Signaling Theory in Credence Good Markets: The Need for Third-Party Certification

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Introduction

In the past, a person could walk into a grocery store and pick out food based on looks and prices because basically an apple was an apple, a chicken was a chicken, and a pound of beef was a pound of beef. This meant that the consumer was able to assess the quality of their food stuffs and was responsible for making purchases accordingly. This is no longer the case. Today, people are concerned with many attributes of their food: pesticide residue, animal-welfare, labor conditions, carbon footprint, etc. It is therefore possible to think of food as a bundle of n-attributes and often times consumers are willing to pay extra for goods with more attributes.[1] With this in mind, many producers have begun labeling their foods with information about attributes in order to receive a price premium from consumers.

People often believe that more information is unquestionably desirable because consumers with more information make decisions that are better aligned with their preferences thus maximizing their welfare. However, this assumes that consumers are machines who infallibly process limitless amounts of information at no cost. Put this way, the notion that increasing information always leads to higher benefits is problematic. Signals are one way producers can aid consumer evaluation of information because signals allow consumers to find and process information at lower costs. In markets where information is not easily found, producers can use labels as a signal to tell consumers the attributes of a good.

It is possible to distinguish three attribute types for a good. These attributes influence whether or not simply providing more information will be beneficial to the consumer. First, there are search attributes, those which can be discovered prior to the purchase of a product.[2]

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[1] K. Giannakas (2001). Information asymmetries and consumption decisions in organic food product markets. *Canadian Journal of Agricultural Economics* 50: 36.

[2] M.R. Darby, and E. Karni (1973). Free Competition and the Optimal Amount of Fraud. *Journal of Law and Economics* 16 (1): 68.

Some examples are the color of a car or the ripeness of an avocado. Second, there are experience attributes which cannot be discovered before purchase but are easily realized after purchase; for example the taste of a particular food or the content of a newspaper.[3] Finally, credence attributes are those which cannot be easily determined even after purchase. One example of a credence attribute is animal-welfare; when people buy meat they do not know, even after purchase, how the animal was raised and whether it was treated humanely.[4] Providing more information on search and experience attributes is generally helpful for consumers because they can easily verify whether or not the information is true. For credence attributes, the cost of verifying information is high so consumers do not know if the information they are given is true.[5] Because of the credence nature of many attributes of food products, the market is characterized by information failure due to for-profit firms' provision of labels with misinformation; this failure can be corrected by a trustworthy signal which can come from the government or third-party non-profit organizations.

The rest of this paper will continue as follows. First, a model will be developed under the assumption of perfect competition which segments food markets by attributes. In the next section, the perfect information assumption is relaxed and I will explain why the market is likely to collapse when consumers cannot identify the different product attributes. In this case, for-profit firms are found to provide false information whenever the marginal cost of doing so is less than the marginal benefit of the misinformation, as measured by the price premium.[6] The third section will explain how a label verified by a third-party audit can act as an effective signal to consumers. However, even an audited label will fail as a signal when for-profit firms provide it.

[3] Ibid.
[4] Ibid.
[5] Ibid, 69.
[6] Ibid, 73.

Therefore, the fourth section will discuss the role the government and non-profits can play as third-party label verification providers.

Segmented Food Markets

Food with more quality attributes is generally more costly to produce; for example the producer has to pay his laborers higher wages, or has to avoid the use of pesticides and find costlier solutions, or has to own more land so that his animals can be pasture fed. Therefore, a producer will only sell food with more attributes if the marginal benefit of the attribute – measured by the price premium – is greater than the marginal cost.

In this paper I will focus specifically on environmental attributes that a food can have, but this analysis could be reasonably expanded to most attributes for which consumers are willing to pay a premium. Many studies find that consumers are willing to pay more for environmentally-friendly foods. Loureiro, McCluskey, and Mittelhammer (2002) found using a double-bounded logit model that customers will pay about 5 cents per pound above the conventional price for eco-labeled apples.[7] A 1995 report put out by the Food and Agriculture Organization of the United Nations (FAO) states that organic food regularly receives premiums exceeding 20%.[8] Vogel (1995) claims that in the 1990s dolphin-safe tuna was receiving a premium of $400 per ton.[9] These higher prices induce producers who can create attributes at a low enough cost to sell food with more attributes.

