Observable persuaders: A longitudinal study on the effects of quality signals in the contemporary visual art market

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CHAPTER 3

LOOKING FORWARD TO THE PAST:

The Effects of Past Sales and Signals on Expert Buyers

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ABSTRACT

In markets where quality differences between producers may be hard-to-observe, signals convey information about quality and past performance, helping some producers gain a competitive advantage over their rivals. If this advantage is persistent then past performance, as a hard-to-imitate non-material resource, helps describe inequalities in the distribution of success, particularly in markets where underlying quality differences between producers may be indeterminate. Analyzing 22 years of unique sales and signal data about 471 contemporary visual artists who are alumni from an elite art institution, we study the extent to which past sales, different kinds of signals, i.e., reviews, awards and affiliations, and the credibility level of third party sources transmitting those signals influence expert buyers' purchase decisions. Our results show strong self-reinforcing processes governing competitive dynamics. We provide empirical support showing significant increases in producers' sales in a given year in relation to the number of past signals of the same kind received in the preceding year. But per kind of signal this increase has differential effects on sales, which can be attributed to the level of credibility of the third party source transmitting the signal. We also find that past sales significantly affect future sales. Our results provide evidence that expert buyers infer quality from signals concerning past performance, and also the past performance itself, which provides new insights into the persistence of performance differentials between producers.

Keywords

Quality signals, source credibility, expert buyers, uncertainty, non-linear panel data models

3.1 INTRODUCTION

In markets where producer quality is not easily visible or discernible because it may either be latent or require specialized knowledge to detect underlying differences among competitors, some producers repeatedly outperform their rivals. An obvious explanation for this is that these producers possess exceptional talent or abilities that provide them with a superior competitive advantage compared to other competitors. Yet even between producers with minute or undetectable differences in underlying attributes, some producers still consistently outperform others (Rosen, 1981; Merton, 1968).

An alternative explanation to understanding inequalities in the distribution of success is rooted in producers' past performance, and particularly in the signals conveying quality information about that performance. Especially if producers' quality is indeterminate, signals help reduce pre-purchase uncertainty by providing publically available information about unobservable or indiscernible quality (Spence, 1973). In markets with many producers, limited possibilities to evaluate all tenable alternatives in a choice set and imperfect and incomplete information about producers' quality in that set, signals help buyers in their pre-purchase decision making. Signals facilitate economic exchanges by acting as proxies of quality that enable commensurability, i.e., relative comparison between contending producers, and make producers' past performance public (Spence, 1973, 1974; 2002; Connelly, Certo, Ireland and Reutzel, 2011; Espeland and Steven, 1998). The literature on observational learning (Bandura, 1977; Bikhchandani, Hirshleifer, Welch, 1998,) and small world networks (Milgram, 1967; Uzzi and Spiro, 2005) has also shown that buyers' purchases, if observable to others buyers, act as signals of quality that can directly affect the purchase decisions of those observing the signal (Salganik, Dodds and Watts, 2006; Salganik and Watts, 2009).

Research has shown that past performance can be considered a hard-to-imitate resource if *ex ante* it persistently provides producers' access to opportunities not available to other competitors (Merton, 1968; Azoulay, Stuart and Wang, 2013). Past performance may even elicit preferential treatment *ex post* when performance outcomes are based upon evaluations of third party sources (Waguespack and Salomon, 2015). In markets where quality is difficult to determine *a priori* (Nelson, 1970; 1974), the construction of producers' quality can be directly observed through signals, facilitating post signal comparisons based on whether producers with a particular signal outperform their competitors (Spence, 1973, 1974; 2002; Bergh, Connelly, Ketchen and Shannon, 2014). This means that some signals may have a greater effect on producers' performance outcomes, and this may help trigger preferential treatment to those producers who have outperformed others in the past, granting them opportunities not afforded to others. Especially in markets where quality differentials between competing producers are hard to observe directly, third party signals can help select producers gain access to better opportunities compared to their rivals. If this leads to superior performance, than a self-reinforcing feedback mechanism may be created, further increasing the performance differentials between these competitors (Merton, 1968; Azoulay et al., 2013).

In this paper, we study the extent to which past performance, and especially signals conveying information about that performance, affect producers' sales in terms of expert buyers' purchase decisions. A distinction can be made between producers who signal about themselves (e.g., Spence, 1973; Chung and Kalnins, 2001; Kirmani and Rao, 2000), and third party sources, who may have different levels of source credibility, i.e., expertise and trustworthiness (Hovland, Janis, and Kelley, 1953; Ohanian, 1990; Meyer, 1988; Newell and Goldsmith 2001), but nevertheless evaluate producers' quality and disseminate that information to a broader public (Sauder, 2006). In general, we concentrate on third party sources transmitting these focal kinds of signals about producers: reviews, awards, and affiliations; we also include producers' past sales as signals of quality. And then specifically, we analyze the extent to which a) quantitative characteristics i.e., the number of past sales and the number of signals of a particular kind received in time t-1, b) qualitative dimension, i.e., the credibility level of the third party sources transmitting the signals in time t-1 and c) the interaction effect between the number of signals and the source credibility levels, affect both the absolute number of sales and the sales price paid by expert buyers in time t.

Focusing on a market with quality information imperfections, and where buyers have limited possibilities to search for information about all competing alternatives, we contribute to the literature by analyzing the differences between the effects of different kinds of signals and different levels of source credibility; possibly our strongest contribution is that we establish that past sales, and past signals moderated by the credibility level of the third party sources transmitting those signals, have strong yet differential affects on producers' sales, both in terms of the number of sales and the sales price paid. Referring to signaling theory (Spence, 1973), which provides a useful framework to help distinguish between high and low quality producers, we test the strength of the effect of each kind of signal about producers' past performance on buyers' purchase behavior. Focusing on a homogenous cohort of competitors, with near equal training and technical abilities, we provide empirical evidence that signals and past sales systematically affect the purchase decisions of expert buyers, thus influencing the dynamic process of competitive differentials among producers. This category of buyer has high-levels of specialized knowledge and access to information in their professional networks, which help them form beliefs about desired producer attributes and decision rules for acting on those beliefs (Alba and Hutchinson, 1987; Moorthy, Ratchford and Talukdar, 1997). We empirically demonstrate that the number of sales and the number of signals in a given year positively increase the likelihood of producers' products to be purchased in the following year. However, per kind of signal the increase in the quantity of sales and sales price is different, and this difference is caused by the level of credibility of the third party source transmitting the signal.

We extend our study to a new empirical domain in the creative industries: the contemporary visual art market. Extant research has shown the cultural industries are rife with uncertainties caused by informational gaps about producers' quality. The literature provides empirical evidence on how signals help buyers overcome pre-purchase uncertainty across a variety of markets, such as: movies (e.g., Eliashberg and Sugan, 1997; Basuroy, Chatterjee and Ravid, 2003; Lehmann and Weinberg, 2000; Elberse, 2007; Gemser, Leenders and Wijnberg, 2008; Lui, 2006; Chen, Liu, and Zhang, 2012); luxury fashion (Fuchs, Prandelli, Schreier and Dahl, 2013); video games (Zhu and Zhang, 2010) classical music (e.g., Ginsburgh and Van Ours, 2003; Glejser and Heyndels, 2001) and novels (e.g., Berger, Sorensen, and Rasmussen, 2010). These earlier studies focusing on the effects of third party signals of quality on buyer behavior, analyzed the effects of signals, which directly concern the focal product of interest, on uninformed buyers. We add to this stream of literature by focusing on expert buyers and focusing on signals that concern the prior performance of producers, largely occasioned by products that have been sold in the past.

In the empirical setting of the contemporary visual arts, we analyze a unique longitudinal dataset consisting of 471 visual artists, i.e., painters, sculptors, photographers, and video and installation artists, from an internationally renowned fine arts program located in the Netherlands. The artists, whose career trajectories we study over a 22-year observation period, are predominately active in the primary art market, where artworks are sold for the first time as opposed to re-sold on the secondary or auction markets (Singer and Lynch, 1994). An important category of expert buyers active in this market are corporate art collectors. Over half of the Fortune 500 companies and other corporations worldwide have a corporate art collection (Kottasz, Bennett, Savani, Mousley, and Ali-Choudhury, 2007; Kottasz, Bennett, Savani, and Ali-Choudhury, 2008), employing expert buyers who mostly purchase art for these collections on the primary art market (Wu, 2002). The corporate art collectors in our study account for 77% of the sales made to corporate collections in the Netherlands during our observation period from 1990 to 2012 (www.vbcn.com). We analyze these data estimating Poisson regressions with cohort and discipline fixed effects. Using panel data, we estimate sales results, both the number of sales and the sales price[30] paid by corporate art collectors based upon past sales, the focal kinds of signals, and the credibility of the third party sources transmitting these signals, that artists received in the previous year.

The remainder of this paper is organized as follows: In the next section we review existing literature on signals of quality, expert buyers, source credibility, commensurability of signals and observational learning; and we present our hypotheses. In the subsequent section we describe our empirical setting of the contemporary visual arts; followed by a description of our modeling approach, data and the empirical analysis used to test our hypotheses. We conclude with a discussion of the results, managerial implications, and limitations and avenues for future research.

3.2 THEORETICAL FRAMEWORK AND HYPOTHESES

3.2.1 Signals and pre-purchase uncertainty

Art, movies, novels, fine wine, financial assets, health care and other professional services are examples of products surrounded by quality uncertainty, albeit in varying degrees. In marketing, classifying goods and/or services based upon the availability of pre-purchase quality information is widely accepted in the literature (Klein, 1998). For instance, experience goods, in contrast to search goods, are products or services whose quality is not readily observable or discernable *a priori* (Nelson, 1970, 1974).

