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Food Safety Regulation and Their Impact on Azerbaijan Vegetable Oil Trade

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Abstract: The research aimed to assess the impact on the overall export of the Republic of Azerbaijan of adapting existing food safety regulations, based on technical standards for vegetable oils, to international requirements such as the CODEX Alimentarius. This study employed both qualitative and quantitative methods. A systematic literature review was conducted to establish methodologies for evaluating export diversification. A regression model was also constructed to determine the relationship between the volume of exports and the degree of export concentration. After scientific works related to the research examination after analysing the data, it was determined that most scholars focused on examining the impact of regulations on the expansion of export markets and the rise in the price of exported goods rather than its effect on overall export volumes. To explore this further, the study initially investigated the contribution of vegetable oil exports to the overall export of food products in the Republic of Azerbaijan. Along with the Herfindahl Hirschman Index, which reflects the concentration level of vegetable oil exports, statistical data analysis and comparison methods were used. One of the main issues when examining data on vegetable oil export was the concentration level of vegetable oil export in the Republic of Azerbaijan. As a result of the analysis of export data for individual importing countries, it is clear that in 2022, the number of countries importing vegetable oils from the Republic of Azerbaijan has increased compared to 2019. In addition, with the help of the Herfindahl Hirschman Index, the degree of concentration of Azerbaijan's vegetable oil export was studied. It was found that although positive progress was achieved in the concentration level of the export market in the country compared to 2019, in general, the export market of vegetable oils was considered highly concentrated. In addition, although there was a negative relationship

between the export amount of vegetable oils and the Herfindahl Hirschman Index, this relationship was not considered significant.

Keywords: food safety regulation, export concentration, Herfindahl Hirschman Index, Republic of Azerbaijan.

Introduction

There is a big polemic concerning the sanitary and phytosanitary (SPS) regulations effect on agricultural product trade in developing countries. Thus, the analysis of literature on the effect of sanitary and phytosanitary (SPS) regulations on trade highlight the different point of view on this topic. It obviously depends on the level of development of these countries applying these standards. Sanitary and phytosanitary (SPS) regulations in developed countries have come under strict inspection due to growing concerns about the health threats connected with foodstuffs. Standards are used to safeguard plant and animal health from illnesses as well as to protect people's health from hazardous additives, pollutants, poisons, or pathogenic microorganisms in foods and drinks. The situation becomes different when the issues of food safety enforcement are approached from the perspective of developing countries. Thus, the implementation of food safety standards by importing countries creates trade barriers for developing countries to a certain extent. In addition, the application of international food standards in developing countries leads to an increase in the competitiveness of their exported food products and diversification of export markets. Since the impact of the adaptation of food safety norms to international standards on the export of any agricultural product of the country has not been investigated in the Republic of Azerbaijan, the scientific work is considered as novelty in this field. This study addresses a significant research gap pertaining to the attributes associated with the exportation of agricultural products in the Republic of Azerbaijan.

Research Problem

Although the adaptation of the current regulations to international requirements is mainly considered as a step taken in the direction of export promotion, there are many opposite approaches to this issue. So, in the opinion of some researchers, although the mentioned requirements for developed countries play the role of an import barrier, the issue is a little different in relation to exports to developing countries. For this reason, a detailed analysis of the steps taken to adapt the current food requirements to international standards is important. Although the research conducted on the subject is mostly related to agriculture and food security, currently the impact of food safety regulations on the economy, including trade, in the Republic of Azerbaijan has not been studied. In the presented scientific work, since 2018, when Republic of Azerbaijan became a member of the CODEX Alimentarius Commission, the impact of food safety regulations adapted to international requirements on trade has been investigated.

Research Focus

Taking into account the above-mentioned issues, the main focus of the research work is on the vegetable oil product which was exported from the Republic of Azerbaijan from 2016 to 2022. In addition, the normative acts applied in regulating the export of vegetable oils were analysed in detail.

Research Aim and Research Questions

The main purpose of the research was to study the changes in vegetable oils export as a result of adapting the regulations in force regarding vegetable oils in the Republic of Azerbaijan to international requirements. In this regard, the following questions were worked during the research:

1. What is the share of vegetable oils in the total export of processed food products in the Republic of Azerbaijan?
2. What changes occurred in the export volume and export price of vegetable oils after the adoption of the technical regulation?
3. How has the concentration of export of vegetable oils exported from the Republic of Azerbaijan changed over the years?
4. Is there a relationship between the export volume of vegetable oils exported from the Republic of Azerbaijan and the concentration of exports?

Literature review

Once limited to a specific region, foodborne illnesses are now swiftly disseminating and presenting a grave concern for worldwide public health (Yadav et al., 2023). In 2020, 2,122 notifications of new and modified SPS measures were filed, indicating how crucial food safety is to the agriculture industry. According to the data of the World Trade Organisation, the group of products with the most notifications since 1995 includes animal and vegetable oils, which makes up 3% of the total notifications (Committee on Sanitary and Phytosanitary Measures, 2021). According to the findings of Orden et al. (2021), a significant proportion of notifications submitted to the World Trade Organisation (WTO) Technical Barriers to Trade (TBT) committee were associated with measures pertaining to agricultural and food items, specifically amounting to 38 percent (Orden et al., 2021). The majority of the identified sanitary and phytosanitary (SPS) measures primarily focus on ensuring food safety through the regulation of maximum residue levels (MRLs) for pesticides (Grübler & Reiter, 2021). According to Tiu (2021), the establishment of Maximum Residue Limits (MRLs) is a perpetual difficulty due to the rapid advancements in pesticide technology, which continually give rise to novel concerns.

The implementation of food safety measures (FSMs) at the organisational level has the potential to enhance production and stimulate demand in the global market. Ensuring adherence to Food Safety Standards might present difficulties, however it is an essential need for engaging in international trade (Yadav et al., 2021). Moreover, enterprises have problems stemming from limited resources and insufficient institutional capacity as they navigate varying rules across multiple markets. Consequently, delays emerge as a significant worry for these firms (DaSilva-Glasgow, 2019). According to Hunga et al. (2023), a significant majority of the surveyed groups, namely 70%, said that the execution of their initiatives was hindered by inadequate infrastructure and human resources. Furthermore, 85% of these organizations attributed these challenges to a combination of insufficient political will and inadequate media backing. Non-tariff measures (NTMs) can pose significant challenges for small enterprises in engaging in trade activities. The implementation of testing and inspection processes, for instance, has been shown to result in a reduction in exports by around 9%. Similarly, the presence of NTMs can lead to a decrease in exports by around 3% (Hussain et al., 2023). According to Sanjuán et al. (2023), the distribution of costs related to compliance associated with sanitary and phytosanitary (SPS) measures, as well as additional technical rules, may exhibit unevenness among various trading partners, potentially leading to disproportionate consequences for economically disadvantaged nations.

