

THIRD-PARTY CERTIFICATION IN THE FOOD SYSTEM: A PRINCIPAL-AGENT APPROACH
TO SIGNALING PRODUCT ATTRIBUTES

By

Paige Van Poppelen

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Agricultural, Food and Resource Economics- Master of Science

2014

ABSTRACT

THIRD-PARTY CERTIFICATION IN THE FOOD SYSTEM: A PRINCIPAL-AGENT APPROACH TO SIGNALING PRODUCT ATTRIBUTES

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Third-party certification has evolved as an independent assurance of credence attributes, which a consumer cannot identify pre or post-consumption, of a product when asymmetric information exists between sellers and buyers. Since the adoption of third party certification schemes, specifically in the global agri-food system, there have been several incidents of losses in credibility when a certified product is discovered not to have the attributes it is certified as having. These losses in credibility raise the question of whether the amount of fraud depends on whether the certifier is hired by the seller or by the buyer (e.g. leading up to their 2009 salmonella outbreak, King Nut obtained numerous certifications and food purity guarantees by an auditor that was selected and paid for by Peanut Corporation of America, the peanut supplier for King Nut's peanut butter). The principal-agent model might help explain the opportunistic behavior and lack of objectivity that evolves from a difference in interests between the certifier and seller compared to the buyer(s), which can hinder the food safety or quality goals of the certification scheme. This research will examine the institutional and behavioral forces that appear in the principal-agent model to identify contributing factors to certification fraud, including a survey of current certification bodies.

ACKNOWLEDGMENTS

I am especially indebted to my major professor and thesis supervisor, Dr. David Schweikhardt, for his support throughout my master's degree program and during writing this thesis. I would also like to thank my guidance committee members, Dr. Brent Ross and Dr. Larry Busch for providing me with invaluable guidance and comments in conducting my thesis research.

Also, I would like to thank the Elton R. Smith Endowment and the Department of Agricultural, Food and Resource Economics for providing me with funding for this research.

Finally, I would like to thank my family, including my soon-to-be husband, for all their love and support.

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CHAPTER 1

INTRODUCTION

1.1 Background

Economic models, in general, assume information to be perfect (costless). However, stemming from the work of George Akerlof, Michael Spence and Joseph Stiglitz it is now understood that imperfect information can have a profound effect on market performance. Globalization and other factors caused the global food supply chain to increase in complexity, creating shifting markets from local or national agribusinesses to multi-national food supply chains. With this shift there became a greater possibility of asymmetric information between the sellers and buyers concerning products' credence attributes. A credence attribute is an attribute of a product that cannot be detected pre- or post-consumption. In particular, sellers are likely to have information about the attributes of goods, which buyers don't have.

Increasingly, consumers find interest in the credence attributes of food products, such as organic, locally grown, and food safety characteristics. Given market uncertainties, such as that with credence attributes, Spence (1973) asserts that some individuals or institutions may attempt to signal differences to prospective buyers. He defines a signal as providing indirect information about a product attribute that influences probabilistic beliefs about quality (Spence, 1973). Signaling can be done in several ways, including building a reputation, price signaling, certification, etc.

The distinct possibility of the attribute not being observed leaves room for opportunistic behavior by the seller to fraudulently signal credence attributes. For

example, a *Consumer Reports* study (1998) found traces of pesticides on organically labeled tomatoes, peaches, green bell peppers, and apples. Fraud generally occurs because there are significant benefits associated with producing quality attributes, which usually entail a price premium. Price premiums exist because of higher costs associated with credence goods and consumer willingness-to-pay for the credence attribute. According to Hamilton and Zilberman (2006), “consumers prefer environmental attributes in their products much like they prefer any other desirable product attribute in market goods.”

In a market with asymmetric information, it is costly for buyers to fully know if a product meets their consumer standards. Busch (2011) argues the attempt to fill the trust and predictability gap lies within the development of logos, seals and statements that accompany both people and things. Certifications have become increasingly popular in the food system to signal differentiating quality standards. In particular, third-party certification (TPC) programs, as independent agents, are adopted to act as a remedy for asymmetric information. This is done in response to the possibility that sellers are able to falsely claim credence attributes when their products do not contain them. There are advantages to TPC for both economic agents; TPC provides the buyers with a lower cost source of information and sellers may be able to access new markets or offer their products at a price premium.

In general, TPC programs begin with a standard owner or accreditation body. The standard owner sets quality standards and gives formal recognition that a particular certification body is competent to carry out specific tasks. “The central task of certification, the reduction of information asymmetry within the market, can be fulfilled only if the institutions in charge succeed in assuring certification quality and, thus, the validity of the

audit signal” (Jahn et al., 2005). Following accreditation by a fourth-party (i.e. the certifier of the third-party certifier) the certifier can be hired to perform its responsibilities. Some of TPC responsibilities include document reviews, on-site audits and awarding certifications.

When performing the previously mentioned responsibilities, the certifier incurs fixed costs, such as investments, and variable costs, such as laboratory costs and labor hours. Costs may also be incurred if the seller attempts to disguise the quality of attributes to the certifier; this study will examine the impact of disguise costs. In order to cover these costs, the certifier chooses a fee structure that maximizes profit. Alternatively, in an effort to minimize costs, the certifier might also forego investments, laboratory tests, or other costly monitoring efforts. In this study, adjustment of audit quality is given a significant role in the utility function of the certifier.

In principle, there is a demand for certification from both sides of the market. The seller may request certification in order to sell the product at the price premium, or the buyer may request certification in order to avoid purchasing the lower quality product. Stahl and Strausz (2011) argue that the economic role differs between seller-induced certification and buyer-induced certification, where the former is a signaling game and the latter is an inspection game. Their results concluded that seller-induced certification is socially desirable and preferable to the certifier. However, Stahl and Strausz (2011) only focused on honest certification and did not take into account the ability of the seller to bribe the certifier or the ability of the certifier to create deception.

Since the adoption of TPC programs, specifically in the global agri-food system, there have been many incidents of credibility loss when a certified product is discovered not to have the attributes it is certified as having. Leading up to the 2009 peanut butter

salmonella outbreak, King Nut obtained numerous certifications and food purity guarantees by a certifier that was selected and paid for by Peanut Corporation of America, the peanut supplier for King Nut's peanut butter (Eaton, 2009). Certification fraud is costly to all parties involved; this is especially true for food safety certifications. The four most common bacteria, including salmonella and e-coli, contribute to about 5,000 deaths each year and cost the U.S. economy nearly \$7 billion annually (The Washington Times, 2007). The recall costs of removing food from store shelves, lawsuits, updating equipment and repairing public relations, can be significant for companies. In addition, the loss in reputation and loss in future sales that can be difficult to fully monetize. According to Eaton (2009), Kellogg spent \$65 to \$70 million recalling products made with the tainted peanuts. In addition, a class action suit brought by victims of the outbreak required Kellogg and Peanut Corporation to pay \$12 million in settlements before Peanut Corporation filed for bankruptcy (Basu, 2014). Other examples of credibility loss within the food industry and other industries support the work of Akerlof, Spence and Stiglitz on the importance of examining equilibrium effects of imperfect information.

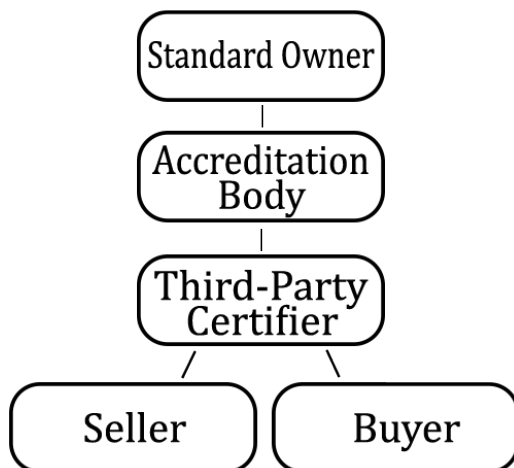
Fraudulent certifications can also create costs to the economy, buyers and sellers. Also, in the case of food safety certification fraud, cause serious injury and even lead to deaths. For these reasons it is important to understand what factors contribute to certification fraud and how to mitigate certification fraud. This research seeks to better understand TPC in the food system in order to identify opportunities for certification fraud.

This research will use a principal-agent model to explain the opportunistic behavior and lack of objectivity that evolves from a difference in interests between the certifier, the seller, and the buyer, which can hinder the quality goals of the certification scheme. This

research will further examine the institutional and behavioral forces that appear in the principal-agent model to identify factors that could contribute to certification deception.

When developing the model and survey of third-party certification bodies, the sellers of the good are referred to as “sellers” and the buyers of the good as “buyers”. The term “customer” may refer to either buyers or sellers since it can be either party paying for the certification services. The “accreditation body” refers to a fourth-party certifier that inspects and certifies the third-party certification body as being capable of providing certification services. The final party that will be mentioned throughout this paper is the “standard owner”, which is the party that defines the standard that must be met by the party seeking certification and those involved in the certification process. In some cases, the accreditation body and standard owner may be the same party.

Figure 1.1 Relationship of TPC System¹



¹ This analysis does not include principal-agent relationships within parties. For example, the auditor working for the TPC or employees of the seller.

1.2 Research Objectives

The principal research objective of this study is to examine the institutional structures of the current certification market and identify areas that affect certification fraud. To examine this issue, the level of assurance will be examined under various assumptions. Assurance is the process by which a third-party expresses findings intended to enhance the degree of confidence that buyers have about an evaluation or measurement, against a criterion of a product attribute that is controlled by seller (Park and Brorson, 2005; IFAC, 2004). Specific research objectives include:

1. To review literature on the role of TPC, including finance and cost structure, and the principal-agent relationships between a TPC and other economic agents.
2. To develop a model of principal-agent relationships including sellers, buyers and certifiers.
3. To analyze the equilibrium market conditions with varying information costs and institutional structures.
4. To conduct comparative analysis of alternative institutional relationships.
5. To form hypotheses of market performance under alternative institutional relationships and with varying information.
6. To survey the current certification market in the agri-food system.
7. To combine the results of objectives two and five, with the results of objective six to assess the issue of TPC in the food system.

The study also seeks to answer the following research questions:

- a) What is the effect on the level of assurance when information costs about the certifier are included in the analysis?
- b) How do other variables such as disguise costs and reputational factors affect the level of assurance?
- c) Where do current certification bodies fit in the hypotheses of market performance?

To analyze this problem I apply a utility maximization model. This approach allows me to represent economic agents that are maximizing their own utility in a principal-agent relationship.

1.3 Contribution to the Research Literature

This study will contribute to the literature on TPC by explicitly recognizing asymmetric information regarding certifiers in addition to sellers (i.e. it is costly for buyers to determine the quality of goods and TPC service providers). Many studies recognize asymmetric information between sellers and buyers but they attempt to solve the information problem with TPC. However, the introduction of TPC creates a new information problem where the buyers and sellers must incur information costs about the certifier. Second, this research takes into consideration opportunistic behavior by certifiers and/or sellers in a market with positive information costs. This study uses a utility maximization model that allows for deception by the seller and for the seller and certifier to become joint profit maximizers in order to deceive the buyer.

Finally, by conducting a survey of the current certification market, the results of the utility maximization model are compared with the actual certification market. The survey results will also identify any other factors that may contribute to certification fraud.

1.4 Organization of Thesis

The paper begins with a literature review that focuses on the development of TPC followed by a review of the principal-agent relationship of TPC with sellers, buyers, and accreditations. Chapter 3, the theoretical framework, derives the three-party utility maximization model and incorporates various assumptions of information costs and institutional relationships. Chapter 4 discusses the survey conducted of current certification bodies and the results from the survey, and Chapter 5 ends with the conclusion and implications.

CHAPTER 2

LITERATURE REVIEW

2.1 Third-Party Certification as a Tool

In the modern global agri-food system buyers have a broader awareness of credence attributes and are placing greater importance in attributes such as organic, locally grown, animal welfare, and many more. Given uncertainty in the market, sellers may attempt to signal product attributes to prospective buyers or employers (Deaton, 2004). Signaling may occur in a number of ways. For example, a brand might develop its reputation as a means for quality signaling or the use of labeling and certification. However, since credence attributes often cannot be identified pre- or post-consumption there is an opportunity for sellers to fraudulently signal quality.

Unlike first-party, in which the seller would self-report, and second-party, inspection by the buyer, quality claims, TPC distinguishes itself through its independence, in an attempt to reduce opportunistic behavior in a market with asymmetric information. By not being connected with the producers or retailers being certified, TPC may offer a comparative advantage if they are perceived as being relatively more objective (Deaton, 2004). This sort of credible quality signaling has become increasingly important in contemporary food markets, as it relates to consumer trust and coordination between firms, where information asymmetries create transaction costs across the supply chain (Anders, Souza-Monteiro and Rouviere, 2010).

2.1.1 Willingness-to-Pay for TPC in the Agri-Food System

In developing countries, where infant malnutrition is an issue, there is a demand for information about the nutritional density of infant food. Masters and Sanogo (2002) conducted a market experiment in Mali to produce a willingness-to-pay for quality assurance from a third-party certification scheme. At the time of the experiment, mothers could either prepare infant food at home from raw ingredients, a labor-intensive process, or purchase a precooked product, such as Cérélac, which is highly advertised and priced above its nutritionally equivalent competitors. Thus, Nestlé, the producer of Cérélac, could have been using price as a signal of quality assurance. Through a lottery set up at food markets in City of Bamako in Mali, Masters and Sanogo were able to identify the willingness-to-pay for certain quality attributes: processing of infant food, packaging and brand identity, and certification. From this information the authors estimated that buyers' willingness-to-pay for quality assurance for infant food was about four times the estimated cost of certification. Therefore, the authors concluded that the introduction of a certification system would have positive welfare effects within Bamako and possibly throughout Mali.

Business-to-business transactions can also benefit from the assurance of TPC. For example, in the U.S. beef market there are several health concerns that can be prevented with preconditioning at the farm of origin. Bulut and Lawrence (2007) used data from Iowa feed cattle auctions to distinguish the value of preconditioning claims against TPC of preconditioning. The data indicated that cattle with TPC were sold at a statistically higher premium than the premium of the cattle sold with the same qualities as certification but were self-claimed. The premium for cattle with TPC exceeds the average cost associated

with certification compliance and therefore providing evidence of welfare creation from a TPC scheme for feed cattle.

