The Impact of SQF Certification on U.S. Agri-Food Exports with a Focus on Product Quality

Jun Ho Seok, Michael Reed, and Sayed Saghaian

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Jun Ho Seok

Michael Reed

Sayed Saghaian

(University of Kentucky)

Background

- As income of consumers increases, the demand of high quality products increases since the consumption of high quality goods enhances consumers satisfaction (Juran, 1999).

- By considering the positive relationship between high quality demand and income, low income countries may not be able to consume high quality products compared to the high income countries (Trienekens and Zuurbier, 2008).

- There might exist differences in quality demand among countries since income of each country is different, especially between developing and developed countries.

Therefore, the product quality might affect trade flows among countries.

Background continued

Theory : Product Quality and Trade

- Based on our knowledge, only a few papers, such as Linder (1961) and Hallak (2006), deal with a theoretical model which studies the relationship between p roduct quality and trade flow.
- Linder (1961) argues that high quality goods are traded among high income c ountries based on the intra-industry trade theory.
- Hallak (2006) suggests a theoretical framework of product quality and trade, a nd derives the empirical model from this theoretical framework. He focuses on the demand side.

Background continued

Empirical : Product Quality and Trade

- The empirical model by Hallak (2006) can consider the role of quality as a det erminant of bilateral trade. He uses export prices as a proxy variable for qualit y in a number of manufacturing industries. However, export prices are not a g ood proxy variable for quality in agri-food industries.
  - There are lots of non-tariff barriers like the sanitary and phytosanitary barriers in agricultural industries, which distort export prices.
  - To effectively capture agri-food product quality, there is a need for an integrat ed way to capture technological, logistical, economical, and organizational asp ects of quality (Trienekens and Zuurbier, 2008).

A private certification may be a better proxy variable for quality in agri-food sector.

Research Objective

- This paper investigates how the number of SQF certified U.S. firms affects U.S. exports considering the recipient's GDP.

- This paper focuses on Safe Quality Food (SQF) since SQF is the dominant priv ate certification in the U.S. and private certifications may be a better proxy var iable for quality than export prices.

- This paper examines whether developing countries have a tendency to consu me higher quality goods as their income increases by dividing U.S export part ner countries between developed and developing countries.

Private Certification

Table 1. Examples of private quality and safety standards

Standards	Key Element	Part of the Chain Involved
Eurep-GAP	Good Agricultural Practices	Primary production
BRC	HACCP	Processing firms
SQF	HACCP, ISO 9000	Primary production, processing firms, retail

Source : Trienekens and Zuurbier (2008) p. 112.

SQF is the dominant private certification in U.S.

SQF is the comprehensive certification than Eurep-GAP and BRC.

SQF Certification

- The SQF code is a process and product certification standard based on the Hazard Analysis Critical Control Points (HACCP) food safety and quality management system.

- The HACCP focuses on food safety in that HACCP deals with biological, chemical, and physical hazards in production processes to prevent unsafe foods.

- The SQF code is defined on the primary production, manufacture, processing, transport, storage, distribution or retailing of food products and food-contact packaging and SQF certification is divided into three levels.
  - Level 1 is the lowest food safety standard, Level 2 is middle food safety standard, and the Level 3 is the highest food safety standard.

DATA

Variable	Data Source	Data Type
Distance	Mayer and Zignago (2011)	Linear Distance
Colony	Mayer and Zignago (2011)	Dummy
Contiguousness	Mayer and Zignago (2011)	Dummy
Common Official Language	Mayer and Zignago (2011)	Dummy
# of SQF certified firms	http://www.sqfi.com/	# of firms
GDP	World Bank	$

