Asymmetric Impact of Diesel Price Shocks on Household Consumption in Nepal: Evidence from a Nonlinear Autoregressive Distributed Lag (NARDL) Model

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ABSTRACT

Fuel pricing policy in Nepal, as in most oil-importing countries, is typically built on the assumption that diesel price increases and decreases affect household consumption in roughly mirror-image ways. This study tests that assumption directly. Because Nepal does not publish quarterly household consumption figures, official annual Household Final Consumption Expenditure (HFCE) benchmarks were first disaggregated into a quarterly series using the Chow-Lin (1971) generalized least squares method, with real quarterly GDP as the high-frequency indicator, and cross-validated against the Denton-Cholette (1971) modification. The resulting quarterly series, covering 2000Q1 to 2025Q4 (104 observations), was used to estimate a Nonlinear Autoregressive Distributed Lag (NARDL) model that decomposes the log diesel price into cumulative positive and negative partial sums, following Shin, Yu, and Greenwood-Nimmo (2014), while controlling for worker remittances, the nominal exchange rate, broad money supply, food inflation, and structural dummies for the 2015 Gorkha earthquake, the COVID-19 pandemic, and the Russia-Ukraine energy crisis.

The Pesaran, Shin, and Smith (2001) bounds test confirms a long-run cointegrating relationship among the variables, with an F-statistic of 5.84 against an upper bound critical value of 4.43 at the 1% significance level. The long-run Wald test rejects symmetry ($p = 0.000$): a positive diesel price shock carries a long-run elasticity of -0.185, significant at the 1% level, while a negative shock carries a considerably smaller and only marginally significant elasticity of 0.042. Nepali households, in other words, absorb the pain of a diesel price spike far more sharply than they enjoy the relief of a price drop. The short-run Wald test confirms the same pattern, and the model passes the full battery of diagnostic checks, including CUSUM and CUSUM of Squares tests for parameter stability across a 26-year sample marked by civil transition, a major earthquake, and a pandemic. Remittances and broad money supply are associated with higher consumption, while food inflation and exchange rate depreciation are associated with lower consumption, consistent with theoretical priors. These findings indicate that symmetric fuel-pricing frameworks systematically understate the protection households need during a price spike and overstate the relief that a price cut delivers. The study recommends that Nepal Oil Corporation's Fuel Price Stabilization Fund be deployed asymmetrically, weighted more heavily toward cushioning price increases than toward passing through price decreases, and offers a replicable methodological template for studying high-frequency household welfare in other data-scarce developing economies.

Keywords: diesel price shocks; asymmetric price transmission; Nonlinear ARDL; household consumption; Nepal

INTRODUCTION

Background

International oil prices have swung sharply over the past few decades in response to geopolitical conflict, supply-chain breakdowns, OPEC production decisions, pandemics, and periods of broad macroeconomic uncertainty, and these swings act as a structural driver of economic stability worldwide, feeding directly into production

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costs, freight prices, and headline inflation. Among refined products, diesel deserves particular attention because it powers freight transport, heavy agricultural machinery, construction equipment, manufacturing plants, and public transport. Diesel behaves less like an ordinary consumer good and more like a vital production input, so its price shocks reach well beyond what a household spends directly at the pump.

These dynamics are especially pronounced in a landlocked, import-dependent country like Nepal, which has no domestic fossil fuel reserves and imports the entirety of its petroleum products through the Indian Oil Corporation. Although the Nepal Oil Corporation (NOC) uses an automated pricing formula meant to keep domestic retail rates aligned with import costs, market rigidities and policy interventions frequently interrupt that alignment. Diesel accounts for a large share of Nepal's total petroleum consumption, driven by heavy reliance on road transport, so a diesel price shock cascades into food markets and the price of everyday goods, creating a welfare problem that reaches even households that use little or no diesel directly.

Connecting this volatility to Household Final Consumption Expenditure (HFCE), one of the largest components of Nepal's GDP and a reasonable proxy for aggregate household welfare, reveals a further asymmetry. Retailers tend to raise prices quickly during a fuel spike but are much slower to lower them once fuel costs fall, and households facing an economy that is regularly disrupted by instability may treat a price drop as temporary and choose to save rather than spend the difference. This suggests households respond differently to diesel price increases than to decreases, which is the central asymmetry this study investigates. The empirical literature on this question is thin for developing countries generally, and for Nepal specifically it is compounded by a data gap: because Nepal does not publish quarterly household consumption figures, no practical way has existed to test this asymmetry at the frequency needed to observe how quickly households adjust.

Problem Statement, Objectives, and Research Questions

Fuel price policy in Nepal is built largely on the assumption that price increases and decreases affect household spending in roughly mirror-image ways, an assumption that is convenient for modelling but not obviously true given that retail markets rarely behave symmetrically. If Nepali households respond more strongly to diesel price increases than to decreases, policies built on a symmetric view of pass-through will systematically misjudge how much protection households need during a price spike and overstate the relief a price cut delivers. This study addresses that problem, together with the underlying data gap, by constructing a quarterly household consumption series for Nepal and applying an econometric framework capable of separating the effects of diesel price increases from decreases, in both the short run and the long run.

The overarching aim is to evaluate the non-linear pass-through of diesel price shocks into aggregate household demand in Nepal. The specific objectives are: (i) to estimate the long-run and short-run impacts of domestic diesel price movements on real HFCE; (ii) to test for structural short-run and long-run asymmetries in the transmission of positive and negative diesel price shocks using a Nonlinear ARDL (NARDL) approach; (iii) to evaluate the direction and statistical significance of workers' remittances, the nominal exchange rate, broad money supply, and food inflation as determinants of private spending; and (iv) to derive dynamic multiplier trajectories showing how household consumption adjusts toward a new long-run equilibrium following directional fuel price shocks. These objectives translate into four research questions: what is the long-run and short-run impact of diesel price shocks on HFCE; do positive and negative shocks exert asymmetric impacts; how do the macroeconomic controls influence consumption within the same framework; and what is the temporal trajectory and speed of adjustment following an isolated shock?

