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Impact of SPS Measures on the Import Quality of China's Agricultural Products

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Abstract

The paper is aimed to examine the role Sanitary and Phytosanitary (SPS) measures play in quality upgrading of China's imported agricultural products. Based on export data to China from UN Comtrade on agricultural products on the HS6-digit level from 156 countries in 2002-2017, this paper employed Proximity-to-the-Frontier Model to discover the upgrading effect SPS measures have after measuring the quality with Nested Logit Model. The study found that implementing SPS measures exerts a long-term positive effect on quality upgrading. Particularly, SPS measures tend to discourage bulk agricultural products close to world frontier from innovation and quality upgrading, exhibiting a more pronounced opposite of the escape-competition effect. Therefore, it is recommended that Chinese quarantine and market supervision departments should learn from the inspection processes of developed countries in relation to agricultural products and appropriately refine SPS measures to improve the quality of agricultural imports for the health and safety of domestic consumers.

Keywords: Agricultural Products, Import Quality, SPS, Proximity-to-the-Frontier Model

1. INTRODUCTION

China's agricultural import has gained rapid development since WTO accession, with a consistent and considerable expansion in the scale and volume. It grew from US$12.42 billion in 2002 to US$149.85 billion in 2019, with an average annual growth rate of 17.2%. China's agricultural products, on the other hand, are facing a massive trade deficit. The agriculture trade surplus was US$5.6 billion at the time of China's WTO accession, but the trade deficit began to manifest in 2004 and reached US$71.28 billion in 2019. As a result, there has been an influx of agricultural imports into the Chinese market to satisfy the diversified requirements for food products.

However, the increase in agricultural imports can also lead to higher risks of toxic and deadly germs, as well as foreign epidemics. To ensure the health of animal and plant and meet the increasingly urgent needs of consumers for food safety, governments around the globe have been enacting Sanitary and Phytosanitary (SPS) measures, which is one of the most widespread and frequently used trade measures in the post-tariff era. Since accession to the WTO, the use of SPS measures has been stepped up in China, based on the experience of other WTO members and the needs of China's agricultural import practices. For example, the number of SPS notifications increases from 15 in 2002 to a peak of 339 in 2015, with a total of 1121 in 2019.

SPS measures contribute to higher quality standards for China's agricultural products, laying a solid foundation for the health and safety of Chinese consumers. Therefore, this paper focuses on the following questions: What is the impact of SPS measures on the quality of China's agricultural imports? What are the implications for different importing countries and agricultural products?

2. LITERATURE REVIEW

The earliest study of product quality in economics can be traced back to Chamberlain (1933), who stated in the monopolistic competition model that producers would differentiate their products in the face of competition to become the price taker in the market. In contrast, Lancaster (1966, 1971, 1979) proposed the product characteristics approach, which brought the concept and indicator of product quality back into the mainstream model. He emphasized that product quality is unobservable and all goods possess characteristics or attributes that are demanded by the consumers, not the goods themselves.

Empirically, cross-country and time-series variations in product quality were linked to firms' exports (Brooks, 2006; Verhoogen, 2008), skill spillover (Verhoogen, 2008), import quantity restrictions (Aw & Robert, 1986; Feenstra, 1988), and trade patterns (Schott, 2004; Hallak, 2006). The contribution of quality upgrading to macroeconomic growth has also been verified theoretically and empirically by Grossman & Helpman (1991) and Hummels & Klenows (2005) respectively. The results of equilibrium analyses by Gervais (2009), Feenstra and Romalis (2012) and Crozet (2012) all suggested that export prices depend on productivity and quality. Chen and Xu (2018) used the back-induction method on product-level regression to measure the quality of China's imported agricultural products based on data from the China Customs in 2000-2013. Jiang and Yao (2019) concluded that the EU Maximal residual limits (MRLs) standard

not only significantly inhibits the speed of quality upgrading of imported fresh fruits, but also has a non-linear impact on quality upgrading.

In terms of research on the quality of China's agricultural products, Dong and Qiu (2014) identified Traceability, Transparency, and Assurance System of Quality Safety (TTA) as a proxy for the quality competitiveness of agricultural products. They pointed out that the level of TTA of Chinese pork was significantly and positively related to export performance. Yan and Qi (2016) noted that the exporting countries determines whether the growth of China's agricultural products is marginally quality-driven or quantity-driven. Liu and Dong (2019) found that the overall export quality of China's agricultural products demonstrates a fluctuating upward tendency in 2000-2017 and will become much more stable in 2018-2025.

