DEMAND FOR INDONESIAN PATCHOULI OIL EXPORTS: THE PANEL AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) APPROACH

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ABSTRACT

**Purpose:** This study aims to analyze the demand for oil exports and determine the short-term and long-term impact of patchouli oil price variables, per capita income of patchouli oil export destinations, and the real exchange rate on Indonesia's patchouli oil export demand.

**Theoretical framework:** is supported by literature on demand of patchouli oil export

**Method/design/approach:** This study employed panel ARDL regression (Autoregressive Distributed Lag) on data from 2006 - 2021

**Results and conclusion:** All variables significantly adversely affected the export demand over the long term but not the short term.

**Research implications:** The Indonesian government is advised to carry out more intensive policies on the patchouli oil price variable to increase demand for patchouli oil exports in various countries so that the gap between world prices and export prices can be adjusted. It is also recommended that the central or regional government be able to establish various cooperations between countries so that world patchouli oil prices could remain stable, with the hope of increasing state revenues and demand for Indonesian patchouli oil exports.

**Originality/value:** Indonesia is a country whose economy is supported by the export sector of agricultural commodities, one of which is patchouli oil exports. Because this sector greatly contributes to the national economy, it is important to analyze the determinants of demand for patchouli oil exports.

**Keywords:** Export Demand, Panel ARDL, Patchouli Oil Price, GDP Per Capita, Real Exchange Rate.

DEMANDA POR EXPORTAÇÕES DE ÓLEO DE PATCHOULI INDONÉSIO: A ABORDAGEM DE PAINEL AUTORREGRESSIVO DISTRIBUÍDO (ARDL)

RESUMO

**Objetivo:** Este estudo tem como objetivo analisar a demanda por exportações de petróleo de patchouli e determinar o impacto de curto e longo prazo das variáveis de preço do óleo de patchouli, renda per capita dos destinos de exportação de óleo de patchouli e a taxa de câmbio real na demanda de exportação de óleo de patchouli da Indonésia.

**Referencial teórico:** é apoiado pela literatura sobre a demanda de exportação de óleo de patchouli.

**Método:** Este estudo empregou regressão de painel ARDL (Autoregressive Distributed Lag) em dados de 2006 – 2021.
Resultados e conclusão: Todas as variáveis afetaram significativamente a demanda de exportação no longo prazo, mas não no curto prazo.

Implicações da pesquisa: O governo indonésio é aconselhado a realizar políticas mais intensivas sobre a variável do preço do óleo de patchouli para aumentar a demanda por exportações de óleo de patchouli em vários países, de modo que a diferença entre os preços mundiais e os preços de exportação possa ser ajustada. Também é recomendado que o governo central ou regional seja capaz de estabelecer várias cooperações entre os países para que os preços mundiais do óleo de patchouli possam permanecer estáveis, com a esperança de aumentar as receitas do estado e a demanda pelas exportações de óleo de patchouli da Indonésia.

Originalidade/valor: A Indonésia é um país cuja economia é sustentada pelo setor de exportação de commodities agrícolas, uma das quais é a exportação de óleo de patchouli. Como esse setor contribui muito para a economia nacional, é importante analisar os determinantes da demanda pelas exportações de óleo de patchouli.

Palavras-chave: Demanda de Exportação, Painel ARDL, Preço do Óleo de Patchouli, PIB Per Capita, Taxa de Câmbio Real.

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1 INTRODUCTION

Manufacturing companies that sell their goods both domestically and internationally are vulnerable to external shocks caused by both local and global forces. For instance, a firm's domestic sales may decrease if domestic demand falls, whereas its exports may rise if its trading partners' economies develop. Businesses take a number of factors into account when adjusting their sales between domestic and foreign markets, existence of production limits, level of partially incurred costs, level of demand for the product, etc. In any case, the importance of the interaction between the two markets is to reduce the dampening effect of the request. The relationship between domestic and export sales can be used as an indicator of potential. (Gul, 2021)

Over the past two decades, many developing countries have carried out trade liberalization in the agricultural sector to integrate domestic agricultural markets with global markets. Market interdependence on domestic and international levels is best understood through trade. The domestic price producers receive when a specific commodity is exported and traded on the global market is equal to the international price, with fewer transaction costs (Rapsomanikis & Sarris, 2006).