Outright prohibitions, standards that specify the circumstances under which items must be manufactured and/or the qualities of the finished products, as well as labelling and other disclosure requirements, are all actions taken to safeguard public health (Wilson & Outski, 2003).

There has been a progressive rise in concerns pertaining to Non-Tariff Measures (NTMs) within the realm of international trade talks and academic research. Furthermore, the elimination and reduction of agri-food tariffs have been facilitated by various free-trade agreements throughout the

last twenty years (Beghin & Schweizer, 2020). To protect their own interests, developing nations must actively participate in all SPS issues, international standard-setting bodies, and SPS committees. Several studies also contend that if developing nations actively participate in the SPS agreement and its institutions, they may be able to reap the positive effects of the SPS agreement. In their research, Gebrehiwet et al. (2007) examined the countries by income groups and, as a result, based on the World Bank's distribution principles, analysed the data on World Trade Organization (WTO), SPS, Office International des Epizooties (OIE), CODEX Alimentarius Commission (CODEX), International Plant Protection Convention (IPPC) membership of countries in different income groups and compiled a table. The figures illustrated that approximately 62 per cent of countries with low, lower, and intermediate incomes participated in the WTO. In contrast, the participation rates for upper-middle- and high-income nations were 83 and 92 percent, respectively. The OIE, which is in charge of coordinating sanitary requirements for transnational trade in animals and animal products, and (CODEX), an international body for developing standards for particular foods or classes of foods, both have membership rates above 70%, and these can be viewed as relatively more representative data.

The SPS agreement is mostly driven by wealthy nations' interests, as seen by the minimal involvement of low-income countries in these institutions (Gebrehiwet et al., 2007). The results of the qualitative measurement of SPS (Sanitary and Phytosanitary) standards indicate a strong negative impact on the exports of processed products from lower-income countries, as well as on the exports of primary and processed products from low-income countries to high-income countries. Similarly, there was a substantial negative relationship seen between the qualitative TBT variable and food products exported from lower-middle-income to high-income nations (Akune, 2023).

The Codex Alimentarius Standards for food safety are an international set of standards that are supported by the World Trade Organization (WTO) Agreement on Sanitary and Phytosanitary Standards. The Agreement allows importing nations to enact regulations that are stricter than internationally accepted norms (Hong et al. 2020). The SPS agreement aimed to address non-tariff barriers (NTBs) resulting from variations in technical standards among nations, while also respecting governments' authority to take measures for disease and pest prevention (Lee, 2021). But if different standards obstruct commerce, there must be scientific explanation. In this regard, WTO members may be expected to adhere to international norms as a minimum. Disputes over trade are more likely to occur when norms diverge from accepted international scientific principles and risk assessment methodologies and impose considerable costs on exporting nations. Geetha et al. (2020) argue that there is a necessity for the establishment of standardized safety and quality regulations in worldwide surveillance systems, as well as the adoption of science-based requirements and procedures, among prominent importing nations. According to the findings of Boza et al. (2023), the implementation of harmonization measures has been shown to mitigate the adverse impacts of foreign sanitary and phytosanitary (SPS) regulations on export activities.

According to several studies (Cadot & Gourdon, 2014), developing countries' access to developed countries' markets has been hampered by the strict SPS standards set by those nations, as well as their lack of financial and technical resources to participate in the process of establishing those standards. As a result of failing to adhere to the SPS criteria, several developing nations have had negative effects on their economy. As a result, there was a considerable loss of money, jobs, and export earnings. Moreover, the regulatory requirements are commonly established with the intention of accomplishing valid country-specific objectives. However, they might impose expenses related to compliance and monitoring on industries, especially in the context of international commerce when several nations implement distinct regulatory standards (Nogales et al., 2023). Since 2015, the expansion and earnings of shrimp exports have experienced a state of stagnation, characterised by either a static or falling trend. This may largely be attributed to challenges in achieving the quality and safety criteria set by importing nations (Hobbs et al., 2023).

Thuong (2018) analysed Vietnam's rice exports and the impact of sanitary and phytosanitary regulations. During the investigation, the gravity model was applied. The utilisation of the gravity model for trade has become prevalent and has emerged as an empirical instrument for analysing international trade patterns (Weidner & Zylkin, 2021). The concept posits that the magnitude of commerce is positively correlated with the Gross Domestic Product (GDP) of the two nations, while being negatively correlated with the geographical distance separating them (Mo, 2022). The most significant point to keep in mind is that the researcher looked at the nations that imported rice from Vietnam between 2000 and 2015 and examined the effects of new sanitary and phytosanitary standards that were implemented in these nations on their trade relationships. Thus, during the research, it became clear that as the number of countries applying international sanitary and phytosanitary norms increased, rice export from Vietnam to the mentioned countries decreased (Thuong, 2018).

Başıyigit and Kart (2022) calculated the degree of concentration of Turkey's main metal exports through the Concentration Ratio and Herfindal Hirschman Index. A market characterised by high concentration would provide a potential risk for both exporters and importers. The exporters face a potential risk in terms of price volatility and revenue instability due to their reliance on a single country or a limited number of nations (Chen & Mao, 2020). During the research, it became clear that the export of other metals besides aluminium is highly concentrated. In the discussion section, they investigated whether there is a relationship between the export volume of the mentioned products and the level of concentration, and as a result, it was clear that there is a strong dependence between the level of concentration and the volume of exports of metals other than aluminium (Başıyigit & Kart, 2022).

In 2021, the export concentration of Japan and China by product was analysed by Erkan and Bozduman (2021). The researchers used the Herfindahl Hirschman Index and Trade Concentration Ratio in their scientific work and made calculations for a total of 66 product groups. The Herfindahl Hirschman Index and the level of concentration were the most frequently cited methods by researchers when examining the factors affecting trade (Rodríguez-Castelán et al., 2023). When calculating the degree of trade concentration, the main goal is to determine the number of products exported from it. The index has a value between 0 and 100. An index close to 0 indicates that the concentration of exports is very low and that the share of one sector in the country's exports is small, in other words, it reflects the diversification of exports. If the indicator is close to one, on the contrary, it reflects a high concentration of exports. It should be noted that one of the main successes achieved in China's trade field during the years 2000-2020 was the diversification of exports. The Herfindahl Hirschman Index and Trade Concentration Index prove this once again (Erkan & Bozduman, 2021).