However, there is still a lack of literature focusing on the impact of SPS measures on the quality of agricultural products. Bao and Yan (2014) explored the extent to which SPS measures affect China's agricultural exports based on gravity model and the measurement for binary margin. They found that the negative effect SPS measures have on the export is mainly reflective on the intensive margin, but has minimal impact on the extensive margin. Dong and Huang (2018) utilized distance-to-the-frontier model to examine the impact of Japan's SPS measures on the quality upgrading of agricultural products exported by each country and underscored that the increase in the standard of Japan's SPS measures contributed to the quality upgrading of agricultural products in each exporting country.

To sum up, most of the existing literatures as to SPS measures focus on the analysis of the impact on the scale of trade, but few concentrate on the impact on the quality of imported products. This paper adopts proximity-to-the-frontier model, in which SPS measure is deemed as competition measure while quality upgrading is a proxy for innovation. Constructing a relationship between competition and innovation helps explore the impact of SPS measures on the quality upgrading of agricultural imports, which can better examine agricultural production, trade policies as well as import market diversification strategies.

3. METHODOLOGY

3.1. Models, Variables and Data

Proximity-to-the-frontier model (ABGHP), developed by Aghion et al (2005, 2009), has been widely applied and extended to innovation, such as quality upgrading. The model was constructed based on the fact that the empirical evidence exhibits a nonmonotonic relationship between competition and innovation, which depends on whether a firm is close to world technology frontier. ABGHP underscores two forces between competition and innovation. First, for firms whose products approaching the quality frontier, the increase in competition will boost innovative activities in order to win over other competitors, which is referred to as escape-competition effect. Second, for firms far from the world frontier, increasing competition will reduce innovation on the grounds that these firms would not catch up other powerful competitors even though they strive for innovation, that is, discouragement effect.

A measure of distance to the quality frontier is the proximity to frontier (PF). The basic intuition is that the product is close to world frontier provided that PF value is close to 1, while the

product is far from the frontier if PF value is close to 0. In the measurement of PF, the quality frontier shall be first defined as the highest quality of the agricultural products at the HS6-digit level. To obtain a non-negative proximity to frontier, let λ_{iht}^{F}=exp (λ_{iht}), then PF is measured as the ratio of the quality to the highest quality of the HS6-digit agricultural products, i.e., $PF_{iht} = \lambda_{iht}^{F}/max_{i\in ht}(\lambda_{iht}^{F})$.

As is known to all, SPS measures will not be implemented immediately, but around three to six months after the notification. For instance, when the SPS measures are implemented, the exporting countries need to make corresponding improvements in technology to satisfy the inspection and quarantine requirements of the importing countries. However, it is difficult to determine the exact period of adjustment. As a result, the model does not include the number of notifications for the current year (Dong and Li, 2015), but instead treats the lagging years as the validity periods of the SPS measures. In addition, this paper regards the number of SPS notifications as a proxy variable for SPS measures considering data availability and introduces 3, 4 and 5-year lagged data respectively, to analyze the impact of the implementation of SPS measures on the quality upgrading of agricultural imports.

Besides, based on the studies of Chen and Xu (2016) as well as Xiong and Cheng (2018), the paper will include a number of control variables for quality upgrading of agricultural imports, such as GDP per capita (lnperGDP), value added in agriculture (lnAGR), degree of openness (lnopen) and the proportion of rural population (lnPOR) in the importing countries. Therefore, the model is obtained as follows.