DATA

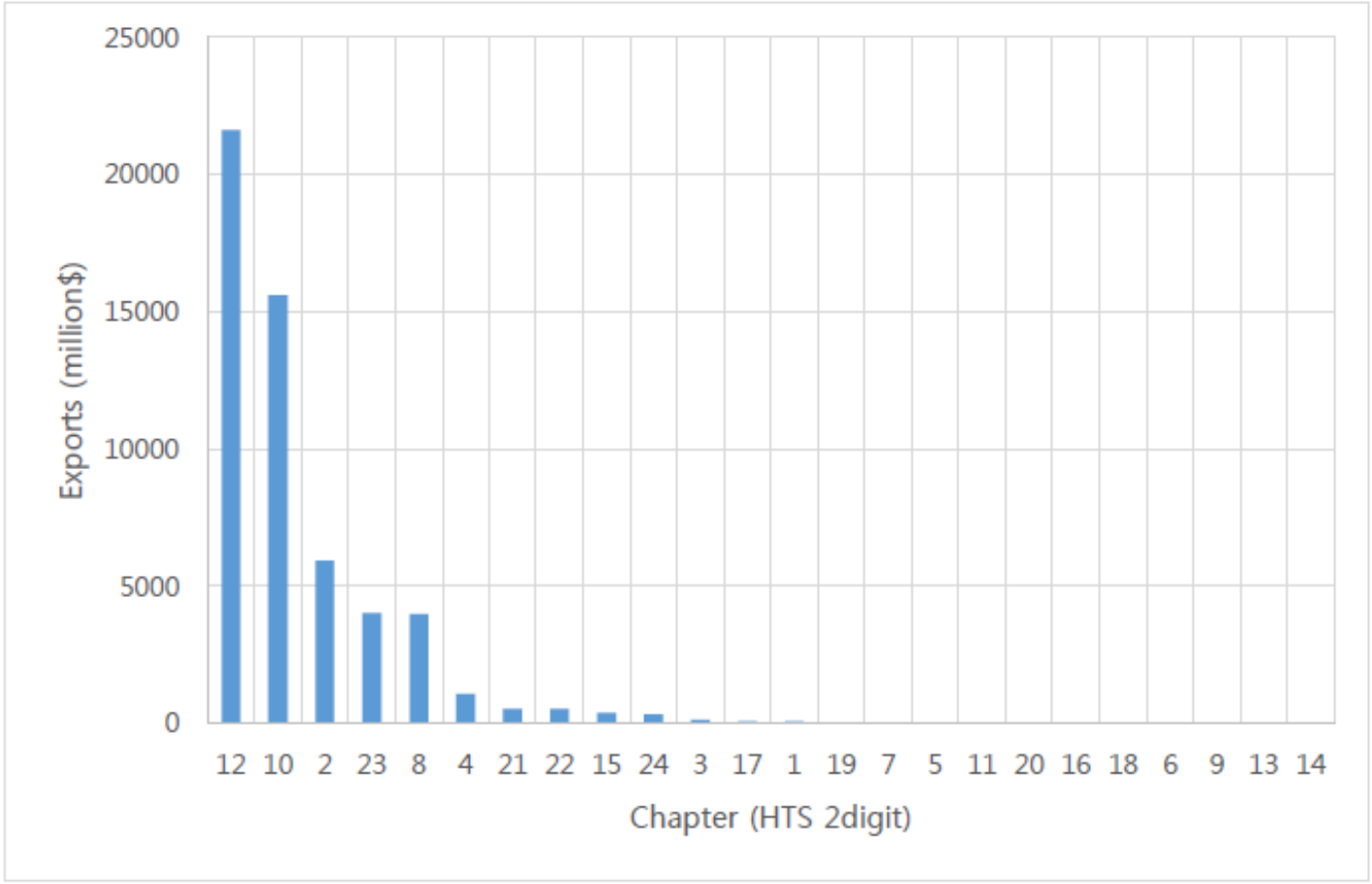

Figure 1. U.S. agri-food exports by HTS chapter (section)

Source: author's calculation based on SQF website (www.sqfi.com)

- Figure 1 shows the most U.S. exports in two categories: 10(Cereals) and 12 (Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruits; industrial or medicinal plants; straw and fodder).

DATA

Table 3. Compare the ratio of the average imports of U.S. agri-food products and average GDP between OECD and non-OECD countries (2014)

	OECD	non-OECD
Average GDP per capita	$33943.12	$6254.627
Average imports of U.S. agri-food products	$4995.438	$31.66864
Average imports of U.S. agri-food products / Average GDP	0.147171	0.0050632

Source: author's calculation based on USITC and World Bank

- The average GDP of OECD countries among the U.S. agri-food exporting partner countries is more than 5 times the average GDP of non-OECD countries. Moreover, the average U.S. agri-food products imports of OECD countries are much higher than the average U.S agri-food product imports of non-OECD countries.

Estimation Method (PPML)

- Problems in the gravity type model
  - Many zeros in trade data
  - Presence of heteroscedasticity

- Silva and Tenreyro (2006) show that the Poisson pseudo-maximum likelihood (PPML) estimator gives consistent estimates. They find that PPML is robust to wide range of heteroscedasticity since the robust variance-covariance matrix in PPML estimator is easily estimated by using multiplicative exponential model.