Research Hypotheses

Drawing on the Permanent Income Hypothesis, Keynesian absolute income theory, and Asymmetric Price Transmission theory, the study tests three hypotheses. H1: domestic diesel price movements exert a statistically significant short-run and long-run impact on HFCE in Nepal (against H0 of no significant impact). H2: the long-run and short-run impacts of positive and negative diesel price shocks on household consumption are asymmetric, i.e. $\beta^+ \neq \beta^-$ and $\Sigma\delta_j^+ \neq \Sigma\delta_j^-$ (against H0 of symmetry). H3: the macroeconomic control variables, remittances, the exchange rate, broad money supply, and food inflation, significantly determine household consumption in Nepal (against H0 of no significant determination).

Significance and Scope

The study speaks to several audiences at once. For the Nepal Rastra Bank and the Ministry of Finance, it offers empirical insight into how fuel price changes move through the domestic economy, helping avoid policy mistakes such as over-tightening monetary instruments in response to a temporary global oil supply squeeze. For the Nepal Oil Corporation and fiscal planners, it provides a quantitative basis for designing fuel price smoothing bands, targeted transport subsidies, or cross-subsidization schemes. Methodologically, it offers a working template for high-frequency macroeconomic modelling in a data-constrained developing economy, showing how annual national accounts benchmarks can be converted into quarterly series using the Chow-Lin and Denton-Cholette techniques. For development organizations and national planning bodies, it identifies where energy shocks create the most strain on household budgets, informing the design of social safety nets.

The analytical boundaries are set across four dimensions. Temporally, the study covers a 26-year period from 2000Q1 to 2025Q4 (104 quarterly observations), capturing Nepal's transition to a federal state, the 2015 Gorkha earthquake, the adoption of automated fuel pricing, and recent global supply-chain shocks. The core independent variable is the retail diesel price, with workers' remittances, the nominal exchange rate, broad money supply, and food inflation included as controls to limit omitted variable bias. The analysis is bounded by Nepal's national economy, with international drivers treated as upstream catalysts assessed only through their transmission into domestic markets. Methodologically, the study relies on indicator-based temporal disaggregation and non-linear cointegration testing rather than micro-level household survey panels.

LITERATURE REVIEW

Theoretical Foundations

Four theoretical strands motivate the empirical specification. Friedman's (1957) Permanent Income Hypothesis (PIH) holds that consumption is driven by expected lifetime income rather than current, transitory income; an unexpected diesel price rise erodes purchasing power, and if households read the spike as temporary they draw down savings or borrow to protect normal consumption, but if it proves persistent, expectations of permanent income are revised downward and consumption adjusts, gradually rather than all at once. Modigliani and Brumberg's (1954) Life-Cycle Hypothesis (LCH) similarly implies that the propensity to consume out of a transitory shock is low, so what matters most for diesel volatility is how long a shock lasts: a brief fluctuation barely dents lifetime wealth, while a structural increase forces a permanent scaling back of non-essential spending.

Keynes' (1936) Absolute Income Hypothesis offers a more immediate framework through the consumption function $C = a + bYd$, where current consumption is tied closely to current disposable income (Yd). A diesel price spike suppresses Yd both directly, by raising transport costs, and indirectly, by feeding into food and other essential prices; as prices rise while wages remain sticky, real disposable income falls and consumption falls with it. Cost-push inflation theory explains how a shock to a single commodity turns into an economy-wide contraction through the transmission chain: diesel price up, transport and logistics costs up, agricultural and food prices up, headline inflation up, real purchasing power down. Finally, Asymmetric Price Transmission (APT) theory, well documented in the energy economics literature, holds that retail prices respond faster and more fully to cost increases than to cost decreases, an outcome usually explained by menu costs, search costs, and imperfect competition among retailers and transport operators. Relying on standard linear cointegration models, such as OLS, Johansen VAR, or VECM, in the presence of this kind of asymmetry risks a misspecified model and, downstream, policy recommendations that carry real political and economic cost.

Empirical Literature and Control Variables

Global empirical work has documented oil-price transmission mainly at the macro level: Hamilton (1983, 2003) and Kilian (2008) established the link between oil shocks and aggregate output, and a growing literature applies asymmetric frameworks specifically to consumption and commodity prices. Chowdhury, Meo, Uddin, and Haque (2021) find asymmetric energy-to-commodity price transmission using NARDL and wavelet methods, and Nayan, Khan, and Shafiullah (2024) report asymmetric impacts of refined petroleum product shocks on

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private consumption expenditure, also using a NARDL approach. Zakaria, Khiam, and Mahmood (2021) and Anand, Coady, Mohommad, Thakoor, and Walsh (2023) document how oil and utility price shocks transmit into inflation and household welfare across South Asia, generally concluding that fuel and refined-product price increases exert a stronger drag on household budgets than equivalent price decreases provide relief.

Four macroeconomic controls enter the model on theoretical grounds. Workers' remittances are expected to raise consumption (a positive sign) because they directly expand household disposable income and act as a consumption-smoothing buffer during domestic shocks. The nominal exchange rate is expected to reduce consumption (a negative sign) in Nepal's specific context: the country is heavily import-dependent, runs a fixed peg to the Indian rupee, and sources diesel and other goods entirely from abroad, so a depreciation raises the domestic cost of imports without a competing export channel large enough to offset it. Broad money supply (M2) is expected to raise consumption (a positive sign) through the standard liquidity channel, as expanding money supply eases borrowing constraints. Food inflation is expected to reduce consumption (a negative sign), consistent with Engel's Law, since food is a low-elasticity necessity and a price rise crowds out other spending.

