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# Trade Effects and Compliance Costs of Food Safety Regulations: the Case of China

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**Abstract**

This paper assessed the short run and long run impacts of food safety regulations on trade. Using aggregate trade data, the results showed that food safety regulations had a significantly negative effect on China's short run export, while had a positive effect on China's long run export in agricultural products. The costs of China's agri-food exporting enterprises in complying with foreign food safety regulations was investigated through two firm level surveys during the year of 2008 and 2009. The results showed that the total compliance costs increased over time. Building renovation, technological innovation, and testing equipments were major components of total compliance costs. The results of surveys also showed that compliance costs of domestic private enterprises were more than that of foreign-funded enterprises. The compliance costs of small-scale enterprises were more than that of big- and medium-scale enterprises.



*Keywords:* Food Safety Regulation; Trade Effect; Compliance Cost; Exporting

## 1. Introduction

Since the occurrence of global financial crisis, trade protectionism has been on the rise. Many countries have taken measures to restrict trade so as to protect their domestic industries. Under this situation, non-tariff measures replacing tariffs have become one of the major obstacles to impede agricultural trade. Food safety regulations could be used to interrupt international agricultural trade under the name of protecting human life or health. Henson and Lorder [1] suggested that food safety regulations issued by developed countries under World Trade Organization's framework had seriously prevented developing countries' agricultural exports. Moenius [2] through analyzing different types of regulations pointed out that importer's country-specific standards uniformly hinder agricultural trade, but harmonization of standards uniformly promote trade in agricultural goods because they provided useful information about the markets. The empirical question is whether food safety regulations restrict or promote trade in a given country.

There are many forms of food safety regulations, such as Sanitary and Phytosanitary (SPS) measures in order to protect animal, plant, and human's life and health, technical barriers on trade (TBT) initiated to protect human health and safety, and barriers to protect the environment. Beghin and Bureau [3] developed a framework to analyze the impact of SPS measures and TBT, and summarized the methods of measuring their impact on agricultural trade,

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such as price-wedge method, inventories-based approaches, survey-based approaches, gravity based approaches, risk assessment-based cost-benefit measures, stylized microeconomic approaches using sector or multi-market models. Peterson and Orden [4] evaluated the impact of SPS measures, tariffs, and tariff-rate quotas on the world poultry trade using a competitive partial-equilibrium spatial model, and found that the removal of all barriers simultaneously has a larger impact on trade than removing only tariffs and tariff-rate quotas. Wilson and Anton [5] pointed out food safety regulations such as SPS measures should be applied in importing and exporting countries. Dong et al. [6] analyzed the impact of SPS measures on China's pork trade using BOX-COX functions and found a negative effect. Sun et al. [7] estimated the impact of EU's MRLs on China's tea export through estimating the cost equation and also found a negative effect. Although many studies have dealt with the impact of food safety regulations, few focus on how exporting enterprises respond to these regulations and estimated the corresponding compliance costs to regulations in developing countries.

Many food safety regulations introduced by trade partners may affect China's exports. Data[b] of WTO notification, refusing or notifying China's agricultural or food products by the United States, Japan, and European Union showed that China's main agri- food products' trade partners (such as US, Japan, and EU) were also the countries which initiated the majority of food safety regulations on China's products. China's main exporting products such as horticultural products, sea products, and livestock were also those which faced the majority of foreign food safety regulations. China's main exporting provinces such as Shandong, Guangdong, Fujian, and Zhejiang were also the main areas which faced the majority of foreign food safety regulations. At what extent food safety regulations affects China's agricultural export? How much are compliance costs by China's exporting enterprises to deal with foreign food safety regulations? The rest of the paper is organized as follows. Trade effect of food safety regulations is discussed in the second section. Firm level compliance costs of food safety regulations through survey are presented in the third section. Conclusion is presented in the final section.

## 2. Trade Effect of Food Safety Regulations: Theory and Evidence

### Short Run Impact of Food Safety Regulations on Agricultural Trade

In exporting country, when new food safety regulations are initiated by trade partner, agricultural exporters can not meet the requirements immediately. The products under the required standards of food safety regulations could not be exported. The quantity of product (Q-Q') that was originally exported should be resold to domestic market (Figure 1).

