PUBLISHED BY
VOPROSY
EKONOMIKI
N. P.

Russian Journal of Economics 9 (2023) 271–283
DOI 10.32609/j.ruje.9.103780
Publication date: 3 October 2023

Russian
Journal of
Economics

www.rujec.org

Impact of EU sanctions on EU19 food imports from Russia

Agus Dwi Nugroho[a,b,*], Imade Yoga Prasada[c], Zoltan Lakner[a]

[a] *Hungarian University of Agriculture and Life Sciences, Godollo, Hungary*
[b] *Universitas Gadjah Mada, Yogyakarta, Indonesia*
[c] *Universitas Putra Bangsa, Kebumen, Indonesia*

Abstract

The EU has agreed to sanction Russia by prohibiting bilateral trade, including food imports. This study aims to determine the impact of EU sanctions on EU19 food imports from Russia. The two-stage least squares (TSLS) and propensity score matching (PSM) were used to analyze EU19 food import data from January 1999 to October 2022. According to the findings of this study, the sanctions have no impact on EU19 food imports from Russia. The sanctions were only recently imposed so they have not had a significant impact on bilateral trade between the EU and Russia. On the other hand, EU19 is trying to be realistic about the implementation of sanctions due to their reliance on Russian food. Our findings provide a new perspective for the development of a non-tariff-barrier theory in which sanctions or other trade barriers are ineffective in countries that rely heavily on other countries.

Keywords: sanction, EU, Russia, trade barriers
JEL classification: F49, F51.

1. Introduction

Many countries reacted to the Russia–Ukraine conflict because of its devastation. Some countries only condemn Russia, while others prioritize diplomacy. Developed countries are taking more extreme steps, such as sending weapons to Ukraine and imposing sanctions on Russia (Chernobrov and Briant, 2022). However, the most interesting aspect is the economic sanctions imposed by the European Union (EU) on Russia, considering that both of them are geographically close and mutually dependent. Russia accounted for about 2% of total goods exports and 3% of imports in 2019, ranking it as the EU's 6th and 5th most important trading partner, respectively (Astrov et al., 2022).

* Corresponding author, E-mail address: agus.dwi.n@mail.ugm.ac.id

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In general, economic sanctions take the form of a ban on participating in international trade, technological barriers, and the blocking of foreign financing that has had a significant impact on a country's macroeconomic situation. The sanctions will have a significant impact on the Russian and EU economy and financial sector. Russia could potentially suffer annual losses of at least $996 million, set against a loss for EU consumers of $150 million. The rest of Europe is also experiencing the consequences of these sanctions, namely high inflation, which will weigh on real incomes and slow economic growth. Russia's response to trade sanctions on 72 sectors cost the EU more than $560 million (Latipov et al., 2022). Another study has found that Western financial sanctions had a $280 billion negative impact on Russian gross capital inflows from 2014 to 2017 and reduced GDP by 2.4% when compared to the period without sanctions (Gurvich and Prilepskiy, 2015).

We will focus on agriculture in this study because the EU is heavily reliant on Russian food imports, especially wheat (Nasir et al., 2022). Moreover, agriculture is an important issue in the EU for several reasons. First, while trade restrictions in other sectors have largely been eliminated in the EU, they remain significant in agricultural and food products. Second, agriculture is subject to a complex set of instruments under the Common Agricultural Policy (CAP), including veterinary, phytosanitary, and commercial policies, resulting in specific and politically sensitive accession issues. Third, agriculture employs a significant number of people (Swinnen, 2002).

EU sanctions apply to food bilateral trade between the EU and Russia, but third-country individuals and companies could import agricultural products from Russia if they are not on the EU sanctions list and do so entirely outside the EU. EU member states may grant Russian-flagged vessels access to EU ports to import or transport agricultural products such as fertilizers and grain. It is also possible for EU companies to receive public financing or financial aid for trade in the Russian agricultural sector (European Union, 2022). We want to examine the impact of EU sanctions on EU19 food imports from Russia. This is a novelty since no study has yet been conducted to examine the impact of EU sanctions on the performance of Russian agricultural trade. The EU19 region was chosen as the study sample because it has been formed for a long time and has stronger ties to fulfill the commitment to introduce trade restrictions. This differs from the EU27, where some members oppose imposing sanctions on Russia thus possibly giving biased results.