Indonesia has a comparative advantage as an agricultural and maritime country, with many islands scattered throughout the country (Fahri & Alhadar, 2021). These advantages are economic fundamentals that need to be utilized through economic development to become a competitive advantage. That way, the economy developed in Indonesia has a solid foundation on domestic resources, can compete, and is efficient for all Indonesian people. Indonesia is an agricultural country with farming as the main source of income (BPS, 2021). With 9.23 million workers, the agricultural industry has the second highest employment rate in Indonesia after manufacturing (Elfira, Silvia & Nasir (2022). In 2021, the agricultural sector has the potential to contribute 13.28 percent to national GDP (BPS, 2021). In Indonesia there are many biological and animal natural resources. There are more than 80 types of essential oils that are traded internationally, and with a sizable amount, The largest producer of essential oils in the world is Indonesia (Ginting, 2013).
One of the commodities that have become a national priority is patchouli in the form of essential oil products. Indonesia has a significant potential for patchouli production because it is a tropical nation. The patchouli plantation covers 21,351 ha and produces about 2,100 tons of patchouli oil equivalent to patchouli oil in over 19 provinces. Of that area, the entire area is cultivated by smallholders. In 2018 five provinces had the largest patchouli plant population: Aceh, West Sumatra, Jambi, South Sulawesi, and Southeast Sulawesi. Previously, Aceh Province was one of the centers of patchouli in Indonesia, with several types of patchouli being cultivated (Ditjenbun, 2021).

According to the Dewan Atsiri Indonesia (2021), annual export prices exceed USD 400 million or the equivalent of IDR 5.6 Million Trillion. As world market leaders, namely patchouli essential oil, clove oil and its derivatives, nutmeg oil, citronella oil, the Indonesian Essential Council seeks to continue to develop the upstream industry downstream based on essential oils, seeks to provide superior seeds and cultivation techniques that are tested and standardized. This was done because this essential oil is one of the leading commodities and is the best product in Indonesia.

As one of the leading export commodities, Indonesian patchouli has a high value. However, its benefits cannot be felt significantly by farmers and refiners. Smallholder patchouli businesses only have relatively few production results, even though patchouli has potential for essential oils and has a clear market, so it is considered to have a selling value to be traded on the international market (Anggraini, Arida, & Hakim, 2019).

Patchouli oil is one of several types that are included in the essential oil group which is an Indonesian export commodity. Patchouli oil is currently the largest contributor compared to other types of essential oils. This is because patchouli plants can grow well in various land conditions in Indonesia.

Figure 1. Patchouli Oil Export Volume 2017-2021 (Kilograms)

Figure 1 states that the volume of exports in the world fluctuates every year from 2017 to 2021. The figure shows that there are six export destinations for Indonesian patchouli oil. The United States has the highest demand for patchouli oil exports, followed by France and Singapore. Meanwhile, other requests for Indonesia's patchouli oil exports are from Spain, England, and Switzerland. Exports of goods and services in the current era of globalization can not only be carried out between countries. However, they can also be carried out in a regional scope, but over time many countries will carry out these export activities outside their countries.
Throughout 2020, the Indonesian Ministry of Trade has been very aggressive in conducting free trade agreements, which aim to increase the volume of trade in the global market.

Price is a factor that directly affects income. A commodity's price can also impact the demand for exports. The price of patchouli oil at the export level was relatively stable. Although there was an increase or decrease, it did not seem to impact the export value of patchouli oil. The level of income can also affect exports because a country's income level can be a benchmark criterion for measuring a country's economic growth (Ya & Pei, 2022; Dang, Zhang, Nguyen & Nguyen, 2020). The exchange rate can affect the price of an exported good. An increased export volume would occur when the exchange rate declined because when the export destination country's exchange rate or currency value becomes weak, it will get higher profits as an exporting country (Maygirtasari et al., 2015; Taufiq & Natasah, 2019; Chen, 2011). However, currency depreciation can also increase export demand (Karagöz, 2016; Riyani, Darsono & Ferichani, 2018).