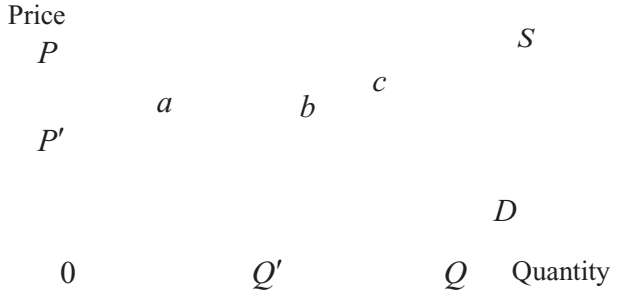


*Figure 1: Food safety regulations' impact on exporting country*

In world market, when agricultural trade partners initiate new food safety regulations, the export supply curve will shift from S to S' (Figure 2) because some enterprises in exporting countries cannot meet new requirements immediately. At the same time, the export demand for agricultural products will not change in short run. The price will increase from P to P', while the quantity of agricultural export will reduce from Q to Q'. As a result, food safety regulations will reduce agricultural export.

[b] WTO'S notification data come from its website (www.wto.org/); data of refusing China's products by US's Food and Drug Administration come from its website (www.fda.gov/); data of detaining China's products by Japan and of notifying China's products by EU come from the website of General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (www.aqsiq.gov.cn).

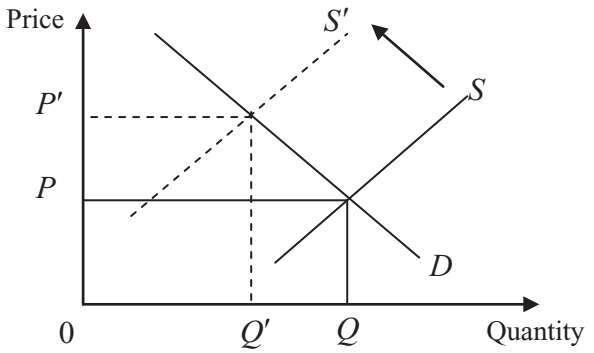


*Figure 2: Food safety regulations' impact on world agricultural market*

**Long Run Impact of Food Safety Regulations on Agricultural Trade**

The impact of food safety regulations on agricultural export is uncertain in the long run. For example, Moenius [2] pointed out that new regulations could deliver quality information to reduce consumers' searching costs and strengthen their confidence on products. Further, as a form of description, food safety regulations can give exporting enterprises information to help them manufacture qualified products, so as to increase agricultural export.

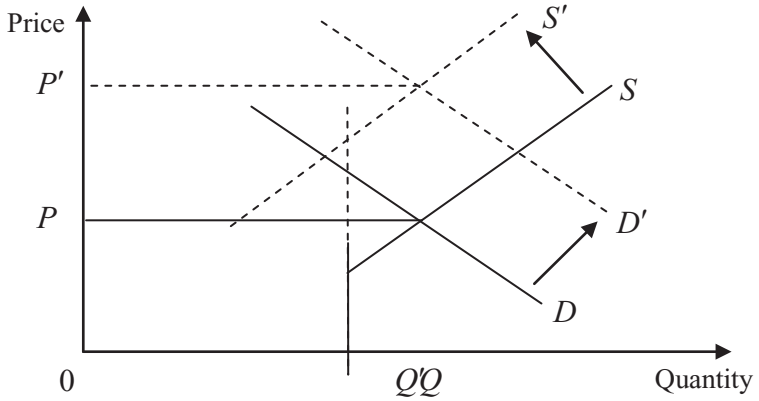


*Figure 3: Impact of Food Safety Regulations in the Long Run*

When new food safety regulations are initiated by importing countries, it may take a while for agricultural exporters to meet the requirements. Then consumers in importing countries will have more confidence for consumption. The demand curve for qualified agricultural products will shift from D to D'. As new regulations will increase products' exporting costs, which will lead to supply curve shifting from S to S'. Whether the eventual impact of food safety regulations on agricultural export is positive or negative, it relies on the relative magnitude of supply and demand shifts. When the change of demand curve for agricultural import is more than that of supply curve, food safety regulations will increase agricultural export. When the change of demand curve is less than that of supply curve, food safety regulations will decrease agricultural export. The long run impact of food safety regulations on agricultural trade is unclear.

