Category Signaling and Reputation

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We propose that category membership can operate as a collective market signal for quality when low-quality producers face higher costs of gaining membership. The strength of membership as a collective signal increases with the sharpness of the category boundary, that is, contrast. Our empirical study focuses on biodynamic and organic viticulture in Alsace.

Keywords: sociology of markets; organization theory; signaling; reputation; categories; wine industry; Alsace

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1. Introduction


In this study we propose another role of category membership in markets: communicating collective market signals. According to theories of market signaling, some agents can demonstrate their hard-to-observe quality by investing in a signal, and the audience can use the signal as a screening mechanism (Spence 1973a, 1974). For an action to be a signal, the cost of producing the signal must decrease with increases in the agent’s quality. Then a separating equilibrium can result where those who provide the signal have higher average quality.

Noise can affect the observability and interpretability of individual signals, particularly in markets with large numbers of producers and labels. We propose that category signals can, under specified conditions, identify otherwise unobservable differences in quality in such settings and operate as common signatures in the interface between producers and the audience (Bacharach and Gambetta 2001). This requires that (1) low-quality producers find it more costly to gain category membership and (2) the category has a sharp boundary, or a high contrast in technical terms.

Our empirical study of these issues focuses on the use of two unconventional and categorically coded approaches to viticulture: organic and biodynamic. Following the codes for these categories requires higher capability and commitment (and higher production costs) than conventional winemaking. Membership in either category therefore qualifies as a market signal of quality. In particular, many renowned wineries in the region we examine follow the very distinctive (“bizarre” in the eyes of some) biodynamic approach, proposed by the Austrian polymath Rudolph Steiner in a series of lectures in 1924. His holistic view of farming, which builds on principles involving cosmic forces, is considered unique. His claim that “gnomes, undines, sylphs and fire spirits are actively involved in plant growth” (Steiner 2003, p. 158) gives the flavor of this approach.

The biodynamic category arguably has higher contrast in the context we study—the French region of Alsace—for two reasons. First, its unique required practices (e.g., using cow horns and red-deer bladders to cure manure and yarrow blossoms in sprays for vineyards and compost) and the additional commitment to these methods make biodynamicists stand out. Second, the organic category has a fuzzy boundary because of the perceived overlap with another category, (sustainable),1 whose adherents claim to be “nearly organic.” This confusion lowers the contrast of the (organic)—but not the (biodynamic)—category. We surmise that membership in biodynamics sends a stronger market signal because of its high categorical contrast. We evaluate this claim using evidence collected in fieldwork and statistical analysis of critics’ ratings and retail prices.

2. Theory

2.1. Market Signals

Producers and what they offer generally differ in quality. Information about quality tends to be asymmetric: a job applicant, a loan seeker, and a used-car seller know more
than the prospective employer, lender, and buyer. In general, both high-quality producers and audience members benefit from transmission of reliable information about quality. The benefits include material advantages such as higher prices. Other kinds of motivations also matter. For example, some producers simply take personal pride in the recognition of their offer as being of high quality.

Those possessing high quality face a problem: can they communicate their capability to the audience? This is where market signals come in. A signaling mechanism can overcome problems of information asymmetry about quality by yielding equilibria in which only high-quality producers find it worthwhile to invest in the signal. This requires that producing the signal costs less for highly capable producers. In Spence’s job market model (Spence 1973a), some prospective employees can demonstrate their potential productivity by investing in education, which employees of low potential find more costly (that is, requiring more effort). Applications of market signaling consider investments made by individual agents: in economics, Spence (1973a, b; 1974); in biology, Zahavi (1975) and Grafen (1990); in political science, Jervis (1970); and in sociology, Gambetta (2009). Connelly et al. (2011) offer a comprehensive review of applications in management.

The cost–quality relationship defines the key condition of the signaling mechanism, what Connelly et al. (2011) call signal fit. For a signal to be effective, it has to meet a second condition, observability: the audience must be able to detect and decode the signal. Many markets populated by a mix of high- and low-quality producers—for example, markets for food and clothing—pose challenges to interpreting market signals. The presence of large numbers of producers makes the investments made by any one of them more difficult to notice. For instance, the wine industry contains well over 100,000 different labels. Individual market labels can only provide summary information about a product or producer, making quality difficult to ascertain. Identifying quality also becomes complicated when names and labels of producers of different quality resemble one another. Individual signals can lose their diagnostic power, and the resulting equilibrium, if there is one, will be a pooling equilibrium (with mixes of high- and low-quality producers lumped together) rather than a separating one.

In some cases, category signals—collective signals associated with category membership—can still solve the problem of information asymmetry in the face of noise. The advantage of category signals comes partly from the fact that multiple producers can display the signal, which increases the visibility to the audience (Connelly et al. 2011). Political scientists make this argument about the efficiency of investing in industry associations for political action by individual firms (Lohmann 1993). Similarly, in highly fragmented industries, such as wine and food, common labeling helps promote the products of groups of small producers. When multiple producers use the same sign, collective signaling also enhances interpretability. The audience likely trusts conformity to a category more than idiosyncratic individual observables. For example, collective enforcement has more credibility than individual monitoring of one’s own actions.

### 2.2. Category Contrast

Properties of categories likely shape how category signals operate. In our interpretation, the matter lies in the hands of the audience, and any number of properties might be relevant in any particular situation. Some of these properties are accidental and not subject to prediction. We narrow our focus to one that has proven to have predictive value: the sharpness of the category boundary.

The line of theory we follow ties the sharpness of a category’s boundary to contrast. **High contrast** means that category membership is nearly crisp: producers tend to be fully in or out. Contrast falls when the label gets applied to those whose feature values do not fit fully to the audience member’s schema for the label. Recent research has used the application of multiple labels (category spanning) as an indirect way to assess contrast based on the grounds that a producer whose characteristics cause it to be assigned to multiple labels (at the same level in a focal domain) fits imperfectly in each (Hsu et al. 2009). The intuition is that a category whose members get assigned to only that label and no other has very high contrast. Here, we consider producers gaining membership in just one of two categories, which differ primarily in terms of contrast (one category has high contrast and the other low).

Higher contrast increases the likelihood that audience members use similar interpretive schemas for a category (Hannan et al. 2007). When such interpretive agreement obtains, audience members will generally find that the producers/products to which others have assigned a label have observable feature values that fit their understandings of the label. Under such conditions, conformity to category schemas by those bearing the category label becomes accepted as natural, or taken for granted.

We suggest that categories with high taken-for-grantedness can support strong category signals. Category members will have highly similar observable characteristics and audience members will apply the label in very similar ways. When one member applies the label to a producer, then others will also treat it as satisfying their schemas for the category (Hsu et al. 2011). The core of our argument is that high-contrast categories are more likely than low-contrast ones to become market signals. Moreover, if membership in a category does serve as a market signal of quality, then the strength of this signal increases with the category’s contrast.

Just as categories are constructions of audiences, so too are category signals tied to particular audiences. One
organization’s recognition of categorical membership as a signal does not necessarily mean that all other audiences will recognize it in the same way. Therefore, the argument has a conditional nature: if a label marks a category for a focal audience and the cost of membership in the category is inverse to producer quality, then the category functions as a market signal for that audience.

2.3. Category Reputation

Category signaling is related to another process: collective reputation for quality (Tirole 1996, Levin 2009). Models of collective reputation also begin with the assumption of imperfect observability of current and past individual behavior/quality. They posit that the resulting noise in screening processes of persons or products by audience members sharply limits the value of relying on individual reputation.

Collective reputation models exploit the fact that individual agents can also belong to collective entities, groups in which members share personal relationships or interests. The models of Tirole (1996) and Levin (2009) treat the current quality of a group as partially observable over the market interface. At any time, group quality is simply the average quality of its members. The group’s “track record” of quality for past generations of members is its collective reputation. Individual members affiliate with a group based on the advantages linked to its collective reputation. A bad reputation creates incentives for members to cut corners, because high quality would not be rewarded. Conversely, a good reputation produces incentives to strive for quality.

When membership and the past track record of the group are known, collective reputation conveys information about the average current quality of individual members. Consequently, a strong collective reputation can yield a separating equilibrium for an audience that recognizes the group.

The two theoretical mechanisms differ in how they treat the free-rider problem that can undo the separation. In these contexts, free riding means that low-quality producers gain an affiliation with the valued category/group. If this occurs, those evaluating the candidates in the market lose confidence that reliance on membership in the category/group is informative about quality.