30 Poisson regressions provides consistent estimates even when the dependent variable is not an integer and contains many zero observations (Santos Silva and Tenreyro, 2006, 2011).

A further differentiation can be made between goods with pre -and post- purchase quality uncertainty. Credence goods are products and/or services, e.g., vitamins or higher education, whose quality can never really be known with certainty, but rather post purchase assessments are made based upon buyers' beliefs in the quality of those products (Darby and Karni, 1973). Signals are helpful in reducing pre-purchase uncertainty about quality of both experience and credence goods because they act as proxies of quality. Quality, in this context, can be described as the "underlying and unobservable ability of a producer to fulfill the needs of buyers observing the signals" (Connelly et al., 2011, p.43). One of the mechanism behind pre-purchase uncertainty reduction is rooted in how signals "separate" between competing producers' quality.

Signaling theory (Spence, 1973) provides a useful framework to describe how signals, through the creation of a separating equilibrium, help distinguish between high and low quality producers. In his seminal paper, Spence (1973) described a separating equilibrium in the empirical setting of the labor market by illustrating how higher education is a signal of high quality because it would be too difficult, or costly, for low quality job applicants to transmit such a signals. Signals help create a separating equilibrium based on an inverse cost quality relationship, in which being the subject of a signal or sending a signal is less costly for a high quality producer compared to those of lesser quality (Spence, 1973; Connelly, Certo, Ireland and Reutzel, 2011). Marketing research has focused on signals as sources of valuable information about hard to observe quality, ranging from advertisements and warranties (e.g., Chung and Kalnins, 2001; Kirmani and Rao, 2000), to awards and reviews, (e.g., Anand and Watson, 2004; Eliashberg and Shugan, 1997). Signals can be transmitted directly by first party sources, i.e., producers, as illustrated by Spence (1973), or from third party sources. It is reasonable to expect that some signals from some sources are more persuasive, hence, more effective than others. One way to understand the persuasive power of signals is by differentiating between the sources transmitting the signal. This is an important distinction because third party sources compared to first party sources may trigger distinctive cognitive processes in buyers, which may result in different purchase outcomes (Lurie, 2004; Lynch and Ariely, 2000).

On the one hand, first party signals conveyed directly by the producer– e.g., advertisements and warranties –provide quality information, however, this information may be biased because the producer has an evident self-interest in influencing buyer behavior. Especially in markets with high pre-purchase quality uncertainty, this can decrease the informative value of the signal if there is the perception from the buyer that the signal is biased or false (Kelley, 1967; Eagly and Chaiken, 1975; Mizerski, Golden and Kernan, 1979). On the other hand, third party sources transmitting signals, e.g., reviews (Eliashberg and Sugan, 1997; Basuroy, Chatterjee and Ravid, 2003), awards (Anand and Watson, 2004; Gemser, Leenders and Wijnberg, 2008), and affiliations or business relationships (Rindova, Williamson, Petkova, and Server, 2005; Simcoe and Waguespack, 2011). Third party sources are perceived to be relatively fair and impartial in conveying quality information to potential buyers[31] (Lampel and Shamsie, 2000; Pollock and Rindova, 2003; Dean and Biswas, 2001; Higgins and Gulati, 2003) because if they do not than these sources risk incurring costs, e.g., financial and/or reputational, and jeopardizing their position in the market (Spence, 1973; Ippolito, 1990; Kirmani and Rao, 2000; Bergh et al., 2014). Earlier studies have shown that signals from third party sources help shape producers' reputations (Higgins and Gulati, 2003) and help define status hierarchies (Scott, 1994; 1995).

Especially in markets with informational gaps, signals originating from third party sources play an important role in helping to convey information about producers' unobservable or latent quality. Signals help create (and maintain) structuring mechanisms, e.g., rankings or other segmentation, that enable relative comparisons between producers (Spence, 1973, 1974; 2002; Bergh, Connelly, Ketchen and Shannon, 2014). Structuring mechanisms cause hierarchies among producers to be created, explicitly informing buyers about what is "good" and what not by demarcating boundaries that separate high quality producers from those of lesser quality (Anand and Watson, 2004). Rankings and other segmentation mechanisms are standardized ways to judge competitors and reduce uncertainty through commensuration in decision-making (Espland and Stevens, 1998). Commensuration is a socially influenced process in which heterogeneous information about producers' quality is reduced into a common metric that helps to reveal and represent value in competitive environments (Espeland and Stevens, 1998). This is important because commensurability among competing alternatives can affect pre-purchase decision-making and the likelihood of economic exchange.

3.2.2 Expert buyers and numbers of signals

Research focusing on buyers' decision making processes between competing alternatives in terms of their information search intensity has shown that, in general, buyers conduct limited pre-purchase information search activities (e.g., Moorthy, Ratchford, and Talukdar, 1997; Huang, Lurie and Mitra, 2009), even for items such as automobiles (Beatty and Smith,1987; Newman, 1977; Wilkie and Dickson,1985). However, the buyers in many of these studies lacked familiarty and/or factual knowledge about what they were purchasing, raising the costs associated with learning where and how to search for information and interpret the accumulated information. As previous research has shown, this may overwhelm buyers and result in abbreviated searches for information, even for high-ticket items (Beatty and Smith,1987; Newman, 1977; Wilkie and Dickson,1985). Compared to uninformed buyers, expert buyers, have high-levels of expertise, professional knowledge and access to information in their networks (East, 1992). Therefore, they have a greater ability to analyze, interpret, and make accurate judgements from limited information, further accentuating the ratio between higher payoffs at lower costs (Alba and Hutchinson, 1987; Moorthy et al., 1997).

However, even these expert buyers may still find it difficult to unequivocally integrate information on the basis of many possible kinds of signals of quality about many competitors in a market environment characterized by high overall uncertainty. It seems reasonable to assume that expert buyers' confidence in their judgments about particular producers increases with the availability of many signals of a particular kind about those competitors. A higher number of signals also increase producers' visibility and may function as a heuristic helping expert buyers who, because of time scarcity or other costs, are unable to search for information about all competing alternatives. Moreover, a greater number of signals of a particular kind may

31 Producers' past sales are signals of quality (Vogel, Evanschitzky and Ramaseshan, 2008; Miklos-Thal and Zhang, 2013) if observable to other buyers (Salganik and Watts, 2009; Salganik, Dodds and Watts, 2006).

be perceived as an aggregate indicator of quality, and provide a basis for evaluations rooted in comparison among alternatives, especially when expert buyers have limited possibilities to evaluate all competitors in the market. The commensurability between producers based upon this common metric, i.e., number of signals, provides additional information to expert buyers about the producer's quality. When considering these arguments, we propose that the greater the number of signals of a certain kind, the more confident expert buyers become about producers' quality and their own judgments, which translates into a greater likelihood of purchase.

Thus, in markets in which the available signals originating from third party sources are of different kinds and these different kinds may have different effects on expert buyers, we argue that there is a positive correlation between the number of signals of each kind transmitted by third party sources about a producer in a particular year and sales in the following year. Therefore, we propose the following hypotheses:

> *H1a: In a given year, the greater the number of signals of a particular kind originating from third party sources about a producer, the greater the number of sales to expert buyers in the subsequent year.*
>
> *H1b: In a given year, the greater the number of signals of a particular kind originating from third party sources about a producer, the higher the price paid by expert buyers in the subsequent year.*

3.2.3 Expert buyers and source credibility of third party sources

Precisely because expert buyers are assumed to be highly skilled professionals, they are likely to explicitly take into account source credibility levels. Previous research has shown that the credibility of the source emitting a signal is an important determinant of the strength and impact of a signal (Sternhal, Dholakia and Leavitt, 1978; Pornpiktapan, 2004). Source credibility is a function of the source's expertise and trustworthiness. Expertise refers to the extent to which a source is perceived to have knowledge and experience (Hovland, Janis, and Kelley, 1953; Ohanian, 1990), while trustworthiness refers to the extent to which buyers perceive a source to be honest and dependable (Hovland et al., 1953; Meyer, 1988; Newell and Goldsmith 2001; Ohanian, 1990).

Earlier research has shown that if source credibility is high, customers are willing to accept the signal. However, if source credibility is low then attribution theory (Kelley, 1967) helps explain why buyers find the signal less persuasive. According to attribution theory, buyers do not accept signals at face value but rather first evaluate the level of credibility of the source and the willingness of the source to communicate unbiased and accurate information (Kelley, 1967; Eagly and Chaiken, 1975; Mizerski, Golden and Kernan, 1979; Kirmani and Rao, 2000). As discussed earlier, the credibility of first-party sources – the producers signaling about themselves – is generally lower than that of third party sources (Mizerski, Golden and Kernan, 1979; Dean and Biswas, 2001; Higgins and Gulati, 2003). Supporting this argument, Gemser, Leenders and Wijnberg (2008) found empirical evidence supporting the claim that more credible third party sources more strongly influence buyers' purchase decisions. One way to understand this is by considering the separating equilibrium, in the sense of Spence (1973), which is created when a third party source conveying a signal about a producer is perceived to be highly credible and hence, thought not to jeopardize this position by signaling about producers of inferior quality (Bergh, Connelly, Ketchen and Shannon, 2014; Higgins and Gulati, 2003; Ippolito, 1990). Expert buyers are aware of the costs third party sources bear in transmitting signals[32]; and they will therefore consider it less likely that highly credible sources will transmit false or biased signals (Bergh, Connelly, Ketchen and Shannon, 2014; Higgins and Gulati, 2003; Ippolito, 1990).