## Empirical Model and Results

***Gravity Model***

The idea of Newton's law on earth gravity has been referred as gravity model. Anderson and Wincoop [8] indicated that gravity model was the main research method to connect trade barriers and trade flows. The model was first used in 1960s by Tinbergen [9] and Poyhonen [10]. They pointed out that trade between two countries was proportional to each country's aggregate economy, and was inversely proportional to the geographical distance between them. After the success of gravity model in interpreting trade, Anderson [8], Helpman and Krugman [11], and many other economists established a theoretical framework for gravity model.

The original form of gravity model is

$$T_{ij} = A\left(G_i G_j \Big/ D_{ij}\right) \quad (1)$$

Where $T_{ij}$ denotes the trade from exporting country $i$ to importing country $j$, $G_i$ and $G_j$ denote national income of country $i$ and country $j$ and expressed by GDP, $D_{ij}$ denotes geographical distance between country $i$ and country $j$. The trade policies, population, and some other factors have gradually been introduced in the specification of gravity model. Traditional gravity model could be expanded to estimate food safety regulations' impacts on China's trade. To capture the current and lagged food safety regulations, the model is expanded to

$$\ln T_{ij} = \beta_0 + \beta_1 F_j + \beta_2 F_j' + \beta_3 \ln G_i + \beta_4 \ln G_j + \beta_5 \ln D_{ij} + \beta_6 P_i + \beta_7 P_j + \beta_8 A_i + \beta_9 A_j + \beta_{10} R_{ij} + \mu_{ij} \quad (2)$$

Where $F_j$ denotes current food safety regulations initiated by importing country $j$, which is expressed by current WTO/SPS notifications. $F_j'$ denotes lagged food safety regulations introduced by importing country $j$, which is expressed by lagged WTO/SPS notifications. $P_i$ and $P_j$ denote GDP per capital of country $i$ and country $j$ respectively. $A_i$ and $A_j$ denote agriculture accounts for the proportion of national GDP in country $i$ and country $j$. $R_{ij}$ is a dummy variable to denote regional trade agreement.

***Data***

China's agricultural trade flow from 2002 to 2007 is obtained from the Ministry of Commerce of the People's Republic of China. Twenty-two China's agricultural trade partners are chosen by their market shares in China's total agricultural export, including Japan, the United States, Korea, Germany, Malaysia, Russia, Indonesia, Netherlands, England, Canada, Philippine, Vietnam, Thailand, Italy, Singapore, Spain, Australia, India, France, Belgian, UAE, and Mexico. WTO/SPS notifications, obtained from the website of WTO (http://www.wto.org/), are used to measure food safety regulations because each WTO member should notify all of its regulations related to trade under the principle of transparency in SPS Agreement. There are 60 days after circulation of the notification according to SPS Agreement. Two months earlier notifications are chosen to illustrate current food safety regulations. Further previous two years' notifications are chosen to illustrate the lagged food safety regulations because the growth cycle of agricultural products is one year and international trade contracts are often signed one year before. Distance between China and trade partner is obtained from the website of http://www.indo.com. Real GDP in 2000 US dollar is illustrated for GDP, which is obtained from World Development Indicator. Population of each country is obtained from US Census Bureau. Dummy variable is used to illustrate whether regional trade agreement has been singed between China and agricultural trade partner. The descriptive statistics of main variables are presented in Table 1. The United States initiated more current SPS notifications than any other China's agricultural trade partner, followed by Netherlands, Germany, France, and Belgian. Total notifications increased to 1203 in the year of 2004, and then decreased to 716 in 2005.

