

Research article

The Role of Global Commodity Prices in the Dynamics of the Business Cycle in Indonesia

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ABSTRACT

This study examines the dynamic impact of global export commodity price fluctuations on the Indonesian economy, a representative small open economy with a significant reliance on primary resources. Using a Structural Vector Autoregression (SVAR) framework and quarterly data spanning from 1993 to 2019, the research analyzes the transmission of price shocks to the terms of trade, trade balance, and domestic business cycle variables, including per capita output, consumption, and investment. The empirical findings reveal that a positive shock to export commodity prices initially leads to a deterioration in the trade balance—consistent with the J-curve effect—due to the inelastic nature of imported industrial inputs and energy. However, the medium-term analysis identifies a significant "wealth effect," where increased export revenues stimulate domestic investment and consumption. Forecast error variance decomposition results further indicate that commodity price shocks are a dominant driver of trade balance volatility, accounting for nearly 48% of its variance over a 12-quarter horizon. At the same time, their impact on the broader business cycle remains persistent but modest. Robustness checks using a VARX model confirm these results, asserting the exogeneity of commodity prices. Policy implications suggest that Indonesia should utilize counter-cyclical fiscal buffers and maintain a flexible exchange rate to mitigate external volatility and prevent "Dutch disease" symptoms.

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1. INTRODUCTION

Global commodity prices have re-emerged as a critical concern for economists. In the wake of the COVID-19 pandemic, fluctuations in these prices are identified as a primary catalyst for the current surge in global inflation and the broader disruptions in the global business cycle (Gagliardone & Gertler, 2023; Blanchard and Bernanke, 2023; and Ball et al., 2022). Such price shifts exert a direct influence on international inflation rates and drive business cycle volatility through variations in a nation's terms of trade (ToT) (Kose, 2002; and Mendoza, 1995). However, the impact of global commodity shocks extends beyond ToT alone; they also permeate domestic economies through capital inflows and inherent vulnerabilities within the financial system (Kinda et al., 2016, 2018). This study builds upon existing literature to empirically examine how commodity price dynamics influence the business cycle in Indonesia, a developing economy where primary commodities dominate the export profile.

The body of literature exploring the macroeconomic effects of commodity price shocks reveals a landscape of contrasting findings, particularly regarding the role of ToT in business cycle fluctuations. Seminal studies by Mendoza (1995); and Kose (2002) posit that ToT shocks serve as a fundamental driver of macroeconomic volatility, especially in developing nations. Empirical evidence by Grimes (2006) often supports this; for instance, some findings suggest that ToT volatility accounts for nearly 45% of economic fluctuations. Furthermore, study by Broda (2004) ToT plays a more pronounced role in driving business cycles and inflation in economies governed by fixed exchange rate systems compared to those with flexible regimes. While study by Jääskelä & Smith (2013) an improved ToT tends to stimulate economic expansion, it does not necessarily trigger corresponding changes in inflation. These studies are grounded in the

premise that a heavy reliance on primary commodity exports renders developing nations highly susceptible to global price shifts. This dependence positions ToT as the primary conduit through which external disturbances penetrate domestic economies, impacting key aggregates such as output, consumption, and investment.

Conversely, contemporary research challenges this traditional perspective by Fernández et al. (2017, 2018); and Schmitt-Grohé & Uribe (2018), providing evidence that the contribution of ToT to macroeconomic fluctuations may be significantly overestimated. When broader global factors, including international financial risk, shifts in global demand, and variations in international liquidity, are integrated into empirical models, the explanatory power of ToT diminishes considerably. Additionally, study by Roch (2019) certain policy frameworks, such as exchange rate flexibility, inflation targeting, and stringent fiscal rules, have been found to help insulate economies from commodity price movements. These findings imply that the significance of ToT is not a universal phenomenon; rather, it varies according to a country's unique production structures, trade compositions, and exchange rate regimes. In certain economies, export and import prices exhibit co-movement due to shared underlying drivers, resulting in relatively stable ToT even amidst sharp fluctuations in global commodity prices. Consequently, the study by Di Pace et al. (2025) suggests that the roles of export and import prices should be analyzed separately.

This observation has prompted a distinct line of inquiry that shifts focus toward global commodity prices themselves, positing them as a more accurate external shock for commodity-dependent economies. Researchers such as Shousha (2016); and Fernández et al. (2018; 2020) underscore that commodity prices directly and significantly affect domestic economic activity, independent of their influence on ToT. The mechanisms through which these price movements impact economies extend beyond relative price shifts to encompass financial conditions, credit supply dynamics, capital flows, and domestic investment behaviors. Supporting this view, studies by Kinda et al. (2016); and Satria et al. (2021) illustrate that commodity prices play a vital role in shaping credit allocation and driving long-term capital inflows. Collectively, this body of work suggests that an exclusive focus on ToT may obscure the comprehensive macro-financial mechanisms through which external shocks impact developing economies.

Theoretical and empirical literature presents a diverse range of perspectives on the impacts of commodity price shocks and terms of trade in developing nations (Ben Zeev et al., 2017; Schmitt-Grohé & Uribe, 2018; Fernández et al., 2018, 2020; and Shousa, 2016). These varied findings highlight a significant conceptual gap regarding the conditions under which ToT should be treated as a purely exogenous shock versus when it becomes intertwined with domestic economic dynamics. This ambiguity is partly attributed to the heterogeneity of countries included in cross-country studies. Study by Shousa (2016); and Di Pace et al. (2025), which frequently aggregate commodity exporters, manufacturing exporters, and various income levels into a single analytical framework. Such broad categorization complicates the ability to discern whether ToT acts as a primary driver of economic fluctuations or merely reflects cyclical changes within the domestic economy.