Nepal-Specific Evidence and Research Gap

Nepal-specific evidence remains fragmented. Wasti and Subedi (2025) link structural shocks and remittance inflows to household expenditure dynamics in Nepal without isolating the specific role of diesel prices. Baniya and Subedi (2024) examine how the NOC's automated pricing formula transmits international shocks into domestic retail rates, and Koirala and Acharya (2025) trace how Nepal's fixed exchange rate regime shapes the macroeconomic adjustment to oil price shocks, but neither extends the analysis to household consumption. Broader South Asian panel studies conclude the region is highly exposed to energy supply shocks, but do not capture Nepal-specific institutional realities such as its bilateral trade and transit arrangements with India or NOC's localized pricing interventions. Existing Nepali literature also leans heavily on annual data, which smooths over the short-term volatility that matters most for understanding household responses.

Taken together, this review points to six interconnected gaps. Conceptually, most literature examines oil price effects on inflation, exchange rates, and financial markets rather than on HFCE directly. Geographically, most fuel-consumption literature focuses on advanced economies, major oil exporters, or large emerging markets, leaving little evidence on a small, landlocked, fully import-dependent economy like Nepal. Methodologically, earlier Nepali energy studies rely mostly on linear models that cannot capture non-linear adjustment behavior. A data gap arises from the absence of official quarterly HFCE records. A variable gap arises because existing studies typically model oil prices in isolation, without a unified set of country-specific macroeconomic controls. And a policy gap arises because fuel-pricing and welfare policy in Nepal currently operates without clear empirical evidence on consumer behavioral asymmetry. This study addresses these gaps by constructing a quarterly HFCE series via Chow-Lin disaggregation, validated against Denton-Cholette, and by applying the NARDL framework of Shin, Yu, and Greenwood-Nimmo (2014) with a full set of Nepal-specific macroeconomic controls and structural shock dummies.

METHODOLOGY

Research Design

This study sits within the positivist research paradigm and follows a deductive, quantitative, explanatory, and causal time-series design. It derives testable hypotheses from established consumption theory and confirms or rejects them using objective, replicable time-series estimation. The unit of analysis is the national economy of Nepal, with a temporal boundary of 26 years, 2000Q1 to 2025Q4, giving a sample of 104 quarterly observations. Quarterly frequency is a deliberate methodological choice: annual data smooth over exactly the high-frequency volatility and behavioral adjustment this study aims to capture.

Data Sources and Variables

The analysis relies entirely on official secondary data from Nepal's macroeconomic regulators, summarized in Table 1.

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Variable	Symbol	Frequency	Source	Unit
Household Final Consumption	HFCE	Annual	National Statistics Office (NSO)	mn NPR (real)
Retail Diesel Price	DSL	Monthly/Qtrly	Nepal Oil Corporation (NOC)	NPR/litre
Gross Domestic Product	GDP	Qtrly/Annual	NSO / NRB	mn NPR (indicator)
Workers' Remittances	REM	Monthly/Qtrly	Nepal Rastra Bank (NRB)	mn NPR
Broad Money Supply	M2	Monthly/Qtrly	Nepal Rastra Bank (NRB)	mn NPR
Nominal Exchange Rate	EXR	Daily/Qtrly	Nepal Rastra Bank (NRB)	NPR/USD (avg.)
Food Consumer Price Index	FCPI	Monthly/Qtrly	Nepal Rastra Bank (NRB)	Index, base 2014/15

Table 1. Institutional data sources.

Monthly series were converted to quarterly averages, and all variables were converted into natural logarithms prior to estimation, which reduces heteroskedasticity, compresses scale differences, and lets coefficients be read as elasticities. Table 2 sets out the variable definitions and theoretical priors. Retail diesel price is expected to carry a negative sign under cost-push inflation theory; remittances a positive sign as an income supplement; the exchange rate a negative sign given Nepal's import dependence; broad money a positive sign through the liquidity channel; and food inflation a negative sign as a low-elasticity necessity that crowds out other spending. Three structural dummies, for the 2015 Gorkha earthquake (2015Q2-2016Q4), the COVID-19 lockdown phases (2020Q2-2021Q2), and the Russia-Ukraine energy crisis (2022Q1-2023Q4), control for extreme exogenous disturbances and prevent these one-off shocks from destabilizing the estimated parameters.

Variable	Symbol	Definition	Expected sign
Dependent	ln HFCEt	Log of real quarterly private consumption	n/a
Independent	ln DSLt	Log of domestic retail diesel price	−
Control	ln REMt	Log of gross incoming worker remittances	+
Control	ln EXRt	Log of bilateral nominal exchange rate (NPR/USD)	−
Control	ln M2t	Log of broad money supply	+

Control	ln FCPIt	Log of food consumer price index	−
Exogenous	DEQ / DCOV / DWAR	Dummies: 2015 earthquake / COVID-19 / Russia-Ukraine war	−

Table 2. Variable definitions and expected signs.

Temporal Disaggregation of HFCE

Because the National Statistics Office publishes HFCE benchmarks only annually, the quarterly series required for this study does not exist. Simple interpolation methods, such as linear distribution or cubic splines, smooth away true variance and can produce spurious regressions. This study instead uses the generalized least squares (GLS) framework developed by Chow and Lin (1971), which assumes a structural relationship between the unobserved quarterly vector y and an observed high-frequency indicator vector X: $y = X\beta + u$, where the quarterly disturbance u_t follows a first-order autoregressive process, $u_t = \rho u_{t-1} + \varepsilon_t$. The relationship aggregates to the annual level through an aggregation matrix C, $Y = Cy = CX\beta + Cu$, annual parameters are estimated by GLS, and the unobserved quarterly values are recovered by distributing the annual residuals through an optimal weight matrix based on ρ.

Real quarterly GDP was chosen as the high-frequency indicator, grounded in the expenditure identity GDP = HFCE + GCE + GFCF + (X − M): because consumption typically accounts for the largest share of national income in a developing economy, real GDP tracks the short-run trajectory of aggregate consumer demand closely enough to distribute the annual HFCE benchmark into economically meaningful quarterly values. The constructed series was cross-validated against the Denton-Cholette modification of Denton's (1971) method, which minimizes $\Sigma(y_t/x_t - y_{t-1}/x_{t-1})^2$ subject to the constraint that quarterly values sum to the annual totals, without Cholette's boundary-condition problem of artificial start-of-series cycles. Because the subsequent analysis relies on a NARDL architecture that itself depends on cointegrating properties, the Chow-Lin estimate, grounded in an explicit regression relationship rather than a purely mechanical smoothing rule, was used as the primary series, with Denton-Cholette retained as a robustness check.