*Table 1: Descriptive Statistics of Main Variables*

| Variable | Numbers of observations | Unit | Average Value | Standard Deviation | Min Value | Max Value | Expected Effect |
|---|---|---|---|---|---|---|---|
| $T_{ij}$ | 132 | 0,000s of $U.S. | 99362.96 | 172385.2 | 6335.65 | 935932 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $F_j$ | 132 | | 42.83 | 66.15 | 0 | 449 | - |
| $F'_j$ | 132 | | 36.39 | 50.82 | 0 | 267 | +/- |
| $G_i$ | 132 | billions of $U.S. | 1832.97 | 310.21 | 1416.1 | 2319.3 | + |
| $G_j$ | 132 | billions of $U.S. | 1248.32 | 2345.08 | 35.68 | 11545.79 | + |
| $D_{ij}$ | 132 | kilometer | 6689.36 | 3598.18 | 872 | 12924 | - |
| $P_i$ | 132 | 000s of $U.S. per capital | 1.41 | 0.22 | 1.1 | 1.75 | + |
| $P_j$ | 132 | 000s of $U.S. per capital | 17.01 | 12.76 | 0.44 | 43.9 | + |
| $A_i$ | 132 | % | 12.45 | 0.76 | 11.29 | 13.50 | + |
| $A_j$ | 132 | % | 5.67 | 6.19 | 0 | 23 | + |
| $R_{ij}$ | 132 | | 0.91 | 0.29 | 0 | 1 | + |

*: "+" denotes the expected effect will be positive; "-" denotes the expected effect will be negative; "+/-" denotes the expected effect will be positive or negative.

***Results***

The result of econometric estimation of Equation 2 is reported in Table 2. The GLS estimation results of random effects showed that there was a significantly negative effect of food safety regulations on China's short run export. The coefficient of -0.0015 indicated that foreign SPS notifications would decrease China's current export of agricultural products. Notification of SPS measures reflects food safety regulations because, if there is no revision after the expected comment period, it will be implemented and can influence international trade. There had been 92 WTO members who introduced more than 7,000 SPS notifications until the end of 2007 and more than 5,000 notifications among them might impact China's agricultural trade because their affected region/country was China or trading partners. At the same time, the refusal actions by Food and Drug Administration (FDA) of the United States as recorded in OASIS for China had increased over time. There were 758 actions in 2003, but increased to 938 actions in 2007. The reasons of FDA's refusal against China's agricultural products were mainly under the requirements of food safety regulations.

*Table 2: Estimation Results of China's Export*

| Dependent variable: Log ( $T_{ij}$ ) | GLS Estimation of Equation (2) | | | |
|---|---|---|---|---|
| | Fixed effect | | Random effect | |
| | Coefficient | $t$ | Coefficient | $z$ |
| Constant | 112.9963*** | 8.51 | 119.6991*** | 8.66 |
| Log ( $F_j$ ) | -0.0016** | -2.02 | -0.0015* | -1.85 |
| Log( $F'_j$ ) | 0.0021 | 1.58 | 0.0032*** | 2.56 |
| Log( $G_i$ ) | -16.4651*** | -7.57 | -17.5507*** | -7.98 |
| Log( $G_j$ ) | -0.7912 | -1.44 | 0.4101*** | 3.81 |
| Log( $D_{ij}$ ) | — | — | -0.8586*** | -4.76 |
| Log( $P_i$ ) | 14.7129*** | 8.44 | 15.1189*** | 8.46 |
| Log( $P_j$ ) | 0.0290 | 1.29 | 0.0298** | 2.53 |
| $A_i$ | 0.3702*** | 5.03 | 0.3725*** | 4.93 |
| $A_j$ | 0.0671* | 1.87 | 0.0488** | 2.10 |

| | | | | |
|---|---|---|---|---|
| Dummy for $R_{ij}$ | — | — | 0.9577** | 2.20 |
| Adjusted R-squared | 0.6629 | | 0.7188 | |

"***", "**", and "*" imply statistical significance at the 1, 5, and 10 percent levels respectively.

It is interested in noting that there was a significantly positive impact of food safety regulations on China's long run export. The coefficient of 0.0032 indicated that SPS notifications would increase China's long-term export of agricultural products. Although some of China's products cannot meet the requirements of foreign food safety regulations in the short period of time, China's exporters do not seem to have trouble to meet the requirement in the long run. This point was further confirmed during authors' survey of exporting enterprises in Shandong, Zhejiang, and Fujian provinces. Most enterprises encountered foreign food safety regulations, but 83.54 percent investigated firms chose to take actions to meet these requirements, such as technological innovation, or applying for certifications and remain competitive in the world market.