As mentioned earlier, a number of scholars believe that SPS has no effect on trade. For Santeramo and Lamonaca (2022), in general, bilateral sanitary and phytosanitary (SPS) measures have a tendency to yield minimal impacts on imports, and it is possible that SPS measures may not have any discernible influence on trade when considering the global context.

According to Siswana and Phiri (2021), there is nonlinear correlation between diversity and the development of exports. In the study conducted by Haini et al. (2023), there exists a positive and statistically significant relationship between export diversification and export upgrading over an extended period of time. Nevertheless, this has little significance in the immediate timeframe. In addition, a number of scientists approach the relationship between the export development and export concentration depending on the development levels of countries. Some studies illustrated that there exists a positive relationship between export growth and export diversification in developing nations, whereas high-income nations experience a negative association between both variables (Jongwanich, 2020; Kaitila, 2019). But for Mora and Olabisi (2023), the key element of the relationship between

export volume and export diversification is transportation costs. So, for middle-income countries export diversification results in higher transportation cost and as a result export volume affected negatively. As a result of the study of palm oil exports in Indonesia during 2017-2021, it became clear that 87% of the factors affecting the diversification and export volume of palm oil exports in Indonesia are the country's total GDP, population, production, export prices (Nazhifah & Faridatussalam, 2023).

Research Methodology

General Background

As a result of the analysis of more than 30 articles and scientific studies on the diversification of exports by various products, it was found that scholars have referred to the Herfindahl Hirschman Index to study the level of diversification of exports. For this reason, the Herfindahl Hirschman Index was used in this scientific work. During the study process, the Herfindahl Hirschman Index was applied along with data collecting, analysis, and comparative analysis methodologies to analyse the level of export concentration.

According to the Organisation for Economic Co-operation and Development (OECD) Hirschman-Herfindahl (HH) concentration used as a tool for measuring trade performance of country (OECD & World Trade Organization, 2019). The HHI and trade concentration Ratio, which measures the degree of concentration in the nation's exports, is the most often used indicator of the concentration of exported commodities (Erkan & Bozduman, 2021). The total squared product shares in a nation's exports (imports) are used to produce the HH export (import) product concentration index, which is then normalized to fall between one and zero. Analogously, HH market concentration indicators are computed. A varied, or equally dispersed, product portfolio is indicated by HH import and export product concentration indices with scores near to zero, whereas scores close to one imply significant concentrated on a few items. Similar to the HH instance, scores near to zero on the export and import market concentration indicators show that trade is distributed, or equally dispersed, across economies, while scores close to concentration on a few countries show tight concentration on certain regions (OECD & World Trade Organization, 2019).

Thus, as a result of the literature review on the subject, it become clear that a number of researchers referred to the Herfindahl Hirschman Index in their scientific works when examining the effect of the policy applied by the country on the purification of exports (Başyigit & Kart, 2022). In this scientific research work, the export diversification of vegetable oil export in the Republic of Azerbaijan was analysed. When calculating the export diversification of vegetable oils, the Herfindahl Hirschman Index interval referred to by D. Şanlı, Bashigit and Kant in their research works was chosen.

Table 1

Herfindahl Hirschman Concentration Index Intervals

HHI	Concentration Level
HHI < 100	Highly Diversified Market
100 ≤ HHI < 1500	Diversified Market
1500 ≤ HHI < 2500	Moderately Diversified Market
2500 ≤ HHI < 10000	Highly Concentrated Market
HHI = 10000	Monopoly / Monopsony

Source: Erkan and Bozduman (2021).

In addition to the above-mentioned methods, a linear regression model was built in order to study the relationship between the volume of exports and the degree of concentration of exports. A simple linear regression model is formulated below:

$$Y = \beta_0 + \beta_1 x + \varepsilon \quad (1)$$

In here Y express dependent variable (in our research Y reflects Herfindahl Hirschman Index), β_0 is intercept, β_1 regression coefficient, x is independent variables (in this research x reflects export values).

Instrument and Procedures

During the research, data on the export of vegetable oils were collected from the State Statistics of the Republic of Azerbaijan. The total share of countries in vegetable oils exported from the Republic of Azerbaijan was calculated based on the export amount of vegetable oils for the main importing countries. Then, the concentration level of export of vegetable oils for 2019 and 2022 was calculated based on the Herfindal Hirschman Index. To calculate the relationship between Herfindal Hirschman Index and the amount of vegetable oils export from Azerbaijan linear regression model was used and a significance level of the model calculated based on the t-test.

Data Analysis

During the research, all the necessary information was obtained from the official website of the State Statistics Committee of the Republic of Azerbaijan and the Unified Electronic Database of Legal Acts of the Ministry of Justice of the Republic of Azerbaijan.

Research Results

By 2023, a total of 15 draft technical normative acts in the Republic of Azerbaijan have been successfully aligned with the international standards set by the Codex Alimentarius Commission. This achievement is noteworthy considering that Azerbaijan has been a member of the Commission since 2011. Furthermore, it is important to highlight that the Republic of Azerbaijan's Security Agency has assumed the responsibility of being the national coordinating organization within the Codex Alimentarius Commission as of 2018 (AQTA, 2018). Regulations adopted in 2020 were reviewed in order to be able to monitor the change in export as a result of the technical normative act adapted to the accepted international standards in the research work. Thus, in 2020, "Minimum quality and safety requirements for vegetable oils" was adopted by the decision of the Board of the Food Safety Agency of the Republic of Azerbaijan. To make the research work more accurate, it should be mentioned that vegetable oils normally include babassu oil, almond oil, rice bran oil, hazelnut oil, sunflower oil, corn oil, palm oil, pistachio oil, rapeseed oil, soybean oil, etc. However, regulations on olive oils are not covered by the noted regulation. For this reason, the olive oil was not taken into account in the calculations to be carried out during scientific research.

According to the data of the State Statistics Committee of Azerbaijan, vegetable oils have a high share in the total export of products included in the food safety control of the Republic of Azerbaijan. Thus, in 2022, the export of vegetable oils totalled 13,987 thousand US dollars, which makes up 6.2% of the products included in the total food safety control. It should be noted that in the export of the Republic of Azerbaijan, sugar and sucrose with an export amount of 55,868 tons have a 43% share in the total export, while fruit and vegetable juices have an export amount of 19,390 tons and have a 15% share in the total export. Detailed information is given in Table 2.

