

## DETERMINATION ANALYSIS OF INDONESIAN PALM OIL COMMODITIES IN THE COVID-19 PANDEMIC ERA ON INDONESIAN PER CAPITA GDP AND EXPORT TAX REVENUES

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### ABSTRACT

**Background:** The fundamental problem faced in the process of economic transformation in Indonesia is that the GDP growth of the agricultural and plantation sectors is still relatively low and the contribution of tax revenue from exports has not been optimal, especially in the midst of the Covid-19 pandemic era.

**Aim:** The data is compiled in the form of panel data consisting of 10 provinces producing the largest production of palm oil in Indonesia and with a time series of research period 2012-2021. The research model was formulated as a linear model and analyzed recursively using linear regression using the ordinary least squares method (OLS).

**Method:** This study uses the explanatory method to explain the causal relationship in Indonesia's GDP growth model per capita and Indonesia's export tax revenue through hypothesis testing.

**Findings:** The research findings are that production, selling prices, exchange rates, and exports have a simultaneous effect on Indonesia's GDP per capita and export tax revenues. In part, Indonesia's GDP per capita is more determined by production, selling prices, and exchange rates. Meanwhile, some export tax revenues are more influenced by production and selling prices.

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### KEYWORDS

*Production, Selling Price, Exchange Rate, Export, Indonesian GDP Per Capita, Export Tax Revenue*

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## INTRODUCTION

The outbreak of the Coronavirus Disease pandemic at the end of 2019 or better known as Covid-19 which is thought to have originated from the city of Wuhan, China's Hubei Province, which spread very quickly throughout the world. The number of positive cases is increasing exponentially. From tens of patients in January 2020 to more than six million in early June 2020 ([World Health Organization 2021](#)). After the determination of Covid-19 as a pandemic, many countries carry out disease containment through restrictions on activities, travel, and physical contact and even lockdowns. This activity restriction policy aims to reduce the spread of the epidemic, but triggers a sharp weakening of the world economy, causing supply chain disruptions, reducing production and public consumption activities, increasing unemployment, and correcting economic growth ([Schneeweiss, Murtaugh, and Economics 2020](#)). The world economy is even predicted to grow negatively in 2020. The performance of manufacturing and services weakened sharply, causing millions of people to lose their jobs. The Indonesian government has taken steps through monetary and fiscal policies by implementing ultra-accommodative policies on a scale that goes beyond the era of the global financial crisis. On the one hand, these policies can withstand further economic downturn and create financial market stability. But on the other hand, it also contains risks that need to be observed and mitigated. Governments in various countries, especially emerging countries, need

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to maintain fiscal sustainability, monetary policy credibility, and continue structural reforms to strengthen economic resilience in the face of various future risks.

In Indonesia, the agriculture and plantation sector is one of the sectors least affected by the Covid-19 pandemic compared to other sectors. In the midst of the weakening of the national economy due to the Covid-19 pandemic, agricultural and plantation exports continued to show good performance (Yuana, Kholifah, and Anas 2020). This is evidenced that in April 2020 agricultural and plantation exports amounted to US\$ 0.28 billion or grew 12.66% compared to the same period last year (Warta Ekonomi online, 02 June 2020). According to the analysis of the SGD's Center UNPAD, this is due to the minimal impact of social restrictions in the agriculture and plantation sectors, although there are still risks from supply chain disruption and declining demand (Yusuf et al. 2020). The impact of social restrictions on agriculture and plantations is small because the centers of agricultural and plantation production are not in densely populated areas, but in rural areas. In addition, agricultural and plantation commodities have a low elasticity of demand, so there is no spike in demand in a short time. Indonesia's economic data shows that the agricultural and plantation sectors can still grow positively during the Covid-19 pandemic. Economic performance in the agriculture and plantation sectors was able to grow by 1.77% (yoy) in 2020 and 1.84% (yoy) in 2021 where the Covid-19 pandemic was in turmoil. Looking at the facts and existing data, the agriculture and plantation sector is one of the mainstay candidates in revitalizing the Indonesian economy, especially in the 10 largest provinces in Indonesia that produce oil palm plantation commodities, namely the provinces of Aceh, Sumatera Utara, Sumatera Barat, Riau, Jambi, Sumatera Selatan, Kalimantan Barat, Kalimantan Tengah, Kalimantan Selatan, and Kalimantan Timur which can provide opportunities for farmers to earn larger incomes in a short time. This sector has proven to be a buffer sector during the 1997-1998 monetary crisis. To make the agricultural and plantation sectors a leading sector to revive the Indonesian economy, a number of strategies are needed.