2. Material and methods

2.1. Data source

This study employed monthly time series data. The secondary data was collected from January 1999–October 2022 (286 data observations). Table 1 shows the variables used in this study were the index of EU19 total food imports from Russia (as dependent variable), inflation, real exchange rate, consumer confidence index, money supply, unemployment rate, the index of EU19 total food imports from the U.S., the index of EU19 total food imports from China, crude oil prices, dummy recession, and dummy EU sanction (as explanatory variables).

Table 1
Data variables.

Variable	Symbol	Source	Ex. sign
The index of EU19 total food, beverages, drinks, tobacco, live animals, and animal and vegetable oils, fats and waxes imports from Russia (million euro adjusted to U.S. dollars)	RUS	Eurostat	
Food inflation	INF	IMF	+
Real exchange rate	RER	Eurostat	+
Money supply	MON	Federal Reserve Bank of St. Louis	+
Consumer confidence index	CCI	Federal Reserve Bank of St. Louis	–
Unemployment rate (%)	UNE	Federal Reserve Bank of St. Louis	–
The index of EU19 total food, beverages, drinks, tobacco, live animals, and animal and vegetable oils, fats and waxes imports from the U.S. (million euro adjusted to U.S. dollars)	US	Eurostat	–
The index of EU19 total food, beverages, drinks, tobacco, live animals, and animal and vegetable oils, fats and waxes imports from China (million euro adjusted to U.S. dollars)	CHI	Eurostat	–
Crude oil prices: Brent — Europe (U.S. dollars per barrel)	OIL	IndexMundi	–
Dummy recession (1 = a recessionary period, 0 = an expansionary period)	REC	Federal Reserve Bank of St. Louis	–
Dummy EU sanction (1 = after sanction, March 2022–October 2022; 0 = before sanction, March 2022)	SAN	Index	–

Source: Compiled by the authors.

2.2. Determinant factors of the EU19 food imports

The empirical analysis begins with a unit root test or the stationarity test before the estimation. The stationarity test was performed to eliminate spurious regression caused by using nonstationary time-series data throughout the period. One type of test is used to evaluate the stationarity of the variables, including Augmented Dickey–Fuller (ADF) (Wooldridge, 2020).

The two-stage least squares (TSLS) was used to analyze all variables to address an endogeneity issue, especially the INF_t variable. Endogeneity occurs since INF_t is supposed to influence EU19 food imports while other variables also influence INF_t at the same time (Prasada et al., 2022). The TSLS model is solved in two steps: addresses the INF_t's endogeneity problem and determines the factors influencing EU19 food imports from Russia (Greene, 2003). The following equations are used in each step:

First step:

The function estimates the statistical relationship between INF_t and its determinant factors:

$$INF_t = \beta_0 + \beta_1 RER_t + \beta_2 MON_t + \beta_3 CCI_t + \beta_4 UNE_t + \mu. \quad (1)$$

Second step:

The function estimates the statistical relationship between EU19 total food, beverages, drinks, tobacco, live animals, and animal and vegetable oils, fats and waxes imports from Russia and its determinant factors:

$$RUS_t = \gamma_0 + \gamma_1 INF_t + \gamma_2 US_t + \gamma_3 CHI_t + \gamma_4 OIL_t + \gamma_5 REC_t + \gamma_6 SAN_t + \sigma. \quad (2)$$

The TSLS model must pass several post-estimation tests to be valid. Post-estimation tests for the TSLS model include: (1) the model must have an endogeneity problem (Li et al., 2021); (2) the model's instrument variables are strongly correlated with endogenous regressors (Choi et al., 2018), and 3) the TSLS model must meet the identification restriction test criteria (Mariano, 2007).