Indonesia serves as an illustrative case study for investigating this conceptual gap. As a major global exporter of primary commodities, including coal, palm oil, and base metals, Indonesia maintains an import structure dominated by industrial raw materials and energy, particularly petroleum. Consequently, the demand for these imports is intrinsically linked to the domestic business cycle. When domestic economic activity accelerates, the rising demand for industrial inputs leads to a synchronization of import and export prices. This co-movement mitigates fluctuations in the ToT, thereby reducing its reliability as an indicator of external shocks. In this context, ToT should be characterized as an endogenous variable shaped by domestic conditions rather than an exogenous driver of macroeconomic volatility. This nuance suggests that empirical models relying solely on ToT may misinterpret the causal relationships governing the Indonesian economy.

Furthermore, Indonesia's deepening integration into global commodity markets since the mid-1990s has heightened its susceptibility to global price cycles. A study by Satria et al. (2021) indicates that commodity price shocks exert a more significant influence on long-term capital inflows into Indonesia than global financial risks. This underscores that the external factors driving Indonesia's macroeconomic and financial dynamics are primarily rooted in commodity prices rather than trade price dynamics. Therefore, prioritizing global commodity prices over ToT provides a more precise understanding of the external disturbances shaping the economy.

Indonesia represents a compelling case for evaluating commodity price shocks as primary drivers of business cycle fluctuations in a commodity-dependent economy. The movements in Indonesia's ToT largely reflect variations in import demand tied to domestic activity, empirical approaches treating ToT as an exogenous shock may misidentify the key external forces at work. Therefore, empirical approaches that treat ToT as an exogenous shock may misidentify key external forces at work. This study employs an analytical framework centered on global commodity prices, offering a more appropriate lens to examine the primary external influences on the Indonesian economy. This article consists of four sections: an introduction and a review of the literature on commodity price shocks and terms of trade in relation to the business cycle, an explanation of the empirical analysis methods and data descriptions, results and discussion from the empirical findings, and a conclusion summarizing the research outcomes.

2. RESEARCH METHODS

2.1. Data Collection

This study utilizes six variables within the Structural Vector Autoregression (SVAR) framework: export commodity prices (cp_t), terms of trade ($\widehat{tot}_t$), trade balance (tb_t), per capita output ($\widehat{y}_t$), per capita consumption ($\widehat{c}_t$), and per capita investment ($\widehat{i}_t$). The analysis covers data from the first quarter of 1993 to the fourth quarter of 2019. This time period was selected because quarterly data for Indonesia have been available since the first quarter of 1993. Years beyond 2019 are excluded from the empirical model due to the impact of the COVID-19 crisis on the period from 2020 to 2022. The data sources for this research are the Central Statistics Agency (BPS) and Bank Indonesia.

Table 1. Data Definition and Data Sources

Variables	Definition	Unit	Source
Export commodity prices (cp_t)	The average IMF commodity price index for Indonesia's main export products, crude palm oil (CPO), coal, and liquefied natural gas (LNG), is calculated by considering each commodity's contribution to total exports.	Index changes	IMF
Terms of Trade ($\widehat{tot}_t$)	The ratio of Indonesia's export prices to its import prices.	Ratio to time trend	BPS, Bank Indonesia
Trade balance (tb_t)	The difference between Indonesian total exports and total imports of goods and services over a quarter	Ratio to output	BPS, Bank Indonesia
Per capita output ($\widehat{y}_t$)	Indonesian total real output per capita (base year: 2010)	Ratio to time trend	BPS, Bank Indonesia
Per capita consumption ($\widehat{c}_t$)	Indonesian real consumption per capita (base year: 2010)	Ratio to time trend	BPS, Bank Indonesia
Per capita investment ($\widehat{i}_t$)	Indonesian real gross fixed capital formation per capita (base year: 2010)	Ratio to time trend	BPS, Bank Indonesia

2.2. SVAR Model Specification

In alignment with existing literature, trade is identified as the primary transmission mechanism for global commodity price shocks in small open economies like Indonesia. This study employs an SVAR model to analyze the impact of these shocks on Indonesia's business cycle and to quantify the contribution of external variables to fluctuations in output, investment, and consumption. The empirical framework is based on the model developed by Schmitt-Grohé & Uribe (2018), which treats the ToT as a critical conduit for shock transmission. These shocks originate from global fluctuations in Indonesian export prices, highlighting the deep integration of international commodity markets with domestic economic performance.

In our empirical framework, we identify terms of trade as a crucial factor in the transmission of these exogenous shocks. Such shocks stem from fluctuations in the prices of Indonesian export commodities on the global market, underscoring the interconnectedness between international commodity prices and domestic economic conditions. As a small open economy, Indonesia functions as

a "price taker" in global commodity markets. Given its high degree of trade openness, frequent shifts in commodity prices play a decisive role in driving domestic economic volatility (Satria et al., 2021). Following Schmitt-Grohé & Uribe (2018), the SVAR model is specified as follows:

$$A_0 x_t = A_1 x_{t-k} + \mu_t \quad (1)$$

Here, the vector x_t is a vector containing the variables detailed in Table 1. The business cycle is represented by log deviations from long-term trends in real per capita output, investment, and consumption. In Equation (1), A_0 and A_1 are 6 x 6 coefficient matrices, where the elements of A_0 are located below the main diagonal. The term μ_t represents a random error vector, with dimensions of 6 x 1, a vector of random errors with a mean of zero. The diagonal variance-covariance matrix of the random error is detailed in Enders (2015). Multiplying the equation by the inverse matrix A_0^{-1} yields the reduced-form solution:

$$x_t = A x_{t-k} + \Pi \epsilon_t \quad (2)$$

Where:

$$A \equiv A_0^{-1} A_1 \quad \Pi \equiv A_0^{-1} \Sigma^{1/2} \quad \epsilon_t \equiv \Sigma^{-1/2} \mu_t \quad (3)$$