According to Ya & Pei (2022) and Dang et al. (2020) concluded that real exports, the income of export-oriented nations, relative prices, and exchange rates significantly impact export demand for agricultural commodities. Meanwhile, Riyani et al. (2018) stated that there is a need for exports of agricultural products from Indonesia China is significantly affected by GDP per capita, exchange rates in real terms, and export prices. Dang et al. (2022) and Nguyen (2022) concluded that the demand for exports in Vietnam is influenced by GDP, prices, population, and exchange rates. Indonesian agricultural commodity export demand is influenced by the actual per-capita GDP of the importing country, the real Rupiah exchange rate, and commodity export prices. (Ringga, Silvia, & Abrar, 2022); Fonchamnyo & Akame (2017) GDP significantly affects export demand.

2 THEORETICAL FRAME

The theory of export demand aims to identify the contributing effect of demand. The demand for exports of a country is the dispute between domestic production or supply minus domestic demand plus the stock (Salvatore, 2014). For export commodities, the demand for the commodity in question will be allocated to meet domestic demand for domestic or foreign consumption, namely exports, and the remaining will be supplied that will be sold in the following year. The export-import price, the income of the populace, and the preferences of the people of the export destination country will impact a country’s exports due match the demand for the product made in that nation (Fahad & Abdurrazaq, 2022; Saad et al., 2019).

The determination of Indonesia's export prices can be seen from the nation's trade currency's exchange rate with the price of its imported commodities. Besides being affected by factors originating from the export destination country. Exports demand is also affected by prices in the international market and exchange rates. Edwards (1989) explained that there are two types of external and domestic fundamentals. International prices, real interest rates and international remittances influence real exchange rates through external fundamentals. Meanwhile, breakdown of capital and exchange controls, import duties, import quotas, export duties, other taxes and subsidies, and government expenditures, and technological advancements are some domestic factors that affect the real exchange rate.

Rahardja & Manurung (2008) described that the demand for an item is affected by several things, including (1) the price of the item itself; (2) the price of other related goods; (3) the level of income per capita; (4) preferences or habits; (5) population; (6) forecasts of future prices; (7) income distribution; and (8) producers’ efforts to increase sales. Slowing economic growth in export destination countries can cause the purchasing power of people in the export destination countries to decline, thereby affecting the decline in export demand of a country. When the income level of a country experiences growth, the greater country’s ability to carry
out international trade, such as exports, will increase people's consumption behavior (Pratomo, Clara & Saputra, 2022).

The price at which the people of two countries have decided to conduct a trade is the currency exchange between the two nations (Mankiw, 2012). According to the study, real exports, real income, and relative price are correlated (Ya & Pei, 2022). The two parts of the exchange rate consists of nominal and real exchange numbers. In contrast to other exchange rates, which measure the cost of goods between the two nations, the nominal exchange rate measures the cost of relative exchange rates for money. Plus, Real Exchange Rates Mentions Conditions of Use, is the price at which goods from one country can be exchanged for goods from another country. As a result, trade exchange rate of a nation is always the opposite of the trade exchange rate of other nations, which is the trade exchange rate of other countries (reciprocal). An oil-exporting economy utilizing a set exchange rate regime is affected negatively by oil price shocks (Yilidrim & Arifli, 2021). By causing currency depreciation, these shocks dramatically change the macroeconomic conditions of the typical oil-exporting country. If crude oil export revenues decline, the trade balance will deteriorate when crude oil prices fall. As a result pressure on the nation's foreign exchange reserves and exchange rate will eventually compel the central bank to devalue the currency in order to maintain the country's trade balance. In general, a drop in oil prices could result in currency depreciation, which has a significant impact on the macroeconomy through a number of channels.

After cost elasticity cut-off was connected to a significant and positive number, our model concluded that exporting Asian goods may improve the quality of their products as a hedge against the appreciation of Asian currency. This is in reference to how financial strain and exchange rate fluctuations may affect their export quality. A probable explanation is that buyers frequently believe that expensive goods must be of a high caliber; as a result, overseas exporters frequently improve the caliber of their goods to reassure customers that their purchase was worthwhile. Additionally, when financial hardship increased, international exporters would improve the quality of their exports. The entry barrier for marginal exporters rises along with the possibility that they will exit the exporting industry as financial hardship rises. Businesses are forced to increase export quality by financial pressure. This model also predicts that as financial stress increases, international exporters would be more inclined to increase the extent of the export quality adjustment caused by exchange rate movement (Chen, Lu & Tian (2021).

