range they might be interested in spending. They develop relationships over time with these buyer side agents, and their knowledge and expertise is key in becoming a central participant in the marketplace.

H3a. Seller side agent centrality will be associated with higher prices brought at auction

The actions of more central buyer side agent #1's will be observed more closely in the marketplace by both the seller side agents and the other buyer side agent #1's. More central buyer side agent #1's have access to more information (Freeman 1978/79; Wasserman and Faust 1994) and thus should be able to make better decisions by being more "in the thick of things". Marketplace participants will observe what products the more central buyer side agent #1's are interested in. Social contagion theory predicts that actors' adoption of products is a

function of their exposure to the knowledge, attitude, or behavior of other actors in regards to the product (Coleman, Katz et al. 1966; Van Den Bulte and Lilien 2001; Gladwell 2002). In particular contagion occurs between people who are in the same group- in this case the group of buyer side agent #1's. This group represents a condition where people will see themselves as socially similar and will find value in similar ideas and behaviors (Burt and Janicik 1996). The actions of the more central buyer side agent #1's will be more visible to the group of other agents, and will exert proportionally more influence (by being more "in the thick of things") than the actions of less central buyer side agent #1's.

The seller side agents will be alerted that a more central buyer side agent #1 is interested in their goods and will adjust their expectations of what price that good should bring at auction. Likewise, other buyer side agent #1's will observe the actions of these more central buyer side agent #1's and will infer from those actions that they too should be interested in that product.

H3b: Buyer side agent centrality will be associated with higher prices brought at auction.

The research model presented above represents an auction marketplace where multiple producers consign their product for sale via downstream channel members. At the other end of the channel, end users of the product enlist the help of expert agents to assist in their purchase decisions. As such, there are several groups of third-party agents acting in this market. The focus of this study is on the role of these third-party agents and their effect on business performance outcomes.

An overall goal of this research is to assess the information obtained through the qualitative component of this research. Three main themes were identified. The first theme, that information is tantamount to this marketplace, is assessed overall in the research model. Support for the research hypotheses will lend support for this theme that informants believed that the marketplace is focused on information. A second theme is that the informants believed that the seller side agent of the product did not matter much. Variables included in this study should allow for an assessment of this allegation, by isolating the attributes of the products for sale to examine the effect of the seller side agents. Third is that there is a general denial that it is possible to quantitatively explicate the outcomes of the marketplace. Informants believed that the un-measureable phenotypic qualities of the products were the

drivers of the marketplace, not the variables which can be quantitatively deduced. Significant findings for the quantitative variables measured in this research would support the alternative hypothesis, that it is possible to deduce the market outcomes.

TABLE 3.1			
TABLE OF HYPOTHESES			
Number	**Dependent Variable**	**Independent Variable**	**Hypothesized relationship**
H1a	Price brought at auction	Seller side principal performance reputation	Seller side principals who have a reputation for producing high performing products will be associated with higher prices brought at auction.
H1b	Price brought at auction	Seller side principal price reputation	Seller side principals who have a reputation for producing high priced products will be associated with higher prices brought at auction.
H2a	Price brought at auction	Seller side agent performance reputation	Seller side agents who have a reputation for consigning high performing products will be associated with higher prices brought at auction
H2b	Price brought at auction	Seller side agent price reputation	Seller side agents who have a reputation for consigning high priced products will be associated with higher prices brought at auction
H3a	Price brought at auction	Seller side agent centrality	Seller side agent centrality will be associated with higher prices brought at auction
H3b	Price brought at auction	Buyer side agent centrality	Buyer side agent centrality will be associated with higher prices brought at auction.

Control Variables

Control variables accounting for the relative quality of the horses offered will be utilized to control for the effects of third-party agents in this marketplace.

Item Specific Quality Variables

The marketplace studied is an auction for Thoroughbred yearlings. These yearlings are comprised of two main inputs- their father (sire) and their mother (dam). The cost of these

inputs can vary dramatically. Just to breed to some sires can cost close to half a million dollars. Buyers assess these yearlings based on the on-racetrack performance of their sires, dams, and extended family members, along with the performance of the yearling's siblings (half or full). These individual level variables will be used as control variables in this study. Market traders look to past auction results for information to determine the value of the object at hand. More favorable information (higher prices or higher levels of past performance) convey more favorable information about the quality of the objects being sold (Milgrom 1981; Ashenfelter 1989).

When the seller side principal is making the decision of what raw inputs to combine to produce a product, they are considering these control variables. An input with higher price and on-racetrack performance will have a higher procurement cost, raising the base cost of the item offered for sale at auction.

Chapter Summary

The purpose of this chapter has been to formalize a set of hypotheses that link market signaling effects to business performance outcomes. The measurement of these variables is discussed in the next chapter.

CHAPTER FOUR:
RESEARCH METHODOLOGY

Introduction

The purpose of this chapter is to present the methodology employed for testing the research model developed in the previous chapter. The first section describes the research setting for the current study. The next section outlines the research design, including sampling procedures and data collection. Measurement of the research variables will then be considered. Finally, the analytical procedures for testing the research hypotheses and overall model will be discussed.

Research Setting

The setting for this study is a distribution channel within the Thoroughbred racing industry that involves the flow of one-year-old horses from producers to buyers. The equine sector of United States Agriculture is a multi-billion dollar industry. Around 30 percent of the approximately 36,000 Thoroughbred foals born annually in North America are born in Kentucky (The Jockey Club 2009). Until recently, the Thoroughbred industry was Kentucky's leading cash crop, with sales in excess of $1 billion in 2007 and with $306 million worth of horseflesh exported in that same year. The estimated annual economic impact of the industry in Kentucky is $4 billion. The six percent tax on stallion stud fees alone, which is the cost to breed a mare (female horse) to a stallion (male horse), earned Kentucky $16 million in 2007 (KTA-KTOB 2009). Between the two largest auction houses for Thoroughbreds in Kentucky, Keeneland Sales Company and Fasig-Tipton Sales Company, 9,461 horses were sold for a total of $712,650,700 (Fasig-Tipton 2009; Keeneland Association 2009). The Keeneland September Yearling Sale, the largest marketplace for Thoroughbred yearlings in the world, sold 3,605 horses for a total of $327,999,100 in 2008, representing 46 percent of the total dollar volume and 38 percent of horses sold at auction in Kentucky in 2008 (Keeneland Association 2009). There were 5,555 horses cataloged for the 2008 sale, which represented 15 percent of the total Thoroughbred foals born in North America in 2007 (The Jockey Club 2009). Buyers and sellers from all over the world come annually to Lexington in September to purchase yearlings at auction.

Production of these horses begins with the breeder, who is the seller side principal in this study. This breeder plans a mating between a mare and a stallion. Matings are planned based on the relative quality of the mare and stallion, as indicated by the pedigree and race

record of their families and the past ability of the mare and stallion to produce high-performing horses. Mares with better pedigrees, race records, and proven ability to produce high-performing horses are more valuable. Likewise, stallions with better pedigrees, race records, and proven ability to sire high performing horses will command higher stud fees for their services. The breeder then consigns the resulting offspring with a consignment agency (seller side agent), which takes that horse, along with the horses of other producers, and sells them at auction (*figure 4.1)*.

FIGURE 4.1

Yearling consignor supervising inspection of horses

On the other end of the channel, the end buyer (buyer side principal) enlists the help of third-party agents to assist its selection of which yearlings to inspect and purchase at auction. One of these agents, known as the bloodstock agent (buyer side agent #1), is an expert in evaluating the potential of young horses (*figure 4.2)*.

FIGURE 4.2

Bloodstock agent inspecting yearling

The other agent, a veterinarian (buyer side agent #2), is an expert in evaluating the physical soundness of young horses. They take and inspect radiographs of the legs, endoscopically evaluate the horse's airway, evaluate the reproductive organs for breeding soundness, and visually appraise the horse's movement (*figure 4.3)*.

FIGURE 4.3

Veterinarians taking radiographs of yearling's legs

These agents render their opinions of the animal in question and report back to the buyer on their evaluations. Based on the evaluation, decisions are made regarding which animals the bloodstock agent should bid on at auction on behalf of the buyer. The auction house takes a 5 percent commission on the final selling price of all horses sold, or 5 percent the reserve price if the horse does not meet their reserve on the auction block. Bloodstock agents and consignors typically work on commission, while veterinarians usually receive a fee per service rendered (Blood-Horse Publications 2004).

The focus of this research is on the effect that these third-party agents have on business performance outcomes. The particular mechanism of study is the market signaling phenomena involving these third-party agents as links in the network connecting buyers and sellers. This channel provides an ideal situation for exploring the role of these third-party agents. In other channels where third-party agents are active, such as the real-estate market, it is very difficult to control for variables aside from the agent used which might also affect the selling price of a house. Even two homes that sell on the same street might not be comparable. For example, one section of the street might be more desirable than the other, one house might have a slightly newer roof, one might have newer appliances or higher quality flooring, etc., etc. If the homes do not sell at the same time of year, one must control for the economic conditions that

varied in those two periods of time. In the channel studied here, it is possible to control for many variables that affect the price of a yearling horse at auction. All horses are housed to be inspected within the same facility location, and they are all sold within a relatively short 16-day period. They all sell in the same auction ring. There is a wealth of information available on the pedigree and race history of the yearling's family, so data can be collected to control for those variables. In addition, several companies including The Blood-Horse, The Thoroughbred Times, and the Jockey Club publish statistical information regarding past sales, making it possible to conduct this study using high-quality secondary data on the sale.

Research Design

This study utilizes a combination of qualitative and quantitative data. The qualitative data is utilized to produce a grounded theoretical base for the research, along with providing additional evidence to support relationships which cannot be quantitatively assessed. This study will determine if there is a significant relationship between the independent measures of signaling phenomena and the dependent measures of auction sale price. The use of complete secondary data to measure the variables of input quality, and the actions of the bloodstock agent and veterinarian agent eliminates many threats to internal validity, as the data gathered is considered to be a true and accurate depiction of what took place at the Keeneland September 2008 Yearling Sale. Variables which cannot be directly observed from pre-existing data, including those of reputation and centrality, are constructed through the use of longitudinal data capturing the historical performance of the producers, consignors, and agents. The use of historical data to account for these variables is supported by the notion that reputation is considered the ability of an entity to fulfill it's quality claims over time (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996).

Sampling Procedures

The sampling frame consists of 3,605 horses cataloged for the Keeneland September 2008 Yearling Sale. This sample represents approximately 64.8% of the total number of items entered in the sale.

