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Effects of International Trade on Global Food Security and Energy Use

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Abstract

This study examines the effects of global trade, Food Security, and the use of fossil energy in Indonesia before covid 19 and before the Ukraine-Russian war. This study uses a fairly long period of time, namely from 1974 to 2014. The determination of the period of this research is to investigate the consequences on international trade, Indonesian food security with indicators of Indonesia's net food export, and the use of fossil energy in Indonesia. We avoid the shock of covid 19 and the Ukraine - Russia war so that our estimation results can provide a more accurate estimate. We use a model on vector error correction to investigate causality in between two method. We found the impact of global trade significant effect on food security and energy use. Where when there is a disturbance in the world supply chain, such as a war, it will have an impact on world food security and energy use. Food security is important for humanity and international trade is important in maintaining supply chains for global food security.

Keyword : International Trade, Energy Use, Global Food Security

JEL Classification : C01, E31, P24, P44

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Background

Food security and food affordability due to the Russian invasion of Ukraine exacerbated the world food crisis (Ben Hassen & El Bilali, 2022). European Union countries are coordinating action to help people cope with rising prices and help the world's poorest (de Janvry & Sadoulet, 2020). The European Union and its member states remain united in the face of Russian military aggression in Ukraine and are firmly committed to overcoming the global food crisis (Osička & Černoch, 2022). Currently, food security is a major global challenge. Russia's war against Ukraine has exacerbated the current world food crisis. Hunger looms over many parts of the world (Behnassi & El Haiba, 2022). One of the main priorities of EU countries when it comes to

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reducing growing food insecurity is to help Ukraine export its agricultural food production, which had been seriously compromised by the Russian invasion (Woertz, 2022). Ukraine is an important producer and exporter of staple food products, such as wheat and corn. With Russia's blockade of Ukrainian ports from the start of the war, some twenty million metric tons of grain were caught in storage warehouses on the shores of the Black Sea (Stober, 2022).

The impact of wars between Russia and Ukraine had an impact on the Indonesian economy and food security, especially wheat. Ukraine is one of the wheat-supplying countries for Indonesia (Zhou, Lu, Xu, Yan, Khu, Yang, & Zhao, 2023). Russia is also Indonesia's trading partner. When there was a war between Ukraine and Russia, of course, it had an impact on Indonesia's international economy (Riyanto, Widyastutik, Krisnamurthi, & Almasyhari, 2022). In June 2022, the President of Indonesia, Joko Widodo, visited Ukraine and Russia on peace and humanitarian mission (Sande, 2022). In July 2022, Russia agreed to end the blockade of Ukraine's Black Sea ports and since the opening of the blockade, grain shipments from the Black Sea have resumed in Ukraine (Pereira, Zhao, Szymochko, Inacio, Bogunovic, & Barcelo, 2022).

Ukraine, considered Europe's granary, is one of the top producers and exporters of agri-food items in the globe. It is the world's fifth-largest exporter of wheat and fourth of corn. Together with Russia, another major exporter, Ukraine supplies about 30% of the global supply of corn and wheat and more than half of the global population supply of sunflower oil. Africa and Asia are the main recipients of Ukrainian agricultural production (Hellegers, 2022). Ukraine plays a significant part in ensuring food security in some of the world's poorest countries. The damage caused by Russian troops to Ukrainian crops, food warehouses, and agricultural machinery has severely affected the country's production and export capacity (Bezpartochnyi, Britchenko, & Bezpartochna, 2022). The use of fossil energy in fulfilling energy to support the agricultural industry and its derivatives is certainly a matter that must be a serious concern (Chakrabarty, Hakeem, Mohanta, & Varma, 2022).

The global problem we are facing today is the increase in the population suffering from food and nutrition insecurity (Ahmadzai, Tutundjian, & Elouafi, 2021). Both immediately and later, trade openness and energy use have a large reduction in carbon emissions that is positive (Lv & Xu, 2019). Meanwhile, income per square of income per capita and per capita have no effect affects Indonesia's level of carbon emissions, both in the distant and immediate future (Kusumawardani & Dewi, 2020).

Islamic banking has an impact on financial conditions nationally (Wilantari, Widarni, & Bawono, 2021). Islamic banking financing, and export-import commerce have a detrimental and severe impact on Indonesia's air quality. Prove hypotheses regarding pollution impacts and scale effects in Indonesia (Fatoni, 2021). International trade has a favorable impact on the environment as evidenced by a positive value for the effect of scale and composition effect, while the technical effect is not significant (Liobikienė & Butkus, 2019)

Partially, The impact of the currency rate is significant world oil prices, whereas negative (significant) effect and Economic growth is positively (significantly) impacted by inflation. (Antono, Jaharadak, & Khatibi, 2019). Inflation has a favorable but not substantial influence on the volume exports of gas and oil, as well as the exchange rate, an adverse but substantial impact

on the volume Concerning Indonesian oil and gas exports (Aisyah & Renggani, 2021), and foreign investment has a favorable and substantial effect on Indonesian oil and gas exports (Ajija, Zakia, & Purwono, 2021). Furthermore, simultaneously oil and gas production, inflation, and currency exchange rates have a considerable and favorable Result on the amount Indonesian oil and gas exports (Wahyono, Nugroho, & Imron, 2019). This study examines the effects of global trade, Food Security, and the use of fossil energy in Indonesia before covid 19 and before the Ukraine-Russian war.