$$\Delta ln\lambda_{iht}^{F} = \beta_1 PF_{ih,t-5} + \beta_2 SPS_{ih,t-k} + \beta_3\left(PF_{ih,t-5} \times SPS_{ih,t-k}\right) + lnperGDP + lnAGR + lnopen + lnPOR + \alpha_{ih} + \alpha_{ht} + \alpha_{it} + \varepsilon_{iht} \quad (1)$$

where $\Delta ln\lambda_{iht}^{F}$, as the explanatory variable, measures the magnitude of quality upgrading between year t and t-5. $PF_{ih,t-5}$ denotes the 5-year lagged proximity to frontier, i.e., the ratio of the quality of product h exported to China by country i in the year t to the highest quality of import h in the current year. $SPS_{ih,t-k}$ denotes the number of China's SPS notifications for k-year lags. According to the WTO's principle of transparency, the enactment or amendment of SPS measures must be notified to the SPS Committee. The number of notifications reflects the changes and escalation of a country's SPS measures. The higher the number of notifications is, the more stringent the SPS measures will be.$PF_{ih,t-5} \times SPS_{ih,t-k}$is the interaction term that takes into account the combined effect of the proximity to frontier and the number of SPS notifications for k-year lags. $lnperGDP$ measures the economic level of the exporting country, while $lnAGR$ measures the supply of agricultural products from exporting countries. $lnopen$ indicates the degree of openness of exporters, measured as the ratio of a country's total exports and imports to GDP for the year. $lnPOR$ stands for the share of the rural population in the total population of exporters, which measures the share of agriculture labor. α_{ih}、α_{ht}、α_{it} denote individual fixed effects, product-year fixed effects and country-year fixed effects, respectively. ε_{iht} is the error term.

This paper selects export data to China from UN Comtrade on agricultural products on the HS6-digit level from 156 countries in 2002-2017, including the import value and volume of agricultural products. SPS notifications are obtained from the China WTO/TBT-SPS Notification

Information Website. Data on control variables are obtained from the World Bank. After extreme values of the relative quality are excluded, descriptive statistics for each variable are shown in Table 1.

Table 1. Descriptive Statistics

Variables	Sample size	Average value	Standard deviation	Minimum	Maximum
Proximity to frontier with 5-year lag	59289	0.335	0.299	0.001	1
GDP per capita (US$)	59289	31085.55	21030.57	244.286	102913.5
Value added of agriculture (US$)	59289	4.46e+10	6.31e+10	2.14e+07	4.34e+11
Degree of openness	59289	0.9891297	0.9283933	0.0016742	4.4262
Share of rural population (%)	59289	28.20939	18.6358	2.039	89.085

Source: Based on Stata 14.

3.2. Measurement for Quality

To apply equation (1), this paper measures the import quality of China's agricultural products based on nested logit model. The assumption is that consumer preferences can be divided into horizontal and vertical components. The framework considers the market share of an export product in the target market as a function of the price, the horizontal preferences and the product quality (vertical preferences) (Wang, 2014). After removing the price factor from the market performance, the remaining part is the quality. The "quality" analyzed in this paper refers to as the vertical difference after excluding the price and horizontal difference of the same product. The equation is obtained as follows according to Khandelwal (2009).

$$\ln(s_{iht}) - \ln(s_{0t}) = \lambda_{1,ih} + \lambda_{2,t} - ap_{iht} + \sigma \ln(ns_{iht}) + \gamma lnMarket_{it} + \lambda_{3,iht} \quad (2)$$

where s_{iht} denotes the market share of product h imported from country i while s_{0t} denotes the domestic market share. On the right-hand side of the equation, $\lambda_{1,ih}$ is the individual fixed effect of country c's export product h that does not vary over time, excluding non-quality effects on the exporting country's product such as bilateral trade relations, trade barriers, etc. $\lambda_{2,t}$ is the time fixed effect and $\lambda_{3,iht}$ is the unobservable error term that includes deviations from the time and product fixed effects. ns_{iht} denotes the nested market share, while p_{iht} denotes the price level of product h imported from country i at time t. $Market_{it}$ means the market size of importing country i at time t. The measurement for quality can then be derived backwards as follows.

$$\lambda_{iht} \equiv \hat{\lambda}_{1,ih} + \hat{\lambda}_{2,t} + \hat{\lambda}_{3,iht} \quad (3)$$

4. RESULTS

4.1. Baseline Results

Based on equation (1), the impact of SPS measures on the quality of imported agricultural products was estimated by taking k as 3, 4 and 5 respectively, with different lags of SPS notifications and the interaction term $PF_{t-5}\times SPS_{t-5t-k}$. The results are presented in Table 2.