Thus, in markets in which the source credibility levels of third parties are different, ranging from high to low, we argue that expert buyers pay more attention to highly credible third party sources transmitting signals of a certain kind as opposed to third party sources of lower credibility conveying the same kind of signals, and this can be observed by the number of sales and price paid in the year succeeding the year in which the signals appear. Thus, we propose:

> *H2a: In a given year, the higher the credibility level of third party sources transmitting signals of a particular kind about a producer, the greater the number of sales to expert buyers in the subsequent year.*
>
> *H2b: In a given year, the higher the credibility level of third party sources transmitting signals of a particular kind about a producer, the higher the price paid by expert buyers in the subsequent year.*

3.2.4 Number of signals and the moderating role of source credibility

Referring to our arguments in the previous sections, we expect that in markets characterized by high uncertainty a high number of signals and high credibility of the sources transmitting those signals will positively affect the purchase decisions of expert buyers. Specifically, we expect that these two arguments will also strengthen each other. The reasoning is straightforward: As reviewed earlier, signals conveyed by third party sources are common in markets with informational deficiencies about producers' quality. However, with a wide variety of different kinds of signals originating from different sources with different levels of credibility, it is highly probable that expert buyers will not consider all available information about all producers in their choice set but look for shortcuts that ease the burden of making comparisons by transforming quantities and qualities of this information into a common metric (Espeland & Stevens, 1998). Heterogeneous and multidimensional information provided by many signals and their source credibility dimension can be combined into a so called gestalt metric in which "the whole is greater than the sum of the parts" (Koffka, 2013), making it possible to form judgments based on information provided by quantitative dimensions of the signals and the qualitative dimensions of the signals' sources.

32 Cost can be understood in terms of reputation loss caused by transmitting biased signals and/or costs involved in transmitting a signal.

We argue that in markets with imperfect and incomplete information about producers' quality, expert buyers pay attention to both a high number of signals of a certain kind and a high level of source credibility. In a general sense, such stable and shared evaluations reinforce one another and give expert buyers' additional confidence of producers' high quality. Specifically, any accountability concerns expert buyers may have related to post purchase quality are reduced because of the conservative nature of their purchase decision, which can be shown to be based on the opinions of many highly credible sources.

Thus, in markets in which the available signals originating from third party sources are of different kinds and originate from different third party sources with different levels of credibility, which may differentially affect sales to expert buyers, we argue that there is a positive association between a high number of signals of each kind together with high credibility levels of third party sources transmitting those signals about producers in a particular year and sales in the following year. Therefore, we propose the following hypotheses:

> *H3a: In a given year, the greater the number of signals of a particular kind originating from third party sources and the higher the credibility level of these sources transmitting signals about a producer, the greater the number of sales to expert buyers in the subsequent year.*
>
> *H3b: In a given year, the greater the number of signals of a particular kind originating from third party sources and the higher the credibility level of these sources transmitting signals about a producer, the higher the price paid by expert buyers in the subsequent year.*

3.2.5 Expert buyers and past sales

Decision-making based upon observing the choices of others (Banerjee, 1992) or converging to uniform social behavior is known as herd behavior (Bikhchandani et al., 1998), and has been studied in a variety of empirical settings, e.g., investments decisions on the stock market (Cipriani and Guarino, 2014), investments decisions in IT (Kauffman and Li, 2003), on-line auctions (Dholakia, Basuroy, and Soltysinski, 2002), retailing (Hui, Bradlow, and Fader, 2009) and digital retailing (Chen, Wang, and Xie, 2011). This type of behavior can arise through "rational processing of information gained by observing others" known as observational learning (Bikhchandani, Hirshleifer, Welch, 1998, p. 153). To overcome uncertainties caused by informational deficiencies, observational learning theory suggests that individuals may follow the actions of other individuals when they are able to observe them (Bandura, 1977).

Herd behavior can arise in different situations, one of which is a decision-making context where there are observable signals to facilitate comparison among competitors, but buyers forgo this information and choose to follow the purchase decisions of others instead (Banjeree, 1992; Bikhchandani et al., 1992; Bikhchandani, Hirshleifer, Welch, 1998). For instance, Salganik and Watts (2009) found that rankings, e.g., *New York Times* bestseller lists or *Billboard* music charts, announcing the popularity of a particular producer positively affect the economic performance of that producer by increasing their popularity to a broader customer base. These authors empirically demonstrated that socially constructed segmentation mechanisms aid in influencing the purchase decisions of those observing them, both on an individual and collective level (Salganik and Watts, 2009). Similarly, Salganik, Dodds and Watts (2006) found, in the empirical setting of music downloads, that the extent to which buyers can directly observe the purchases of other buyers influences their purchase decisions. Most research on herd behavior focuses on uninformed buyers; nevertheless, these studies clearly demonstrate that past purchases of buyers act like signals of quality if they are observable to others.

In markets characterized by high uncertainty about quality because of imperfect and incomplete information, we argue that it is also reasonable to assume that expert buyers engage in observational learning to reduce uncertainty and perceived risk. This category of buyer often has similar expectations about quality as their peers; and these expectations can be strongly influenced by the social dynamics of members in the focal network. It is probable that expert buyers' networks can also be characterized as being "small world" (Milgram, 1967) because of high level clusters, in which individuals in the network either know one another directly or are connected through someone else (Milgram, 1967; Uzzi and Spiro, 2005). Earlier studies have shown that connectivity between clusters helps spread new information, which can strongly influence the behavior of both individual members and the group (Granovetter 1973; Frank and Yasumoto 1998; Moody and White 2003). We argue that in highly clustered networks, where past purchases of members are also observable to other members of the focal network, producers' past sales will function as a signal of quality.

Thus, in markets with high uncertainty about producer quality and where past purchases of expert buyers are observable to other expert buyers, we argue that in a particular year expert buyers pay attention to purchases made by other expert buyers, and this can be observed by the number of sales and price paid in the succeeding year. Therefore, we propose:

> *H4a: In a given year, the greater the number of sales, the greater the number of sales to expert buyers in the subsequent year.*
>
> *H4b: In a given year, the greater the number of sales, the higher the price paid by expert buyers in the subsequent year.*

3.3 EMPIRICAL SETTING

3.3.1 Primary market for contemporary visual art

The contemporary art market is comprised of a network of artists, gallery owners, curators, museum directors, auction houses and art collectors. Determining the quality of contemporary artworks is notoriously difficult because there are no objective measures for comparison (Caves, 2000); and aesthetic evaluations as alternative measures are highly subjective and largely uninformative (Yogev, 2010). In this market, third party sources are particularly important in helping to reduce uncertainty because the signals these sources transmit function as proxies of quality; that both reflect and help constitute the reputation of an artist (Hirsch 1972; Ertug, Yogev, Lee and Hedstrom, 2015; Velthuis, 2003; Caves, 2000; Prinz, Piening and Ehrmann, 2015).

There are many buyers active in the contemporary visual arts market, of which the main categories are: museums, private collectors and corporate collectors. This study focuses on the latter category for two reasons: First, corporate collectors are predominantely active on the primary art market (Wu, 2002), where artworks are bought for the first time (Singer and Lynch, 1994). This reliance on the primary market means there are no additional factors, such as provenance of an artwork, which can also act as a signal. Second, corporate collectors are a homogenous group of expert buyers who are well educated and actively search for information. It can be assumed that they are aware of the signals we analyze in this study. Third, the size of the group makes it possible to collect data about a sizable part of this submarket; in fact, the data of this study cover 77% of all sales to corporate collections in The Netherlands (NL) .

3.3.2 Prestigious art residency

We study the career trajectories of alumni of the Rijksakademie van beeldende kunsten (RABK), who are visual artists mostly active in the primary art market and to a lesser extent at art auctions. RABK alumni are held in high esteem by the international art community, as can be measured by the number of exhibitions at prestigious museums, e.g., Tate Modern, London and MOMA, New York City, international art exhibitions, e.g., Venice Biennale, Venice and Documenta, Kassel, and art fairs, e.g., Art Basel in Basel, Miami and Hong Kong and Frieze in London. Notwithstanding some differences in talent and abilities, the RABK alumni can be generally regarded as a relatively homogenous cohort of visual artists who work in the upper echelon of the international art community. This is because RABK invests heavily in talent scouting and development, which starts with a rigorous selection process. In accordance with RABK goals, the selection committee, consisting of prestigious peers as jury members, selects based upon the potential talent of visual artists to allow them to further develop and deepen their visual art practice work (www.rijksakademie.nl).

RABK has a long history of excellence; it was established in 1870 by King Willem III as a classical art academy, focusing exclusively on teaching, both the technical and creative aspects of fine art disciplines, e.g., painting, drawing, and sculpture. From this time period to the late 1980s, eminent RABK graduates include: Jan Toorop, Berlage, Breitner, Piet Mondrian, Constant, and Karel Appel (www.rijksakademie.nl).

Commencing in the late 1980s, RABK began to transition from being a classical art academy to becoming a two-year artists' residency program, in which the focus from teaching art skills shifted to conducting artistic research. As a residency program, RABK provides selected artists the unique opportunity to focus on artistic experimentation, innovation and critical discourse. The goal of this program is to select the most talented visual artists and offer them a platform where research, experimentation, innovation and critical discourse are central, and complemented with technical facilities, workshops, podia for artistic presentations and networking opportunities (Rijksakademie Annual Report, 2014).

Since the late 1980s, there has been a steady increase in the number of visual artists applying to the residency program and the number of foreigners accepted. For instance, in 1990, 25 out of 368 visual artists who applied were accepted, and of the accepted applicants more than half were Dutch. While in 2008, 27 of the 1,415 artists who applied were accepted, and more than two-thirds came from other European countries as well as Asia, Africa and North America. The average age of an accepted applicant is 29 years old, and more than 95% have received a bachelor and/or master degree in fine arts or in a related discipline and have had between two to five years art practice experience. RABK does not offer an academic degree upon finishing the residency program but it does offer financial support and studio space so that residents can devote the two years of their residency to developing their art practice.

