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Evidence from the BRC Food Safety Standard

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Selected Paper prepared for presentation at the 2015 Agricultural & Applied Economics Association and Western Agricultural Economics Association Annual Meeting, San Francisco, CA, July 26-28

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Evidence from the BRC Food Safety Standard*

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Preliminary and Incomplete.

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Abstract:

Standards play a vital role in promoting food safety. Certification helps buyers identify suppliers who meet certain expectations defined by various standards. Producers choose a certification body to audit their manufacturing site and determine if they can be issued a certification for a given standard. Using data the from the British Retail Consortium global standards program, we examine producers' choice of certification bodies. Two important considerations in producers' choice of certification bodies are the geographic proximity between the certification body office and the audited site, and the perceived audit leniency of the certification body.

* We are grateful to Antony Harrison, Directory Services Manager at the BRC global standards, for providing data and for his insights about the program. We are indebted to Harry Kaiser and Wuyang Hu for their comments.
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1. INTRODUCTION

1.1 Motivation.

In the food industry, retailers and end consumers usually cannot observe quality and production methods. Private voluntary food safety standards play a vital role in alleviating inefficiencies associated with asymmetric information, and contribute to food safety and consumers' health. Food safety certification has emerged as a prominent and influential regulatory mechanism. Faced with an increasing number of food recalls, many food retailers (e.g., Wal-Mart, Target) now demand that their suppliers obtain food safety certification for certain standards (Crandall et al., 2012). Government agencies have also adopted food safety certification procedures. For example, the Food and Drug Administration's (FDA) new requirement of a credible food safety certification on high-risk imported foods. Certification is important for consumers' wellbeing and producers' profitability.

Food producers, in the United States and around the world, increasingly rely on third party certification bodies to verify and disclose that they meet the requirements of food safety standards. Certification may help producers reduce risk and liability, improve market access, and gain a competitive advantage (Tanner, 2000). Hatanaka et al. (2005) attribute the growing importance of third party certification to the globalization of the agri-food system, the consolidation of the food retail industry, and the rise of private retail standards. While the popularity and prominence of food safety certification has grown substantially over time, little economic research has been conducted on these markets, and no empirical study examined the determinants of producers' choice of certification bodies.

In this paper we identify key factors that affect producers' choice of third party certification bodies for a food safety standard. First, because manufacturing sites pay the cost of travel of their auditor, we expect that they prefer closer certification bodies. Second manufacturers prefer to obtain high audit grades and are therefore likely attracted to "leniently grading" certification bodies. Additional factors we consider are the effects of performance rating of certification bodies, and their offering of certification for other types of standards. We also investigate how small-scale producers differ from larger producers in the choice of certification bodies and in audit grades.

To empirically explore how manufacturers select certification bodies, we use data obtained from the British Retail consortium (BRC) global standards program. Our dataset contains information about all BRC certified manufacturing sites as of March 2015 and their choice of certification bodies. We matched these data with data we collected on all BRC-accredited certification bodies in the U.S. We use the addresses of sites and certification bodies to find the distances between them. We proxy for perceived audit leniency by the share of A grades the certification body assigns.

Our study contributes to the literature on certification. A central issue in the economics of certification is the potential for biased quality reports. Certification bodies compete for producers who pay for certification, and this introduces a potential conflict of interest which can result in biased quality reports (Dranove and Jin, 2010). Additionally, the accuracy of an audit depends on whether certifiers opt for a quick turnaround (Farhi et al., 2010) and on the cost of the audit, which likely increases with the auditing quality (Jahn et al., 2005). Incentives for information disclosure also depend on market structure (Lizzeri, 1999).

There are only a few empirical studies related to food safety certification. Anders et al. (2007) used data from the EurepGAP standard and showed that later entry into the system entails higher competitive pressure (as measured by the number of competing certification bodies). In 2011, the FDA performed an assessment of third party certification bodies for aquacultured shrimp and found "[w]ide variation in certification bodies (CBs) auditor performance across CBs." Differences in audit quality between certification bodies provide producers with an incentive to choose lenient certification bodies. In this paper we find empirical evidence on the effect of leniency on producers' choice of certification bodies. Our finding that manufacturers are attracted to certification bodies that assign higher audit grades suggests that competing certification bodies could have an incentive to grade more leniently[1].