The signaling mechanism prevents free riding. Although low-quality producers can invest in the signal, this investment is not free. Indeed, under the postulated inverse relationship between quality and the cost of exhibiting the signal, this is an expensive tactic. Self-interest therefore deters low-quality producers from investing in the signal because they will not expect to recoup their high costs (given that the payoff to the signal is the same for all who exhibit it). The collective reputation model must rely on another mechanism: collective action by the high-quality members of the group to prevent low-quality members from joining. But this mechanism encounters well-known problems when the group is large and dispersed (as for most markets). For instance, there is the so-called second-order free-rider problem: monitoring and sanctioning is costly for the individual doing it, and the gain is a public good for the group.

On this analysis, the category signaling mechanism will be more durable in market settings in which collective action by category members would be problematic. Nonetheless, the two mechanisms can interact.

The existence of a category signal of quality is a kind of collective reputation, one that is hard to acquire and fake.

Based on our analysis of the role of categories in market signaling, we examine two specific questions. First, can membership in a market category operate as a signal for quality? Second, is membership in a high-contrast category recognized as a stronger signal than membership in a low-contrast category? The first question relates to signal fit and focuses on whether membership in a market category is inversely related to the quality of the producer. The second question pertains to signal observability and requires that we examine whether the audience response in the market differs between members of the high-contrast and the low-contrast categories, particularly when category membership can be noticeably linked to quality.

3. Biodynamic and Organic Winemaking in Alsace

We now explore the potential analytic value of the notion of category signaling by delving into the case of Alsatian winemaking. Membership in the unconventional categories has spread rapidly in the region. In 1980, only one winery in the region was regarded as “biodynamic” and one as “organic.” By 2010, roughly half of the 142 wineries in our sample had joined one of these categories (30 “biodynamic” and 44 “organic”). We find this development interesting because adhering to the codes for membership in either category increases production costs considerably. It was not clear that the market would pay a premium for these wines or if they would have more than a fringe market.

The labels “biodynamic” and “organic” point to codified sets of practices. What are these codes? Both codes proscribe the use of fertilizers and pesticides. However, the code for biodynamics subsumes the one for organic production and goes further. It proposes a unified approach to agriculture that relates the ecology of the earth to that of the entire cosmos. Biodynamics sets itself apart from other agricultural systems, including organic farming, by its association with the precepts of anthroposophy developed by Rudolph Steiner in the 1920s. His teachings propose that the farm is a living organism. His code for biodynamic farming requires procedures including use of a set of preparations to promote healthy soil and plant growth (Steiner 2003), described in Table 1.

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Table 1 Codes of Biodynamic and Organic Farming

<table>
<thead>
<tr>
<th>Farming type</th>
<th>Characteristic/description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodynamic and organic</td>
<td>Excludes chemical fertilizers, excludes growth regulators, excludes genetically modified organisms, avoid risk of pesticide drifts from neighboring farms, long-term plan for maintaining soil fertility, monitoring suitable cleaning measures</td>
</tr>
<tr>
<td>Biodynamic only</td>
<td>Philosophical motivation, observation of lunar and other cosmic rhythms for crop cultivation, create biodiversity in the field, moderate or no use of SO₂, manual harvesting, manual selection</td>
</tr>
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</table>

Preparations used in biodynamic farming

- 500: Cow manure buried in cow horns in the soil over the winter
- 501: Ground quartz buried in cow horns in the soil over the summer
- 502: Yarrow flowers buried sheathed in a stag's bladder
- 503: German chamomile flowers sheathed in a cow intestine
- 504: Stinging nettles buried in the soil in the summer
- 505: Oak bark buried sheathed in the skull of a farm animal
- 506: Dandelion flowers buried sheathed in a cow mesentery
- 507: Valerian flower juice sprayed over or inserted in the compost
- 508: Common horsetail made either as a fresh tea or fermented liquid manure applied to the vines or to the soil

Although organic agriculture has become fairly mainstream, biodynamic production remains more esoteric. Its colorful and mystical practices mark a very strong turn from the scientific winemaking of the New World. Especially conspicuous is the use of several fermented “preparations” as field sprays and compost inoculants. These preparations consist of plant parts or extracts stored in animal tissues that have been buried in the soil. For instance, Preparation 500 is made by filling cow horns with manure from lactating cows fed with biodynamic grains, burying the horns in the vineyard on the autumn equinox, and digging them up on the spring equinox. Farmers then make very diluted liquids by combining about one teaspoon of the cured manure with 40–60 liters of water and stirring for one hour in a pattern that “dynamizes” it. The preparation is then sprayed on the vines in the descending phase of the moon. (Reliance on astral and lunar calendars for timing actions in the vineyard and the cellar is a hallmark of this approach.) Adherents believe that these preparations stimulate soil cycling, promote healthy plant growth and optimal compost development, and have myriad other beneficial effects.

Microbiologists and biochemists report mixed evidence about the impact of these unconventional methods. One study found that both improve soil quality over conventional cultivation, but soil parameters or tissue nutrients do not differ significantly between the two approaches (Reeve et al. 2005). A recent study comparing chemical profiles finds that the three methods of conventional, organic, and biodynamic do not yield different biochemical characteristics in grapes and wines (Tassoni et al. 2013). If viticultural science tells us that these methods produce similar or no improvements, we reason that the romantic, unique imagery of biodynamics and its apparatus of precepts could still serve as the basis for a very distinctive identity in the market.

3.1. Winemaking Practices and Quality

Issues of wine quality arise at least at two levels. First, there is what might be called abstracted quality. Here, the issues are mainly technical, including the following: is the taste clean and intense; are the acids balanced; how much minerality is detected; are flavor and aroma complex; and are there off smells, tastes, or reduction? The second level concerns contextualized quality. Here, the issues are more socially embedded and involve typicality and authenticity. They include whether the wine faithfully expresses the region’s identity and tradition, the winery’s terroir, and the winemaker’s style.

Quality depends on many decisions that outsiders cannot observe. These include how much care was taken in pruning and canopy management; how much was yield controlled; whether the harvest was timed appropriately; whether the grapes were properly sorted; how cold soaking was conducted; how fermentation, racking, and filtering progressed; whether anything (acids, sugar, oak chips or fluids, coloring agents, etc.) was added to the product; and whether the wine was ultra-filtered or put through reverse osmosis.

The producers know these facts; the rest of the audience does not. How a wine from a past vintage tastes can prove a useful guide for the audience to assess current quality. But producers change practices all the time in response to changes in climatic conditions or technical developments. Wine quality can only be assessed accurately in the act of consumption, and perhaps not completely (Nelson 1970, Darby and Karni 1973). This explains why critics have such importance as well as why information communicated through market signals has value for foretelling the quality of wines from new vintages.

Although quality depends on many actions and decisions that cannot be fully observed by outsiders, audience members scan for signals (Gulati and Higgins 2003). Wine critics actively engage in this role: they visit...
wineries and consultants, attend wine fairs and conferences, contact industry associations, and communicate with one another and with the larger audience. Through these mechanisms, critics learn about producers and their category membership. Wine customers learn about wine in similar ways. However, they tend to have less knowledge than critics. For this reason, in wine, like in other mediated industries (film, music, art, stocks, etc.), the assessments provided by critics represent another source of information for the choices of consumers.

4. Fieldwork
We conducted semistructured interviews with vigneron
from 23 wineries in 19 villages in Alsace in 2009 and
2010. The quotations in this section are drawn from
these interviews.6 The interviews allowed us to better
understand the process of joining the two unconventional categories. Because we knew less about them, we
targeted more biodynamic wineries, 14 in total. These
interviews provide some valuable insight into the core
issues from the producers’ perspective. They also help us
understand the applicability of our theoretical argument
to the empirical case.

4.1. Joining the Biodynamic and
Organic Categories
We learned that the initial turn to biodynamic and
organic production stemmed from a mix of intertwined
reasons, including making higher-quality wines that also
better reflect the terroir and protecting the environment.
Arguably, the experience of these dedicated producers
provided a plausible connection between these categori-
cal memberships and quality.