3.3.3 Corporate art collectors

Corporate collectors can be understood to be any business engaged in commerce, and who also collect art, but whose core activity is not preservation, research and communication of works of contemporary visual art (Weil 1990). Corporate collectors have convergent roles of setting the standards for recognizing and attributing value in the visual arts (Balfe 1987; Martorella 1990; Wu 2002). Although historically museum collections have played a role in determining art value based upon what art became institutionalized, since the 1980s corporate art collections have steadily gained credibility and authority to also determine the value of art (Wu 2002). Most corporate art collections have been initiated by the corporate elite such as the CEO or senior partners (Wu 2002), implicitly or explicitly reflecting the culture and aims or ambitions of the company (Caves 2000), and mostly formed under the auspices of art experts (Wu 2002; Martorella 1990). The expert buyers who are employed by these corporations, and buy art on their behalf, usually have advanced degrees in art history and extensive curatorial museum experience. These expert buyers also move freely between building public, semi public and private collections (Martorella 1990). In doing so, they have helped legitimize many corporate collections authenticating them to museum art standards (Wu 2002). In the Netherlands, most organizations[33] that, in addition to their core business activities also collect art, are members of the Netherlands Association of Corporate Art Collections (VBCN) (www.vbcn.com); expert buyers whose buying behavior is studied in this paper are all employees of organizations that are members of this association.

3.4 EMPIRICAL STRATEGY

3.4.1 Model

We use Poisson regressions with cohort fixed effects, robust standard errors clustered at the artist level for possible non-independence across same artist observations, and artistic discipline fixed effects. As discussed by Santos Silva and Tenreyro (2006, 2011) Poisson regressions provide consistent estimates even when the dependent variable is not an integer. All that is needed is correct specification of the conditional mean, which is assumed here to be log-linear. An important advantage of the Poisson pseudo Maximum Likelihood estimator[34] is that it accommodates the case of a dependent variable with many zeros.

33 ABN AMRO, Ahold, AkzoNobel, DNB Bank, DSM, KPMG, OCE and RaboBank are examples of some of the VBCN members.
34 We use the Stata code ppml to estimate Poisson regressions by pseudo maximum likelihood; this code differs from the Poisson command in Stata because it uses the method of Santos Silva and Tenreyro (2006; 2010) to identify and drop regressors that may cause the nonexistence of the (pseudo-) maximum likelihood estimates.

Furthermore, we supplement the coefficient estimates with standard errors clustered at the artist level. The sign of the coefficients is equal to the sign of their marginal effects. The marginal effects, however, depend on the value of the regressors due to the nonlinearity of the Poisson regression model.

The resulting estimated regression specification is:

$$s_{it} = \beta_{REVIEWS} REVIEWS_{i,\,t-1} + \beta_{AWARDS} AWARDS_{i,\,t-1} + \beta_{AFFILIATIONS} AFFILIATIONS_{i,\,t-1} + \beta_{PAST\ SALES} PAST\ SALES_{i,\,t-1} + \gamma' w_{it} + \varepsilon_{it},\ (1)$$

where the dependent variable is sales for artist i in year t (labeled S_{it}) and the main regressors of interest are reviews, awards, and gallery affiliations; a variable for sales for artist i in year t-1 is also included; w represents a vector of control variables described more fully below. As stated before, sales can be measured by count (number) or average price, while each kind of signals can be quantified as count (number) or the level of credibility of third parties, calculated as a yearly average. The vector of control variables varies over specifications. A description of the variables is provided in the next section.

3.4.2 Variables

RABK tracks the careers of their alumni; we received these raw data consisting of reviews, award records, listings of exhibitions and art fairs, and gallery information for all 471 alumni from 1986 to 2012. Thus, we have a complete sample of all alumni.

Upon retrieval, we first, verified these data by checking artists' curricula vitae (CV) on their websites. The verification process, conducted through the Internet, took place from September to December 2012. Most artists use their CV to provide a comprehensive listing of their professional history, including art education, and achievements, such as awards, reviews and gallery affiliations. Second, we cross-validated these data for accuracy by checking art market news platforms such as artnet.com and artfacts.com, and collecting sales data from corporate art collections. This resulted in a unique and very comprehensive dataset.

We then constructed a panel dataset. The dimension of the panel data are T=22 time periods (1990-2012) and N=471 artists. We code sales and signals as zero in years without a registered event. Hence, we assume that the individual was still active in those years. Also we assume that all artists have been active until 2012, i.e. the last year in our data. Furthermore, we code sales and signals as not available for years before the start of the career, as defined as the starting year of the first art education. It should be noted that this makes the panel data highly unbalanced, i.e. the average number of available time periods per individual is 15. The minimum is 5 (cohort of 2008) and maximum is 22 periods (first year of collecting data).

3.4.2.1 Sales

Our dependent variables are the quantity of sales and the price paid in euros. The quantity is simply the total number of sales to corporate collectors for an artist in a particular year. The price[35] is defined as total euro amount of sales divided by the number of sales in a given year. These data were collected from 22 corporate art collections in the Netherlands (out of 35) who participated in our study. These corporate collectors account for 77% of the sales made to all corporate collections in the Netherlands during our observation period (www.vbcn.com).

35 Our results are substantively the same if we use maximum price in a year as compared to average price as the dependent variable; these results are also robust if we transform our dependent variable into a binary variable, measuring if a sale was made in a given year or not.

3.4.2.2 Past performance and signals

Our four explanatory variables are past sales (both quantity and average price depending upon the dependent variable), reviews, awards and gallery affiliations. First, including past sales as an explanatory variable allows us to gain a deeper understanding of persistence of performance across artists. We include one-year lagged sales to measure the impact of past performance on current performance (Waguespack and Salomon, 2015). By including these variables we implicitly control for individual unobserved heterogeneity, and reduce omitted variable bias. Second, for each kind of signal we construct a variable measuring the total number of signals in a given year. We also created a variable measuring the average credibility score of sources issuing a particular kind of signal in a year. The credibility of third party sources was determined by two independent art experts and one of the authors based on a validated scale measuring the source credibility construct (discussed in the next section). If an artist did not receive a particular kind of signal in a given year, then a zero was given for both variables. The granularity level of these data is annual; to avoid problems due to reverse causality, we only include the one-year lagged signals as predictors and not their contemporaneous values.

These explanatory variables are operationalized as follows: Reviews are either in art journals or national/ international newspapers and are broadly interpreted as anything from a discourse about an artist's oeuvre to critiquing national and international exhibitions. In the contemporary visual arts, the chance of a particular product or producer being reviewed is much smaller than in other creative industries, e.g., movies (e.g., Eliashberg and Sugan, 1997; Basuroy, Chatterjee and Ravid, 2003) or books (Berger, Sorensen, and Rasmussen, 2010); and of the art critics who do review selected exhibitions, 9 out of 10 give positive reviews (see: The Visual Arts Critic: A Survey of Art Critics at General Interest Publications in America, New York: National Arts Program - Columbia University, 2002; Elkins, 2003). Based on this previous research, we do not control for the valence of reviews, nor of the other signals discussed below, as neither awards nor affiliations can ever be considered to express anything but positive valence.

Awards range from Dutch national art awards such as the Prix de Rome to internationally recognized art awards such as the Turner Prize (arguably Britain's most visible award for contemporary visual artists). Although jury members and critics can derive reputational benefits, e.g., being the first to discover a new star talent, from the awards they bestow and reviews they write, a gallery owner is often not only exclusively interested in the artistic contribution and potential of the artist but also in the evolving art market and financial gains to be made. As such, gallery owners are both promoters and service providers because they select artists, monitor their professional development and convey signals about them to the public, while also selling the artworks to art collectors (Velthuis 2003). One of the strategies an art gallery can use to promote artists is to attend annual art fairs. Art Basel, Frieze, and Artissima are examples of international art fairs that provide selected art galleries a platform to exhibit artists and to sell artworks to collectors as well as promote these artists to museum representatives, curators and art critics (Yogev and Grund, 2012). We operationalize affiliation as an artist's association with a gallery at an art fair. Earlier research has shown that affiliations signal quality (e.g., Jensen 2003) by the suggestion to buyers that the producer is worthy of the association (Khaire 2010).

3.4.2.3 Measuring credibility of third party sources

Using a multi-item and validated scale underlying the source credibility construct (Ohanian, 1990), we scored the credibility level of 967 third parties sources. Initially, we were concerned that the sheer number of sources to rate could overwhelm and negatively affect our expert panel of judges, therefore, similar to Stanford et al. (2002), we first took a sample of 200 sources and asked three well -informed judges to rate these sources on a six items scale using a 5 point Likert measurement to measure the credibility level of third party sources in our sample. The six items were: trustworthiness, honesty, dependability, experience, expertise and how knowledgeable a source is (Ohanian, 1990). If a judge did not know the source and could not provide a rating based upon a quick Internet search, then 'do not know source' option could be checked. Two art experts, each with more than 18 years of experience in the field, served as judges; the third judge is one of the authors.

The internal validity of the six items measured was high, with a Cronbach's alpha of .98. Inter-rater reliability was calculated by using an intraclass correlation coefficient (ICC), specifically a two -way random effects model (Shrout and Fleiss, 1979). This resulted in an intraclass correlation (ICC 2,3) of .744 and significant at the .001 level. This indicates the judges' ratings to be internally consistent, which suggests low random and specific errors (Bravo and Potvin, 1990). Based upon the construct's high internal validity and internal consistency between judges, the third judge continued rating the remaining 767 sources.