Export prices are a reflection of each region's and nation's economic progress. Economic clout The conventional definition of "markets power" that appears in the literature on the subject is substantially narrower than the understanding of economic power (ridha et al., 2022). Economic strength also includes other factors, such as availability of market data (including availability of contemporary communication channels), degree of infrastructure development (transportation, minimal storage), degree of financial system development in addition to the share of market supply, which determines its impact on prices. Determinants for exports of certain countries and regions for a long period of time It can be acknowledged that the influence of export demand also affects the value of exports and their dynamics. in this case emphasizes the importance of a country's economic development as a differentiating factor that can affect an export value, demand and dynamics (Dudzinski & Knap, 2022).

3 METHOD

To examine the correlations throughout the long and short terms to variables, this research used an ARDL (Autoregressive Distributed Lag) model with panel data. This model explains how the autoregressive model uses one or more directions of past data from explanatory variables. The unit root test, determining how long the lag should be the cointegration test, and the ARDL estimation model were the analytical techniques used. The
first goal of this paper, which was to ascertain effects of long and short prices for mink, per capita income of export destination countries, and exchange rates on demand for patchouli oil exports, was satisfied by the ARDL estimation model. To examine the long- and short-term relationships between the relevant variables, the Panel ARDL method is used. Model Panel ARDL is described in this essay as follows:

\[ \Delta \ln P_{EXP,j,t} = \alpha_{o1} + \sum_{i=1}^{n} \alpha_{1i} \Delta \ln H_{P,i,t-1} + \sum_{i=1}^{n} \alpha_{2i} \Delta \ln GDPP_{i,t-1} + \sum_{i=1}^{n} \alpha_{3i} \Delta \ln EXCH_{i,t-1} + u_{j,t} \]  

(1)

**3.1 Unit Root Test**

The long-term relationship was identified through the cointegration approach. The observed data was tested for stationary behavior using the unit root test. Unit-root-containing variables or were not stationary would result in meaningless conclusions. Therefore, stationarity was an important condition. It was distinguished by a high R square and t statistics that seemed significant and, ultimately, would point in the incorrect direction and use improper policies. Unit root tests can be carried out using a variety of techniques, including as the Dickey-Fuller, ADF (Augmented Dickey Fuller Test), PP (Philip-Perron), and KPSS (Kwiatkowski Philips Schmidt Shin). The unit root test model in this study employed the PP (Phillips Perron) test model. Both the first difference and the second difference might be used if the data were not stationary at the increased level. The data under test was Stasioners if the PP absolute statistik number is higher than the essential number; alternatively, if the absolute value of the PP statistic was lower than the crucial value, the data was not stationary.

The data collected would be stationary if the mean and variance of the data were constant or if there was no systemic change over time. Stationarity test showed whether all variables in the analysis were stationary or not, using the Phillips-Perron (PP) Test. The first stage in conducting research using the Method ARDL is to determine whether something is true the data is stationary at the level, differencing 1 or differencing 2, because the ARDL method is not suitable for stationary data in differencing 2. The Phillip-Perron (PP) test may be considered as in the discussion below:

\[ \Delta Y_t = \eta_0 + \eta_1 t + \delta Y_{t-1} + u_t \]

Hypothesis tested:
H0: \( \delta = 0 \) (contains unit root, data is not stationary)
H1: \( \delta < 0 \) (does not contain unit root, data is stationary)
3.2 Determining Optimum Lag

In order to paint a realistic image of the link between research variables, the optimum lag test examined theory on the number of lags that is suitable for the model of analysis. Finding the lag at which a variable will yield the best estimate is crucial for the ARDL model. The Schwarz Criterion (SC) and the Akaike Information Criterion (AIC) were used to choose the ideal lag in the Autoregressive Distributed Lag Model. The number of lags was chosen if the size of a lag gave the model the minimum SC and AIC values (Wardhana et al., 2021).