2.1.2 Consumers' Role in TPC Development

In an agri-food system characterized by asymmetric information about the quality of a product, a fully credible certification scheme can provide consumers with a substitute for the lack of information and trust. "In recent years several new control and certification bodies have been created and compete to offer its services to firms seeking certification from good farming practices to processor specifications in various standards" (Anders et al., 2007). The firms seeking TPC are using it strategically to gain access to new markets of consumer needs currently not being met, to coordinate their operations, to provide quality and safety assurance to their consumers, to complement their brands, or to define niche products and markets (Hatanaka et al., 2005). Each of these objectives stems from the development of TPC as a mean to reconnect consumers with production by increasing consumer awareness and harnessing consumer purchasing power.

Where government regulation is lacking, certification schemes can function as an incubator for what might eventually become industry standards (National Research Council, 2010). In response to a broader awareness by consumers, or in an effort to foster it, non-governmental organizations and consumers activists have adopted certification schemes as a tool to promote social and environmental issues related to food production. For example, ServSafe classes and certification for food safety in foodservice were voluntary for most restaurant workers up to August 2001, but are now required for one or more employee by law in several states across the U.S. (Schilling et al., 2003).

2.1.3 Financing & Cost Structure

Whether a certification scheme is a for-profit or non-profit organization, it needs financing to carry out its certification services. Crespi and Marette (2001) analyzed the welfare effects of various fee structures for food safety certification. Their analysis took into account the certifier's cost structure where consumers are imperfectly informed about the safety of products.

"The main difference between public and private monitoring agencies is that the private ones cannot raise money through private taxes, yet they can directly benefit from penalties (whereas public monitors may be required to turn collected fines over to the treasury)" (Crespi and Marette, 2005). Analyzing funding mechanisms including public revenues, unit fees, fixed fees and penalties, the authors conclude that a per-unit fee for certification services is optimal because the costs are internalized in the market. This is true even when there is no opportunity cost for public funds. Also, a per-unit fee results in the greatest welfare gains because it fosters competition among producers, where a fixed fee might act as a barrier to entry.

If there is only one private certifier, then they will charge a per-unit fee for their certification that will maximize profits. According to Crespi and Marette (2001) the main factor in limiting the certifier's capturing of rent is to foster competition among the certifiers in a highly concentrated market with costly services. With homogenous services, a competitive certification market will lead to the same fee and welfare effects that would be set by a public agency.

2.2 Principal-Agent Model

Consumers of food products indirectly (or directly) contract producers to supply them with quality food products. However, an increased frequency of food safety outbreaks and other quality concerns has diminished consumer confidence in the ability of the agri-food system to assure the provision of safe, quality food products. The difference in buyer's interest for high quality and the food seller's interest in profit maximization results in a principal-agent problem. Jensen and Meckling (1976) define an agency relationship as a contract under which one or more persons (the principal) engage another person (the agent) to perform some service on their behalf, which involves the principal delegating some decision-making authority to the agent. In the agri-food system, buyers lack the technical ability to verify credence attributes and therefore entrusts a certifier to provide assurance of credence attributes. Using the principal-agent model, we can examine how the certifier acting in their self-interest may affect the equilibrium between buyers and sellers.

2.3. Principal-Agent Model for Certification Schemes

2.3.1 Buyer-TPC Relationship

Beginning with the final consumer, demand for product and process attributes move up the supply chain to purchasers of intermediary products and raw materials. Certifiers hired by the buyer act as an inspection device or a traceability system. In the case of food safety, traceability systems not only help in the reduction of sickness during a food borne illness outbreak but also can provide an incentive to improve quality and safety concerns. As a product moves through the supply chain, a traceability system accumulates information about product attributes, including safety and origin, through a series of

procedures by which the identification, preparation, collection, storage, and verification of data are performed (Starbird and Amonor-Boadu, 2006 as cited in Resende-Filho, 2007). Resende-Filho (2007) focused on the liability component of traceability systems in addressing food safety concerns. Using the principal-agent model, he found that a reliable traceability system could also be used to signal the buyer that safer food products were being produced.

Buyer-induced certification, as an inspection device, is used to verify the quality claims of the seller. Stahl and Strausz's (2010) inspection game is a mixed strategy, in which non-credence sellers cheat with some probability and the buyer pays for certification with some probability. Under the mixed strategy, the buyer normally picks between three options: 1) to not buy certification and not buy the good, 2) to not buy certification and buy the product, or 3) to buy certification and only buy if the certifier reveals high quality. A buyer's decision of whether or not to buy certification depends on the price of certification and their belief in the credibility of the seller.

2.3.2 Seller-TPC Relationship

Within a market only differentiated by the existence of a credence attribute, firms choose whether or not to produce a high-quality product that claims to contain the attribute. Since the buyer may never perceive these attributes, there is an opportunity for the seller to make false claims. Fraud is assumed to only occur when it is cheaper on the margin to disguise non-credence goods as credence goods than to produce credence goods (Hamilton and Zilberman, 2006). Positive marginal costs associated with producing and selling in the credence good market can reduce or mitigate fraud. However, positive fixed

costs associated with the credence good market have no effect within an oligopoly, but can eliminate fraud under monopolistic competition. This is because unit certification costs deter fraud by reducing the marginal return to disguising non-credence goods as credence goods, and fixed certification costs mitigate adverse selection in industries with free entry by reducing the number of firms.

In seller-induced certification with perfect discoverability, only credence goods will demand certification and if the seller decides to certify, the quality is revealed and there is no asymmetric information (Stahl and Strausz, 2010). Perfect discoverability also means that fraudulent certification can only occur from collusion between the seller and certifier (Peyrache and Quesada, 2011).

2.3.3 Standard Owner-TPC Relationship

The majority of certification systems begin with a standard owner that sets a quality standard for the credence attribute. The standard owner can either be a governmental agency or private firm, and is assumed to be interested in the highest possible inspection quality. For example, Fair Trade USA is a standard owner because it developed a fair trade standard and defined what a company is required to achieve to reach this standard and become certified. The organization does not actually provide certification; Fair Trade USA uses accredited TPCs to provide certification services (Fair Trade USA, 2014). Previous research suggests that the institutional structure has substantial influence on the effectiveness and reliability of the TPC scheme (Jahn et al., 2005). In particular, with the goal of reducing information asymmetry, the agencies overseeing certification must have a

credible commitment to the principles of the certification in order for the certification scheme to be perceived as a valid surrogate for the information.

The standard owner sets the monitoring standards and their implementation has implications on the reliability of the certification and its effectiveness as a signaling device. The standard owner can require additional spot checks to increase the discovery errors and separate consulting from certification in order to mitigate a dependent relationship between the certifier and their employer (Jahn et al., 2005). Focusing on the relationship of the certifier to the standard owner, Jahn et al. (2005) determine that the probability of certifiers falsely claiming credence attributes depends on the level of monitoring of the respective product quality and whether the company is noteworthy enough for widespread media coverage. Increasing the certifier's liability through claims of negligence or the burden of proof could reduce opportunistic behavior by the certifier in the form of higher quality inspections.

2.4 Conclusion

This literature review provides evidence that the certification market is affected by how it collects its financing and who is paying the costs. By examining the various aspects of TPC, and how TPC maintains its comparative advantage, factors that either facilitate or reduce the likelihood of TPC being an independent assurance of credence attributes. Subsequent research will examine the institutional and behavioral forces that affect the principal-agent model to identify contributing factors to certification fraud. Finally, conclusions from this research will be used to contribute to future TPC studies as a signaling device, and to assist in the development of credible certification schemes.

CHAPTER 3

THEORETICAL FRAMEWORK

In economics, the principal agent problem is the challenge of structuring incentives for one party (the agent) to act in the interest of another party (the principal) rather than in the agent's own interest. The problem arises when (1) the principal and the agent have different interests and (2) when the information between the principal and agent is asymmetric. In the context of TPC there can be multiple layers of principal agent relationships. For the purposes of this research, the focus will be on the relationships between sellers, buyers and certifiers.

With costless information, the seller is an agent of the buyer by providing a product and a service to the buyer. The principal agent problem arises with the introduction of asymmetric information, in which the seller has information about itself and its product that the buyer either cannot determine or the information for the buyer is costly to determine.

When TPC is present, either the seller or the buyer can hire the certifier. The certifier is acting as an agent of the seller when the seller seeks out the certifier and pays the certification fees. Conversely, the certifier is acting as an agent of the buyer when the buyer seeks out the certifier and pays the certification fees.

3.1 Utility Maximization Model

This research presents a utility maximization model with many sellers, many buyers, and a competitive market for certification service providers. Sellers offer homogenous products that only differ in whether or not the good contains a desired, credence attribute. The credence attribute is a binary variable, where a good either has the attribute ($\sigma=1$) or does not have the attribute ($\sigma=0$). This is similar to Bulut and Lawrence's (2007) approach to modeling weaning and vaccinations in cattle auctions. Whether a good has the credence attribute is determined by the standard set by a standard owner. That standard is then used during the certification process; including the certifier's background, on-site inspections, and as a tool for making certification decisions.

Sellers that produce credence goods generally have a higher marginal cost of producing the good compared to sellers of non-credence goods. Reasons for the higher costs may include implementing processes/inputs related to the credence good or productivity losses due to not employing certain inputs. For example, foregoing pesticide use in organic farming might result in lower crop yields. Consistent with neoclassical economic theory, prices are determined by marginal costs because the sellers operate in a competitive market. Therefore, the price of credence goods is greater than the price of non-credence goods. The seller's utility maximization problem when deciding whether to produce credence goods, and whether to receive certification, subject to the price premium for credence goods and certification fees is:

$$\text{Credence Seller: } U_c(p, q, c) = p_c q_c - q_c(c_c + c_i) - F_c - F_i \quad (3.1)$$

$$\text{Non-credence Seller: } U_n(p, q, c) = p_n q_n - q_n c_n - F_n \quad (3.2)$$

Where:

p_c = price of credence good

p_n = price of noncredence good

q_c = quantity of credence good

q_n = quantity of non – credence good

c_c = variable costs of credence good

c_n = variable costs of non – credence good

c_i = unit fees for certification

F_n = fixed costs in producing non – credence good

F_c = fixed costs in producing credence good

F_i = fixed fees for certification

In a competitive market, buyers are heterogeneous in their preference for the credence attribute. A buyer's preference can range from zero preference (never buys credence goods), partial preference (sometimes buys credence goods) and exclusive preference (always buys credence goods). Preference is determined by a myriad of factors that may differ depending on the credence attribute. Factors may include the price premium, private benefits to the individual that consumes the credence good and the affiliated public good dimensions (Lusk et al., 2007).

It is costly for buyers to determine the type of the good. Under seller-induced certification, buyers can only observe whether the seller has received certification for a

credence attribute from a third-party certifier. In seller-induced certification, buyers maximize utility subject to preferences and price:

$$U_B(p, q, \theta) = \theta q_c(k + \sigma - p_c) + (1 - \theta)q_n(k - p_n) \quad (3.3)$$

Where:

p_c = price of credence good

p_n = price of non – credence good

q_c = quantity of credence good

q_n = quantity of non – credence good

θ = preference for credence attribute

k = consumptive qualities

σ = credence attribute

With buyer-induced certification, buyers maximize utility subject to certification fees in addition to preferences and prices:

$$U_B(p, q, \theta) = \theta q_c(k + \sigma - p_c) + (1 - \theta)q_n(k - p_n) - q_c(c_i) - F_i \quad (3.4)$$

Where:

p_c = price of credence good

p_n = price of non – credence good

q_c = quantity of credence good

q_n = quantity of non – credence good

θ = preference for credence attribute

k = consumptive qualities

σ = credence attribute

c_i = unit fees for certification

F_i = fixed fees for certification

When a third-party certifier is introduced, the certifier chooses a fee schedule of fixed and/or unit fees, and offers its services to buyers and/or sellers of the certified good. Certifiers have the technology, education, and experience to accurately assess the true quality of the good. However, somewhat unique from previous literature, the certifier can adjust their effort by not conducting a complete audit, avoiding costly procedures, etc. An adjustment of effort and other dishonest certification activities affect inspection costs of the certifier.

Private voluntary TPC is financed through certification activities, including certification fees paid to the certifier. These certification bodies may also perform other business services that provide revenue to the organization. These may include consulting services or training/education services.

A public voluntary TPC differs only through the addition of public funds paid to the certifier. Public funds can be subsidies in the form of cash payments (as part of policy incentives) or implicit subsidies created through offering public recognition, regulatory benefits, or information sharing. Subject to the aforementioned revenue and costs, the certifier maximizes utility with the following equation:

$$U_I(q, c, s, d, r) = c_i q_c + F_i + T - s(q_c)(c_i) - d - \phi(r) - \delta \quad (3.5)$$

Where:

c_i = unit fees for certification/ variable costs of providing certification services

d = disguise costs

q_c = quantity of credence goods

ϕ = probability of being caught committing certification fraud

s = audit quality

F_i = fixed fees for certification

r = reputation/future profits

T = external revenue

δ = fixed costs in providing certification services

This three-party utility maximization model will be used as the foundation for the following section that examines utility equilibriums under varying information costs and institutional relationships. The model will then be used in the next chapter for developing survey questions and analyzing the survey results.

3.2 Information costs

Neoclassical economics rests upon the assumption that people maximize utility with full and relevant information (Weintraub, 2007). This branch of economics emphasizes equilibrium, where the equilibria are the solutions of utility maximization problems. The

following sections are mathematical and graphical representations of utility equilibria under various information cost and institutional structure assumptions. The solution of the equilibrium is the level of assurance provided to the buyer. Assurance is the process by which a third-party expresses findings intended to enhance the degree of confidence that buyers have about an evaluation or measurement, against a criterion of a product attribute that is the controlled by seller (Park and Brorson, 2005; IFAC, 2004)

3.2.1 Baseline Scenario: Zero Information Costs

In the presence of costless information about the seller, the demand for the services of TPCs would be nonexistent in that buyers would have perfect information about the sellers. The resulting level of assurance with zero information costs is similar to the Coase Theorem with zero information costs (Mercuro and Medema, 2006; Coase, 1960), which states that regardless of the assignment of rights to the buyer or seller, the parties will bargain towards an identical outcome with regard to the level of assurance provided. This outcome is shown in Figure 3.1 as the intersection of the seller's marginal cost of assurance and the buyer's marginal benefit of assurance.