Table 2. Regression Results of Different Lag Periods

Variables	(1)	(2)	(3)
	3-year lag	4-year lag	5-year lag
$PF_{ih,t-5}$	-0.7979***	-0.7848***	-0.8042***
	(-30.73)	(-30.34)	(-33.13)
$SPS_{ih,t-3}$	0.0105***		
	(3.84)		
$PF_{ih,t-5}\times SPS_{ih,t-3}$	-0.0002		
	(-0.53)		
$SPS_{ih,t-4}$		0.0108***	
		(5.90)	
$PF_{ih,t-5}\times SPS_{ih,t-4}$		-0.0004	
		(-1.46)	
$SPS_{ih,t-5}$			0.0117***
			(13.59)
$PF_{ih,t-5}\times SPS_{ih,t-5}$			-0.0002*
			(-0.72)
lnperGDP	0. 2850***	0. 2701***	0. 2416***
	(8.71)	(8.47)	(8.00)
lnopen	0.0671***	0.0668***	0.0753***
	(6.58)	(6.57)	(7.43)
lnAGR	-0.0149**	-0.0155**	-0.0204***
	(-2.95)	(-3.09)	(-4.06)
lnPOR	0.0734***	0.0709***	0.0668***
	(6.44)	(6.24)	(5.58)
_cons	-0.3854**	-0.4409**	-0.6441***
	(-2.90)	(-3.32)	(-4.85)
R^2	0.2452	0.2781	0.2476
Obs	54001	54001	54001

t statistics in parentheses, $^{*}p< 0.1$, $^{**}p< 0.05$, $^{***}p< 0.01$

According to the regression results, the coefficient of PF is significantly negative at the 1% level in all the 3 models, indicating that proximity to frontier exerts a negative effect on the quality upgrading of imports. In other words, agricultural imports closer to the frontier experience slower quality upgrading. Countries far from the technology frontier are usually affected by discouragement effect and reluctant to innovate, but in this case, have more incentive to

innovate in a harsh and competitive trade environment, and thus are faster to achieve quality upgrading due to technology spillovers and the "learning by doing" effect. On the other hand, technologically-advanced countries have a considerable advantage over the quality of agricultural products. Therefore, these products close to quality frontier are more likely to meet market requirements and face a more relaxed competitive environment, which directly results in a slow quality upgrading.

The coefficients of the lagged SPS measures are significantly positive at the 1% level, demonstrating that the implementation of lagged SPS measures has a positive effect on the quality upgrading of China's agricultural products. For example, holding other variables in column (3) constant, each additional SPS measure implemented by China in year (t - 5) increases the absolute quality of imported agricultural products in year *t* by 0.0117.

The coefficient of the interaction term is negative but not significant in columns (1) and (2). However, the estimates in column (3) have been found that PF_{t-5} and SPS_{t-5} are significantly negative at the 10% level. This suggests that an increase in the 5-year lagged SPS measures reduces the quality upgrading of agricultural products close to the frontier (PF_{t-5}=1) by 0.0002, reflecting the opposite of the “escape-competition effect”. It means that higher quality products are less innovative when meeting market standards, compromising quality upgrading. On the whole, for agricultural imports close to the frontier, an increase in SPS measures leads to an increase of 0.0115 in quality upgrading.

Furthermore, an increase in the GDP per capita of exporting countries can also contribute to the improvement of import quality, with the absolute quality of China's agricultural imports increasing 0.24 for every 1% increase in the GDP per capita of exporting countries in the 5-year lagged SPS regression. The coefficient of lnopen is significantly positive at the 1% level in all lagged SPS regressions, indicating that the more open the agricultural exporting country is to the world, the greater the share of import and export trade in the national economy will be, and thus the higher the quality of agricultural products exported to China. The coefficients of value added of agri-food from exporting countries are all negative, but more statistically significant in column (3). The negative coefficient implies that increase in agricultural value added may boost the export to China, but will instead exert a negative effect on quality upgrading of agricultural products, on the grounds that exporting countries that rely on the agricultural economy may be lacking in technology and innovation capabilities. Finally, the coefficient of the share of rural population in the exporting country is significantly positive at the 1% level, suggesting that the input of the agricultural population in the exporting country has a positive effect on the quality of agricultural products to China.

4.2. Comparison between Developed and Developing Countries

In order to further examine the heterogeneity in the impact of China's SPS measures on agricultural products from countries at different levels of economic development, the paper categorizes 152 exporting countries into developed and developing countries according to the UN Human Development Index (HDI) and obtains the following results.