**Table 1.** Production and Export Development of Oil Palm Plantation Commodities in Indonesia in 2012-2021

Economic Factor	Years	THE LARGEST COMMODITY OF PALM OIL (CPO) IN INDONESIA BY PROVINCE										TOTAL	
		ACEH	SUMATERA UTARA	SUMATERA BARAT	RIAU	JAMBI	SUMATERA SELATAN	KALIMANTAN BARAT	KALIMANTAN TENGAH	KALIMANTAN SELATAN	KALIMANTAN TIMUR		LAINNYA
Palm Oil Production (Tons)	2012	654.800	3.975.430	930.120	6.384.540	1.718.290	2.492.900	1.830.860	2.958.280	1.233.080	1.298.140	2.539.080	26.015.520
	2013	817.550	4.549.200	1.022.330	6.647.000	1.749.620	2.690.620	1.794.470	3.127.140	1.244.040	1.349.780	2.790.270	27.782.000
	2014	945.600	4.870.200	924.800	6.993.200	1.773.700	2.791.300	1.945.500	3.158.200	1.460.600	1.407.300	2.987.300	29.278.200
	2015	896.500	5.193.100	926.600	6.059.800	1.794.900	2.821.900	2.168.100	3.573.000	1.049.500	1.586.600	3.000.200	31.070.000
	2016	732.700	3.983.700	1.183.100	7.668.100	1.435.100	2.929.500	2.192.600	4.260.100	1.750.400	2.358.400	3.237.300	31.731.000
	2017	867.300	4.852.000	1.209.200	7.591.200	1.783.000	2.987.000	2.529.000	5.209.800	1.560.100	2.538.700	3.813.000	34.940.300
	2018	1.037.400	5.737.300	1.248.300	8.496.000	2.681.300	3.793.600	3.086.900	7.230.100	1.454.200	3.788.500	4.311.900	42.883.500
	2019	1.133.300	5.647.300	1.253.400	9.512.900	2.864.400	4.049.200	5.233.300	7.664.800	1.665.400	3.988.900	4.085.300	47.120.200
	2020	1.134.600	5.776.800	1.312.300	9.984.300	3.022.600	4.267.000	5.471.400	7.685.800	1.561.100	3.823.200	4.257.800	48.296.900
	2021	1.036.100	5.310.900	1.352.000	8.629.100	2.575.100	3.062.400	5.835.900	8.600.900	1.212.800	3.808.700	4.799.400	46.223.300
CPO Export (Tons)	2012	498.214	3.006.551	703.434	4.828.520	1.299.514	1.885.338	1.384.649	2.237.297	932.558	981.761	1.920.263	19.675.100
	2013	640.641	3.564.888	801.128	5.208.787	1.371.054	2.108.450	1.406.200	2.430.520	974.867	1.057.728	2.186.538	21.770.800
	2014	774.154	3.987.172	797.122	5.725.246	1.452.096	2.285.612	1.609.131	2.885.579	1.195.775	1.152.139	2.445.866	23.969.700
	2015	798.241	4.624.951	825.226	7.178.021	1.598.530	2.513.171	1.920.900	3.182.097	934.680	1.413.019	2.671.964	27.670.800
	2016	555.719	3.021.453	897.327	5.815.900	1.088.457	2.221.891	1.662.986	3.231.089	1.327.598	1.788.738	2.455.343	24.065.500
	2017	714.145	3.995.195	995.670	6.250.685	1.468.144	2.459.832	2.082.409	4.289.812	1.284.605	2.090.396	3.139.670	28.770.264
	2018	708.858	3.920.311	852.966	5.805.337	1.838.972	2.592.176	2.109.286	4.940.345	1.000.491	2.587.325	2.946.332	29.302.400
	2019	710.664	3.541.281	785.976	5.965.302	1.808.735	2.539.152	3.282.926	4.806.405	1.044.331	2.501.340	2.561.790	28.547.900
	2020	641.950	3.268.479	742.492	5.649.058	1.710.169	2.414.243	3.095.686	4.348.580	883.261	2.163.144	2.409.038	27.326.100
	2021	602.915	3.090.454	786.739	5.021.341	1.498.471	1.782.035	3.395.956	5.004.931	705.738	2.116.312	2.792.808	26.897.700

Source: BPS data presented by researcher, 2022

Exports and tax revenues play an important role in the economic activities of a country. Exports will generate foreign exchange which will be used to finance imports of raw materials and capital goods needed in the production process which will form added value. The aggregation of added value generated by all production units in the economy is the value of the Gross Domestic Product (GDP). Taxes are used to carry out development in Indonesia. The Ministry of Industry through the policy of the acceleration and expansion strategy of agro-industry seeks to encourage the development of supporting infrastructure in line with the

Master Plan for the Expansion and Acceleration of Indonesian Economic Development (MP3EI).

**Table 2.** Development of Exchange Rate, CPO Selling Price, Indonesia's GDP Per Capita and Indonesia's

Years	Exchange Rate	Selling Price Per Ton	Indonesia's GDP Per capita (IDR)	Export Tax (Billion in IDR)
2012	9.670	8.651.202	35.100.000	21.238
2013	12.189	9.398.958	38.370.000	15.835
2014	12.440	9.660.972	41.900.000	11.329
2015	13.795	8.189.516	45.120.000	3.727
2016	13.436	8.913.824	47.960.000	2.999
2017	13.548	9.578.568	51.890.000	4.147
2018	14.481	8.845.437	55.990.459	6.765
2019	13.901	7.327.077	59.065.349	3.527
2020	14.105	9.520.298	56.000.000	4.278
2021	14.269	15.127.494	62.200.000	18.000