Table 2

Statistics of Products Included in the Priority Food Safety Control Exported in the Republic of Azerbaijan in 2022, (ton)

No	Product	Export quantity	Export share
1	Sugar and sucrose	55868.11	43%
2	Fruit and vegetable juices	19390.28	15%
3	Vegetable oils	8075.08	6.2%

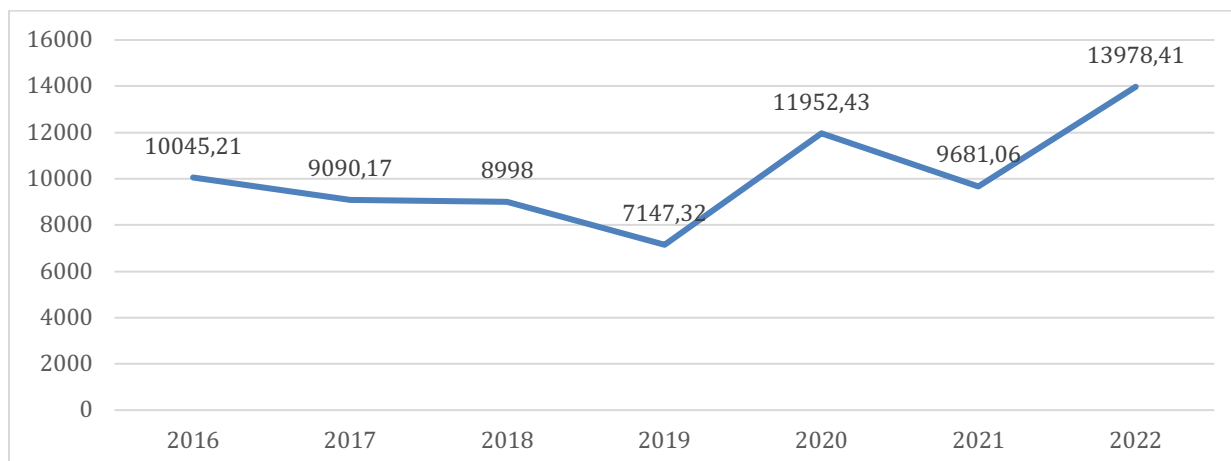
4	Chocolate and other prepared food products containing cocoa	7976.22	6%
5	Fruits and vegetables prepared or preserved by other methods	7164.66	6%
6	Bread, pastries, cakes, cookies and other bread rolls and pastries	5197.85	4%
7	Other vegetable fats and oils, their fractions	5113.28	4%
8	Jams, fruit jellies, marmalades, fruit or nut puree, fruit or nut paste	4081.47	3%
9	Vegetables prepared or preserved without vinegar or acetic acid	2750.97	2%
10	Pasta products	2408.07	2%

Sources: The table was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

In order to analyse the export of vegetable oils in detail, it is necessary to look at the export of the mentioned products from the Republic of Azerbaijan during 2016–2022. Thus, when looking at the export trend over the years, it is clear that a constant decrease in exports was observed from 2016 to 2019. As a result, from 2016 to 2020, a 28% increase was observed in the export of vegetable oils in the Republic of Azerbaijan. Since 2020, a 17% increase has been observed in the total export of vegetable oils compared to 2022.

Figure 1

Vegetable Oil Export of the Republic of Azerbaijan from 2016 to 2022, (thousands USD)



Sources: The figure was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

In order to investigate the degree of concentration of the export of vegetable oils in the Republic of Azerbaijan, the export of the mentioned product by year was studied by country. Taking into account that the regulations on vegetable oil products was adopted in 2020, the years 2019 and 2022 were compared in the research. The Republic of Azerbaijan exported vegetable oils to 12 nations in 2019, however in 2022, the export geography was enlarged to include 5 more nations (Pakistan, Syria, Qatar, the USA, and Sri Lanka). While talking about this positive progress, it should be noted that compared to 2019, a decrease was observed in the export of vegetable oils from the Republic of Azerbaijan to Switzerland, Germany and the Russian Federation. Details on the export of vegetable oils by nation are provided in Table 3. Iraq, Georgia, and Tajikistan were the top destinations for vegetable oil exports from the Republic of Azerbaijan between 2019 and 2022, as shown in the table. Vegetable oil

shipments to Iraq, Georgia, and Turkey increased significantly (by almost two times) in volume in 2022 compared to 2019, whereas exports to Tajikistan, Kyrgyzstan, and Switzerland decreased.

Table 3

Statistics on Vegetable Oils Exported from the Republic of Azerbaijan in 2019 and 2022, by Importing Countries (Thousands of US Dollars)

Countries	2019	2022	The export difference
Iraq	1558.21	5359.73	3801.52
Georgia	3090.53	5005.89	1915.36
Tajikistan	2292.89	1807.65	-485.24
Turkey	44.13	1470.87	1426.74
Turkmenistan	9.12	167.25	158.13
Kyrgyzstan	129.06	83.68	-45.38
Pakistan	0	27.25	27.25
Syria	0	26.81	26.81
Kazakhstan	9.66	18.93	9.27
United States of America	0	5.27	5.27
Qatar	0	2.15	2.15
Canada	2.31	1.92	-0.39
Belarus	1.04	1	-0.04
Sri Lanka	0	0.01	0.01
Switzerland	3.89	0	-3.89
Russian Federation	0.47	0	-0.47
Germany	6.01	0	-6.01
Grand Total	7147.32	13978.41	6831.09

Sources: The table was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

To evaluate the concentration level of the vegetable oil export of the Republic of the Azerbaijan there was a need to assess the share of the importer country in the whole Azerbaijan vegetable oil export. At the table 4 the share of the importer country in the whole Azerbaijan vegetable oil export was introduced and as shown from the table in 2019 the greater share consists of four countries: Iraq, Georgia, Tajikistan and Kyrgyzstan with approximately 22 per cent, 43 per cent, 32 per cent and 2 per cent. In general, the part of the other eight countries were less than 1.2 per cent. In 2022, The Republic of the Azerbaijan exported vegetable oil to five main countries: Iraq, Georgia, Tajikistan, Turkey and Turkmenistan. The share of the mentioned countries in the export of vegetable oils of the Republic of Azerbaijan in 2022 is 38, 36, 13 and 1 per cent, respectively. in that year, the total share of other countries in the total export of vegetable oil was 1.2 per cent.