Consider the market for a single good. Some producers sell this good with attribute A and some sell it without. If consumers have perfect information and thus are able to distinguish

[7] M.L. Loureiro, J.J. McCluskey, and R.C. Mittelhammer (2002). Will consumers pay a premium for eco-labeled apples? *The Journal of Consumer Affairs* 36 (2):214.
[8] Food and Agriculture Organization of the United Nations (FAO) (1995). Organic Agriculture. Dec. 2009. Retrieved from http://www.fao.org/unfao/bodies/COAG/COAG15/X0075E.htm
[9] D. Vogel (1995). *Trading Up: Consumer and Environmental Regulation in a Global Economy* (Cambridge: Harvard University Press), 115.

between the products with attribute A and those without before purchase some will pay a premium for the high-attribute good. The consumers' willingness to pay causes the market to segment into two separate markets, as shown in figure one. The supply curve for the high-attribute good is above the low-attribute supply curve because high-attribute production costs are higher. This makes P_H greater than P_L; the difference is the price premium.

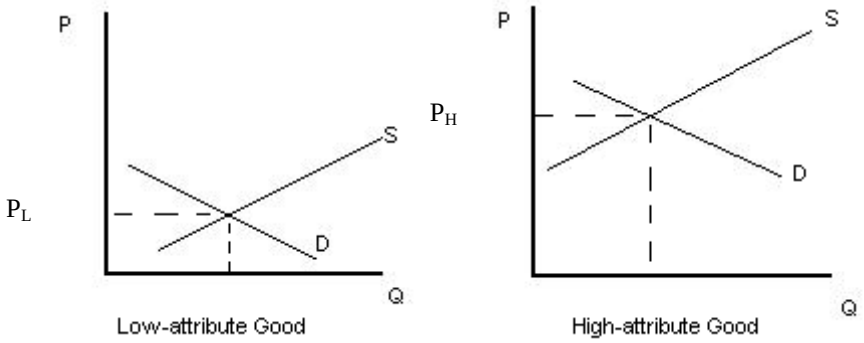

Figure 1

In the market for the low-attribute good, buyers who do not care about or cannot afford to care about attribute A interact with sellers who produce the good without said attribute. In the high-attribute good market, buyers who demand attribute A and are able to pay for it buy from sellers who produce the good with this additional attribute. These two goods are close substitutes; an example would be conventionally-raised beef and beef from humanely-raised cows. This substitutability keeps the price of the high-attribute good from getting too high. It would be straightforward to expand this analysis to include more levels of the attribute which would result in more segments.

This theory of a segmented market is based on the assumption of perfect information; consumers know which goods have a certain attribute and which do not. Relaxing this assumption slightly: in markets where information regarding attributes can be obtained at low cost to consumers, segmentation will still occur. The more interesting case is when consumers

are not easily able to obtain information about the attributes a product has. The next section explores this idea.

Imperfect Information and Lying

Most food products have credence attributes; those which cannot be verified by the consumer even after consumption except at very high cost. For these attributes, consumers have to rely on the producer to provide the information in a low-cost format. A firm has the incentive to voluntarily provide any information that increases its marginal revenue more than the marginal cost of providing the information.[10] As discussed above, firms can receive a premium for food with environmental attributes, so at least some firms will make such attributes available.

These informative labels act as a signal to consumers about whether or not a good has a certain credence attribute. Spence (1973) shows that for a signal to be effective the cost of obtaining the signal must be inversely related to the value of the signal.[11] Those firms that value the attribute more must be able to produce it at a lower cost. A second requirement for a credible signal is that it must be costly-to-fake. The marginal cost of faking must be higher than the marginal benefit of not faking. In food markets this means the cost to mislabel must be higher than the price premium received for labeling.[12]

Figure 2 illustrates how an efficient signal works. Group 1 (G_1) firms can produce attribute A, shown on the horizontal axis, more cost-efficiently than group 2 (G_2) firms. This is why the G_1 cost curve lies below the one for G_2. The vertical axis shows price as a function of the level of attribute A. There is some quantity of attribute A, a*, for which consumers are willing to pay a premium. Each firm group selects the level of A that maximizes their net benefit – the difference between the price they will receive for A and the cost of producing A. In figure

[10] E. Golan, F. Kuchler, and L. Mitchell (2001). Economics of Food Labeling. *Journal of Consumer Policy* 24: 119.
[11] M. Spence (1973). Job market signaling. *Quarterly Journal of Economics* 87 (3): 358.
[12] R.H. Frank (2008). *Microeconomics and Behavior* (7th ed.). (Boston: McGraw-Hill/Irwin), 171.