3.4.2.4 Control variables

In addition to the explanatory variables described above, we include a number of control variables. First, we included a lagged dummy variable, which is coded 1 if an artist did not receive a signal in a particular year and the corresponding credibility level was coded 0; otherwise if the artist did receive a signal of a particular kind, this dummy variable is coded 0. Initially, we created dummy variables for each kind of signal, each equaling 1 when the corresponding credibility level was 0. However, the correlation between these dummy variables and the signal count variables as well as the source credibility level variables was high: between -0.73 and -0.96. One way to reduce collinearity is to impose an equality of coefficients restriction. The F test statistic, which is robust to multicollinearity, was used to verify equality. Imposing this restriction lead to creating a new dummy variable, as described above, which we lagged one year. This dummy variable controls for not receiving a signal in a given year but it also represents the impact of an individual going from no signals (review, award, affiliation) in a previous year to receiving at least one signal in the following year; thus, reflecting possible non-linear effects of receiving at least one signal. Given the many zero observations in these data, accounting for this effect is warranted.

Second, we construct a set of dummy variables to measure the effect of being in the same cohort (Merluzzi and Phillips, 2015) and to control for years since completion of the RABK residency. Furthermore, we create binary indicators for gender (1 equals female) and nationality (1 equals Dutch) and for each of six artistic disciplines: drawing, installation, painting, photography, sculpture, and video-film. Miscellaneous, a basket category for other disciplines, e.g., graphics, book making, is the base.

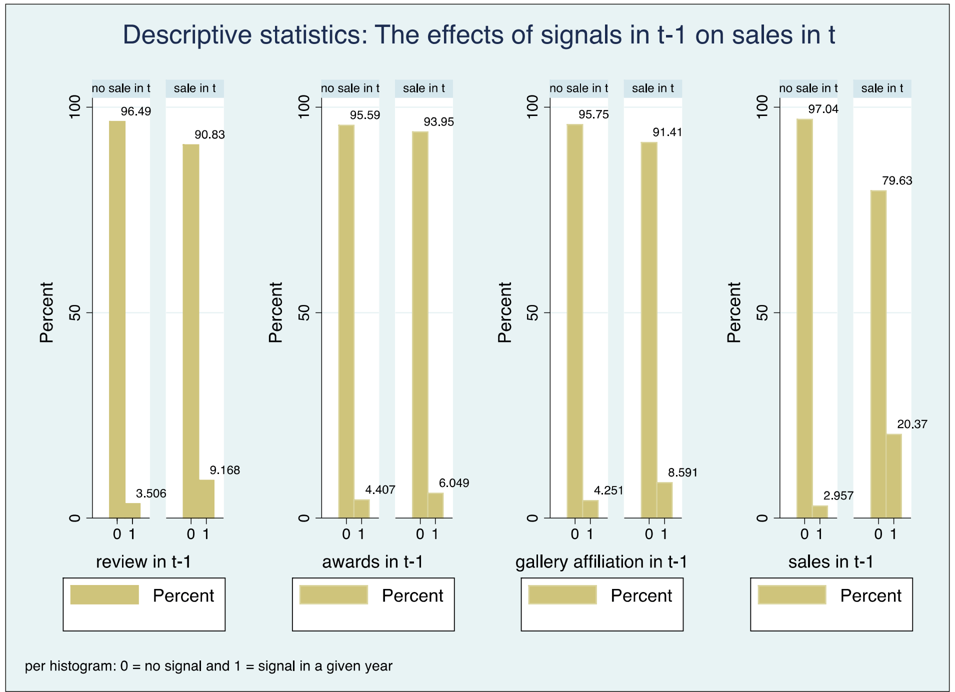
3.4.3 Estimation

The unit of observation is the individual artist in a particular year. Given the longitudinal nature of our data (T=22), there may be serial correlation embedded in the error term. We control for these with cohort fixed effects and artistic discipline fixed effects, although we note that, for example, Greene (2007) suggests that fixed or random effects may be used to account for serial correlation. However, in our application, we argue that neither fixed nor random effects are appropriate for two reasons: First, as mentioned earlier, 31% (n=147) of the artists in our sample have had a sale to a corporate art collector. This means that there is no variance in sales within the rest of the artists (i.e., those who have no sales) in our sample. Under such conditions, using fixed effects specification causes sample selection bias, because only artists with positive sales are analyzed. Effectively, using fixed effects we lose information about the other artists without sales, which is valuable information because it adds to the explanation of sales in general based on the values of artists' signals and other individual characteristics, especially considering that all artists try to sell their artworks. Second, although some literature suggests using random effects in models with little variance in the dependent variable caused by many zeros (see: Waguespack and Salomon, 2015), this is problematic in dynamic panel data models because the random effects correlate with the included lagged dependent variable regressor and lagged independent variable regressor, which may lead to endogeneity problems (Wooldridge, 2010). The literature also suggests correlated random effects (CRE) models, which are efficient for static models, allowing for unobserved heterogeneity to be correlated with observed covariates and selection mechanisms (Wooldridge, 2010), however, the strict exogeneity of the covariates is restrictive and cannot be extended to dynamic models. Instead, as noted above, we control for unobserved heterogeneity by including cohort fixed effects and discipline fixed effects.

3.4.4 Summary statistics

In the period 1990 up to and including 2012, we observe 732 sales to corporate collectors, 2956 reviews, 676 awards and 335 gallery affiliations. As noted above, getting reviewed occurs more frequently than selling. This may be indicative of the primary art market where there is an oversupply of artists and uncertain demand (Caves, 2000). The majority of the 471 artists in our sample receive at least one review (399) or award (281) during their two-year residency at RABK or thereafter. However, there are only 146 artists who ever sold anything to corporate collectors and only 132 have a gallery affiliation. The result is an abundance of zero observations in the data. In our data the maximum price paid for an art work sold to a corporate collector is € 120,000 and the minimum is € 313 with a mean price of € 4786. With respect to the signals, the average score for 'review credibility' is 3.24 on a 1 (low credibility) to 5 (high credibility) scale; the average 'award credibility' is 2.70, on a 1 (low credibility) to 5 (high credibility) scale; and the average 'affiliation credibility' is 2.89 on a 1 (low credibility) to 5 (high credibility) scale.

FIGURE 3.1



We foreshadow our estimation results, by first looking at general patterns in the data. Figure 3.1 shows the probability of having a sale in year t if a signal is received in t-1. For instance, if a producer receives a review in a given year then the probability that the producer will have a sale in the following year is 9.2%, compared to not receiving a review last year, in which the probability of a sale in the following year is 3.5%. We observe a similar pattern across all signals if producers receive a signal in t-1, specifically: the probability of a sale in t if a producer receives a signal in t-1 is 6.1% for awards, 8.6% for gallery affiliations and 20.4% for past sales, compared to not receiving a signal in t-1 than the likelihood of a sale in t drops to 4.4% for awards, 4.2% for gallery affiliations and 3.0% for past sales.

3.5 RESULTS

3.5.1 Explaining sales and sales price by signal counts

In this first part we measure signals (*reviews*, *awards* and *affiliations*) in equation (1) with their counts only. We analyze the effects of signal counts on two outcome variables, i.e. sales count and average price. Table 3.1 presents the PPML estimation results for the sales count.

TABLE 3.1 Explaining sales counts by lagged signal counts

	(1)	(2)	(3)	(4)
LAGGED REVIEWS	0.215**	0.123**	0.133**	0.128**
	(0.023)	(0.027)	(0.029)	(0.033)
LAGGED AWARDS	0.434**	0.346**	0.358**	0.377**
	(0.122)	(0.142)	(0.137)	(0.141)
LAGGED AFFILIATIONS	0.417**	0.392**	0.489**	0.443**
	(0.097)	(0.091)	(0.098)	(0.112)
LAGGED SALES COUNT				0.303**
				(0.034)
N	8918	8918	8918	8918
Control Variables	No	Yes	Yes	Yes
Discipline FE	No	Yes	Yes	Yes
Cohort FE	No	No	Yes	Yes
BIC	5449	4736	4803	4562

Clustered standard errors in parentheses
FE – fixed effects
* p<0.10, ** p<0.05

These results show that impact of signals on sales is positive, with a similar magnitude across the four specifications (even when no control variables are used). Furthermore, there is significant effect of lagged sales on sales in the subsequent period. As can be seen in column 4, adding lagged sales to an improved (lower) value of the Bayesian Information Criteria (BIC), a test for comparing the explanatory power of nested models, suggesting that lagged sales should be included in our model. Stated alternatively, model 4 is the most appropriate model for the sales count data and will be used in further analysis below.

Table 3.2 presents estimation results using the average price as dependent variable. As compared to the model of sales count, the estimates of the coefficients show some variation across the models, but primarily for the measure of lagged awards which is not significant at the p<0.05 level. For price, as with sales count, model 4 has the lowest value of BIC and should be used for interpretation of our results. As can be seen in the results for model 4 in Table 3.2, in addition to the past year's average sales price, both lagged reviews and lagged affiliations are significantly associated with the average price paid.