Data Collection

To obtain the information necessary to test the research model, secondary data were gathered from several different sources. Keeneland Sales results, available on the Keeneland

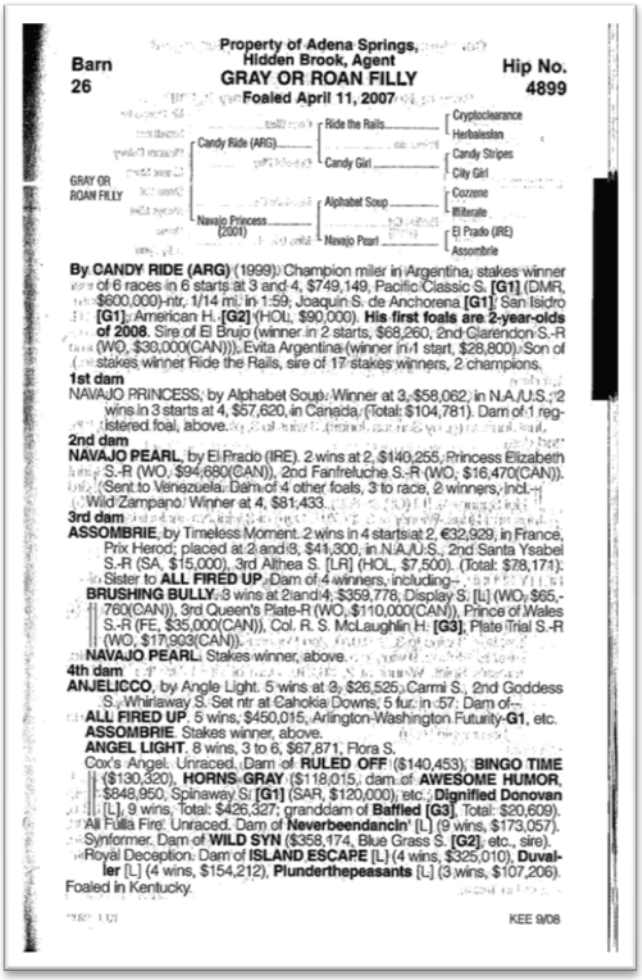
website (Keeneland Association 2008), provided the basic information of which horse sold to whom and from whom, and for how much. This is the official record that Keeneland compiles of auction results, and is a true and accurate representation of the results of the auction. This data was downloaded from the Keeneland website in Excel format.

The published materials containing detailed information about each individual horse in the sale were obtained from Keeneland (Keeneland Association Inc. 2008), along with *The Thoroughbred Times Buyer's Guide* (Thoroughbred Times 2008). These sources provide the control variables accounting for each yearling's pedigree and the performance of their immediate and extended family, both on the racetrack and in the sales ring. The Keeneland Catalog *(Figure 4.4)* allocates one page per yearling offered in the sale. This page contains documentation of the following information on each yearling: on track performance of the sire, along with the basic information on the performance of his offspring on the racetrack; racetrack performance of the dam (and often the extended female family of the dam) along with information on her foals and their racetrack performance; the "Engagements" each yearling has (special races the yearling is nominated to); the state and date of birth; and identification of the consignor.

The *Thoroughbred Times Buyer's Guide (Figure 4.5)* expands on the information contained on the Keeneland Catalog Page. This guide is available for purchase from The Thoroughbred Times for $185. This guide provides a greater depth of detail on information regarding the yearling. Information contain here includes the following: the stud fee of the sire (both in the year the yearling was conceived and the current year); the breeder (buyer side principal) of the yearling; the dosage index and center of distribution; the sales performance of sires other offspring; racetrack performance of other Thoroughbreds with the same genetic cross as the yearling cataloged; the racetrack performance of the yearling's dam; and the racetrack performance of the dam's other offspring. Also included is the price the cataloged yearling has sold for at auction previously, if applicable.

FIGURE 4.4

Sample- Keeneland Catalog Page



Property of Adena Springs, Hidden Brook, Agent

Barn 26

GRAY OR ROAN FILLY

Foaled April 11, 2007

Hip No. 4899

GRAY OR ROAN FILLY

- Candy Ride (ARG)
  - Ride the Rails
    - Cryptoclearance
    - Herbalesian
  - Candy Girl
    - Candy Stripes
    - City Girl
- Navajo Princess (2001)
  - Alphabet Soup
    - Cozzene
    - Illiterate
  - Navajo Pearl
    - El Prado (IRE)
    - Assombrie

By CANDY RIDE (ARG) (1999). Champion miler in Argentina, stakes winner of 6 races in 6 starts at 3 and 4, $749,149, Pacific Classic S. **[G1]** (DMR, $600,000)-ntr, 1/14 mi. in 1:59; Joaquin S. de Anchorena **[G1]**, San Isidro **[G1]**, American H. **[G2]** (HOL, $90,000). **His first foals are 2-year-olds of 2008.** Sire of El Brujo (winner in 2 starts, $68,260, 2nd Clarendon S.-R (WO, $30,000(CAN))), Evita Argentina (winner in 1 start, $28,800). Son of stakes winner Ride the Rails, sire of 17 stakes winners, 2 champions.

1st dam

NAVAJO PRINCESS, by Alphabet Soup. Winner at 3, $58,062, in N.A./U.S.; 2 wins in 3 starts at 4, $57,620, in Canada. (Total: $104,781). Dam of 1 registered foal, above.

2nd dam

NAVAJO PEARL, by El Prado (IRE). 2 wins at 2, $140,255, Princess Elizabeth S.-R (WO, $94,680(CAN)), 2nd Fanfreluche S.-R (WO, $16,470(CAN)). Sent to Venezuela. Dam of 4 other foals, 3 to race, 2 winners, incl.--

Wild Zampano. Winner at 4, $81,433.

3rd dam

ASSOMBRIE, by Timeless Moment. 2 wins in 4 starts at 2, €32,929, in France, Prix Herod; placed at 2 and 3, $41,300, in N.A./U.S., 2nd Santa Ysabel S.-R (SA, $15,000), 3rd Althea S. [LR] (HOL, $7,500). (Total: $78,171). Sister to **ALL FIRED UP**. Dam of 4 winners, including--

BRUSHING BULLY. 3 wins at 2 and 4, $359,778, Display S. [L] (WO, $65,760(CAN)), 3rd Queen's Plate-R (WO, $110,000(CAN)), Prince of Wales S.-R (FE, $35,000(CAN)), Col. R. S. McLaughlin H. **[G3]**, Plate Trial S.-R (WO, $17,903(CAN)).

NAVAJO PEARL. Stakes winner, above.

4th dam

ANJELICCO, by Angle Light. 5 wins at 3, $26,525, Carmi S., 2nd Goddess S., Whirlaway S. Set ntr at Cahokia Downs, 5 fur. in :57. Dam of--

ALL FIRED UP. 5 wins, $450,015, Arlington-Washington Futurity-**G1**, etc.

ASSOMBRIE. Stakes winner, above.

ANGEL LIGHT. 8 wins, 3 to 6, $67,871, Flora S.

Cox's Angel. Unraced. Dam of **RULED OFF** ($140,453), **BINGO TIME** ($130,320), **HORNS GRAY** ($118,015, dam of **AWESOME HUMOR**, $848,950, Spinaway S. **[G1]** (SAR, $120,000), etc.; **Dignified Donovan** [L], 9 wins, Total: $426,327; granddam of **Baffled [G3]**, Total: $20,609).

All Fulla Fire. Unraced. Dam of **Neverbeendancin'** [L] (9 wins, $173,057). Synformer. Dam of **WILD SYN** ($358,174, Blue Grass S. **[G2]**, etc., sire).

Royal Deception. Dam of **ISLAND ESCAPE** [L] (4 wins, $325,010), **Duvaller** [L] (4 wins, $154,212), **Plunderthepeasants** [L] (3 wins, $107,206).

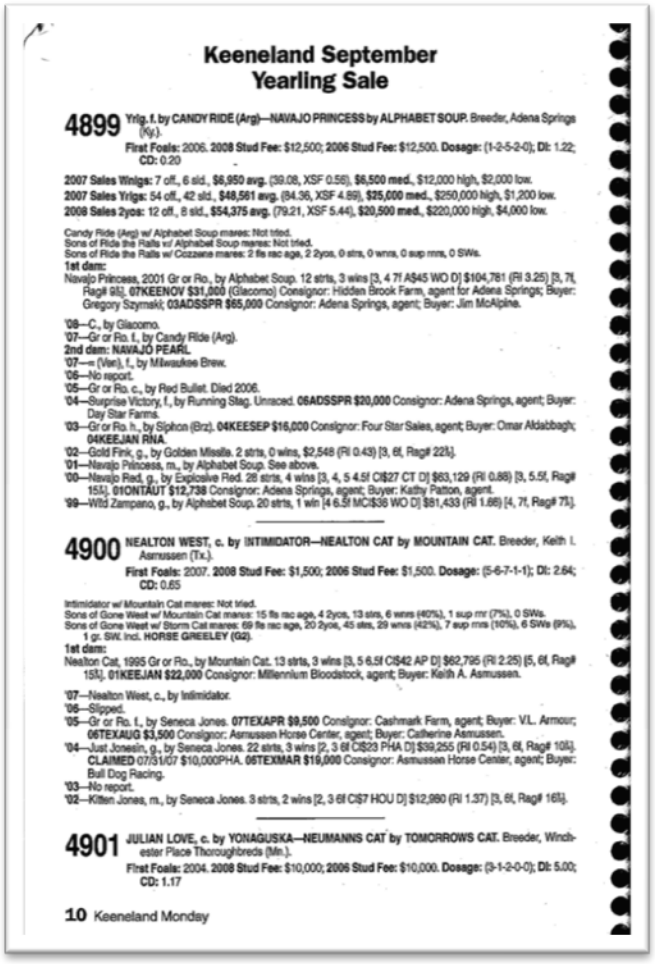
Foaled in Kentucky.

KEE 9/08

Various issues of *The Blood-Horse Market Watch*, *The Thoroughbred Times* and *The Blood-Horse* were used to gather historical sales and on-racetrack performance information on individual sires and dams, producers, consignors, and bloodstock agents. From these sources, proxy variables can be constructed to capture the variables in the research model. Each specific issue utilized will be detailed later in the discussion of measurement of research variables.

FIGURE 4.5

Sample- Thoroughbred Times Buyer's Guide



Keeneland September Yearling Sale

4899 Yrlg. f. by CANDY RIDE (Arg)—NAVAJO PRINCESS by ALPHABET SOUP. Breeder, Adena Springs (Ky.).
First Foals: 2006. **2008 Stud Fee:** $12,500; **2006 Stud Fee:** $12,500. **Dosage:** (1-2-5-2-0); **DI:** 1.22; **CD:** 0.20

2007 Sales Wnrgs: 7 off., 6 sld., **$6,950 avg.** (39.08, XSF 0.56), **$6,500 med.**, $12,000 high, $2,000 low.
2007 Sales Yrlgs: 54 off., 42 sld., **$48,561 avg.** (84.36, XSF 4.89), **$25,000 med.**, $250,000 high, $1,200 low.
2008 Sales 2yos: 12 off., 8 sld., **$54,375 avg.** (79.21, XSF 5.44), **$20,500 med.**, $220,000 high, $4,000 low.

Candy Ride (Arg) w/ Alphabet Soup mares: Not tried.
Sons of Ride the Rails w/ Alphabet Soup mares: Not tried.
Sons of Ride the Rails w/ Cozzene mares: 2 fls rac age, 2 2yos, 0 strs, 0 wnrs, 0 sup rnrs, 0 SWs.
1st dam:
Navajo Princess, 2001 Gr or Ro., by Alphabet Soup. 12 strts, 3 wins [3, 4 7f A$45 WO D] $104,781 (RI 3.25) [3, 7f, Rag# 9⅞]. **07KEENOV $31,000** (Glacomo) Consignor: Hidden Brook Farm, agent for Adena Springs; Buyer: Gregory Szymski; **03ADSSPR $65,000** Consignor: Adena Springs, agent; Buyer: Jim McAlpine.