2, G_2 firms will produce zero A because the difference between P_H and P_L is less than their cost of producing a*. G_1 firms will produce a* because the price difference is greater than their cost to produce a*. In this case, labeling can be either continuous or discrete but consumers are only willing to pay a premium for goods with an attribute level above a* and they are unwilling to increase their premium further for higher levels of the attribute. An expansion of this model would allow for more price differentials at increasing levels of the attribute.

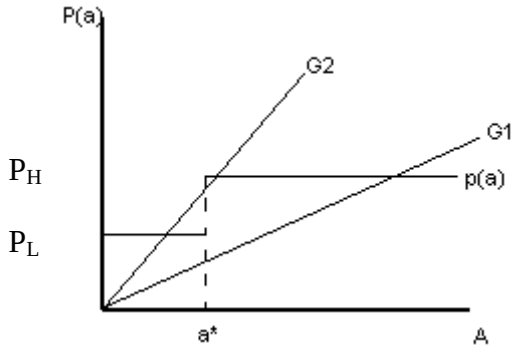

Figure 2

For credence attribute food markets where producers voluntarily provide labels, the inverse relationship between cost and value of the label holds. As an example, consider animal-welfare: small farms will be able to produce welfare-enhanced meat at a cheaper cost than Concentrated Animal Feeding Operations (CAFOs) are able to. However, the costly-to-fake principle is violated. Firms that are truthful about their claims and firms that are lying face the same costs to physically label their product. The only cost of faking is the loss of future sales if caught. However, for credence attributes consumers can never easily figure out if a firm's label is false, so the cost of possible lost sales is trivial.

Since the costs of labeling are the same, some firms will advertise false attributes on their labels to garner a premium price without the extra cost of actually producing the credence attribute. A study done by Terrachoice Environmental Marketing (2001) on greenwashing – the phenomenon of providing false or misleading information to seem more environmental – found

that all but one of the 1018 products they sampled advertised at least one misleading or false environmental claim.[13] Straight-up lying is not the only way to entice consumers to buy a falsely-labeled green product; in fact, less than one percent of environmental labels were found guilty of the "sin of fibbing."[14] The other sins include hidden trade-offs, no proof, vagueness, irrelevance, and the lesser of two evils.[15] Terrachoice offers no explanation as to why firms make false or misleading environmental claims.

Karni and Darby (1973) developed one of the earliest models on the potential for fraud in competitive markets. They looked at automotive repair services, where the consumer does not know the quality of the repair before, and in some cases even after, purchase.[16] They found that when business is slow shops defraud customers by charging for superfluous measures or undesired preventative maintenance. When business picks up firms charge for services not actually provided or they resell used parts.[17] The potential for fraud decreases with repeat purchases because over time customers learn whether or not a company is making valid repairs based on how often their cars break down.[18] In this way, automotive repairs are not a pure credence good because the consumer can eventually establish the quality. The repair is more similar to an experience good.

In a market for a pure credence attribute, like those I'm considering for food, the customer is unable to ascertain the quality of the good even with repeat purchases over a long period of time. McCluskey (2000) builds a game theoretic model examining organic claims and finds that without some third-party verification many producers will falsely label their products

[13] TerraChoice Environmental Marketing Inc. (2007). The Six Sins of Greenwashing, 1.
[14] Ibid, 5.
[15] Ibid, 1.
[16] Darby and Karni, 67.
[17] Ibid, 79.
[18] Ibid, 74.

as organic to receive the price premium.[19] Since consumers will be unable to discern the lying firms from the trustworthy ones the market will collapse because consumers will not pay a premium for food that may or may not be organic.[20]

Consider again the two markets from section one, one for a high-attribute good and one for a low-attribute good. In that case, the high-attribute good commanded a higher price because the consumer knew which products were which, leading to market segmentation. With imperfect information consumers cannot differentiate between the high and low attribute products and producers will label their product as high-attribute regardless of which it truly is. Knowing that firms lie, consumers will refuse to pay a premium.