TABLE 3.2 Explaining average sales by lagged signal price

	(1)	(2)	(3)	(4)
LAGGED REVIEWS	0.257**	0.162**	0.190**	0.178**
	(0.019)	(0.028)	(0.027)	(0.027)
LAGGED AWARDS	0.301*	0.075	0.119	0.194
	(0.182)	(0.261)	(0.212)	(0.214)
LAGGED AFFILIATIONS	0.364**	0.190	0.265*	0.300**
	(0.100)	(0.170)	(0.153)	(0.136)
LAGGED SALES PRICE				0.032**
				(0.006)
N	8918	8918	8918	8918
Control Variables	No	Yes	Yes	Yes
Discipline FE	No	Yes	Yes	Yes
Cohort FE	No	No	Yes	Yes
BIC	17046	15532	14751	14486

Clustered standard errors in parentheses
FE – fixed effects
* p<0.10, ** p<0.05

Our first set of results show that there is a robust positive correlation between the two dependent variables--the number of sales and the price paid--and the occurrence of signals in the previous year. Table 3.1 provides evidence to support hypothesis 1a. In count data models, such as Poisson, a regression coefficient measures the relative change in the conditional mean of the outcome variable if the corresponding regressor changes by one unit (Cameron and Trivedi, 2005) Therefore the magnitude of the coefficients can be directly compared, as all variables are counts. For example, in Table 3.1, Model 4 the relative change in the number of sales caused by the number of sales in the previous year is 0.30, while it is 0.13 for reviews, 0.38 for awards and 0.44 gallery affiliations. This suggests that awards and gallery affiliations are most important for sales followed by past sales, while reviews are least important. The results from Table 3.2 provide evidence to support hypothesis 1b, except that awards are not significantly associated with the sales price.

As noted above, in Table 3.1 and Table 3.2, we exploited Bayesian information criterion (BIC) as a model selection statistic for nested models. In both tables, Model 4 had the lowest BIC, indicating that this model, as compared to the other three models, is the one most likely to have generated the observed data. In Table 3.3 and for the remainder of the paper, we continue reporting only the results from Model 4, which includes lagged sales, control variables, discipline FE and cohort FE.

3.5.2 Explaining sales and sales price by source credibility

Given the positive association between quantity of past signals and quantity (or average price in the price equation) of past sales on both sales count and price, we now analyze the credibility dimension of the third party sources transmitting the signals (*reviews*, *awards* and *affiliations*) in equation (1). We perform similar regressions as before, predicting sales count and average price, but now we include as explanatory variables the level of credibility of third party transmitting different kinds of signals instead of the count. If an artist has more than one signal of a certain kind in a year, than the variable is measured as the average value of credibility for that signal in the year. Table 3.3.1 presents the PPML estimation result per model for sales count and average sales price.

TABLE 3.3.1 Explaining sales count by lagged sales credibility

	(1)
LAGGED REVIEWS	0.076*
	(0.046)
LAGGED AWARDS	0.185**
	(0.045)
LAGGED AFFILIATIONS	0.182**
	(0.065)
LAGGED SALES COUNT	0.292**
	(0.032)
N	8918
Control Variables	Yes
Discipline FE	Yes
Cohort FE	Yes

Clustered standard errors in parentheses
FE – fixed effects
* p<0.10, ** p<0.05

TABLE 3.3.2 Explaining sales price by lagged sales credibility

	(1)
LAGGED REVIEWS	0.205**
	(0.079)
LAGGED AWARDS	0.126*
	(0.076)
LAGGED AFFILIATIONS	0.180*
	(0.102)
LAGGED SALES COUNT	0.035**
	(0.007)
N	8918
Control Variables	Yes
Discipline FE	Yes
Cohort FE	Yes

Clustered standard errors in parentheses
FE – fixed effects
* p<0.10, ** p<0.05

In Table 3.3.1 shows a positive association between signal transmitted by highly credible third party sources in a given year and the number of sales in the subsequent year. These results provide evidence to confirm hypotheses 3a. Similar effect sizes of awards and affiliations: 0.18 and 0.18, respectively, indicate that expert buyers are influenced by highly credible third party sources transmitting these signals, while highly credible third party sources conveying reviews seem to have a slightly lesser effect on this category of buyers. The results from Model 1 in Table 3.3.2 indicate a strong positive correlation between reviews transmitted by highly credible third party sources, 0.20, in one year and the price paid in the following year followed by affiliations and awards, 0.18 and 0.12, respectively. Hypothesis 3b is also confirmed.

3.5.3 Explaining sales and sales price by signal counts moderated by source credibility

To estimate the interaction effects between number of signals and the source credibility, we follow the procedure described in Dhar and Weinberg (2016) and Ai and Norton (2003). These papers show that nonlinear models inherently include interactions among the variables, so that specific interactions terms do not need to be added to the model unless justified by theory and supported by statistical results[36]. The validity of this argument is based on the definition of the interaction effect as the 'cross partial' derivative of the dependent variable y on the two (in their example) independent varibles, x and z. The argument is based on the idea that in most nonlinear models the cross partial depends on the values of both x and z, hence even without an explicit interaction term xz it is a function of both x and z values.

In the data the minimum and maximum number of reviews is 0 and 17, but 85% of the data concerns 0, 1, or 2 reviews only. For awards and gallery affiliations more than 95% of the data concerns 0, 1 or 2 signals only. We therefore evaluate the mean predicted sales (or average price) for signal count equal to 0, 1 or 2. Regarding the source credibility dimension, we choose zero, low, medium or high levels. Medium level is just the sample mean, while low and high levels are defined as one standard deviation below and above the sample mean respectively. We show the results as the number of signals increases within a representative source credibility range.

36 Our results from BIC model selection statistic showed the overall fit of the model without the interaction terms was better than the fit of the model with an interaction term included, thus supporting our use of the model without explicit interaction terms.

FIGURE 3.2 Estimating sales count: A counter-factual experiment

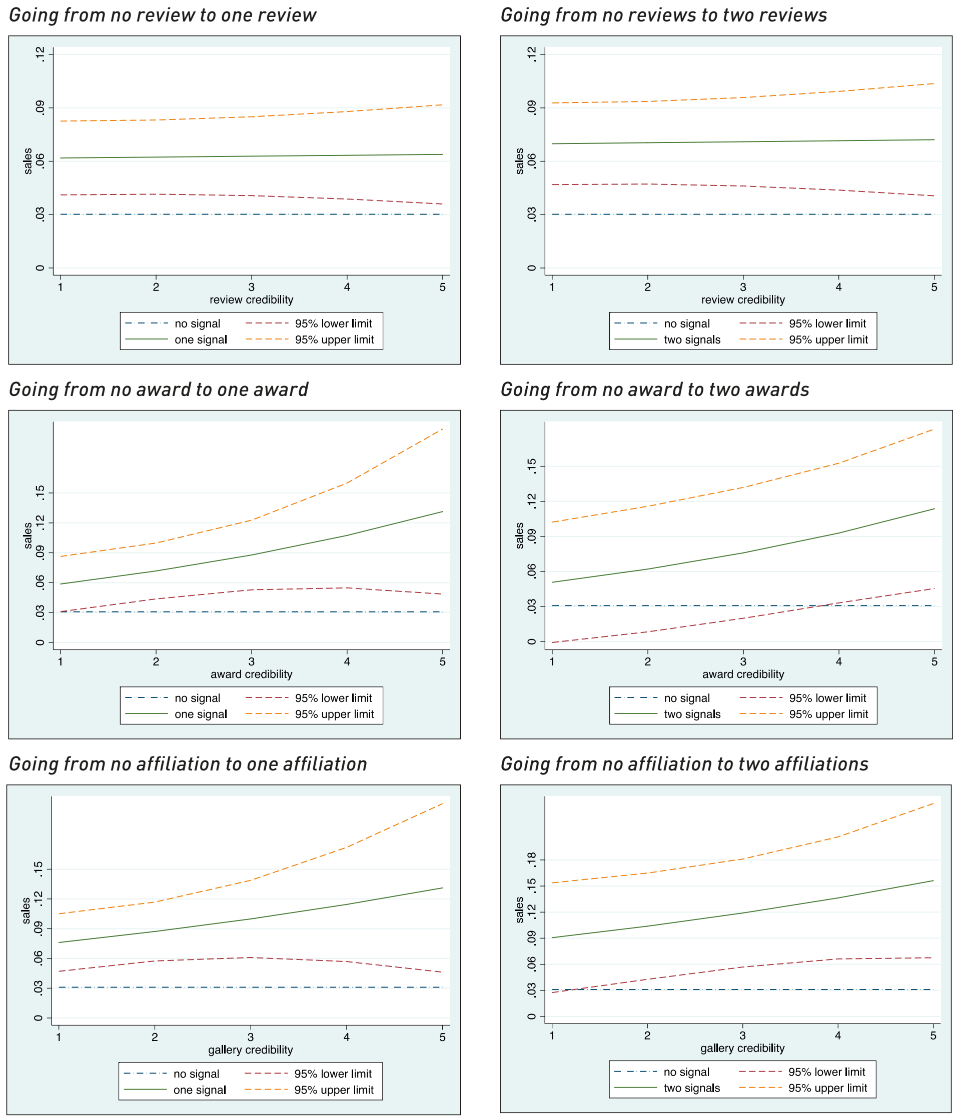


TABLE 3.4 Explaining sales count by signal count and source credibility level: A counter-factual experiment

	REVIEWS	*AWARDS*	*AFFILIATIONS*
NO SIGNAL	0.031	0.031	0.031
ONE SIGNAL LOW CRED	0.062	0.059	0.076
TWO SIGNALS LOW CRED	0.070	0.051	0.091
ONE SIGNAL MED CRED	0.063	0.088	0.100
TWO SIGNALS MED CRED	0.071	0.076	0.119
ONE SIGNAL HIGH CRED	0.064	0.131	0.131
TWO SIGNALS HIGH CRED	0.072	0.114	0.156