Table 4

Statistics on the Share of Importing Countries in Vegetable Oils Exported from the Republic of Azerbaijan in 2019 and 2022 and Herfindahl Hirschman Index (Thousands of US Dollars)

Countries	2019	Share of export 2019	HHI 2019	2022	Share of export 2022	HHI 2022
Iraq	1558.21	21.8%	475.29749	5359.7	38.3%	1470.1792
Georgia	3090.53	43.2%	1869.73249	5005.9	35.8%	1282.4695
Tajikistan	2292.89	32.1%	1029.15310	1807.7	12.9%	167.2296

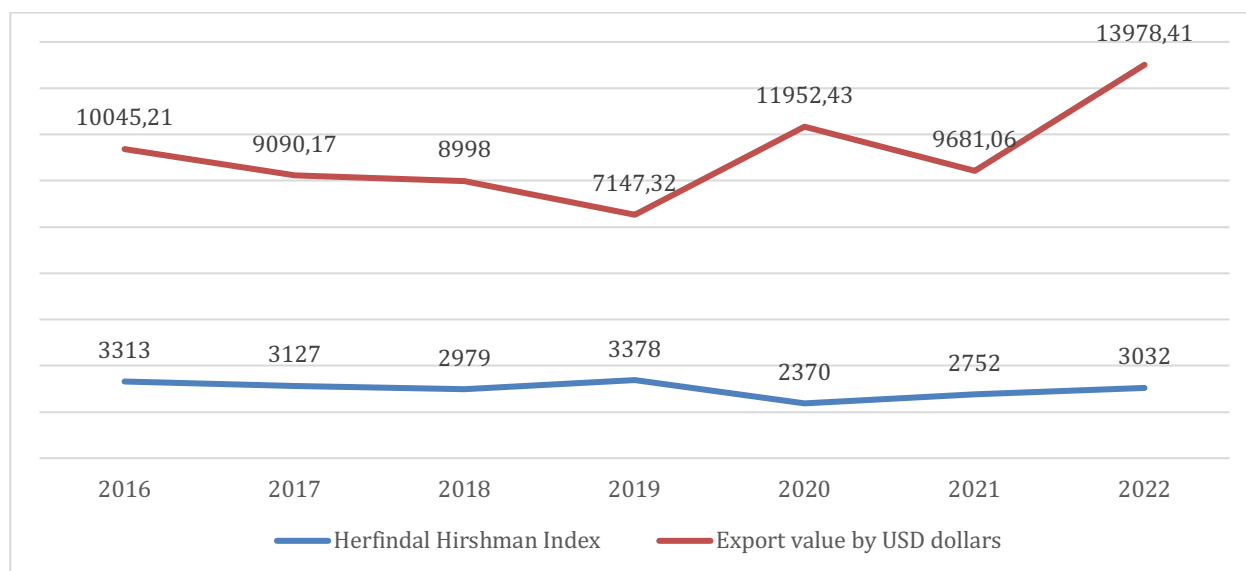
Turkey	44.13	0.6%	0.38123	1470.9	10.5%	110.7218
Turkmenistan	9.12	0.1%	0.01628	167.3	1.2%	1.4316
Kyrgyzstan	129.06	1.8%	3.26060	83.7	0.6%	0.3584
Pakistan	0	0.0%	0	27.3	0.2%	0.0380
Syria	0	0.0%	0	26.8	0.2%	0.0368
Kazakhstan	9.66	0.1%	0.01827	18.9	0.1%	0.0183
United States of America	0	0.0%	0	5.3	0.0%	0.0014
Qatar	0	0.0%	0	2.2	0.0%	0.0002
Canada	2.31	0.0%	0.00104	1.9	0.0%	0.0002
Belarus	1.04	0.0%	0.00021	1.0	0.0%	0.0001
Sri Lanka	0	0.0%	0	0.0	0.0%	0.0000
Grand Total	7147.32	100.0%	3377.861	13978.41	100%	3032.5

Sources: The table was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

As seen from the table 5 in 2019 the Herfindahl Hirschman Index was equal to 3377.8 and in 2022 was 3032. This index indicates that however the big amount of decrease observed vegetable oil export concentration level in the Republic of the Azerbaijan, yet it is considered as highly concentrated market. In order to analyse more details, the Herfindahl Hirschman Index trend in Azerbaijan vegetable oil market from 2016 to 2022 was monitored. In Figure 2 the Herfindahl Hirschman Index trend in Azerbaijan vegetable oil market from 2016 to 2022 was illustrated. As seen from the table from 2016 to 2022 the Herfindahl Hirschman Index for vegetable oil export of the Republic of the Azerbaijan approximately decreased 8 per cent.

Figure 2

Herfindahl Hirschman Index for Vegetable Oil Export of the Republic of the Azerbaijan from 2016 to 2022



Sources: The figure was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

From the graph, it is evident that the Herfindahl Hirschman Index for vegetable oil exports in the Republic of Azerbaijan declined from 3313 to 2979 between 2016 and 2018. However, in 2019, the index experienced a significant surge, reaching a value of 3378. Subsequently, between 2020 and 2022, a gradual growth pattern was observed.

In the research result section, we have analysed vegetable oil export data from 2016 to 2022. Results indicate that, in comparison with 2019, in the 2022 the export value of the vegetable oil increased about two time. Taking into account of the number of the importer countries, there is also increasing in this indicator. From 2019 to 2022 the list of the countries which vegetable oil import from Azerbaijan 5 more countries were added. In addition, the concentration level of the vegetable oil export decreased about 8 per cent from 2019 to 2022.

The main point of attention during the analysis is the dependence between Herfindahl Hirschman Index and export volume. A linear regression model was built to investigate the relationship between indicators. In addition, to check the significance and reliability of the established regression model, the t statistic coefficient was used (Table 5).