'09—C., by Glacomo.
'07—Gr or Ro. f., by Candy Ride (Arg).
2nd dam: NAVAJO PEARL
'07—(Van), f., by Milwaukee Brew.
'06—No report.
'05—Gr or Ro. c., by Red Bullet. Died 2006.
'04—Surprise Victory, f., by Running Stag. Unraced. **06ADSSPR $20,000** Consignor: Adena Springs, agent; Buyer: Day Star Farms.
'03—Gr or Ro. h., by Siphon (Brz). **04KEESEP $16,000** Consignor: Four Star Sales, agent; Buyer: Omar Aldabbagh; **04KEEJAN RNA.**
'02—Gold Fink, g., by Golden Missile. 2 strts, 0 wins, $2,548 (RI 0.43) [3, 6f, Rag# 22⅞].
'01—Navajo Princess, m., by Alphabet Soup. See above.
'00—Navajo Red, g., by Explosive Red. 28 strts, 4 wins [3, 4, 5 4.5f CI$27 CT D] $63,129 (RI 0.88) [3, 5.5f, Rag# 15¾]. **01ONTAUT $12,738** Consignor: Adena Springs, agent; Buyer: Kathy Patton, agent.
'99—Wild Zamparo, g., by Alphabet Soup. 20 strts, 1 win [4 6.5f MC$36 WO D] $81,433 (RI 1.66) [4, 7f, Rag# 7⅞].

4900 NEALTON WEST, c. by INTIMIDATOR—NEALTON CAT by MOUNTAIN CAT. Breeder, Keith I. Asmussen (Tx.).
First Foals: 2007. **2008 Stud Fee:** $1,500; **2006 Stud Fee:** $1,500. **Dosage:** (5-6-7-1-1); **DI:** 2.64; **CD:** 0.65

Intimidator w/ Mountain Cat mares: Not tried.
Sons of Gone West w/ Mountain Cat mares: 15 fls rac age, 4 2yos, 13 strs, 6 wnrs (40%), 1 sup rnr (7%), 0 SWs.
Sons of Gone West w/ Storm Cat mares: 69 fls rac age, 20 2yos, 45 strs, 29 wnrs (42%), 7 sup rnrs (10%), 6 SWs (9%), 1 gr. SW. Incl. **HORSE GREELEY (G2).**
1st dam:
Nealton Cat, 1995 Gr or Ro., by Mountain Cat. 13 strts, 3 wins [3, 5 6.5f CI$42 AP D] $62,795 (RI 2.25) [5, 6f, Rag# 15⅞]. **01KEEJAN $22,000** Consignor: Millennium Bloodstock, agent; Buyer: Keith A. Asmussen.

'07—Nealton West, c., by Intimidator.
'06—Slipped.
'05—Gr or Ro. f., by Seneca Jones. **07TEXAPR $9,500** Consignor: Cashmark Farm, agent; Buyer: V.L. Armour; **06TEXAUG $3,500** Consignor: Asmussen Horse Center, agent; Buyer: Catherine Asmussen.
'04—Just Jonesin, g., by Seneca Jones. 22 strts, 3 wins [2, 3 6f CI$23 PHA D] $39,255 (RI 0.54) [3, 6f, Rag# 10⅞]. **CLAIMED** 07/31/07 $10,000PHA. **06TEXMAR $16,000** Consignor: Asmussen Horse Center, agent; Buyer: Bull Dog Racing.
'03—No report.
'02—Kitten Jones, m., by Seneca Jones. 3 strts, 2 wins [2, 3 6f CI$7 HOU D] $12,980 (RI 1.37) [3, 6f, Rag# 16⅞].

4901 JULIAN LOVE, c. by YONAGUSKA—NEUMANNS CAT by TOMORROWS CAT. Breeder, Winchester Place Thoroughbreds (Mn.).
First Foals: 2004. **2008 Stud Fee:** $10,000; **2006 Stud Fee:** $10,000. **Dosage:** (3-1-2-0-0); **DI:** 5.00; **CD:** 1.17

Measurement of Research Variables

This section will present the set of measures used to examine the research model. Measures that represent each of the three focal research variables are described first. Then, the set of measures utilized as control variables is presented. This section concludes with a discussion of measurement validity and reliability.

Reputation

Reputation, by definition, is determined by the past performance of a firm (Herbig and Milewicz 1994; Herbig and Milewicz 1994; Herbig and Milewicz 1996). Firms that consistently are able to deliver successfully on the quality claims that they make will develop positive reputations in the market. Consumers use market statistics of past results to gather information regarding the relative performance of a firm (Akerlof 1970; Caminal and Vives 1996). These

statistics serve as signals to the marketplace of the firm's reputation. To measure these variables, longitudinal data on the past performance of firms in this specific market will be gathered to determine their reputation. Data will be compiled from several printed sources. The two leading industry trade publications, *The Thoroughbred Times* and *The Blood-Horse,* publish detailed statistics by sale regarding performance of producers, consignors, and agents. *The Blood-Horse MarketWatch* is a specialized publication which provides information and analysis for the Thoroughbred investor, including statistics on performance of producers, consignors, and agents beyond what is available in the trade publications. Complete data on past sales results of the Keeneland September Yearling Sale is available through the Keeneland Association. These sales data includes information on the agents and consignors for every horse sold at Keeneland in the year prior to the 2008 sale.

There are two components of reputation- price reputation and performance reputation. These two components align with the notion that there are two basic uses for a Thoroughbred racehorse. The first is to race them and win money on the racetrack, and the second is to breed them and sell or race their offspring. While more expensive horses are not guaranteed to win more money on the racetrack, they are likely to hold a higher residual value (as a breeding animal). This can roughly be compared to the residual value of, say, a high-end sports car compared to an economy car. The high-end sports car costs more in the beginning, but is likely to also be worth more upon resale. So, buyers and their agents will consider the reputation of consignors and producers for offering animals that sell for a high price, and also the ability of those horses to perform on the racetrack. For example, there is a farm called "Monticule" that acts as both a breeder and consignor of yearlings. This farm has developed a reputation for quality both through the racetrack and sales ring performance of their yearlings. Monticule bred 2008 Kentucky Derby and Preakness winner Big Brown. These high profile wins served as evidence that the Thoroughbreds bred and sold by Monticule were worthy of the high prices they brought in the sales ring. As of this year, Monticule is the leading yearling consignor by average price, and the farm is also ranked eighth on the list of leading consignors by percentage of stakes winners (The Blood-Horse MarketWatch 2009). Contrast this reputation with a consignor who does not have any past performance to represent their yearlings, such as a consignor who is just entering the market and does not have any past sales or racetrack performance to their name. For example Woodford Thoroughbreds will be offering their first September yearling consignment this year at Keeneland.

Price Reputation

Consignor and Producer

Consignor price reputation will be measured using historical sales data from Keeneland September Yearling Sale results from 2007. Producer price reputation will be measured based on the historical sales results of the Keeneland September yearling sale for the producer.

Average sale price will be used to gauge the results of the consignor. The average price is used to rank the relative price outcomes of consignors in publications such as the "Thoroughbred Times Today", which is published on a daily basis throughout the sale. *The Blood-Horse MarketWatch* also publishes a yearly list of the relative performance of consignors, ranking them by average price (The Blood-Horse MarketWatch 2009). This data was gathered from the Jockey Club Information Systems database, the worldwide clearinghouse for data on the Thoroughbred Industry. Statistics of every registered Thoroughbred are recorded by The Jockey Club, the breed registry for Thoroughbred horses in the United States, Canada, and Puerto Rico. Precise record keeping in the Jockey Club Information Systems database is paramount, as they are the industry source for information. Every time a registered Thoroughbred runs in a race, is sold at public auction, or produces a foal, the information is contained here. Experience in the marketplace indicates that buyer side marketplace participants are regularly exposed to these published statistics, and will consider them when assessing the yearlings offered for sale.

Producer price ranking is not readily available through published sources. The average price for horses bred by producers and sold at the 2007 sale was manually compiled by referencing the breeder names from the 2007 Thoroughbred Times Buyers Guide (Thoroughbred Times 2007) with the complete sales results from the 2007 Keeneland September Yearling Sale.

Performance Reputation

Consignor

Performance statistics for consignors were gathered from *The Blood-Horse MarketWatch*. *The Blood-Horse MarketWatch* publishes a yearly listing of the racetrack performance of yearlings that consignors have sold at auction (Russo 2008). This list includes all consignors who have offered at least 20 horses for sale over the three-year period considered (2004-2006). Of the total sample of 3,605 transactions, 233 individual horses were sold by consignors who had not offered at least 20 horses for sale over the time period from 2004-

2006, representing approximately 6.4%. Statistics included in this listing include: number of yearlings offered on consignment; the number that were actually sold; average price of yearlings sold; average earnings of yearlings sold; the number and percentage of runners from the total number of yearlings offered (horses who have run in at least one race); number and percentage of winners; number and percentage of two-year-old winners; number and percentage of stakes winners; number and percentage of stakes horses; number and percentage of graded stakes winners; number and percentage of graded stakes winners; number and percentage of horses who have won over $100,000; the Average Earnings Index of the yearlings; and the average number of starts per yearling. Stakes races represent an upper level of competition. These races offer tougher competition and higher purse amount to be won. The percentage of stakes winners is used as a representation of consignor performance reputation, as this statistic is often the one touted by consignors in their advertisements (Monticule 2008).

Producer

To capture producer reputation for producing high-performing horses a ranking of leading breeders as published by Equineline.com will be used. This list is published weekly and ranks producers by total dollars won. The list from September 3, 2008 was utilized, capturing performance just up to the start of the Keeneland September sale (Equineline.com 2008). Equineline.com is widely read by industry participants, so marketplace participants will be exposed to these rankings and will use them as signals of the ability of a producer to breed high-performing horses. The hierarchy of this list of the top 300 breeders is a signal to the marketplace of the producer's ability to produce high-performing horses. The top 300 breeders in North America are the upper echelon of producers of Thoroughbreds, and as such the majority of producers who bred the yearlings for sale at the 2008 Keeneland September are not included on this list. Total dollar value of earnings was divided by the number of races started by horses bred per producer, giving a metric of earnings per starter. Of the total 3,605 of individual yearlings sold, 61% were produced by breeders who were not included in the list of the top 300 breeders for 2008. The data for these rankings as published on the Equineline.com website is compiled from the Jockey Club's Equibase Company LLC. This company, which operates under The Jockey Club, is the Thoroughbred industry's Official database for racing information.