Table 3. Regression Results of Imported Agricultural Products from Different Countries

Variables	(1) All countries	(2) Developed countries	(3) Developing countries
$PF_{ih,t-5}$	-0.8042***	-0.8896***	-0.7596***
	(-33.13)	(-21.17)	(-25.41)
$SPS_{ih,t-5}$	0.0117***	0.0019***	0.0127***
	(13.59)	(11.11)	(18.02)
$PF_{ih,t-5}\times SPS_{ih,t-5}$	-0.0002*	-0.0006*	-0.0002*
	(-0.72)	(-1.84)	(-0.55)
lnperGDP	0. 2416***	0.1103***	0. 0664**
	(8.00)	(6.73)	(2.94)
lnopen	0.0753***	0.0227*	0.1022***
	(7.43)	(1.64)	(4.81)
lnAGR	-0.0204***	-0.0032	-0.0460**
	(-4.06)	(-0.48)	(-4.85)
lnPOR	0.0668***	0.1150***	0.1113***
	(5.58)	(8.84)	(4.35)
_cons	-1.9441***	-2.0706**	-1.5383**
	(-8.85)	(-8.06)	(-6.15)
R^2	0.2476	0.2430	0.2520
Obs	54001	33430	20571

t statistics in parentheses, p *< 0.1, ** p< 0.05, *** p< 0.01

In terms of regression results of developed and developing countries, it is found that the coefficient of proximity to frontier is both significantly negative at the 1% level. However, what makes it different is that the absolute magnitude of proximity to frontier coefficient is much larger for developed countries, suggesting that the agricultural exports from developed countries are superior in quality, but on the other hand, more difficult to improve than that those from developing countries.

In terms of the effect of 5-year lagged SPS measures, for each SPS measure notified, the quality of agricultural products from developed countries only improves 0.0019 after 5 years compared to 0.0127 in developing countries, if the effect of proximity to frontier is not taken into account. It demonstrates that SPS measures implemented in China will have a higher impact on quality upgrading of agricultural products from developing countries than developed countries.

The coefficient of the interaction term is significantly negative at the 10% level, but the negative effect from developed countries is much larger than developing countries. For high-quality agricultural products from developed countries with PF_{t-5} value close to 1, an increase in 5-year lagged SPS notifications is associated with an increase of 0.0013 in the quality upgrading of agricultural products in the current year. It suggests that, overall, an increase in SPS standards appears to have small escape-competition effect in developed countries. On the other hand, for agricultural products far from the frontier in developing countries, the quality of agricultural products increases 0.0125 for each additional 5-yaer lagged SPS notification. The escape competition effect seems to outweigh the discouragement effect mainly because of the non-marketization. The government may excessively intervene in the economy in relatively backward regions. For example, a large number of investment subsidies are likely to be

allocated to traditional agricultural enterprises to encourage innovative activities and technology development. Moreover, due to technological spillovers and latecomer advantages, the cost of innovation is lower in developing countries, providing more possibilities for quality upgrading (Acemoglu D et al, 2006).

4.3 Comparison between Different Types of Agricultural Products

Based on the USDA Global Trade System (GTS) classification criteria for agricultural products, this paper further explores the extent of the impact of 5-year lagged SPS measures on the quality upgrading for four major categories of agricultural products, i.e., intermediate agricultural products[1], consumer-oriented agricultural products[2], bulk agricultural products[3], and other related agricultural products[4] (Zhang et al, 2016)

Table 4. Regression Results of Four Main Categories of Imported Agricultural Products

