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Import Tariffs to Reduce the Use and Consumption of Fossil Energy in Indonesia

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Abstract

This Research aims to simulate the application of import tariffs on reducing the use of fossil energy and the impact of using alternative energy on minimizing the use of fossil fuels in Indonesia. This research method applies VECM (Vector Error Correction Model) model to analyze the effect vectors on Energy Use, usage of energy from fossil fuels, and Import Costs with the research period from 1999 to 2020. The data used in this analysis is time series. This secondary data was used in the study. secondary data from the World Bank. We found that import tariffs have a significant effect on reducing using fossil fuels in Indonesia. Where the application of environmental taxes can be effective in limiting the use of fossil energy and increasing environmental sustainability. This is related to a sustainable economy. The utilizing energy itself has no significant effect on the use of fossil energy and import tariffs. This shows that the use of alternatives has not significantly reduced the use of fossil fuels in Indonesia.

Keyword : Energy, Import, panel data, Vector Error Correction Model
JEL Classification : C01, O47, F64

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Introduction

The use of renewable energy results in increased imports for non-OECD countries. This happens because of the high cost of using renewable energy, but countries that are members of economic cooperation (OECD) can overcome the increase in imports of renewable energy (Ilechukwu, & Lahiri, 2022). The renewable energy community (REC) is a leading initiative to give end users to participate actively in the energy sector. Country of Flanders, Belgium. shows that REC has the

ability to lower these expenses and emissions from business as usual by 10% to 26% and 5% to 13%, respectively,but that these reductions can be made depending depending on the level and kind of power tariff asset absorption (Felice, 2022).

In the midst of a pandemic, the use of energy consumption has decreased. Whereas in 2020 the utilization of renewable energy has increased in power generation, however in the national energy mix its utilization is still low. To overcome this, national energy policies must be implemented by expanding the percentage of renewable energy used in national energy blend (Nugroho & Muhyiddin, 2021). The Baltic countries can be an example for other countries on how to assess the benefits of renewable energy support. The Baltic States are able to reduce the external costs of power generation with policies and measures to promote renewable energy as a source of clean energy generation (Lu, Gozgor, Mahalik, Padhan, & Yan, 2022).

In Indonesia, to reduce the use of fossil fuels and replace them with renewable energy, the Indonesian government implements a carbon policy to reduce the use of fossil fuels and improve the environment. In addition, the carbon tax also encourages Indonesia not to depend on fossil fuels (Selvi, Rahmi, & Rachmatulloh, 2020). Economic growth and population growth did not significantly affect the consumption of renewable energy in Indonesia in 1990-2018 (Ahmad, Draz, Chandio, Su, Ahmad, & Irfan, 2021). However, energy subsidies have a negative impact and substantial effect on the use renewable energy (Yang, He, Xia, & Chen, 2019), while fossil fuel the use of energy has a positive and considerable effect on the use of renewable energy in Indonesia for the period 1990-2018 (Adebayo, Awosusi, Rjoub, Agyekum, & Kirikkaleli, 2022). Simultaneously, the variables of economic growth, population growth, energy subsidies, and energy use from fuel affect use of renewable energy in Indonesia for the period 1990-2018 (Afriyanti, Sasana, & Jalunggono, 2020).

Utilizing renewable energy reduces the competitiveness of trade. This is because the use of renewable energy sources costs. However, some heterogeneity was also found in this regard. While the Increased usage of renewable energy increases exports for nations that are members of the Organization for Economic Co-operation and Development, whereas it decreases exports for non-OECD countries (Ilechukwu & Lahiri, 2022). The switch to renewable energy will not only affect the decreasing and increasing import costs for a country, but it can also affect the barriers to the new Non-Tariff Policy for Indonesian CPO. Where the European Union does not consider that palm oil is a sustainable product, because there is no RSPO certification (Natashya, 2019)

In the Malta government's policy of choosing to increase oil imports even though the country is implementing the EU framework which reduces the amount of imported oil to achieve Renewable energy targets (Carfora, Pansini, & Scandurra, 2022). One of the obstacles to this occurred because Malta became an oil trade route so that oil prices became cheaper (Simon, 2022). The construction of renewable energy is a target in ASEAN region which aims to have a positive impact on the social life of social communities. Where the goal is to alleviate the problem of poverty with the role of the community in utilizing natural potential such as building power plants, creating new jobs and having an impact on ASEAN economic growth (Yana, Yulisma, & Zulfikar, 2022). The purpose of this study is to simulate the application of import tariffs on lowering fossil fuel consumption impact and energy of using alternative energy on lowering fossil fuel consumption in Indonesia.