Source: BI data presented by researcher, 2022

One of the strategies taken by the government is to provide disincentives in the form of export duties on exported raw goods. The export tax policy is considered as one of the most effective policy options to control the export of agro-industry raw materials. To prevent shortages in raw material availability, the Indonesian government implemented a crude palm oil (CPO) export tax policy from 5% in January to 40% in April and 60% in July 1998. This tax stipulation was adjusted to changes in current world prices. that. One of the implementations of the export tax is to maintain the availability and stabilization of domestic cooking oil prices and the price of cooking oil begins to fall, the government again reduces export taxes gradually (Munadi 2007). In addition to exports and tax reven Boediono ues, the exchange rate (exchange rate) also affects the magnitude of economic growth. In an open economy, the growth rate will also be influenced by the exchange rate. The effect of the exchange rate on the growth rate can be seen either through the aggregate supply (AS) channel, namely through the formation of capital and aggregate demand (AD), namely through international trade and investment transactions.

Based on the background of the problems above, it can be identified the problems of Indonesia's economic growth, namely Indonesia's economic growth rate was corrected during the Covid-19 pandemic era; export tax revenues have increased; one of which was contributed by the oil palm plantation sector commodity during the Covid-19 pandemic era; the production performance of the agricultural and plantation sectors grew positively in the midst of the Covid-19 pandemic era; the price of oil palm plantation commodities experienced an upward trend during the Covid-19 pandemic era; the exchange rate (exchange rate) experienced fluctuations in the weakening of the rupiah currency during the Covid-19 pandemic era; and the export performance of oil palm plantation commodities has increased in the midst of the Covid-19 pandemic era, so from the identification of these problems, problems can be formulated, namely:

1. How is the effect of production, selling price, exchange rate and exports of palm oil commodities simultaneously on Indonesia's GDP per capita in 2012-2021?
2. How is the effect of production, selling price, exchange rate and exports of palm oil commodities partially on Indonesia's GDP per capita in 2012-2021?
3. How is the effect of production, selling price, exchange rate and exports of palm oil commodities simultaneously on Indonesia's export tax revenue in 2012-2021?
4. How is the effect of production, selling price, exchange rate and exports of palm oil commodities partially on Indonesia's export tax revenue in 2012-2021?

## METHOD

Framework consists of relevant variables, the relationship between variables, a framework of thought, and the formulation of the research model (Jaya 2020). The framework is based on

theoretical studies and the results of previous research. The theoretical studies in question are economic growth theory, export tax revenue theory, production theory, price theory, currency exchange rate theory and commodity export theory.

Operational Definition in the study consisted of the independent variable (X) and the dependent variable (Y), namely:

1. Production ( $X_1$ ) is the number (volume) of units produced from the Indonesian plantation sector in the form of oil palm.
2. Selling Price ( $X_2$ ) is the commodity price prevailing in the international market in the context of selling exports of agricultural and plantation commodities.
3. Exchange Rate ( $X_3$ ) is the exchange rate of other countries' currencies which are converted into Rupiah.
4. Export ( $X_4$ ) is a foreign trade activity in the form of selling domestic crude palm oil (CPO) products in the currency of another country.
5. GDP of Agriculture and Plantation Sector ( $Y_1$ ) is Indonesia's long-term per capita output of economic activity accumulated from year to year, as measured by Gross Domestic Product (GDP) per capita.
6. Export Tax Revenue ( $Y_2$ ) is tax revenue sourced from commodity export activities or foreign trade.

Relevant Variables In this study, the production of oil palm plantations, the selling price of crude palm oil (CPO) commodities, the rupiah exchange rate against the dollar and the export value of crude palm oil (CPO) commodities function as independent variables. Meanwhile, Indonesia's GDP per capita and Indonesia's export tax revenues function as dependent variables. The theoretical framework and the relationship between variables are described as follows (Sanyoto 2018).

1. The Relationship of Production, Selling Prices, Exchange Rates, Exports to Indonesia's GDP

One form of international business activity is export. Export is selling products made in one's own country for use or resale in other countries (Griffin and Pustay 2015). Exports generally play a significant role in contributing to the country's foreign exchange reserves. Indonesia is one of the countries that carry out export activities. The diversity of export commodities exported by Indonesia is due to the diversity of abundant resources owned by Indonesia. One of the leading export commodities of Indonesian plantations is the export of palm oil in crude palm oil (CPO) products. Indonesia as a CPO commodity exporting country must be able to compete with other countries (Malaysia, Thailand, Colombia, and Nigeria) in order to become the main commodity of choice chosen by palm oil importing countries, rubber, and white pepper. Increasing exports of palm oil (CPO) can be done by focusing on the factors that affect exports. Several factors that affect the GDP of the agricultural and plantation sectors are the volume of production, international selling prices, exchange rates (exchange rates), and the value of exports and imports. Production is one of the factors that affect exports. Production is an activity that converts inputs into outputs (Sugiarto et al. 2005). Input can be in the form of capital, labor, land, and natural resources, while output is a product that has added value after production. The quality and quantity of products produced can affect the demand and supply of exports. International selling prices are another factor affecting exports. If the price of an item increases, then producers tend to increase the number of goods produced (Rahardja and Manurung 2010). Fluctuations in the international selling price of palm oil (CPO) will affect CPO exports from Indonesia. Another factor that deserves attention because it affects other exports is the exchange rate (exchange rate). The exchange rate can affect the purchasing power of importers as well as the cost of producing commodities carried out