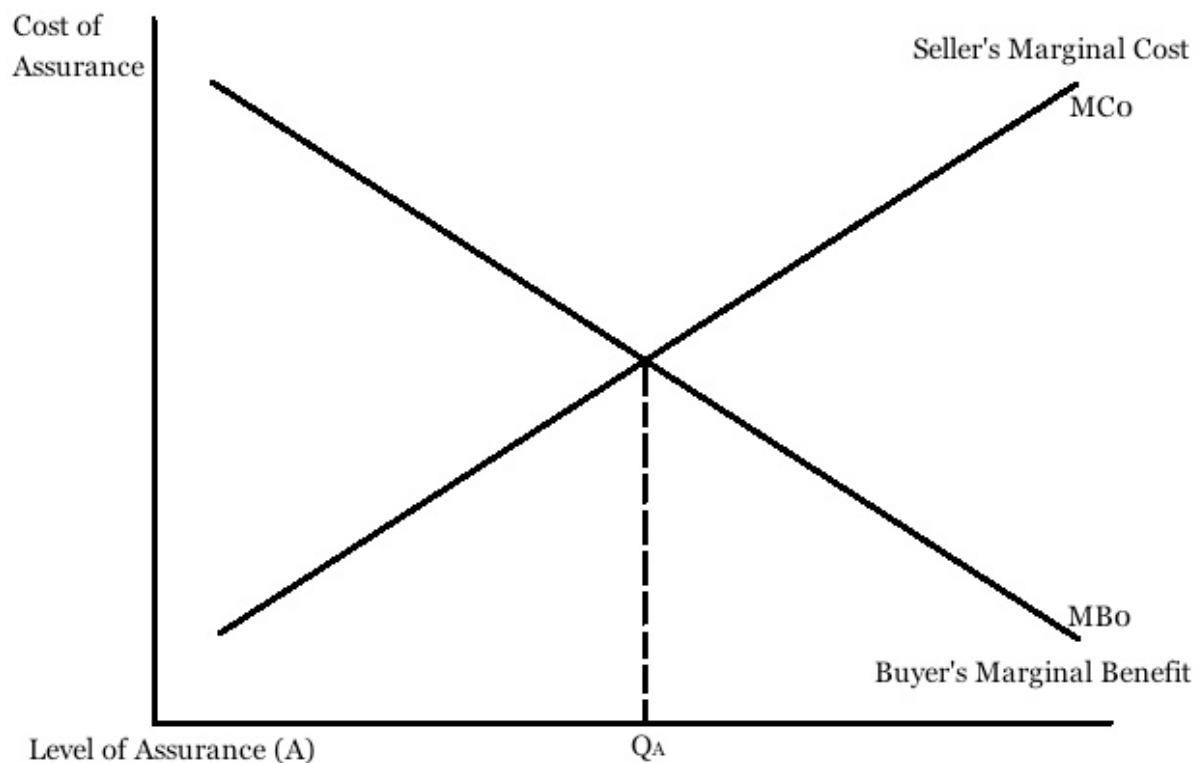
Using the functions 3.1 and 3.3, when a credence seller and a buyer with an exclusive preference for the credence good maximize utility, the equilibrium condition will be:

$$dU_C = dU_B$$

$$p_c q_c - q_c c_c - F_c = q_c (k + \sigma - p_c) \quad (3.6)$$

In this case, all information costs related to credence versus non-credence goods will be zero. This baseline scenario is equivalent to the traditional neoclassical economic result that buyers and sellers maximize utility with full and relevant (costless) information as noted by Weintraub (2007). The equilibrium level of assurance occurs where the seller's marginal cost of assurance equals the buyer's marginal benefit of assurance. In Figure 3.1, this occurs at the quantity Q_A .

Figure 3.1 Baseline Case Scenario with Zero Information Costs



The buyer's negatively sloped marginal benefit curve represents the decreasing marginal benefit for each increase in the level of assurance. The positive slope of the seller's marginal cost curve represents the increase in the marginal cost for each increase in the level of assurance.

The remainder of this chapter will use this zero-cost assumption as a base scenario, but relax it in order to gain insight into the relationship between sellers, buyer and certifiers when information is asymmetric.

3.2.2 Scenario 1: Positive Information Costs Regarding Sellers

Information costs arise from the due diligence process, which includes all costs an individual or company incurs when investigating whether a particular investment activity, such as purchasing a food item for personal consumption or for business operations, is likely to be profitable or maximize utility (Farlex Financial Dictionary, 2009). The organizations or consumers that purchase the food items face these costs in the search for information about products, prices, inputs and sellers (Coase, 1937).

3.2.2a. Buyer Conducts Inspection

Information costs about the seller are an additional cost to whichever party performs the inspection. Using the utility maximization model of a credence seller (Equation 3.1) and a buyer with exclusive preference for credence goods (Equation 3.4) performing the inspection, the equilibrium with the buyer conducting an inspection is:

$$dU_C = dU_B$$

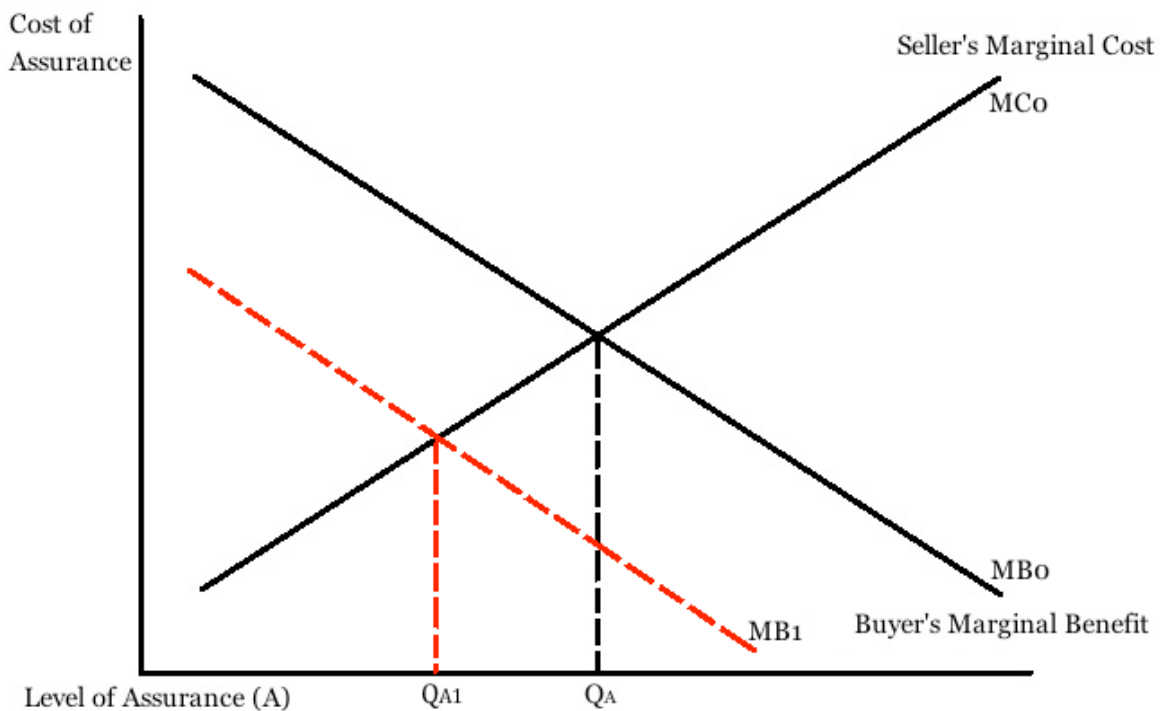
$$p_c q_c - q_c c_c - F_c = q_c (k + \sigma - p_c) - I_S \quad (3.7)$$

Where:

I_S = *information costs for the buyer regarding the seller*

In this scenario, the buyer incurs information costs of conducting due diligence regarding the seller. Examples of these costs include inspecting or interviewing with the seller to acquire more information about the quality of the good. The buyer's marginal benefit of assurance decreases from the information costs, causing a change in the resulting equilibrium.

Figure 3.2 Positive Information Costs Regarding the Seller with Buyer Performing Inspection



As shown in Figure 3.2, the buyer's marginal benefit of assurance (MB_1) is reduced by the information cost, I_s , leaving a reduced net marginal benefit for the buyer. Thus, the equilibrium level of assurance is reduced from the quantity Q_A in the baseline scenario to the quantity Q_{A1} . The magnitude of the shift is determined by the magnitude of the information costs that the buyer must pay.

3.2.2b. Seller Conducts a Self-Inspection

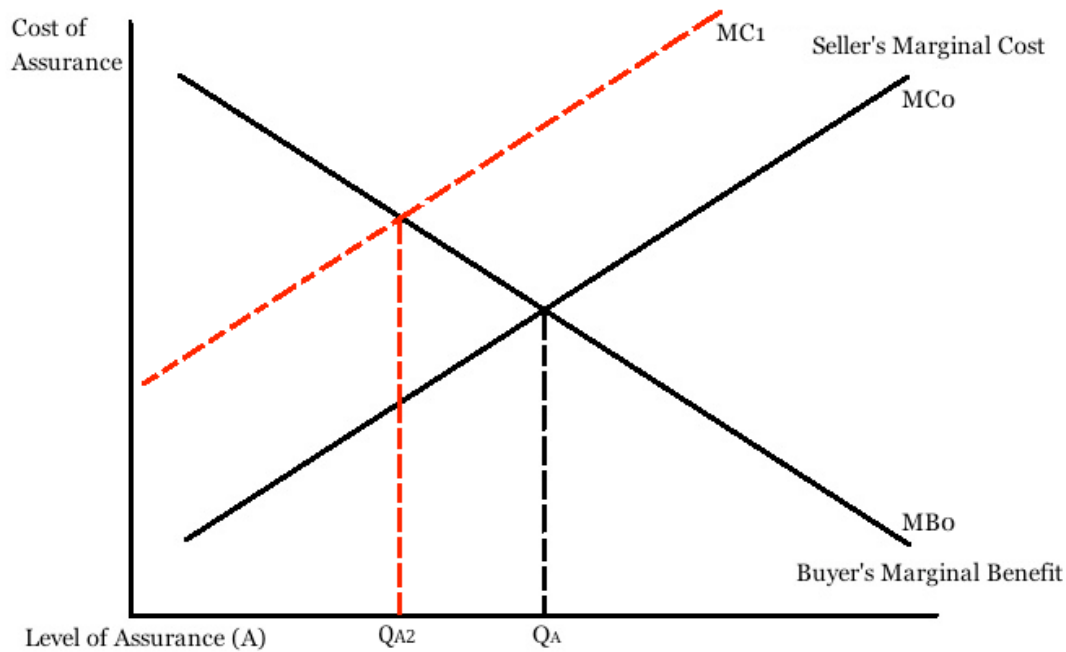
The equilibrium level of assurance when the seller incurs the information costs by self-inspection changes in a manner similar to the changes in equilibrium when the buyer conducts the inspection. Through self-inspection and disclosure of information about itself and its goods, the seller incurs additional costs. The equilibrium condition when a credence seller performs a self-inspection for a buyer with exclusive preference for the credence attribute will be:

$$dU_C = dU_B$$

$$p_c q_c - q_c c_c - F_c - I_s = q_c (k + \sigma - p_c) \quad (3.8)$$

The seller's marginal cost of assurance is increased by the information costs of self-disclosing information about itself and its goods.

Figure 3.3 Positive Information Costs about Seller with Seller Performing Inspection



As shown in Figure 3.3 there is a shift in the seller's marginal cost curve to the left. The resulting level of assurance decreases from the base case scenario with zero information costs. Thus, the equilibrium level of assurance is reduced from the quantity Q_A in the baseline scenario to the quantity Q_{A2} .

3.2.3 Scenario 2: Introduction of Third-Party Certification

The introduction of positive information costs about the seller creates a demand for TPC if the certifier can perform the inspection at a lower cost than the buyer or seller. When the certifier is fully financed by certification activities, certification fees are equal to the certifier's marginal cost in a competitive certification market.

Buyers request certification in order to avoid purchasing the lower quality good when they have a preference for the credence attribute, $\theta > 0$. Also, buyers want to avoid paying the price premium associated with credence goods when the good does not contain the credence attribute. Conversely, sellers request certification in order to enter a credence market and to charge their goods for a price premium.

3.2.3a. Buyer-induced Certification

The buyer's marginal benefit curve with the introduction of the TPC includes the certifier's fees. A buyer will be willing to pay certification fees up to the amount it would cost the buyer to conduct the inspection. In Figure 3.2, this represents the difference between the buyer's marginal benefit curve in the base case scenario, MB_0 , and the buyer's marginal benefit when the buyer performs the inspection, MB_1 .