Centrality

Central actors in the marketplace will be better able to leverage the social processes of the auction marketplace and will be more aware of the actions of others because they have more access to and control of information due to their centrality (Freeman 1978/79; Wasserman and Faust 1994). For both consignor and bloodstock agent centrality, Freeman's betweenness centrality measure will be used, as this specific measure of centrality measures the "degree to which a point falls on the shortest path between others and therefore has a potential for control of communication" (Freeman 1977, p. 35). Both 2007 and 2008 auction data will be used to measure centrality. This accounts for both past and current centrality of the actors, as we are interested in finding out how the centrality of actors in this marketplace affects the business performance outcomes. The data to measure centrality contains the information regarding which consignor sold which animal to which bloodstock agent:

Yearling Number i	Producer j	→	Consignor x	→	Bloodstock Agent y

While the producers are not active in the sale, they do have access to information about the animals that they bred, so there does exist a flow of information from them to the agents through the consignors. The centrality of the consignor will represent the degree to which they are in the path of information flows between producers and bloodstock agents. For the bloodstock agents, their centrality will represent the degree to which they are in the path of information flows between consignors and the hidden marketplace buyers. The Freeman Node betweenness measured in *UCINET 6 for Windows* will be used to obtain the betweenness scores for network actors. This measure is obtained by summing the partial betweenness values for all unordered pairs of points.

Control Variables

Control variables accounting for the relative quality of the horses offered will be utilized to control for the effects of third-party agents in this marketplace.

Thoroughbred Variables

A set of variables were collected to control for the individual differences of each yearling sold at the Keeneland September Yearling Sale. These variables include information about the yearling's sire, dam, and siblings. Data for these variables was obtained from *The Thoroughbred Times Buyer's Guide* (Thoroughbred Times 2008), which is a supplementary

catalog for the sale which includes detailed information about the family each individual yearling offered for sale.

TABLE 4.1	
TABLE OF MEASURES	
Variable	Description
DV: Final auction price	Complete sales results from Keeneland September 2008 sale
Reputation (performance): seller side principal	Ranking of the top breeders by racing performance, as measured by dollars per starter, from Equineline.com "Year-To-Date Leading Breeders" September 3, 2008
Reputation (price): seller side principal	Complete sales results from Keeneland September sale 2007, average price of seller side principal
Reputation (performance): seller side agent	Performance statistics of consignors, as measured by percentage of stakes winners, from The Blood-Horse MarketWatch "Yearling Sales Statistics 2004-2006"
Reputation (price): seller side agent	Complete sales results from Keeneland September sale 2007, average price of seller side agent
Centrality: seller side agent, buyer side agent.	Complete sales results from Keeneland September sale, 2007 & 2008, network of principal – seller side agent – buyer side agent. *UCINET* Freeman Node Betweenness Measure
Identity of seller side agent, buyer side agent	Complete sales results from Keeneland September sale 2008
Control variables accounting for yearling's pedigree and on-track performance of family	Thoroughbred Times Buyers Guide 2008 (Sire Stud Fee, Dam racetrack performance as measured by "Racing Index", performance of yearlings' half siblings as measured by dollars won per starter)

Measurement Validity

The validity of the research variables must be considered. Validity refers to "the degree to which instruments truly measure the constructs which they are intended to measure" (Peter 1981, p.165). Typically, validity is assessed in relation to how "the differences in observed scores reflect the true differences in the characteristic one is attempting to measure and nothing else" (Churchill Jr. 1979, p.196). In this research there are no survey instruments utilized to measure variables- relying instead on secondary data as proxies for the constructs. While marketing scholars rarely employ secondary data, in other disciplines such as finance and

economics, secondary data proxies are widely accepted and even preferred over self-report scale measures (Day and Montgomery 1999). Procedures for assessing the validity of multi-item scales are well-established (Churchill Jr. 1979), but guidelines for assessing the validity of secondary data proxies are less established. Some literature, such as Houston (2004), present guidelines for assessing the validity of secondary data. Secondary data provides several benefits over traditional self-report measures, as they represent actual decisions and outcomes conducted by genuine decision-makers in their natural environment. Secondary data can also avoid sampling biases that are inherent in research where key informant sampling is used. Since it is rarely used as independent variables in marketing research, secondary data proxies can provide multimethod triangulation (Campbell and Fiske 1959) to other research findings gathered through the use of surveys or experiments.

In the case of secondary data, validity addresses the credibility of the data, ensuring that the data is an accurate representation of what actually occurred. This study utilizes multiple sources of secondary data and the reliability of each will be addressed in turn. First is the data cataloging the results of the Keeneland September sale. The 2008 data forms the basis for this study, containing the information of the seller side agent, buyer side agent, and dollar amount of auction transaction for each transaction. This same information is gathered for the previous year of the sale- 2007. This prior year data is used to assess longitudinal performance of the marketplace. This data is obtained directly from the Keeneland corporation website and downloaded into Microsoft Excel. It is of great importance that these records are a true and accurate representation of the transactions that occurred during the sale, as this data is what is recorded to the Jockey Club Information Systems databases. The Jockey Club Information Systems databases are the worldwide clearinghouse for information on the sales and racing performance of Thoroughbreds. The Thoroughbred industry including individual participants (such as owners, breeders, trainers, or veterinarians) wishing to research performance, Thoroughbred farms who breed and race horses, and publications such as The Blood-Horse and the Thoroughbred Times utilize the Jockey Club Information Systems databases for information. Other secondary sources of information utilized in this study, including several issues of The Blood-Horse MarketWatch publication, utilize these databases as their data source. The Thoroughbred-Times references Equibase Company LLC, which is under the same umbrella (The Jockey Club of North America) of ownership as The Jockey Club Information Systems. The Jockey Club is the breed registry for Thoroughbred horses in the United States, Canada, and Puerto Rico.

Houston (2004) lays out a three-stage process for assessing the construct validity of secondary data proxies. In the first stage, the domain of the construct is specified, following the same pattern as laid out in Churchill (1979). This study uses the theory of market signaling as defined in Kirmani and Rao (2000) within the context of a marketplace as a social process where third party expert agents are market drivers (Zuckerman 1999). Signals are marketing activities that transmit information beyond the activity itself, exposing the unobservable message within the message. Quality in this marketplace cannot be observed prior to purchase, so agents must use market signals to determine the interest in and willingness to pay for the items that are available for sale. Agents send and receive signals through their actions and, through the aggregation of the signals, a determination of the true value of an item can be made (Ashenfelter 1989; Klemperer 1999). The domain is the marketing channel of an auction for heterogeneous goods.

In the second stage, the ability of the indicator to measure the construct is assessed. Traditional methods for assessing reliability and unidimensionality are not applicable when using secondary data proxies as indicators of a construct. Instead, the quality of the indicator must lie within the evaluation of content validity. Several industry experts were asked to evaluate the validity of the chosen measures, and these experts confirmed that the secondary measures were indeed valid indicators of the constructs (Sweezey 2009; Rosenberg 2010).

The third stage is to assess the fit of the measure within a theoretically specified network of constructs. This is undertaken once the data has been collected and analyzed to "assess whether the measure of the focal construct relates in the manner specified to the other constructs" (Houston 2004, p. 159). In studies such as this where theory testing is the focus one method to assess nomological validity to examine simple correlations (Houston and Johnson 2000).

If average sale price for seller side principals and seller side agents is a valid measure of price reputation, these two measures should correlate positively with one another. The prices received at auction reflect on both the seller side principal and seller side agent, as they are partners in the single transaction. Examination of the correlation table reveals positive ($r = .275$, $p < .000$). Likewise, the variables capturing racing performance of the seller side principals and their seller side agent should be positively correlated, as the eventual performance of the thoroughbreds bred by the principals and sold by the agents should reflect upon each other. The correlation table confirms this posited relationship ($r = .172$, $p < .000$).

Analytical Procedures

This section will provide an overview of the analytical procedures used to test the proposed research model. For the network-based calculations of centrality, initial calculations will be performed using *UCINET 6.0 for Windows* (Borgatti, Everett et al. 2010). This program is designed specifically for applications of network analysis. *PASW Statistics 18 (SPSS Inc. 2009)* will be used to perform multivariate regression to test the research model. Next, and overview of the procedures used for testing the hypotheses is discussed.

Data Analysis

Before regression can be employed, the data must be prepared and screened (Kline 2005). The data must be assessed for normality (that the error terms are normally distributed, homoscedasticity (that there is constant variance of the error terms), independence of error terms (that the error terms are uncorrelated), and the presence of outliers . These assumptions will be tested by conducting statistical tests and examining the graph plots in *PASW Statistics 18.0* (SPSS Inc. 2009).

Once this procedure has been completed multivariate regression will be employed to test the fit of the proposed model.

Multiple Regression Analysis

Multiple regression analysis is a widely used method to test a dependence relationship between a set of independent variables and a single dependent variable (Hair, Anderson et al. 1998; Lattin, Carrol et al. 2003). This technique models the relationship as a linear combination of independent variables that correspond to the dependent variable. It describes the relationship and also offers indication of how strong that relationship is as captured by the model.

There are several steps involved in the design of a multiple regression analysis. First, power analyses must be employed to determine the appropriate sample size. Power in multiple regression refers to "the probability of detecting as statistically significant specific R^2 or a regression coefficient at a specified significance level for a specific sample size" (Hair, Anderson et al. 1998, p. 165). The recommended power level as specified in Hair et al. (1998) is 80 percent . With a sample size of well over 1,000 (3,605) and 9 independent variables, the minimum R^2 that can be found statistically significant is .02. With a very large sample size, caution must be taken in interpreting results, as almost any relationship is statistically significant.

Next, the assumptions regarding multiple regression analysis were examined. These assumptions include linearity (a linear relationship exists between the dependent and independent variables), homoscedasticity (constant variance of the error terms), and independence of the error terms (error terms are uncorrelated), normality (error terms are normally distributed)(Hair, Anderson et al. 1998). These assumptions were tested by examining plots such as the residuals (r_i) versus the predicted dependent values (Y_i). Violations of assumptions can be identified by specific patterns in the residual plots, along with statistical tests such as the Bartlett test for homogeneity of variances.

Finally, an ordinary least squares regression model was estimated using *PASW Statistics 18.*

$$\text{PRICE} = \propto_0 + \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9$$

Where

PRICE = final price brought at auction,

X_1= Seller side principal performance reputation,

X_2= Seller side principal price reputation,

X_3= Seller side agent performance reputation,

X_4= Seller side agent price reputation,

X_5= Seller side agent centrality,

X_6= Buyer Side agent centrality,

Three control variables were modeled:

X_7= Sire stud fee,

X_8= Racing performance of dam, and

X_9= Racing performance of siblings

Note that the natural logarithm of final auction hammer price ((ln)PRICE) is used in this regression model. Thoroughbred Yearling pricing models typically utilize (ln)PRICE, as price results typically do not follow a normal distribution. See Parsons and Smith(2008), Robbins and Kennedy (2001), and Vickner and Koch (2001)for examples. Variables were mean centered to allow for relative comparison of effect sizes of independent variables. Variance inflation factors ranging from 1.020 to 1.426 suggest that multicollinearity is not a threat in the estimated model.