## 3. Firm Level Compliance Costs of Food Safety Regulations

Two surveys had been conducted to understand exporting enterprises' compliance costs of meeting foreign food safety requirements. One was the survey to Shandong, Zhejiang, and Fujian provinces during February and Jun in 2008, while the other was the survey on the members of China Chamber of Commerce for Import and Export of Foodstuffs, Native Produce and Animal Byproducts (CCCFNA) and European Business Council (EBC) in August 2009. The first survey was mainly designed to identify the general impact of foreign food safety regulations on China's agricultural exporting enterprises and their total compliance costs. In the second survey, categories of compliance costs were further investigated. 127 questionnaires were distributed in the first survey. 105 responses are returned, with 15 unusable questionnaires. Among 90 effective samples, there were 55 percent domestic-funded enterprises, and 45 percent foreign-funded enterprises. Nearly half of them were middle-scale enterprises, their capital were between ¥5 million and ¥50 million. Small enterprises, which less than ¥5 million capital was registered, and big enterprises, which more than ¥50 million capital was registered, were all about 25 percent, respectively. 29 responses were returned in the second survey, with 26 usable questionnaires. Among the samples, there were 7 foreign-funded enterprises and 19 domestic-funded enterprises. 12 enterprises had less than 100 employers, 7 between 100 and 500 labors, and 7 more than 500 employees. The main target market of 16 enterprises was Asia, 5 enterprises was Europe, and another 5 was North America.

### *Total Compliance Costs*

When a company faces a new food safety regulation or related requirement, it has the option of giving up this market or complying. In the survey, most enterprises had taken measures to comply with the new requirement through technological innovation, equipment modification, or applying for a certification. From the first survey results, total compliance costs of the 90 sampled enterprises were increased for all three year surveyed. The total costs of meeting foreign food safety requirements was $28.11 million in 2005, further increased to $28.92 million in 2006, and to $83.42 million in 2007. Average compliance costs for each enterprise were ¥2.559 million in 2005, further increased to ¥2.561 million in 2006, and to ¥7.051 million in 2007 (Table 3). The ratio of food safety regulations' compliance costs in total sales by enterprise was 1.71% in 2005, and 3.48% in 2007, respectively. The changing pattern of the ratio of food safety regulations' compliance costs in total exports just likes that in total sales. They all showed an upward trend. The cost on technological innovation was the largest part among all categories of compliance costs in the first survey, which were more than 65 percent in all the three years. The second largest cost was testing fee on products, followed by the cost on certification registration fee.

*Table 3: Average Compliance Costs to Food Safety Regulations, the First Survey*

| Costs | Unite | 2005 | | 2006 | | 2007 | |
|---|---|---|---|---|---|---|---|
| | | Costs | Ratio in total compliance cost | Costs | Ratio in total compliance cost | Costs | Ratio in total compliance cost |
| | | 000s of ¥ | % | 000s of ¥ | % | 000s of ¥ | % |

| | | | | | | |
|---|---|---|---|---|---|---|
| Certification registration fees | 50.3 | 1.97 | 63.92 | 2.5 | 210.64 | 2.99 |
| Technological innovation costs | 1817.41 | 71.02 | 1713.71 | 66.91 | 4667.79 | 66.2 |
| Testing fees | 570.88 | 22.31 | 597.11 | 23.31 | 982.38 | 13.93 |
| Other costs | 120.42 | 4.71 | 186.42 | 7.28 | 1190.36 | 16.88 |
| **Total Costs** | **2559.01** | **100** | **2561.16** | **100** | **7051.17** | **100** |

Source: Authors' Survey in 2008.

As showed in Table 4, among all 26 samples, average compliance cost of food safety regulations was ¥12.08 million in 2006 and ¥18.72 million in 2008. The ratio of food safety regulations' compliance costs in total sales by enterprise was 4.3% in 2006 and 4.68% in 2008, respectively. Among four categories of compliance costs, renovating building, equipment, and associated training accounted for more than 80% of total compliance costs in the three years surveyed, followed by testing fee, annual fees on registration or certification. Procedural fee on obtaining the certificate or registration was the smallest categories in the second survey.