2.3. Impact evaluation of the recession and EU sanction on the EU19 food imports from Russia

The results of a dummy variable analysis from the TSLS model can only be used to determine whether there are differences in EU19 food imports from Russia following the recession and the implementation of EU sanctions. As a result, the Propensity Score Matching (PSM) method must be used after the TSLS analysis (Kuss et al., 2016).

$$ATT = E(R_1 | I = 1) - E(R_0 | I = 0), \quad (3)$$

$$ATT = E\{R_1 | I = 1, p(Z)\} - E\{R_0 | I = 0, p(Z)\}, \quad (4)$$

where *ATT* (average treatment effect of the treated group) represents the impact of implementing the policy; I is the indicators of the recession and the implementation of the EU sanction policy ($I = 0$ control group, $I = 1$ treatment group: the recession and the EU sanction treatment); R_0 and R_1 show the outcome value of control data and from treatment data; $p(Z)$ is the propensity score. $p(Z)$ is obtained from the probit estimation of the recession and the EU sanction.

Before the PSM analysis results can be properly interpreted, several post-estimation stages must be completed. If the PSM meets two basic assumptions, it is valid: conditional independence and overlapping assumptions (Sseguya et al., 2021). Furthermore, the PSM model is prone to bias due to factors not observed in the model (Mavromaras et al., 2009). Therefore, the PSM output must be re-analyzed with a sensitivity test. The Mantel–Haenszel bounds sensitivity test method was used in this study, which has advantages for data analysis that focuses on binary-outcome variables (Becker and Caliendo, 2007).

3. Non-tariff barrier theory

Non-tariff barrier (NTB) may be any policy measures other than tariffs that have an impact on trade flows. The first type of NTB is those imposed on imports, which include quotas, prohibitions, licensing, customs procedures, and administrative fees. The second type of NTB is those that are imposed on exports. Taxes, subsidies, quotas, prohibitions, and voluntary restraints are examples. The third

type of NTB is those imposed within the domestic economy. Domestic legislation covering health/technical/product/labor/environmental standards, internal taxes or charges, and domestic subsidies are examples of such behind-the-border measures. Quotas limit the products and services that can be imported into a country. Embargoes are formal prohibitions imposed by one or more countries on the trade of specific goods and services to another country. Sanctions may include increased administrative actions — or additional customs and trade procedures — that slow or limit a country's ability to trade. NTBs to trade can be more restrictive than tariffs. Any international trade barrier, including NTBs, has an impact on the global economy because it limits the functions of the free market (Staiger, 2012).

Currently, more than half of global trade is subject to NTB, posing a significant threat to the global trading system. NTB do not result in an immediate increase in the price of goods, so the consumer does not perceive them as an additional tax (Osypenko and Korolenko, 2018). The main goal of NTB is protecting domestic employment, consumers, infant industries, national security and retaliation (Deardorff and Stern, 2011).

Various attempts have been made to estimate the impact of NTB on imports using various methodologies and data, including frequency/coverage measures, price comparison measures, quantity impact measures, and residuals of gravity-type equations (Staiger, 2012). The main difficulty in considering NTB is that they are determined from the reverse (Deardorff and Stern, 2011). Kee et al. (2016) measured the impact of NTB using a tariff approach. This method uses tariff data or collects customs duties, with the assumption that all other instruments are positively correlated with tariffs. We employ this approach to assess the impact of NTB in the form of sanctions from a tariff standpoint.

4. Estimation results and discussion

4.1. Determinant factors of the inflation (INF)

First of all, we performed the ADF unit root test to determine the stationarity of the data. Unit root test shows that only RUS_t is stationary at level. At the same time, INF_t, RER_t, MON_t, CCI_t, UNE_t, US_t, CHI_t, and OIL_t are stationary at the first-difference level (Table 2).

Table 2
ADF stationarity test.