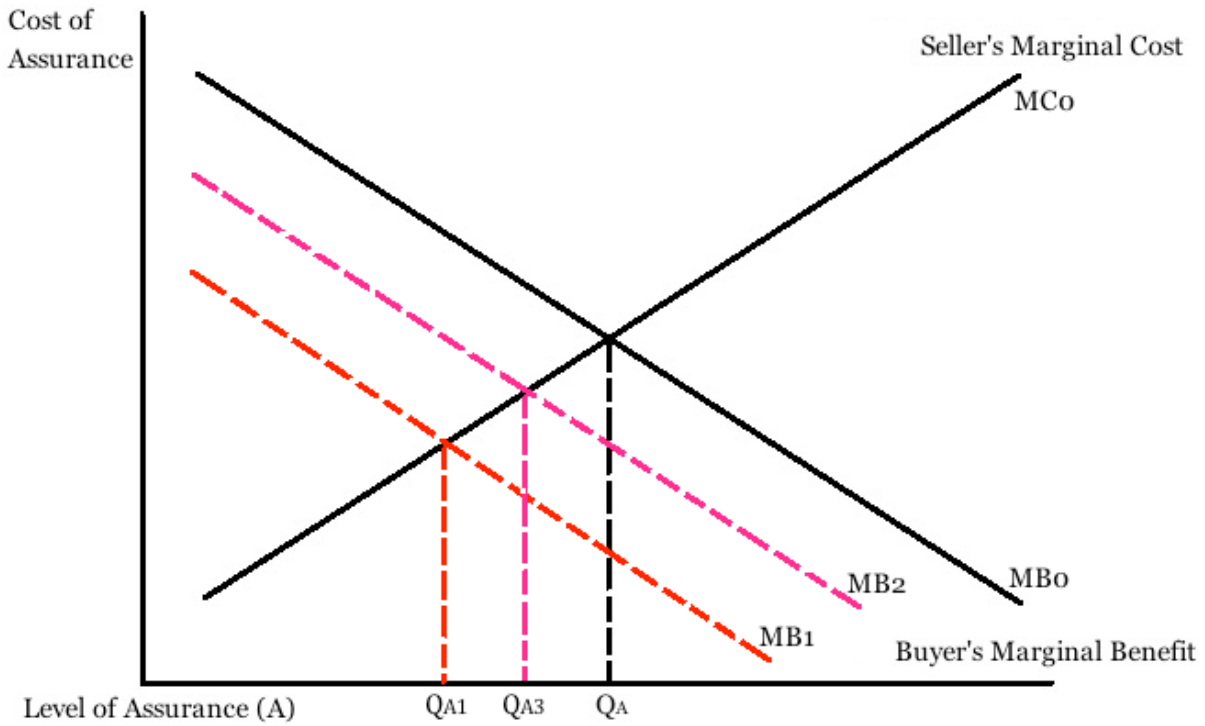
Continuing with the utility maximization model for a credence seller and buyer with exclusive preference, the equilibrium condition when the buyer hires a certifier will be:

$$dU_C = dU_B$$

$$p_c q_c - q_c c_c - F_c = q_c(k + \sigma - p_c - c_i) - F_i \quad (3.9)$$

The buyer's marginal benefit curve decreases from the baseline case scenario due to the certification fees, but these fees are less than the information costs of the buyer conducting a inspection.

Figure 3.4 Positive Information Costs about Seller with TPC Agent of Buyer



The buyer's marginal benefit of assurance is increased from when the buyer performs the inspection. This is shown in Figure 3.4 as the shift from MB₁, representing the buyer performing the inspection, to MB₂, representing the buyer hiring a certifier who is able to conduct the inspection at a lower cost than the buyer. Because of the TPC's lower

cost of inspection, the equilibrium level of assurance increases from Q_{A1} to Q_{A3} but does not exceed the base case scenario of Q_A .

3.2.3b. Seller-induced Certification

Seller-induced certification is a mirror image of buyer-induced certification. Sellers of the credence good will hire the certifier and will be willing to pay certification fees up to the amount that it would cost for the seller to perform self-inspection. With the inclusion of TPC, the level of assurance increases from the scenario where the seller uses self-inspection.

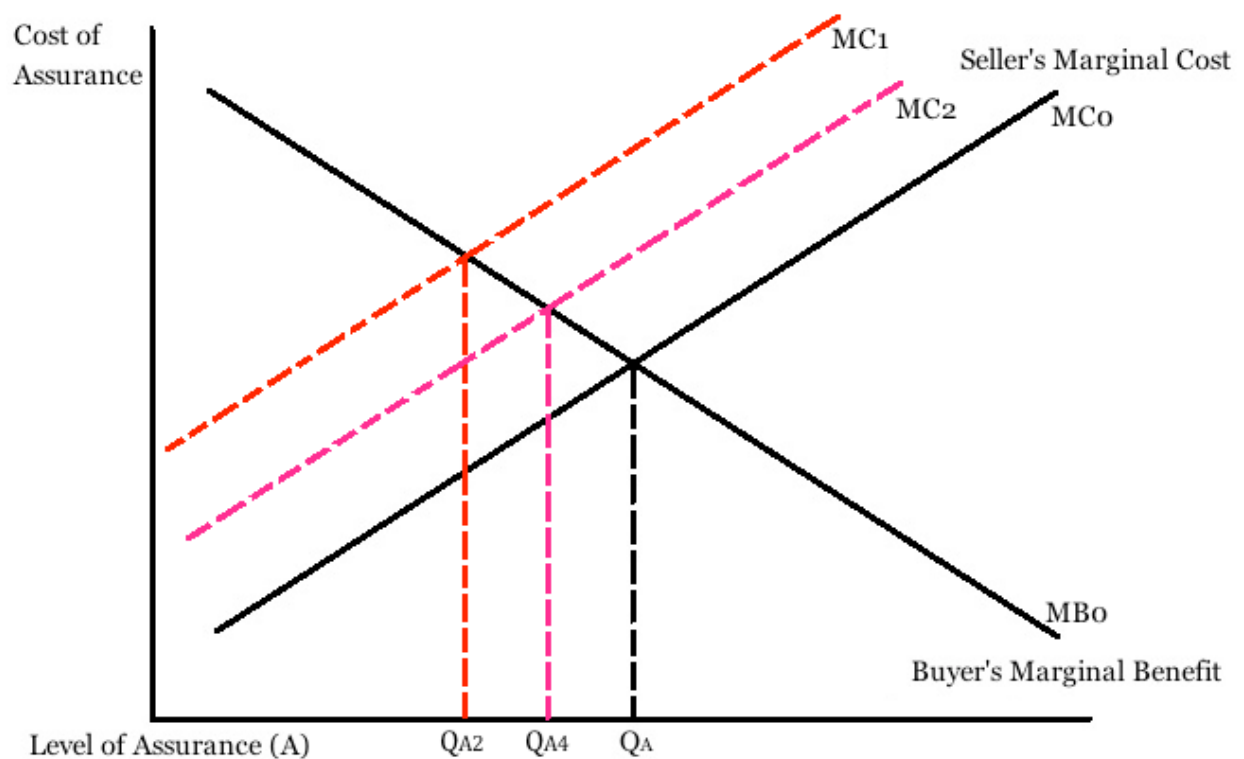
The equilibrium condition when a credence seller hires a certifier for a buyer with exclusive preference will be:

$$dU_C = dU_B$$

$$p_c q_c - q_c(c_c + c_i) - F_c - F_i = q_c(k + \sigma - p_c) \quad (3.10)$$

The seller's marginal cost of assurance increases from the baseline scenario due to the certification fees, but the fees are less than the costs of the seller conducting a self-inspection.

Figure 3.5 Positive Information Costs about Seller with TPC Agent of Seller



A seller's marginal cost of assurance when hiring a certifier is less than when the seller performs a self-inspection. This is shown in Figure 3.5 as the difference between MC_1 , representing the seller performing a self-inspection, and MC_2 , representing the seller hiring a certifier to conduct the inspection. The equilibrium level of assurance increases from QA_2 to QA_4 but cannot exceed the base case scenario of QA .

This is where most studies of TPC end: introducing a third-party to solve the information problem. If buyers in the modern agri-food system have positive information costs about sellers and zero information costs about certifiers, then certification induced by the seller or buyer would provide a higher level of assurance than the seller or buyer performing the inspection. Since it is assumed that buyers possess costless information about the quality and accuracy of inspection services provided by certifiers, only honest

certification would exist under the assumption of zero information costs about the certifiers.

3.2.4 Scenario 3: Positive Information Costs Regarding Sellers and Certifiers

Introducing positive information costs about both the seller and the certifier better represents the complicated, modern agri-food system. In hopes of solving the asymmetric information problem between sellers and buyers, TPC is introduced. However, there are also information costs associated with TPC, introducing another asymmetric information issue for buyers.

3.2.4a. Buyer-induced Certification

Again, in order to avoid purchasing the low quality good, a buyer that prefers credence goods hires a certifier when that certifier can inspect the quality of the seller at a lower cost than a buyer. Building on the earlier equilibrium with buyer-induced certification, this equilibrium includes the buyer's information costs about the certifier.

The equilibrium with the buyer hiring a certifier and having positive information costs about that certifier will be:

$$dU_C = dU_B$$

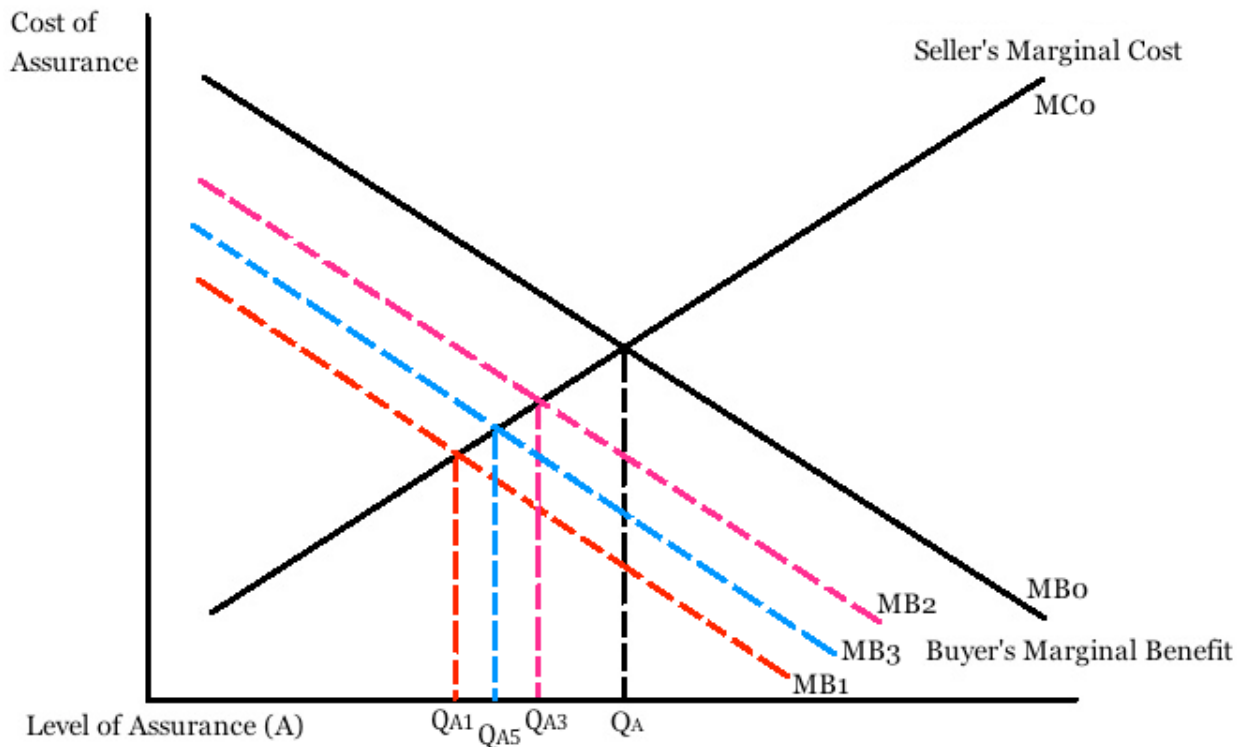
$$p_c q_c - q_c c_c - F_c = q_c (k + \sigma - p_c - c_i) - F_i - I_{CB} \quad (3.11)$$

Where

I_{CB} = information costs for the buyer regarding the certifier

This new buyer's utility model includes information costs regarding the certifier in addition to the certification fees. However, the two of these costs should not be greater than the information costs of the buyer conducting the inspection, MB_1 .

Figure 3.6 Positive Information Costs about Seller and Certifier with TPC Agent of Buyer



As shown in Figure 3.6, the buyer's marginal benefit of assurance is reduced by the additional information cost related to the certifier, I_{CB} , leaving a reduced net marginal benefit for the buyer. The addition of positive information costs about the certifier shifts the buyer's marginal benefit curve from MB_2 to MB_3 . Thus, the equilibrium level of assurance is reduced from the quantity Q_{A3} to Q_{A5} .

In Figure 3.6 the seller still has zero information costs about the certifier; only the buyer has positive information costs about the certifier. The next step of the analysis would include positive information costs for the seller regarding the certifier.² Shifting the seller's marginal cost curve to the left results in an even lower level of assurance due to positive information costs about sellers and certifiers for each party.

