

SUSTAINABLE MARKET LANGUAGE

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ABSTRACT. In markets of heterogeneous quality and asymmetric information, producers need to develop verifiable quality proxies in order to differentiate. In this paper we study the incentives of vertically differentiated firms to agree on sustainable meanings of unowned market language and standards. We find that high quality firms can sustainably differentiate even when there is no explicit barrier to challenging the standard. If the first best standard is unsustainable due to outside pressure, it may be distorted either up to soften its effect on the competition or down to co-opt the competition.

While the identification of the threshold for challenging a standard is problematic, roughly speaking, if distortion is necessary, a low threshold indicates loosening the standard, while a medium threshold indicates a tightening of the standard.

PRELIMINARY: DO NOT CITE

1. BACKGROUND AND MOTIVATION

In markets of heterogeneous quality and asymmetric information, producers need to develop verifiable quality proxies in order to differentiate. This paper focuses on a set of widely used but little studied proxies: those based on unowned commercial speech. The definitions of these proxies — the standards that underlie them — are governed either by general consensus on their meanings and relatively weak “truthtelling” regulations, or more explicitly, but still imperfectly, by industry association or governmental agency.

Examples of government or association controlled standards include: the marketing term “Organic,” various appellations of origin, the American “Energy Star” designation, “Green Building” certifications and a number of authenticity/definitional standards such as “ice-cream,” “cheese,” “low-fat,” “bourbon,” the German “vorläufiges Biergesetz”, Champagne (not simply an appellation), pizza, diamond, pearl, and so on. Examples of non-controlled standards include just about any descriptive term used in commercial speech that is not specifically regulated: “natural,” “green” (as a general descriptor), “sustainable,” “biotech,” “genetically modified,” “Chablis,” “Wagyu” or “Kobe” beef (in the USA particularly).

These proxies are attractive because they are cheap to use relative to owned quality proxies (i.e., trademarks), can involve commonly understood and used language (which removes trademark as an option) and may sidestep contentious rent-seeking issues with privately controlled standards. However, the lack of control means that they are subject to varying degrees of manipulation and change, depending, for example, on the value of the market, the opacity of the consumer relevant quality attributes — which is inversely proportional to the applicability of truthtelling constraints — and the ease of influencing an existing standard.

In this paper we study three key pieces to sustainable standards for market language. First, the per firm costs of publicizing or certifying quality information

can be lowered by spreading them over many firms. This gives rise to coalitions of producers — implicit or explicit — and relatively coarse partitions of the underlying quality space. Second, there is some stickiness in these standards such that once a standard is proposed, there is a threshold of harm (or benefit) that must be met before any challenge to the standard is addressed. This threshold can arise for a number of reasons, but the most likely are due to a belief that the standard adheres to the proxy’s “true” meaning, a political bias in favor of self-definition (as opposed to indirect definition by someone else’s standard) or a fixed cost of accessing the political process. This threshold then favors the self-definers, or “insiders” over the outsiders. Lastly, we assume that consumers use some updating mechanism based on their experience of the good in question so that the relationship between a proxy, its proposed standard and the relevant product quality under that standard are not necessarily immediately apparent. This means that the value of a standard may rise (or fall) as consumers update their beliefs, and thus the incentives to fight or coopt a standard may also change. For this paper we examine steady-state standards under instantaneous updating. This greatly simplifies the model while allowing us to highlight the basic problem of sustaining general and unowned standards.

1.1. Why is this important? Given that these quality proxies are widely used, consumers, producers and regulators need to know the incentives behind how the proxies are defined, whether they are stable and whether, if stable, they are first-best so that they can better form strategies for and beliefs about them. For example, if producers can correctly assess the long-term viability of a standard they may be able to avoid investing in proposed proxies that will quickly lose value. If consumers are aware that a proxy is unstable they may use a more intense and expensive updating technology in order to spot changes more quickly. Finally, regulators may be able to design standard setting mechanisms that are more sensitive to strategic action by the various interested parties.