Other studies provide qualitative discussions and insights about food safety certification. Hensen and Caldwel (1999) discuss issues that influence the evolution of food safety regulations, especially in developing countries. Based on a survey of retailers, Fulponi (2006) examines the main incentives of OECD retailers to use voluntary standards. Retailers' with growing buyer power use food safety standards to satisfy their consumers' demand for food safety and quality,

[1] In the context of higher education, Bar, Kadiyali and Zussman (2010) showed that students are attracted to leniently graded courses.

to improve reputation and provide protection against legal liabilities. Fagotto, 2014 examines advantages and limitations of private food safety standards. In the conclusion of her paper, Fagotto states that "research on third-party organizations and their role in the enforcement of standards could significantly expand the understanding of this regulatory system and provide useful lessons for other fields where enforcement is left to non-governmental bodies." Our paper provides a step towards filling this research gap.

1.2. U.S. Food Safety Certification and the BRC standards program

There are four types of key players in food safety certification, accreditation bodies, certification bodies (CBs), producers, and buyers, centering around various food safety standards. ANSI-ASQ National Accreditation Board (ANAB) is the U.S. accreditation body that oversees conformity assessment and accredits certification bodies in food safety. Third party certification bodies are firms that offer independent verification that the producer meets the requirements of a certain standard. There are about 50 accredited food safety certification bodies operating in the United States. Most of them have accreditation from ANAB and several international ones have accreditation from other countries.[2] In 2014, 81,575 producer facilities registered with the FDA's Food Facility Registration. A producer that decide to certify to some standard, needs to choose an accredited certification body that will conduct an audit and determine if the producer's site can be certified. Figure 1 illustrates the chain of certification on the left. Solid arrows indicate choices that key players make.

A large number of individual food safety standards have been developed in different countries. Table 1 shows the seven internationally accepted private voluntary standards, distinguishing farming standards (applicable to agriculture only), manufacturing and processing standards, and standards that cover both **(**see the Global Food Safety Initiative, 2015). PrimusGFS, Safe Quality Food (SQF), and BRC are the most commonly adopted standards in the United States.

[Insert table 1]

The British Retail Consortium global standards program is a leading safety and quality certification program for manufacturing and processed products. Over 17,000 suppliers in more than 100 countries are BRC certified. The program offers standards for food safety, packaging

[2] Source: ANAB's Web site plus our own search of certification bodies in the United States.

and packaging materials, storage and distribution, agents and brokers, consumer products. Our paper focuses on the food standard and includes 1,681 sites in the U.S. BRC audits are carried out by approved certification bodies that are accredited by a national accreditation body. The BRC program imposes rules on certification bodies to ensure "the integrity and consistency of the BRC Standards Certification scheme…"[3] they conducts performance reviews of certification bodies every six month. Each certification body then obtains a performance rating, which could range from 5 starts (Excellent) to one star (unsatisfactory). This rating measures the certification body's overall management of BRC certification.

Manufacturers that decide to obtain BRC certification might start with a self-assessment or a pre-assessment conducted by an advisor or auditor to determine what changes would need to be made to comply with the standard. If the manufacturer decides to continue with certification, the manufacture chooses a certification body and sets an audit date. According to the BRC web page, audits usually last 2 days, but this duration may vary depending for example on the number of products and the size of the site.

The cost of certification is determined case by case. The BRC program has a fee (currently £185), and also sets some rules for how to determine the length of the audit which influences its cost. The rest of the audit costs are set by the independent certification bodies, these depend on the length of the audit. Additionally, the manufacturer needs to cover the auditor's cost of travel and stay. Thus, working with a certification body that is geographically close can lower certification costs for the manufacturer. A representative of one of the certification bodies we contacted indicated that "Prior to receiving an application, I typically tell potential customers to budget $5000 plus expenses." An additional cost of certification is the cost of fixing any problems that the auditor identified. After the audit, the certification body issues an audit report.