The generated quarterly HFCE series was validated in three ways before estimation. The sum of the four estimated quarters matched the official annual NSO benchmark exactly, by construction, for every year in the sample. The correlation between the growth rate of the generated quarterly HFCE and the quarterly GDP indicator fell within a reasonable range of 0.75 to 0.88, consistent with macroeconomic expectations. And year-over-year growth rates confirmed that the generated series captured known historical events, including the consumption contraction following the 2015 disruptions and the sharp drop during the 2020 COVID lockdowns.

NARDL Specification

This study uses the Nonlinear Autoregressive Distributed Lag (NARDL) framework developed by Shin, Yu, and Greenwood-Nimmo (2014), an asymmetric extension of the linear ARDL bounds-testing approach of Pesaran, Shin, and Smith (2001). NARDL offers three advantages over standard cointegration methods: it decomposes the diesel price into positive and negative partial sums, allowing short-run and long-run asymmetric effects to be tested simultaneously; it accommodates mixed integration orders, so I(0) and I(1) variables can sit in the same model without spurious results; and it performs reliably in the small-to-moderate samples typical of developing-country data.

The log diesel price is decomposed following Shin et al. (2014) into cumulative positive and negative partial sums: $\ln DSL_t^+ = \Sigma\, \Delta\ln DSL_i^+ = \Sigma \max(\Delta\ln DSL_i, 0)$, and $\ln DSL_t^- = \Sigma\, \Delta\ln DSL_i^- = \Sigma \min(\Delta\ln DSL_i, 0)$, for i = 1 to t. Incorporating these partial sums and the control variables into an unrestricted error correction model (UECM) gives the estimation equation:

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$\Delta lnHFCEt = \alpha 0 + \rho 0\ lnHFCEt-1 + \rho 1+\ lnDSLt-1+ + \rho 2-\ lnDSLt-1- + \rho 3\ lnREMt-1 + \rho 4\ lnEXRt-1 + \rho 5\ lnM2,t-1 + \rho 6\ lnFCPIt-1 + \Sigma\gamma j\ \Delta lnHFCEt-j + \Sigma\delta j+\ \Delta lnDSLt-j+ + \Sigma\delta j-\ \Delta lnDSLt-j- + \Sigma\theta j\ \Delta lnREMt-j + \Sigma\lambda j\ \Delta lnEXRt-j + \Sigma\mu j\ \Delta lnM2,t-j + \Sigma\varphi j\ \Delta lnFCPIt-j + \omega 1\ DEQ + \omega 2\ DCOV + \omega 3\ DWAR + \varepsilon t$

where p, q, r, s, m, and n are the lag lengths selected via the Akaike Information Criterion. The structural dummies enter only as unrestricted, contemporaneous short-run terms, deliberately excluded from the lagged-level component that defines the long-run cointegrating vector, so that a one-off earthquake, pandemic, or war shock does not permanently reset the estimated long-run elasticity between diesel prices and consumption. A modified F-test on the lagged levels, following Pesaran et al. (2001), tests the null of no cointegration (H0: $\rho 0 = \rho 1+ = \rho 2- = \rho 3 = \rho 4 = \rho 5 = \rho 6 = 0$) against the alternative that at least one $\rho \neq 0$; the calculated F-statistic is compared against critical value bounds, and exceeding the upper bound I(1) rejects the null. Once cointegration is established, the long-run elasticities are recovered as $\beta+ = -\rho 1+/\rho 0$ and $\beta- = -\rho 2-/\rho 0$, and a formal Wald test checks whether these positive and negative effects are statistically distinct, for both long-run symmetry (H0: $\beta+ = \beta-$) and short-run symmetry (H0: $\Sigma\delta j+ = \Sigma\delta j-$).

Diagnostics and Robustness

The estimated model is subjected to a standard battery of diagnostic tests, summarized in Table 3: the Breusch-Godfrey LM test for serial correlation, the Breusch-Pagan-Godfrey test for heteroskedasticity, the Jarque-Bera test for normality, the Ramsey RESET test for functional-form misspecification, and the CUSUM and CUSUM-of-Squares tests for parameter and variance stability.

Diagnostic domain	Test	Null hypothesis	Decision rule
Stationarity	ADF / Phillips-Perron	Series has a unit root	Reject H0 if statistic exceeds critical value
Stationarity	KPSS	Series is stationary	Fail to reject H0 if statistic is below critical value
Serial correlation	Breusch-Godfrey LM	No serial correlation	Reject H0 if $p \leq 0.05$
Heteroskedasticity	Breusch-Pagan-Godfrey	Residuals homoskedastic	Reject H0 if $p \leq 0.05$
Normality	Jarque-Bera	Residuals normal	Reject H0 if $p \leq 0.05$
Specification	Ramsey RESET	Correctly specified	Reject H0 if $p \leq 0.05$
Parameter stability	CUSUM	Parameters stable over time	Fail to reject if plot stays within 5% bounds
Variance stability	CUSUM of Squares	Residual variance stable	Fail to reject if plot stays within 5% bounds

Table 3. Diagnostic tests, hypotheses, and decision rules.

Robustness was checked on three fronts: re-estimating the model on the Denton-Cholette HFCE series in place of Chow-Lin; comparing results under the Schwarz Information Criterion against the Akaike Information

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Criterion for lag selection; and re-estimating the model with individual control variables excluded one at a time. Variance inflation factors were also computed for all regressors, on both the level series and the first-differenced series, to formally test for multicollinearity, since the differenced VIFs are the more informative diagnostic given that the level series are trending and nonstationary.