by exporters. Exchange rate fluctuations will cause instability in the export market. Indonesia as an exporting country needs to make an appropriate exchange rate policy in order to trigger an increase in exports. Mistakes in decision-making in making policies will be able to reduce exports which can harm Indonesia. The export of palm oil (CPO) commodities is a very promising prospect for Indonesia. The increase in the export of these commodities can encourage state income obtained through exports or as state foreign exchange. This promising prospect in order to be realized requires careful planning and supervision. Exports of palm oil products (CPO) are also required to increase competitiveness in order to be able to compete with other palm oil exporting countries.

2. Relationship of Production, Selling Price, Exchange Rate and Export to Export Tax Revenue. The tendency to increase the volume of palm oil production has an impact on the export of upstream products from Indonesia, namely crude palm oil (CPO), which has prompted the government to implement an export tax imposition policy. The application of the Export Tax in Indonesia aims to maintain the availability of raw materials and encourage the downstreaming of the domestic palm oil industry (Warta Bea Cukai, 2015). Export taxes are usually applied by countries that still rely on primary raw materials in international trade with the aim of protecting the need for raw materials in the domestic market. Export taxes are levied on commodity prices on goods sold to world markets. This policy research on the impact on price changes has been carried out with varying results depending on the type of country implementing it. Export taxes applied by countries with small market shares do not affect international markets, in contrast to countries with large market shares that are able to affect international market conditions (Solleder 2013). The economic development targets set by the government are directed at promoting economic growth. The decline in economic growth will be transmitted into a decrease in tax revenue. Efforts to support the achievement of economic development targets are to maintain the stability of macroeconomic indicators, one of which is the macroeconomic indicator of the rupiah exchange rate (exchange rate) (Ministry of Finance, 2008). A weakening exchange rate against foreign currencies or a depreciation will result in an increase in the prices of goods and services consumed by the public. This will affect people's purchasing power because the price of goods and services has increased while the level of people's income tends to be constant or fixed. People's purchasing power or consumption which is influenced by the rupiah exchange rate will ultimately affect tax revenues. Research conducted by Salawati (2008) shows that the exchange rate has a significant effect on VAT receipts. Research conducted by Hamzah and Suryowibowo (2005) and Agbeyegbe et al. (2006) also shows that the exchange rate has an effect on tax revenue. Research conducted by Salawati (2008) shows that the exchange rate has a significant effect on VAT receipts. Research conducted by Hamzah and Suryowibowo (2005) and (Agbeyegbe, Stotsky, and WoldeMariam 2006) also shows that the exchange rate has an effect on tax revenue. Research conducted by Salawati (2008) shows that the exchange rate has a significant effect on VAT receipts. Research conducted by Hamzah and Suryowibowo (2005) and (Agbeyegbe et al. 2006) also shows that the exchange rate has an effect on tax revenue.
3. Research Paradigm based on theoretical studies, previous research, relevant variables, and descriptions of relationships between variables, the research paradigm as a model of functional relationships between variables in this study is as follows:

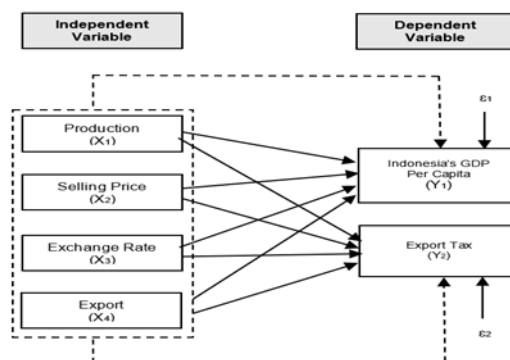


Figure 1. Research Framework

Information :

—————▶ : Partial Influence    - - - - -▶ : Simultaneous Effect

4. Model Formulation functional relationship between variables, as shown by the research paradigm above, is formulated as a recursive linear function, namely:

$$Y_1 = \beta_{01} + \beta_{11}X_1 + \beta_{21}X_2 + \beta_{31}X_3 + \beta_{41}X_4 + \varepsilon_1 \quad (1)$$

where :  $\beta_{11}, \dots, \beta_{41} > 0$

$$Y_2 = \beta_{02} + \beta_{12}X_1 + \beta_{22}X_2 + \beta_{32}X_3 + \beta_{42}X_4 + \varepsilon_2 \quad (2)$$

where :  $\beta_{12}, \dots, \beta_{42} > 0$

Information :

$X_1$ : Production	$X_4$ : Export
$X_2$ : Selling Price	$Y_1$ : Indonesia's GDP Per capita
$X_3$ : Exchange rate	$Y_2$ : Export Tax Revenue

The model formulation above shows the form of an econometric causal relationship between palm oil production factors, the selling price of CPO commodities, the rupiah exchange rate against the dollar and the export value of CPO commodities that affect Indonesia's GDP per capita and Indonesia's export tax revenue.