Literature Review

The presumption behind international trade is that shifting the structure of the industry network is a good asymmetric result. When generalized properly, it can be useful for studying the various geopolitical, institutional, and economic trends that are likely to drive globalization in the future structures (Garbellini, 2021). In the International Factor Price Equation theorem it can be easily generalized to the technological domain where producing two commodities, in Autarky equilibrium a free trade is practiced in this nation, equalization of factor prices may be hampered by production at the full non-employment portion of the production possibilities frontier.. Meanwhile, from Autarky to international trade involving two countries, an acceptable world market commodity price ratio should force an even distribution of factor prices in both countries (Etula, 2009).

In Klaus Wilde's Heckscher-ohlin price distribution model Two goods and two factors can be traded freely produces factors that are not much different where intensity is not a factor, production occurs with the same technology and the expense of transportation ignored (Walde, 1994). Simultaneously the content in terms of the Heckscher-Ohlin theorem in fundamental two-factor multi-commodity sample of a world with two countries does not call for equalization of international factor prices (Viphindrartin & Bawono, 2021). This is also evident from the global trade between the two nations that are members of experiencing trade barriers, the two countries can accept problems that occur together (Brecher & Choudri, 1982). commerce pacts at the megaregional scale aim at liberalizing buying and selling. They suggest that the evaluation agreements relating to trade and investment should also take into account investment regulations (Heid & Vozzo, 2020). A developing financial system will increase market share in international trade. But it's fun to drive bigger trades. To realize the bond, there needs to be causality between financial institutions, exports and imports (Caporale, Sova, & Sova, 2022). From linking the EU and China ETS trading system Experiencing income differences. Where the impact is heterogeneous in EU countries it can lead to differences of opinion among the EU region, which can help find mutually beneficial liaison solutions with trading partners (Winkler, Peterson, & Thube, 2021).

In examining the geometry which defines the "factor value" of different goods, to characterize the efficient production plan, and the connection between product costs and factor prices. know that factor prices uniquely determine the price of goods, and that, in general, equate the price of goods with factor prices (Ekeland & Guesnerie, 2010). The adequacy analysis of the distribution of factor prices for a number of nations and items using the "lens condition" in the case of a two-dimensional grid of two-dimensional supporting factors (Xiang, 2001). Import price difference intrade is caused by trading price errors based on statistical aggregate mirror trading, as well as a deficiency in sufficient statistical infrastructure, even when sophisticated trading centers such as Switzerland (Mehrotra & Carbonnier, 2021). Mistaken pricing practices Without proper cost allocation on default services , will continue to hold a leading position in the retail market as a result of the noteworthy subsidies produced through distribution tariffs. This can be resolved by implementing a comprehensive and suitable cost allocation for the standard service (Lacey, 2019).

The impact of international trade both directly and indirectly impacts economic growth affects the environment. The use of large amounts of energy causes environmental problems. To control the environment, it is necessary to stipulate environmental protection in international agreements and laws to control the environment caused by international trade (Jijian, Twum, Agyemang, Edziah, & Ayamba, 2021). International trade demonstrates that the level of state income increases the consumption of renewable energy. This is because OECD countries are shifting the use of renewable energy to fossil fuels. This will reduce the cost of importing fossil fuels to other countries. Because this potential is positively correlated with the consumption of renewable energy, income, carbon dioxide emissions, and energy costs per person all enhance the desire for green energy (Lu, Gozgor, Mahalik, Padhan, & Yan, 2022).

Trade globalization can improve production performance but cannot solve environmental problems. The impact of trade globalization has implications for intensity of emissions of carbon dioxide and the intensity of sulfur dioxide emissions (Ma & Wang, 2021). The occurrence of international trade shows a rise in the amount of electricity consumed, which a significant impact on export activities. In the short term, exports have a considerable impact on electricity usage. (Zhang, Jiang, Qi, & Hao, 2022). The spillover of technology export trade has a promotional impact on increasing the efficiency from carbon emissions in the economy, such as Manufacturing of textiles, leather products, the chemical industry, etc. experienced the greatest increase in the contained carbon and chemicals also experienced an increase. More about On average, exports would decrease and imports will rise due to renewable resources (Shen, Liu, Tian,2022).

The nations for Economic Cooperation and Development (OECD) were able to avert a conflict relating export results to the usage of sustainable power (Ulucak, Khan, Baloch, & Li, 2020). Energy market leakage that causes high emissions in a country, is a small impact discrepancies in energy prices and trade patterns. The step to overcome this is to impose tax rates for importation of specific products and services with a high energy content (Jakob, 2021). Use of cleaner and renewable energy Leads to reduced exports and increased imports for nations outside the OECD. This is because using renewable energy sources is costly. The solution is to reduce competitiveness on the global market and the unit cost of renewable energy (Ilechukwu & Lahiri, 2022).