Many winemakers observed that chemical herbicides
and pesticides had killed organic life in the soil and had
diminished perceived wine quality. For instance, a wine-
maker in Turckheim focusing on the abstracted dimension said,

Chemical products and technology were a real miracle.
They helped the growers a lot in reducing the amount of
heavy-duty, physical work. It made it a lot easier, allowed
the growers to do more vineyard stuff, so to be more
productive, to lower the cost of a bottle of wine. Growers
like my father were told, “This is new, it’s modern, it
works, it doesn’t pollute, it’s clean,” all the stuff you
want to hear. It took years to realize that—oh, it was
supposed to help me, but, in fact, I’m getting more and
more diseases and more problems, and my soil has lost
its fertility.

Many also suspected that the degradation of the vine-
yards had lowered the quality of the wine. For instance, a vintner in Beblenheim recalled,

I was thinking we were wrong—we should turn to a better agriculture. We were destroying what is the foundation of everything. I saw some vineyards, tasted some

wines, and I thought, what could help me get more harmonious wines, more complex wines? The wines we
were producing before sold nicely, they had good reviews from [Robert] Parker. But I found that I liked less and
less what I was producing.

Others told us that they started to notice off-aromas in
the wine, increasing heaviness, less minerality, and the
loss of the ability of the wines to age properly.

The theme of contextualized quality also comes through strongly in our interviews, especially those with biodynamic winemakers. A vintner from Wintzenheim
said,

My objective is not to be biodynamic…[but] to make
the best wine from the place, from our soils, from
our terroir. And the icing on the cake is that it’s
biodynamic…because [this is] the more natural way
to reach this goal.

Another from Ammerschwihr agreed: “We have a
great terroir…. For us biodynamics…really allows the
terroir to express itself much better in the wine.” And
one from Epfig said,

Terroir is the key for great wines. There is no great wine
without terroir…this is why you move to biodynamics,
because you are convinced, because you have an environ-
mental consciousness, but also you can come to bio-
dynamics without any environmental consciousness because
biodynamics increases terroir in taste.

4.2. Costs of Category Membership
Organic and biodynamic codes impose higher costs than
those they replaced. Adopting either method rules out
the use of some labor-saving practices (e.g., the use
of herbicides to eliminate weeds as a substitute for
plowing). And biodynamic production also imposes dis-

tinctive actions, such as spraying with the famous prepa-
trations and elaborate procedures of composting.7

In our fieldwork, informants provided some informa-
tion on this issue (unless noted otherwise, all quotations
come from the field interviews described above). One,
from Wintzenheim, said, “[W]e earn less money than a
conventional winery because we have 20% lower yields.
We have 30% more handwork. In France, it costs a lot
of money. So for me to produce a bottle of wine, it costs
at least 50% more. But we cannot charge 50% more.”

And a biodynamic winemaker from Turckheim told us,

It’s not the organic and biodynamic estates that make the
higher profits, because we have higher costs, but the price
of the bottle is not that much more expensive. An organic
or biodynamic wine cannot be sold at 40% or 50% more
than a conventional wine at the same quality level, from
the same area and in the same style. We are maybe
less profitable…. I employ about seven more people per
hectare than the average in the area…for a bottle of wine
my labor cost is several times higher.
Our first question for signaling is whether the cost of the signal is negatively associated with quality. We think that there are good reasons for thinking that this is the case here. Both organic and biodynamic category codes bring viticulture closer to the traditional craft of farming but impose discipline. Escaping chemical pesticides requires great attention to the vineyard and skill in reacting to the appearance of pests. Wine writer Matt Kramer argues the case for biodynamics in particular, which requires elaborate manual procedures and organizing by multiple natural cycles:

Biodynamic cultivation signals a willingness to pay extreme attention to vines and wines. Like driving a race car, if you take your eyes off the road—or in this case a highly vulnerable vineyard—an irremediable disaster can result. Ask any farmer: attentiveness is always a good thing. Biodynamic processes are a form of discipline, some of which may actually work, while other practices may be more emotionally and psychologically sustaining to the practitioner than practical to the plant or wine. (Kramer 2010, p. 117)

### 4.3. Contrasts of Biodynamic and Organic Categories

Our second question is the extent to which the audience can notice the signal. Many consider the procedures of biodynamic viticulture unique, which makes them highly salient. A winemaker from Wintzenheim who joined biodynamics in 1996 said that many scoffed at these methods: “Early on, everyone was laughing at us. They were only waiting for us to have problems, to lose a harvest. But I knew what I was doing. I was sure. But these were hard times.” Farming biodynamically is visible. Another winemaker said, “A neighbor…told me in Alsatian dialect, ‘At your place, you really have grass for the rabbit.’ I mean, for him it was dirty because you had plants, herbs, and flowers in the vineyard.”

A leader in the biodynamic movement told us his reaction to a lecture by François Bouchet (who influenced many who converted to biodynamics): “I thought that’s a fantastic thing. It’s crazy, it sounds absolutely mad, but it was also quite fascinating and interesting.” It is precisely the unusual quality of its practices that makes this category stand out, that gives it high contrast. Adhering to a category that demands use of peculiar practices and incurs ridicule, in addition to greater amounts of time, plausibly signals a commitment to quality.

Relatedly, organic production can represent one step along the way to becoming biodynamic. As a result, the movement of higher-quality producers to biodynamic from organic will further lower the contrast of the organic category, as biodynamic production becomes regarded as the end goal.

In addition, a generic problem of organic foods is the lack of consistent interpretation of what is “organic.” Survey studies among European consumers suggest that nonconventional farming, particularly organic, is perceived as having benefits related to a series of values focused around health, safety, and ethical soundness (Torjusen et al. 2004). An international review that covers North America in addition to Europe draws similar conclusions (Yirode et al. 2005). However, the definition of “organic” recalls different labels, including “green,” “ecological,” “environmental,” “natural,” and “sustainable” (Hutchins and Greenhalgh 1995). This can lead consumers to choose products that do not, in fact, have the attributes implied by the label, and, as a consequence, it can lead to skepticism. In particular, in Alsace, the contrast of organic is lowered by its perceived overlap with lutte raisonnée (loosely translated as “the reasoned struggle”), which might be called sustainable farming. This competing code specifies minimal use of herbicides and pesticides. In Alsatian winemaking, this alternative is promulgated by an association called Tyflo, which encourages “a viticulture that preserves the environment, is economically viable, and protects the safety of consumers and producers.” (http://www.alsace-vintage.com/content/11-association-tyflo, accessed September 8, 2014; in French).

Theories of market signaling suggest that low-quality producers have an incentive to imitate market signals (Spence 2002). Lutte raisonnée appears to us to be such a case. This imitation blurs the boundary and lowers the contrast of the organic category. Its members face a problem: the adherents of lutte raisonnée claim to be “nearly organic.” We interpret the situation as one in which the sustainable producers have a partial grade of membership in organic winemaking. These partial memberships lower the contrast of organic. Their presence on the scene, as well as the attempts by their industry association to legitimate their nearly organic character, blurs the boundary of organic but, because of its sharper boundary and highly distinctive practices, not biodynamic. Indeed, “organic” and “sustainable” are often used interchangeably (Ministère de l’Agriculture 2011, European Commission 2012).

The claim to be nearly organic incites strong reactions to lutte raisonnée. For instance, the director of a large organic winery in Riquewihr said, “I’ve never met somebody who’s not at least raisonnée. Because if you are not, you are really a dirty bastard!” A biodynamicist from Epfig also objected: “Lutte raisonnée—it’s a big lie. It’s an invention from the conventional agriculture to give a smoke screen about the real practice and to produce some confusion with real organic practice.” Another from Pfaffenheim said, “We should call it pollution raisonnée. The solution was to say we do lutte raisonnée—they are organic but we are raisonnée, it’s almost like organic farming. That’s not true! It has nothing to do with organic farming.” These arguments about category contrast lead us to expect that membership in
the biodynamic category sends a stronger signal of quality in the Alsatian winemaking context.

The next section explains how we seek more systematic evidence of signaling in hazard data and critical ratings of quality and retail prices, and that differences in the critics’ tasting methods allow us to isolate the role of the signal from confounding influences. We expect that biodynamic wines will receive better ratings than organic wines when the evaluator knows the producer’s identity (and category membership).

We conduct empirical analyses to see whether this is the case. To be clear, we observed the main patterns in the average ratings by category before building models. The pattern suggested that a signaling interpretation might be warranted. This means that we cannot perform an independent test of the implications of the argument. At best, our empirical work speaks to its plausibility.

5. Statistical Analysis
In addition to the qualitative data from in-person interviews described in the previous section, our quantitative data come from three archival sources and a telephone survey.