The vectors ϵ_t consists of random variables with a zero mean and a variance-covariance matrix with unit diagonal elements. A characteristic of developing countries is that they are small players in the global market for exported and imported goods, which means that commodity prices are considered exogenous variables in the economic models for these countries, including Indonesia. As an exogenous variable, cp_t is assumed to follow an independent autoregressive process. This assumption is supported by Satria et al. (2021). Thus, the equation representing this behavior in the SVAR system, as shown in Eq. (4) as follows:

$$cp_t = a_{11} cp_{t-k} + \pi_{11} \epsilon_t^1 \quad (4)$$

According to Eq. (4), the elements a_{11} and π_{11} are coefficients in the matrices A and Π , respectively. Furthermore, the interpretation of the elements ϵ_t , denoted by ϵ_t^i , represents the exogenous shock from commodity prices cp_t . Following the SVAR model developed by Schmitt-Grohé and Uribe (2018), commodity export prices are assumed to be unaffected by other variables in the system, meaning only the first row of matrix A_1 , contains non-zero elements relative to cp_t . By expanding the matrix equation (5) and (6), the following model structure can be derived:

$$A_0 x_t = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix} \begin{bmatrix} cp_t \\ \widehat{tot}_t \\ \widehat{tb}_t \\ \widehat{y}_t \\ \widehat{i}_t \\ \widehat{c}_t \end{bmatrix} \quad (5)$$

$$A_1 x_{t-k} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} & a_{26} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} & a_{36} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} & a_{46} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & a_{56} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} \end{bmatrix} \begin{bmatrix} cp_{t-k} \\ \widehat{tot}_{t-k} \\ \widehat{tb}_{t-k} \\ \widehat{y}_{t-k} \\ \widehat{i}_{t-k} \\ \widehat{c}_{t-k} \end{bmatrix} \quad (6)$$

The data processing will adhere to a specific procedure utilizing the SVAR method. This procedure will include conducting data stationarity tests, determining the optimal lag length, and testing the stability of the VAR system. If the SVAR model is confirmed to be stationary and stable, we will proceed

with the SVAR analysis using tools such as the Impulse Response Function (IRF) and the Forecast Error Variance Decomposition (FEVD).

3. RESULTS AND DISCUSSION

3.1. Results

Table 2 presents the descriptive statistics for the variables used in the study, including export commodity prices, terms of trade, trade balance, and per capita measures of output, consumption, and investment. The mean values for several variables, such as export commodity prices (2.98×10^{-13}) and per capita output (6.61×10^{-13}), are near zero, which is often indicative of data that has been detrended or transformed into growth rates or gaps. Notably, the trade balance exhibits the highest level of volatility, with a standard deviation of 2,063.17 and a wide range between a minimum of -5,300.08 and a maximum of 5,039.15. In contrast, per capita investment and output show relatively low dispersion, with standard deviations of 0.0960 and 0.0981, respectively.

Table 2. Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
Export commodity prices	2.98×10^{-13}	-0.0053	0.4318	-0.3018	0.1449
Terms of trade	7.60×10^{-12}	-0.5059	58.438	-58.554	18.2469
Trade balance	3.36×10^{-10}	7.7834	5,039.15	-5,300.08	2,063.17
Per capita output	6.61×10^{-13}	0.0150	0.2059	-0.3938	0.0981
Per capita consumption	6.42×10^{-13}	0.0115	0.3458	-0.5425	0.1324
Per capita investment	4.21×10^{-13}	0.0141	0.2145	-0.3564	0.0960

This study assessed its feasibility by testing the stationarity of the data in Table 3, to ensure the validity of the time-series analysis, the stationarity of the variables was assessed using the Augmented Dickey-Fuller (ADF) test. As shown in Table 3, all variables, including export commodity prices, terms of trade, and per capita metrics, exhibit ADF statistics that exceed the 1% critical value of -3.4950 at their levels. Specifically, the trade balance (-4.979), per capita consumption (-3.922), and per capita investment (-5.396) are all significant at the 1% level. These results indicate that the null hypothesis of a unit root can be rejected, confirming that all series are stationary at the level. This stationarity justifies the use of a stable VAR system without the need for further differencing.

Table 3. Result of Unit Root test

Variables	ADF test at Level	ADF test at 1 st difference
	(1)	(2)
Export commodity prices	-5.552***	-7.090***
Terms of trade	-5.529***	-8.360***
Trade balance	-4.979***	-12.799***
Per capita output	-5.414***	-10.035***
Per capita consumption	-3.922***	-10.116***
Per capita investment	-5.396***	-7.631***

Note: ***significant at 1% critical value (-3.4950)

Table 4 reports the structural integrity of the SVAR model, which was evaluated through the AR roots of the characteristic polynomial, as detailed in Table 4. For a VAR system to be considered stable and suitable for further analysis, such as IRF and FEVD, all roots must lie within the unit circle. The diagnostic results confirm this condition, as the modulus of every root is less than one, with the largest modulus being approximately 0.7649. Furthermore, with an optimal lag length of four identified, the satisfaction of the stability condition ensures that the model is non-explosive and provides a reliable framework for economic inference.

The estimated SVAR model will be further analyzed using the IRF in the following subsection. The IRF is a tool used to assess the impact of shocks, specifically those stemming from standard deviations of innovations, on the current and future values of the endogenous variables included in

the research model, as highlighted by Gujarati and Porter (2009). This function enables the examination of dynamic effects resulting from unexpected changes in these variables over time.

Table 4. Results of SVAR Model Stability

Roots of Characteristic Polynomial	
Endogenous variables: cp_t , $\widehat{tot}_t$, tb_t , $\hat{y}_t$, $p\hat{c}_t$, and $\hat{i}_t$.	
Root	Modulus
0.707946 - 0.289540i	0.764867
0.707946 + 0.289540i	0.764867
-0.020516 - 0.746995i	0.747276
-0.020516 + 0.746995i	0.747276
0.472939 - 0.329421i	0.576359
0.472939 + 0.329421i	0.576359
-0.452987	0.452987
-0.048757 - 0.353134i	0.356484
-0.048757 + 0.353134i	0.356484
-0.239782	0.239782
0.116121	0.116121
0.000000	0.000000

No root lies outside the unit circle; VAR satisfies the stability condition.