The evolution in the USA of the food production technology standard “Organic” illustrates how these proxies can be manipulated. Initially, organic was a common language term employed by a relatively small group of producers and consumers. As more consumers became interested in organic products and the value of the market grew the designation became more formally defined, although not necessarily in a binding way, by competing private or governmental organizations. No one group controlled the term, which meant that essentially anyone could challenge the standard by putting forth their own interpretation. In an attempt to strengthen the meaning of “organic” and stave off creeping bastardization of the term, some American producers successfully campaigned to pass control of the Organic standard to the federal government, accepting some loosening of the standard to gain acceptance — a strategy of coopting some formerly non-organic producers into backing the standard. However, even this move has not stabilized the standard, as there are current proposals to weaken it further.

Even as a government controlled standard, the threshold for challenging “organic” has proven to be fairly low. Part of its vulnerability stems from its lack of a specific, commonly understood meaning: the proxy “organic” plausibly refers to a wide range of possible standards and therefore underlying quality.

Other proxies — like “cheese,” “low-fat,” “pesticide-free” and “GM-free” — are more subtly (to the consumer at least) disconnected from the attributes that they purportedly define because while they appear more specific, the sets of attributes

these terms have been applied to are quite large. Consumers often have a particular meaning in mind that they believe is “true” when they see these descriptors, but they are, nonetheless, potentially malleable proxies for the characteristics that we might wish these products to have.

We show that it is at least possible to define a proxy by a stationary, first best standard, and that if the first best is not sustainable, these standards may be distorted up or down in order to make it so. Roughly speaking, if the standard must be distorted, a low threshold forces a strategy of coopting the outsiders, while a mid-level threshold forces a “niche market” strategy of tightening the standard. The intuition is that if the threshold is low, insiders cannot profitably tighten the standard enough bring the effect on the outsiders in below the threshold, so the only option is to coopt them. As the threshold rises, cooption becomes more difficult because it reduces the ability of both insiders and outsiders to fight, but simply hiding the effect by tightening the standard becomes easier.

In the next section we introduce the basic market. In Section 3 we give some examples, discuss the application of the model, and explore the identification of the basic parameters.

2. THE MARKET

Time subscripts, excepting prior conditions at $t = -1$, will be suppressed because there is no ongoing dynamic in this market. All of the action takes place at $t = 0$.

2.1. Step -1 : Prior conditions. In the beginning, at $t = -1$, there is no consumer-observed differentiation. There is a uniform mass of quality differentiated, unit production firms $\bar{m} = m[0, 1]$. There is a uniform mass of consumers differentiated by quality taste, $\bar{\mu} = \mu[0, 1]$. The mass of firms is normalized to 1 and the mass of consumers is assumed strictly greater than 1: $\bar{\mu} > 1 = \bar{m}$.

Market participants observe all prices. Firms maximize profit equal to price, $\pi = p$, where production costs over quality are fixed and normalized to zero. Reservation profits for firms are zero so that if $p > 0$ then supply is $m[0, 1]$. Consumers’ utility is given by $u = \omega\beta_{-1} - p$ where ω is the type of the consumer and β_{-1} is the common prior belief of consumers about quality. Consumers also have a reservation utility of zero so that demand is given by $\mu\{\omega : \omega\beta_{-1} \geq p\}$, or, solving for the ω just indifferent between buying and not, $\mu[\frac{p-1}{\beta_{-1}}, 1]$. Market clearance implies that the equilibrium price p_{-1} solves $m[0, 1] = \mu[\frac{p_{-1}}{\beta_{-1}}, 1]$. Because the measure on consumers is assumed uniform, we can write $\bar{m} = \bar{\mu} \left(1 - \frac{p_{-1}}{\beta_{-1}}\right)$. Solving for price we have:

$$p_{-1} = \beta_{-1} \left(1 - \frac{1}{\bar{\mu}}\right).$$

This price gives the baseline profit for firms wishing to either prevent or induce differentiation.

We next characterize a steady-state differentiated market.

2.2. Step $-\frac{1}{2}$. For a given standard s_0 the market can be characterized by a vector of prices, supply inside and outside the standard, and demand inside and outside the standard. That is, $\{(p_L, p_H), L = [0, s_0], H = [s_0, 1], \mathcal{L} = [\underline{\omega}, \omega_0], \mathcal{H} = [\omega_0, 1]\}$. A consumer directly observes membership in H or L , but not the quality of firms in each group. The motivation for this is that a consumer can sample quality

in each group at some cost so that over time the true quality of each group will emerge. We assume in this paper that this cost is zero, so that beliefs are updated instantaneously. Updated beliefs β are then $\beta_L = E(q|L)$ and $\beta_H = E(q|H)$. The beliefs and underlying distribution of quality are such that $0 < \beta_L < s_0 < \beta_H < 1$.