3.3 Cointegration Test

Model cointegration test to assess whether the model had a long-term and short-term relationship or not was conducted by using the Cointegration Bound Test. According to ARDL, the cointegration bound test produced short-term and long-term models simultaneously. Economically, the two variables could be cointegrated if the variable had a Long term or balance between the two variables.

By contrasting the F-value statistic's with the F-table, the cointegration bound test was performed. It was determined that there was no cointegration because the F-statistic was less than the value of the lower bound. Whenever the F-statistic value exceeded the upper bound I(1), cointegration had taken place. The outcome was equivocal if the F-statistic was between the upper bound I(1) and lower bound I(0). The following was the hypothesis for this F test:

$H_0 : \theta_1 = \theta_2 = \theta_n = 0$; no long-term relationship (not cointegrated)

$H_1 : \theta_1 \neq \theta_2 \neq \theta_n \neq 0$; there is a long-term relationship (cointegration)

Since $H_0$ could not be rejected if the F-statistic value was lower than the lower limit value, cointegration was not present. On the other hand, the $H_0$ was rejected, indicating that cointegration had taken place, if the F-statistic value exceeded the upper limit value. However, it was inconclusive whether the F-statistic fell in the range of the lower and upper limit values.

4 RESULTS AND DISCUSSIONS

Panel Autoregressive Distributed Lag Approach (ARDL) was the model used in this study. Whether or not the regressors or explanatory variables are I(0) or I(1), consistent estimates with good long-term coefficients are produced by the ARDL method (1). A regression model called the distributed lag model explains how the independent variable and dependent variable interact for one period and previous periods and the dependent variable for one period. The stationarity test was run to see if the variables formed a unit root. The stationary data existed since non-stationary data prevented the retrieval of the regression outcomes. The Levin, Lin, Chu test statistical approach was used for the stationarity test in this study.

The results in Table 1 illustrate that the stationarity of each variable varies in The first and second differences (I(1) and I(2)). The PEXP variable was stationary in the first difference at -3.4416 (0.0003), the GDPP variable was stationary at the first difference at -4.52490 (0.000), and the At the initial difference, the exchange rate was stationary at -4.33695 (0.000). While the Patchouli Oil Price (HP) variable stationarity in the second difference at -2.82247 (0.0024).

The Panel ARDL model may be employed in this investigation because there were discrepancies in stationarity. This survey's findings align with those of Sugeti et al. (2017), who found that the product price variable possesses a negative and significant undertone PT Apparel One Indonesia's export volume. This increases the export price of Man Polo Shirt Products, which will reduce the export volume of these goods at each additional price. According to Ginting (2013), Chairperson of the Indonesian Entrepreneurs Association (Apindo) Sofjan Wanandi stated that due to the influence of domestic internal factors, Indonesia will have
difficultly increasing export volumes. An increase in the exchange rate of $1 will increase the quantity exports by 2.1 million dollars in terms of output. Increases in the Basic Electricity Tariff (TDL), Provincial Minimum Wage (UMP), and fuel prices will indirectly have an impact on production costs. As a result, it is increasingly difficult for domestic products to compete with international products in the market.

Table 1. Panel Unit Root of Levin, Lin, Chu Test Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Individual Intercept</th>
<th>First Difference</th>
<th>Second Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEXP</td>
<td>-0.60598 (0.2723)</td>
<td>-3.44146 (0.0003)</td>
<td></td>
</tr>
<tr>
<td>HP</td>
<td>-0.93145 (0.1758)</td>
<td>-0.82399 (0.2050)</td>
<td>-2.82247 (0.0024)</td>
</tr>
<tr>
<td>GDPP</td>
<td>0.57496 (0.7173)</td>
<td>-4.52490 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>EXCH</td>
<td>3.69605 (0.9999)</td>
<td>-4.33695 (0.0000)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Data processing, 2022 (processed)

The results in Table 1 illustrate that the stationarity of each variable varies in the first difference (I (1)), and second difference level (I (2)). The PEXP variable was stationary in the first difference at -3.4416 (0.0003), the GDPP variable was stationary at the first difference at -4.52490 (0.000), and at the initial difference, the exchange rate remained unchanged at -4.33695 (0.000), while the other variables were stationary HP. in the second difference at -2.82247 (0.0024). Because there were differences Panel ARDL, a stationeritas model, is frequently used in this study.