In Figure 1, we present the estimated results of the impulse response function, which specifically addresses the structural shocks affecting the prices of Indonesian export commodities, referred to as shock 1. These findings offer valuable insights into how such shocks may influence overall economic performance concerning structural shocks in the prices of Indonesian export commodities (referred to as shock 1), which are presented as follows:

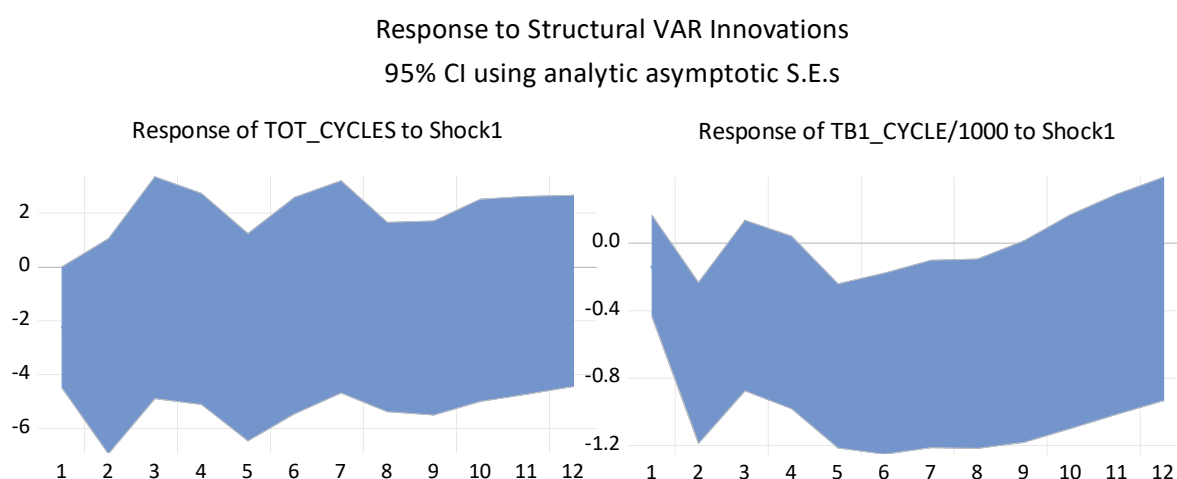


Figure 1. IRF of Terms of Trade and Trade Balance to Shocks in Changes

Figure 1 illustrates the dynamic response of Indonesia's terms of trade and trade balance to a one-standard-deviation shock in export commodity prices. The IRF analysis reveals that both indicators experience a significant and sustained negative response following the price shock. This adverse reaction indicates that an increase in export commodity prices leads to relatively higher import prices, thereby deteriorating the terms of trade and widening the trade deficit. Notably, the trade balance exhibits a more pronounced negative impact compared to the terms of trade. This phenomenon is partially driven by Indonesia's reliance on imported petroleum; as global commodity prices rise, the surge in energy costs exacerbates the trade deficit. The observed pattern follows a J-curve effect, where an initial deterioration in the trade balance is followed by a gradual return toward equilibrium in the long run.

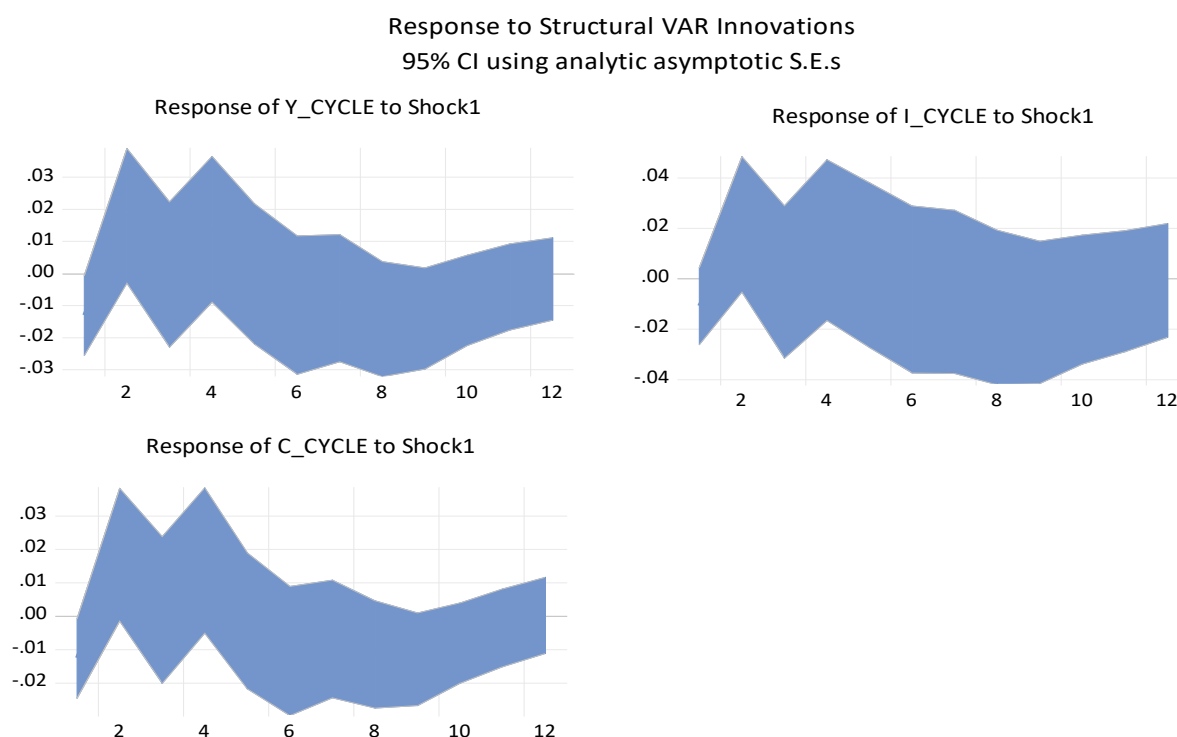


Figure 2. IRF of Business Cycle (Per capita Income, Investment, and Consumption) to Shocks in Change.