If the equilibrium involves separation, i.e. $p_H > p_L > 0$, then:

$$\begin{aligned} m[0, s_0] &= \mu\{\omega : \omega\beta_L - p_L > \{\omega\beta_H - p_H \vee 0\}\} \\ m[s_0, 1] &= \mu\{\omega : \omega\beta_H - p_H > \{\omega\beta_L - p_L \vee 0\}\}. \end{aligned}$$

Given that utility has the single crossing property in type and quality we can write the market clearing conditions as:

$$\begin{aligned} (2.1) \quad m[0, s_0] &= \mu \left[\frac{p_L}{\beta_L}, \frac{p_H - p_L}{\beta_H - \beta_L} \right] \\ m[s_0, 1] &= \mu \left[\frac{p_H - p_L}{\beta_H - \beta_L}, 1 \right]. \end{aligned}$$

Lemma 2.1. *If a set of prices $\{p_L, p_H\}$ exists to solve equations 2.1, then $p_H > p_L > 0$.*

Proof. By assumption, $\mu[0, 1] > m[0, 1]$ and by definition an interior standard s_0 implies that $m[0, 1] > m[s_0, 1]$ which in turn implies that $m[0, s_0] > 0$. Let $m[s_0, 1] = \mu[r, 1]$, then $r > 0$. Let $m[0, s_0] = \mu[b, r]$, then $0 < b < r$.

Because $\beta_H > \beta_L$ and

$$\frac{p_H - p_L}{\beta_H - \beta_L} > \frac{p_L}{\beta_L} > 0,$$

it must be true that $p_H > p_L$ for any interior standard. \square

We solve for prices from the market clearing conditions $\mu[\mathcal{L}] = m[L]$ and $\mu[\mathcal{H}] = m[H]$:

$$\begin{aligned} p_L^*(s_0) &= \beta_L \left(1 - \frac{1}{\bar{\mu}} \right) \\ p_H^*(s_0) &= p_L^* + \left(1 - \frac{1 - s_0}{\bar{\mu}} \right) [\beta_H - \beta_L] \\ &= \beta_H \left(1 - \frac{1}{\bar{\mu}} \right) + \frac{s_0}{\bar{\mu}} [\beta_H - \beta_L]. \end{aligned}$$

2.3. Step 0. Given the market clearing prices for differentiated and undifferentiated markets, we proceed to study the preferences of firms over standards. Profits are given in continuous time. The total cost of setting up an unopposed standard is given by a lump sum cost payable at $t = 0$ of c . The per firm cost is then c divided by the measure of firms using the standard $m[s_0, 1]$. Profits for the undifferentiated case, the high interval and the low interval, are, respectively:

$$\begin{aligned} \pi_{-1} &= \int_0^\infty p_{-1} e^{-rt} dt = \frac{1}{r} p_{-1} \\ \pi_H(s_0) &= \int_0^\infty p_H^*(s_0) e^{-rt} dt - \frac{c}{m[s_0, 1]} = \frac{1}{r} p_H^*(s_0) - \frac{c}{m[s_0, 1]} \\ \pi_L(s_0) &= \int_0^\infty p_L^*(s_0) e^{-rt} dt = \frac{1}{r} p_L^*(s_0). \end{aligned}$$

As discussed above, there is the per firm threshold for either opposing or supporting a particular standard. This threshold is denoted by $\bar{\theta} > 0$. The problem of creating sustainable standards is then for insiders to maximize profit subject to the following constraints:

- (1) the insiders prefer to differentiate then not,

$$\pi_H(s_0) - \pi_{-1} \geq 0; \text{ and either}$$

- (2) (a) the loss to the each outsider is less than the threshold $\bar{\theta}$,

$$\pi_{-1} - \pi_L(s_0) \leq \bar{\theta}, \text{ or}$$

- (b) the total net gain to the insiders is greater than the loss to outsiders, which is positive,

$$m[s_0, 1][\pi_H(s_0) - \pi_{-1} - \bar{\theta}] \geq m[0, s_0][\pi_{-1} - \pi_L(s_0) - \bar{\theta}] > 0.$$