The price premium is what induces firms to enter the high-attribute market, so without it firms have no incentive to incur the higher costs needed to produce the high-attribute good. This is shown in figure three where both goods receive P_L, the price for the low-attribute good. In the market for the high-attribute good, this price leads to a shortage – quantity demanded for the good is greater than quantity supplied. Quantity supplied is actually zero at P_L because this price is too low for any producers to cover the extra costs of producing the attribute. Normally a shortage would drive the price up but that is not possible here because consumers will not pay a higher price for a good they are unsure has the credence attribute. The lack of supply will cause the two markets to collapse into one where only the low-attribute good is bought and sold.

[19] J.J. McCluskey (2000). A game theoretic approach to organic foods: an analysis of asymmetric information and policy. *Agricultural and Resource Economics Review* 29 (1): 5.
[20] Ibid.

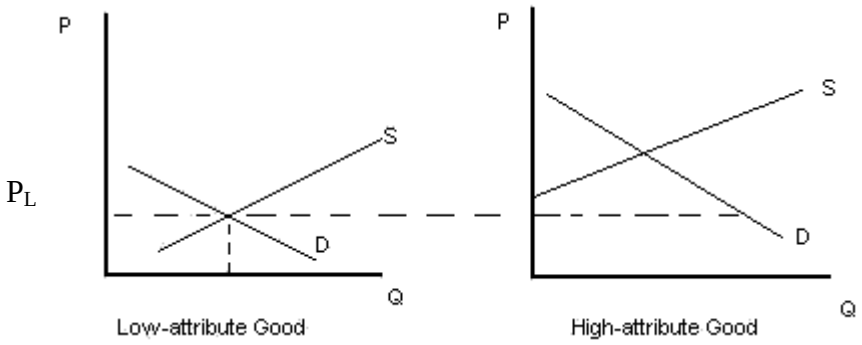

Figure 3

This single market outcome with only the low-attribute good represents a market failure. There are consumers who are willing to for the high-attribute good and suppliers who would sell this good at the higher price. However, these transactions cannot occur because of imperfect information. The conclusion here is that an unverified label is not an efficient signal of credence attributes in food markets because the label is not costly-to-fake. Backing of labels by a trustworthy third-party auditor could solve this problem by making it more difficult for lying firms signal.

Signaling and Third-Party Audits

Having a third-party auditor evaluate the claims on a label changes the costs of labeling. To signal, firms now have to pay for an audited label. Knowing that firms who label without an audit are likely to be lying, consumers will not pay a price premium for products with an unverified label. This loss of sales makes it costlier to fake a signal by using a misrepresenting self-declared label. Due to copyright and trademark laws it is also expensive for a firm to copy an audited label in order to fool consumers. A third option to fake the signal would be for a noncompliant firm to bribe an auditor to approve their claim anyway raising the costs above those of compliant producers.

Because it is costly to fake, an audited label will act as an efficient signal to consumers of the presence of an attribute in a product. With this signal, firms who make a food product with an attribute will signal it and receive a higher price. Firms who do not produce the attribute will be unable to lie and signal to the consumers that they do, and thus receive a lower price.

Who does the auditing and how stringently they set their standards also matters. Giannakas finds that in food markets, assuming perfect label enforcement by a third-party and a high preference for organic food, the organic label will increase consumer welfare and increase organics' share of the market.[21] However, when enforcement is not perfect because of the associated costs, the outcome is not so cut and dry. Imperfect enforcement creates an incentive for mislabeling if the marginal benefits are higher than the marginal costs measured by the dollar loss in sales when caught times the probability of getting caught.[22] One firm getting caught is not only bad for that firm but also reduces the credibility of the whole market and results in customers' reduced willingness to pay for organic food.[23]

Many papers only differentiate between public and private certification, disregarding the further split between private for-profit and private non-profit certifiers. Jahn, Schramm, and Spiller find that firms cheat when there is imperfect enforcement of labels and they actually conclude that for-profit third-party auditors of credence attributes have an incentive to let firms get away with it.[24] Firms in need of certification are mainly interested in the ease and cost of the process and thus will choose auditors who offer cheap certification with low inspection standards.[25] To attract customers auditing firms often offer a below cost fee for the initial

[21] Giannakas, 10.
[22] Ibid, 12.
[23] Ibid, 13.
[24] G. Jahn, M. Schramm, and A. Spiller (2005). The Reliability of Certification: Quality Labels as a Consumer Policy Tool. *Journal of Consumer Policy* 28: 54.
[25] Ibid, 60.

inspection and make profits only on ongoing relationships, this technique is known as low-balling and makes the auditor detrimentally reliant on their customers' continued patronage.[26] The firm seeking an audit has no such dependence and can easily switch between auditors if one makes inspections undesirably difficult. This leads for-profit auditors to set lax standards in order to keep their customers.[27] These low-quality standards are not beneficial to consumers who are interested in actually purchasing products with a certain credence attribute. Non-profit certifiers that are funded by for-profit industries often encounter the same financial dependence problem and also produce lax standards.