3.2.4b. Seller-induced Certification

If the certifier is an agent of the seller, the seller experiences a similar shift in its marginal cost curve as the buyer did when adding information costs about the certifier. When the credence seller hires a certifier and there are positive information costs associated with certifier by the seller, the equilibrium condition will be:

$$dU_C = dU_B$$

$$p_c q_c - q_c(c_c + c_i) - F_c - F_i - I_{CS} = q_c(k + \sigma - p_c) \quad (3.12)$$

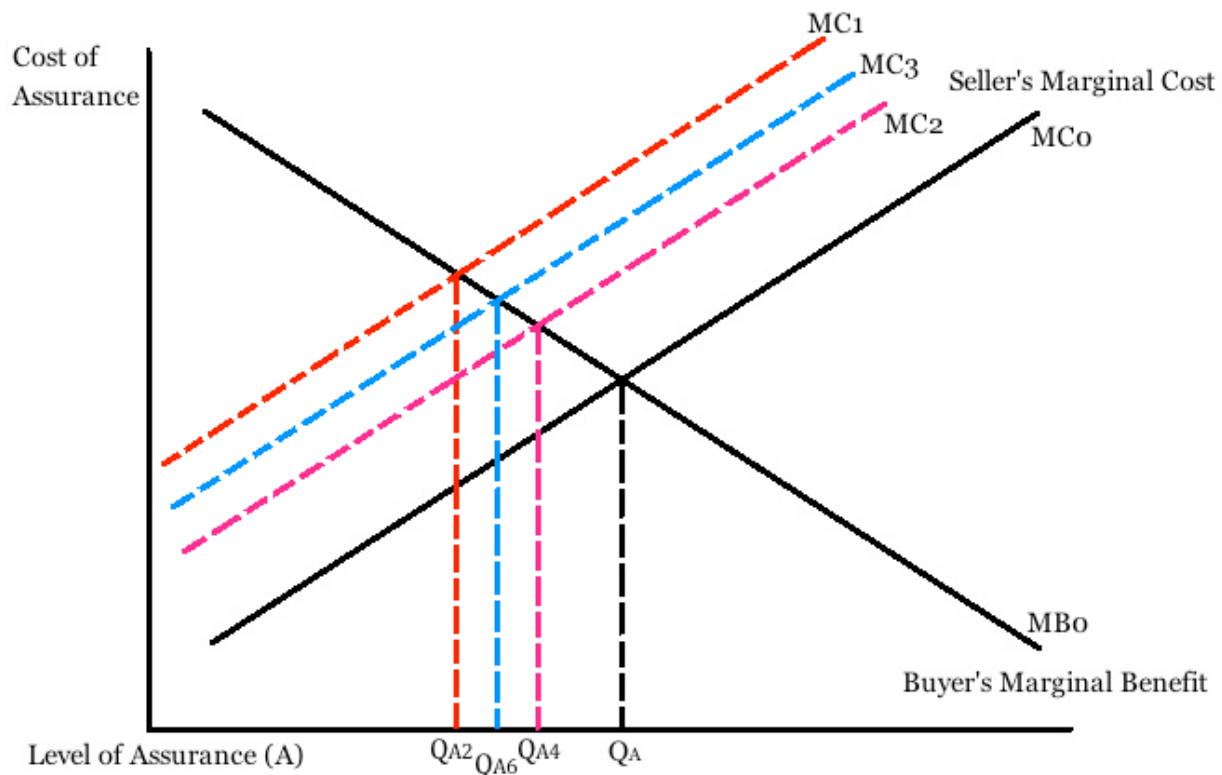
Where

I_{CS} = information costs for the seller regarding the certifier

The seller's marginal cost increases from the information costs regarding the certifier. However, the seller will only be willing to hire the certifier if this new marginal cost is not greater than the seller's marginal cost when the seller performs the inspection.

² The graph for this step on the analysis is not shown but would be a mirror image of Figure 3.8. Also, it is shown as an intermediary step in Figure 3.9.

Figure 3.7 Positive Information Costs about Seller and Certifier with TPC Agent of Seller



The seller's marginal cost of assurance is increased by the information cost about the certifier, I_{CS} , leaving an increased net marginal cost for the seller, as shown in Figure 3.7. Thus, the equilibrium level of assurance is reduced from the quantity Q_{A4} to the quantity Q_{A6} . Again, the equilibrium with positive information costs associated with the certifier has a lower level of assurance compared to when there are zero information costs about the certifier.

3.2.4c. Positive Information Costs for Both Parties Regarding the Certifier

In the above scenario with seller-induced certification, there are zero information costs for the buyer about the certifier. The next equilibrium the buyer's marginal benefit decreases due to positive information costs about the certifier hired by the seller. This is

the most common case in the certification market in the food system: seller-induced certification with positive information costs about sellers and certifiers for both parties.

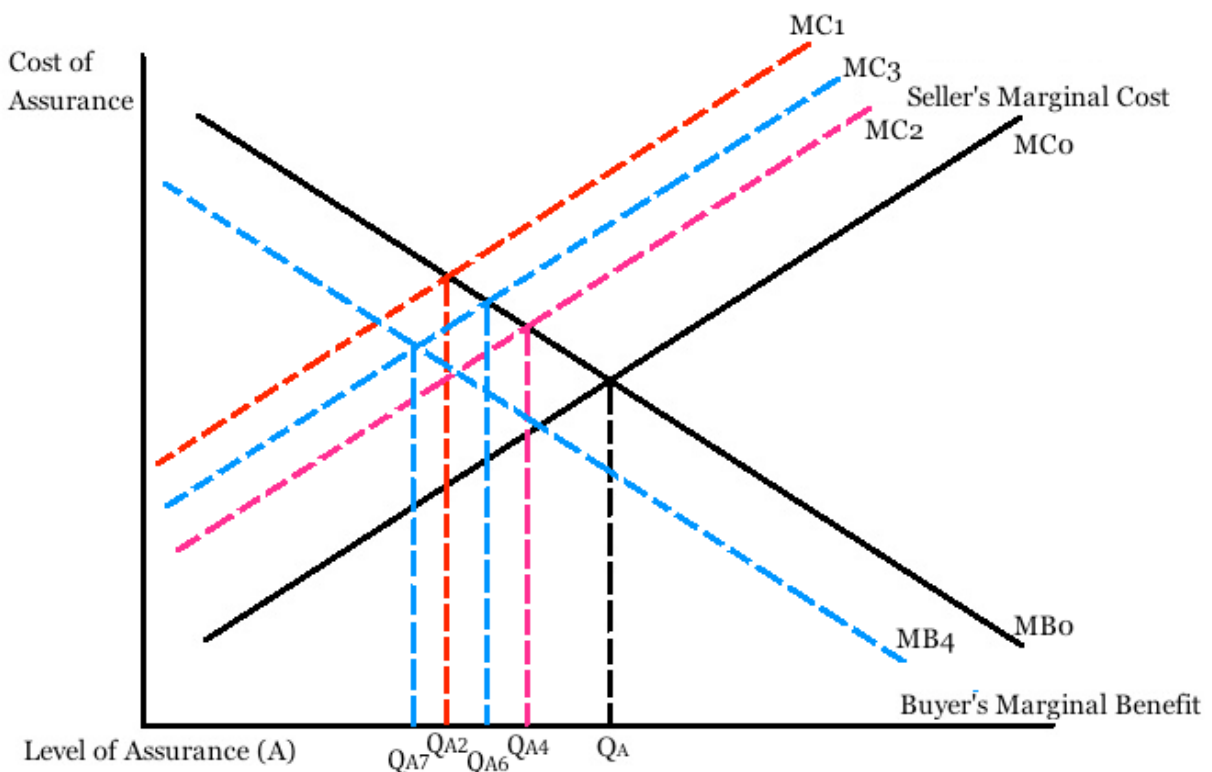
The equilibrium condition when both the credence seller and buyer have positive information costs about a certifier hired by the seller will be:

$$dU_C = dU_B$$

$$p_c q_c - q_c(c_c + c_i) - F_c - F_i - I_{CS} = q_c(k + \sigma - p_c) - I_{CB} \quad (3.13)$$

The buyer's marginal benefit of assurance is lowered by the information costs regarding the certifier. However, the marginal benefit will not be lower than the marginal benefit if the buyer performed the inspection or the buyer would not be willing to hire the certifier.

Figure 3.8 Positive Information Costs about Seller and Certifier for Both Parties with TPC Agent of Seller



With the information costs about the certifier for both the seller and buyer, the equilibrium has shifted several times to a lower level of assurance than the baseline case scenario. The buyer's marginal benefit of assurance is reduced by the addition of positive information costs about the certifier. Thus, the equilibrium level of assurance is reduced from the quantity Q_{A6} to the quantity Q_{A7} .

3.2.5 Scenario 4: Introduction of Disguise Costs and Deception

Positive information costs allows for the introduction of disguise costs by the seller, as well as the certifier. Disguise costs arise when a seller seeks to sell a non-credence good in the credence good market (or certified market). Examples of disguise costs incurred by the seller could be hiding product defects or non-compliances, falsifying documentation, etc. An example of deception occurred in the King Nut salmonella scenario when Peanut Corporation of America hid positive test results for salmonella (Andrews, 2012). This also occurs outside the food system. For example, the Captain faulted for the air crash on February 12, 2009 near Buffalo, NY had several unsatisfactory and failed training tests during his career as a pilot that were not revealed to the employer (Pasztor, 2009).

3.2.5a. Buyer-induced Certification

In the presence of disguise costs, credence sellers will not behave differently and the equilibria will be the same as the previous section of positive information costs regarding sellers and certifiers. In Figure 3.9, there is perfect deception by a non-credence seller to the certifier hired by the buyer (i.e. the deception is successful in deceiving the certifier to certify the non-credence good as a credence good) similar to Hamilton and Zilberman

(2006). Deception exists because on the margin it is cheaper to disguise non-credence goods than it is to produce credence goods.

Using the functions 3.2 and 3.3, the equilibrium condition when a non-credence seller³ creates deception for a certifier hired by the buyer with an exclusive preference for the credence good will be:

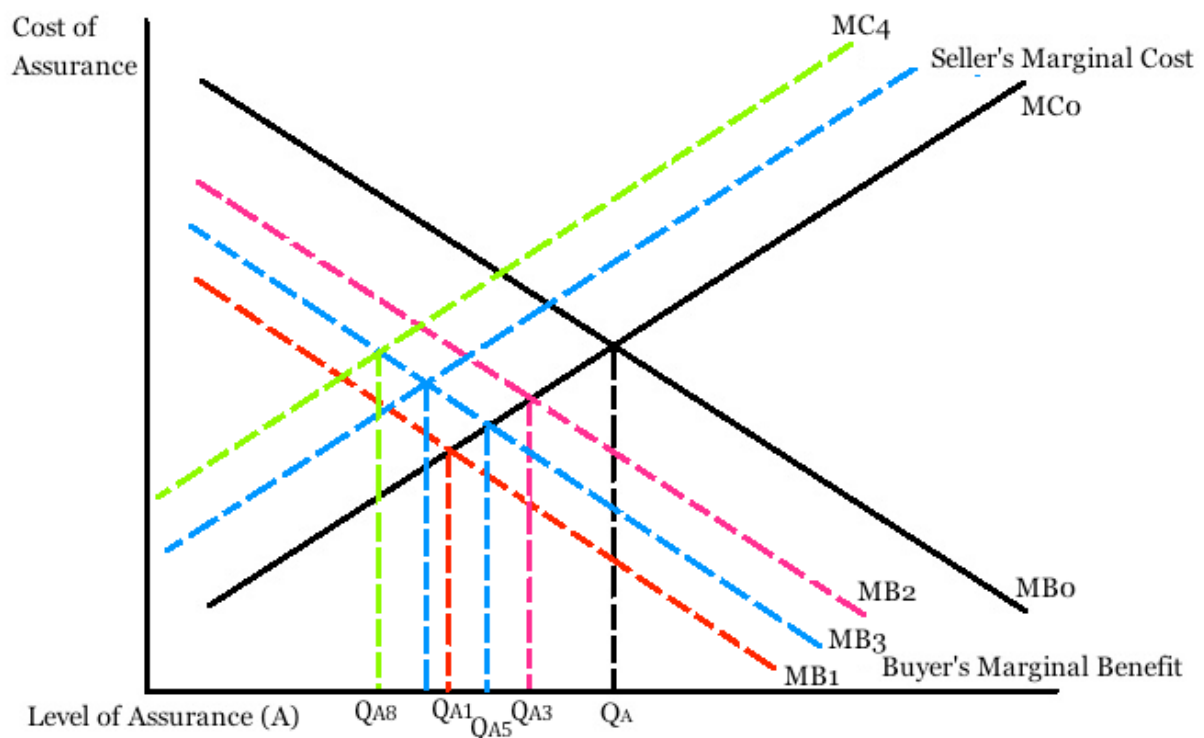
$$dU_N = dU_B$$

$$p_n q_n - q_n c_n - F_n - d - I_{CS} = q_c(k + \sigma - p_c - c_i) - F_i - I_{CB} \quad (3.14)$$

In this equilibrium scenario, a seller is willing to deceive the certifier at the increased costs because they are able to sell the goods at a premium if they are certified as having the credence attributes. Therefore, the marginal return of selling the non-credence goods in the credence market is greater than or equal to the marginal cost of credence goods and deception.

³ This scenario and the following scenarios that include deception will now use the utility model of a non-credence seller. This is because a credence seller would not need to deceive the buyer and/or certifier.

Figure 3.9 Buyer-induced Certification with Perfect Deception by Seller



The seller's marginal cost of assurance is increased first by the information costs about the certifier and second by the costs incurred during deception, leaving an increased net marginal cost for the seller, as shown in Figure 3.9. Thus, the equilibrium level of assurance is reduced to the quantity Q_{A8} .

3.2.5b. Seller-induced Certification

With seller-induced certification and the possibility of deception, credence sellers also behave the same as if there were no disguise costs. In the presence of disguise costs, non-credence sellers and certifiers become joint profit maximizers in deceiving the buyer. Certifier disguise costs include fabricating documentation, non-complete audits, etc.