From the aspect of supply, Indonesia is a country rich in energy resources, both non-renewable and renewable resources (Hanif, Aziz, & Chaudhry, 2019). With Indonesia's oil production, Indonesia can also export to other countries. Oil commodities exported by Indonesia to other countries consist of 2 types, namely exports of crude oil and exports of finished oil (Rifin, 2020). Economic progress can be achieved with the role and function of planning. Government intervention in an effort to control the level of economic growth of a country on key economic variables such as employment, investment, export-import, income and consumption long-term in order to fulfill predetermined development objectives is the meaning of economic planning. With the inter-industry model and having set output targets for each economic sector, the need for labor, imported goods and capital can be carried out in accordance with the level of production of the required resources (Widarni, Drean, & Bawono, 2022). Having a population with a fairly high number can be an advantage for some countries. Globalization is a process that can eliminate the economy between countries in the world and is a driving force for the advancement of the world economy (Verbeke, Coeurderoy, & Matt, 2018).

Globalization has become part of the trend in the world economy, has an influence on the development of open market mechanisms, so that countries are not affected by the existence of physical boundaries (cross borderless) (Siregar & Sinaga, 2021). According to Keynes' theory, the high awareness of certified workers and the strong union of workers make it difficult for companies to reduce the prevailing wage rate (Avram, Benvenuto, Avram, & Gravili, 2019). If the wage rate falls, income will also experience the same thing and accompanied by less purchasing power, this can have an impact on unabsorbed production capacity and harm producers or companies so that unemployment arises due to the impact of company layoffs. In practice, the economic activity of a country is based on the effective level of demand, namely demand accompanied by the ability to pay for goods or services. Aggregate demand includes three sectors, namely household spending and private spending and government spending, in an open economy the addition of exports and imports (Forsythe, Kahn, Lange, & Wiczer, 2020).

Research Method

This study uses a fairly long period of time, namely from 1974 to 2014. The determination of the period objective this study is to look at the effects on international trade, Indonesian food security with indicators of Indonesia's net food export, and the use of fossil energy in Indonesia. We avoid the shock of covid 19 and the Ukraine - Russia war so that our estimation results can provide a more accurate estimate. We use a model for vector correction to investigate causality between variables. With the following equation:

$$Tr_t = \beta_0 + \beta_1 Ex_t + \beta_2 En_t + et \quad \text{eql 1}$$

$$Ex_t = \beta_0 + \beta_1 Tr_t + \beta_2 En_{t2} + et \quad \text{eq1 2}$$

$$En_t = \beta_0 + \beta_1 Ex_t + \beta_2 Tr_{t2} + et \quad \text{eq1 4}$$

Where Tr is total international trade, Ex is net food exports, En is total energy use. β is a constant, where e denotes the passing time and is the error term.

Result and Analysis

We conducted a stationarity test on each of the variables presented in Tables 1,2, and 3. This is necessary because autoregressive estimation requires stationary data.

Table 1. Root Test Net Food Exports

	t-Statistic	Prob.*
Statistic for the enhanced Dickey-Fuller test	-9.335480	0.0000
Test critical values: 1% level	-3.596616	
5% level	-2.933158	
10% level	-2.604867	

One-sided p-values from MacKinnon (1996).

Table 2. Root Test Total Energy Use

	t-Statistic	Prob.*
Statistic for the enhanced Dickey-Fuller test	-6.226337	0.0000
Test critical values: 1% level	-3.596616	
5% level	-2.933158	
10% level	-2.604867	

*One-sided p-values from MacKinnon (1996).

Table 3. Root Test Total International Trade

	t-Statistic	Prob.*
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Statistic for the enhanced Dickey-Fuller test -9.817827 0.0000

Test critical values: 1% level	-3.596616
5% level	-2.933158
10% level	-2.604867

One-sided p-values from MacKinnon (1996).

Considering the outcomes of the stationarity test at the first different level, it is seen from the probability value with a significant level of alpha (α) Considering the outcomes of the. first different stationarity test (1st diff) for all variables, It is apparent that the probability value of 0.0000 more compact than the alpha significant degree of 5% or 0.05 so that the data can be said to be all stationary variables in the first different. After knowing the stationary data on the first different, then the optimum lag test is carried out to determine the lag used this study's results, which are reported on table 4.