*Table 4: Average Compliance Costs to Food Safety regulations, the Second Survey*

| Costs \ Unit | 2006 | | 2007 | | 2008 | |
|---|---|---|---|---|---|---|
| | Costs | Ratio in total compliance costs | Costs | Ratio in total compliance costs | Costs | Ratio in total compliance costs |
| | 000s of ¥ | % | 000s of ¥ | % | 000s of ¥ | % |
| Procedural fee of obtaining the certificate or registration | 42.27 | 0.35 | 42.27 | 0.4 | 42.27 | 0.23 |
| Annual fees on certification or registration | 86.63 | 0.72 | 86.63 | 0.82 | 86.63 | 0.46 |
| Testing Fees | 1662.57 | 13.76 | 1730.85 | 16.4 | 3328.54 | 17.78 |
| Costs on building renovations, lab equipments, training, and others | 10291.96 | 85.17 | 8694.03 | 82.38 | 15265.72 | 81.53 |
| **Total Costs** | **12083.43** | **100** | **10553.78** | **100** | **18723.16** | **100** |

Source: Authors' Survey in 2009.

### *Various Categories of Compliance Costs*

Specific categories of enterprises' compliance costs to meet foreign food safety requirements were identified in the second survey. Results were showed in Tables 5 and Table 6. Many types of certifications had been included in the questionnaires, including HACCP, GMP, GAP, ISO9001, ISO14001, ISO22000, COSHER, HALAL, GMA (Food Processors Association), and SGF. Two types of fees were also included in the survey, procedural fee on obtaining certificate or registration and annual fee on certification or registration. Among all certifications, one time procedural cost of obtaining HACCP certificate was ¥57,220, followed by ISO9001 at ¥49,520, and GAP-Global at ¥12000. The payment for certificate and registration was also required for related administrative organizations every year. The annual cost of SFG certificate was ¥250,000, GMA (FPA) at ¥56,000, COSHER at ¥54,000, and HALAL certificate at ¥50,000, and GMP at ¥ 6,000.

*Table 5: Costs of Certification and Registration (000s of ¥)*

| *Costs* | Procedural fee | Annual fee |
|---|---|---|
| HACCP | 57.22 | 26.39 |
| GMP | 15.00 | 6.00 |
| GAP-China | 30.00 | 21.00 |
| GAP-Global | 12.00 | 8.00 |

| | | |
|---|---|---|
| ISO9001 | 49.52 | 26.81 |
| ISO14001 | 41.00 | 20.67 |
| ISO22000 | 18.00 | 10.00 |
| COSHER | / | 54.00 |
| HALAL | / | 50.00 |
| GMA（FPA） | / | 56.00 |
| SGF | / | 250.00 |
| Hygiene registration | 56.63 | 27.33 |
| Green Food | 40.67 | 11.65 |
| Organic Food | 30.67 | 16.00 |

Source: Authors' Survey in 2009.

According to the second survey, each enterprise spent about ¥1.42 million on average for testing to the second or third parties, ¥2.99 million on purchasing new equipment, and ¥0.64 million on recruiting specialists in 2008. Those costs were increased steadily from 2006 to 2008. Costs on improving infrastructure by far were the largest parts in total compliance costs. Each enterprise paid nearly ¥16 million on renovating buildings, nearly ¥8 million on technology renovation, ¥0.15 million on training, ¥0.79 million on supervision, and ¥1.9 million on others. It was unclear what are included in other costs. Compared with 2006 and 2007, there was a significant increase for the costs of improving infrastructure in 2008.

*Table 6: Categories of Compliance Costs, the Second Survey (000s of ¥)*

| | *2006* | *2007* | *2008* |
|---|---|---|---|
| **Testing Fees** | | | |
| Testing (Second or Third Parties) | 1180.47 | 1402.91 | 1415.36 |
| Purchasing equipment | 1062.18 | 976.09 | 2993.92 |
| Recruiting specialists | 156.43 | 228.14 | 635.13 |
| **Costs on building renovations, lab equipments, training, and others** | | | |
| Building or Renovations | 13401.93 | 8851.67 | 15523.46 |
| Technological Renovation | 2997.65 | 3298.31 | 7957.15 |
| Training | 61.36 | 117.51 | 150.16 |
| Supervision and management | 77.26 | 132.56 | 795.03 |
| Other | 267.50 | 202.50 | 1928.33 |

Source: Authors' Survey in 2009.