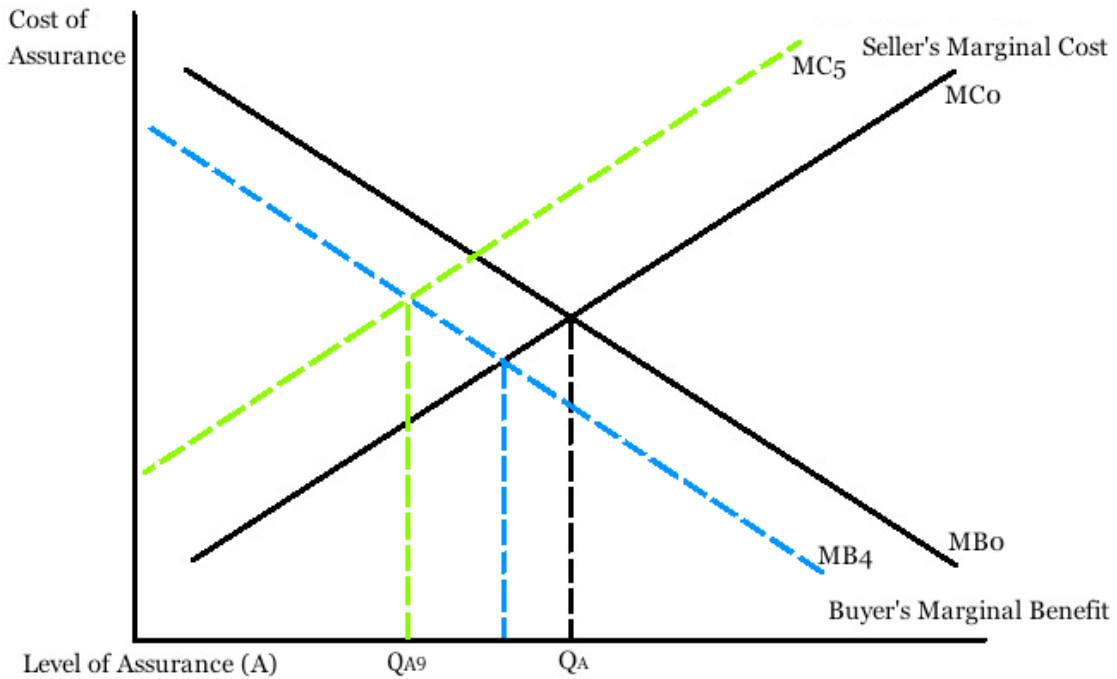
When a non-credence seller hires a certifier and the pair become joint profit maximizers in deceiving the buyer, the equilibrium level of assurance occurs when:

$$dU_N = dU_B$$

$$p_c q_n - q_n(c_n + c_i) - F_n - F_i - d = q_n(k + \sigma - p_c) - I_{CB} \quad (3.15)$$

The seller's marginal cost of assurance increases by the costs associated with deceiving the buyer. Both the seller and certifier are willing to risk deception and incur any disguise costs because of increased revenue. If successful, the seller can sell non-credence goods at the price premium in the credence market. Certifiers would have increased revenue from any fixed and/or unit certification fees and from avoiding inspection costs. In addition, increased certification may help the certifier's brand.

Figure 3.10 Joint Deception by Seller and Certifier



In Figure 3.10 the deception occurs where the seller's marginal cost curve shifts to the left to represent the disguise costs incurred by the seller. Deception by the seller and certifier causes a decrease in the level of assurance. The resulting equilibrium with deception by the seller, and the buyer having positive information costs associated with the certifier occurs at quantity Q_{A9} .

3.3 Conclusion

This chapter has examined a utility maximization model for the relationship between sellers, buyers and third-party certifiers. This analysis provides an in-depth analysis of equilibrium outcomes under various information costs and institutional relationships. With these equilibriums, it would be hypothesized that positive information costs about both the seller and certifier would decrease the level of assurance about the quality of the goods exchanged and introduce the possibility of deception (fraud). This would be true for the food system and other industries. The extent to which an optimal equilibrium is achieved is dependent on the size of the information costs. The resulting outcomes of the equilibriums will be used in the following chapter along with the results from a survey of certification bodies to examine the level of assurance provided by TPC under various institutional structures and information costs.

CHAPTER 4

SURVEY, DATA AND RESULTS

This chapter reports a survey of certification bodies in the food system that has the purpose of determining the presence of information costs and test the hypotheses developed in the previous chapter's theoretical framework. The survey's other purpose is to determine if participants in the TPC market are aware of the information costs and actions being taken to minimize these costs. The derivation of the survey from the utility maximization model developed in chapter 3, the survey responses and the interpretation of the results will then be discussed. The interpretation of the results will include a descriptive summary of the certification market for credence attributes, as well as an in depth analysis that examines the implications of the results on the future of TPC research.

4.1 Construction of the Survey

After weighing various research methods, including econometrics, a content analysis and a case study, a survey of certification bodies was conducted to collect data on key variables. The variables included in the three-party utility maximization model developed in Chapter 3 were used to design the majority of the survey questions. Other questions collect information on other variables that may affect the operation of each organization. Survey questions fall under five categories: business model, customers, certification process, auditors/inspectors and accreditation.

4.1.1 Business Model

Questions regarding the organization's business model provide general information about the responding organization. These include years in business and whether the organization operates as for-profit, non-profit or as a government agency. The utility maximization model of the certifier captures all three types of certification bodies by allowing for flexibility in the revenue and cost structures of the organization. This category gathered information on the responder's certification business, such as whether certification services are the only services offered by the organizations, how many certifications the organization offers to food/agriculture customers and what percentage of the organization's revenue are obtained from certification services.

4.1.2 Customers

For the remainder of the survey, responders were asked to answer survey questions in reference to the certification offered to food/agriculture customers that generates the most revenue for the organization. By focusing on one certification, the survey reflects the utility maximization model in which a buyer has a preference for a single credence attribute that is revealed through TPC. Responses were obtained in reference to the certification that generates the largest share of revenue for the organization to provide comparison with organizations that only offer one certification. Also, the highest revenue generating certification is likely to be a large part of the organization's identity.

The three questions dedicated to the organization's customers collected information on who is purchasing the certification services, which is a critical part of the hypotheses formed in the theoretical framework and the principal agent relationship between the

certifiers and buyers of certification services (i.e. the seller of the certified goods). It also collects information on why those customers obtain certification and how many customers obtain certification from the responding organization.

4.1.3 Certification Process

The certification process category is the largest in terms of the number of questions and collects the most significant information for this research. Questions in this category were intended to collect information on the process used by the certifier to inspect the party seeking certification against a given standard. This portion of the survey gathers information on the costs incurred by the certification body and the fees charged to customers. Questions about revenue and costs are directly linked to the utility maximization model, which includes a question about revenue sources outside of certification services. These include other business services, government subsidies, donations, etc. This category also obtains information about the certification's length of validity and enforcement mechanisms in place by the certification body. These questions seek information on how the responding organization ensures that the customer meets the certification standard at the time of certification and continues to meet the standard for how long it would like to remain certified. These enforcement mechanisms are intended to increase the level of assurance by reducing the information costs regarding the seller.

4.1.4 Auditors/Inspectors

Certification bodies often use auditors to complete inspections of the sellers seeking certification. Questions about the auditors reveal information on the auditor's employment

status, background and enforcement mechanisms to ensure a high-quality, independent audit. In addition to asymmetric information regarding the certifier, there could also be asymmetric information regarding the individual(s) performing the audit.

4.1.5 Accreditation

Finally, the section dedicated to the accreditation of the responding organization examines the certification of the certifier (i.e. the third-party certifier is certified by a fourth-party certifier). This section reveals whether an outside party accredits the certification body and the quality of the information services provided by the accreditation process including fees and enforcement mechanisms. The accreditation process is intended to mitigate the information costs regarding the certifier and its ability to perform certification services.

Table 4.1 Survey Questions

<u>Third-Party Certification Survey Questions</u>
<u>Business Model Questions</u>
1. Under what name does your organization operate? Written answer.
2. How long has your organization been in business? Choose one of the following. a. 5 years or less b. 6-25 years c. 26-50 years d. 51-75 years e. 76-100 years f. More than 100 years
3. Which of the following best describes your organization? Choose one of the following: a. A for-profit organization/firm b. A non-profit organization c. A government agency
4. In total, how many different certifications do you offer for food and agriculture? Choose one of the following: a. One certification b. 2-5 certifications c. 6-10 certifications d. 10+ certifications
5. Who are your competitors for food/agriculture certification services? List up to three competitors. Written answer.
6. In addition to certification services, what business services do you offer to food and agriculture customers? Mark all that apply. a. We offer certification services only b. Consulting services c. Training/education services d. Advertising services e. If other, please describe: _____

Table 4.1 (cont'd)

7. What percent of your organization's revenue is from certification services?

Choose one of the following.

- a. 25 percent or less
- b. 26-50 percent
- c. 51-75 percent
- d. 76-99 percent
- e. 100 percent

For the remainder of the survey, please answer all questions in reference to the certification that generates the most revenue for your organization.

8. What is your organization's highest revenue generating certification offered to food/agriculture customers? If your organization only offers one certification, respond to the remainder of the survey in reference to the one certification.

Written answer.

Customer Questions

9. To what parties do you sell your certification services?

Choose one of the following in reference to the certification stated above.

- a. Sellers of the goods being certified
- b. Buyers interested in purchasing certified goods
- c. Both

10. To how many customers do you provide certification services?

Choose one of the following in reference to the certification stated above.

- a. 100 customers or less
- b. 101-2,500 customers
- c. 2,501-5,000 customers
- d. 5,001-10,000 customers
- e. More than 10,000 customers

11. Why do your customers receive certification?

Mark all that apply in reference to the certification stated above.

- a. To justify a price premium
- b. For market entry
- c. For legal purposes
- d. If other, please describe: _____

Certification Process Questions

12. What fees do you charge for certification services?

Mark all that apply in reference to the certification stated above.

- a. Fixed fee for each applicant
- b. Per unit fee for each unit of good inspected

Table 4.1 (cont'd)

- c. Per unit fee for each unit of good sold with certification
- d. Fees based on auditor time and travel
- e. Membership fees
- f. If other, please describe: _____

13. Do you have any other revenue sources other than the certification fees?

Mark all that apply in reference to the certification stated above.

- a. No, certification services are the only revenue source
- b. Consulting services
- c. Training/education services
- d. Laboratory services
- e. Donations
- f. Membership fees
- g. Monetary penalties assessed by your organization
- h. If other, please describe: _____

14. What costs do you incur when you are providing certification services?

Mark all that apply in reference to the certification stated above.

- a. Auditor time
- b. Auditor travel
- c. Laboratory costs
- d. Fees to an accreditation organization
- e. If other, please describe: _____

15. Which of the following are included in your audit process?

Mark all that apply in reference to the certification stated above.

- a. Document Review
- b. On-site inspection using checklist
- c. On-site inspection using physical tests
- d. Laboratory tests
- e. Report filed by auditor
- f. Certification decision made or recommended by auditor
- g. Review of decision by other individual(s) in your organization
- h. Random or scheduled follow-up audits
- i. If other(s), please describe: _____

16. What happens if a party fails to meet the certification standard during the initial audit?

Choose one of the following in reference to the certification stated above.

- a. The organization receives certification because of flexibility with initial compliance
- b. The organization receives certification but has to fix non-compliance issues within a given amount of time, which is followed-up by an auditor

Table 4.1 (cont'd)

c. The organization does not receive certification but can reapply when it is in compliance

d. If other, please describe: _____

17. How long is the certification valid?

Choose one of the following in reference to the certification stated above.

a. Until the next audit

b. One year

c. 2-4 years

d. 5+ years

e. Lifetime of the organization

f. If other, please describe: _____

18. What enforcement mechanisms are in place for parties with certification in order to ensure that they continue to meet certification requirements?

Mark all that apply in reference to the certification stated above.

a. Monetary penalties

b. Published infractions

c. Scheduled audits in between re-certification

d. Unannounced or random audits

e. None of the above

f. If other, please describe: _____

19. What happens if a party is found not meeting the certification requirements after approved for certification?

Mark all that apply in reference to the certification stated above.

a. Certification is taken away

b. The organization is put on probation and must fix the non-compliances within a given amount of time

c. The organization is charged a monetary penalty

d. If other, please describe: _____

Auditor/Inspector Questions

20. Who performs the audits?

Mark all that apply in reference to the certification stated above.

a. Employees of your organization

b. Contractors working for your organization

c. Government employees

d. If other, please describe: _____

21. What is the background of your auditors?

Mark all that apply in reference to the certification stated above.

a. Education, minimum degree in certain field

Table 4.1 (cont'd)

- b. Training program by an outside party
- c. Internal training
- d. Industry expertise, minimum amount of experience in industry
- e. If other, please describe: _____

22. What mechanism(s) are in place to ensure that auditors maintain the level of quality your organization expects?

Mark all that apply in reference to the certification stated above.

- a. Shadow audits- someone from your organization accompanies an auditor periodically during their audits
- b. Review of audit reports
- c. Regular auditor training
- d. If other, please describe: _____

23. What is the level of quality your organization expects?

Mark all that apply in reference to the certification stated above.

- a. Inspection of every checkpoint
- b. Meets minimum requirements during laboratory tests
- c. Sample size for any laboratory or physical tests meets minimum size
- c. If other, please describe: _____

24. How do you ensure that the auditors remain independent of the parties they are auditing?

Mark all that apply in reference to the certification stated above.

- a. Randomly assign auditors
- b. Rotate auditors
- c. Review board for certification decisions
- d. If other, please describe: _____

Organization Accreditation Questions

25. Are you accredited by an independent body as being capable of conducting certification?

- a. No
- b. Yes

26. If yes, what organizations have accredited your organization?

Written answer.

27. If your organization is accredited, what is the accreditation process used by the accrediting organization(s)?

Mark all that apply:

- a. Initial document review
- b. On-site assessment of capability

Table 4.1 (cont'd)

- c. Training of organization's auditors
- d. If other, please describe: _____

28. What type of fees do you have to pay for accreditation services?

Mark all that apply.

- a. Fixed initial application fee
- b. Variable initial application fees based on assessor time
- c. Fixed renewal fees
- d. Variable renewal fees based on assessor time
- e. Royalty fees for each certification given to a party
- f. If other, please describe: _____

29. If your organization is accredited, what enforcement mechanisms does the accreditor(s) use?

Mark all that apply:

- a. Regular review of audit documents to maintain accreditation
- b. Regular on-site assessments of capability to maintain accreditation
- c. Shadow audits with your organization's auditors
- d. If other, please describe: _____

4.1.6 Preliminary Research/Pre-test Survey

Preliminary research was conducted at the 2013 Fresh Summit Convention and Expo hosted by the Produce Marketing Association (PMA). Fresh Summit connects, informs, and delivers industry solutions to over 20,000 people in the produce industry. The convention and expo is attended by every segment of the produce and floral supply chain, including retailers, industry suppliers, wholesalers, grower-shippers, importers/exporters, etc. ("Fresh Summit," n.d.)

Also in attendance were organizations that provide certification services. These organizations set up exhibition booths at Fresh Summit to advertise their certification services to companies involved in the produce and floral supply chain. The 13 organizations in attendance were a variety of government agencies, non-profit and for-

profit organizations. Out of the 13 representatives from certification organization, nine were interviewed during the weekend event. These include four government, two non-profit, and three for-profit organizations; a broad sample of the TPC market. The representatives interviewed were mostly involved in sales or a manager of certification services/supply chain and were well informed about the organization and at least one certification offered by the organization.