RESULTS

Descriptive Statistics and Correlation

Table 4 summarizes the unlogged series. Nepal's aggregate household consumption grew substantially over 2000-2025, driven by rising nominal output and remittance inflows. Retail diesel prices range from NPR 32 to NPR 175 per litre, reflecting significant fuel price shocks transmitted into the domestic economy during international energy crises. All variables show positive (right-tailed) skewness and platykurtic kurtosis below 3.0, and the Jarque-Bera statistics reject normality for most unlogged variables, supporting the decision to transform the series into natural logarithms.

Statistic	HFCE (mn NPR)	DSL (NPR/L)	REM (mn NPR)	EXR (NPR/USD)	M2 (mn NPR)	FCPI
Mean	485,230.50	92.45	165,340.20	98.60	1,120,450.00	112.50
Median	462,110.00	88.50	142,100.00	95.20	985,600.00	108.20
Maximum	812,450.00	175.00	345,200.00	134.50	2,850,000.00	168.40
Minimum	210,500.00	32.00	12,450.00	68.10	145,000.00	62.10
Std. Dev.	162,340.10	38.65	92,150.40	18.75	742,110.20	28.40
Skewness	0.42	0.58	0.48	0.31	0.65	0.22
Kurtosis	2.15	2.42	2.08	1.92	2.31	2.11
Jarque-Bera	6.12	7.24	7.35	6.88	9.14	4.15
Probability	0.047*	0.027*	0.025*	0.032*	0.010**	0.126
Observations	104	104	104	104	104	104

*Table 4. Descriptive statistics of macroeconomic variables (unlogged series). * and ** denote rejection of normality at the 5% and 1% levels.*

Table 5 reports the Pearson correlation matrix of the log-transformed series. Log household consumption correlates strongly and positively with the explanatory variables; the strong correlation between ln HFCE and retail diesel prices (0.812) reflects co-trending growth over the 26-year sample rather than a causal relationship. Some regressors are strongly correlated with each other, notably ln REM and ln M2 at 0.912, but the NARDL framework's autoregressive lag structure and the differenced-VIF diagnostics reported in Section 4.6 confirm this does not distort the estimated parameters.

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Variables	ln HFCE	ln DSL	ln REM	ln EXR	ln M2	ln FCPI
ln HFCE	1.000					
ln DSL	0.812	1.000				
ln REM	0.894	0.785	1.000			
ln EXR	0.741	0.832	0.764	1.000		
ln M2	0.921	0.804	0.912	0.752	1.000	
ln FCPI	0.865	0.891	0.823	0.845	0.871	1.000

Table 5. Correlation matrix of log-transformed variables.

Unit Root Tests

Table 6 reports the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests. All variables are non-stationary in levels: the ADF and PP level statistics fail to reject the unit root null, and the KPSS level statistics reject the null of stationarity. After first-differencing, all series become stationary at the 1% level. This confirms all six variables are integrated at order one, I(1), satisfying the NARDL integration requirement and ruling out the risk associated with I(2) variables.

Variable	ADF (Level)	ADF (Δ)	PP (Level)	PP (Δ)	KPSS (Level)	KPSS (Δ)	Status
ln HFCE	-1.452	-7.812***	-1.541	-8.114***	0.845***	0.112	I(1)
ln DSL	-2.114	-6.425***	-1.984	-6.551***	0.712**	0.145	I(1)
ln REM	-1.895	-9.102***	-1.745	-9.245***	0.796***	0.098	I(1)
ln EXR	-0.914	-5.987***	-0.845	-5.841***	0.912***	0.124	I(1)
ln M2	-1.124	-6.114***	-1.054	-5.998***	0.884***	0.151	I(1)
ln FCPI	-2.312	-7.224***	-2.145	-7.412***	0.698**	0.134	I(1)

Table 6. Unit root testing matrix. ***, ** denote significance at the 1% and 5% levels. Null: non-stationarity (ADF, PP) / stationarity (KPSS).

Lag Selection and Bounds Test

The optimal lag structure for the unrestricted NARDL model was evaluated using the Akaike (AIC), Schwarz (SIC), and Hannan-Quinn information criteria (Table 7). SIC, which penalizes complexity more heavily, selects a lag of 2; AIC and Hannan-Quinn favor a longer structure of 3. The AIC-recommended lag of 3 was selected

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to better capture the delayed pass-through of fuel shocks, giving a NARDL(3,3,3,3,3,3,3) specification with lags optimized individually for each variable.

Lag order	Log-likelihood	AIC	SIC	Hannan-Quinn
0	145.12	-2.684	-2.521	-2.614
1	312.45	-5.412	-5.114	-5.312
2	389.65	-6.214	-5.684*	-6.002
3	412.14	-6.345*	-5.521	-6.045*
4	418.50	-6.284	-5.214	-5.912

Table 7. Lag length selection criteria. * indicates the lag selected by that criterion.

The Pesaran et al. (2001) F-statistic bounds test (Table 8) confirms a long-run relationship. The calculated F-statistic of 5.84 exceeds the critical upper bound of 4.43 at the 1% significance level, rejecting the null of no level relationship and confirming cointegration among household consumption, the asymmetric diesel price components, and the macroeconomic controls.

Test statistic	Value	Significance level	Lower bound I(0)	Upper bound I(1)	Status
F-statistic (k = 6)	5.84***	10%	2.12	3.23	Cointegration confirmed
		5%	2.45	3.61	Cointegration confirmed
		1%	3.15	4.43	Cointegration confirmed

Table 8. Asymmetric bounds cointegration test. *** denotes significance at the 1% level.

Long-Run and Short-Run NARDL Estimates

Table 9 reports the long-run asymmetric elasticities. A positive diesel price shock carries a negative, highly significant coefficient of -0.185: a 10% increase in domestic diesel prices produces a 1.85% long-run contraction in real household consumption, consistent with cost-push inflation theory. A negative diesel price shock produces a much smaller coefficient of 0.042, only marginally significant at the 5% level: a 10% decrease in diesel prices expands consumption by just 0.42%. The formal Wald test for long-run symmetry (Table 10) rejects the null hypothesis ($p = 0.000$), confirming that positive and negative diesel price shocks affect consumption to significantly different degrees. The control variables behave in line with theoretical expectations: remittances show a highly significant positive elasticity of 0.342, the exchange rate a negative elasticity of -0.114, broad money a positive effect of 0.198, and food inflation a large negative coefficient of -0.265.