Chapter Summary

The purpose of this chapter has been to present the set of methods that will be used to test the effects of market signaling phenomena on business performance outcomes. Secondary data from the Keeneland 2008 September Yearling Sale are collected to investigate the role of third-party agents as links in the network connecting buyers and sellers and their effect on the dependent variable of auction sale price. Key variables investigated include price and performance reputation, centrality, and the actions of third-party agents. Control variables which account for the specific qualities of the individual animals in the sale are included to isolate the effects of these agents. Significance of the overall model and its regression coefficients are examined and interpreted in relation to the hypothesized research model, and the results are discussed in detail in the following chapter.

CHAPTER FIVE:
RESULTS

Introduction

The purpose of this chapter is to present the results of this study. The chapter begins with a discussion of the sample. Several different sources of secondary data are employed here. These openly available published sources were selected as representative of the information that would typically be available to marketplace principals and agents to use in planning interactions in this unique live auction marketplace. Subsequently, a report of the procedures used to prepare the data is presented. The sample represents a percentage of the total number of products transacted in this marketplace where the principals and agents are operating. Finally, the results are presented.

Sample

Hypotheses are tested in the context of an auction for Thoroughbred yearlings. Data was collected from the Keeneland September 2008 yearling sale, which is held annually at the Keeneland Racetrack and Sales Company in Lexington, Kentucky. This is the largest individual marketplace for this product in the world. In 2008, 3,605, out of a total 9,095 yearling's sold in North America, were sold at the Keeneland September sale, with transactions totaling $327,999,100 out of the total gross revenues of $468,296,939. In 2008, 5,555 yearlings were entered in the sale. A total of 760 horses entered into the sale were never presented at the auction ring for sale, eliminating them from the sample. Another 1,190 horses did not bring a bid for the minimum reserve amount at auction, classifying them as "reserve not attained". These horses were also excluded from the sample, as they were not engaged in a sale transaction through the live auction. This left a final sample of 3,605, or 64.89% of the total population of products registered for sale in the auction.

Data Preparation

All data for this study was compiled from published sources containing information about the entities in the marketplace- seller side principals, seller side agents, and buyer side agents and their principals. Some of this information is available for free; other sources must be purchased. The Keeneland Corporation provides the complete results of their sale for download in spreadsheet format from their website (Keeneland Association 2008) for free. The

data provides a unique numerical identifier for each yearling entered into the sale, along with identification of the yearling's seller side agent and if a sale is recorded as completed for the item, the identification of the buyer side agent and the price at which the transaction was recorded as complete.

Control variables accounting for the relative quality of each auction item (yearling) input were obtained from the *Thoroughbred Times Buyer's Guide* (Thoroughbred Times 2008). The *Thoroughbred Times Buyer's Guide* is available for purchase for a price of $185. Three classes of variables were drawn from this source. First is the "stud fee" of the yearlings father, which is the cost of breeding a mare to that particular stallion to produce a foal. This fee is typically the first method of classifying yearling quality- better stallions have higher stud fees. Next is the racing performance of the yearling's dam. This is measured by the "Racing Index" (RI), which is "based on the average earnings per start for all runners in the United States, Canada, England, Ireland, France, Italy, Germany, Puerto Rico, Hong Kong, Australia, Argentina, Japan, and United Arab Emirates. RI is determined by calculating the average earnings per start, divided into males and females, of all starters in each individual country, and the average for each individual year is by definition 1.00" (Thoroughbred Times 2008, p. 4). Horses with higher RI performed to a higher standard than those with a lower RI. Finally, the total earnings of the yearling's half siblings (other foals born to the yearling's dam) were totaled and divided by the number of half siblings. This variable controls for the relative quality of the yearling's half siblings, which, along with the quality of the sire and dam, is used to gauge the relative quality of that yearling in comparison to others. All data was coded into a *Microsoft Excel* database.

Data from the 2007 Keeneland yearling sale was also downloaded from the Keeneland Association website. Variables for price reputation of the seller side agent (average price) and seller side principal (average price) were tabulated from these databases. The data containing details about leading breeders (seller side principal performance reputation) was downloaded directly from the equineline.com website and included into the master *Microsoft Excel* database. Likewise, the data from the *Blood-Horse Marketwatch (Russo 2008)* on performance of seller side agents was manually entered into this master database. The manually entered data was checked for error, with 25% (900) of the sample checked against the published data to ensure accuracy. Seventeen errors were found, leading to an error rate of 1.8%.

From this master *Microsoft Excel* database, data for calculation of the centrality measures was constructed. The name of the seller side principal, the seller side agent, and the buyer side agent were pulled from the database, along with the sale price. This data was then

imported into *Ucinet 6.0 for Windows* and converted into a valued matrix of ties between market participants for further analysis. This network was analyzed using the Freeman Node Betweenness measure. This measure for any individual node is calculated by assessing the proportion of ties linking two other nodes which pass through the node in question. Betweenness is defined as "the share of times that a node *i* needs a node *k* (whose centrality is being measured) in order to reach a node *j* via the shortest path" (Freeman 1978/79; Borgatti 2005, p. 60). The measure assesses the activity of the node in question and is often considered a measure of the importance or prominence in a network (Van Den Bulte and Wuyts 2007). The scores from this measure were exported from the *Ucinet 6.0* program and then input into the master *Microsoft Excel* database. Finally, all variables from the *Microsoft Excel* database were transferred to *PASW Statistics 18.0* for further analysis.

TABLE 5.1

Variables

Variable	Description
DV: Final auction price	(PRICE) dollar value of sale
Reputation (performance): seller side principal	(SSP_PERF_REP: seller side principal performance reputation) total dollars won by horses bred by principals year to date/ divided by total number of starters year to date- dollars/starter
Reputation (price): seller side principal	(SSP_$REP: seller side principal price reputation) average sales price of yearlings bred by principal and sold at Keeneland September sale 2007
Reputation (performance): seller side agent	(SSA_PERF_REP: seller side agent performance reputation) percentage of stakes winners from total number of yearlings sold by seller side agent from 2004 to 2006
Reputation (price): seller side agent	(SSA_$REP: seller side agent price reputation) average price of yearlings sold by seller side agent at Keeneland September yearling sale, 2007
Centrality: seller side agent, buyer side agent.	(SSA_CENT: seller side agent centrality) valued betweenness centrality, as calculated by Ucinet 6.0 (BSA_CENT: buyer side agent centrality) valued betweenness centrality, as calculated by Ucinet 6.0

Assumptions

All variables in the study were screened to assess the fit of the responses to a normal distribution. Data normality is a fundamental assumption in all forms of multivariate analysis

(Hair, Anderson et al. 1998). Each variable was assessed for normality, linearity, homoscedasticity, and independence of error terms using histograms, stem-and-leaf plots, normal probability plots, and measures of skewness and kurtosis. Variables including *price, sire, dam, siblings, ssp_perf_rep, ssp_$rep, ssa_perf_rep, ssa_$rep, ssa_cent,*and *bsa_cent* exhibited excessive skewness and/or kurtosis. Procedures for remedying nonnormality (e.g. Curran, West et al. 1995; Hair, Anderson et al. 1998) were followed, and the offending variables were transformed prior to their use in subsequent analysis. Examination of the plots of the offending variables indicated the use of logarithmic transformations for *price, sire, dam, siblings, ssp_perf_rep, ssa_perf_rep, ssa_cent,*and *bsa_cent* . Distributions of *ssp_$rep, ssa_$rep* necessitated the use of a square-root transformation. All variables in the model achieved acceptable levels of normality after transformation. One variable, *siblings,* exhibits slightly high values of kurtosis-- 2.764 which is just outside the Hair's (1998) guidelines of +/- 2.58. Examination of further evidence (i.e. histograms, stem-and-leaf plots, probability plots) indicate that distribution is acceptably close to normality.

Descriptive Statistics for Focal Research Variables

The purpose of this section is to report descriptive statistics for the variables used in this study. First, reputation study variables will be described. Then, measures used to assess network centrality will be presented. All descriptive statistics presented herein are based on raw data.

Reputation

The reputation variables collected include those representing the seller side principal and seller side agent. These are further classified into performance reputation and price reputation.

Performance Reputation

Seller Side Principal

Seller side principal performance reputation was taken from a published report of dollars won by yearling breeders for the year to date up to the time of the Keeneland yearling sale. This list is restricted to the top 300 leading breeders in North America, and as such this variable has many seller side principals for which there is no information-- 61.7% of the population, or 2,223 total sale transactions. While this leaves many entities with a score of zero for seller side principal reputation, the very fact that a particular principal is or is not on the list

is a source of information. If the principal is included on this list of leading breeders, it is telling of its place in the market as a leading participant. If it is not, then it is a more minor player, with not as much performance reputation in the marketplace. Maximum dollars per starter for a principal in the sample is $1,047,2541 with a mean of $37,158 and a standard deviation of $51,691. Minimum dollars per starter is $2,088.

Seller Side Agent

Seller side agent performance reputation is a measure of the percentage of stakes winners that resulted from yearlings sold by seller side agents in the years 2004 to 2006 and racing in the time period of January 1, 2005 through June 5, 2008. This list is restricted to those seller side agents that offered at least 20 yearlings for sale during this time period. The percentage of stakes winners is a figure often touted by seller side agents in promoting their ability to sell high performing products (Figures 5.2 – 5.3). There were a total of 283 sale transactions where the seller side agent had no past performance reputation, and were coded zero stakes winners. The maximum percentage of stakes winners for seller side agents was .13, with a mean of .051 and a standard deviation of .023.

Price Reputation

Seller Side Agent

Seller side agent price reputation is measured based on the average selling price for that agent for the prior year of the Keeneland September yearling sale. The average selling price for agents is a commonly used measure to assess the relative performance of those agents. This metric is published in the industry trade publications such as *The Thoroughbred Times (Figure 5.1), The Blood-Horse,* and *The Blood-Horse Marketwatch* (e.g., Russo 2008; Thoroughbred Times 2008; The Blood-Horse MarketWatch 2009). This variable was drawn from the official Keeneland sales results for the 2007 sale (Keeneland Association 2007), representing the reputation of the agent in this marketplace. While the results included the complete history of sales, there were several seller side agents transacting in the marketplace in the year of study (2008) who had not transacted there before. This is not missing data per se, but rather a zero score for reputation. There were a total of 84 sale transactions where the seller side agent was assigned a zero for price reputation. The maximum average sale price for seller side agents was $400,000, with a mean of $104,193 and a standard deviation of $57,151.

Seller Side Principal

Like seller side agent price reputation, seller side principal price reputation was calculated based on the results of the prior-year Keeneland September yearling sale. The principal names were obtained from the *Thoroughbred Times Buyer's* Guide (Thoroughbred Times 2007), and input into the master database containing sales results. A total of 912 sale transactions were conducted by seller side principals that had no prior year price reputation to draw from, giving them a price reputation of zero. The maximum average price for seller side principals was $1,296,667, with a mean of $81,744 and a standard deviation of $102,651.