5. Hypothesis based on the formulation of the problem and the framework of the research hypothesis can be derived as follows:
- Production, selling prices, exchange rates, and exports have a simultaneous effect on Indonesia's GDP per capita in 2012-2021.
  - Production, selling prices, exchange rates, and exports have a partial positive effect on Indonesia's GDP per capita in 2012-2021.
  - Production, selling price, exchange rate and exports have a simultaneous effect on Indonesia's export tax revenue in 2012-2021.
  - Production, selling price, exchange rate and exports partially positive effect on Indonesia's export tax revenue in 2012-2021.
6. Data Collection Technique used in this study is secondary data which is panel data, which is a combination of cross section data and time series data. The data collected is sourced from the Central Statistics Agency, Bank Indonesia, the Ministry of Trade, BAPPEBTI, online mass media and other sources of information published to the public using data. The data available is annual data, between the years 2012-2021. The selection of this time period is based on the consideration that it covers the conditions and situation of the Indonesian economy, especially the 10 largest palm oil producing provinces in Indonesia, both before the Covid-19 pandemic and in the midst of the Covid-19 pandemic era. The

data used in this study include data on oil palm production, commodity selling prices, the rupiah exchange rate against the dollar, the value of commodity exports, Indonesia's GDP per capita, and Indonesia's export tax revenue for 2012-2021.

7. Analysis Design used is Multiple Linear Regression Analysis (Multivariate Linear Regression Analysis) to test hypotheses about the effect of production, selling price, exchange rate and export of palm oil on Indonesia's GDP per capita and Indonesia's export tax revenue in 2012-2021. Regression model is used to analyze the relationship pattern of several independent variables with the dependent variable for the purpose of predicting changes in the dependent variable on the basis of changes in the independent variables. Regarding the adequacy of data, the Ordinary Least Square (OLS) method requires that the amount of data used must be greater than the total number of variables involved in the model ([Gujarati 2022](#)). The model in this study consists of four independent variables (production, selling price, exchange rate and export value of palm oil commodities) and two dependent variables (Indonesian GDP per capita and Indonesian export tax revenue). Thus, the amount of data is  $n$  where  $n > 6$  has met the adequacy of the data as required. In this study the amount of data used is  $n = 100$ . The data processing process for all analyzes in this study was carried out using the e-views 10 software program. The assumptions that are prerequisites for using Ordinary Least Square (OLS) in linear regression are classical assumptions regarding the residual (error term) or disturbance term that must be met. Tests regarding the presence or absence of violations of these assumptions are carried out before the model output is analyzed. The assumptions tested include the normality of the residual distribution, the absence of multicollinearity situations that damage the model, the absence of autocorrelation situations, and the absence of heteroscedasticity
8. Hypothesis Testing Design of the regression equations in each model were tested by means of multiple linear regression coefficients, either simultaneously or partially with the following statistical hypotheses:

Hypothesis 1:

H0 :  $\beta_{11} = \beta_{21} = \beta_{31} = \beta_{41} = 0$ ; Production, Selling Prices, Exchange Rates and Exports have no simultaneous effect on Indonesia's GDP per capita.

H1 : there is at least one  $\beta_{i1} \neq 0$ ; Production, Selling Prices, Exchange Rates and Exports have a simultaneous effect on Indonesia's GDP per capita.

Hypothesis 2:

H0 :  $\beta_{i1} < 0$ ; Production, Selling Prices, Exchange Rates and Exports have no partial positive effect on Indonesia's GDP per capita.

H1 :  $\beta_{i1} > 0$ ; Production, Selling Prices, Exchange Rates and Exports have a partial positive effect on Indonesia's GDP per capita.

Hypothesis 3:

H0 :  $\beta_{12} = \beta_{22} = \beta_{32} = \beta_{42} = 0$ ; Production, Selling Price, Exchange Rate and Export have no simultaneous effect on Export Tax Revenue.

H1 : there is at least one  $\beta_{i2} \neq 0$ ; Production, Selling Prices, Exchange Rates and Exports have a simultaneous effect on Export Tax Revenue.

Hypothesis 4:

H0 :  $\beta_{i2} < 0$ ; Production, Selling Prices, Exchange Rates and Exports have no partial positive effect on Export Tax Revenue.

H1 :  $\beta_{i2} > 0$ ; Production, Selling Price, Exchange Rate and Export partially positive effect on Export Tax Revenue.

The research hypothesis of the effect is simultaneously tested using the F test. H0 is rejected if  $F_{count} > F_{table}$  (at significance level = 0.05 and degrees of freedom  $db1 = k$  and  $db2 = n - k - 1$ ; where  $n$  = sample size and  $k$  = number independent variable) or if the probability value of statistical error (p-value)  $< 0.05$ . In the opposite condition, H0 is accepted. The sub-hypothesis of the influence research hypothesis was partially tested using the t-test. H0 is rejected if  $t_{count} > t_{table}$  (at significance level = 0.05, 1-sided test type and degrees of freedom  $db = n - k - 1$ ) or if p-value  $< 0.05$ . On the other hand, H0 is accepted.