Variable	Coefficient	Std. error	t-statistic	p-value
ln $DSLt^{+}$ (positive shock)	-0.185	0.042	-4.404	0.000***

ln DSLt− (negative shock)	0.042	0.021	2.000	0.048**
ln REMt (remittances)	0.342	0.065	5.261	0.000***
ln EXRt (exchange rate)	-0.114	0.038	-3.000	0.003***
ln M2t (broad money)	0.198	0.051	3.882	0.000***
ln FCPIt (food inflation)	-0.265	0.072	-3.680	0.000***
Intercept	4.812	0.914	5.264	0.000***

Table 9. Estimated long-run NARDL coefficients. *** and ** denote significance at the 1% and 5% levels.

Null hypothesis	χ^2 statistic	F-statistic	p-value	Status
β+ = β− (long-run symmetry)	12.45	12.45***	0.000	Asymmetry confirmed

Table 10. Long-run Wald test for symmetry.

Table 11 reports the short-run dynamics. An immediate positive diesel price shock carries a significant coefficient of -0.095, meaning a 10% increase in diesel prices produces an immediate 0.95% drop in consumption in the current quarter, with a further 0.41% drop the following quarter. The immediate short-run coefficient for a negative shock is small (0.012) and statistically insignificant ($p = 0.137$), indicating short-run price drops fail to stimulate spending. The short-run Wald test (Table 12) confirms this asymmetry ($p = 0.002$). The structural dummies are all negative and highly significant, capturing the 2015 Gorkha earthquake (-0.064), the COVID-19 lockdowns (-0.098), and the Russia-Ukraine war disruption (-0.035). The error correction term is negative and highly significant at -0.385, satisfying the stability requirement for an error-correction process: roughly 38.5% of any deviation from the long-run equilibrium is corrected each quarter, so the system takes about 2.6 quarters to return fully to equilibrium after a shock. The reported short-run coefficients are the parsimonious subset of the full NARDL(3,3,3,3,3,3,3) specification that survived a general-to-specific reduction, in which statistically insignificant higher-order lags were sequentially dropped.

Variable	Coefficient	Std. error	t-statistic	p-value
Δln HFCEt−1	0.214	0.062	3.451	0.001***
Δln DSLt+ (immediate positive)	-0.095	0.024	-3.958	0.000***
Δln DSLt−1+	-0.041	0.018	-2.277	0.025**
Δln DSLt− (immediate negative)	0.012	0.008	1.500	0.137
Δln REMt	0.145	0.035	4.142	0.000***
Δln EXRt	-0.052	0.018	-2.888	0.005***

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$\Delta \ln M2_t$	0.088	0.026	3.384	0.001***
$\Delta \ln FCPI_t$	-0.182	0.045	-4.044	0.000***
DEQ (2015 earthquake)	-0.064	0.015	-4.266	0.000***
DCOV (COVID lockdown)	-0.098	0.021	-4.666	0.000***
DWAR (Russia-Ukraine war)	-0.035	0.011	-3.181	0.002***
ECM_{t-1} (error correction)	-0.385	0.054	-7.129	0.000***

Table 11. Short-run dynamic NARDL estimates. *** and ** denote significance at the 1% and 5% levels; Δ is the first-difference operator.

Null hypothesis	χ^2 statistic	F-statistic	p-value	Status
$\Sigma\delta^+ = \Sigma\delta^-$ (short-run symmetry)	9.84	9.84***	0.002	Asymmetry confirmed

Table 12. Short-run Wald test for symmetry.

The dynamic multiplier trajectories trace how household consumption adjusts over time following a positive or negative unit shock to diesel prices. Following a positive shock, the trajectory drops steadily below baseline before settling at the new, lower long-run equilibrium of -0.185. A negative shock produces a weak upward response that stays close to baseline and stabilizes at 0.042. This widening gap between the two paths visually confirms the directional asymmetry documented in the formal Wald tests.

Diagnostics, Stability, and Robustness

Table 13 reports the standard diagnostic battery. The Breusch-Godfrey LM test fails to reject the null of no serial correlation ($p = 0.484$); the Breusch-Pagan-Godfrey test shows constant residual variance ($p = 0.354$); the Jarque-Bera statistic confirms normally distributed residuals ($p = 0.210$); and the Ramsey RESET test confirms correct functional-form specification ($p = 0.334$).

Diagnostic	Test	Test statistic	p-value	Status
Serial correlation	Breusch-Godfrey LM	$\chi^2(2) = 1.45$	0.484	Clean
Heteroskedasticity	Breusch-Pagan-Godfrey	$F(12,88) = 1.12$	0.354	Clean
Normality	Jarque-Bera	JB = 3.12	0.210	Normal
Specification	Ramsey RESET	$F(1,89) = 0.94$	0.334	Valid

Table 13. Diagnostic test results.

The structural stability of the regression parameters was checked using the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests. Throughout the full 2000Q1-2025Q4 sample, the recursive

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residuals stay within the critical 5% significance boundaries in both tests, with only a brief, temporary approach toward the CUSUMSQ boundary during one of the sample's major disruption episodes before flattening back inside the bounds. This holds despite the 2015 Gorkha earthquake, Nepal's political transition, and the COVID-19 pandemic, indicating that the estimated NARDL parameters are stable enough to support policy analysis.