Table 5

Regression Between Herfindahl Hirschman Index and Vegetable Oil Export Volume of the Republic of the Azerbaijan

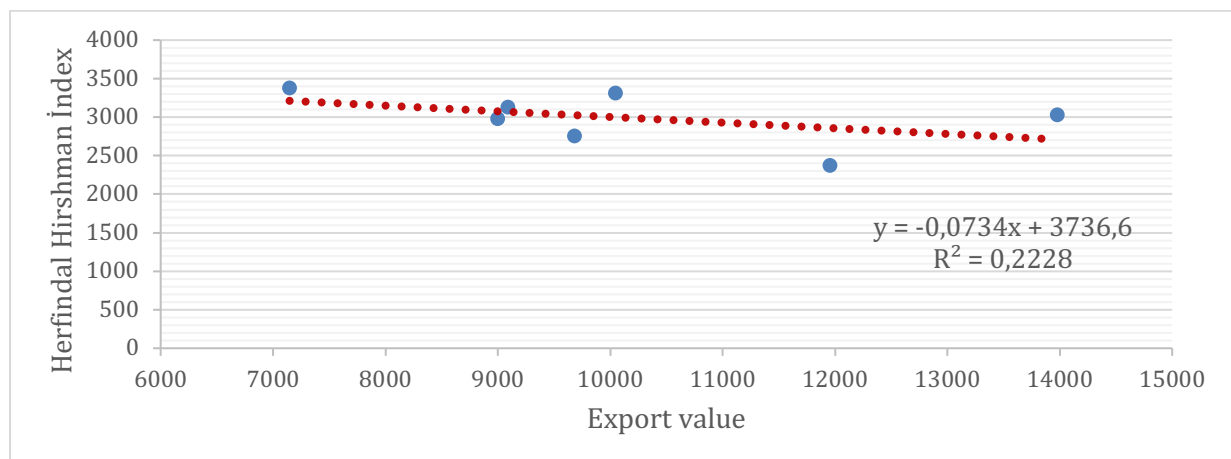
<i>Regression Statistics</i>	
	0.47198
Multiple R	1
	0.22276
R Square	6
Adjusted R	0.06731
Square	9
	333.622
Standard Error	4
Observations	7

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3736.597	633.7096	5.896387	0.001996
X Variable 1	-0.07341	0.061322	-1.19711	0.28492

Sources: The table was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

Figure 3

Regression between Herfindahl Hirschman Index and Vegetable Oil Export Volume of the Republic of the Azerbaijan



Sources: The figure was compiled by the writer based on information from State Statistics Committee of Azerbaijan.

From the Table 5 and Figure 3, it is clear that there is a negative relationship between Herfindahl Hirschman Index and export value (-0.073) but at the time p-value for this model equals to 0.001996 and it is bigger than 0.001. It means that the export value has not a big effect on Herfindahl Hirschman Index.

Discussion

According to a number of scientists, the adaptation of the current technical normative acts to international requirements leads to additional inspections during export, loss of time and money. However, as it is clear from the research, after the adaptation of the technical regulations related to vegetable oils in the Republic of Azerbaijan to the international requirements, on the contrary, a 17% increase in the export volume was observed. As a result of the analysis of research conducted in this field before, it is clear that although scientists mostly use economic models to assess the impact of technical normative acts on the economy, they have not carefully analysed the requirements contained in technical normative legal acts. In some developing countries, such as the Republic of Azerbaijan, the technical regulatory acts in force have excessively high requirements related to export and are not risk-based, on the contrary, they had a negative effect on export. However, as a result of the detailed analysis of normative documents, it is clear that the reforms carried out in the Republic of Azerbaijan and the adopted technical normative legal acts are aimed at increasing the volume of exports and supporting entrepreneurs.

Furthermore, the analysis of annual vegetable oil export trends highlights a notable decline in exports in 2021. This decline can be attributed to the global decrease in exports caused by both the ongoing war in the region and the impact of the COVID-19 pandemic.

In addition to the above-mentioned issues, as a result of researching the relationship between rice export in Vietnam, diversification of agricultural products export in Korea, Kenya, Israel and SPS adaptation, scientists have suggested that there is a serious dependence between these two indicators. In our research, it is clear that after the SPS adjustment, although there was an increase in the partial diversification of exports and the number of exported countries, it did not cause a significant change over the years. So, if we take into account that the technical normative act was adopted in 2019 and if we compare 2019 and 2022, it is clear that from 2019 to 2022 there was a total of 8 percent change in the general Herfindahl Hirschman index, which is a very small change. However, it should be noted that if it was possible to examine the mentioned indicators in the long term, the results could be different. If taking into account that the adaptation of the norms in force in food safety to international requirements has started in the Republic of Azerbaijan since 2019 and the norms have recently been adapted to international requirements, it is clear that the currently available data do not allow to study and analyse the issue in the long term. As a result of scientific studies conducted by a number of researchers, it was reported that there was a negative relationship between the export volume and export concentration in developing countries, but as a result of the given scientific research, it is evident that there is a positive relationship between the export volume of vegetable oils and the degree of concentration in the Republic of Azerbaijan, but this dependence is not significant.

Conclusions and Implications

The current sanitary and phytosanitary norms adaptation to international requirements is currently one of the main priority issues of many developing countries. This makes it necessary to assess the impact of the changes made to the mentioned sanitary and phytosanitary norms and regulations on the country's economy in general. When considering the reforms carried out in the Republic of Azerbaijan in the direction of stimulating exports and increasing access to European markets and the steps taken in the direction of adapting the current sanitary and phytosanitary norms to international requirements from 2019, in order to evaluate the effectiveness of the mentioned reforms, it is important evaluating their impact on the general economy, including the trade.

Considering that vegetable oils have a large share in the volume of products included in the food safety control exported from the Republic of Azerbaijan, the export of vegetable oils was taken as a research object in the evaluation of the impact of the country's food safety norms on the economy. The share of vegetable oils in the volume of the main processed food products exported in the Republic of Azerbaijan is 6.2 percent. In addition, the general trend of export of vegetable oils in the Republic of Azerbaijan during 2016-2022 was monitored. Taking into account that the technical regulation was carried out in 2020, the export amount of 2022 was compared with 2019 and it became clear that a 17% increase in the total export of vegetable oils was observed in 2022 compared to 2019. As mentioned earlier, in the study, the impact of the adaptation of technical regulations related to vegetable oils to international requirements in the Republic of Azerbaijan the general trend of export of vegetable oils in the Republic of Azerbaijan during 2016-2022 was monitored. Taking into account that the technical regulation was carried out in 2020, the export amount of 2022 was compared with 2019 and it became clear that a 17% increase in the total export of vegetable oils was observed in 2022 compared to 2019.

In addition, during the study, only the total export volume of vegetable oils was not investigated and attention was paid to the number of importing countries. Thus, it is clear that in 2019, the Republic of Azerbaijan offered vegetable oils to 12 different countries; however, in 2022, Pakistan, Syria, Qatar, the USA, and Sri Lanka were added to the list of countries that import them.