The IRF results in Figure 2 depict the reaction of business cycle variables, per capita income, consumption, and investment, to shocks in Indonesian export commodity prices. Initially, all three variables exhibit a negative response in the first quarter, reflecting the immediate pressure of rising production costs and energy-related import prices. However, this impact shifts to a positive trajectory in subsequent quarters. Per capita income and consumption show steady signs of improvement, while domestic investment demonstrates the most pronounced positive reaction. This medium-term recovery is attributed to an influx of foreign capital and a subsequent reduction in relative import prices, which lowers industrial input costs. Nevertheless, the prolonged contraction observed after the fifth quarter suggests a potential "Dutch disease" scenario, where growth is concentrated in primary commodity sectors at the expense of non-commodity-producing industries.

Table 5 presents the FEVD for the terms of trade ($\widehat{tot}_t$) and the trade balance (tb_t), illustrating the relative contribution of structural shocks to their respective forecast error variances over a 12-quarter horizon. In the initial period, export commodity price shocks (Shock 1) account for 3.52% of the variation in the terms of trade, a figure that remains relatively modest throughout the duration, reaching only 8.19% by the twelfth quarter. In contrast, the trade balance exhibits a dynamic sensitivity to these shocks; while the initial contribution is negligible at 0.76%, it escalates significantly to 19.41% by the fourth quarter and reaches 48.05% by the end of the forecast horizon. These findings suggest that while commodity price fluctuations have a limited impact on terms of trade variations in the Indonesian context, they serve as a dominant and persistent driver of trade balance volatility in the long run.

Table 5 also details the FEVD for the Indonesian business cycle, specifically examining the impact of structural shocks on per capita output ($\widehat{y}_t$), investment ($\widehat{i}_t$), and consumption ($\widehat{c}_t$). During the first quarter, shocks to export commodity prices (Shock 1) explain a relatively small portion of the variance across these metrics, such as 3.87% for output, 1.83% for investment, and 4.03% for consumption. However, the influence of these shocks is notably persistent, particularly for consumption, where the explanatory power grows to 12.01% by the twelfth quarter, the highest among the three business cycle components. While the overall contribution of commodity price shocks to the business cycle is modest compared to other structural shocks, their persistent nature underscores their role in shaping long-term economic stability. This aligns with empirical evidence suggesting that in small open economies with

flexible exchange rates, such as Indonesia, commodity price shocks are often muted or overshadowed by other factors like interest rate shocks.

Table 5. The FEVD Result of Terms of Trade, Trade Balance and Business Cycle on Structural Shocks

Variance Decomposition of $\widehat{tot}_t$:							
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5	Shock6
1	11.82	3.520	96.480	0.000	0.000	0.000	0.000
4	17.49	5.020	86.720	2.450	1.460	4.320	0.040
8	20.11	6.900	68.910	6.260	7.820	8.850	1.270
12	20.58	8.190	66.320	6.120	9.120	8.770	1.480
Variance Decomposition of $\widehat{tb}_t$:							
1	1.570	0.760	22.840	76.400	0.000	0.000	0.000
4	2.130	19.410	19.440	58.230	0.810	1.800	0.320
8	2.560	42.470	13.790	41.120	0.610	1.710	0.300
12	2.710	48.050	12.390	36.670	0.770	1.710	0.400
Variance Decomposition of $\widehat{y}_t$:							
1	0.065	3.865	0.5373	4.3351	91.262	0.000	0.0000
4	0.096	7.459	1.2732	4.9304	75.751	5.832	4.7536
8	0.106	9.149	3.7138	4.3805	70.506	6.964	5.2849
12	0.109	10.960	3.9057	4.2371	68.206	7.557	5.1328
Variance Decomposition of $\widehat{i}_t$:							
1	0.079	1.834	0.7808	4.2519	74.875	18.256	0.000
4	0.136	4.369	0.8563	5.7890	66.679	18.626	3.679
8	0.142	5.004	2.4895	5.7316	63.849	18.689	4.236
12	0.146	6.001	2.5668	5.4598	62.917	18.824	4.230
Variance Decomposition of $\widehat{c}_t$:							
1	0.062	4.026	0.0731	3.3895	84.589	0.077	7.843
4	0.090	9.495	0.7126	4.2162	69.666	3.838	12.070
8	0.101	10.352	2.6225	4.2624	66.661	6.131	9.970
12	0.104	12.009	2.7610	4.1580	64.571	6.619	9.880
Structural VAR Innovations							

Table 6 presents the results of the robustness check using a Vector Autoregression with exogenous variables (VAR_x) model to validate the initial SVAR findings. The estimation, spanning from 1993:Q1 to 2019:Q4 with an optimal lag of two, confirms the structural stability of the system as all autoregressive roots possess a modulus of less than one.