The first archival source is Robert Parker’s Wine Buyer’s Guide. Parker is widely regarded as the world’s most influential wine expert (Hadj Ali et al. 2008). His guide compiles scores for wineries on a five-star scale, where five stars indicate the highest rating, producers that “make the greatest wine of their viticultural region, and [who] are remarkably consistent and reliable even in mediocre and poor vintages” (Parker 1993, p. 8). We constructed a time series of ratings from the seven editions of the guide.9 Because of its focus on wineries of high quality, we use this source to understand generalized winery quality. Our main ratings analyses focus on the next two archival sources.

The second source is the U.S. publication Wine Spectator (hereafter, WS), arguably the most influential wine guide internationally. Its online database contains tasting notes for Alsatian wines from the issues of February 1987. We compiled ratings and prices through August 2010. WS conducts blind tasting: its tasters and editors do not know who made the wine or how much it costs when they assign a score, but they do know some of the context including the vintage, appellation, and grape variety. Each editor generally covers the same wine regions from year to year, allowing lead tasters to develop expertise in a region. Other tasters might participate in blind tastings to help confirm impressions. However, the lead taster always has the final say.

The third source is Le Guide des Vins de France, curated by Gault et Millau. Starting in 1984, this guide (hereafter, GM) published special bulletins with general notes on leading wineries and price information for a few selected wines, but no comprehensive ratings. These early editions provide winery-level information, particularly price levels and the number of bottles produced. Starting in the 2003 edition, the guide began to provide comprehensive non-blind wine ratings. We coded label-level information in this and subsequent yearly editions through 2010. GM has considerable influence in France. Wineries often highlight the ratings received from the guide in the “pressrooms” on their websites.

Beginning with the 2007 edition, GM discusses category memberships. However, we lacked such data for earlier periods. Accordingly, we conducted a telephone survey in 2010 with informants from all the wineries with wine ratings in either guide, a total of 155 wineries. We asked about viticultural practice, particularly biodynamics and organics. We obtained such data for 142 of the 155 wineries. Our informants also indicated when they began bottling, which we use to determine the time at risk of conversion. We used these data to code memberships in the two nonconventional categories. We code the distinction between organic and biodynamic production as mutually exclusive: (organic) means “organic” but not “biodynamic” throughout. Because of the inherent ambiguity in adherence to sustainable, or lutte raisonnée, practices (with several producers claiming adherence and no strict method to ascertain these claims), we do not try to distinguish membership in this partially overlapping category. These producers are treated as part of the baseline, conventional category, in all analyses.

When we analyze the hazards of becoming biodynamic or organic as a function of a winery’s quality, we use three indicators of quality. The first measures the quality of resource endowments by the number of grand cru, the highest quality classification for a vineyard, in the winery’s portfolio. The other measures are experts’ assessments of the overall quality of a winery’s products. One is Parker’s overall ratings of wineries, described above. But Parker can review wines using blind or open tastings, and these ratings likely reflect some combination of quality and status. As an alternative, we use the average of WS’s blind ratings of a winery’s products by vintage.

When we seek to understand how critics and consumer audiences respond to category signals, we follow previous studies and characterize such response in terms of ratings assigned by specialized critics and of prices in retail markets (Shrum 1991, Hsu et al. 2009). Critical evaluations, the first type of response we analyze, yield an important type of audience reaction, because the critics constitute a crucial audience for experience goods such as wine.

We first examine ratings based on WS’s blind tastings, where category signals remain hidden. Members of the unconventional categories can receive similar evaluations to conventional producers if the intrinsic quality of the product does not change, or better evaluations in
these tastings only to the extent that they put more discipline into their work; that is, the investment in the signal is productive. One category will receive higher ratings than another only if its methods improve on the other’s.

We also examine ratings from GM’s non-blind tastings. Here, the taster knows the identity of the producer but not the wine’s price. When the evaluator knows producers’ identities, the category schemas enter directly in evaluations. One such schema is what wine journalist Matt Kramer calls site deference: “Less about where great wines come from and more how they are from” (Kramer 2010, p. 39). Knowledge of the context of production can shape perceptions of a wine as different. This is where biodynamics stands out more sharply because of the high contrast that results from the philosophical framework—that is, the unique practices (which precludes overlap with the other categories considered). The potential confusion of the boundary of (organic) created by the claims of members of the (sustainable) category also plays a part in making the identity of (biodynamics) more distinctive. Arguably, the blind tastings incorporate the abstracted quality dimension we described above. The non-blind tastings can also feature the contextualized dimension more explicitly.

GM presumes that its audience cares about the categories we study. It categorizes wineries as “conventional,” “organic,” or “biodynamic.” Given our emphasis on the distinctiveness of biodynamics, we find it interesting that it chose to symbolize (organic) with a generic leaf and (biodynamics) with a more distinctive crescent moon.

We consider the difference in tasting method as a unique opportunity to distinguish more clearly the signaling effects of category memberships. Inference depends on the counterfactual assumption that blind tastings by GM would provide the same patterns of association as recorded from the blind WS ratings. In general, we cannot verify that this is the case; our conclusions are therefore conditional on this assumption. However, we conducted additional analyses to validate our analytic strategy using a smaller sample of ratings data of blind and open tastings drawn from another archival source, as we explain below. These and other tests of the robustness of the ratings results are described in the next section.

To consider our second type of audience reaction, the consumer audience reaction, we examine retail prices in the American market using WS data. Categorical signals can affect prices in two ways: directly via audiences’ interpretations of the categories and indirectly via critical evaluations. Consumers have less domain knowledge than specialized critics. In the wine world, thousands of labels compete in the marketplace. Because clear and simple information has great value for consumers, signaling ought to operate in their market as well.

6. Results

6.1. Quality and Category Membership

We begin by examining the relationship between winery quality and transitions among categories. We examine the hazards of adopting the two unconventional codes and claiming affiliation with the associated categories during the period ranging from 1981, the first year of availability of winery scores from Parker, through 2010.10

We use lagged values of the three measures of each winery’s quality discussed in the previous section: number of grand crus, Parker’s ratings, and WS ratings.11 We control for the size of the operation, measured as the number of bottles produced (in thousands) using data from GM and WS and the telephone survey, and calendar year (set to zero in 1981), which controls for time effects including trends in the wine market. We include a left-censoring dummy equal to 1 for wineries in operation in 1981. The model analyzing the hazard of joining the biodynamic category includes a control for whether the winery had already become organic (six had done so); no winery moved the other way.

The strong and consistent finding is that the hazard of adopting biodynamics increases with winery quality, measured in each of the three ways described above (Table 2, columns (1)–(3)). In contrast, the effects of winery quality on the hazard of adhering to the organic code are negative but not statistically significant for all three measures of quality (Table 2, columns (4)–(6)). So, on average, the biodynamic wineries had higher quality than the baseline conventional category when they joined. This was not the case for (organic).

We think these results reinforce the interpretation of the reputational basis for efficient category signaling so long as the inverse relationship between quality and the cost of the signal persists. When the condition for a signaling equilibrium obtains and high-quality producers join a category, the information conveyed by the track record of numerous high-quality producers is consistent, and the signalers will succeed at having their quality signaled (Connelly et al. 2011). However, if the cost condition is not satisfied, then the process is purely reputational and we would expect to see lower-quality producers flock to the category to free ride on its valued signal. In unreported analyses we examined whether the hazard of adopting the biodynamic code becomes more prevalent, as following this code and adopting the label proliferates and the value of the signal becomes observable to the producers. In hazard models with interaction terms between the three quality measures and the time trend, we do not find the effects of winery quality to vary significantly over time. This is indirect evidence suggesting that some factor, likely the cost constraint, prevented an inflow of lower-quality producers. We also examined whether the hazards increase as the number of
biodynamic wineries increases, since collective reputation should decline with increasing group size because of free-riding problems. But we find no significant effects of the interactions between the indicators of winery quality and the number of biodynamic wineries in operation each year.

6.2. Effects on Critical Evaluations: Levels

We next address the category signaling question using ratings data and examine our second question: Does membership in a high-contrast category serve as a stronger signal than membership in a low-contrast one? We examine the ratings assigned to wines by GM and WS for the vintages from 1981 through 2008 (the most recent vintage covered by the publications at the time of writing). The analysis includes ratings of all dry white wines and excludes sparkling wines and red wines because they differ substantially in production processes and because only a small fraction of the high-quality producers make them. The data set generated from the two publications comprises 4,715 ratings from GM and 3,775 ratings from WS. The dependent variable is the critical rating of a wine on a 100-point scale.