Assessing the proportion of the importer nation in the total export of vegetable oil from the Republic of Azerbaijan is necessary to determine the concentration level of such export. In Table 5, the importer country's percentage of the total vegetable oil exports from Azerbaijan is displayed. As can be seen, in 2019, four countries accounted for the majority of this percentage: Iraq, Georgia, Tajikistan, and Kyrgyzstan, with respective shares of around 22%, 43%, 32%, and 2%. The remaining eight countries made up less than 1.2% of the total. The Republic of Azerbaijan exported vegetable oil in 2022 to Iraq, Georgia, Tajikistan, Turkey, and Turkmenistan, which are the top five destinations. In 2022, those four countries will contribute 38, 36, 13 and 1%, respectively, to the Republic of Azerbaijan's export of vegetable oils. The overall percentage of foreign nations in the entire export of vegetable oil in that year was 1.2%.

The Herfindahl Hirschman Index was calculated in order to determine the level of concentration of vegetable oil export and make a comparative analysis. As a result, it became clear that in 2022, although the export of vegetable oils for the Republic of Azerbaijan was highly concentrated, the Herfindahl Hirschman Index over the years progressed in a positive direction and decreased by approximately 8%. When considering the model built on the basis of the linear regression equation, it became clear that although there was a negative relationship between the amount of export of vegetable oils in the Republic of Azerbaijan and the Herfindahl Hirschman Index, the investigated relationship is weakly dependent because the significance level is greater than 0.001.

Thus, taking into account all the research results mentioned above, it can be noted that there are positive effects of food safety regulations in the Republic of Azerbaijan, such as the increase of the total amount of exports in the export of vegetable oils, increasing the number of exported countries, and lowering the level of export concentration.

Suggestions for Future Research

One of the main attention-grabbing issues while conducting the research work is that although fundamental measures are being taken in the direction of adapting the current requirements in the field of food safety to international requirements in the Republic of Azerbaijan, the scientific research conducted in the country is more in the direction of ensuring food security. Thus, it is appropriate to apply various econometric models in order to evaluate the impact of changes in the field of food safety on the economy and the social situation of the country in general. Since it is not included in the scope

of the present scientific work, the index of diversification in the export of agricultural products has not been calculated. However, in the future, it is recommended to those conducting research in this field to assess the impact of the changes in the food sector on the economy based on the Trade Concentration index and the Gravity model.

In addition, when examining research studies concerning the adaptation of food safety standards to international requirements, it is known that scientists focus more on the volume of exports as a dependent variable. However, as a result of a detailed analysis of food safety standards, it is clear that the adaptation of products to international requirements has a considerable impact on their market prices. In fact, this idea is indirectly confirmed by a number of scientists in their research work. So, according to scientists, adapting the current standards to international requirements increases the production costs of their product. This means that if the cost of the product increases, it should lead to an increase in its price. Thus, when calculating the increase in the export volume of the product, both value and weight should be calculated.

Another approach could be that producing better quality products provides access to higher value markets for local producers. This will create an opportunity to earn a higher amount of income with a lower volume of product exports. Moving forward, we advise researchers to jointly investigate the impact of enhancing SPS standards on the product's price, export volume, and overall income derived from its export.

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Conflict of Interest

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References

- Akune, Y. (2023, July 23–25). *Impact of non-tariff measures on agri-food trade: Quantitative and qualitative regulatory differences* [Conference presentation abstract]. 2023 Agricultural & Applied Economics Association annual meeting, Washington DC. <https://ageconsearch.umn.edu/record/335934/files/26880.pdf>
- AQTA. (2018, September 15). “KODEKS ALİMENTARIUS” Komissiyasının nümayəndə heyəti Azərbaycanada rəsmi səfərdə oldu. <https://afsa.gov.az/az/xeberler/kodeks-alimentarius-komissiyasinin-numayende-heyeti-azerbaycanda-resmi-seferde-oldu114>
- Başığit, M., & Kart, E. U. (2022). Analysis of Turkey’s base metal ore exports by Herfindahl Hirschman Concentration Index. *Gazi Mühendislik Bilimleri Dergisi*, 8(2), 237–246. <https://doi.org/10.30855/gmbd.0705007>
- Beghin, J. C., & Schweizer, H. (2020). Agricultural trade costs. *Applied Economic Perspectives and Policy*, 43(2), 500–530. <https://doi.org/10.1002/aep.13124>
- Boza, S., Muñoz, J., & Cáceres, J. (2023). Does harmonization reduce the impact of SPS measures on agricultural exports? An assessment from the Chilean fruit sector. *Revista De La Facultad De Ciencias Agrarias*, 55(1), 75–85. <https://doi.org/10.48162/rev.39.097>
- Cadot, O., & Gourdon, J. (2014). Assessing the price-raising effect of non-tariff measures in Africa. *Journal of African Economies*, 23(4), 425–463. <https://doi.org/10.1093/jae/eju007>