Variable	Stage	ADF statistic	Prob.	Information
RUS_t	Level	–3.75	0.00	Stationary
INF_t	1st difference	–13.37	0.00	Stationary
RER_t	1st difference	–13.90	0.00	Stationary
MON_t	1st difference	–11.97	0.00	Stationary
CCI_t	1st difference	–5.10	0.00	Stationary
UNE_t	1st difference	–9.01	0.00	Stationary
US_t	1st difference	–4.74	0.00	Stationary
CHI_t	1st difference	–3.28	0.00	Stationary
OIL_t	1st difference	–11.95	0.00	Stationary

Source: Authors' calculations.

Table 3
Determinants of EU food imports from Russia.

Variable	Coefficient	Std. error	*t*-statistic	Prob.
Dependent variable: INF				
RER	0.064^{ns}	0.039	0.160	0.871
MON	–4.18e–14^{ns}	1.22e–12	–0.030	0.973
CCI	–1.318***	0.242	–5.450	0.000
UNE	–1.354**	0.596	–2.270	0.024
Cons.	2.852***	0.231	12.320	0.000
Adj. R^2				0.647
F-statistic				65.630
F-prob.				0.000
Dependent variable: RUS				
INF	5.738**	2.374	2.420	0.016
US	0.513***	0.094	5.440	0.000
CHI	0.537***	0.068	7.950	0.000
OIL	0.180^{ns}	0.132	1.370	0.171
REC	3.898*	2.172	1.800	0.073
SAN	–24.878^{ns}	18.685	–1.330	0.183
Cons.	–21.227**	7.245	–2.930	0.003
Adj. R^2				0.626
F-statistic				511.470
F-prob.				0.000
Overidentification test				15.837***
Weak instruments test				12.927***
Endogeneity test				4.852***

Note: Number of observed data = 286; *** significant at 1% alpha; ** significant at 5% alpha; * significant at 10% alpha.
Source: Authors' calculations.

The TSLS model was used to analyze all variables after the data became stationary. Several post-estimation tests were performed on the TSLS model to determine whether it is suitable for determining the factors influencing EU19 food imports from Russia (Table 3). The model shows that the endogeneity test produces a Hausman of 4.85200 at the significance level, indicating that the equation has an endogeneity problem. The overidentification test and the weak instrument test show a significant value at the 5% alpha level, meaning that the structural model is included in the overidentified category (the Sargan statistic is 15.83650) and each equation has a strong instrument variable (Stock and Yogo statistic value of 12.92740).

According to our studies, the following explanatory variables influence the INF in the EU19: consumer confidence index (CCI) and unemployment rate (UNE). Increases in both explanatory variables reduce the INF in EU19. Consumer confidence reflects how consumers assess their financial ability, purchasing habits, and overall economic condition (Shayaa et al., 2018). According to Ekren et al. (2017), CCI can reduce inflation in Europe. The same thing happened in China, where inflation gradually fell after the CCI surpassed 100 (Wang and Li, 2012). Optimism about market conditions leads to increased expenditures on goods production by producers and firms (Sinamo and Hanggraeni, 2022). Investors will be eager to fund various businesses and FDI inflows will rise under this condition (Verma and Bansal, 2021). These various activities encourage increased domestic production, lowered product prices, and reduced inflation.

An increase in unemployment leads to a decrease in inflation in the EU. The findings of this analysis are consistent with the Phillips curve model, which states that unemployment and inflation have a negative relationship (Liargovas and Psychalis, 2022). Our findings are even more extreme, with inflation falling by 1.354% as the unemployment rate rises by 1%. However, conditions in the EU can change quickly because the relationship between these two variables tends to be reversed (Liargovas and Psychalis, 2022). Phelps and Friedman stated that an unemployment rate above the natural limit will cause an increase in inflation (Popescu and Diaconu, 2022).

The RER of a country is a key indicator for assessing its trade capabilities and current import/export situation. EU countries keep the RER stable to maintain the current account balance, accelerate economic competitiveness, and encourage exports (Nikas et al., 2019). Hence, the euro has low volatility and the amounts are well regulated, so the RER and MON have no impact on INF. The EU's monetary policy also promotes a stable relationship between money and prices as a precondition for the optimum monetary aggregates condition (Jung and Carcel Villanova, 2020).