The controls include dichotomous variables that identify wines made from old vines, vieilles vignes (VV), and vendange tardive (VT) or selection grains nobles (SGN) wines, two types of late-harvest wine. We include the lagged star rating in Parker’s guide to measure a winery’s vintage-to-vintage variation in quality and status. Alternatively, we include lagged scores in WS and GM ratings to control for variation at the level of the specific wine. All specifications also include fixed effects for vintages, as well as for the grape varieties from which Alsatian white wines can be made and, for each of the 51 grand crus, the sites judged by the French authorities as producing exceptional wines. Finally, we include the predicted hazards of joining (organics) and (biodynamics) obtained from the hazard analysis to control for time-varying propensity to invest in unconventional farming methods.

We take advantage of the difference in the method of evaluation used by the two sources to address our second question in two steps. First, are the categories productive? That is, do category members receive different evaluations on average when the evaluator does not know either the identity of the producer or its categorical membership? Second, do the results of non-blind tastings and blind tasting diverge as our argument suggests, such that the returns in ratings are substantially higher in non-blind tastings when wineries switch to biodynamic production than when they switch to organic production in non-blind tastings as compared with blind tastings?

We explore the productivity issue by analyzing the (blind) WS ratings. In both analyses we control for persistent differences stemming from endowments and winemakers’ skills in analyzing ratings by examining only within-winery variation over vintages. That is, we

Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Biodynamic</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect on the hazard of becoming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>−7.27*</td>
<td>−8.20*</td>
</tr>
<tr>
<td></td>
<td>(0.870)</td>
<td>(0.790)</td>
</tr>
<tr>
<td>No. of grand crus</td>
<td>0.612*</td>
<td>−0.105</td>
</tr>
<tr>
<td></td>
<td>(0.124)</td>
<td>(0.231)</td>
</tr>
<tr>
<td>Parker winery rating</td>
<td>0.318*</td>
<td>−0.065</td>
</tr>
<tr>
<td></td>
<td>(0.105)</td>
<td>(0.104)</td>
</tr>
<tr>
<td>Mean WS rating</td>
<td>0.205*</td>
<td>−0.074</td>
</tr>
<tr>
<td></td>
<td>(0.078)</td>
<td>(0.062)</td>
</tr>
<tr>
<td>Bottles produced</td>
<td>−0.002*</td>
<td>−0.002*</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Left censoring</td>
<td>0.422</td>
<td>−0.481</td>
</tr>
<tr>
<td></td>
<td>(0.392)</td>
<td>(0.342)</td>
</tr>
<tr>
<td>Year trend</td>
<td>0.063*</td>
<td>0.133*</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Already organic</td>
<td>2.74*</td>
<td>2.13*</td>
</tr>
<tr>
<td></td>
<td>(0.389)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Log pseudolikelihood</td>
<td>−37.1</td>
<td>−59.8</td>
</tr>
<tr>
<td></td>
<td>(41.6)</td>
<td>(40.0)</td>
</tr>
<tr>
<td>No. of observations</td>
<td>3,790</td>
<td>3,813</td>
</tr>
<tr>
<td></td>
<td>142</td>
<td>142</td>
</tr>
<tr>
<td>No. of producers</td>
<td>142</td>
<td>142</td>
</tr>
</tbody>
</table>

Note: Standard errors adjusted for clustering on winery are in parentheses. *p < 0.05.
use fixed effects at the winery level. This lets us examine the effects of changes in category membership; we compare a producer’s ratings after joining biodynamics or organics to its ratings before.

WS ratings rise significantly after a winery becomes a member of either unconventional category (column (1) in Table 3). The variables are labeled become biodynamic and become organic. In these analyses, we can further separate signal observability from signal credibility, that is, communicating a signal honestly (Connelly et al. 2011). Formal certification can serve as a measure of credibility. As one would expect, formal certification in either category does not matter in the blind evaluations (column (2) in Table 3). We cannot reject the null hypothesis that the effects of the two category memberships are equal ($X^2 = 0.13, p = 0.72$ with 1 df). Making the changes required to gain membership in either category is productive—it improves quality, but apparently not differently so.

Overall, this pattern conforms to the notion that membership in either category can serve as a categorical signal of quality. Moreover, these estimates suggest that critics and consumers do not have a “real” basis for preferring biodynamic over organic wine, at least according to the aesthetics of the WS tasters. Below we discuss supplementary tests conducted on blind tastings of another French publication, which shows that critics might not have a basis for preferring unconventional wines in general.

We turn now to the second issue of comparing effects of the category memberships in the non-blind GM ratings and the blind WS ratings. That is, we compare the effects of categorical memberships in columns (1) and (3) (and (2) and (4)) in Table 3. We see that the effect of membership in biodynamics is again positive and significant; indeed, the magnitude of this effect is nearly double that estimated from the WS blind tastings. Moreover, the effect of membership in organics is much smaller. Indeed, the effect of claiming adherence to this code is negative for the GM ratings. We see in column (4) that certification as biodynamic seems to amplify the positive effect for this category for the GM ratings. This pattern agrees with our expectations based on considerations of category signaling and contrast.

Our argument does not predict that the organic effect would be significantly negative in non-blind tastings. Although the effect is not stable in analyses of another set of evaluations presented below, in the Discussion section we speculate about what this might mean.

### 6.3. Effects on Critical Evaluations: Dynamics

It is natural to wonder whether the effect of membership in the categories remains stable over time. We address this issue by estimating dynamic models for ratings. We do so by including lagged ratings as covariates, which converts the specifications we have used to this point to growth models (see Tuma and Hannan 1984, Part III). (The lagged rating is not available for a wine’s first entry into the data, and so the number of cases and of wineries drop.)

Here, we face another choice on what variation to analyze. If we continue with fixed effects for wineries, we will learn how ratings differ after shifts in membership compared with before. But the audience is not static. So it seems more interesting to compare patterns of changes in ratings between those who become members with those who do not. This means analyzing both within- and between-winery variation. We do so using generalized estimating equations, which report average differences adjusted for values of covariates (including lagged dependent variables).  

Membership in the biodynamic category has a significant positive effect on changes in (blind) WS ratings, but membership in the organic one does not (Table 4, column (1)). This suggests the presence of general and continuing gains in quality from membership in the biodynamic category linked to vineyard and cellar management.

For (non-blind) GM ratings (column (2) in Table 4), the effect of biodynamic membership on change in ratings is again positive and significant, but the effect of

### Table 3: Effects of Category Membership on Ratings from Blind Tastings by Wine Spectator and Non-Blind Tasting by Gault et Millau (Ordinary Least Squares Estimates of Winery Fixed-Effects Regressions)

<table>
<thead>
<tr>
<th>Variable</th>
<th>WS (1)</th>
<th>WM (2)</th>
<th>GM (3)</th>
<th>GM (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>87.0</td>
<td>87.0</td>
<td>91.1</td>
<td>90.9</td>
</tr>
<tr>
<td></td>
<td>(2.35)</td>
<td>(2.35)</td>
<td>(6.05)</td>
<td>(6.04)</td>
</tr>
<tr>
<td>Become biodynamic</td>
<td>0.706</td>
<td>0.732</td>
<td>1.30</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>(0.232)</td>
<td>(0.249)</td>
<td>(0.444)</td>
<td>(0.444)</td>
</tr>
<tr>
<td>Become organic</td>
<td>0.860</td>
<td>1.148</td>
<td>-2.18</td>
<td>-2.06</td>
</tr>
<tr>
<td></td>
<td>(0.410)</td>
<td>(0.449)</td>
<td>(0.420)</td>
<td>(0.423)</td>
</tr>
<tr>
<td>Biodynamic certification</td>
<td>-0.123</td>
<td>1.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.308)</td>
<td>(0.594)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic certification</td>
<td>-1.38</td>
<td>-6.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.826)</td>
<td>(0.762)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parker winery rating</td>
<td>-0.018</td>
<td>-0.019</td>
<td>-0.171</td>
<td>-0.170</td>
</tr>
<tr>
<td></td>
<td>(0.080)</td>
<td>(0.080)</td>
<td>(0.103)</td>
<td>(0.103)</td>
</tr>
<tr>
<td>VV</td>
<td>0.243</td>
<td>0.239</td>
<td>0.131</td>
<td>0.135</td>
</tr>
<tr>
<td></td>
<td>(0.353)</td>
<td>(0.353)</td>
<td>(0.324)</td>
<td>(0.323)</td>
</tr>
<tr>
<td>VT/SGN</td>
<td>2.40</td>
<td>2.39</td>
<td>0.66</td>
<td>0.658</td>
</tr>
<tr>
<td></td>
<td>(0.211)</td>
<td>(0.211)</td>
<td>(0.226)</td>
<td>(0.225)</td>
</tr>
<tr>
<td>Year trend</td>
<td>0.011</td>
<td>0.18</td>
<td>-0.53</td>
<td>0.541</td>
</tr>
<tr>
<td></td>
<td>(0.089)</td>
<td>(0.089)</td>
<td>(0.223)</td>
<td>(0.233)</td>
</tr>
<tr>
<td>$R^2$ within</td>
<td>0.279</td>
<td>0.280</td>
<td>0.437</td>
<td>0.439</td>
</tr>
<tr>
<td></td>
<td>3.775</td>
<td>3.775</td>
<td>4.715</td>
<td>4.715</td>
</tr>
</tbody>
</table>
organic membership on change in ratings is negative and not significant. Moreover, formal certification as \( \text{'biodynamic'} \) amplifies the effect of self-claims to category membership.