Sites that are certified for the BRC food standard are assigned a grade. The grade D is a failing grade it is not observed in our dataset. Grades C, B and A are passing grades. Grades reflect the degree to which the site met the requirements of the BRC standard at the time of the audit visit. Lower grades indicate a larger number or more severe disconformities. BRC glossary indicates that "All certificated sites, no matter what grade, have corrected all of the non-

[3] See BRC we page: http://www.brcglobalstandards.com/Manufacturers/Certificationprogram.aspx#.VVkwPvlViko

conformities before they receive their certificate." Presumably, sites with lower grades needed to pay more in order to fix any disconformities so that they can obtain certification. Additionally, sites with higher grades probably signals to buyers a higher degree of safety or quality. Audit grades are reported in the BRC directory and can be publically viewed, except for the grades of producers who opted to keep their certification information private.

2. Data

We use data that we have obtained data from the BRC standards program. Focusing on the food standard in the U.S. (excluding Hawaii and Alaska and Puerto Rico), the data set includes 1,648 observations of producers who are certified with a BRC food standard with an expiry date ranging from February 2015 to February 2016. Our data includes each producer's address, audit grade, audit owner (which allows us to distinguish sites owned by a larger manufacturer that certifies multiple sites) and the certifying body. We also have the evaluation start date and expiry date. One unique feature of this proprietary BRC data is the inclusion of 121 (about 7% of the total) certified producers who opted to keep their certification information private. Compared with the sites that opted to make their certification information public, the share of A grades is slightly lower at 0.844 (versus 0.884 for those publicly disclosed). As indicated in Table 1, two additional food safety standards programs provide audit grades as well, namely PrimusGFS and Safe Quality Food (SQF). However, PrimusGFS does not publicly disclose the grades and SQF does not disclose certification bodies of certified sites. We chose to study the BRC standards program because it does not suffer from either of the above drawbacks, allowing us to observe the choice of certification body and grade of each site.

We merged the site level observations with data we collected form the web page of each of the certification bodies in the choice set. We used SAS function (zipcitydistance) and the addresses in our dataset, to obtain the distance between manufacturing site and certification body pairs. To obtain a measure of perceived audit leniency of certification bodies, we computed the share of "A" audit grades each certification body assigned. Table 2 reports summary statistics of the variables at the certification body level that we use in this paper.

[Insert Table 2]

Figure 2 displays the location of all the producers in our data and all U.S. accredited BRC certification bodies. As can be seen on the map, the majority of BRC certified producers are

located in the eastern half of the United States, and most certification bolides are in the Northeast.

[Insert Figure 2]

Table 3 lists the US states in which the headquarters of each of the 17 BRC certification bodies are located, three are located in Illinois and one or two in each of 10 other states. The second column shows the number of sites and the third column includes the market share, defined as the number of sites the certification body certified over the total number of sites certified. The market shares of the largest four certification bodies add up to about 70% of the market, and the Herfindhal Hirschman index of market concentration (see Hirschman, 1964) is 1539, suggesting this is moderately concentrated market according to the Horizontal Merger Guidelines (2010). The last column in table 3 shows the share of A grades out of the total number of passing grades assigned by each certification body. On average about 88.2% of passing grades were A. Most of the other passing grades were B. The overall share of C grades was less than 1%.

[Insert table 3]

Table 4 shows the mean audit grade and the distance from the chosen certification body for small-scale (single site) manufacturers, large scale (multisite) manufacturer, and all manufacturers combined. As Table 4 suggests, on average small-scale manufacturers travel longer to their certification body, and they obtain lower audit grades.

[Insert table 4]

3. Empirical Evidence

To establish which factors affect food manufacturers' choice of certification bodies we use a multinomial choice model. There are 17 certification bodies that manufacturers can choose from. Our two main explanatory variables of interest are the distance between the site to be audited and the certification body, the perceived leniency of the certification body as measured by the share of A grades that it assigned and the BRC rating of the certification body. We thus use the following empirical model where the utility of choice *j* to consumer *i* is a function of the certification body's leniency, the distance between the site and the certification body, a dummy

indicating if the certification body had excellent BRC performance raining and a vector of other characteristics X_j

$$(1) \qquad U_{i,j} = \beta_1 Distance_{i,j} + \beta_2 Leniency_j + \beta_3 ExcelentRating_j + \boldsymbol{\beta_4 X_j} + \varepsilon_{i,j}.$$