Table 6. Result of Robust Check Estimation

	$\widehat{tot}_t$	$\widehat{tb}_t$	$\widehat{y}_t$	$\widehat{i}_t$	$\widehat{c}_t$
Constant	-0.0020 (-0.0079)	-7.1218 (-154.06)	0.0013 (-0.0071)	0.0019 (-0.0081)	0.0021 (-0.0068)
cp_{t-1}	-0.1043 (-0.1002)	-5503.25** (-1949.26)	0.1973 (-0.0905)**	0.2342 (-0.1025)**	0.1935 (-0.0870)**
cp_{t-2}	0.0218 (-0.1047)	1456.07 (-2035.03)	-0.1813* (-0.0945)	-0.2419** (-0.1069)	-0.1562 (-0.0908)
R-squared	0.5855	0.4850	0.5056	0.6491	0.5110
F-statistic	10.9517***	7.2999***	7.9260***	14.3422***	8.0994***

Note: *, ** and *** represent significance at 10%, 5% and 1% levels respectively

The results indicate that lagged export commodity prices (cp_t) exert a statistically significant influence on the trade balance, per capita output, per capita investment, and per capita consumption at the 5% significance level. Specifically, the first lag of commodity prices shows a strong negative impact on the trade balance (-5503.25) while providing a positive short-term stimulus to output (0.1973) and investment (0.2342). Interestingly, and consistent with the SVAR analysis, commodity prices do not significantly affect the terms of trade, reinforcing the assumption that for a small open economy like

Indonesia, these prices act as exogenous drivers rather than endogenous determinants. These robust results align with the empirical evidence provided by Schmitt-Grohé & Uribe (2018), suggesting that while export commodity prices are central to the business cycle and trade dynamics, their overall explanatory power remains modest but statistically verifiable.

3.2. Discussion

The empirical results from the SVAR model indicate that a positive shock to Indonesian export commodity prices leads to an immediate and significant deterioration in the terms of trade and the trade balance. This counterintuitive finding suggests that the price-elasticity of Indonesian imports, particularly for essential commodities like petroleum and industrial raw materials, remains low in the short term. As global commodity prices rise, the cost of these inelastic imports increases more rapidly than the revenue gains from exports, leading to a widening trade deficit. This mechanism aligns with the "price effect" of international trade, where the immediate impact of a price surge is felt through higher import expenditures before volume adjustments can occur.

The observed response of the trade balance mirrors the classic J-curve phenomenon. Following the initial shock, the trade balance undergoes a sharp decline before eventually trending back toward a long-term equilibrium. In the Indonesian context, this trajectory is heavily influenced by the country's energy dependency. Because increases in primary commodity prices often correlate with rising global energy costs, Indonesia faces a dual burden: higher costs for industrial inputs and a surge in the oil and gas import bill. Consequently, the trade balance suffers a more substantial negative impact than the terms of trade, highlighting the structural vulnerability of the Indonesian trade sector to global price volatility. Regarding the business cycle, the initial contraction in per capita output, consumption, and investment during the first quarter reflects the "cost-push" nature of the commodity shock. The rise in the prices of imported primary commodities increases production costs for domestic industries, which suppresses immediate investment and reduces disposable income. However, the subsequent positive trajectory in these variables from the second quarter onward suggests a "wealth effect" and capital inflow. As noted by Satria et al. (2021), rising commodity prices attract foreign direct investment into the primary sectors, which eventually stimulates broader economic activity and per capita consumption.

The divergence between the responses of different business cycle components is particularly noteworthy, with investment showing a more pronounced recovery than income or consumption. This reflects a structural shift in the economy where capital is reallocated toward commodity-producing sectors to capitalize on higher global prices. While this influx of capital provides a medium-term boost to investment metrics, it also sets the stage for sectoral imbalances. The temporary nature of the initial contraction followed by a surge in investment underscores the complexity of Indonesia's adaptation to price volatility, where short-term cost pressures are eventually offset by sector-specific capital accumulation. The long-term dynamics characterized by a prolonged contraction after the fifth quarter provide evidence of the "Dutch disease" in the Indonesian economy. Consistent with the findings of Naraidoo & Paez-Farell (2023), the results suggest that while the primary commodity sectors expand, the non-commodity-producing sectors, such as manufacturing, may experience a squeeze due to rising costs and resource reallocation. This structural misalignment poses significant risks to long-term economic stability and highlights the need for robust stabilization measures. Policy interventions, including counter-cyclical fiscal buffers and monetary adjustments, are essential to mitigate the adverse effects of commodity price swings and to prevent the de-industrialization associated with a heavy reliance on primary exports.

The FEVD results reveal a stark contrast between the vulnerability of the trade balance and the relative stability of the terms of trade in response to commodity price shocks. While export commodity price shocks explain less than 10% of the variance in the terms of trade over a 12-quarter horizon, their contribution to trade balance fluctuations grows substantially, reaching 48.05% by the end of the period. This suggests that while global price changes do not fundamentally alter the ratio of export-to-import prices for Indonesia in a volatile manner, they exert a dominant, delayed influence on the country's net trade position. This finding aligns with the research of Schmitt-Grohé & Uribe (2018), who argue that terms of trade shocks often play a more limited role in explaining business cycles in developing countries than previously theorized. Regarding the business cycle, the study identifies consumption as the component most sensitive to structural shocks in export commodity prices. By the twelfth quarter, commodity shocks account for

12.01% of the variation in consumption, compared to 10.96% for income and only 6% for investment. This persistent impact on consumption is critical for Indonesia, as domestic consumption serves as a primary driver of the national GDP. The relatively modest initial impact, ranging from 1.8% to 4% across business cycle variables, suggests that while commodity prices are important, the Indonesian economy is influenced by a diverse array of structural factors beyond just primary commodity markets.

The muted response of the Indonesian business cycle to these shocks can be largely attributed to the country's exchange rate regime. As noted by Broda (2004); and Jääskelä & Smith (2013), commodity price shocks tend to be more disruptive in nations with fixed exchange rate systems. In Indonesia's case, the flexible exchange rate acts as a shock absorber, muting the transmission of global price volatility into the domestic real economy. Furthermore, the significant role of other shocks, such as interest rate fluctuations, is evident; literature suggests that in small, open developing economies with floating rates, interest rate shocks can account for a vast majority of business cycle variations, often exceeding ninety percent. Ultimately, these findings highlight a complex transmission mechanism where capital flows and interest rate dynamics play a mediating role. While a study by Shousa (2016) identifies commodity prices as a key source of fluctuation for commodity-exporting nations, the Indonesian experience suggests that these effects are temporary and heavily influenced by financial sector constraints. The results underscore that while commodity prices are a significant driver of the trade balance, their impact on the broader business cycle is tempered by domestic monetary conditions and capital flow management. This necessitates a holistic policy approach that integrates trade stabilization with robust financial and exchange rate management to mitigate the long-term effects of global commodity market volatility.