4.2. Determinant factors of the EU19 food imports from Russia

According to our findings, an increase in INF, US, CHI, and REC will lead to an increase in EU19 food imports from Russia, whereas OIL and SAN have no impact on EU19 food imports from Russia. As consumer prices or inflation rise, domestic products become more expensive than imported products. Hence, imported products will more easily enter a country and be liked by consumers. According to a study by Černý et al. (2021), import demand is indeed highly and positively correlated with inflation in the EU. Inflation in the EU has been low and stable thus far, causing import volumes to fall. This situation changed when inflation began to rise, causing imports to increase dramatically (Ben Cheikh and Rault, 2017).

During the study period, EU19 food imports from Russia increased (Fig. 1). Russia is the world's leading producer of several food commodities, the fourth-largest producer of wheat, the eighth-largest producer of soybeans, and the tenth-largest producer of maize (Nasir et al., 2022). Russian agriculture has shown stable growth since 1999 after a significant decline in the early 1990s and the long process of transformation. The food trade balance is steadily improving and the share of imported food in retail markets is decreasing due to the government's import substitution policies (Uzun et al., 2019). Several conditions and domestic policies contributed to this result. Russia can increase cropland area and production efficiency; distribute direct subsidies for fertilizers, fuel, lubricants, and soil nutrients; subsidize interest rates on agricultural loans and insurances; develop supply chain infrastructure and market access; and improve the knowledge and skills of farmers (Tleubayev et al., 2022).

Despite its strong performance, Russian food exports to the EU19 remain lower than those of China and the U.S. The US and China can dominate the global food trade, including exporting to the EU. In addition, both countries produce more food than Russia. China is the second-largest wheat producer globally, the fourth-largest soybean producer, and the second-largest maize

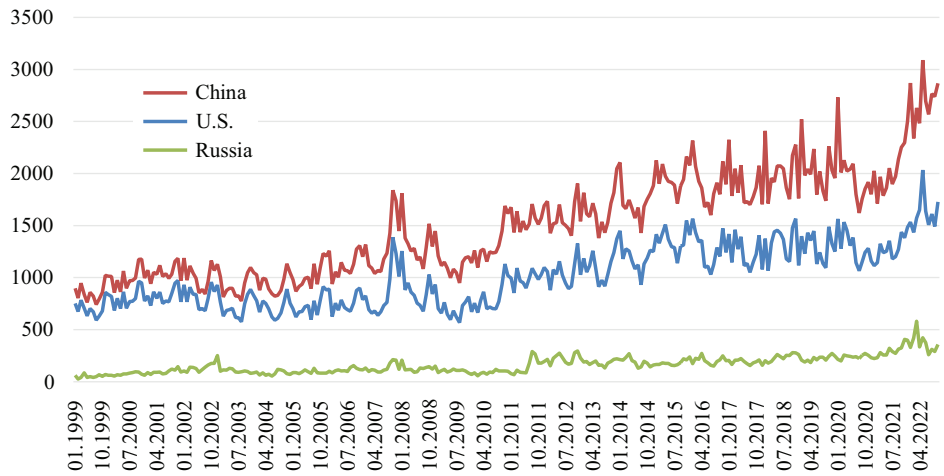

Fig. 1. EU19 food imports from Russia, China, and the U.S., January 1999–October 2022 (million euro).

Source: Authors' calculations.

producer. Similarly, the U.S. is the world's fifth-largest wheat producer, the world's second-largest soybean producer, and the world's largest maize producer. China and the U.S. have a comparative advantage in global food trade, both due to low product prices, reliance on intellectual property rights, and product brands (Nasir et al., 2022). However, Russia is closer in distance to the EU so transportation costs are lower than the U.S. and China. Hence, the U.S., China, and Russia have their advantages, and their food exports to Europe are all increasing.