TABLE 5.2

Descriptive Statistics for Reputation Variables

	N	Minimum	Maximum	Mean	Std. Deviation
SSP_PERF_REP	3605	0.00	19,248,406.00	1,413,656.38	3,565,573.22
SSP_$REP	3605	0.00	1,296,667.67	81,744.51	102,651.30
SSA_PERF_REP	3605	0.00	108.00	29.311	33.38
SSA_$REP	3605	0.00	400,000.00	104,193.12	57,151.79

Centrality

The network measure of Freeman Betweenness Centrality was calculated for both the seller side agent and the buyer side agent. Data from the 2007 and 2008 Keeneland September yearling sale were compiled for this measure, representing both the present and near-past network position of each marketplace participant considered as a whole, giving a more enduring and complete representation of that participant's position relative to just assessing the present year or past year singularly. This centrality calculation utilized valued ties which were not directed, meaning that a tie is indicated between two parties regardless of the direction of the tie. For example, even though in this scenario there are parties on the buyer side who purchase products from those on the seller side, the ties measured do not account for the direction of the transaction from seller to buyer. This measure for any individual node is calculated by assessing the proportion of ties linking two other nodes which pass through the node in question. Betweenness is defined as the share of times that a node *i* needs a node *k* (whose centrality is being measured) in order to reach a node *j* via the shortest path (Freeman 1978/79; Borgatti 2005, p. 60). The measure assesses the activity of the node in question and is often considered a measure of the importance or prominence in a network (Van Den Bulte and Wuyts 2007).

Seller Side Agent

Maximum betweenness centrality for seller side agents was 1,736,599, with a mean of 479,576 and a standard deviation of 528,983.

Buyer Side Agent

Maximum betweenness centrality for buyer side agents was 221,504, with a mean of 26,763 and a standard deviation of 42,545.

TABLE 5.3

Descriptive Statistics for Centrality Variables

	N	Minimum	Maximum	Mean	Std. Deviation
SSA_CENT	3605	1.00	1,736,599.38	478,576.94	528,983.19
BSA_CENT	3605	1.00	221,504.91	26,763.92	42,545.89

Descriptive Statistics for Control Variables

This section reports descriptive statistics for the control variables used in this study. These variables control for the relative quality of the inputs of the item offered for sale. Inputs of the parentage and siblings of the yearling in question are included.

Sire

Stud fee for 2008 captures the influence of the quality of the sire side input of the auction item (yearling) in question. Sire stud fee is a publicly advertised price which is the cost for the female horse (dam) owner to breed to that particular sire to produce a foal. Keeneland sales company uses sire stud fee as one of the main bases for placing yearlings in the sale, with higher priced stud fees occurring in earlier books (Blood-Horse Publications 2004). There were 202 items sold that had no stud fee for 2008 associated with them. These sires could be deceased or pensioned from stud duty. The last known stud fee for these stallions was used in this model. Maximum sire stud fee in this sample is $300,000, with a mean of 91,026 and a standard deviation of 53,780.

Dam

While the price of the sire stud fee is an important variable in assessing the base quality of the item in question, the quality of the dam is also important. The quality of the dam is measured here by the maximum Racing Index she received while in her racing career. This is a widely used statistic to compare the overall performance of race horses, and is published in the *Thoroughbred Times Buyer's Guide*. The maximum Racing Index for dams in this sample was 63,

with a mean of 3.7 and a standard deviation of 4.38. There were a total of 729 items sold that had no associated dam Racing Index, meaning the dam did not race.

Siblings

The performance of the half-siblings of the yearling in question is the third important determinant in assessing base item quality. A yearling who has siblings who have already shown their prowess on the racetrack gives some assurance that the dam of the yearling in question is able to produce a high quality product. This variable was obtained by summing the total dollars won by the dam's other offspring as published in the *Thoroughbred Times Buyer's Guide*, and dividing it by the number of offspring. In this sample, 1,131 products did not have associated racing performance of their half-siblings and were scored as zero. The maximum dollars per starter in the sample was $1,828,582 with a mean of $46,002 and a standard deviation of $83,526.

TABLE 5.4

Descriptive Statistics for Control Variables

	N	Minimum	Maximum	Mean	Std. Deviation
SIRE	3605	0	300,000	41,234.95	53,780.63
DAM	3605	1	63	3.70	4.38
SIBLINGS	3605	0	1,828,582	46,002.81	83,526.26

TABLE 5.5

Means, Standard Deviations, and Pearson Correlations

	MEAN	SD	N	PRICE	SIRE	DAM	SIBLINGS	SSP_ PERF_ REP	SSP_$ REP	SSA_ PERF_ REP	SSA_$ REP	SSA_ CENT	BSA_ CENT
PRICE	.00	1	3605	1.00									
SIRE	.00	1	3605	.518**	1.00								
DAM	.00	1	3605	.221**	.250**	1.00							
SIBLINGS	.00	1	3605	.181**	.069**	.102**	1.00						
SSP_PERF_REP	.00	1	3605	.244**	.138**	.060**	.041*	1.00					
SSP_$REP	.00	1	3605	.241**	.264**	.111**	.071**	.066**	1.00				
SSA_PERF_REP	.00	1	3605	.135**	.108**	.043**	.040*	.172**	.049**	1.00			
SA_$REP	.00	1	3605	.245**	.245**	.124**	.038*	.070**	.275**	.039*	1.00		
SSA_CENT	.00	1	3605	.155**	.191**	.066**	-.001	.038*	.161**	.011	.408**	1.00	
BSA_CENT	.00	1	3605	.198**	.121**	.058**	.025	.058**	.061**	.041*	.063**	.061**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

TABLE 5.6

Independent Variables Individually Regressed on Dependent Variable (PRICE)

	Model Summary		ANOVA			Unstandardized Coefficients		Standardized Coefficients		
	R	R Square	F	df	sig	B	Std. Error	Beta	t	Sig.
SIRE	.518	.268	1322.070	1	.000	.518	.014	.518	36.36	.000
DAM	.221	.049	184.857	1	.000	.221	.016	.221	13.59	.000
SIBLINGS	.181	.033	121.858	1	.000	.181	.016	.181	11.03	.000
SSP_PERF_REP	.244	.060	228.030	1	.000	.244	.016	.244	15.10	.000
SSP_$REP	.241	.058	221.983	1	.000	.241	.016	.241	14.89	.000
SSA_PERF_REP	.135	.018	66.935	1	.000	.135	.017	.135	8.18	.000
SSA_$REP	.245	.060	230.321	1	.000	.245	.016	.245	15.17	.000
SSA_CENT	.112	.013	45.905	1	.000	.112	.017	.112	6.77	.000
BSA_CENT	.198	.016	12.155	1	.000	.198	.016	.198	12.15	.000

Model Development

This study utilizes a single-item indicator approach to modeling. There is one single variable to represent each hypothesized variable in the model. Recent evidence suggest that for many constructs a single item measure is preferred over multiple item measures (Bergkvist and Rossiter 2007). Each item was assessed individually to check its relationship to the dependent variable, initially exploring the proposed relationships in the model. In this study, the six independent reputation and centrality variables, along with the three item quality control variables, are posited to affect the dependent variable of price. All independent variables were regressed individually onto the dependent variable of PRICE and revealed statistically significant loadings of all independent variables onto the dependent variables. This serves as confirmation of the predicted relationships of these independent variables affecting the dependent variable in the model.

Ordinary linear regression, where all independent variables were loaded onto the single dependent variable, revealed an adequately fitting model where all variables were significant.

TABLE 5.7

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.598[a]	.358	.356	.80246	.358	222.416	9	3595	.000

a. Predictors: (Constant), SIRE, DAM, SIBLINGS, SSP_PERF_REP, SSP_$REP, SSA_PERF_REP, SSA_$REP, SSA_CENT, BSA_CENT

b. Dependent Variable: PRICE

TABLE 5.8

Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.892E-5	.013		.004	.997
	SIRE	.412	.015	.412	28.093	.000
	DAM	.067	.014	.067	4.851	.000
	SIBLINGS	.126	.013	.126	9.326	.000
	SSP_PERF_REP	.152	.014	.152	11.117	.000
	SSP_$REP	.071	.014	.071	4.992	.000
	SSA_PERF_REP	.044	.014	.044	3.253	.001
	SSA_$REP	.100	.016	.100	6.273	.000
	SSA_CENT	-.018	.015	-.018	-1.180	.238
	BSA_CENT	.121	.013	.121	8.941	.000

a. Dependent Variable: PRICE

Hypothesis Testing

Examination of the regression coefficients revealed five of six hypothesized relationships were significant and in the predicted direction. Hypotheses H1a and H1b relate seller side principal reputation to the dependent variable of price brought at auction. H1a, relating seller side principal performance reputation (SSP_PERF_REP) and PRICE is supported, with a significant path coefficient in the expected direction (β = .152, *p* = .000). H1b is supported as evidenced by a statistically significant coefficient between seller side price reputation (SSP_$REP) and PRICE (β = .071, *p* = .000).

Hypotheses H2a and H2b posit a relation between seller side agent price and performance reputation and price. Support was found for H2a which predicated seller side agent performance reputation (SSA_PERF_REP) would positively affect PRICE (β = .044, *p* = .000). Likewise, H2b was also supported, which predicted a positive relationship between seller side agent price reputation (SSA_$REP) and PRICE (β = .100, *p* = .001).

Centrality of seller side agent (SSA_CENT) and buyer side agent (BSA_CENT) were hypothesized to positively affect price. H3a, relating seller side agent centrality to PRICE was not supported, with a significant path coefficient in a negative direction (β = -.018, *p* = .238). H3b was supported, showing a positive significant relation between buyer side agent centrality and PRICE (β = .121, *p* = .000).

TABLE 5.9

Results of Marketplace Model

**.significant at the 0.01 level (2-tailed).
*.significant at the 0.05 level (2-tailed).

Summary of Hypothesis Testing

Overall, five of six hypotheses were supported. Hypotheses H1a, H1b, H2a, H2b, and H3b were supported, while H2a was not significant. These results indicate that seller side principal and agent reputation, and buyer side agent centrality affect eventual marketplace outcomes.

TABLE 5.10		
Summary of Hypothesis Testing Results		
H1a	(β = .152, *p* = .000)	supported
H1b	(β = .071, *p* = .000)	supported
H2a	(β = .044, *p* = .000)	supported
H2b	(β = .100, *p* = .000)	supported
H3a	(β = -.018, *p* = .238)	not supported
H3b	(β = .121, *p* = .000)	supported

Post Hoc Analyses

Results of hypothesis testing indicate that seller side agent centrality is not significant in the marketplace model. Individually, this variable was shown to significantly influence the dependent variable of final auction price. In order to explore this relationship additional analyses were conducted. Seller side agent centrality exhibited a moderate correlation with seller side agent price performance (Table 5.5). It is possible that the insignificant result of seller side agent centrality in the model is due to this multicollinearity. When multicollinearity is limited to pairs of independent variables, as is the case here, one way to disentangle unique from shared contributions is to regress one variable onto the other and substitute the residual for the original independent variable in the regression model (Slotegraff, Moorman et al. 2003). To control for seller side agent price reputation when examining the influence of seller side agent centrality, seller side agent price reputation was regressed onto seller side agent centrality, and the standardized residual values from this regression were substituted for seller side agent centrality in the marketplace model.

Results of this analysis show that seller side agent centrality still is insignificant in the mdoel. The results of this analysis indicate that when isolating the unique variance of seller side agent centrality, this variable is still insignificant.