The robustness check using the VARX model reaffirms that export commodity prices function as a significant exogenous driver for Indonesia's trade balance and business cycle. By treating commodity prices as a strictly exogenous variable, the model validates the premise that Indonesia, as a small open economy, acts as a price-taker in the global primary goods market. The statistically significant negative impact of the first lag of commodity prices on the trade balance suggests that price adjustments in global markets have a delayed but profound effect on the domestic trade position. This aligns with the findings of Satria (2021), who notes that for commodity-dependent emerging markets, external price shocks are often the primary source of long-term trade volatility, requiring a transition period for domestic industries to adjust their production and import volumes. Furthermore, the robustness results demonstrate a consistent, positive influence of commodity price shocks on per capita output and investment. The estimated coefficients for the first lag (cp_{t-1}) indicate that an increase in export prices stimulates domestic production and capital formation, albeit with a relatively modest elasticity. This confirms the "wealth effect" identified in the SVAR analysis, where higher export revenues eventually translate into increased industrial activity and investment. This pattern is supported by the work of Schmitt-Grohé & Uribe (2018), who emphasize that while terms of trade and commodity prices are statistically significant drivers of aggregate activity in developing nations, their overall explanatory power is often lower than conventional wisdom suggests, typically accounting for less than 10% of output variation.

The gap between commodity price shocks and the terms of trade, which remained non-significant in the VARX model, provides crucial insight into the structural characteristics of Indonesia's external sector. In many theoretical models, commodity price shocks are expected to be the primary determinant of terms of trade fluctuations; however, the empirical evidence here suggests a more complex reality. This finding echoes the arguments of M'boueke (2025), who posits that aggregate terms of trade indices may be poor proxies for capturing the specific transmission of individual commodity shocks. In Indonesia's case, the simultaneous rise in both export and import prices (particularly for energy) likely keeps the terms of trade ratio relatively stable, even as the trade balance and real economic variables undergo significant shifts. The stability of the VARX system, with all roots residing within the unit circle, underscores the reliability of the domestic business cycle's response to external shocks. The persistent positive trajectory of consumption ($\hat{c}_t$) following an initial lag highlights the role of domestic demand as a stabilizing force. As argued by Shousha (2016), while commodity prices are a key source of fluctuation, their impact is often mediated by the financial sector and capital flow management. The robust evidence from the VARX estimation suggests that while Indonesia remains vulnerable to global commodity price volatility, the economy possesses inherent structural mechanisms, potentially including flexible exchange rates and counter-cyclical domestic policies, that prevent these shocks from leading to explosive or permanent economic instability.

4. CONCLUSIONS

The findings of this research provide a nuanced understanding of how global export commodity price fluctuations influence the Indonesian economy. The SVAR and VARX analyses consistently demonstrate that while Indonesia is susceptible to external price shocks, the transmission mechanism is complex and non-linear. Specifically, the results confirm that commodity price surges initially lead to a deterioration of the trade balance, consistent with the J-curve effect and exert short-term pressure on output and investment due to rising input costs. However, in the medium term, a "wealth effect" and capital inflows into primary sectors help stabilize and boost business cycle variables, particularly investment and consumption. The robustness tests further validate that these commodity prices act as exogenous drivers, significantly impacting the real economy even if their direct explanatory power over the terms of trade is statistically limited. In light of these findings, several critical policy implications emerge for Indonesian policymakers. First, there is a clear need for a counter-cyclical fiscal buffer, such as a sovereign wealth fund dedicated to commodity revenues. Since the trade balance is highly sensitive to price volatility, accumulating reserves during price booms can provide the necessary fiscal space to support the economy during subsequent downturns. This would help mitigate the "Dutch disease" symptoms observed in the long-term IRF results, where growth in primary sectors potentially crowds out non-commodity industries. Second, the central bank should maintain a flexible exchange rate regime as a primary shock absorber. The empirical evidence suggests that Indonesia's floating rate helps mute the transmission of global price volatility into the domestic economy. Complementary to this, monetary policy should remain vigilant regarding "cost-push" inflation triggered by rising import prices of primary commodities. Targeted subsidies or strategic reserves for essential industrial inputs and energy could prevent the initial contraction in investment and consumption identified in the first quarter of the impulse response analysis. The government must prioritize structural diversification to reduce the economy's over-reliance on primary commodities. The persistent explanatory power of commodity shocks over the trade balance underscores a structural vulnerability. Policies aimed at increasing the value-added of exports, often referred to as "downstreaming" can transform the export profile from raw materials to processed goods. This transition would not only stabilize the trade balance against global price swings but also foster a more resilient business cycle less dependent on the exogenous fluctuations of international commodity markets.