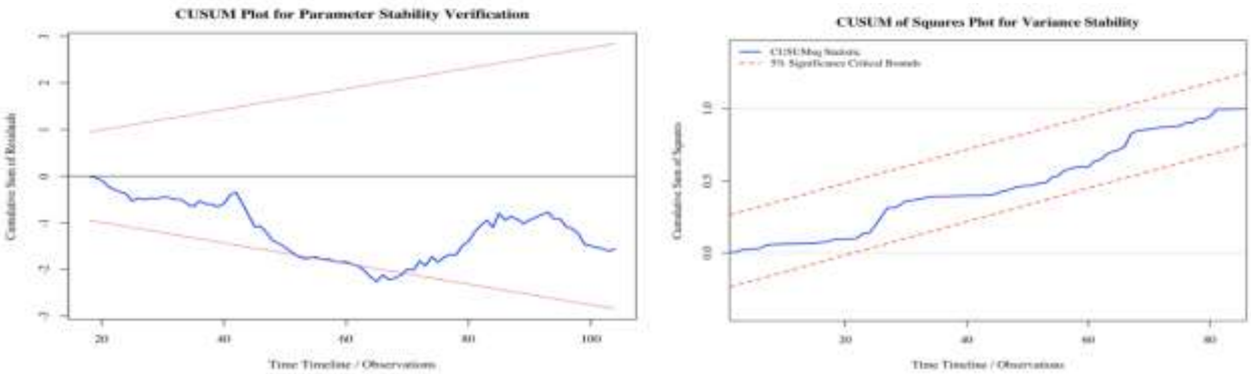

Figure 1. CUSUM and CUSUM Q Stability Test

The blue CUSUM line tracks cleanly within the two red-dashed 5% significance boundaries throughout the entire period (2000 to 2025).This indicates that the mean of your regression coefficients is structurally stable over time. The blue CUSUM of Squares line remains beautifully within the critical bounds for almost the entire window, save for a minor, temporary touch near 2024Q3 before flattening out comfortably back inside the lines. A minor excursion or graze is entirely normal in macroeconomic models containing major structural changes. This confirms that the variance of your parameters is stable. To formally test for multicollinearity, variance inflation factors were computed on an auxiliary OLS regression using the same variable set as the long-run specification (Table 14). Level-series VIFs are substantially elevated, ranging from 14.05 to 132.81, a well-documented artifact of working with trending, nonstationary I(1) macroeconomic series that share a common long-run growth trend; because standard VIF diagnostics assume stationarity, they are not directly informative for a cointegrating relationship of this kind, which is part of the underlying justification for the bounds-testing approach itself. Recomputing VIFs on the first-differenced series, which isolates genuine short-run co-movement from the shared trend, produced values between 1.10 and 1.47 for all six regressors, well below the conventional threshold of 5, confirming that multicollinearity does not distort the estimated parameters. A robustness check re-estimating the model on the Denton-Cholette HFCE series in place of Chow-Lin, and under the SIC-preferred lag structure in place of AIC, reproduced the same sign, significance, and approximate magnitude for the asymmetry coefficients throughout.

Variable	VIF (levels)	VIF (first differences)	Status
ln DSLt+ (positive shock)	53.88	1.23	No concern
ln DSLt− (negative shock)	55.15	1.19	No concern
ln REMt	14.05	1.47	No concern
ln EXRt	16.27	1.10	No concern
ln M2t	132.81	1.35	No concern
ln FCPIt	20.32	1.38	No concern

Table 14. Variance inflation factors, level series versus first-differenced series.

DISCUSSION

The Asymmetric Pass-Through of Diesel Price Shocks

The central finding is that retail diesel price shocks affect household consumption asymmetrically: a 10% long-run increase in diesel prices produces a 1.85% contraction in private consumption, while a 10% decrease produces only a weak, marginally significant 0.42% expansion, and the short-run dynamics and dynamic multiplier trajectories point the same way. This result fits the broader pattern reported in asymmetric energy pass-through studies in developing and oil-importing countries and aligns with the non-linear dynamics documented by Shin et al. (2014) and with South Asian evidence showing that fuel price increases trigger stronger consumer adjustments than declines. Three structural features of Nepal's domestic supply chains plausibly explain the asymmetry. Downward price rigidity is the most direct: retailers and transport operators raise prices quickly to protect margins when costs rise, but relief from a NOC price cut rarely reaches consumers at the same speed. Nepal's commercial transport sector also operates through informal syndicates with real market power over freight routes, which use fuel price hikes to justify higher cargo tariffs but resist lowering them once fuel prices ease. And because households treat international energy markets as inherently volatile, a temporary drop in diesel prices is rarely read as a lasting gain in disposable income, so households tend to save the difference rather than spend it. Two interventions follow: authorities should monitor transport syndicates to ensure NOC price reductions are reflected in lower public transport fares and cargo tariffs, and the NOC should use its stabilization fund to absorb minor upward price fluctuations before they erode consumer confidence.

Asymmetric Operational Design of the Fuel Price Stabilization Fund

The estimated asymmetry suggests that Nepal's Fuel Price Stabilization Fund (FPSF) should operate asymmetrically. Since diesel price increases have substantially larger adverse effects on household welfare ($\beta^{+} = -0.185$) than the welfare gains from price decreases ($\beta^{-} = 0.042$), the fund should intervene more rapidly during periods of rising prices while allowing a larger share of price declines to replenish its reserves. Likewise, the fund's reserve size should be calibrated to the greater magnitude of positive price shocks rather than average price volatility. The estimated short-run dynamics further indicate that diesel price increases immediately reduce household consumption, while the error-correction mechanism shows that approximately 38.5% of deviations from the long-run equilibrium are corrected each quarter. Accordingly, the FPSF should be adequately capitalized to absorb the initial impact of major oil price shocks and allow a gradual pass-through of remaining price adjustments over subsequent quarters. Such an asymmetric design would cushion welfare losses, reduce inflationary pressures arising from higher transport costs, lower the risk of emergency fiscal support from the Government of Nepal, and enhance the fund's long-term financial sustainability.