FIGURE 3.3 Estimating sales price in € (x1000): A counter-factual experiment

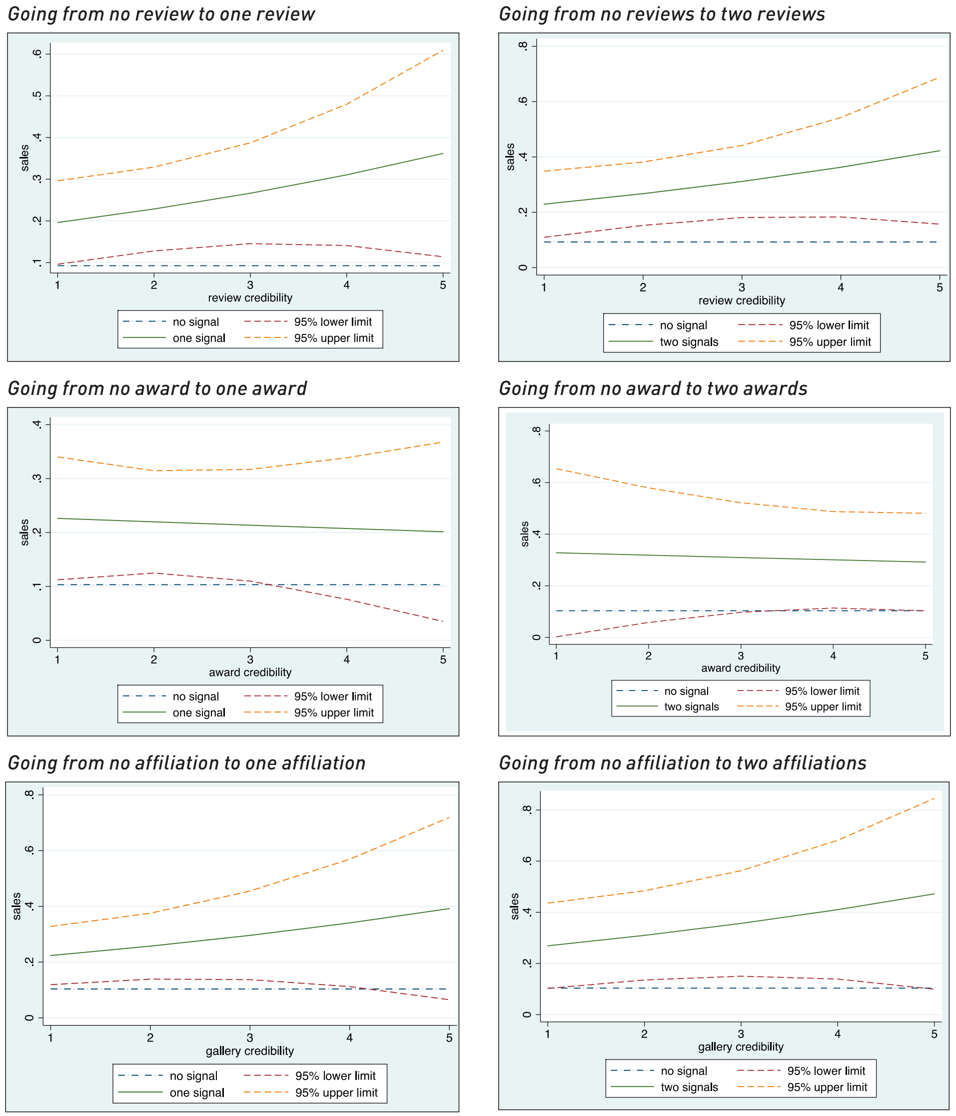


TABLE 3.5 Explaining sales price by signal count and source credibility level: A counter-factual experiment

€ (x1000)	*REVIEWS*	*AWARDS*	*AFFILIATIONS*
NO SIGNAL	0.103	0.103	0.103
ONE SIGNAL LOW CRED	0.196	0.226	0.223
TWO SIGNALS LOW CRED	0.229	0.328	0.270
ONE SIGNAL MED CRED	0.266	0.213	0.296
TWO SIGNALS MED CRED	0.311	0.309	0.356
ONE SIGNAL HIGH CRED	0.362	0.201	0.392
TWO SIGNALS HIGH CRED	0.422	0.292	0.472

Table 3.4 and Figure 3.2 presents our results that show a general pattern indicating that a higher number of signals, i.e., reviews, awards, and affiliations, have a greater effect on sales count, and this effect increases as the credibility level of the third party source issuing the signal increases, with the exception of reviews, where the credibility appears not to have an impact. Greene (2010) advises to graphically show the effect in nonlinear models, because the interpretation is difficult. When we graphically plot the interaction effects, with their corresponding confidence intervals, we find that for reviews: going from 0 to 1 or from 0 to 2 reviews in a given year has a statistically significant influence on sales count in the following year. For awards: going from 0 to 1 is statistically significant for a source credibility level of 1.5 and higher. The upward slope indicates that the higher the source credibility of the award in a given year, the greater the number of sales the artist has the next year. The plot shows an upward slope when going from 0 to 2 awards; however, this is not statistically significant unless the awards are from highly credible sources. For gallery affiliations: going from 0 to 1 or from 0 to 2 affiliations in a given year has a statistically significant effect on sales count in the following year. In summary, for all signals an increase from 0 to 1 or from 0 to 2 in count shows a monotonic increase in function in relation to higher source credibility. The greater the number of signals originating from highly credible third party sources received in a given year, the greater the number of sales in the subsequent year. Hence hypothesis 3a is confirmed.

Examining the results for sales price in Table 3.5 and Figure 3.3, we see that having one signal as compared to no signal or two signals as compared to no signals in a given year at the mean level of credibility of third parties transmitting each kind of signal has a statistically significant effect ($p>0.05$) on the sales price in the subsequent year. For both reviews and affiliations, the difference between the sales price at the high credibility level (.422 for reviews, .472 for gallery affiliations) at the level of two signals as compared to the sales price at low credence (.229 for reviews, .279 for affiliations) are statistically significant. The differences are also statistically significant for one review (affiliation) signal at the high credence level as compared to the low credence level. For awards, however, perhaps surprisingly, the credence level does not appear to have an impact on the sales price. Hence, hypothesis 3b is supported for reviews and affiliations, but not for awards.

3.5.4 Explaining sales and sales price by past sales

The results in Table 3.1 Model 4 show that the number of past sales has a positive significant effect on sales count, thus confirming hypothesis 4a. Model 4 in Table 3.2 shows a positive significant association between the number of past sales the average sales price in the previous year and average sales price in the subsequent year; hypothesis 4b is confirmed. Although not the main focus of our study, in the discussion section we examine the relative importance of past sales or past sales prices as compared to the three signals that we study on sales and average sales price respectively.

3.6 DISCUSSION AND CONCLUSIONS

3.6.1 Summary of contributions

The main aim of this paper is to study the effects of signals conveying quality information about producers' past performance in a market characterized by high uncertainty about the quality of the particular products on sale. We add to the marketing literature on quality signals by demonstrating the differential effects of four different kinds of signals on the sales behavior of our focal category of buyer: expert buyers. Our results show that past sales as well as reviews, awards and affiliations conveying information about producers' quality positively and significantly influence the number of sales and the sales price, but per kind of signal the level of credibility of the third party sources transmitting the signal moderates the strength of this effect. Additionally, we provide empirical evidence demonstrating the change in magnitude of the effect on sales when producers transition from having no signals in a given year to receiving one signal, and when they segue from no signal in a given year to two. In our analysis of past performance, we find serial correlation between past sales and current sales, indicating systematic patterns of performance persistence. We find that simply being reviewed, regardless of the level of credibility of the source transmitting the review, has a positive and significant effect on the quantity of sales to expert buyers compared to not receiving a review at all. Source credibility (of the third party source transmitting the review) does have a significant and positive effect on average sales price, which increases as the level of source credibility increases. With awards we see a steep increase in the number of sales, when in a given year a producer receives an award compared to not receiving an award; this pattern continues when receiving two awards but is only significant at high credibility levels. Awards influence sales price too; namely, there is an increase in the price paid for a product when a producer receives an award, compared to not receiving an award. But this is only significant at low source credibility levels, while receiving two awards positively and significantly affects sales price but only at higher credibility levels. Gallery affiliations also have a significant and positive effect on the number of sales and sales price. The increase in going from no affiliation to one affiliation or to two affiliations, as the level of source credibility increases, is monotonic. In a general sense, these results about signals and the credibility levels of the sources conveying these signals suggest the degree to which self-reinforcing processes govern competitive dynamics in markets characterized by high uncertainty about producer quality. This is even more the case when we notice the strength of the effect of past sales, which describes in a most direct manner the self-reinforcing effect of past performance.

The primary market for contemporary visual art is a suitable setting to test our hypotheses, precisely because it is so clearly characterized by imperfect and incomplete information about artwork quality (Becker, 1982; Caves, 2000). Within this empirical domain, we focus on customers who are clearly expert buyers, namely the curators of corporate art collections, and on producers who are alumni from an elite and highly selective fine arts program (RABK). This group of visual artists can be considered, at least initially, i.e., at the start of the program, to be a homogenous cohort because at selection they usually share the following comparable characteristics: similar previous art training, age, art practice experience, and technical art making abilities. For this reason, we explicitly control for unobserved heterogeneity and omitted variable bias. Our specific hypotheses – about the effects of source credibility, numbers of signals, the interaction between source credibility and numbers, and past sales as signals - were all confirmed. The differences in the effect sizes of the different types of signals serve to better understand the weight of particular signals of quality in this particular market. Overall, the analysis shows the strength of the effect of signals and of past performance in markets with informational deficiencies, and transmits a sense of the extent to which self-reinforcing processes can govern competitive dynamics (Merton, 1968; Azoulay et al., 2013).