Before attending Fresh Summit, a list of interview topics and questions was created. This provided a framework for the interviews with representatives from the organizations providing certification services. Topics covered in the 26 open-ended questions include the business model, audit process, enforcement of the auditor, and whether the organization is accredited. All of the original questions remained in the formal survey based on feedback from interviews with the organizations at the expo. However, many questions were modified from open-ended questions to multiple choice and checklist format. This revised list of questions was used to create the online survey.

From the interviews it was learned that certification is very labor intensive and these costs are usually passed on directly the customer. In addition, it is common for certification organizations to offer services other than certification services as other revenue sources. This mostly includes training services to assist sellers in complying with certification standards. Finally, the interviews at Fresh Summit revealed that many of the certification standards have some flexibility for minor violations against the standard. This allows parties that do not comply during the initial audit some time to comply with the standard while maintaining certification.

4.1.7 Sample Selection Process

The organizations chosen for the survey were certification bodies offering food/agriculture certifications that I could find using Internet searches. These searches included the websites of several accreditation bodies with lists of accredited certifiers. For example, part of the sample was obtained from the American National Standards Institute (ANSI) website, ANSI-ASQ National Accreditation Board website, Accreditation Services International website, United States Department of Agriculture's website for certification bodies accredited against the National Organic Program (NOP), and other accreditation body websites. Potential responders to the survey included a variety of certification bodies. There were no geographical boundaries put on the sample. These organizations represent various state, national or international certification markets. Any organization that offers one or more certifications to food/agriculture customers was sent the link to the survey.

The online version of the survey was sent using Google Forms with the majority of questions in multiple choice or checkbox format to lower the transaction cost for the people responding. The link to the survey along with an explanation of the study was sent by email to 43 certification bodies. In the email with the survey link, introduction the researchers, and summary of the research there was a two-week deadline for responses. This email was sent to general information contacts, media relations or, in some cases, a sales manager. For those organizations that did not respond in the first week, a reminder email was sent. However, when the deadline approached, the deadline was extended another week and a third email was sent to organizations that had not filled out the survey informing them of the extension. At the end of the extended deadline, 18 out of the 43 organizations that received the survey had responded.

4.2 Descriptive Summary of Survey Responses

4.2.1 Business Model Questions

As shown in Table 4.3 (Question 3), the 18 responding organizations represented a mix of government agencies (22%), non-profit organizations (39%) and for-profit organizations (39%). Although there is not an official list of all TPCs in the agri-food system, this sample appears to be an accurate representation of the TPC market. Responding organizations ranged from a newer interest in TPC in the food system or have provided certification services for almost a century. Ten organizations had been in business for 6-25 years, three for 26-50 years, two for 76-100 years, and two for more than 100 years.

This provides evidence that the growth of TPC in the agri-food system is a relatively new phenomenon. As shown in Table 4.2, a majority of the for-profit organizations offering certification services have been in business 25 years or less. These results suggest that TPC, services especially from for-profit and non-profit organizations, are likely to have become a substitute for government agencies that provided inspection services in prior years. This can partially be attributed to the globalization of the agri-food system, which has made it increasingly difficult for governments to regulate quality standards when goods are being shipped around the world and therefore, sellers operate further away from the buyers. In addition, the expansion in product differentiation and the development of quality attributes has placed a constraint on government regulatory bodies. (Hatanaka et al., 2005)

Table 4.2 Years in Business by Type of Certification Organization

	Years in business					
	Less than 5	6-25	26-50	51-75	76-100	More than 100
Government Agency	0	2	1	0	1	0
Non-profit	0	3	2	0	0	2
For-profit	0	5	0	0	1	0

However, the high percentage of for-profit organizations providing certification services may be a concern for those parties seeking a certain level of assurance with TPC. For-profit organizations have their own incentive and objectives, primarily to maximize profit. In order to maximize profit, the certifying organization may have an incentive to lower standards to attract more customers or provide a lower quality inspection in order to decrease costs incurred when providing certification services.

Table 4.3 Survey Results

Business Model

2. How long has your organization been in business?

0	5 years or less
10	6-25 years
3	26-50 years
0	51-75 years
2	76-100 years
2	More than 100 years

3. Which of the following best describes your organization?

7	A for profit organization/firm
7	A non-profit organization
4	A government agency

4. In total, how many different certifications do you offer for food and agriculture?

7	One certification
9	2-5 certifications
1	6-10 certifications
1	10+ certifications

5. Who are your competitors for food/agriculture certification services?

List up to three competitors.

TPC01: Our program is mandatory to our members, so there are no "competitors" per se

TPC02: None

TPC03: SGS, NSF, Siliker

TPC04: Global GAP, Primus, NSF

TPC05: NSF, SAI Global, Siliker

TPC06: SGS, Bureau Veritas, Intertek

TPC08: I do not consider other agencies as competitors; we all have the same goal, clean food for consumers

TPC09: See USDA accredited certifier list

TPC10: NSF, Siliker, AIB

TPC11: NSF, Siliker, AIB

TPC13: CCOF, QAI, MOSA

TPC14: None

TPC15: Siliker Labs, AIB, SAI Global

TPC16: CCOF, OTCO, QAI

TPC17: Organic, Certified Human, Non-GMO

TPC18: Humane Farm Animal Care, Global Animal Partnership, Animal Welfare Approved

Table 4.3 (cont'd)

6. In addition to certification services, what business services do you offer to food and agriculture customers?

- 7 We offer certification services only
- 1 Consulting services
- 11 Training/education services
- 2 Advertising services
- 1 Other: Lab services and arbitration

7. What percent of your organization's revenue is from certification services?

- 3 25 percent or less
- 0 26-50 percent
- 2 51-75 percent
- 7 76-99 percent
- 5 100 percent

8. What is your organization's highest revenue generating certification offered to food/agriculture customers? If your organization only offers one certification, respond to the remainder of the survey in reference to the one certification.

- TPC03: SQF
- TPC05: SQF
- TPC06: ISO 22000
- TPC07: Organic
- TPC10: BRC
- TPC11: GFSI
- TPC15: SQF

Customers

9. To what parties do you sell your certification services?

- 7 Sellers of the goods being certified
- 1 Buyers interested in purchasing certified goods
- 8 Both

10. To how many customers do you provide certification services?

- 3 100 customers or less
- 12 101-2,500 customers
- 0 2,501-5,000 customers
- 1 5,001-10,000 customers
- 0 More than 10,000 customers

11. Why do your customers receive certification?

- 4 To justify a price premium
- 15 For market entry
- 6 For legal purposes

Table 4.3 (cont'd)

5	Other: Consumer confidence, to confirm the integrity of organic food, they believe in growing/producing organically, values of stewardship, environmentalism, and brand protection and enhancement.
<u>Certification Process</u>	
12. What fees do you charge for certification services?	
8	Fixed fee for each applicant
2	Per unit fee for each unit of good inspected
5	Per unit fee for each unit of good sold with certification
10	Fees based on auditor time and travel
1	Membership fees
1	Other: Combination
13. Do you have any other revenue sources other than the certification fees?	
5	No, certification services are the only revenue source
0	Consulting services
7	Training/education services
2	Laboratory services
2	Donations
5	Membership fees
1	Monetary penalties assessed by your organization
1	Other: Grants
14. What costs do you incur when you are providing certification services?	
13	Auditor time
13	Auditor travel
4	Laboratory costs
12	Fees to an accreditation organization
2	Other: overhead costs for maintaining an office and accreditation for the US and Canada and Technical Experts when needed
15. Which of the following are included in your audit process?	
17	Document Review
16	On-site inspection using checklist
7	On-site inspection using physical tests
6	Laboratory tests
16	Report filed by auditor
11	Certification decision made or recommended by auditor
16	Review of decision by other individual(s) in your organization
13	Random or scheduled follow-up audits
1	Other: Technical review

Table 4.3 (cont'd)

16. What happens if a party fails to meet the certification standard during the initial audit?

- 0 The organization receives certification because of flexibility with initial compliance
- 6 The organization receives certification but has to fix non-compliance issues within a given amount of time, which is followed-up by an auditor
- 9 The organization does not receive certification but can reapply when it is in compliance
- 0 The organization cannot receive certification for a fixed period of time
- 2 Other: There is a "fixed" and "scored" criteria. A business that does not meet fixed criteria will not be certified. A business that narrowly misses the required number of points on scored criteria may be certified with a requirement that it fix non-compliance issues within a defined period and A certification decision or adverse action is specific to each case. See USDA organic regulations for how certification proceeds.

17. How long is the certification valid?

- 1 Until the next audit
- 14 One year
- 2 2-5 years
- 0 5+ years
- 0 Lifetime of the organization
- 1 Other: depending on the score, 6 to 12 months.

18. What enforcement mechanisms are in place for parties with certification in order to ensure that they continue to meet certification requirements?

- 2 Monetary penalties
- 7 Published infractions
- 3 Scheduled audits in between re-certification
- 12 Unannounced or random audits
- 1 None of the above
- 2 Other: Site inspection if deemed necessary and Requirement to submit annual updates that become subject to validation in scheduled (every 3 years) or random audits.

19. What happens if a party is found not meeting the certification requirements after approved for certification?

- 13 Certification is taken away
- 9 The organization is put on probation and must fix the non-compliances within a given amount of time
- 2 The organization is charged a monetary penalty
- 2 Other: It depends on the specific circumstance. Reference the USDA organic regulations. Depends on the type of infraction.

Table 4.3 (cont'd)

Auditors/ Inspectors

20. Who performs the audits?

- 10 Employees of your organization
- 13 Contractors working for your organization
- 3 Government employees
- 0 Other

21. What is the background of your auditors?

- 15 Education, minimum degree in certain field
- 13 Training program by an outside party
- 15 Internal training
- 16 Industry expertise, minimum amount of experience in industry
- 2 Other: Continuing education and must meet requirements of certification scheme

22. What mechanism(s) are in place to ensure that auditors maintain the level of quality your organization expects?

- 15 Shadow audits- someone from your organization accompanies an auditor periodically during their audits
- 17 Review of audit reports
- 17 Regular auditor training
- 1 Other: Auditor calibration activities

23. What is the level of quality your organization expects?

- 12 Inspection of every checkpoint
- 2 Meets minimum requirements during laboratory tests
- 3 Sample size for any laboratory or physical tests meets minimum size
- 3 Other: Practical compliance, USDA organic regulations are a process-based standard. The expectation is that the certified operation follows their organic system plan, and Compliance with every clause of the schemes.

24. How do you ensure that the auditors remain independent of the parties they are auditing?

- 6 Randomly assign auditors
- 12 Rotate auditors
- 9 Review board for certification decisions
- 5 Other: Ethical guidelines, signed conflict of interest affidavits, predefined avoidance of conflicts of interest, disclosure of conflict of interest by auditors, tracking activities, and reputable firm reporting to our organization.

Accreditation of your organization

25. Are you accredited by an independent body as being capable of conducting

Table 4.3(cont'd)

certification?

- 2 No
- 15 Yes

26. If yes, what organizations have accredited your organization?

- TPC03: ANSI
- TPC05: ANSI
- TPC06: ANAB, ANSI
- TPC07: Both EU organic authorities and also USDA/ NOP authorities
- TPC08: USDA/AMS, Canadian Standards Council
- TPC09: USDA, IOAS
- TPC10: ANSI
- TPC11: BRC, SQF
- TPC12: ANSI
- TPC13: USDA
- TPC14: Colorado State University
- TPC15: ANSI
- TPC16: USDA, ISO
- TPC17: ISO
- TPC18: USDA

27. If your organization is accredited, what is the accreditation process used by the accrediting organization(s)?

- 14 Initial document review
- 13 On-site assessment of capability
- 6 Training of organization's auditors
- 0 Other

28. What type of fees do you have to pay for accreditation services?

- 10 Fixed initial application fee
- 8 Variable initial application fees based on assessor time
- 0 Fixed renewal fees
- 0 Variable renewal fees based on assessor time
- 1 Royalty fees for each certification given to a party
- 3 Other: Ongoing reaccreditation fees, update fee, and none.

29. If your organization is accredited, what enforcement mechanisms does the accreditor(s) use?

- 12 Regular review of audit documents to maintain accreditation
- 13 Regular on-site assessments of capability to maintain accreditation
- 8 Shadow audits with your organization's auditors
- 1 Other: None

These organizations may specialize in one certification or offer multiple certifications. For those offering multiple certifications, the menu of certifications may be offered only to food/agriculture sellers or may be offered in other industries. Seven organizations that responded to the survey offered one certification to food/agriculture customers, as shown in Table 4.3 (Question 4), while nine offer 2-5 certifications. One responded that they offer 6-10 certifications and one organization offered more than 10 different certifications to food/agriculture customers.

As shown in Table 4.4, the government agencies offer only one certification, while the non-profits offered either one or multiple certifications. On the other hand, the responding for-profit organizations offer multiple certifications. This implies that certification services for one certification standard are unlikely to provide revenues that are adequate to pay the fixed costs associated with providing a single certification. Also, this suggests that the for-profit organizations are maximizing profit by offering multiple certifications.

Table 4.4 Number of Food/Agriculture Certifications Offered by Government Agencies, Non-Profit and for-profit Organizations

	Number of certifications offered to food/agriculture customers			
	1	2-5	6-10	10+
Government Agency	4	0	0	0
Non-profit	3	3	0	1
For-profit	0	6	1	0

As shown above, many TPC suppliers are a business, and organizations compete for the business of providing certification services, as shown in Table 4.3 (Question 4). Out of the 16 organizations that responded to the question “Who are your competitors for

food/agriculture certification services?” four answered that they did not have any competitors (Table 4.3, Question 5). Those four organizations were a mix of for-profit, non-profit and two government organizations. The other 12 organizations, listed one to three organizations they viewed as direct competitors in the market for TPC services. These results confirm two important aspects of the three-party utility maximization model. The first is that TPC organizations are often self-interested and can be expected to act in pursuit of their own welfare, usually as profit maximizers. Second, these results confirm that TPC organizations usually operate in a marketplace in which they compete with other TPC parties to acquire business revenue.