Variables	(1) Intermediate agricultural products	(2) Consumer-oriented agricultural products	(3) Bulk agricultural products	(4) Other related agricultural products
$PF_{ih,t-5}$	-0.6930***	-0.9203***	-0.7916***	-1.220***
	(-10.63)	(20.74)	(-5.07)	(-16.18)
$SPS_{ih,t-5}$	0.0026***	0.0014***	0.0021**	0.0024***
	(9.00)	(7.96)	(3.03)	(7.07)
$PF_{ih,t-5}\times SPS_{ih,t-5}$	-0.0008*	0.0008	-0.0013*	-0.0012*
	(-0.95)	(1.50)	(-1.55)	(-2.28)
lnperGDP	0. 0250*	0.0833***	0.0645*	0. 0209*
	(1.84)	(4.33)	(0.84)	(1.57)
lnopen	0.1498**	0.0277*	0.4044*	0.3505**
	(2.91)	(0.77)	(4.84)	(6.90)
lnAGR	0.0241*	-0.0227*	-0.0983*	-0.2630*
	(1.90)	(-1.82)	(-2.85)	(-2.13)
lnPOR	0.1083***	0.1079***	0.2635**	0.1825***
	(2.08)	(3.18)	(2.66)	(2.34)
_cons	-0.2479*	-0.4704***	-1.1143**	-1.5383**
	(0.84)	(-2.39)	(-2.83)	(-6.15)
R^2	0.3655	0.3211	0.4641	0.5160
Obs	12284	25193	2553	9652

[1] Intermediate agricultural products refer to primary agricultural products and reprocessed agricultural products that continue to be put into the production process.

[2] Consumer oriented agricultural products refer to agricultural products with high price elasticity of demand such as fresh meat and eggs, dairy products, fresh vegetables and vegetable beverages, fruit juices, coffee, tea, liquor, beer, cocoa and chocolate.

[3] Bulk agricultural products refer to agricultural products that have a large weight in the structure of the commodity agricultural economy and are produced, consumed, traded and transported in large quantities.

[4] Other related agricultural products refer mainly to most fishery products and distilled spirits.

t statistics in parentheses, p *< 0.1, ** p< 0.05, *** p< 0.01

As shown in Table 4, the coefficients of PF_{t-5} are significantly negative at the 1% level in all four categories of agricultural products. More specifically, quality upgrading of other related agricultural products is most negatively affected by proximity to frontier. Quality of other related agricultural products with PF value close to 1 will be improved 1.220 less than the one close to 0. This is followed by consumer-directed agricultural products, for which 5-year lagged proximity to frontier also has a negative effect. Compared to the previous two, bulk and intermediate agricultural products are relatively less affected.

The SPS measures have a positive effect on the quality upgrading of all four categories of agricultural products in the long term. More importantly, stronger effect is shown on the quality upgrading of intermediate agricultural products, other related agricultural products, and bulk agricultural products. In view of the interaction term, the variable for consumer-oriented agricultural products differs from the other three categories in that the coefficient is not significant. It suggests that consumer-oriented agricultural products of high or low quality are not prone to have the escape-competition effect. In contrast, bulk agricultural products, which are close to the quality frontier, exhibit the opposite of the escape-competition effect.

5. DISCUSSION AND CONCLUSION

This paper uses proximity-to-the-frontier model to analyze the relationship between SPS measures and quality upgrading of China's agricultural imports. It is found that SPS measures have a significant positive impact on the quality of China's agricultural imports in the long run. However, the proximity to frontier is negatively correlated with quality upgrading. For agricultural products close to the frontier, quality upgrading is much slower. For low-quality products far away from the frontier, the quality upgrading is more obvious thanks to technological spillovers and latecomer advantages. The paper further shows that developed countries tend to exhibit a more pronounced opposite of escape-competition effect in the face of SPS measures, which means higher-quality products are less innovative in meeting stricter market standards. In contrast, quality upgrading of agricultural products is less subjected to the discouragement effect in developing countries. Interestingly, firms in developing countries are more willing to embrace innovation for quality escalating. At the product level, the quality of intermediate agricultural products is relatively insensitive to the proximity to frontier, whereas bulk agricultural products close to the frontier are more likely to depict the opposite of escape-competition effect.

Based on the above findings, there are a number of policy implications for the quality control of China’s agricultural imports and the implementation of SPS measures. First, the quality of Chinese agricultural imports should be strengthened. With the increasing demand for foreign high-quality agri-food, Chinese quarantine and market supervision authorities should take the responsibility of refining prosecution measures. It is also crucial to guide domestic enterprises to choose better agricultural imports. Second, the government is supposed to look for ways in which the implementation of SPS measures is improved to safeguard the health of domestic consumers. Relevant Chinese government departments shall also learn from the inspection

processes of developed countries in relation to agricultural products, introduce advanced quarantine techniques and improve quarantine standards for agricultural products so that the SPS measures can exert an incentive effect. Finally, relevant departments should also proactively disclose the terms and conditions of the SPS measures in a timely manner to create a good and fair environment for importing trade partners and to attract more quality trading partners.