As noted before, the expert buyers we study are all members of the VBCN (the Netherlands Association of Corporate Art Collections) who frequently interact with each other, The high levels of connectivity between these corporate art collectors can be understood in terms of its usefulness in helping to reduce uncertainty about quality and decrease search costs associated with pre-purchase decision-making. Because these expert buyers are able to observe each other's actions directly and communicate regularly, the degree of observational learning is high, and this can lead to optimal purchase decisions (Bikhchandani, Hirshleifer and Welch, 1992). As new information about signals and past sales accumulates, these expert buyers may converge on buying the same producers' products, which may have the additional benefit of helping to increase both individual and collective payoffs by increasing the popularity of select producers.

Earlier studies on small world networks have shown that small groups of individuals disproportionately influence network dynamics because of access they have to new information, which they spread within the network (Milgram, 1967). For example in academia, Newman (2004) and Goyal et al. (2006) studied co-authorship across various academic disciplines, and found that a few, but very influential individuals spread new information to the network, keeping the small world structure strong. These individuals move between clusters of members in a network, increasing the connectivity between individuals in different clusters. However, too much connectivity has been shown to have a curvilinear effect on performance because with high levels of connectivity no new information enters the network, not even via highly influential members. When this happens individuals in the network may start behaving similarly (Uzzi and Spiro, 2005), and possibly start exhibiting herd behavior because of the lack of new information entering the network (Bikhchandani, Hirshleifer and Welch, 1992).

Again, in most of the previous studies the buyers were uninformed, rather than expert buyers, who are the focal category in this study. In fact, it is reasonable to expect that expert buyers would be less susceptible to herd behavior. However, this study strongly suggests that the choices of expert buyers can also be determined to a large extent by high levels of connectivity in a small world network that leads to paying attention to explicit evaluations of others and observed sales to peers, instead of making autonomous and well-advised decisions based on their professional knowledge This counterintuitive conclusion is consistent with the results of an earlier study (Situmeang, Leenders & Wijnberg, 2014) that cast doubts on the independence of experts' decisions by showing how expert reviewers of sequels of computer games tend to follow the consumer reviewer of past editions of the same game, instead of the other way around.

3.6.2 Managerial relevance

In general, our findings are relevant for both producers and buyers active in markets with high uncertainty about quality and where information provided by signals about past performance drive dynamic economic processes. For instance, nascent ventures, high tech firms and professional services are examples of producers and/or products surrounded by high levels of uncertainty about quality. Our findings provide fine-grained specifications about the effects of different kinds of signals, transmitted by third party sources with different levels of source credibility, on sales. We also provide insights on how signals and past sales can increase performance differentials between competitors. From a marketing perspective, the empirical evidence provided by this study about signal effectiveness, may have two general implications for producers.

First, producers could start by making a strategic decision to invest part of their marketing budget to elicit select signals to gain competitive success. Because signals may provide producers with a reputational advantage, and this advantage may trigger preferential treatment from buyers and other decision-makers (Waguespack, and Salomon, 2015), it seems highly relevant for producers, and especially those active in markets with extreme informational gaps about product quality, to actively pursue becoming the recipients of signals transmitted by third party sources, even if it means investing money. Furthermore, signals, and especially early signals received by new competitors, may grant producers access to opportunities and/or material resources not available to other competitors. This is important because even seemingly minor or inconsequential initial advantages may lead to future systematic patterns of persistent performance if the opportunities afforded lead to superior performance (Merton, 1968; Azoulay et al., 2013; Sorenson and Waguespack, 2006). On the other hand, our results suggest that highly credible sources transmitting signals have a significantly greater impact than low credibility sources. So marketers must take care and ensure that the signals do not seem to be self-serving and of having little real value in terms of their likely credibility.

Second, producers such as nascent entrepreneurs, high tech firms and service professionals, could lower introductory prices to attract early adopters so that other buyers will imitate their purchase behavior. This strategy could be useful in generating past sales as a signal of quality. Especially in markets with hard to observe quality, and where buyers may use the same kinds of products yet are unable to differentiate between the quality of competing alternatives, early adopters may help to increase the popularity of a product. The social influence exerted by early adopters, may affect the preferences of those who observe their purchase decisions. Such social influence, starting at the individual level, may grow to influence collective level purchase decisions and significantly affect performance differential between competitors. In such settings, early adopters may also be a source of signals, particularly in terms of providing (online) reviews of products. Thus, both the direct effect of adoption and the indirect effect of signals need to be considered. As early adopters may at times provide negative reviews, innovators should be cautious and ensure that their products are of high standard before attempting to induce early adoption.

3.6.3 Limitations and future research

When considering the results of this study, there are some limitations to bear in mind, which also point to further research opportunities. In this paper, we focus on one type of product (i.e., contemporary visual art) from one type of producer (i.e., alumni from a highly prestigious art program), and we study the purchase behavior of one type of buyer: expert buyers (i.e., corporate art collectors in The Netherlands) who are largely active in one market segment (i.e., the primary art market). Although this empirical setting is extremely useful in analyzing the effects of different kinds of signals originating from different kinds of third party sources with different levels of source credibility, and studying the differential effects these signals have on producers' sales to expert buyers, follow-up studies could examine other empirical domains and focus on qualitative dimensions of signals, other qualitative dimensions of sources transmitting signals besides credibility, and characteristics of competitive processes in markets with high uncertainty about producer and/or product quality. We now discuss each of these possible extensions.

First, in markets with incomplete or imperfect information about producer quality, different kinds of signals may also have different qualitative dimensions. Valence, i.e., positive or negative tenor of the information conveyed by the signal, is an example of such a qualitative attribute. As mentioned earlier, the valence of the focal signals in our study is positive, but that is specific to our empirical context. Expanding our research, it could be useful to focus on other settings in which there are many different kinds of signals from different kinds of sources, and where the information conveyed by signals has different valence. Earlier studies have analyzed valence in the context of movie reviews (e.g., Basuroy, Chatterjee and Ravid, 2003; Chen, Liu, and Zhang, 2012) and books (e.g., Berger, Sorensen, and Rasmussen, 2010). These studies, however, focused on one kind of signal transmitted by one kind of third party source to uninformed buyers, and analyzed the effects on producers' sales performance immediately after the signal had been transmitted. We suggest focusing on settings with signals from both first and third party sources, and study interaction effects between different kinds of signals and the positive or negative tenor of the message they are conveying. Of course first party signals will have positive valence but other signals from third party sources can range from being highly positive to highly negative. Gaining a better understating of how qualitative dimensions of signals affect signals' persuasive power on expert buyers and uninformed buyers could provide novel insights into how signals help producers gain advantages that may lead to superior performance persistence.

Second, we focus on credibility as a characteristic of third party sources; we determine credibility of each source in our dataset based on validated scales measuring sources' expertise and trustworthiness (Ohanian, 1990) as perceived by our focal buyers. However, it is possible that there are other qualitative dimensions of sources that may also provide useful explanations to understanding differential effects of signals on buyer behavior. For instance, earlier studies have shown that the level of status, i.e., high or low, of individuals or organizations is positively correlated to their performance outcomes (e.g., Washingon and Zajac, 2005; Podolny, 1993). It is reasonable to expect high status third parties to transmit signals that are more persuasive, having greater positive effects on buyer behavior, compared to sources of lower status.

Exploring source characteristics, such as status, of first and third parties transmitting signals and focusing on the differential effects these signals have on uninformed and expert buyers could potentially be another useful extension to our study, especially since status itself is a signal of quality (Podolny, 1993).

Third, another interesting avenue of research would be to explore the characteristics of competitive processes in markets, specifically those with incomplete and imperfect information about quality. One way to do this is to differentiate between different types of "selectors" that convey signals. Selection system theory (Wijnberg and Gemser, 2000; Wijnberg, 2004) describes three ideal types of selectors: market, expert and peer. With selection system theory competitive processes can be viewed in terms of the relative importance of different types of selectors that buyers rely on when making pre-purchase decisions among competing alternatives (Gemser, Leenders and Wijnberg, 2008). For instance, in a study focusing on how awards affect sales performance of mainstream films and art-house movies, Gemser, Leenders and Wijnberg (2008) argued that if the preference of the selectors conveying the signal is the same as the buyers making the purchase decisions than signals' effectiveness is high, compared to selection preferences between selectors and buyers that are different. In our study, we focused on the extent to which signals conveyed by third party sources affect expert buyers; using selection system theory typology, the signals in our study are predominately conveyed by expert selectors. A useful extension to our study could be to examine the effects of signals conveyed by peer selectors. Comparing the effects of signals originating from peer selectors to those originating from expert selectors or even market selectors[37] could provide a finer-grained understanding of competitive dynamics in markets with high uncertainty about producer quality.

37 Examples of signals based on market selection are the MTV Award and People's Choice Award, where primarily end users choose the recipients of the signals.

3. 7 APPENDIX

APPENDIX A: Correlation matrix

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
(1) LAGGED REVIEW COUNT	1.0000							
(2) LAGGED AWARDS COUNT	0.1691	1.0000						
(3) LAGGED AFF COUNT	0.0842	0.0332	1.0000					
(4) LAGGED REVIEW CRED	0.9803	0.1635	0.0902	1.0000				
(5) LAGGED AWARDS CRED	0.2174	0.8990	0.0366	0.2157	1.0000			
(6) LAGGED AFF CRED	0.0963	0.0303	0.9647	0.1051	0.0357	1.0000		
(7) LAGGED SALES COUNT	0.1693	0.0410	0.1203	0.1829	0.0705	0.1353	1.0000	
(8) LAGGED SALES PRICE	0.11800	0.0097	0.0428	0.1240	0.0204	0.0472	0.3418	1.0000

Legend: r values are significant at p<.01
Observations: N = 12717

Artists: N = 471