Trade relations between the EU19 and China or the U.S. have flourished in recent decades. China and the U.S. are engaged in a „silent war" for global economic hegemony. Both countries are also involved in direct conflict over the food trade. As a result, China and the U.S. are looking for new markets for their food products and the most potential target is the EU. This is reflected in the EU and US commitments to bilateral trade agreements such as the Transatlantic Trade and Investment Partnership (TTIP). This agreement gives American companies greater access to European markets and equalizes perceptions of quality and food safety standards between the U.S. and EU (Pietrzyck et al., 2021). The Chinese and the U.S. governments also provide subsidies to farmers to increase agricultural competitiveness. The competition between both countries has allowed Russia to enter the European market.

The economic recession, which we use as dummy variables in this study, has a significant effect on EU19 food imports from Russia. The economic recession did not harm EU food imports from Russia. Food businesses in Russia have successfully chosen strategic development paths such as focusing on the needs of the most promising client groups, expanding service offerings, and expanding geographically (Dybskaya and Vinogradov, 2018). Meanwhile, the per capita income of EU countries increased from 1999 to 2022, causing imports to rise despite the economic downturn.

Next, we performed a PSM analysis to examine how REC affected changes in the import value of RUS. The results of the balance test show a reduction in

Table 4
Balancing test for matching based on the propensity score.

Parameters	Value of parameter
Pseudo R^2 before matching	0.62
Pseudo R^2 after matching	0.00
LR X^2 before matching	44.92
LR X^2 after matching	0.00
Mean standardized bias before matching	356.80
Mean standardized bias after matching	1.60
Total % |Bias| Reduction	99.50

Source: Authors' calculations.

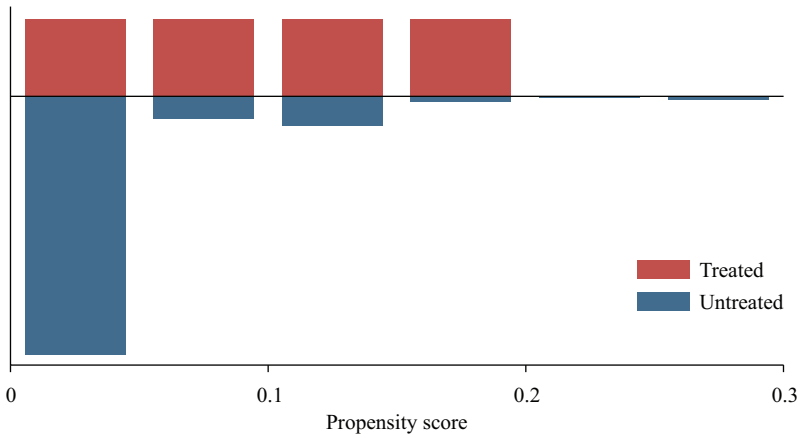

Fig. 2. Propensity score distribution for the EU recession period.

Source: Authors' calculations.

the mean absolute standard bias between before and after matching. The decrease in the total bias is 99.50%, indicating that the impact evaluation results were unbiased (Table 4).

The overlapping assumptions are met before and after the EU recession (Fig. 2). All data can be perfectly matched, allowing for the proper use of research data to assess the impact of a policy or condition. These findings indicate that the matching quality was well maintained.

The PSM analysis produced consistent results with the TSLS analysis. The PSM test is also significant (t-statistics = 2.56) and unbiased (MH Bounds sensitivity = 4.56), meaning that the remaining unobserved individual heterogeneity after applying the PSM model is not a problem. The PSM analysis results show that EU19 food imports from Russia continued to increase despite the EU currently being in recession. EU19 food imports from Russia increased by 36.74 units after the EU experienced recession (Table 5).

According to this study, oil prices do not affect EU19 food imports from Russia. Volatility in global oil prices will not continue to have an impact on global food prices. Olayungbo (2021) found there is a unidirectional causality relationship originating from food prices to oil prices in the long run; however, there is no reverse relationship between oil prices and food prices. This implies that changes in oil prices can be explained by the value of previous food prices. The absence of

Table 5
Impact evaluation results of EU recession on EU19 food imports from Russia.