### *Different Enterprises' Compliance Costs*

The results of two surveys were compared respectively to show the difference in compliance costs by enterprises. The costs of 2007 in the first survey and cost of 2008 in the second survey were showed in Table 7. From the ownership point of view, the compliance costs of foreign-funded enterprises were less than that of domestic-funded enterprises in the first survey of 2007. The ratio of food safety regulations' compliance costs in total sales and/or total exports for foreign-funded enterprise was less than that of the domestic-funded enterprises. This indicated that China's domestic-funded enterprises paid more than foreign-funded enterprises to meet the requirements of foreign food safety regulations. This was also confirmed in the second survey. The results of the second survey showed that, although average compliance costs of foreign-funded enterprises were more than that of domestic-funded enterprises,

the ratio of the costs in total sales and/or total exports for domestic private enterprises was more than that of foreign-funded enterprises.

*Table 7: Compliance Costs of Different Enterprises*

| Types of enterprise | Unit | First survey (2007) | | | Second survey (2008) | | |
|---|---|---|---|---|---|---|---|
| | | Compliance costs | **Ratio of compliance costs in total sales** | Ratio of compliance costs in total exports | Compliance costs | **Ratio of compliance costs in total sales** | Ratio of compliance costs in total exports |
| | | 000s of ¥ | **%** | % | 000s of ¥ | **%** | % |
| Ownership | State or collective enterprise | 4419.73 | **1.1** | 1.24 | 15672.13 | **2.09** | 2.87 |
| | Private enterprise | 12597.20 | **7.86** | 10.93 | 1795.24 | **9.42** | 12.75 |
| | Foreign-funded enterprise | 1940.04 | **0.84** | 0.82 | 33392.41 | **4.15** | 4.52 |
| Labor | Less than 100 | 2671.85 | **2.33** | 2.79 | 1084.19 | **5.25** | 13.33 |
| | Between 100~500 | 2155.59 | **1.88** | 2.37 | 8288.64 | **1.51** | 2.43 |
| | More than 500 | 14208.03 | **4.11** | 4.32 | 45489.47 | **3.84** | 4.18 |
| Main target market | Asia | 9127.18 | **5.61** | 5.89 | 9121.09 | **1.83** | 2.02 |
| | North America | 3593.40 | **1.11** | 1.34 | 423.04 | **0.16** | 0.30 |
| | Europe | 2105.54 | **0.80** | 0.91 | 37115.98 | **6.52** | 8.60 |

Source: Authors' Survey in 2009.

In terms of the scale of operation, the results of two surveys all showed that, compared with large companies, small-scale enterprises had more disadvantages in meeting the requirements of foreign food safety regulations. The compliance costs and the ratio of compliance costs in total sales or total exports for medium-scale enterprises were less than that of small-scale enterprises, and also less than that of big enterprises in the first survey. However, the results of the second survey showed that, although the compliance costs of average small-scale enterprises were less than that of medium enterprises, and further less than that of big enterprises, their ratios in total sales and/or total exports of small enterprises were more than that of large-scale and medium-scale enterprises. This indicated that China's private enterprises, especially small private enterprises, needed to pay more to meet the increasingly higher requirements of foreign food safety regulations.

In terms of the target market, compliance costs of the enterprises exporting to the Asian countries were more than that of exporting to the North American countries, and also more than that of exporting to the European countries in the first survey. But the results of the second survey were different from that of the first survey. The compliance costs and their share in total sales and/or total exports of enterprises mainly exporting to the European countries were more than that of the Asian countries, and also more than that of the North American countries. However, the reasons for the difference between two surveys were not clear, which required further analysis in the near future.

## 4. Conclusions

The result showed the importance of differentiating short- and long–run impact of food safety regulations. The requirements of food safety regulations had a significantly negative impact on China's short run export but a significantly positive effect on China's long run export. Overall, it was found that the impact of increased food safety regulations (as measured by the increased number of WTO notifications on SPS) on China's exports was positive. The costs of China's agri-food exporting enterprises in complying with foreign food safety regulations had been investigated through two firm surveys during the year of 2008 and 2009. Both results showed that total compliance costs were increased year by year. Among specific categories of costs, the costs on building renovation, technological innovation, and testing were the main components. In all types of certifications, HACCP certificate required the largest amount of compliance cost. The cost of obtaining ISO9001 certificate was less than that of HACCP certificate. GAP-Global certificate costs were the smallest. In terms of annual fee, the highest

cost was SFG certificate, followed GMA certificate. The results also showed that compliance costs of private enterprises were more than that of foreign-funded enterprises. The compliance costs of small-scale enterprises were more than that of big- and medium scale enterprises.

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