This study used the AIC (Akaike Information Criteria) value to calculate the perfect lag. According to the AIC criteria, the ARDL Panel is the lag in this study that creates the best model (1.2.2.2). The model's cointegration test came next. The non-stationary variables were tested for cointegration to see if they were or were not.

Table 2. Cointegration Panel

<table>
<thead>
<tr>
<th>Pedroni Cointegration Test</th>
<th>Statistic</th>
<th>Weighted Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel v-Statistic</td>
<td>-0.6854 (0.7535)</td>
<td>-0.7103 (0.7613)</td>
</tr>
<tr>
<td>Panel rho-Statistic</td>
<td>0.5894 (0.7222)</td>
<td>0.6205 (0.7326)</td>
</tr>
<tr>
<td>Panel PP-Statistic</td>
<td>-1.8635 (0.0312)</td>
<td>-1.6354 (0.0510)</td>
</tr>
<tr>
<td>Panel ADF-Statistic</td>
<td>-2.5017 (0.0062)</td>
<td>-2.6147 (0.0045)</td>
</tr>
<tr>
<td>Group rho-Statistic</td>
<td>1.2391 (0.8924)</td>
<td></td>
</tr>
<tr>
<td>Group PP-Statistic</td>
<td>-1.9012 (0.0286)</td>
<td></td>
</tr>
<tr>
<td>Group ADF-Statistic</td>
<td>-2.8926 (0.0019)</td>
<td></td>
</tr>
</tbody>
</table>

KAO Cointegration Test

<table>
<thead>
<tr>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF</td>
</tr>
</tbody>
</table>

ADF: -4.8800 (0.000)

Source: Data Processing, 2022 (processed)

The Pedroni Panel and KAO Based Cointegration, cointegration test used in this study sought to observe multiple integrated variable integrations with varying orders I(0) or I(1) (Badalayan et al., 2014). Table 2 shows the outcomes between the cointegration panel test PEXP, HP, GDPP, EXCH, and C were significant on the KAO Co-integration Test of -4.8800 (0.000). Thus this Panel ARDL model cointegrated the short term to the long term.
Table 3. ARDL Panel Regression Results

<table>
<thead>
<tr>
<th>Estimate</th>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Run</td>
<td>HP</td>
<td>-1.032614</td>
<td>-66.94224</td>
<td>0.0000*</td>
</tr>
<tr>
<td></td>
<td>GDPP</td>
<td>2.487267</td>
<td>3.463518</td>
<td>0.0023*</td>
</tr>
<tr>
<td></td>
<td>EXCH</td>
<td>0.209422</td>
<td>3.517885</td>
<td>0.0020*</td>
</tr>
<tr>
<td>Short Run</td>
<td>C</td>
<td>15.469369</td>
<td>4.344501</td>
<td>0.0003*</td>
</tr>
<tr>
<td></td>
<td>ΔHP</td>
<td>-0.100216</td>
<td>-0.387644</td>
<td>0.7022</td>
</tr>
<tr>
<td></td>
<td>ΔHP (-1)</td>
<td>-5693E-05</td>
<td>-0.000542</td>
<td>0.9996</td>
</tr>
<tr>
<td></td>
<td>ΔGDPP</td>
<td>2.702135</td>
<td>0.876164</td>
<td>0.3909</td>
</tr>
<tr>
<td></td>
<td>ΔGDPP (-1)</td>
<td>-1.964315</td>
<td>-0.375154</td>
<td>0.7113</td>
</tr>
<tr>
<td></td>
<td>ΔEXCH</td>
<td>-0.129738</td>
<td>-0.407624</td>
<td>0.6877</td>
</tr>
<tr>
<td></td>
<td>ΔEXCH(-1)</td>
<td>0.155825</td>
<td>0.631213</td>
<td>0.5347</td>
</tr>
<tr>
<td></td>
<td>ECT (-1)</td>
<td>-0.831387</td>
<td>-4.009793</td>
<td>0.0003*</td>
</tr>
</tbody>
</table>

Source: data processing results, 2022 (processed)
Note: *significance level of 5%

The panel ARDL regression was considered because there was a negative and significant shock in the Error Term coefficient. Thus, this Panel ARDL model met the requirements, so it could be used as a model to analyze the relationship between export demand and independent variables that included patchouli oil prices, per capita income of exporting nations, and the real exchange rate depicted in the following Table 3.