- PPML is alternative solution to the problem with zeros in trade data (Silva and Tenreyro, 2006). Silva and Tenreyro (2011) also show that PPML method perfor ms powerfully for the dataset with large numbers of zeros.

Model

- The empirical model of Hallak (2006)

$$\ln imp_{iz}^{c} = \varphi_{iz} + \psi_{z}^{c} - \widetilde{\sigma_z}\eta_z \ln Dist_{t}^{c} + \beta_z I_{i}^{c} + \widetilde{\sigma_z}\mu_z \ln \theta_{iz} \ln y^{c} + \varepsilon_{iz}^{c}$$

where the fixed effect for the exporting country is φ_{iz} and the fixed effect for the importing countries are ψ_{z}^{c}, $\beta_z = -\widetilde{\sigma_z}\widetilde{\beta_z}$, and $\varepsilon_{iz}^{c} = \widetilde{\sigma_z} v_{iz}^{c}$.

- The model of this paper

$$\mathrm{Ln}(export_{ij}^{US}) = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \cdot Ln\,(Distance_i) + \beta_2 \cdot Contig_i +$$

$$\beta_3 \cdot Colony_i + \beta_4 \cdot ComLanguage_i + \beta_5 \cdot Ln(GDP_i) \cdot Ln\left(SQF_j^{us}\right) +$$

$$\beta_6 OECD + \beta_7 OECD \cdot Ln(GDP_i) \cdot Ln(SQF_j^{US}) + \varepsilon_{ij}$$

Result

Table 5. The estimation results of SQF certification effect on U.S. agri-food exports

	Models with total numbers of SQF		Models with numbers of SQF by levels	
$Ln(GDP_i) \cdot Ln(SQF_j^{us})$	0.022*** (0.0079)	0.021** (0.0104)	--	--
$Ln(GDP_i) \cdot Ln(SQFlevel1_j^{us})$	--	--	-0.015 (0.0114)	-0.014 (0.0147)
$Ln(GDP_i) \cdot Ln(SQFlevel2_j^{us})$	--	--	-0.036 (0.0224)	-0.040 (0.0278)
$Ln(GDP_i) \cdot Ln(SQFlevel3_j^{us})$	--	--	0.042*** (0.0167)	0.040** (0.0179)
OECD	--	-0.328 (0.2087)	--	0.352 (0.2548)
$OECD \cdot Ln(GDP_i) \cdot Ln(SQF_j^{us})$	--	0.001 (0.0033)	--	--
$OECD \cdot Ln(GDP_i) \cdot Ln(SQFlevel1_j^{us})$	--	--	--	-0.0003 (0.0041)
$OECD \cdot Ln(GDP_i) \cdot Ln(SQFlevel2_j^{us})$	--	--	--	-0.0063 (0.0079)
$OECD \cdot Ln(GDP_i) \cdot Ln(SQFlevel3_j^{us})$	--	--	--	0.0085 (0.0058)
constant	-1.829 (2.4454)	-1.354 (1.8283)	6.263* (3.5679)	2.8270 (2.4895)
Pseudo log-likelihood	-634.452	-634.450	-634.336	-634.309

Note : ***, **, * Significant at the 1%, 5%, and 10% level, respectively. ( ) is robustness standard error

- Models with the total number of SQF certified firms show that product quality (SQF) has a positive effect on U.S. exports.
- The results show that SQF level 1 and level 2 do not have a significant effect on U.S. exports at the 10% significance level. However, the SQF level 3 certification has a positive effect on U.S. exports at the 5% significance level.
- In both models, the coefficient dummies for OECD countries are not significant at the 10% level.

Conclusion and Implication

- Firms in the U.S. might consider certification with the highest level of private s tandards if their purpose is to increase their exports.
- Governments also have incentives to employ a high public standard or promo te developing high private standards compared to existing standards.
- On the consumers' side, if there is a higher quality standard than SQF, then m any consumers who want to buy high quality goods enjoy the high quality pr oducts without risks of uncertain information.
- Our results also show that there is no significant difference in quality effects b etween developing countries and developed countries in the sense of product quality demand. These results imply that firms in the agri-food sector should f ocus on the quality competition in order to increase exports.

Thank You

Q&A