9. Model Feasibility Test Design measured through the characteristics of suitability as an econometric model (the goodness of an econometric model). Characteristics that can be expected from an econometric model as referred to by (Koutsoyiannis 1977) and (Wirasmita 2008), are as follows:
  - a. Theoretical plausibility. Whether the post-estimated or post-test hypotheses are in line with the expectations of the pre-estimated hypotheses and are supported by the relevant theory.
  - b. Accuracy of the estimates of the parameters. Whether the hypotheses or post-estimated model parameters are accurate or not, which is indicated by a low probability of statistical error (p-value), where  $p\text{-value} < 0.05$ .
  - c. Explanatory ability. Do post-estimation models have the ability to explain the interrelationships between economic phenomena marked by a low standard error of estimations (SE), where  $SE < (1/2 \text{ the value of the estimated parameter})$ .
  - d. Forecasting ability. Does the post-estimated model have predictive ability which is characterized by a high coefficient of determination, where  $R^2 > 50\%$ .

## RESULTS AND DISCUSSION

### A. The Effect of Production, Selling Prices, Exchange Rates and Exports on Indonesia's GDP Per Capita

Before being analyzed, the influence model is first tested for conformity with outlier analysis and tested for classical assumptions for multiple linear regression which are the requirements. The results of the outlier analysis show that there is no outlier data in the existing equation. Likewise, the results of the classical assumption test also show that all assumptions have been met, namely the data are normally distributed and there are no situations of multicollinearity, heteroscedasticity and autocorrelation.

**Table 3** Equation of Model I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.416670	0.568567	-11.28569	0.0000
LOG(X1)	0.528304	0.048575	10.87595	0.0000
LOG(X2)	0.539186	0.050899	10.59332	0.0000
LOG(X3)	1.055296	0.060359	17.48360	0.0000
LOG(X4)	-0.522289	0.049588	-10.53259	0.0000
R-squared	0.891761	Mean dependent var	3.882911	
Adjusted R-squared	0.887204	S.D. dependent var	0.183342	
S.E. of regression	0.061576	Akaike info criterion	-2.688394	
Sum squared resid	0.360198	Schwarz criterion	-2.658135	
Log likelihood	139.4197	Hannan-Quinn criter.	-2.635676	
F-statistic	195.6718	Durbin-Watson stat	2.577882	
Prob(F-statistic)	0.000000			

The multiple linear regression equation (model I) above for the effect of production, selling price, exchange rate, and exports on Indonesia's GDP per capita is as follows:



$$Y_{1t} = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon_t \quad (1.1)$$

$$Y_{1t} = -6.417 + 0.528X_{1t} + 0.539X_{2t} + 1.055X_{3t} - 0.522X_{4t} + \varepsilon_t$$

Where :

Y<sub>1</sub> : Indonesia's GDP Per capita year t (in IDR)      X<sub>3</sub> : Exchange rate in year t (in IDR per USD)  
 X<sub>1</sub> : Production year t (in Tons)                              X<sub>4</sub> : Export Value in year t (in IDR)  
 X<sub>2</sub> : Selling Price in year t (in IDR per Ton)      β<sub>1</sub>, β<sub>2</sub>, β<sub>3</sub> > 0 (positive) and β<sub>4</sub> < 0 (negative)

Model I above has a coefficient of determination (R-squared) of 89.18%. This value shows the magnitude of the effect of production, selling prices, exchange rates, and exports simultaneously on Indonesia's GDP per capita is 89.18%. The results of the simultaneous test of the effect of production, selling prices, exchange rates, and exports on Indonesia's GDP per capita through the F test give an F value of 195.672 with p-value = 0.0000. This means that the p-value is smaller than = 0.05. Thus, it was decided to reject H1 and accept research hypothesis 1 regarding the simultaneous influence of production, selling prices, exchange rates, and exports on Indonesia's GDP per capita.

Based on the results above, the constant value (C or α) is -6.417 which indicates that if Production (X1), Selling Price (X2), Exchange Rate (X3), and Export (X4) are zero (0) units, then the average mathematical value is Indonesia's average GDP per capita is -6.417 IDR. This means that the regression coefficient of Production (X1) is positive, which is 0.528. This means that every 1 tonne increase in production will be followed by an increase in Indonesia's GDP per capita of 0.528 IDR, assuming ceteris paribus (the value of other causal variables is constant). The regression coefficient value of the Selling Price (X2) is positive, which is 0.539. This means that every increase in the selling price of IDR. 1 per tonne will be followed by an increase in Indonesia's GDP per capita of 0.539 IDR. The regression coefficient value of the exchange rate (X3) is positive, which is 1.055. This means that every increase in the exchange rate of IDR. 1 per USD will be followed by an increase in Indonesia's GDP per capita of 1.055 IDR. And the regression coefficient value of Export (X4) is negative, which is -0.522. This means that every increase in exports by IDR. 1 will reduce Indonesia's GDP per capita by 0.522 IDR.