The probability of site *i* choosing certification body *j* is

(2)

$$Prob(site\ i's\ CB\ choice = j) = \left(\frac{Exp(\beta_1 Distance_{i,j} + \beta_2 Leniency_j + \beta_3 ExcelentRating_j + \boldsymbol{\beta_4 X_j})}{\sum_{k=1}^{17} Exp(\beta_1 Distance_{i,k} + \beta_2 Leniency_k + \beta_3 ExcelentRating_k + \boldsymbol{\beta_4 X_k})} \right)$$

Since the auditor's travel cost is paid by the manufacturer, we expect manufacturers to prefer certification bodies that are closer to the location of the site (β_1<0). We also expect manufacturers to prefer certification bodies that they perceive would more likely assign them a higher audit grade (β_2>0). A higher audit grade means that the auditor identified less disconformities or less sever ones and so the manufacturer would need to spend less on correcting these issues before obtaining certification. Higher audit grades likely also serve as a signal of safety and compliance with the standard requirements for buyers. When certification bodies vary in leniency, manufacturers that are not sure if they comply with all the requirements of the standard might also anticipate a higher probability of passing when selecting a certification body with a high share of As.

BRC also provides a performance rating of BRC accredited certification bodies. This rating captures aspects of the performance of certification bodies such as compliance with audit protocols, quality of reports and the speed of uploading audit data. If the BRC rating is a signal of an efficient certification body that would producer reports on time, we would expect a positive effect of excellent rating (β_3>0). Alternatively, one might think that sites could interpret high rating as indicating a rigorous audits and thus assigns lower grades. However, we find no support for this in the data. The mean share of A grades conditional on a rating of 3, 4 or 5 is 87.50%, 87.81% and 88.64% respectively. We will estimate the effect of certification rating on producers' choice of certification bodies.

Table 5 displays the results of our multinomial logit regression estimation. In column (1) we present a base specification that includes our main three variables of interest (distance, leniency and the BRC performance rating) and no additional controls. The effects are as we expected. The distance between the certification body and the manufacturing site has a negative effect on the choice of the certification body, our measure of perceived leniency has a positive effect. An excellent performance rating has a positive effect on choice.

In column (2) we control for other food standards including the number of other manufacturing food safety standards (i.e. competing standards) that the certification body offers, which has a positive effect on the probability this certification body is chosen, the offering of GlobalGAP – a farming standard, has a negative effect, and offering of U.S. Department of Agriculture (USDA) organic certification has a positive effect on the choice of the certification body. The direction of effects of our main variables of interest remains unchanged. In column (3) we add additional controls. Being a for profit certification body lowers the probability that the certification body is selected, so does the number of employees at the corporate level. Certification bodies that were established earlier have a higher probability of being choses. Our main results are robust to the addition of these other controls.

[Insert table 5]

4. Concluding Remarks

In this paper we study manufacturing sites choice of certification bodies for the BRC food safety standard. Estimating a multinomial logit model we find a negative and statistically significant effect of certification bodies distance from the manufacturing site on the probability that the certification body is chosen. Since as we have seen in figure 2 certification bodies are not uniformly spread geographically, this finding suggests that producers in some area of the country, especially in the center states could be disadvantaged in their need to choose further away certification bodies. We observed that small scale producers are audited by certification bodies that are located further away. Since geographic location matters, location creates a degree of product differentiation which likely creates some market power.

We find a positive and significant effect of grading leniency on the probability that a certification body is chosen. A limitation of our study is that we are unable to tell if a high share of A grades given by a certification body results from its more lenient audit practices or because this certification body was selected by a larger share of sites that deserve a high audit grade. Either way, disparities in perceived leniency can affect the choice of certification bodies. Additionally, our finding that manufacturers prefer certification bodies that assign more lenient grades suggests that certification bodies likely experience some competitive pressure to raise audit grades.

We also find a positive and significant effect of the certification body being rated "excellent" by BRC. Thus, as intended by the BRC program, this rating is likely interpreted by sites as measuring performance rather than strict auditing. Our findings suggest that a performance rating of third party certification bodies issued by the standard program can help manufacturers choose certification bodies. Other standard programs might benefit from making such rating information available to firms.