Considering the Panel's findings ARDL estimation in the long term above, it stated that the variable price of patchouli oil had a significant negative impact in the long term of -1.032614 (0.0000), this meant that if the price of patchouli oil increased by 1 percent, the demand for patchouli oil exports decreased by 1.03 percent. For the variable of income per capita of the exporting nation, it had a significant positive impact in the long term of 2.487267 (0.0023). It meant that if the income per capita in the export destination nation increased by 1 percent, the demand for patchouli oil exports would increase by 2.48 percent. While the real exchange rate had a significant long-term positive impact term of 0.209422 (0.0020), this meant that if the real exchange rate were appreciated by 1 percent, the demand for patchouli oil exports would increase by 0.20 percent.

In the short term, the patchouli oil price variable was not significant because it had a probability of 0.70222, which meant that the patchouli oil price changes had no impact on the variable demand for patchouli oil exports. This estimate's outcome is consistent with studies conducted by Haryadi & Nopriyandi (2017).

These results contradict the research of Ningtias & Bachtiar (2022), which claimed that the export of Indonesia's crude palm oil was positively impacted in the short term by India's GDP per capita. According to Wang, et al contribution, the real exchange rate had a significant positive impact on GDP per person. However, when it came to the consumption of renewable energy, all but the initial production of other liquid biofuels were found to have a significantly positive impact on output growth.

The real exchange also had no effect on the demand for patchouli oil exports because it had a probability of 0.5347. The study's findings are consistent with the theory and research results of Elisha (2015), which stated that the short-term estimation results, The fluctuation in the ratio of the rupiah to the US dollar had little impact on Indonesian coffee shipments to the US. The outcomes of research by Galih & Setiawina (2014) stated that the results obtained by the The value of the US dollar did not affect the volume of Indonesian coffee exports from 2001-2011. if the rate of the US dollar got stronger, then the ability of foreign countries to import from Indonesia would also increase. The study's Observations support the theory and research results Yildirim & Arifli (2021), which clearly said that the following sums up our findings by negative shock to the price of oil, a worsening of the trade deficit, and a declining
real exchange rate creates inflationary and recessionary pressures. A negative shock to the exchange rate creates stagflationary pressures, or a decline in economic activity and export. Oil price shocks' effects on inflation and the economy are shaped by an increase in inflation and a worsening in exports.

The value of the ECT-1 coefficient, which also served to determine how quickly short-term to long-term balance adjustments occurred, is shown in Table 3. The ECT-1 was -0.831387, which meant that if there were a shock or fluctuation in the speed of adjustment, it would be adjusted for 303 days. The value ECT-1 coefficient negative mean that model show cointegrated in short run, in speed of adjustment toward equilibrium 83.14 percent. In one year 365 days, so ECT-1 0.831387 can get 305 days adjustment.

The long-term outcomes of this study are consistent with those of previous studies from Nugraheni et al. (2021), Wahyudi et al. (2021) showed that partial GDP per capita had no effect on export demand. The instability of the world economy after the 2008 global financial crisis was a factor. Global currency crisis that occurred in 2008, with Subprime Mortgages as the initial trigger, had the impact of causing the global economy to falter in both the financial and real sectors. In contrast to the research results from Ringga et al. (2022). Wicaksana et al. (2022) stated that the estimation observations indicate that the GDP per capita of export destination countries significantly negatively impacted the number of exports of Indonesian fishery commodities. Indonesia's GDP per capita reflected an increase in people's welfare which had implications for the increasing economy. This research is inconsistent with Kadigi, et al. (2020) a claim was made The fact that there is no significant relationship between PDB per capita and the cost of coffee, the cost of coffee exports, and the proportion of coffee exports in a given nation's total exports indicates that neither production nor export of coffee is a significant economic factor in developing countries.