The results of the partial effect of production, selling prices, and exchange rates on Indonesia's GDP per capita through the t-test give the results of t-values of 10,876, 10,593, and 17,484 with p-values of each = 0.0000. This means that the p-value for Production, Selling Price, and Exchange Rate is smaller than = 0.05. Thus, it was decided that Production, Selling Price, and Exchange Rate had a positive and partially significant effect on Indonesia's GDP per capita. While the results of the partial export effect test on Indonesia's GDP per capita through the t-test gave the results of a t-value of -10,533 with p-value = 0.0000. This means that the value of the Export regression coefficient is negative. Thus, it was decided that exports had no significant positive effect partially on Indonesia's GDP per capita. Based on the results of the partial effect analysis above, it was decided to reject H0 and partially accept research hypothesis 2. Production, Selling Price, and Exchange Rate partially have a significant positive effect on Indonesia's GDP per capita, but this is not the case with exports.

## **B. Effect of Production, Selling Price, Exchange Rate and Export on Export Tax Revenue**

Before being analyzed, the influence model is first tested for conformity with outlier analysis and tested for classical assumptions for multiple linear regression which are the requirements. The results of the outlier analysis show that there is no outlier data in the existing equation. Likewise, the results of the classical assumption test also show that all assumptions have been met, namely the data are normally distributed and there are no situations of multicollinearity, heteroscedasticity and autocorrelation.

**Table 4** Equation Model II

**Determination Analysis Of Indonesian Palm Oil Commodities In The Covid-19 Pandemic Era On Indonesian Per Capita Gdp And Export Tax Revenues**

Dependent Variable: LOG(Y2)  
 Method: Panel Least Squares  
 Date: 05/05/22 Time: 07:59  
 Sample: 2012 2021  
 Periods included: 10  
 Cross-sections included: 10  
 Total panel (balanced) observations: 100

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	54.85410	3.275453	16.74703	0.0000
LOG(X1)	0.463214	0.279838	1.655296	0.1012
LOG(X2)	2.907067	0.293222	9.914232	0.0000
LOG(X3)	-4.709831	0.347723	-13.54478	0.0000
LOG(X4)	-0.465610	0.285671	-1.629884	0.1064

R-squared	0.766689	Mean dependent var	15.77527
Adjusted R-squared	0.756866	S.D. dependent var	0.719408
S.E. of regression	0.354731	Akaike info criterion	0.813791
Sum squared resid	11.95422	Schwarz criterion	0.944050
Log likelihood	-35.68956	Hannan-Quinn criter.	0.866509
F-statistic	78.04553	Durbin-Watson stat	2.051208
Prob(F-statistic)	0.000000		

The multiple linear regression equation (model II) above for the effect of production, selling price, exchange rate, and exports on Export Tax Revenue is as follows:

$$Y_{2t} = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon_t \quad (2.1)$$

$$Y_{2t} = 54.854 + 0.463X_{1t} + 2.907X_{2t} - 4.710X_{3t} - 0.466X_{4t} + \varepsilon_t$$

Where :

$Y_2$ : Export Tax Revenue year t (in IDR)	$X_3$ : Exchange rate in year t (in IDR per USD)
$X_1$ : Production year t (in Tons)	$X_4$ : Export Value in year t (in IDR)
$X_2$ : Selling Price in year t (in IDR per Ton)	$\beta_1, \beta_2 > 0$ (positive) and $\beta_3, \beta_4 < 0$ (negative)

Model II above has a coefficient of determination (R-squared) of 76.67%. This value shows the magnitude of the effect of production, selling price, exchange rate, and exports simultaneously on export tax revenues amounting to 76.67%. The results of the simultaneous test of the effect of production, selling prices, exchange rates, and exports on export tax revenue through the F test give an F value of 78.046 with p-value = 0.0000. This means that the p-value is smaller than = 0.05. Thus, it was decided to reject H1 and accept research hypothesis 3 regarding the simultaneous effect of production, selling price, exchange rate, and exports on export tax revenues. Based on the above results obtained a constant value (C or  $\alpha$ ) of 54.854 which indicates that if Production (X1), Selling Price (X2), Exchange Rate (X3), and Export (X4) has a value of zero (0) units, then the mathematical value of the average Export Tax Revenue is 54.854 IDR. This means that the regression coefficient of Production (X1) is positive, which is 0.463. This means that every 1 tonne increase in production will be followed by an increase in export tax revenue of 0.463 IDR, assuming ceteris paribus (the value of other causal variables is constant). The regression coefficient value of the Selling Price (X2) is positive, which is 2.907. This means that every increase in the selling price of IDR 1 per tonne will be followed by an increase in export tax revenue of IDR 2.907. The regression coefficient value of the Exchange Rate (X3) is negative, which is -4.710. This means that every increase in the exchange rate of IDR. 1 per USD will reduce export tax revenues by 4,710 IDR. And the regression coefficient value of Export (X4) is negative, which is -0.466. That is, every increase in exports by IDR. 1 will reduce export tax revenues by 0.466 IDR.