Note that $\bar{\theta}$, and any expenditure on political influence is only a potential cost. Because there is no uncertainty, so that the outcome of any political battle over a standard will be known a priori, the agents will avoid this cost. Formally, the problem for insiders is:

$$\max_{0 \leq s_0 \leq 1} \pi_H(s_0) \text{ s.t Constraints 1 and 2}$$

The unique, unconstrained solution is $s_0 = 1 - \sqrt{2cr}$.

We use the constraints to look for r , $\bar{\mu}$, c and $\bar{\theta}$ such that the profit maximizing standard is unconstrained and sustainable.

We let the prior belief of quality match the expected value of quality, $\beta_{-1} = \frac{1}{2}$.

The first constraint, that insiders want to differentiate, establishes an acceptable interval for the standard that widens as the discounted cost of information dissemination falls:

$$\frac{s_0(1 - s_0)}{2} \geq cr$$

Or,

$$(2.2) \quad \frac{1}{2}(1 - \sqrt{1 - 8cr}) \leq s_0 \leq \frac{1}{2}(1 + \sqrt{1 - 8cr}).$$

Substituting the unconstrained optimal standard into the constraint shows that the discounted cost of information must be below a critical value in order for firms to want to differentiate:

$$\frac{1}{8} \geq cr.$$

As we are primarily interested in firms' strategies in differentiation we assume that this condition is met.

Constraint 2a, that the individual loss to the outsiders is less than the threshold of protest $\bar{\theta}$, places a lower bound on s_0 :

$$1 - \frac{2\bar{\theta}r\bar{\mu}}{\bar{\mu} - 1} \leq s_0$$

Again, substituting in the unconstrained optimum yields:

$$(2.3) \quad \sqrt{2} \leq \frac{1}{\bar{\theta}} \sqrt{\frac{c}{r}} \left(1 - \frac{1}{\bar{\mu}}\right).$$

Constraint 2b, that the combined gain of the insiders net of the threshold is greater than the combined loss to the outsiders, again establishes an acceptable interval for the standard:

$$\frac{s_0(1-s_0)}{2\bar{\mu}} \geq cr + (1-2s_0)\bar{\theta}r.$$

Or,

$$\frac{1}{2}(1 + 4\bar{\theta}\bar{\mu}r - \sqrt{1 - 8\bar{\mu}r(2\bar{\mu}r\bar{\theta}^2 + c)}) \leq s_0 \leq \frac{1}{2}(1 + 4\bar{\theta}\bar{\mu}r + \sqrt{1 - 8\bar{\mu}r(2\bar{\mu}r\bar{\theta}^2 + c)}).$$

Substituting in the optimum standard and isolating $\bar{\theta}$ yields:

$$\sqrt{2} \leq \frac{\sqrt{cr}(1 - \sqrt{2cr})}{\bar{\mu}(cr - (1 - 2\sqrt{2cr})\bar{\theta})}.$$

As (will be) illustrated in Figures X, the model shows that anything is possible. The insiders' unconstrained standard may be sustainable. The standard may be distorted upward to push losses to outsiders below the threshold. The standard may be distorted upward or downward to push total net losses to outsiders below the total net gains to insiders. A sustainable standard may not exist. In the next section we give examples of each possibility, discuss the identification of parameters and apply the model to some current standards.

3. APPLICATION/DISCUSSION

If constraint 2a or 2b is met, then the insiders will choose $s_0 = 1 - \sqrt{2cr}$ as their preferred, sustainable standard.

Proposition 3.1. *Unconstrained standards exist for any $\bar{\theta} \geq 0$.*

3.0.1. *Constrained Examples.* Let $\bar{\mu} = 2.6$, $c = .5$, $\bar{\theta} = 1$ and $r = .1$. The unconstrained optimum is $s_0 = .68$.