Research Method

The purpose of this study is to simulate the application of import tariffs on minimizing the use of fossil fuels its effects using alternative energy on minimizing the use of fossil fuels in Indonesia. The research method employs Vector Error Correction Model (VECM) model to analyze the result of vectors for Energy Use, Consumption of energy from fossil fuels, and Import Costs. With the research period from 1999 to 2020. The data used in this analysis is time series. Secondary data was to conduct this study Table 1 displays primary data gathered from the World Bank.

Table 1. Variables and Description

Variable	Description	Source
Import	Import is the legal movement	World Bank data (Processed)

	of goods or commodities between nations, typically as part of the trade process.The data came from the World Bank.	
Energy	Energy, in physics, is a unit of capacity to do work or work. Data obtained from World Bank.	World Bank data (Processed)
Energy Fossils	Energy Fossils are the remains or traces of living things turned into stone or minerals. Data obtained from the World Bank Data.	World Bank data (Processed)

This study focuses on research using aggregate data and secondary data with a sample of all data collected by the world bank. The VECM is used in this research method to determine the vector effect of the country's import costs on renewable energy. This study uses the following equation:

$Y_t = \beta_0 + \beta_1 X1_{t1} + \beta_2 X2_{t2} + e_t$

$X1_t = \beta_0 + \beta_1 Y_{t1} + \beta_2 X2_{t2} + e_t$

$X2_t = \beta_0 + \beta_1 Y_{t1} + \beta_2 X1_{t2} + \beta_3 Ee_{t3} + e_t$

Where, Y is Import Fee, X1 is Energy Usage, X2 is Fossil fuel energy consumption, β is constant, t stands for time, and e for error term.

Results and Discussion

Before analyzing the VECM model, we must first perform a Stationary test, lag optimum test, Stability Test, Cointegration test and then we can perform VECM modeling.

Table 2. Root Test Results (Stationary test)

Variable	Unit Root	Statistic For The ADF	Probability	Information
Y	1st difference	-4.417833	0.0062	Stationary
X1	1st difference	-3.849441	0.0132	Stationary
X2	1st difference	-5.355518	0.0012	Stationary

The output results are known to have Series Y, X1, X2 values, each of which has a probability value smaller than the alpha level of 0.05, so that the three variables are stationary at the 1st difference level. The results obtained that the three variables are stationary, it can be interpreted that the three variables have a long-term link, so it is necessary to carry out a cointegration test.

Table 3. Optimal Lag test Outcomes

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-101.2120	NA*	1844.392*	16.03262	16.16300*	16.00582
1	-92.10341	12.61196	1927.713	16.01591*	16.53740	15.90872*
2	-86.70806	4.980316	4619.257	16.57047	17.48308	16.38289

In the table of results of the Lag Optimum VAR model using the criteria LR, FPE, AIC, SC, HQ, it is known that the Lag Optimum value is at lag "0". LR,FPE,SC have the lowest value with a lag level of "0".

Table 4. Results of Stability Tests

Root	Modulus
-0.012719 - 0.755022i	0.755129
-0.012719 + 0.755022i	0.755129
-0.207902 - 0.626924i	0.660497
-0.207902 + 0.626924i	0.660497
-0.157999	0.157999
0.134061	0.134061

In Table 4, the Var Root estimation test has a modulus smaller than 1 so the data in the Var estimate test is stable.

Table 5. Results of a Cointegration Test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.807017	40.91938	29.79707	0.0018
At most 1 *	0.605079	19.53236	15.49471	0.0116
At most 2 *	0.436406	7.454469	3.841466	0.0063

Analyzing the outcomes of the Johansen Cointegration it is assumed that test the probability value in the non-existent row and the highest row, are 0.0018 and 0.0116, respectively, which is <0.05, which means there is a cointegration equation which means it has a long-term balance. VECM Modeling. From the test data through the Vecm test and get the following results:

Table 6. VECM Test Results

Error Correction:	D(Y)	D(X2)	D(X1)
CointEq1	-1.496515	0.193168	2.145678
	(0.34615)	(0.15679)	(3.23468)
	[-4.32332]	[1.23205]	[0.66334]
D(Y)	0.285914	-0.171639	-2.327030
	(0.23182)	(0.10500)	(2.16632)
	[1.23333]	[-1.63463]	[-1.07419]
D(X2)	0.054550	-1.018612	-30.02306
	(1.39092)	(0.63000)	(12.9977)
	[0.03922]	[-1.61683]	[-2.30987]
D(X1)	0.048444	0.019924	0.599267
	(0.05844)	(0.02647)	(0.54612)
	[0.82894]	[0.75268]	[1.09732]
C	0.163293	0.128684	2.533569
	(0.95472)	(0.43243)	(8.92156)
	[0.17104]	[0.29758]	[0.28398]

To compare the t-statistics with the coefficient values to see whether the significance of the relationship between variables must know how many t-tables are. Whenever the t-statistic value exceeds the coefficient value, it is significant. Import fee (Y) has a substantial negative relationship with energy uses (X1), Fossil Energy (X2) has a significant negative relationship with X1 and has a positive and insignificant relationship with Import fee (Y). However, energy uses is not significantly positively related to the other two variables. This shows that import tariffs suppress the use of energy, both renewable energy and fossil energy.

Conclusion

Import tariffs have a significant effect on reducing utilization of fossil fuels energy in Indonesia. Where the application of environmental taxes can be effective in limiting the use of fossil energy and increasing environmental sustainability. This is related to a sustainable economy. The utilizing energy itself has no significant effect regarding the use of fossil fuels and import tariffs. This shows that the use of alternative energy in Indonesia has not had a substantial effect on reducing the use of fossil energy.

References

Adebayo, T. S., Awosusi, A. A., Rjoub, H., Agyekum, E. B., & Kirikkaleli, D. (2022). The influence of renewable energy usage on consumption-based carbon emissions in MINT economies. Heliyon, 8(2), 1-10.https://doi.org/10.1016/j.heliyon.2022.e08941

Afriyanti, Y., Sasana, H., & Jalunggono, G. (2020). Analisis Faktor-Faktor yang Mempengaruhi Konsumsi Energi Terbarukan di Indonesia. DINAMIC: Directory Journal of Economic, 2(3), 865-884.https://doi.org/10.31002/dinamic.v2i3.1428

Ahmad, F., Draz, M. U., Chandio, A. A., Su, L., Ahmad, M., & Irfan, M. (2021). Investigating the myth of smokeless industry: environmental sustainability in the ASEAN countries and the role of service sector and renewable energy. Environmental Science and Pollution Research, 28(39), 55344-55361.

Brecher, R., A & Choudri, E., U. (1982). The factor content of international trade without factor-price equalization. Journal of International Economics, 12(3),277.-283. https://doi.org/10.1016/0022-1996(82)90040-X.

Caporale, G. M., Sova, A. D., & Sova, R. (2022). The direct and indirect effects of financial development on international trade: Evidence from the CEEC-6. Journal of International Financial Markets, Institutions and Money, 78(1), 1-16.https://doi.org/10.1016/j.intfin.2022.101550

Carfora, A., Pansini, R. V., & Scandurra, G. (2022). Energy dependence, renewable energy generation and import demand: Are EU countries resilient?. Renewable Energy, 195(1), 1262-1274.https://doi.org/10.1016/j.renene.2022.06.098

Ekeland, I & Guesnerie, R. (2010). The geometry of global production and factor price equalization. Journal of Mathematical Economics, 46(5),666-690. https://doi.org/10.1016/j.jmateco.2009.11.009

Etula, E. (2009). International Factor Price Equalization in a limited - substitutability technology framework. International Review of Economics and Finance, 18(2),282-289.https://doi.org/10.1016/j.iref.2007.10.002

Felice A. (2022). Renewable energy communities: Do they have a business case in Flanders?: *Applied Energy*, 322(1),1-12.https://doi.org/10.1016/j.apenergy.2022.119419.

Garbellini, N. (2021). International trade as a process of choice of technique. Structural Change and Economic Dynamics, 59(1),42-50.https://doi.org/10.1016/j.strueco.2021.08.003

Heid, B & Vozzo, I. (2020). The international trade effects of bilateral investment treaties. Economics Letters,196(1), 1-10.https://doi.org/10.1016/j.econlet.2020.109569

Ilechukwu, N., & Lahiri, S. (2022). Renewable-energy consumption and international trade. Energy Report, 8(1), 10624-10629. https://doi.org/10.1016/j.egyr.2022.08.209

Jakob, M. (2021). Climate policy and international trade – A critical appraisal of the literature. Energy Policy, 156(1),1-8.https://doi.org/10.1016/j.enpol.2021.112399