Many of these organizations add value for their customers by offering other services in addition to certification services. Out of the 18 responses seven offer only certification services, while the other 11 offer training/education services in addition to certification services. One organization also offers consulting services, two also offer advertising services, and one organization also offers lab services and arbitration. (Table 4.3, Question 6).

Table 4.5 displays the percentage of revenue obtained from certification services. If an organization’s main objective is to maximize profit, and a majority of revenue comes from certification services, then that organization may have incentive to lower standards in order to increase certification sales. This provides evidence that future research into TPC needs to take into account the role of the certifier’s self-interest.

Table 4.5 Percentage of Revenue from Certification Services for Government Agencies, Non-Profit and for-profit Organizations

	Percent of Organization's Revenue from Certification Services				
	25 percent or less	26-50 percent	51-75 percent	76-99 percent	100 percent
Government Agency	1	0	0	1	1
Non-profit	2	0	1	3	1
For-profit	0	0	1	3	3

4.2.2 Customer Questions

The responding organizations vary in size based on the number of customers to whom they provide certification services. Three organizations have 100 customers or less, while most have 101-2,500 customers, and one organization has 5,001-10,000 customers (Table 4.3, Question 10). As might be hypothesized, the organizations that have 100 or fewer customers tend to operate within one state and the organization with 5,001-10,000 customers has a large international presence.

For six organizations, their customers are sellers of the goods being certified, for one organization its customers are buyers interested in purchasing certified goods and eight organizations offer its certification services to both sellers and buyers (Table 4.3, Question 9). Thus, TPC services are largely marketed towards sellers of food products. As noted earlier and examined in section 4.3.1, this presents a potential conflict of interest as sellers and certifiers have an incentive to provide the seller with certification regardless of product quality in order to increase profit for both parties. Using the model developed in the previous chapter, the seller would be able to sell its goods at a higher price with the certification. In addition, the certifier would have increased revenue from providing

certification services to the seller or would increase profits by adjusting audit quality and reducing inspection costs.

4.2.3 Certification Process Questions

The most common cost for organizations to incur when providing certification services is the cost of auditor time and travel. The second most common cost incurred for certification services are fees to an accreditation organization. Four organizations incur laboratory costs when providing certification services. Two organizations answered “other” for the overhead costs of maintaining an office and for technical experts when needed. (Table 4.3, Question 14)

Since providing certification services is a labor intensive service, 10 out of the 18 organizations charge fees based on auditor time and travel. Responders may have a fee structure that includes several different fees. Eight organizations charge a fixed fee for each applicant, while seven organization charge per unit fees (five for each unit of good sold with certification and two per unit of good inspected). Only one of the surveyed organizations charges membership fees and one responded that it charges a combination of fees. (Table 4.3, Question 12)

As shown in Table 4.6, many organizations charge certification fees that directly relate to the marginal costs incurred by the organization for providing the certification service. This includes directly passing on laboratory costs and auditor travel costs and wages to customers as well as a fixed fee to cover royalty fees to an accreditation organization.

Table 4.6 Certification Fees and Costs Incurred When Providing Certification Services

		Fees charged for certification services				
		Fixed Fee	Per unit fee for each unit of good inspected	Per unit fee for each unit of good sold with certification	Fees based on auditor time and travel	Membership Fees
Costs incurred when providing certification services	Auditor Time	5	1	5	6	0
	Auditor Travel	5	1	5	6	0
	Laboratory Costs	3	0	1	3	0
	Fees to an accreditation organization	6	2	2	9	1

4.2.4 Auditor/Inspector Questions

A research objective of this study is to analyze the equilibrium market conditions with varying institutional structures when the certifier can be hired by the seller or the buyer. Therefore, the survey asked responding organizations what mechanisms are in place to ensure that auditors remain independent of the parties they are auditing. Two-thirds of the organizations rotate auditors to ensure that the auditors remain independent of the parties they are auditing. For 13 of the responding organizations, the auditors are contractors with the TPC organization. Ten organizations use employees from their

organization perform the audits and three use government employees. The organizations using government employees are government agencies. Second, half of the organizations have a review board for certification decisions. Six organizations randomly assign auditors. Other measures to ensure auditor independence include ethical guidelines set by the employer, signed conflict of interest affidavits, predefined avoidance of conflicts of interest, disclosure of conflict of interest by auditors, tracking activities, and use of reputable firms. (Table 4.3, Question 24) These mechanisms have a heavy reliance on self-confession by the auditor, which probably does not reduce information costs about the certifier when compared to other enforcement mechanisms.

Four out of the 18 responding organizations have all four of the most common mechanisms in place to ensure that auditors remain independent of the parties they are auditing (i.e. randomly assigning auditors, rotating auditors, and having a review board in place for certification decisions). Five organizations have two of these mechanisms in place. Thus, certification bodies seek to maintain a system to avoid conflicts of interest between the auditors and the party obtaining certification. This confirms that certification bodies recognize the information costs regarding the auditor and have systems in place to reduce these costs.

A popular mechanism to ensure auditors maintain a certain level of quality, according to Table 4.3 (Question 22), is shadow audits. This occurs when a representative of the organization accompanies an auditor during the audits. Shadow audits introduce another level of information costs about the person conducting the shadow audit (i.e. the cost associated with the shadow auditor).

4.2.5 Organization Accreditation Responses

A majority of certification bodies (15 of 18) are accredited by an independent body (a certifier of the certifier, or a “fourth” party certifier of the third-party certifier) as being capable of conducting certification services (Table 4.3, Question 25). Almost all of the accredited organizations went through an initial document review (14 of 15) and an on-site assessment of capability (13 of 15) in order to gain accreditation. To maintain this accreditation, the accreditation body conducts regular reviews of audit documents to maintain accreditation (12 of 15), conducts regular on-site assessments of capability to maintain accreditation (13 of 15) and conduct shadow audits with the certification body’s auditors (8 of 15).

While this is intended to add another layer of assurance, accreditation also creates another level of information costs (i.e. sellers, buyers and certifiers incur costs in researching prices, quality and other attributes about the accreditation body).

4.3 Analysis of Survey Responses

Several conclusions drawn from the results of the survey revealed a multi-layer information problem. While the information problem between sellers and buyers has been well recognized in the literature, the survey results confirmed that there could be information costs for the buyer regarding the certifier hired by the seller. It has also identified several other layers of information problems absent from the current literature on TPC. This section will further examine this multi-layer problem, in addition to an evaluation of the utility maximization model.

4.3.1 The Model: Asymmetric Information About The Seller and Certifier

Examining the results of the survey, there are two important features of the utility maximization model that are supported by the survey responses. First, the certification organizations that are auditing and providing sellers with certification services are in most case, being paid by the sellers they certify (Table 4.3, Question 9). This creates the potential for a conflict of interest. Secondly, there is competition among certification bodies. A majority of the organizations reported having at least one competitor in providing certification services to food/agriculture customers (Table 4.3, Question 5). Thus, in a competitive market, if the audit standard is too strict with the first certification provider, the seller may ask another certifier with a lower standard to provide the seller with certification.

Third, the survey results confirm that the certifiers are likely to be acting in their own self-interest, often as profit maximizers. The principal-agent problem where the certifier is acting in their own self-interest is absent in the literature on TPC in the agri-food system. For example, Stahl and Strausz (2010) examine the welfare effects of buyer- and seller-induced certification with asymmetric information about the seller. However, the authors only examine honest certification where there is perfect information about the certifier. As shown in the survey, certification bodies usually obtain a majority of their revenue from certification services (Table 4.3, Question 7). If an organization is maximizing profit and receives a majority of their revenue from certification services, there could be an incentive to offer more certifications to parties seeking certification. In order to increase certifications, the organization might lower its standards or auditing procedures that

would allow more parties to meet the certification standard. In addition, auditor quality could be adjusted to reduce costs and increase profit.

The results reported in Table 4.3 (Question 3) demonstrate the certification market is composed of for-profit and non-profit organizations, and government agencies, which have traditionally been relied on to provide quality assurance. These organizations, especially for-profit organizations, have other interests, such as profit maximization, in addition to providing assurance. Such results indicate that economist's modeling of certification organizations must include the organizations' pursuit of their own self-interest. The model of TPCs developed in this research captures the different types of certifiers by allowing for varying cost and revenue structures and allowing for the certifier to either sell its services to the buyer or the seller.

4.3.2 Asymmetric Information About The Auditor/Inspector

Providing certification services is a labor-intensive process. As Table 4.3 (Question 14) shows, a majority of certification bodies incur auditor time and auditor travel costs when providing certification services. TPC suppliers use auditors that may be employees of the certification organization, contractors, or government employees to conduct the audits required for certification decisions. The section of the survey on auditors/inspectors provides evidence that the information costs regarding the individual conducting the audit are also present. A majority of the organizations has one or more enforcement mechanisms in place to ensure that the auditor conducts a high quality audit and to ensure that the auditor remains independent of the party being audited. These monitoring costs, such as

shadow audits and randomly assigning auditors, are an attempt to reduce the information costs regarding the auditor.

This multi-layer information problem also includes the shadow audits meant to mitigate the information problem. Thus, there are additional information costs regarding the individual that provides the shadow audit, by accompanying the auditor periodically on their audits.

4.3.3 Information Costs Regarding The Accreditation Body

Accreditation of a TPC supplier is another example of the multi-layer problem. TPC's intended purpose is to provide assurance to sellers and buyers that the certification body is capable of performing certification services. As shown by the survey results, however, there are also information costs for the seller, the buyer, and the certifier regarding the accreditation body.

Similar to the situation of TPC for credence attributes in the agri-food system, the sellers of the certification services (the certifier) and the buyers of the certification services (sellers and buyers in the agri-food system) face information costs about the accreditation body. Again, similar to the TPC market, the information costs regarding to accreditation body will result in a lower level of assurance.

4.3.4 Multiple Layer of Asymmetric Information

Prior research has assumed one layer of asymmetric information, between the buyer and the seller, and effectively assumed perfect information about the certifier. However, the model developed in the prior chapter and survey results demonstrate that

the TPC issue can contain multiple levels of asymmetric information. The first is the information problem between sellers and buyers. Then, there is the asymmetric information regarding the certifier. The survey also revealed asymmetric information regarding the auditor, acting as an employee of the certification organization, in which the organization is uninformed about the auditor's quality of inspections. Lastly, the survey results suggested asymmetric information between the accreditation body and the certification organization, where the accreditation body is uninformed about the certification organization.

4.4 Conclusion

This chapter outlined the process of constructing the survey, along with the survey responses and the interpretation of the results. The interpretation of the results included a descriptive summary of the certification market for credence attributes. It also included an in depth analysis of the survey results in order to identify factors that may contribute to certification fraud. From the survey, it can be concluded that there is asymmetric information regarding the certifier. Survey results also concluded that there are additional layers of information costs, which include the auditor and accreditation body. From the theoretical framework in the prior chapter, these information costs can have a profound effect on the equilibrium and resulting level of assurance. The parties involved in TPC and policymakers considering issues related to TPC should be aware of these additional costs. In addition, the multiple layers of asymmetric information in the agri-food system should be considered in future economic research on TPC.

CHAPTER 5

CONCLUSION

5. 1 Summary

Using the principal-agent model, this research sought to explain the opportunistic behavior and lack of objectivity that could evolve from a difference in interests between the certifier and seller, compared to the buyer(s). This research found that self-interested behavior hinders the quality assurance objectives of a certification scheme by decreasing the level of assurance provided by certification. This research further examined the institutional and behavioral forces that appear in the principal-agent model to identify contributing factors to certification fraud.

This study reviewed the existing literature on the role of TPC, including finance and cost structure, and the principal-agent relationships between a TPC and other economic agents. Chapter 3 developed a three-party utility maximization model that represents the institutional relationships between sellers, buyers and certifiers. Equilibrium market conditions under varying institutional relationships and information costs were used to predict market performance (i.e the level of assurance). The utility maximization model was used as a reference to create a survey of certification bodies. The results of the survey provide evidence in support of a utility maximization model and that there are multiple layers of information costs associated with TPC.

5.2 Implications

Results of the survey of current certification bodies revealed multiple layers of information costs associated with TPC. It is well recognized in the literature that there are

information costs regarding the seller and that this has an effect on the equilibrium level of assurance. In addition to the asymmetric information problem between sellers and buyers, the information costs regarding the certifier included in the utility maximization model were confirmed by the results of the survey. As shown in the utility equilibriums in chapter 3, the level of assurance in the presence of these additional information costs is lower than in an analysis where there is perfect information about the certifier.

Within the TPC market, there are also several other information problems that are likely to have an effect on the equilibrium level of assurance. These include information costs about the auditors conducting the inspections, other employees of the certification body overseeing the auditor and the accreditation body.

5.3 Limitations and Additional Research

Given the results of this research, future research should examine a larger sample of certification bodies. One limitation of this research is the small sample, which may not be an accurate representation of the certification market in the agri-food market. Since a majority of respondents in this survey were offering certification services in the United States. Future research should also examine international TPC organizations in the agri-food system.

This study revealed several additional layers of asymmetric information that were not fully captured in the survey of certification bodies. One direction for future research would be to examine these information costs in more detail. Just as information costs regarding the certifier have an impact on the level of assurance, these other information costs may affect the equilibrium level of assurance. Other detailed information about the

auditors used as part of the certification process should also be included in future research, such as information on their training, enforcement mechanisms, incentives, etc.

Information on the details of the accreditation process and the organization providing accreditation would also be helpful in determining if the information costs regarding the accreditation body has any effect on the level of assurance.

5.4 Policy Implications

This research demonstrated that there are multiple layers of information costs associated with TPC, most importantly the asymmetric information regarding the certifier. The survey provided evidence that these costs exist in the certification market, and the theoretical framework provided hypotheses on the equilibrium effects of the various information costs. These results suggest that government agencies involved in certification services or the accreditation of certification services should consider the multiple level information problem when developing certification standards. Within those standards, there can be mandated enforcement mechanisms that reduce information costs (i.e. rotating auditors, shadow audits, etc.). This issue spreads more widely than the agri-food system and therefore the utility maximization model is applicable to a wide range of industries.

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