These estimates imply that average quality ratings of the members of the two categories continue to diverge. That is, the difference increases with the duration of category membership. Moreover, some of this pattern appears to arise from category signals because the positive effect of the signal of biodynamic membership on change in ratings is much larger in open tastings (GM) than in blind ones (WS). In other words, the strength of the category signal increases over time. This seems plausible because the confusion effect of the sustainable category (the “category spanners”) has likely intensified as the size of its membership has grown.\(^{15}\)

The categorical signals therefore differ substantially, as predicted. In the case of non-blind tastings, the critics usually know the categorical memberships, so the signals work even when the winery does not seek and receive formal certification. There is some evidence that getting such certification amplifies the signal for critics.

### 6.4. Additional Tests on Ratings

One can wonder whether our findings hide specific differences between the rating sources or their rating systems. One way to support our argument more convincingly would be to find a single source that rates wines with both blind and non-blind tastings. Typically, critics rely on a single methodology to rate wines, which makes such a concern challenging to address using archival data. However, we did locate another influential French wine critic, the \textit{Revue du Vin de France}, which adopts a mixed tasting method. The \textit{Revue} publishes an annual guide with ratings obtained from open tastings and also publishes a second guide of lower-priced wines with ratings from blind tastings. Using this online archive, we identified 385 white wines from Alsace that were tasted twice, once openly and once blindly.

In Table 5 we report estimates of effects on the ratings—measured on a 20-point scale—of the wines from the \textit{Revue} data. As in Table 3, we include the category membership and controls for wines made from old vines, late harvests or selected grapes, Parker’s winery rating, a linear time trend, and the predicted hazards of becoming biodynamic and organic as covariates. The limited sample size does not allow us to add the fixed effects for vintages, varietal, and designated vineyards simultaneously. We include them stepwise. Column (1) reports estimates from the blind ratings, column (2) the non-blind ratings, and column (3) the non-blind ratings where we add the blind rating as an additional regressor. In this way, the effect of the signal ought to be isolated from the intrinsic features of the product (Negro and Leung 2013). Columns (1)–(5) include an additional dichotomous control for whether the wine comes from grand cru sites. Columns (4)–(6) add the fixed effects for vintage, varietal, and vineyard.

When the producer’s identity and thus the signal are hidden by blind tasting, neither category membership has a significant effect on the rating (column (1)). The difference in the effects for the two categories is also not statistically significant \( F = 0.40, p = 0.40 \). When the tasting is open and the signal noticeable, wines of biodynamic wineries receive 1.4-point higher ratings on average than conventional wines (column (2)). The effect is statistically significant and holds in the next specifications, in which we include the blind rating of the same wine as an additional regressor (column (3)) and when we add fixed effects for vintage (column (4)), varietal (column (5)), and vineyard (column (6)).

These supplementary analyses confirm the pattern of results we presented before. Wines made by producers in the biodynamic category receive higher ratings than conventional wines in open tastings, whereas wines made by organic producers do not. The fact that the wines made with unconventional methods do not have higher ratings in blind tastings might be surprising. Each critic might have a different taste. The productivity of the signal, however, is not essential to the signaling argument (Spence 1974, p. 21). More importantly, the effects of the biodynamic category signal are consistently positive.\(^{16}\)

### Table 4

**Effects of Category Membership on Changes in Critical Ratings (Generalized Estimating Equations Estimates)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>WS (1)</th>
<th>GM (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>86.2*</td>
<td>85.9*</td>
</tr>
<tr>
<td>Become biodynamic</td>
<td>(10.7)</td>
<td>(39.3)</td>
</tr>
<tr>
<td>Become organic</td>
<td>0.848*</td>
<td>1.79*</td>
</tr>
<tr>
<td>(0.210)</td>
<td>(0.530)</td>
<td></td>
</tr>
<tr>
<td>Biodynamic certification</td>
<td>0.297</td>
<td>−1.13</td>
</tr>
<tr>
<td>(0.443)</td>
<td>(0.586)</td>
<td></td>
</tr>
<tr>
<td>Organic certification</td>
<td>−1.39</td>
<td>0.297</td>
</tr>
<tr>
<td>(0.744)</td>
<td>(1.20)</td>
<td></td>
</tr>
<tr>
<td>Wine WS rating</td>
<td>0.136*</td>
<td></td>
</tr>
<tr>
<td>(0.014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wine GM rating</td>
<td>0.269*</td>
<td></td>
</tr>
<tr>
<td>(0.020)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VV</td>
<td>0.370</td>
<td>0.126</td>
</tr>
<tr>
<td>(0.393)</td>
<td>(0.449)</td>
<td></td>
</tr>
<tr>
<td>VT/SGN</td>
<td>2.57*</td>
<td>0.203</td>
</tr>
<tr>
<td>(0.202)</td>
<td>(0.355)</td>
<td></td>
</tr>
<tr>
<td>Year trend</td>
<td>0.427</td>
<td>−1.22</td>
</tr>
<tr>
<td>(0.405)</td>
<td>(1.51)</td>
<td></td>
</tr>
<tr>
<td>Wald ( \chi^2 )</td>
<td>1,592</td>
<td>2,182</td>
</tr>
<tr>
<td>No. of observations</td>
<td>2,413</td>
<td>2,557</td>
</tr>
<tr>
<td>No. of producers</td>
<td>71</td>
<td>113</td>
</tr>
</tbody>
</table>

Notes: The specifications include the same fixed effects and covariates as in Table 3. Robust standard errors are in parentheses. \(* p < 0.05.\)
6.5. Effects on Retail Prices

Finally we examine the effects of category membership for a different audience: wine buyers in the United States. As we insisted above, categories and category signals are specific to audiences. Just because membership in the biodynamic and organic categories might provide a market signal to critics, as our analysis suggests, does not mean that the general audience has yet adopted this categorical understanding.

We can gain some insight about the affect of these category memberships for one general audience by analyzing retail prices when the wines first appeared on the American market. Unlike the critics, the consumer audience does not necessarily know about actual practices but can easily learn about certification from widely posted lists of membership; from wine labels; and from guides such as GM, the respected *Hachette* wine-buying guide, and others. So we expect that certification will matter to American consumers. Including this analysis on retail prices allows us to understand the effect of changes in category membership in the supply and demand dynamics of the consumer market.

WS collects price information from retailers and producers. We adjusted nominal prices for inflation, dividing them by the consumer price index (1982 = 1). The distribution is skewed to the right, so we used the natural log transformation as the dependent variable. The modeling strategy followed closely that used to analyze critical ratings. One difference is that we added a control for critical scores obtained from WS to account for the impact of quality of the focal wine on prices. Because some prices for some wines were missing, the final data set covers 3,545 wines from 96 wineries.