An example of weak for-profit certification standards is forestry certification. In 1993 the Forest Stewardship Council (FSC) was formed to certify wood and wood products from forests that are managed in compliance with certain standards. FSC is an international non-profit organization that receives most of its funding from private charitable foundations.[28] Most environmentalists consider FSC to be the most environmentally stringent and credible forestry certification available. The American Forest and Paper Association founded a non-profit organization called the Sustainable Forestry Initiative (SFI) in 1994 to compete with FSC certification.[29] Several environmental groups question the strictness of SFIs certification standards and their commitment to sustainable forestry.[30]

Since for-profit private auditors are likely to set too lax of standards for consumers' preferences I will now explore the efficacy of the government and private non-profits. The bulk

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[26] Ibid, 61.
[27] Ibid, 62.
[28] Forest Stewardship Council (1996). The History of FSC. Retrieved December 10, 2009, from: <http://www.fscus.org/about_us/>
[29] Sustainable Forestry Initiative (2008). Basics of SFI. Retrieved December 10, 2009, from: <http://www.sfiprogram.org/sustainable-forestry-initiative/basics-of-sfi.php>
[30] Sierra Club (2009). Choosing a Forest Certification System: Why is One so Much Better than the Others? Retrieved December 10, 2009, from: <http://www.sierraclub.org/committees/forestcertification/report0409.pdf>

of the work done on labeling in food markets looks at how the government can act as a trustworthy third-party auditor to generate consumer confidence in labels.

Golan et. al. find that part of the usefulness of a label is how responsive it is to consumer preferences and changes in productive technological capabilities.[31] In order to amend standards the government has to go through a lot of bureaucracy and it can take quite a long time to enact changes.[32] Reputation and credibility are also essential to a labeling service. These authors point out that although in the United States the Department of Agriculture (USDA) and the Food and Drug Administration (FDA) are expected to regulate food claims, in Europe "international, environmental, and consumer and farm organizations" are considered much more trustworthy.[33]

Another trouble with government auditing is the majoritarian constraint, which basically restrains the government from placing as much weight on the wants of the minority as the majority because officials are seeking reelection.[34] Since credence attributes are not necessarily desired by the majority this has the potential to result in less strict standards than some people want. Steinberg believes that with government enforcement, provision will equal the amount of the "median-preference voter" – half the people want more, half want less, and only the middle is satisfied.[35] Also, the government will not certify some attributes that only matter to a small portion of the population. One example is kosher certification of food products which most of the population does not care about but is very important to a specific segment. In this industry the government does not provide certification and instead several non-profits have sprung up to provide this service.

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[31] Golan et. al., 134.
[32] Ibid, 135.
[33] Ibid, 134.
[34] W.W. Powell and R Steinberg (2006). Economic theories of non-profit organizations. In *The Non-Profit Handbook* (New Haven: Yale University Press), 122.
[35] Ibid.

Furthermore, regulatory capture – the process by which special interests manipulate government regulations to be favorable toward them – is likely to occur.[36] The industry will lobby the government to set the certification standards lower than consumers want because it will then be less costly to meet the standards. This usually results in lower consumer welfare even though the aim of certifying is to help consumers.

Despite these troubles, the government has some advantages over private certifiers. When necessary the government can make labeling a mandatory practice for all firms – as it has done for nutritional information.[37] The greatest benefit of government labeling is reduction in consumer confusion of labels. Government provision of a single certification with a set meaning allows consumers to easily differentiate between that label and others – as occurs with organic foods.

Private non-profit certification can rectify several of the weaknesses of government certification but also misses out on the benefits. Unlike for-profit auditors, non-profits do not become financially dependent on the firms they audit. This is because non-profits are not trying to maximize profit by attracting as many firms to audit as possible. Instead, non-profit certifiers need only cover the cost of the audit with a fee for service. Many non-profit certifiers, including FSC and Certified Humane, also receive grants from foundations and other non-profit organizations that support their goals. They also generally accept donations from individuals, although these are a relatively small portion of their funding. These multiple sources of revenue keep non-profit auditing firms from becoming dependent on the firms they audit.