TABLE 5.11

Post Hoc Analysis Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.860E-5	.013		.004	.997
	SIRE	.412	.015	.412	28.093	.000
	DAM	.067	.014	.067	4.851	.000
	SIBLINGS	.126	.013	.126	9.326	.000
	SSP_PERF_REP	.152	.014	.152	11.117	.000
	SSP_$REP	.071	.014	.071	4.992	.000
	SSA_PERF_REP	.044	.014	.044	3.253	.001
	SSA_$REP	.091	.014	.091	6.442	.000
	Standardized Residual	-.016	.013	-.016	-1.180	.238
	BSA_CENT	.121	.013	.121	8.941	.000

a. Dependent Variable: PRICE

Chapter Summary

The purpose of this chapter has been to present and analyze the data collected in this study. First, the sample, data, and data preparation procedures were discussed. This was followed by a report of the model development procedures, followed by descriptive statistics for all focal research and control variables. Finally, the results of hypothesis testing were presented.

FIGURE 5.1

Sample published media with ranking of leading seller side agents by average price

KEENELAND SEPTEMBER YEARLING SALE

DARBY DAN FARM

Keeneland September

continued from page 1

Jerry and Ann Moss purchased a filly by first-year sire Rock Hard Ten for $725,000, the highest-priced filly of the day. Named Exceedingly, she is the third foal out of the winning Unbridled mare Unsurpassed. Bred in Kentucky by G. Watts Humphrey Jr., Exceedingly was consigned by Lane's End, agent.

"She was a great-looking filly," said Jerry Moss. "We don't have that much by [Rock Hard Ten], so we thought we'd take the plunge. It was a little more than we expected [to pay] but we just loved her, so we went for it."

The sale continues at 10 a.m. EDT today.—*Jeff Lowe and Pete Denk*

Keeneland September yearling sale
OVERALL SUMMARY

	2008		2007
No. offered	**794**	**(-1.5%)**	806
No. sold	**570**	**(-4.5%)**	597
Pct. not sold	**28.2%**		25.9%
Gross	**$164,164,000**	**(-17.2%)**	$198,212,000
Average	**$288,007**	**(-13.3%)**	$332,013
Median	**$220,000**	**(-4.3%)**	$230,000

Leading buyers, session three

Name	No. purchased	Total	Average
Shadwell Estate Co. Ltd.	8	3,310,000	$413,750
Zayat Stables	9	2,700,000	300,000
Blandford Bloodstock	4	1,775,000	443,750
Legends Racing Stable	5	1,370,000	274,000
Ben Glass, agent	5	1,305,000	261,000
Rabbah Bloodstock	7	1,280,000	182,857
Mr. and Mrs. Jerome S. Moss	3	1,075,000	358,333
Whitehorse Stables	5	1,020,000	204,000
Todd A. Pletcher, agent	3	1,010,000	336,666
Richard O'Gorman Bloodstock	2	950,000	475,000
Mike Ryan, agent	5	880,000	176,000
Southern Equine Stable	4	810,000	202,500
Kaleem Shah	2	775,000	387,500
William Lawrence	4	730,000	182,500
McKeever-St. Lawrence	2	700,000	350,000
Todd Quast, agent for GoldMark Farm LLC	3	680,000	226,666
Jay Em Ess Stable	2	675,000	337,500
Gulf Coast Farms	3	670,000	223,333
RBTS, agent for Sequoia Racing	2	670,000	335,000
George and Lori Hall	3	665,000	221,666
Meadowlands Stud	3	640,000	213,333
Glen Hill Farm	2	595,000	297,500
James B. Tafel	3	575,000	191,666
Vin Cox, agent for Patinack Farm	2	555,000	277,500
Priscilla Graham	2	550,000	275,000
Hartley/De Renzo Thoroughbreds LLC	1	550,000	550,000
Maverick Racing	1	540,000	540,000
G. Watts Humphrey Jr.	1	525,000	525,000

Leading consignors and consignor agents, session three

Name	No. sold	Total
Gainesway	20	$5,795,000
Lane's End	19	5,045,000
Taylor Made Sales Agency	20	4,235,000
Eaton Sales	22	3,872,000
Hill 'n' Dale Sales Agency	23	3,477,000
Woods Edge Farm	11	3,190,000
Bluewater Sales	10	2,365,000
Three Chimneys Sales	16	2,203,000
Legacy Bloodstock	10	1,987,000
Denali Stud	13	1,857,000
Dromoland Farm	8	1,600,000
Claiborne Farm	12	1,287,000
Middlebrook Farm	4	1,195,000
Needham/Betz Thoroughbreds	6	1,000,000
Hunter Valley Farm	7	950,000
Nursery Place	3	850,000
Dapple Stud	4	785,000
Dark Hollow Farm	4	700,000
Mulholland Springs	3	670,000
Greenfield Farm	6	650,000
Calumet Farm	2	630,000
Darby Dan Farm	4	625,000
Summerfield	3	575,000
Castle Park Farm	2	545,000
Edward A. Cox Jr.	5	417,000
James M. Herbener Jr.	2	400,000

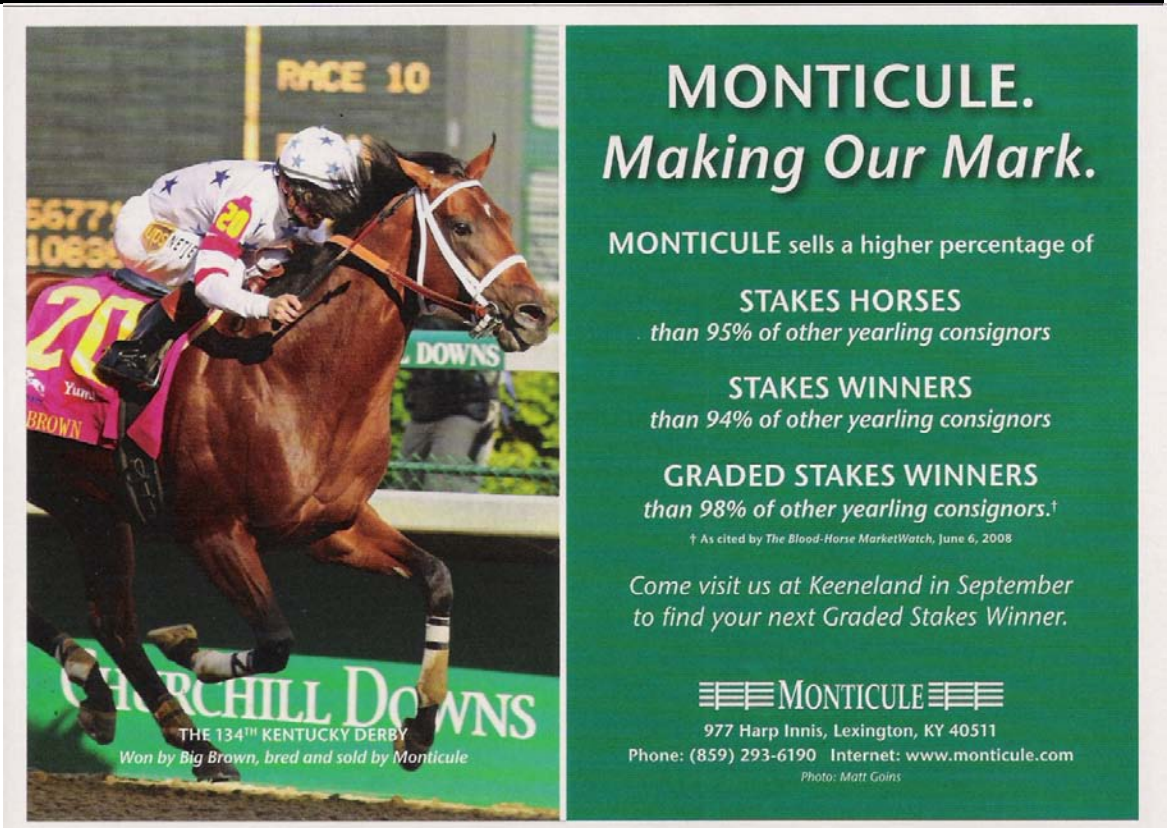
Leading consignors and consignor agents (by average, two or more sold)

Name	No. offered	No. sold	Average
Calumet Farm	4	2	$315,000
Middlebrook Farm	4	4	298,750
Woods Edge Farm	18	11	290,000
Gainesway	25	20	289,750
Nursery Place	4	3	283,333
Castle Park Farm	2	2	272,500
Lane's End	23	19	265,526
Bluewater Sales	13	10	236,500
Mulholland Springs	3	3	223,333
Taylor Made Sales Agency	26	20	211,750
Dromoland Farm	9	8	200,000
James M. Herbener Jr.	3	2	200,000
Legacy Bloodstock	12	10	198,700
Dapple Stud	4	4	196,250
Summerfield	4	3	191,667
Kaizen Sales	2	2	180,000
Eaton Sales	29	22	176,000
Dark Hollow Farm	4	4	175,000
Needham/Betz Thoroughbreds	8	6	166,667
Darby Dan Farm	5	4	156,250
Threave Main Stud	4	2	155,000
Hill 'n' Dale Sales Agency	27	23	151,174
Longfield Farm	5	2	147,500
Denali Stud	17	13	142,846
Three Chimneys Sales	25	16	137,688

(Thoroughbred Times Today 2008)