Parameters	Value of parameter
Treated	102.45
Control	65.70
Difference	36.74
t-statistics	2.56***
MH Bounds sensitivity	4.56***

Note: *** Significant at 1% alpha (*t*-table = 2.3401).
Source: Authors' calculations.

an increase in food prices had no discernible impact on changes in food demand from the EU19.

4.3. Impact of EU sanctions on EU19 food imports from Russia

The EU is dependent on imports of products from various countries, including Russia. Our study shows that EU sanctions against Russia have no impact on EU19 food imports. Hence, we did not perform an impact analysis (PSM) on this variable.

There are two important reasons SAN has no impact on EU19 food imports from Russia. The first reason is that the study runs until October 2022. Meanwhile, the implementation of sanctions began a few months earlier, so the impact has been minimal and poorly quantified. Second, the EU19 is indeed cautious when it comes to managing imports (Černý et al., 2021). So far, the imposition of EU sanctions against a country has hampered trade in almost all sectors, except food. For example, imports of vegetable and animal products, as well as vegetable fats and oils, animal and live products, beverages, and tobacco, from Iran have increased despite EU sanctions. This is largely due to the large Iranian diaspora in the EU, as well as the numerous Iranian grocery stores in EU28 countries (Ghodsi and Karamelikli, 2022).

Furthermore, the EU realizes that the food sector is very sensitive to import bans and embargoes. Food import barriers have the potential to cause food scarcity and price increases. Food import barriers can also stifle economic growth due to the EU19's characteristics as an industrialized country. This area requires raw materials, including from the agricultural sector, to carry out its industrial activities. Hence, EU sanctions only apply to bilateral food trade between the EU and Russia; however, third-country individuals and companies can import food products from Russia if they are not on the EU sanctions list and do so entirely outside the EU (European Union, 2022).

Russia will also not remain silent in the face of EU sanctions, which could worsen its economic situation (Gurvich and Prilepskiy, 2015). However, the impact was not as severe as it was at the beginning and during the COVID-19 pandemic (Kuvalin et al., 2022). Russia has mandated that importers pay for trade transactions in rubles. Ruble transactions will significantly reduce the impact of Western financial sanctions (Timofeev, 2022). Russia is also attempting to diversify its product market beyond the EU (Nasir et al., 2022). China's market is the most diverse and appealing to Russia (Timofeev, 2022). Russian companies are quickly adapting to sanctions by lowering investment and personnel costs,

seeking new suppliers, and launching new products and modernization initiatives (Kuvalin et al., 2022).

5. Conclusion

Our findings show that the implementation of EU sanctions has no influence on EU19 food imports from Russia. On the one hand, the sanctions were only recently imposed so they have not had a significant impact on bilateral trade between the EU and Russia. On the other hand, EU19 is trying to be realistic about the implementation of sanctions due to their reliance on Russian food. The imposition of strict sanctions in the EU has the potential to raise food prices, inflation rates, household spending, and food insecurity. Hence, EU sanctions only apply to bilateral food trade between the EU and Russia; however, third-country individuals and companies can import food products from Russia if they are not on the EU sanctions list and do so entirely outside the EU. Our findings also provide a new perspective for the development of a non-tariff-barrier theory in which sanctions or other trade barriers are ineffective in countries that rely heavily on other countries.

EU19 food imports from Russia are affected by inflation, EU19 food imports from the USA and China, and the recession. The increase of all these variables led to an increase in imports. Our study analysis reveals that there is an endogeneity issue, which we address using TSLS analysis. The variable that causes endogeneity, INF, is influenced by consumer confidence index and unemployment rate.

We propose further studies using longer research data after the Russia–Ukraine conflict to see the impact of this conflict more objectively. Furthermore, we propose further research using Difference in Differences (DID) to provide a different perspective on the impact of the Russia–Ukraine conflict. Furthermore, there is a possibility that the EU27 will agree to sanction Russia, so more research is needed.

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