Jijian, Z., Twum, A. K., Agyemang, A. O., Edziah, B. K., & Ayamba, E. C. (2021). Empirical study on the impact of international trade and foreign direct investment on carbon emission for belt and road countries. Energy Reports, 7(1), 7591-7600.https://doi.org/10.1016/j.egyr.2021.09.122

Lacey, F. (2019). Default service pricing–the flaw and the fix: current pricing practices allow utilities to maintain market dominance in deregulated markets. The Electricity Journal, 32(3), 4-10.https://doi.org/10.1016/j.tej.2019.02.002

Lu, Z., Gozgor, G., Mahalik, M. K., Padhan, H., & Yan, C. (2022). Welfare gains from international trade and renewable energy demand: Evidence from the OECD countries. Energy Economics, 112(1), 1-7.https://doi.org/10.1016/j.eneco.2022.106153

Ma, T., & Wang, Y. (2021). Globalization and environment: Effects of international trade on emission intensity reduction of pollutants causing global and local concerns. Journal of Environmental Management, 297(1), 1-9.https://doi.org/10.1016/j.jenvman.2021.113249

Mehrotra, R & Carbonnier, G. (2021). Abnormal pricing in international commodity trade: Empirical evidence from Switzerland. Resources Policy, 74(1),1-13.https://doi.org/10.1016/j.resourpol.2021.102352

Natashya, J. (2019). Hambatan Ekspor Crude Palm Oil (CPO) Indonesia ke Uni Eropa pasca Kebijakan Renewable Energy Directive (RED). Jurnal Sentris, 2(2), 127-155.https://doi.org/10.26593/sentris.v2i2.4185.127-155

Nugroho H & Muhyiddin, (2021). Menurun dan Meningkat, Maju Namun Belum Cukup: Kinerja Pembangunan Sektor Energi di Tengah Pandemi Covid-19 Tahun 2020. *Bappenas Working Papers*, 4(1), 1-12. https://doi.org/10.47266/bwp.v4i1.95

Selvi, S., Rahmi, N., & Rachmatulloh, I. (2020). Urgensi Penerapan Pajak Karbon Di Indonesia. Jurnal Reformasi Administrasi: Jurnal Ilmiah untuk Mewujudkan Masyarakat Madani, 7(1), 29-34.https://doi.org/10.31334/reformasi.v7i1.845.g483

Shen, Y., Liu, J., Tian,W. (2022). Interaction between international trade and logistics carbon emissions. Energy Reports, 8(1),10334-10345.https://doi.org/10.1016/j.egyr.2022.07.159

Simon, J. (2022). The Collapse of Communist Regimes and the Role of International Factors (1985-1992). Taiwan Journal of Democracy, 18(1).145-161

Ulucak, R., Khan, S. U. D., Baloch, M. A., & Li, N. (2020). Mitigation pathways toward sustainable development: Is there any trade-off between environmental regulation and carbon emissions reduction?. Sustainable Development, 28(4), 813-822.https://doi.org/10.1002/sd.2032

Viphindrartin, S., & Bawono, S. (2021). International Economics. Munich : BookRix.

Walde, K. (1994). On an additional condition for factor-price equalisation in intertemporal Heckscher-Ohlin models. Economics Letters, 44(4),411-414. https://doi.org/10.1016/0165-1765(94)90113-9

Winkler, M. B. J., Peterson, S., & Thube, S. (2021). Gains associated with linking the EU and Chinese ETS under different assumptions on restrictions, allowance endowments, and international trade. Energy Economics, 104(1), 1-16.https://doi.org/10.1016/j.eneco.2021.105630

Xiang, C. (2001). The sufficiency of the 'lens condition' for factor price equalization in the case of two factors. Journal of International Economics, 53(2),463–474. https://doi.org/10.1016/S0022-1996(00)00065-9

Yana, S., Yulisma, A., & Zulfikar, T. M. (2022). Manfaat Sosial Ekonomi Energi Terbarukan: Kasus Negara-negara ASEAN. Jurnal Serambi Engineering, 7(1).2587-2600.https://doi.org/10.32672/jse.v7i1.3820

Yang, X., He, L., Xia, Y., & Chen, Y. (2019). Effect of government subsidies on renewable energy investments: The threshold effect. Energy Policy, 132(1), 156-166.https://doi.org/10.1016/j.enpol.2019.05.039

Zhang, H., Jiang, X., Qi, Y., & Hao, Y. (2022). How do the industrial structure and international trade affect electricity consumption? New evidence from China. Energy Strategy Reviews, 43(1),1-15.https://doi.org/10.1016/j.esr.2022.100904