It is relatively easy for non-profits to update their auditing standards as new information and technology becomes available. Just the board of directors needs to decide that a change will

[36] E. Dal Bo (2006). Regulatory Capture: A Review. *Oxford Review of Economic Policy* 22 (2): 203.
[37] Golan, 138.

be beneficial to the company and the people they serve. This is much simpler than the government process to update standards which can include major legislative changes.[38]

Non-profits are free from the majoritarian constraint and can set their certifications as strict as they like. According to Downing and Brady non-profits will have a higher demand for environmental quality attributes than the average consumer would prefer.[39] This is likely to be tempered by two things: the willingness of firms to pay the necessary production costs to meet the standards and the willingness of consumers to pay a high enough premium to cover the firms costs. Since the end consumers are indirectly financing the auditor, the standards are likely to more closely match consumer preferences than if consumers lacked dollar votes. Furthermore, non-profits will certify those attributes that are important to too small a portion of the population for the government to concern itself with.

Regulatory capture does not occur with non-profits as it is defined as industry influence on government regulation. However, a similar problem can occur for non-profit auditors that receive funding from the industry they audit. The auditor becomes reliant on the industry and allows them a high level of influence in the setting of standards. This is what occurred with SFI, as I discussed above.

Despite these advantages there is one large shortcoming to non-profit auditing. Unlike government labels, a plethora of non-profit certified labels can exist at once. According to Youssef and Abderrazak (2009) introducing a second eco-label into a market with incomplete information raises prices and diminishes the environmental quality represented by each label.[40]

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[38] Ibid, 134.
[39] P.B. Downing and G.L. Brady (1981). The Role of Citizen Interest Groups in Environmental Policy Formation. In M.J. White (Ed.), *Nonprofit Firms in a Three Sector Economy*. Washington D.C.: Urban Institute, 69.
[40] A.B. Youssef and C. Abderrazak (2009). Multiplicity of Eco-Labels, Competition, and the Environment. *Journal of Agricultural & Food Industrial Organization* 7 (2): Art. 7, p 2.

These changes represent a decrease in consumer welfare. However, this model does not consider certified labels. The non-profit auditing firm may have an incentive to lower their environmental standards if many auditing firms exist because there will be competition between the auditors to attract firms to audit. The for-profit production firms looking for audits only care about the ease of the audit not the level of environmental quality it ensures. This would result in lower levels of environmental attributes overall.

A second problem resulting from the entry of more certified labels is the possibility that new auditors will free ride off the reputations of old ones. If consumers make an association between a phrase on a label and environmentally sound practices, that knowledge becomes similar to a public good. By using similar terms, new certifiers can free ride off the association by making less strict standards. Firms will use the new auditor because the certification process is cheaper and they still get the same price premium. This is especially likely if the first auditor is a non-profit and then for-profit or for-profit funded auditors enter. The certification of Fair Trade coffee is one example. The original certification was Fair Trade Certified which has spawned a number of knock-offs including Equitrade, Starbucks Coffee and Farmer Equity Code (CAFE), Common Code for the Coffee Community Association (4C Association), and Utz Kapeh (Guatemalan for good coffee).[41] Each of these certification bodies makes some claim about fair trade, ethical trade, responsible trade, etc., making it very difficult for consumers to distinguish between them and decide which is most in line with their preferences. This consumer confusion results in less overall environmental quality.

The final trouble associated with multiple, similar environmental labels is that consumers will grow confused and apathetic and not incorporate label information into their decision at all.

[41] Can Fair Trade make trade fair? (2007). Retrieved December 13, 2009 from Ethical Consumer website: <http://www.ethicalconsumer.org/CommentAnalysis/Features/fairtradestandards.aspx>

Although labels are meant to reduce information costs, too many labels can do the exact opposite as consumers are forced to research each label to figure out which one they like best.[42] It is beyond the scope of this paper to build a model of information costs but I will discuss some of what has been done by other authors.

The seminal article on the costs of information by George Stigler (1961) looks at the costs of ascertaining the most favorable market price for a good or service. He finds that increased search has diminishing marginal returns, meaning as someone searches more the expected decrease in the minimum price falls.[43] A buyer should only engage in further search if the expected reduction in price is greater than the cost of search. Stigler considers only the cost of discovering price and did not explore the costs of ascertaining quality attributes.