- Chen, K. Z., & Mao, R. (2020). Fire lines as fault lines: increased trade barriers during the COVID-19 pandemic further shatter the global food system. *Food Security*, 12(4), 735–738. <https://doi.org/10.1007/s12571-020-01075-2>
- Committee on Sanitary and Phytosanitary Measures. (2021). *Annual overview – Implementation of SPS transparency provisions and specific trade concerns*. World Trade Organization. <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/G/SPS/GEN804R13.pdf&Open=True>
- DaSilva-Glasgow, D. (2019). Transactions costs perspective of non-tariff barriers to trade: An analysis of food and agricultural exports from Guyana using survey data. *The International Trade Journal*, 34(3), 339–364. <https://doi.org/10.1080/08853908.2019.1664354>
- Erkan, B., & Bozduman, T. (2021). Analysis of export concentrations of China and Japan on product basis. *ASSAM Uluslararası Hakemli Dergi*, 8(19), 140–146. <https://dergipark.org.tr/en/pub/assam/issue/65159/996779>
- Gebrehiwet, Y., Ngqangweni, S., & Kirsten, J. F. (2007). Quantifying the trade effect of sanitary and phytosanitary regulations of OECD countries on South African food exports. *Agrekon*, 46(1), 1–17. <https://doi.org/10.1080/03031853.2007.9523759>
- Geetha, R., Ravisankar, T., Patil, P. K., Avunje, S., Vinoth, S., Sairam, C. V., & Vijayan, K. (2020). Trends, causes, and indices of import rejections in international shrimp trade with special reference to India: A 15-year longitudinal analysis. *Aquaculture International*, 28(3), 1341–1369. <https://doi.org/10.1007/s10499-020-00529-w>
- Grübler, J., & Reiter, O. (2021). Characterising non-tariff trade policy. *Economic Analysis and Policy*, 71, 138–163. <https://doi.org/10.1016/j.eap.2021.04.007>
- Haini, H., Loon, P. W., & Pang, L. L. (2023). Can export diversification promote export upgrading? Evidence from an oil-dependent economy. *Resources Policy*, 80, Article 103292. <https://doi.org/10.1016/j.resourpol.2022.103292>
- Hobbs, J. E., Khorana, S., & Yeung, M. T. (2023). Moving beyond least developed country status: Challenges to diversifying Bangladesh's seafood exports. *Aquaculture Economics & Management*, 27(3), 498–522. <https://doi.org/10.1080/13657305.2022.2162624>
- Hong, Y., Zhang, X., Hu, A., & Ma, P. (2020). Econometric analysis of the Israeli trade protectionism and the export comparative advantage of the primary agricultural products. *Basic & Clinical Pharmacology & Toxicology*, 126, 305–306.
- Hunga, H., Chiwaula, L., & Katundu, M. (2023). Organizational readiness for policy implementation: An assessment of the harmonized seed regulations in Malawi. *Environmental Development*, 45, Article 100828. <https://doi.org/10.1016/j.envdev.2023.100828>
- Hussain, S. S., Sela, S., & Machrouh, J. (2023). A review of non-tariff measures faced by Moroccan firms. In P. Sauve & U. Dadush (Eds.), *Trade policy in morocco: Taking stock and looking ahead* (pp. 259–306). Policy Center for the New South and World Bank Group.
- Jongwanich, J. (2020). Export diversification, margins and economic growth at industrial level: Evidence from Thailand. *The World Economy*, 43(10), 2674–2722. <https://doi.org/10.1111/twec.12921>
- Kaitila, V. (2019). Export product range and economic growth in the EU countries. *The World Economy*, 42(3), 711–737. <https://doi.org/10.1111/twec.12715>

- Lee, Y. S. (2021). Regulatory Autonomy under the WTO Agreement on Sanitary and Phytosanitary Measures: Implications of Korea–Import Bans, and Testing and Certification Requirements for Radionuclides. *World Trade Review*, 20(3), 321–342. <https://doi.org/10.1017/S147474562100001X>
- Mo, J. (2022). The impacts of sanitary and phytosanitary (SPS) measures on China’s tea trade: Empirical analysis based on gravity model. *Scientific Journal of Economics and Management Research Volume*, 4(6), 870–879. <http://www.sjemr.org/download/SJEMR-4-6-870-879.pdf>
- Mora, J., & Olabisi, M. (2023). Economic development and export diversification: The role of trade costs. *International Economics*, 173, 102–118. <https://doi.org/10.1016/j.inteco.2022.11.002>
- Nazhifah, S. A., & Faridatussalam, S. R. (2023). Diversification of Indonesian palm oil exports for the 2017–2021 period. *American Journal of Sciences and Engineering Research*, 6(1), 182–189. <https://www.iarjournals.com/upload/61182189.pdf>
- Nogales, A., Mora-Cantalops, M., Morón, R. D., & García-Tejedor, Á. J. (2023). Network analysis for food safety: Quantitative and structural study of data gathered through the RASFF system in the European Union. *Food Control*, 145, Article 109422. <https://doi.org/10.1016/j.foodcont.2022.109422>
- OECD, & World Trade Organization. (2019). *Aid for trade at a glance 2019: Economic diversification and empowerment*. Paris: OECD Publishing. <https://doi.org/10.1787/18ea27d8-en>
- Orden, D., Cororaton, C., & Rouchdi, K. (2021). Technical regulation and agri-food trade. In J. Roosen & J. E. Hobbs (Eds.), *A modern guide to food economics* (pp. 62-87). Edward Elgar Publishing.
- Rodríguez-Castelán, C., López-Calva, L. F., & Barriga-Cabanillas, O. (2023). Market concentration, trade exposure, and firm productivity in developing countries: Evidence from Mexico. *World Development*, 165, Article 106199. <https://doi.org/10.1016/j.worlddev.2023.106199>
- Sanjuán, A. I., Philippidis, G. P., Pérez, H. F., & De Rentería, P. G. (2023). Empirical insights on the dynamics of SPS trade costs: The role of regulatory convergence and experience in EU dairy trade. *Food Policy*, 119, Article 102524. <https://doi.org/10.1016/j.foodpol.2023.102524>
- Santeramo, F. G., & Lamonaca, E. (2022). On the trade effects of bilateral SPS measures in developed and developing countries. *The World Economy*, 45(10), 3109–3145. <https://doi.org/10.1111/twec.13256>
- Siswana, S., & Phiri, A. (2021). Is export diversification or export specialization responsible for economic growth in BRICS countries?. *The International Trade Journal*, 35(3), 243–261. <https://doi.org/10.1080/08853908.2020.1842823>
- Thuong, N. T. T. (2018b). The effect of Sanitary and Phytosanitary measures on Vietnam’s rice exports. *Economía*, 19(2), 251–265. <https://doi.org/10.1016/j.econ.2017.12.001>
- Tiu, C. (2021). Pesticide residues in food: A never-ending challenge. In P. Scott, R. Strange, L. Korsten, & M. L. Gullino (Eds.), *Plant diseases and food security in the 21st century. Plant pathology in the 21st century, Volume 10* (pp. 251–258). Cham: Springer. https://doi.org/10.1007/978-3-030-57899-2_12
- Weidner, M., & Zylkin, T. (2021). Bias and consistency in three-way gravity models. *Journal of International Economics*, 132, Article 103513. <https://doi.org/10.1016/j.jinteco.2021.103513>
- Wilson, J. S., & Otsuki, T. (2003). *Balancing risk reduction and benefits from trade in setting standards*. International Food Policy Research Institute. <https://ideas.repec.org/p/fpr/2020br/1006.html>

Yadav, D., Dutta, G., & Kumar, S. (2021). Food safety standards adoption and its impact on firms' export performance: A systematic literature review. *Journal of Cleaner Production*, 329, Article 129708. <https://doi.org/10.1016/j.jclepro.2021.129708>

Yadav, D., Dutta, G., & Saha, K. (2023). Assessing and ranking international markets based on stringency of food safety measures: Application of fuzzy AHP-TOPSIS method. *British Food Journal*, 125(1), 262–285. <https://doi.org/10.1108/BFJ-09-2021-1054>