REFERENCES

Aghion P., Blundell R., & Griffith R. (2005). Competition and innovation: an inverted-U relationship. *Quarterly Journal of Economics*, 120(2), 701-728.

Acemoglu, D., Aghion, P., & Zilibotti, F. (2006). Distance to frontier, selection, and economic growth. *Journal of the European Economic Association*, 4(1), 37-74.

Bao Xiaohua, & Yan Xiaojie (2014). A study on the binary marginal measure of China's agricultural exports and the impact of SPS measures. *International Trade Issues*, 6:33-41.

Chen Fenglong, & Xu Kangning (2016). The quality ladder of Chinese exports and its influencing factors. *International Trade Issues*, 10, 15-25.

Crozet, M., Head, K., & Mayer, T. (2012). Quality sorting and trade: Firm-level evidence for French wine. *The Review of Economic Studies*, 79(2), 609-644.

Chen Rong, & Xu He Lian (2018). Measuring the quality of imported agricultural products in China--an analysis based on data from 2000-2013. *Financial Theory and Practice*, 39(6), 125-130.

Dong Yinguo, & Liu Xuemei (2019). Quality evolution of China's exported agricultural products under unstable environment. *Journal of South China Agricultural University (Social Science Edition)*, 18(6), 84-95.

Dong Yinguo, & Qiu Huoye (2014). Analysis of the competitiveness of Chinese pork based on traceability, transparency and assurance system. *Agricultural Economic Issues*, 35(2), 17-25+110.

Dong Yinguo, & Huang Junwen (2018). Impact of SPS measures on quality upgrading of exported agricultural products - an empirical analysis based on frontier distance model. *International Trade Issues*, 10, 45-57.

Dong Yinguo, & Li Zhen (2015). SPS measures: trade barriers or trade catalysts: an empirical analysis based on agricultural import data from developed countries. *Journal of Zhejiang University (Humanities and Social Sciences Edition)*, 2, 34-45.

Henry Etzkowitz, & Loet Leydesdorff (2002). The Transformation of University-Industry-Government Networks. Electronic Journal of Socilogy, April. [Online] www.Sociology.org/content/vol 1005.004/th.html. [Date of accesss: 10.05.2022]

Jiang Dongpo, & Yao Qingxiao (2019). Impact of pesticide maximum residue limit standards on the quality improvement of agricultural products - an empirical analysis based on the import of fresh fruits in the EU. *Agricultural Technology and Economics*, 3,132-144.

Jarunee Wonglimpiyarat (2006). The Dynamic Economic Engine at Silicon Valley and US Government Programs in Financing Innovations, *Technovation*, 26(9),1081-1089

Khandelwal (2009). A. The Long and Short (of) Quality Ladders. *NBER Working Paper*, No.15178.

Ministry of Commerce People's Republic of China. Reports of monthly imports and exports. [Online]http://data.mofcom.gov.cn/hwmy/ncpmonth.shtml?parnode=ncpzj_sub&subnode=ncpzj_month. [Date of accesss: 01.05.2022]

Monica Răileanu Szeles, & Mihaela Simionescu (2020). Regional Patterns and Drivers of the EU Digital Economy, *Social Indicators Research*, 150, 95-119.

Xiong Lichun, & Cheng Baodong (2018). Study on the Quality Measurement of Imported Forest Products in China and its Influencing Factors. *International Business (Journal of the University of International Business and Economics*, 2, 43-52.

Wang Mingyi (2014). Has the Quality of China's Export Products Improved? *Statistical Research*, 31(5): 24-31.

Yan S.T., & Qi Q.C. (2016). A Study on the Ternary Margins and Pricing Ability of China's Fresh Agricultural Exports - An Example of Chinese Fruit Exports to Russia, Japan and the United States. *Agricultural Modernization Research*, 37(4), 694-700.

Zhang Yu'e, Cao Lijuan, & Wei Yanjiao (2016). Definition and Classification of the Scope of Agricultural Products in Agricultural Trade Research. World Agriculture, 05, 4-11.