The results of the partial test of the effect of selling prices on export tax revenues through the t-test gave the results of a t-value of 1.655 with p-value = 0.0000. This means that the p-value for the Selling Price is smaller than = 0.05. Thus, it was decided that the selling price had a positive and significant partial effect on export tax revenues. While the results of the partial effect of Production, Exchange and Export on export tax revenues through the t-test give the results of t-values of 1.655 (p-value = 0.1012), -13.545 (p-value = 0.0000), and -1.630 (p-value = 0.1064). This means that the regression coefficient of Production is positive, while the Exchange and Exports are negative. Thus, it was decided that Production had a positive but not partially significant effect on Export Tax Revenue. While the course, and Exports have no positive but partially significant effect on Export

Tax Revenue. Based on the results of the partial effect analysis above, it was decided to reject H0 and partially accept research hypothesis 4. Production and Selling Prices partially have a significant positive effect on Export Tax Revenue, but this is not the case with Exchange Rates and Exports.

#### Discussion

Production, Selling Prices, Exchange Rates, and Exports have a significant simultaneous effect on Indonesia's GDP per capita. Partially, production, selling price, and exchange rate have a significant positive effect on Indonesia's GDP per capita. Meanwhile, exports have no significant positive effect on Indonesia's GDP per capita. The direction of the negative influence of exports indicates that increasing exports is counterproductive to Indonesia's GDP growth per capita. This means that the government needs to review the palm oil (CPO) export policy carried out during the Covid-19 pandemic era, although the agricultural sector's GDP can still grow relatively positively. Production, Selling Prices, Exchange Rates, and Exports have a significant simultaneous effect on Export Tax Revenue. Partially, production and selling prices have a significant positive effect on export tax revenues. Meanwhile, Exchange and Exports have no significant positive effect on Export Tax Revenue. The direction of the negative influence of the Exchange Rate and Exports shows that an increase in the exchange rate and exports are counterproductive to Indonesia's export tax revenue. This means that fluctuations in the exchange rate will affect palm oil (CPO) export activities on the trade balance so that it has an impact on the contribution of Indonesia's export tax revenue, especially in the midst of the Covid-19 pandemic era.

#### Model Feasibility Test Results

The results of the model feasibility test show that the research model has met the goodness of an econometric model or the expected characteristics.

1) Theoretical plausibility. The research model produces test results that are in line with expectations based on the theory that is the basis of his thinking. The direction of the influence of the majority of the factors that influence the palm oil commodity on Indonesia's GDP per capita and export tax revenue is positive according to theory, while the direction of its negative influence can be explained.

2) Accuracy of the estimate of the parameters. The research model produces a regression coefficient estimator that is accurate or unbiased and significant. The analysis assumptions are met and the probability of statistical error of all simultaneous influence models is very low ( $p\text{-value} < \alpha = 0.05$ ). Likewise partially, the majority of independent variables have  $p\text{-value} < \alpha = 0.05$ . As for the insignificant partial effect ( $p\text{-value} > \alpha = 0.05$ ) of several independent variables, it can be explained. However, based on its overall accuracy, the model under study is still feasible to maintain.

3) Explanatory ability. The research model has a high ability to explain the relationship between the economic phenomena studied. The majority of the Standard Error (SE) of the model is less than  $\frac{1}{2}$  times the absolute value of the regression coefficient ( $SE < \frac{1}{2} \beta_i$ ).

##### Model I Test Results:

- SE Production	= 0.049 < $\frac{1}{2}$ (0.528)
- SE Selling price	= 0.051 < $\frac{1}{2}$ (0.539)
- SE Exchange rate	= 0.060 < $\frac{1}{2}$ (1.055)
- SE Export	= 0.050 > $\frac{1}{2}$ (-0.522)

##### Model II Test Results:

- SE Production	= 0.280 > $\frac{1}{2}$ (0.463)
- SE Selling price	= 0.293 < $\frac{1}{2}$ (2.907)
- SE Exchange rate	= 0.348 > $\frac{1}{2}$ (-4.710)
- SE Export	= 0.286 > $\frac{1}{2}$ (-0.466)

4) Forecasting abilities. The research model has a high level of predictive ability on the behavior of the effect variable as shown by the high coefficient of determination of

the majority of models that exceeds 50% (Model I: Adjusted R<sup>2</sup> = 88.72% and Model II: Adjusted R<sup>2</sup> = 75.69%).

The existence of theoretical plausibility and explanatory ability characteristics in the model shows that the model has been tested to have academic uses. Meanwhile, the characteristics of accuracy and forecasting ability indicate that the model has been tested to have practical uses for policy determination.

## CONCLUSION

The increase in palm oil production, commodity selling prices, the rupiah exchange rate against the dollar, and commodity exports together have a very high ability to encourage Indonesia's GDP growth per capita, and the increase in palm oil production, commodity selling prices, and the rupiah exchange rate partially against the dollar is a determining factor of increasing Indonesia's GDP growth per capita. Meanwhile, the increase in palm oil production, commodity selling price, rupiah exchange rate against the dollar, and commodity exports together have a very high ability to increase the contribution of Indonesia's export tax revenue, and the increase in palm oil production and commodity selling prices are partially the determining factors of the increasing contribution of Indonesia's export tax revenue.

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