Biodynamic and organic wines garner higher prices than conventional wines, net of the effect of WS ratings (column (1) in Table 6). The effects of the two memberships are nearly equal. Formal certification also affects prices significantly—positively for biodynamic and negatively for organic wines in the American market (see also Delmas and Grant 2014). These results also support our interpretation of the situation, that the stronger signal comes from membership in the category with higher contrast. The difference between the membership and certification effects for organic wineries (column (2)) suggests that the price premium falls when the buyers are more informed, particularly when wineries obtain formal certification in the low-contrast category, which makes their lack of connection with high quality more evident. The price regressions control for Parker’s wine ratings and the WS rating of each wine. The estimates indicate that the status accorded to a winery by

<table>
<thead>
<tr>
<th>Variable</th>
<th>Blind</th>
<th>Non-blind</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Constant</td>
<td>16.6*</td>
<td>14.2*</td>
</tr>
<tr>
<td></td>
<td>(0.663)</td>
<td>(0.551)</td>
</tr>
<tr>
<td>Blind rating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Become biodynamic</td>
<td>0.240</td>
<td>1.40*</td>
</tr>
<tr>
<td></td>
<td>(0.714)</td>
<td>(0.594)</td>
</tr>
<tr>
<td>Become organic</td>
<td>0.519</td>
<td>0.436</td>
</tr>
<tr>
<td></td>
<td>(0.620)</td>
<td>(0.515)</td>
</tr>
<tr>
<td>Parker winery rating</td>
<td>−0.156</td>
<td>−0.007</td>
</tr>
<tr>
<td></td>
<td>(0.107)</td>
<td>(0.089)</td>
</tr>
<tr>
<td>Grand cru site</td>
<td>0.789*</td>
<td>1.44*</td>
</tr>
<tr>
<td></td>
<td>(0.219)</td>
<td>(0.182)</td>
</tr>
<tr>
<td>VV</td>
<td>1.54*</td>
<td>0.553</td>
</tr>
<tr>
<td></td>
<td>(0.513)</td>
<td>(0.474)</td>
</tr>
<tr>
<td>VT/SGN</td>
<td>−0.483</td>
<td>0.568</td>
</tr>
<tr>
<td></td>
<td>(0.570)</td>
<td>(0.427)</td>
</tr>
<tr>
<td>Year trend</td>
<td>−0.034</td>
<td>0.034</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Vintage dummies</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Varietal dummies</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Grand cru dummies</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>$P^*$ within</td>
<td>0.091</td>
<td>0.227</td>
</tr>
<tr>
<td>No. of observations</td>
<td>385</td>
<td>385</td>
</tr>
</tbody>
</table>

Notes. Standard errors (adjusted for clustering on winery) are in parentheses. The specifications also include predicted hazards of becoming biodynamic and organic.

*p < 0.05.
Table 6  Effects of Category Membership on (Log) Retail Prices (Generalized Estimating Equation Estimates)

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.922</td>
<td>0.600</td>
</tr>
<tr>
<td></td>
<td>(0.678)</td>
<td>(0.694)</td>
</tr>
<tr>
<td>Become biodynamic</td>
<td>0.082*</td>
<td>0.067*</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>Become organic</td>
<td>0.074*</td>
<td>0.127*</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Biodynamic certification</td>
<td>0.051*</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.045)</td>
</tr>
<tr>
<td>Organic certification</td>
<td>−0.216*</td>
<td>−0.001</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>WS rating of focal wine</td>
<td>0.025*</td>
<td>0.025*</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Parker winery rating</td>
<td>0.041*</td>
<td>0.040*</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>VV</td>
<td>0.136*</td>
<td>0.137*</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>VT/SGN</td>
<td>0.673*</td>
<td>0.671*</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Year trend</td>
<td>−0.030</td>
<td>−0.017</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Wald $X^2$</td>
<td>15,904</td>
<td>15,480</td>
</tr>
<tr>
<td>Number of observations</td>
<td>3,545</td>
<td>3,545</td>
</tr>
<tr>
<td>Number of producers</td>
<td>96</td>
<td>96</td>
</tr>
</tbody>
</table>

Notes. Robust standard errors are in parentheses. The specifications include the same fixed effects and covariates as in Table 3. *p < 0.05.

Parker significantly increases prices in the U.S. market, as does quality measured in blind ratings. Again, the category effects hold net of these factors.

The estimated effect of biodynamic membership on retail price (column (1) in Table 6) implies that wines gain an 8% increment after conversion to (biodynamic). Taking account of the indirect effect on prices through the effect on ratings, the combined effect implies an increase of roughly 11%. The anecdotal evidence we collected suggests that conformity to this code increases a winery’s operational costs by at least 20%. The increase in prices barely goes to repay the associated higher costs of producing the categorical signal. Consistent with what our informants said, biodynamic practice likely reduces profits, at least in the short run.\(^{17}\) We suggest that winemakers value long-term gains in productivity, sustainability, and/or emotional benefits that are not reflected in current prices.

7. Discussion and Conclusion

Many highly regarded Alsation winemakers broke ranks with the highly technicized modern approach to winemaking and adopted the seemingly irrational methods of biodynamics without receiving a negative reaction in the market. Our effort to explain the pattern led us to think of category memberships operating as market signals. This conceptualization requires attention both to costs of membership and to category boundaries. Theories of market signals emphasize that signals provide information about quality (in equilibrium) when the costs of producing the signal fall with the producer’s quality. When the signal comes from membership in a social category, the strength of the signal increases with the contrast of the category.

We think that the conditions for category signaling hold in Alsation winemaking. Use of the two sets of unconventional methods is costly, but more costly (and risky) for less capable wineries. However, the biodynamic category has higher contrast than the organic one because of its many strange practices and its lack of overlap in membership with the “nearly organic” lutte raisonnée. So biodynamics, because of its crisper boundary, sends a stronger positive signal of quality than organic production.

Because critics and consumers see high-quality producers move to biodynamic production in the first place, the subsequent higher quality of biodynamic producers can operate as a “self-confirming belief”: incoming data in a feedback loop confirm the quality signal (Spence 1973a). However, the difference in reactions to organic wines in blind and open tastings seems striking, especially given that GM (the source of the open ratings) professes a commitment to supporting “natural wines.” This difference in blind and non-blind reviews for these two costly categories is interesting precisely because it suggests that the signaling power of the high-contrast biodynamic category matters more to reviewers than that of its organic counterpart.

In some analyses of blind tastings we find a negative effect of membership in (organic). Why? A first explanation for the divergence in the effects of organic viticulture on estimates of quality in blind and non-blind tastings points to a category reputation effect. But this would not have an obvious basis from our research. The hazard of adopting biodynamics was significantly higher for higher-quality wineries, and we did not find that the hazard of adopting organic production was significantly lower for the higher-quality wineries. If the pattern of findings about membership and critical ratings reflects only a reputation effect, then we would expect to find that the wineries that went organic were substantially lower in initial quality, which we do not. In unreported analyses, we observe additional patterns not consistent with a mere reputation mechanism: interaction terms between winery rating and biodynamic membership or between winery rating and the number of biodynamic wineries in operation do not significantly affect the ratings in open tastings; the variance of ratings measured in open tastings for biodynamic wineries does not decrease over time or relative to the variance of ratings in blind tastings.

Some have argued that the negative effect of membership in (organic) reflects a mark of discredit in wine
markets (see, for example, Asimov 2012). In fact, organics tends to be regarded with favor in the wine world. Consumer research shows that organic food is perceived as healthy and safe (Torjusen et al. 2004, Yirode et al. 2005). An online survey indicates that the majority of American respondents who had tasted organic wines had a positive opinion of their quality (Delmas and Grant 2014). The French government and the European Commission also explicitly favor the use of organic practices and define them as “good for nature and good for consumers” (European Commission 2010). The Gault et Millau publication from which we culled our data champions wines that are as close to natural as possible, and put organic in this group of “real” wines (in 2010, the editors published a guide focused on organic wineries). Finally, the effects we report are largely cleansed of fixed winery characteristics.

What does this mean for the interpretation of the greater positive effect of biodynamic production in non-blind tastings compared with blind tastings? If organic and biodynamic viticulture are roughly nonproductive or equally productive (as we see in the static analysis of WS ratings), the initial differences in category status would tend to weaken over time. But our estimates of the dynamic specification tell that the gap judged from blind tastings is growing over time. Taking account of lagged ratings, biodynamic wines—but not organic wines—improve significantly in quality over vintages. This suggests that the strength of the market signal of biodynamic wines relative to organic ones is not fading; it is increasing. We view this pattern as suggesting category signaling has been at work.