The dependence of income and export growth rates is statistically significant in PDB per capita (GDPPC) Category: PBB Economics and Trading Practices non-parametric test of income (BEC). These results demonstrate that export increase affected income over the research period. The independence correlation test shows a strong positive relationship with export earnings and growth, with the exception of the primary energy category (Somwaru, et al, 2018)

The long-term outcomes of this research are consistent with Istiafani & Woyanti (2019), where the export price variable significantly impacts exporting of Indonesian paper to Australia, Hong Kong, Taiwan, Singapore, and Japan. This meant that an increase in prices would increase the number of Indonesian paper exports. This was different from the results of Meidrieswida (2019) that the world cocoa price had no effect on the demand for cocoa exports in Indonesia. This was because the demand for cocoa exports had decreased in the last 15 years, and more cocoa was exported in processed form

Over time, there will likely be a negative correlation between prices for alcohol and food. In addition, In light of the numerous disagreements that exist In accordance with the literature on the relationship between the price of food and the price of oil, this study emphasizes that the movement of causality between the price of food and the price of oil is unidirectional, with the causality originating from the price of food to the price of oil. In that circumstance, the sample countries' energy markets are significantly influenced by the agriculture markets (Chen, et al., 2021). The long-term findings of this study are consistent with (Olayungbo, 2021) which finds a short-term negative association between the price of oil and food but a long-term direct relationship. In that circumstance, the energy markets in the sample nations are significantly influenced by the agriculture markets. As a result, this study adds to the body of knowledge on the connection price of food and price of beer in emerging nations that export oil while importing food.

According to Nainggolan et al. (2021) and the long-term estimation in thi study, the value of the rupiah has a considerable impact on the volume of exports from Indonesia, where
exchange rates influence the low or high price of commodities being traded. In this case, the government and Bank Indonesia were expected to keep the rupiah exchange rate stable compared to the USD to maximize the commodities traded in the international market. Because the exchange rate continued to experience depreciation would also affect credit growth and increase domestic interest rates. In contrast to the research by Risma et al. (2019) that the variables of GDP, credit interest rates, and real exchange rates affected exports for four years. That meant the fluctuations that occurred to the three independent variables would impact after four years.

5 FINAL CONSIDERATIONS

This study compares the effects of short term and long term patchouli oil export demand and patchouli oil price variables, the per capita income of the main export destination countries, and Indonesia's real exchange rate. The panel ARDL regression was considered because there was a negative and significant shock in the Error Term coefficient. Thus, this Panel ARDL model met the requirements, so it could be used as a model to analyze the relationship between export demand and independent variables that included patchouli oil prices, per capita income of exporting nations, and the real exchange rate. Through the Panel ARDL approach, we can conclude that prices can vary depending on patchouli oil is significantly negative on demand for patchouli oil exports in the long term.

The income per capita variable of the export nation's destination significantly positively affects the demand for patchouli oil exports in the long term. However, in the near future, it is not significant. The demand for patchouli oil exports is positively impacted by the real currency rate significantly over the long run, but not significantly so over the short term.

Several policies can be applied to increase demand for Indonesian patchouli oil exports. For the Indonesian government, it is recommended to carry out more intensive policies regarding the patchouli oil price variable to increase demand for patchouli oil exports in various countries so that the dispute between world prices and export prices can be adjusted. It is also recommended that the central or regional governments establish various cooperations between countries so that world patchouli oil prices remain stable, hoping to increase state revenues and demand for Indonesian patchouli oil exports. For researchers, it is recommended to add other variables that can affect export demand and use a more significant amount of data, more in-depth, and offering solutions to the fluctuating export demand research can be achieved.

The Indonesian government is advised to carry out more intensive policies on the patchouli oil price variable to increase demand for patchouli oil exports in various countries so that the gap between world prices and export prices can be adjusted. It is also recommended that the central or regional government be able to establish various cooperations between countries so that world patchouli oil prices could remain stable, with the hope of increasing state revenues and demand for Indonesian patchouli oil exports.

REFERENCES


Demand for Indonesian Patchouli Oil Exports: the Panel Autoregressive Distributed Lag (Ardl) Approach