Aldrich (1999) reports on the many ways consumers obtain information about credence attributes for food and, unsurprisingly, finds that some are more helpful than others.[44] She points out that when deciding how useful a source of information is one must consider not only the quality of the information provided but also the amount of time it takes to acquire the information. For nutritional information, Aldrich finds that "consumers obtain information from sources that require little of their time, but value information from other sources more."[45] For example, consumers obtain more information from TV than dietician consultations even though they consider the latter more valuable.[46] This implies that for labels to be effective at changing consumer behavior they must be easy to interpret or be well known, such that it takes the consumer little time to obtain information from the label.

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[42] Bougherara, D. and Piguet, V. (2009). Market Behavior with Environmental Quality Information Costs. *Journal of Agricultural and Food Industrial Organization* 7 (2): Art. 8, p 2.
[43] G.J. Stigler (1961). The Economics of Information. *The Journal of Political Economy* 69 (3): 215.
[44] L. Aldrich (1999). *Consumer Use of Information: Implications for Food Policy.* Washington D.C.: U.S. Department of Agriculture, Economic Research Service. Agricultural Handbook Number 715, 2.
[45] Ibid.
[46] Ibid.

The increased information costs associated with multiple labels decrease consumer welfare. When labels are provided but consumers do not utilize them in their decision making there is deadweight loss to society as the resources used in making and certifying the label were wasted. This inefficiency can be avoided in a market with only a few labels because the information costs to consumers will be low enough to allow consumers to research each label. Few labels occur in a monopolistic or oligopolistic market structure. Examples of labels that have emerged as the single and best known label in a market in the past include the Good Housekeeping Seal of Approval and the Underwriters Laboratories certification. However, the goods these groups certified had experience attributes and people came to trust the labeler because they could verify the claims as true.

For goods with credence attributes, the consumer cannot verify the certifier's claim anymore than they can verify the existence of the attribute, so labels do not acquire loyalty. Without consumer loyalty, entering labels are easily able to obtain a share of the market. The lack of high barriers to entry keeps the market of certified labels from being monopolistic or oligopolistic. Therefore, without some government imposed barrier to entry there are likely to be too many labeling firms, raising the information costs to consumers above the efficient level. Non-profit certified labels alone are not enough to achieve market efficiency and the government needs to play a role by either providing a single label itself or by fostering an oligopolistic or monopolistic market structure for labels.

Conclusion

Effective signaling of credence attributes requires a third-party certified label. In a market for a good with only search and experience attributes no label is required because consumers can determine, at low cost, which attributes are present. However, in a market with

credence attributes consumers must rely on the producer for attribute information. Since a good with attributes receives a premium price and labeling costs are low, firms are likely to self-declare that their product has the attribute whether or not that is true. This makes an unverified label an inefficient signal because consumers cannot trust it. Without a signal, products with the attribute will not be able to get a price premium and so only the good without the attribute will be provided. A label verified by a third-party will be an effective signal because it is costly for firms without the attribute to fake.

However, the identity of the auditor is also important. A for-profit auditor will set lax standards in order to attract as many clients as possible. This is inefficient because consumers who demand the attribute do not want lenient standards and those who have no demand for the attribute will buy the good without it. The government and non-profit organizations can both act as third-party auditors. The government is subject to the majoritarian constraint and regulatory capture but has the advantage of providing a single standard that everyone knows. Non-profit auditors avoid these issues and are likely to set standards closer to the consumer preferences. However, a proliferation of non-profit audited labels will reduce consumer welfare by raising information costs. With too many labels, consumers are unable to easily distinguish between them and must engage in costly search to differentiate and interpret each one. This makes the best solution either a single label provided by the government or government instituted barriers to entry to the non-profit label auditing market.

There are a few places for research in this area to focus in the future. First, this paper did not look at the efficacy of government mandated labels. There is also the possibility of having a government minimum standard with further labeling available from non-profits.

A second area of research would be how effective signaling is when multiple environmental attributes are present. For example, what are the effects on signaling when one meat is labeled hormone-free and another pasture-fed? Also, the effect of this on information costs could be looked into. In this vain, study could continue into the most effective label designs for consumer interpretation. This could determine how a label can be presented with the lowest information costs and thus most efficiently.

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