A final account involves heterogeneity within the audience. Our research design capitalizes on the difference in method of evaluation of different critics. In the main analyses, one tastes blindly and the other knows the identity of the producer at the time of tasting. We attribute differences in patterns of association from the two critical sources as reflecting only the difference in method. In other words, we rely on the counterfactual that the two sets of critics would produce the same pattern of association if they both used blind tastings. We cannot evaluate the plausibility of this counterfactual using these samples, and only replications can tell whether the process we identify empirically is robust.

In supplementary analyses we conducted such replication. Data from the *Revue du Vin de France* let us compare blind and non-blind ratings from the same source and establish two findings. In blind tastings, organic and biodynamic wines receive ratings similar to those of conventional wines; in non-blind tastings, we find higher ratings for biodynamics similar to the GM data, yet the penalty for organic wines disappears. These results reinforce the signaling interpretation but also underscore that the critics might diverge in their evaluations.

The effect of signaling can interact with differences in tastes. Although different members of the audience can interpret a category signal with high contrast as a mark of quality, taste preferences can generate variation in actual appeal. A critic such as the *Revue* might be less sensitive to the schema of site deference, an important component of the biodynamic identity. This would imply some advantage for biodynamic wines, although other categories such as *organic* could not attract enough attention. A critic such as GM might put more weight on the schema, and biodynamic wines would receive significantly higher ratings; organic wines would be viewed as their poor copies and, as such, unappealing. The effect of signaling can also interact with information provided to the audience, as we observe diverging patterns of the effects of certification on wine prices. When audience members are more informed, the signal of formal membership in a high-contrast category can sustain higher prices, because it clearly indicates producers of high quality. Prices fall for members of a low-contrast category plausibly for the same reason, as their signal does not indicate high quality. In both cases, we restate, the high-contrast signal is strong enough to be noticed. Future studies can study more closely whether category effects, individual attributes, and the market context explain variation in audience responses to category membership.

What, if anything, does the case of Alsatian winemaking tell us about the organization of markets generally? Processes involving concepts and categories have received much recent attention in several branches of sociology and organizational studies. In studies of markets, research now conceptualizes the dynamics of the interface of producers and audiences in these terms. Work on institutional fields, organizational forms, product classification systems, and social movements has been enriched by attention to categorical dynamics (for reviews, see DiMaggio 1997, Benford and Snow 2000, Hannan 2010, Negro et al. 2010b). This line of work shows that category boundaries are construed and controlled by the perceptions of audience members and that category-based processes have significant impact on market outcomes.

Our study on category signaling establishes three general connections to this literature. First, the signals conveyed by category membership help overcome information asymmetries that challenge the audience in screening producers of different quality. Second, membership in categories with sharper boundaries produces a more effective indicator of quality in the presence of multiple potential signals. That is, holding prior quality constant, a high-contrast category has a higher probability of operating as a market signal. Apparently unproductive actions indicating category membership do not affect the quality of a producer’s output. But they can
shape perceptions of the producers’ identities that signal quality, according to our interpretation. Third-party certification agencies and critics, who often meet with producers one-on-one, can monitor active participation and valid membership in this distinctive category. Thus, the category membership itself can provide a monitoring mechanism for the quality signal. Third, the histories of category members link signals to quality when the audience observes actions not readily understood as requiring high capability.

Some treatments of signaling generally stress intentionality: producers want to signal their quality and take actions accordingly. Like the theory’s original account, which argues that signals operate “by design or accident” (Spence 1974, p. 1), we do not put such strong reliance on intentions. What matters is that audience members come to associate quality with a practice that is hard to imitate for low-quality producers.

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Endnotes

1We use angle brackets to highlight our use of the category labels in the actual language of the domain and to differentiate them from the mere use of the adjectives.
2A signal need not but can be productive in the sense that adopting the signal improves performance. For a productive signal to operate effectively, the increase in productivity must be less than the cost of acquiring the signal (Spence 1974).
3Our argument relates more directly to Spence’s model than to others, particularly Podolny’s (1993) status-signal model. Spence begins with quality differentials and derives signals; Podolny begins with the status signal and derives differences in quality.
4A more specific example is the signal of compliance to fair-labor standards in the apparel industry. In the early 1990s, Nike and Reebok invested in factory standards in Indonesia that were superior to the local legal requirements. They hired auditors of the working conditions in their plants, but the audits were not accessible to outsiders. The companies gained credibility once they joined a coalition of other manufacturers, activists, and labor groups, which organized the audits.
5Terroir is a somewhat mystical French notion that refers to the unique combination of geographical, pedological, and climatic characteristics of a certain land.
6Most of the interviews were conducted in French. The quotations that follow are our translations.
7Cole’s fieldwork among Oregon wineries suggests that managing biodynamic vineyards costs 15% more than managing a sustainably farmed property, and hiring a consultant can cost a thousand dollars per visit. Certification is a few hundred dollars, and applicants also pay a licensing fee of 0.5% on gross sales. Cole (2011) notes, “For the same price, organic certification sounds like a safer bet” (p. 58).
8We refer to this category as both lutte raisonnée and sustainable throughout the remainder of this paper.
10Only one winery started using biodynamic methods before the start of the study period (in 1969), and one started using organic methods before the start of the study period (in 1970). We excluded both from the analysis of changes in categorical membership. Our informants suggested to us that these early conversions were somewhat unusual. The first biodynamic winemaker in the region was said to have converted because he had been poisoned by pesticides. A vintner in Pfaffenheim recalled that “he was blind for a week. He couldn’t see anything and so he said to himself, ‘I will no longer work with such products.”
11In additional analyses, we included shared frailties in the same model specifications to correct for unobserved winery characteristics. The patterns we found are similar to those reported, although the frailty parameters did not reach statistical significance. For ease of interpretation, we present estimates without such corrections.
13WS used a 100-point scale throughout. GM used a 100-point scale until 2007, then switched to a 20-point scale. For comparability we converted the latter to the 100-point scale. The median score is 87 for both GM and WS, and the fraction in the upper range is similar: the top 10% of wines receive a score of 90 or higher in GM and 91 or higher in WS. The publications differ somewhat in the lower range distribution: the value of the first decile in the GM ratings is 73 and 80 in WS.
14This method provides high-quality estimates of average effects that do not depend on the distribution of the unobservables (Zeger et al. 1988).
One reviewer also wondered if the observed effects might be driven by cultural differences between American and French critics, for example, the Americans like (organic), and the French like (biodynamic) and/or dislike (organic) because the Americans like it. We collected additional ratings on Alsation white wines from two sources, the Hachette guide in France and the Wine Advocate in the United States. Hachette uses blind ratings. On the Wine Advocate’s website (http://www.robertparker.com/info/legend.asp, accessed January 22, 2013), founder Robert Parker states, “When possible all of my tastings are done in peer-group, single-blind conditions.” Although this claim has been questioned, Parker explicitly describes two exceptions to tasting blind: “All specific appellation tastings where at least 25 of the best estates will not submit samples for group tastings,” and “all wines under $25.” Although the first condition is difficult to control for using the review data, the second is more tractable, and we coded the ratings for wines priced less $25. In analyses unreported for brevity, we modeled the wine ratings of the Hachette and Wine Advocate data. Hachette uses a 1- to 4-star rating system, and Wine Advocate uses a 100-point scale to rate wines. The specifications followed those in Table 3. One exception is the exclusion in the Wine Advocate sample of the late harvest variety—late harvest wines are normally more expensive, and the publication did not review any of these wines below the $25 price point. For Hachette, the estimates show that the membership in the two categories does not have significant effects on the ratings. The difference of the effects is also not statistically significant ($F = 0.34$, $p = 0.56$). For Wine Advocate, the ratings are higher than those of conventional wines for biodynamic wineries but not for organic ones. The difference between the two coefficients of the two non-conventional categories is statistically significant ($F = 6.01$, $p = 0.01$). These findings confirm the pattern of the main analyses as well as the supplementary tests of Table 5. Although the Wine Advocate data are somewhat less representative than the other samples, national differences between French and U.S. critics do not seem to confound the effects of category signaling.

In markets such as these, where competing producers sell differentiated products, (1) changes in prices that are proportionate to changes in costs and (2) stationary demand curves (i.e., firms are moving along the same downward sloping demand curve and not switching curves) result in decreasing profits (Dixit and Stiglitz 1977). Because the elasticity of demand exceeds 1, revenues as well as profits are lower.

References


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