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REFERENCES

- Ball, L., Leigh, D., & Mishra, P. (2022). Understanding US Inflation during the COVID-19 Era. *Brookings Papers on Economic Activity*, 2022(2), 1-80. <https://doi.org/10.1353/eca.2022.a901276>
- Ben Zeev, N., Pappa, E., & Vicondoa, A. (2017). Emerging Economies Business Cycles: The Role of Commodity Terms of Trade News. *Journal of International Economics*, 108, 368–376. <https://doi.org/10.1016/j.jinteco.2017.07.008>
- Blanchard, O. J., & Bernanke, B. S. (2023). *What Caused the US Pandemic-era Inflation?*. *National Bureau of Economic Research (NBER) Working Paper*, 31417, <https://doi.org/10.3386/w31417>
- Bleaney, M., & Greenaway, D. (2001). The Impact of Terms of Trade and Real Exchange Rate Volatility on Investment and Growth in Sub-Saharan Africa. *Journal of Development Economics*, 65(2), 491–500. [https://doi.org/10.1016/S0304-3878\(01\)00147-X](https://doi.org/10.1016/S0304-3878(01)00147-X)
- Broda, C. (2004). Terms of Trade and Exchange Rate Regimes in Developing Countries. *Journal of International Economics*, 63(1), 31-58. [https://doi.org/10.1016/S0022-1996\(03\)00043-6](https://doi.org/10.1016/S0022-1996(03)00043-6)

- Di Pace, F., Juvenal, L., & Petrella, I. (2025). Terms-of-Trade Shocks are not all alike. *American Economic Journal: Macroeconomics*, 17(2), 24-64. <https://doi.org/10.1257/mac.20220035>
- Drechsel, T., McLeay, M., & Tenreyro, S. (2019). Monetary Policy for Commodity Booms and Busts. *CEPR Discussion Paper*, 14030.
- Enders, W. (2015). *Applied Econometrics Time Series*, (4th eds.). John Wiley & Sons Ltd.
- Fernández, A., González, A., & Rodríguez, D. (2018). Sharing a Ride on the Commodities Roller Coaster: Common Factors in Business Cycles of Emerging Economies. *Journal of International Economics*, 111, 99–121. <https://doi.org/10.1016/j.jinteco.2017.11.008>
- Fernández, A., Schmitt-Grohé, S., & Uribe, M. (2020). *Does the Commodity Super Cycle Matter?* (No. w27589). National Bureau of Economic Research. <https://doi.org/10.2139/ssrn.3661081>
- Fernández, A., Schmitt-Grohé, S., & Uribe, M. (2017). World Shocks, World Prices, and Business Cycles: An Empirical Investigation. *Journal of International Economics*, 108, S2–S14. <https://doi.org/10.1016/j.jinteco.2017.01.001>
- Gagliardone, L., & Gertler, M. (2023). *Oil Prices, Monetary Policy and Inflation Surges* (No. w31263). National Bureau of Economic Research. <https://doi.org/10.3386/w31263>
- Grimes, A. (2006). A smooth ride: Terms of trade, volatility and GDP growth. *Journal of Asian Economics*, 17(4), 583–600. <https://doi.org/10.1016/j.asieco.2006.06.005>
- Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (Ed. 5th). New York: McGraw Hill.
- Houssa, R., Mohimont, J., & Otrok, C. (2023). Commodity exports, financial frictions, and international spillovers. *European Economic Review*, 158, 104465. <https://doi.org/10.1016/j.euroecorev.2023.104465>
- Jääskelä, J. P., & Smith, P. (2013). Terms of Trade Shocks: What Are They and What Do They Do? *Economic Record*, 89(285), 145–159. <https://doi.org/10.1111/1475-4932.12039>
- Kinda, M. T., Mlachila, M. M., & Ouedraogo, R. (2016). *Commodity price shocks and financial sector fragility*. International Monetary Fund. <https://doi.org/10.5089/9781498328722.001>
- Kinda, T., Mlachila, M., & Ouedraogo, R. (2018). Do Commodity Price Shocks Weaken the Financial Sector?. *The World Economy*, 41(11), 3001-3044. <https://doi.org/10.1111/twec.12667>
- Kose, M. A. (2002). Explaining Business Cycles in Small Open Economies "How Much do World Prices Matter?" *Journal of International Economics*, 56(2), 299–327. [https://doi.org/10.1016/S0022-1996\(01\)00120-9](https://doi.org/10.1016/S0022-1996(01)00120-9)
- Lubik, T., & Teo, W. L. (2005). *Do Terms of Trade Shocks Drive Business Cycles? Some Evidence from Structural Estimation* (No. 377). Society for Computational Economics. <https://ideas.repec.org/p/sce/scecf5/377.html>
- M'boueke, S. (2025). *The Importance of Commodity-Price Shocks*. Department of Economics, University of Notre Dame.
- Mendoza, E. G. (1995). The Terms of Trade, the Real Exchange Rate, and Economic Fluctuations. *International Economic Review*, 101-137. <https://doi.org/10.2307/2527429>
- Naraidoo, R., & Paez-Farrell, J. (2023). Commodity Price Shocks, Labour Market Dynamics and Monetary Policy in Small Open Economies. *Journal of Economic Dynamics and Control*, 151, 104654. <https://doi.org/10.1016/j.jedc.2023.104654>
- Pesaran, M. H. (2015). *Time Series and Panel Data Econometrics*. Oxford University Press.
- Roch, F. (2019). The Adjustment to Commodity Price Shocks. *Journal of Applied Economics*, 22(1), 437-467. <https://doi.org/10.1080/15140326.2019.1665316>
- Rodríguez, G., Vassallo, R., & Castillo, P. (2023). Effects of External Shocks on Macroeconomic Fluctuations in Pacific Alliance Countries. *Economic Modelling*, 124, 106302. <https://doi.org/10.1016/j.econmod.2023.106302>
- Satria, D., Nachrowi, N. D., Falianty, T. A., & Simorangkir, I. (2021). Dynamic Relationship between Capital Inflows and Bank Lending: The Role of Commodity Price and Global Financial Market Shocks. *Bulletin of Monetary Economics & Banking*, 24(4), 589-630. <https://doi.org/10.21098/BEMP.V24I4.1170>
- Schmitt-Grohé, S., & Uribe, M. (2018). How Important Are Terms of Trade Shocks? *International Economic Review*, 59(1), 85–111. <https://doi.org/10.1111/iere.12263>
- Shousha, S.F. (2016). Macroeconomic Effects of Commodity Booms and Busts: The Role of Financial Frictions. *XVIII Seminário Anual de Metas Para a Inflação Do Banco Central Do Brasil*, 1–57. <http://www.columbia.edu/~sfs2146/research.html>