Constraint 1 is met for $s_0 \in [.11, .89]$, Constraint 2 is met for $s_0 \in [.675, 1]$ and constraint 3 is met for $s_0 \in [.51, 1]$.

The standard is unconstrained at $s_0 = .68$.

Let $\bar{\mu} = 1.1$ and $r = .1$. The constraints are

$$c \leq 1.25 \quad \text{and either:}$$

$$\bar{\theta} \geq .2\sqrt{c}$$

or

$$\bar{\theta} < .2\sqrt{c} \quad \text{and } \bar{\theta} \leq \frac{1.9c + c^{3/2} - 2.03\sqrt{c}}{1 - .89\sqrt{c}}$$

A sustainable, unconstrained optimal s_0 occurs, for example, where the threshold is relatively large, at $c = 1$ and $\bar{\theta} = .5$, thus precluding opposition, or at relatively low cost of information and low $\bar{\theta}$, so that the value to the insiders is high.

If either of the latter two constraints are not met by the preferred standard $s_0 = 1 - \sqrt{2c}$, then the insiders may be able to meet the constraints by distorting the standard either up or down.

3.1. Parameters. The threshold parameter $\bar{\theta}$ measures the cost of engaging in a fight over standards. That is, it sets the cost to both challenging and defending insider rights to set standards. Because this cost is invoked only if a challenge occurs, the threshold can be interpreted as a “property rights” parameter, where higher $\bar{\theta}$ implies greater deference to those producers directly promulgating the standard. It can also be interpreted as a measure of how strongly truth-telling constraints apply. If the standard is strongly tied to the meaning of the proxy then it should take a large effort to change the standard. Lastly, the threshold parameter can be interpreted as an inverse measure of the visibility of the differentiation to the outsiders as a problem that they need to address.

Generally speaking, the more valuable the market is to the outsiders, the greater the threshold $\bar{\theta}$ must be to stave off either distortion or total collapse. Market value is increasing in the mass of consumers relative to producers $\bar{\mu}$ — which increases the marginal utility of quality for the marginal consumer, which in turn determines the marginal value of quality to outsider firms.

Note that control over the standard need not be total in order for the insiders to achieve the unconstrained optimum.

The interest rate effectively raises both the threshold and the cost of information relative to the value of the market. This means that as r rises, the loss to outsiders increases because the optimal standard falls, but it also means that they are less likely to protest for a given $\bar{\theta}$.

For low interest rates the threshold is either constant at zero or increasing in the interest rate. Because a low interest rate implies a low relative cost of information, a low interest rate means a relatively high standard. The net gain to insiders will then outweigh the loss to outsiders so that if $\bar{\theta} = 0$ then each individual outsider wants to fight — constraint 2a is never satisfied — the outsiders as a whole know that they would lose that fight — constraint 2b is. As the interest rate increases, pushing the optimal standard down, the loss to outsiders becomes relatively more substantial so that the minimum threshold needed to block a challenge is also increasing. While the threshold affects both parties’ ability to fight, the greater value of the market to insiders this means that an increase in the threshold is more inhibiting on the outsiders.

For a high enough interest rate the constraint on individual losses (2a) becomes relevant because the effective threshold becomes high enough to block individual incentives to fight. Once this occurs, the minimum threshold needed for a sustainable unconstrained standard is decreasing in the interest rate because the effect of r on the threshold is linear and the effect on the standard is from a square root: the threshold effect dominates.

Finally, increasing the cost of information changes the relationship between the total gains and losses in much the same way that the interest rate does, by lowering the optimal standard. Again, for low costs the minimum threshold necessary for an unconstrained optimum is either zero or increasing as c increases. For high c constraint 2a becomes relevant. But because the relative threshold is constant, only the individual loss, through decreasing standards, is affected, so that the minimum threshold needed for an unconstrained standard is still rising.

All of this suggests that insiders would back any substantial increase in the threshold, such as moving from a completely unregulated standard to a government sponsored standard.

Interestingly, this was one of the claimed reasons for American organic producers backed a national organic standard. However, it has been clear that even if shifting to a federal standard did increase the threshold for intervention, it did not do so enough because the standard is still being pulled downward. This suggests that the final interpretation of $\bar{\theta}$ as a visibility parameter might also be relevant. That is, by consolidating all of the state and private standards, the organic producers raised the visibility of their differentiation — another stated goal, at least in terms of visibility to consumers — thereby offsetting any increase in $\bar{\theta}$ from higher costs of engaging the federal bureaucracy.