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Figure 1 --
The Structure of the Food Safety Certification Market

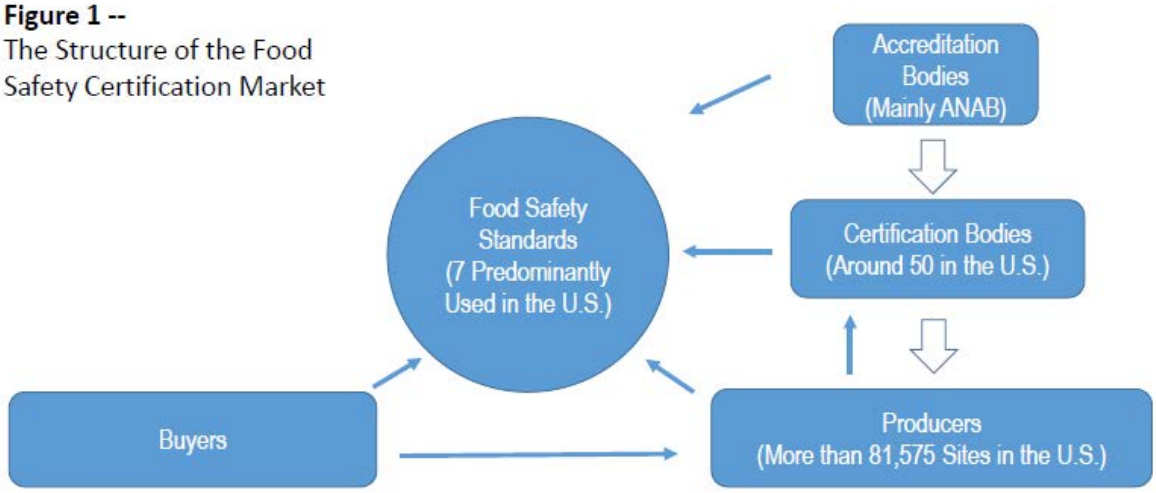
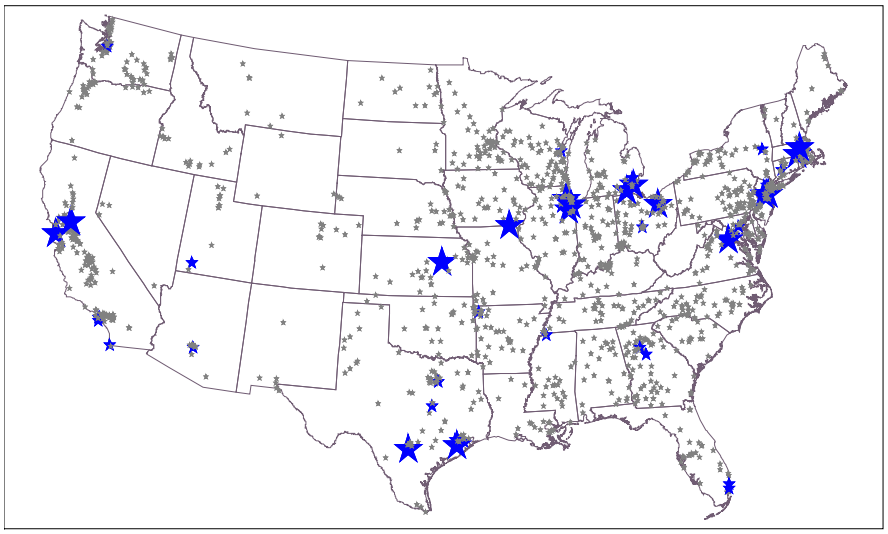


Figure 2. BRC Certified Sites and BRC Certification Bodies in the United States, 2015



Legend: Large blue−CB headquarters; median blue−CB branches; small gray−certified sites.

Table 1. U.S. and Global Adoption of Major Food Safety Standards (February, 2015)

Full Standard Name (Abbreviation)	Classification	Audit Grades	U.S. sites	World Sites
British Retail Consortium (BRC) Food	manuf. & proc.	A-D, D not certified	1,681	17,856
Food Safety System Certification (FSSC 22000)	manuf. & proc.	Not provided	996	10,656
Global Good Agricultural Practices (GLOBALG.A.P.)	farming	Not provided	1,611	140,997
International Featured Standards (IFS) Foods	manuf. & proc.	Not provided	--	15,000
International Organization for Standardization 22000 (ISO 22000)	Farming	Not provided	107	175,792
	manuf. & proc.			
PrimusGFS	farming,	Superior, excellent, good, not certified	8,795	12,679
	manuf. & proc.			
Safe Quality Food (SQF)	farming,	Excellent, good, compliance, fail	4,350	6,398
	manuf. & proc.			