Table 4. Optimum Lag Length Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-333.9389	NA	16306.58	18.21292	18.34353*	18.25896*
1	-327.0910	12.21528	18364.15	18.32924	18.85170	18.51343
2	-317.5301	15.50413	18018.14	18.29892	19.21323	18.62126
3	-312.5223	7.308725	22980.38	18.51472	19.82087	18.97520
4	-303.7775	11.34455	24555.27	18.52851	20.22651	19.12714
5	-288.5948	17.23437	19214.08	18.19432	20.28416	18.93108
6	-267.8134	20.21976*	11704.28*	17.55748*	20.03917	18.43239

* denotes the lag order that the criterion selected.

The number of stars (*) in the above table indicates that the ideal lag length is at lag 6, which is indicated by its location. As a result, lag 6 was chosen as the ideal lag length for this investigation.

Table 5. Stability Test

Root	Modulus

$-0.311684 + 0.886621i$	0.939811
$-0.311684 - 0.886621i$	0.939811
$-0.670721 + 0.627030i$	0.918168
$-0.670721 - 0.627030i$	0.918168
$0.647038 - 0.641326i$	0.911020
$0.647038 + 0.641326i$	0.911020
$0.101359 - 0.904588i$	0.910249
$0.101359 + 0.904588i$	0.910249
$-0.788191 - 0.376759i$	0.873608
$-0.788191 + 0.376759i$	0.873608
$0.844988 - 0.217231i$	0.872465
$0.844988 + 0.217231i$	0.872465
-0.756383	0.756383
$0.443322 + 0.606000i$	0.750846
$0.443322 - 0.606000i$	0.750846
$0.018781 + 0.592922i$	0.593219
$0.018781 - 0.592922i$	0.593219
-0.129947	0.129947

No roots exist outside the unit circle.

The VAR satisfies the stability criterion.

With in the security test with all variables, all modulus below 1, it can be concluded that the data is stable.

Table 6. Test of Unrestricted Cointegration (Trace)

Hypothesized	Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.501665	35.11695	29.79707	0.0111

At most 1	0.231340	10.04357	15.49471	0.2774
At most 2	0.015756	0.571748	3.841466	0.4496

Test of Unrestricted Cointegration (Maximum Eigenvalue)

Hypothesized	Max-Eigen	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.501665	25.07338	21.13162	0.0132
At most 1	0.231340	9.471826	14.26460	0.2490
At most 2	0.015756	0.571748	3.841466	0.4496

The max-eigenvalue test reveals one cointegrating equation (s) at the 0.05 level, suggesting that the hypothesis is not accepted. MacKinnon-Haug-Michelis test values

* indicates that the hypothesis was rejected at the 0.05 level.

**p-values for MacKinnon-Haug-Michelis

In the cointegration test analysis there is a At the 0.05 significance level, trace test which cointegration equation. The second displays one cointegration equation with a p-value of 0.05 of MacKinnon-Haug-Michelis while the One cointegration equation is shown at level 0, 05 in the Max-Eigenvalue test, while the hypothesis is rejected at level 0.05. with a p-value of MacKinnon-Haug-Michelis . so it can be concluded that there is no cointegration and an estimate can be made using the autoregressive vector presented in table 7.

Table 7. Vector Autoregression Estimates

	D(Tr)	D(Ex)	D(En)
D(Tr(-6))	1.247262 (1.09151) [1.14270]	0.801679 (0.65963) [1.21534]	2.004666 (1.23843) [1.61872]
D(Ex(-6))	-2.227381 (1.80638)	-1.315705 (1.09166)	-3.209541 (2.04953)

		[-1.23306]	[-1.20524]	[-1.56599]
D(En(-6))	-0.360818	-0.197824	-0.511119	
	(0.22019)	(0.13307)	(0.24983)	
	[-1.63868]	[-1.48666]	[-2.04591]	
C	0.072291	-0.149929	0.389668	
	(1.50784)	(0.91124)	(1.71080)	
	[0.04794]	[-0.16453]	[0.22777]	
R-squared	0.653155	0.633836	0.546246	

If t count $>$ t table or after parameter estimation is done. Based on the vector estimation results in table 7, international trade (Tr) is significantly positive in relation to international trade itself, food security, and energy use. However, increasing food security has a substantial negative effect on all variables. And the growth in energy use does not have a substantial impact regarding global trade, and increasing food security.

Conclusion

International trade has a significant impact on food security and energy use. Where when there is a disturbance in the world supply chain, such as a war, it will have an impact on world food security and energy use. Food security is important for humanity and international trade is important in maintaining supply chains for global food security.

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