3.2. Constrained Standards. The relationship between constrained standards and the parameters is more complex.

Proposition 3.2. *Standards can be distorted up or down by the sustainability constraints.*

3.2.1. Example: coopting the opposition/loosening the standard. Let $\bar{\mu} = 2.5$, $\bar{\theta} = .2$, $c = .5$ and $r = .1$. The unconstrained optimum is $s_0 = .68$.

Constraint 1 is met for $s_0 \in [.11, .89]$, Constraint 2 is met for $s_0 \in [.94, 1]$ and constraint 3 is met for $s_0 \in [.58, .63]$.

The constrained standard is then $s_0 = .63$. In this case the insiders optimally reduce the standard in order to bleed off opposition to the standard. Note that distorting the optimal standard will make the remaining outsiders worse off.

3.2.2. Example: softening the effect/tightening the standard/niche. Let $\bar{\mu} = 2.6$, $\bar{\theta} = .4$, $c = .5$ and $r = .15$. The unconstrained optimum is $s_0 = .61$.

Constraint 1 is met for $s_0 \in [.18, .82]$, Constraint 2 is met for $s_0 \in [.8, 1]$ and constraint 3 is never met.

The constrained standard is then $s_0 = .81$.

Let $\bar{\mu} = 2.6$, $\bar{\theta} = .1$, $c = .5$ and $r = .2$. The unconstrained optimum is $s_0 = .68$.

Constraint 1 is met for $s_0 \in [.28, .72]$, Constraint 2 is met for $s_0 \in [.61, 1]$ and constraint 3 is met for $s_0 \in [.78, 1]$.

The constrained standard is then $s_0 = .61$. In this case the insiders optimally increase the standard in order to soften the effect on the outsiders. Note that this will make the undistorted outsiders better off, and the switched outsiders worse off.

The constraints are only binding at a relatively low threshold, if at all.

As noted there are three possible cases of for binding constraints: the standard is tightened in order to keep the loss to outsiders under the threshold; the standard is tightened to keep the total net loss to outsiders less than the total net gain to insiders; and the standard is loosened to keep the total net loss to outsiders less than the total net gain to insiders.

Roughly speaking, the incentive to loosen the standard rather than tightening it occurs at relatively low thresholds. When the threshold is low, the standard cannot profitably be tightened enough to make it bind, in part because profit to the insiders drops off steeply at higher standards.

Tightening the standard is most applicable for an intermediate threshold. As the threshold rises, the minimum standard that meets constraint 2a falls, and the minimum standard that meets constraint 2b rises (or disappears entirely).

3.3. Political Economy Notes. We suspect that one reason that economists have not extensively studied these unowned proxies is that while we have developed a

small but far-reaching set of market and property based models, political economy models are still often too general to draw illuminate specific problems, or to ad hoc to draw general conclusions from. This model attempts a middle path.

One important assumption here is that the challenge to a standard by the outsiders is presented as a unite front. A more nuanced approach would be to divide these outsiders into hopeful prospective insiders and clear outsiders. The model as presented implies that the only influence outsiders have is to prevent any standard from forming. This can be justified if we consider that with continuous time many standards could be proposed and blocked in any arbitrarily small amount of time. This implies that by avoiding a more complicated model of influence, we have not in principle blocked counterproposals.

3.4. Further study. This paper is the first part of a look at how unowned standards evolve over time. The second part allows for a more realistic learning dynamic where consumers update their beliefs about the standard more slowly.

This allows for cyclical standard setting, where a group of insiders sets a standard which gains value slowly. This also implies that the cost to outsiders evolves slowly, which means that any challenge to the standard may take some time to emerge. This appears to be a general theme for these unowned proxies. First, a group of relatively high quality insiders develop a proxy. As consumers learn about the proxy the effect on outsiders grow, which gives them the incentive to challenge it. If the proxy would be successfully challenged the insiders may either loosen or tighten the standard in response. And finally, as the new standard is learned, the original insider group may reform around a new proxy and the process repeats itself.