Source: Standards' websites and personal contact with GLOBALG.A.P. Data for ISO 22000 is for 2013. BRC and SQF grades are publically available.

Table 2. Summary Statistics for U.S. BRC Certification Bodies (February, 2015)

Variable	Description	Mean	Standard Deviation	Minimum	Maximum
Distance	Distance in 100 miles	5.75	4.68	0	27.13
Leniency	Share of As	0.88	0.32	0	1
Excellent BRC Rating	Equals 1 if BRC rating is excellent	0.36	0.48	0	1
SQF	Equals 1 if the CB offers SQF certification	1.00	0.04	0	1
FSSC22000	Equals 1 if the CB offers FSSC22000 certification	0.68	0.47	0	1
ISO22000	Equals 1 if the CB offers ISO 22000 certification	0.58	0.49	0	1
IFS	Equals 1 if the CB offers IFS certification	0.61	0.49	0	1
GlobalGAP	Equals 1 if the CB offers GlobalGAP certification	0.39	0.49	0	1
Organic	Equals 1 if the CB offers USDA organic certification	0.35	0.48	0	1
ANAB	Equals 1 if the CB was accredited by the domestic accreditation body	0.93	0.26	0	1
Age	2015-Year CB was founded	48.08	34.98	4	107
Employees co	Number of employees in 1000 at the corporate level	4.55	13.59	0.05	80
For-profit	Equals 1 if the CB is for profit	0.55	0.50	0	1

Source: BRC directory, certification body web pages, authors' derivations.

Table 3. U.S. BRC Certification Bodies (February, 2015)

Certification Body	Head-quarters State	Number of Sites	Market Share	Share of A Grades	Number of Offices Certifying	BRC Rating
1	KS	387	0.23	0.90	1	4
2	MI	340	0.21	0.90	6	4
3	CA	292	0.18	0.93	1	5
4	MA	185	0.11	0.86	1	5
5	MI	137	0.08	0.88	5	4
6	IL	77	0.05	0.78	1	4
7	TX	52	0.03	0.98	1	5
8	IL	48	0.03	0.85	1	4
9	NJ	40	0.02	0.80	9	4
10	TX	33	0.02	0.70	6	5
11	OH	15	0.01	0.60	1	5
12	IL	12	0.01	0.58	6	4
13	IA	11	0.01	0.73	1	5
14	CA	8	0.005	1.00	1	4
15	NH	8	0.005	0.88	1	3
16	NJ	2	0.001	0.50	1	5
17	VA	1	0.001	1.00	1	4
		Total =1648	I4=0.73	Mean=0.88	Mean=2.59	Mean=4.35

Source: BRC directory, certification body web pages, authors' derivations.

Table 4. U.S. BRC Certificated sites (February, 2015)

Manufacturer Scale	Observations	Audit Grade	Distance site to CB
Small-scale (single site)	627	0.81 (0.40)	609.20 (533.80)
Large-scale (multi-site)	1021	0.93 (0.26)	553.40 (421.10)
Large-scale (multi-site)	1648	0.88 (0.32)	574.63 (467.84)

Source: BRC data

Table 5: Factors that affect manufacturers' choice of certification bodies

Variable	(1) Core Variables	(2) Additional Food Standards	(3) More Controls
Distance	-0.075*** (0.005)	-0.103*** (0.006)	-0.076*** (0.006)
Leniency	3.951*** (0.240)	3.458*** (0.322)	3.406*** (0.370)
Excellent Rating	0.163*** (0.053)	0.438*** (0.074)	1.245*** (0.092)
Manuf. Standards		0.254*** (0.055)	0.413*** (0.064)
GlobalGAP		-2.272*** (0.148)	-2.043*** (0.162)
Organic		1.735*** (0.154)	1.503*** (0.157)
Age			0.007*** (0.002)
Employees			-0.030*** (0.003)
For-profit			-0.789*** (0.134)
McFadden's LRI	0.066	0.117	0.192
Log Likelihood	-4669	-4122	-3772
Sample Size	1648	1648	1648