FIGURE 5.2

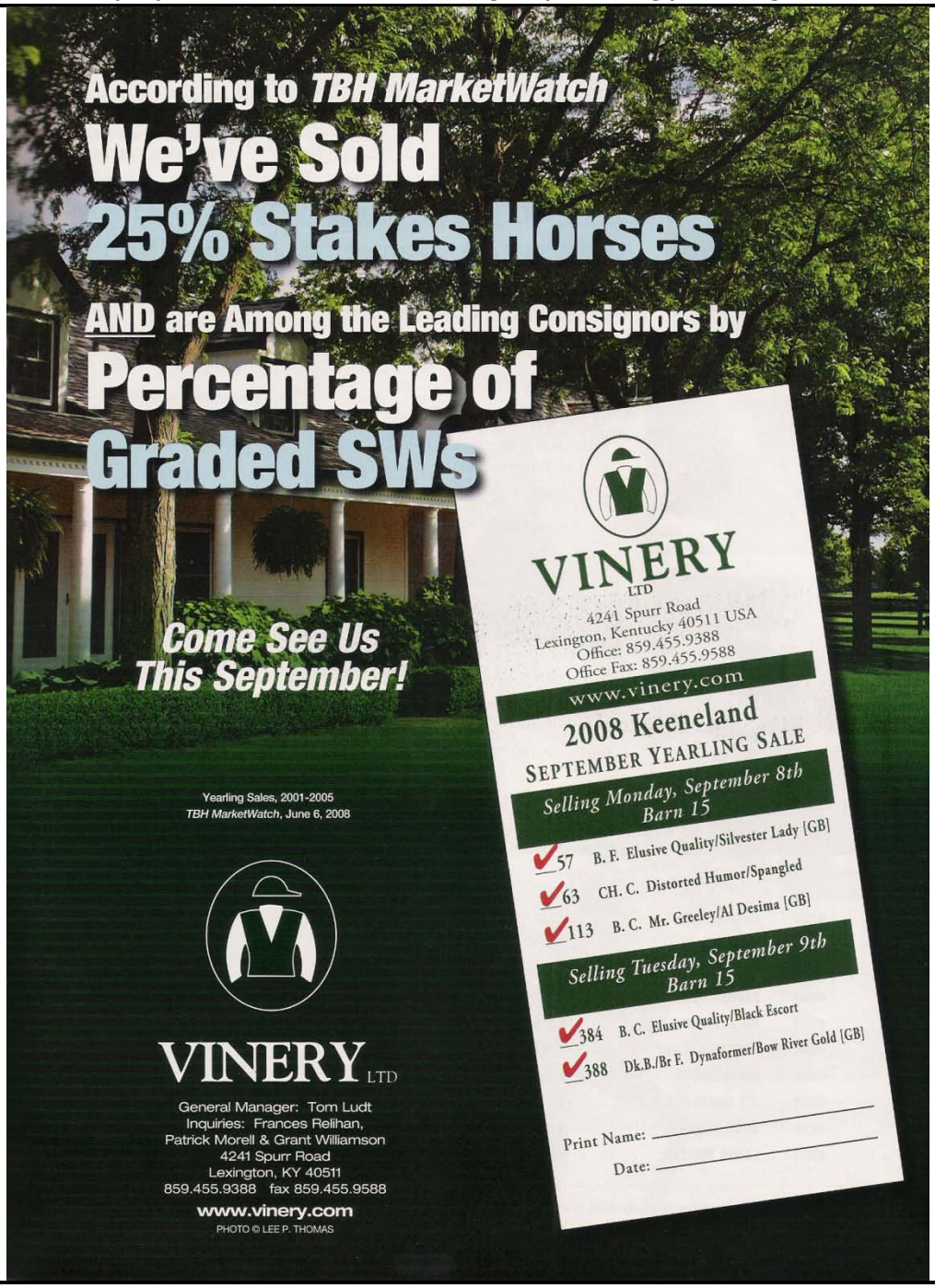
Sample published media- seller side agent promoting percentage of stakes winners



(Monticule 2008)

FIGURE 5.3

Sample published media- seller side agent promoting percentage of stakes winners



(Vinery 2008)

CHAPTER SIX:
DISCUSSION

Introduction

The purpose of this chapter is to discuss the research implications. First, theoretical and managerial implications will be discussed. The chapter then concludes with the research limitations and future research directions.

Theoretical implications

Signaling

Signals convey information to marketplace participants regarding the unobservable quality of a product. Whenever quality is unobservable prior to purchase, there is the risk of adverse selection. Adverse selection, which is also known as the problem of hidden information, occurs pre-contractually when the principal is unable to verify ahead of time that the agent has the desired skills and qualities. Problems of hidden information also occur in the consumer marketplace when the consumer is unable to verify the quality of a good prior to purchase. The sending, receiving, and interpretation of signals are potential ways to overcome the problem of adverse selection. In general, there is a lack of empirical evidence for signaling hypotheses (Boulding and Kirmani 1993; Caves and Greene 1996; Erdem and Swait 1998; San Martin and Camarero 2005; Biswas, Dutta et al. 2006; Erdem, Swait et al. 2006), particularly that which links signaling to business performance outcomes.

This research provides empirical evidence for signaling hypotheses, demonstrating that reputation serves as a marketplace signal to convey unobservable information about products offered for sale. Buyers in a marketplace look to the price and performance reputation of seller side principals and agents for signals to indicate which products are most desirable. Those seller side principals and agents who can send credible signals will be rewarded in the marketplace with higher prices for their goods.

Evidence indicates that participants on the buyer side of the marketplace will look to the reputation of both the seller (seller side agent) and manufacturer (seller side principal) of the good. Seller side principals who have a reputation for producing products with a higher average price and seller side agents who have a reputation for selling products with a higher average price are both associated with higher prices brought at auction. Seller side principal and agent reputation for selling high performing goods also shows a positive association with

price. This supports previous findings that reputation is seen by consumers as a signal of product quality, and that manufacturers can signal product quality by selling through a reputable retailer (e.g., Chu and Chu 1994; Dawar and Parker 1994).

This research examines signaling beyond the dyad, examining the influence of signals throughout the entire network of buyers and sellers in the marketplace. There are many situations where a signal does not affect just one sender and one receiver; multiple constituencies may be aware of and react to a given signal. A limited number of studies have considered agency relationships beyond the dyadic level (e.g., Anderson, Hakansson et al. 1994; Rindfleisch and Moorman 2001; Dahlstrom and Ingram 2003). This study incorporates the actions of seller side principals, seller side agents, and buyer side agents when examining the marketplace signals and provides a new perspective and better vantage point from which to test signaling theory. In a marketplace where buyer and seller do not actually meet, it is impossible to hypothesize about their relationship without considering it in a network context.

Social Networks in Marketing

A key tenent of this network approach is that it allows for the testing of the effect of network positioning on business performance outcomes. Markets are social processes where observation of the actions of other participants is critical in determining interest. More interested parties indicates that a product carries a higher valuation (Rothkopf 1969). The seller side agent is posited to use their position in the marketplace to gather and utilize information about buyer side interest in order to obtain the highest possible price for their goods. These agents can look to records of past marketplaces to determine the past behavior of the buyer side participants and infer possible future behavior (Milgrom 1981; Ashenfelter 1989). In addition, buyer side agents look to the actions of others to determine what actions they should take (White 1981; White 1981; Granovetter 1985; Podolny 1993). Those buyer side agents that are more central will have more access to information and will be more visible in the marketplace. They will be conducting many transactions with many different parties, and their actions will serve as a visible signal to the other agents. Buyer side agents will use the bidding action of others in consideration of their willingness to pay for a good. More bidders willing to bid more money indicates positive information regarding the quality of the good (Milgrom and Weber 1982). The more central buyer side agents are more active and prominent in the marketplace, and their actions will thus be the most visible. Likewise, seller side agents will be more aware of the actions of these more central buyer side agents and can use information

regarding which products they are interested in to possibly foster interest from other buyer side agents. This theory is supported in this research as buyer side agents with relatively higher centrality measures are associated with relatively higher prices paid for goods at auction.

Managerial implications

Managers should consider the reputation of the companies with which they enter into partnership and look beyond the dyad to the broader network of companies with which they are transacting. Buyers read marketplace signals to determine their willingness to pay for goods, and this includes signals from both the retailer itself and the manufacturer of the good. Likewise, manufacturers must also be aware of the reputation of the retailer through which they are selling their goods. Consumers read marketplace signals to provide evidence of unobservable quality, and this perceived quality can affect overall revenues for a firm.

Second, managers should be aware of their relative position in the marketplace and take this position into consideration when making decisions. This study suggests that those on the buying side must be cautious when displaying their intentions to purchase as this could lead to negative consequences in the form of higher prices. As other buyers find out what products a more central buyer is interested in, they too will become interested in that product. Seller side agents can potentially leverage information of buyer side interest to foster interest from other participants on the buyer side. Competition when attempting to make a purchase can drive up prices as more people compete for the same resource.

Limitations and Future Research

The limitations of this research should be noted. First, this study is limited in data available for constructing reputation variables. Reputation is established by fulfilling signaling promises over time (Herbig and Milewicz 1994; Herbig and Milewicz 1996), which implies a long-term measurement time frame. Ideally, long term measures tracing back multiple years would be utilized for the study. However this information is limited by the fact that complete information is not available prior to the year 2007. The researcher had to manually gather much of the data, and so the data is limited to the year when the researcher began to collect this data. Additionally, some information is not available through any published means, forcing reliance on limited information contained in published sources. For example, data on principal performance reputation was limited to the top 300 seller side principals as ranked by total dollars earned through racing for the year, limiting the number of principals for which complete

data is available. This presents an opportunity for future research, as the researcher can continue to collect the relevant data moving forward from 2007 and revisit the study hypotheses with more complete data.

Second, the data is limited by the hidden nature of some parties transacting in the marketplace. The true identity of the buyer side principal is unknown, so the network is calculated based on the seller side principal, the seller side agent, and the buyer side agent. This is not entirely limiting as the buyer side agent is the entity actually transacting visibly in the marketplace, so it is their actions and not the actions of the buyer side agent that will serve as signals to the rest of the marketplace. Likewise, the data only records the network of completed transactions. This does not capture other parties that were interested in an item or who was actually involved in bidding- only the final details of who won the auction. Items which were offered for sale but did not meet the minimum price for a sale (reserve not attained) are also not included.

Finally, there is no way to control for the non-phenotypic qualities of the items offered for sale. These are living creatures who are assessed for quality based not only on the variables which can be quantified but also those that are impossible to measure. A product may be comprised of expensive and highly desirable inputs, but if it is flawed in physical structure this will affect the sale price. Controlling for these qualities is extremely difficult if not impossible. Every marketplace participant has different guidelines for what physical traits they consider desirable. Likewise, they all have different limitations on physical flaws that are undesirable. Future research may attempt to control for these qualities by drawing on the researcher experience in the marketplace to make expert judgment regarding the overall physical qualities of the item in question.

Future research should employ samples from other auction marketplaces to assess if these results are generalizable to other populations. Although this study uses the sample of the largest marketplace in the world for this item so as to get a robust sample, other smaller markets for this good may operate through different mechanisms. There are multiple other marketplaces for this same good operating throughout the United States and abroad, and these marketplaces could be tested for replication. Additionally, a sample could be drawn from a similar open marketplace for another type of good.

This study will continue longitudinally to follow the eventual racing performance outcomes of the agents in this study. The on-track racing performance of the yearlings in this

study will be tracked and included in the model to examine the selection performance of the buyer side agents.

Conclusion

The purpose of this research has been to examine signaling in a network marketplace. Using data collected from the world's single largest marketplace for thoroughbred yearlings, this study demonstrates that signals sent by entities in the marketplace have an effect on business performance outcomes. One type of signal specifically examined is reputation. Seller side principals and agents who have a reputation for producing or selling high-priced goods will be rewarded in the marketplace with relatively higher prices for their goods. Seller side agents who have a reputation for selling high performing goods will likewise be rewarded. Finally, buyer side agents who are more central in the marketplace will pay relatively higher prices for goods due to their visibility and prominence in the marketplace. Although this research provides important theoretical and managerial implications, additional research is needed to further explore marketplace signaling effects on business performance outcomes.

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Information asymmetry occurs when all parties in a transaction do not have access to the same level of information. As information asymmetry increases, adverse selection problems may increase. Signaling is a successful method marketers use to overcome the problem of information asymmetry in a marketplace. A marketing signal is an activity which provides information beyond the activity itself and reveals insights into the unobservable, such as the intention, motives, goals, or internal situation. This research will examine the manner by which buyers, sellers, and their third-party agents signal to the marketplace their opinions of the most desirable products. The role of the third-party agents in shaping the financial business performance outcomes of the marketplace is of particular interest.

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Conference Papers and Presentations

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