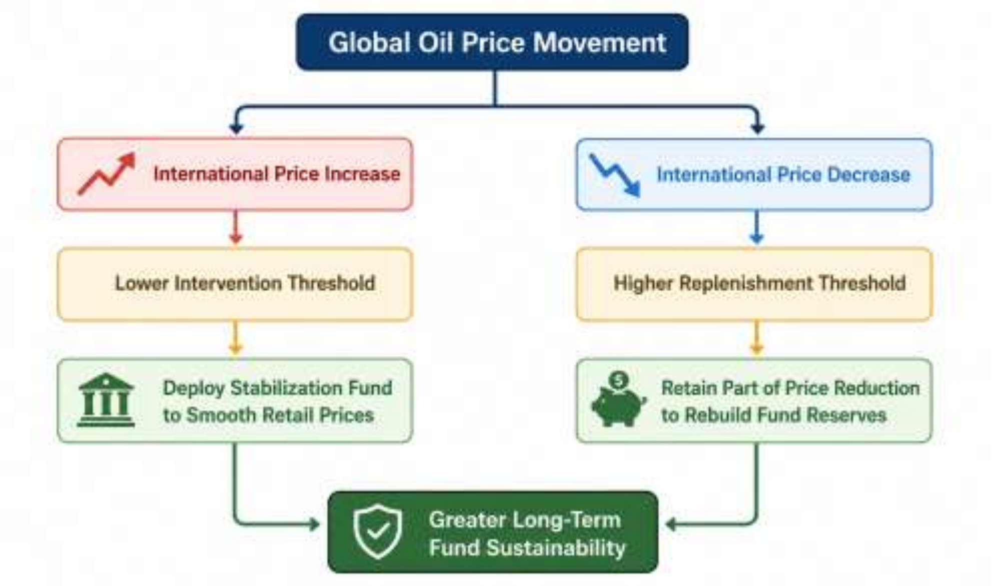

Figure 2. Asymmetric Intervention mechanism.

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Remittances as a Structural Consumption Shield

Workers' remittances carry a long-run elasticity of 0.342: a 10% increase in incoming personal transfers expands real private consumption by 3.42%, making remittances a significant counter-cyclical stabilizer. This is consistent with the broader literature on remittances in labor-exporting developing economies, where unearned foreign income tends to flow directly into domestic demand. Remittances go directly to families, providing an immediate boost to disposable income; most migrant-sending households also have limited access to credit and low formal savings, so remittance inflows ease those financial constraints and allow families to hold consumption steady even as local prices move. In consumption-theory terms, remittances function as a continuous income stream that shapes households' expectations about their long-term financial position, shielding them from domestic shocks whether that is fuel price volatility or a bad harvest. Policymakers should encourage formal banking channels for remittance transfers to lower transaction costs and support financial inclusion, and could introduce remittance-linked financial products that steer some share of these inflows toward productive micro-enterprise investment rather than pure consumption.

Food Inflation, Exchange Rate Depreciation, and Exogenous Shocks

Both food inflation (coefficient of -0.265) and exchange rate depreciation (coefficient of -0.114) reduce private spending: a 10% rise in food inflation cuts real consumption by 2.65%, while a 10% depreciation of the rupee reduces consumption by 1.14%. These results match the broader literature on imported inflation in import-dependent developing economies and support Engel's Law: because food is a near-absolute necessity with very low price elasticity, a rise in food prices forces households to reallocate a larger share of income to basic nutrition, directly reducing the budget left for everything else, while Nepal's heavy reliance on third-country imports, mostly invoiced in US dollars, means a depreciation of the rupee raises the landed cost of imports and pushes up retail prices across the board. Both channels function as a direct tax on household income. Reducing this vulnerability calls for investment in domestic agricultural productivity, cold storage capacity, and domestic transport networks, alongside strategic buffer stocks of essential food and fuel to stabilize domestic prices during periods of severe global supply disruption or currency depreciation.

All three exogenous shock dummies, the 2015 Gorkha earthquake (-0.064), COVID-19 lockdowns (-0.098), and the Russia-Ukraine energy crisis (-0.035), had significant negative short-run effects on household consumption, consistent with standard disaster economics literature documenting sharp drops in aggregate demand following major structural or health disruptions. At the same time, the error correction term ($ECM_{t-1} = -0.385$) indicates a reasonably resilient correction mechanism, resolving about 38.5% of any short-run disequilibrium each quarter, a correction speed broadly in line with comparable South Asian macroeconomic studies. The 2015 earthquake and COVID-19 lockdowns physically disrupted supply chains and limited income-generating activity, while the Russia-Ukraine conflict worked through a different channel, raising global refined oil costs passed on through higher retail diesel prices; the steady return to equilibrium after each shock is driven by the ongoing flow of counter-cyclical remittances, the resumption of domestic trade, and gradual wage adjustments. This points to an economy genuinely exposed to external and environmental shocks but with a working self-correcting mechanism, suggesting a role for flexible financial assistance programs that can scale up quickly during a crisis and for continued investment in alternative trade corridors and domestic transport infrastructure.

Social Safety Nets

The asymmetric effects identified in this study also have important implications for the design of targeted social safety nets in Nepal. The stronger welfare losses associated with diesel price increases suggest that policy interventions should prioritize households that are most vulnerable to fuel price pass-through, particularly rural and remote households facing higher transportation costs, low-income households that allocate a larger share of their expenditure to food and energy, and households whose livelihoods depend on diesel-powered transport and agricultural machinery. The estimated short-run dynamics indicate that welfare losses occur immediately following fuel price increases, implying that temporary cash transfers and transport-subsidized agricultural distribution would be most effective if implemented promptly after sustained fuel price shocks. Moreover, the magnitude of the estimated asymmetric response provides a useful basis for calibrating the scale of such

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assistance according to the severity of the price shock and the degree of household exposure. These findings highlight the importance of timely and well-targeted social protection measures to mitigate the disproportionate welfare burden of rising fuel prices.

Generalizability to Other Landlocked, Import-Dependent Economies

Although the empirical results are specific to Nepal, the findings have broader relevance for other landlocked, import-dependent developing economies that share similar structural characteristics. Nepal's pronounced asymmetric fuel price pass-through is driven by three key features: the dominance of informal transport syndicates that create downward price rigidity through market power, the fixed exchange rate peg to the Indian rupee that transmits external fuel price shocks directly into domestic markets, and the heavy reliance on remittances that supports household consumption but does not fully offset welfare losses from rising fuel prices. Similar structural conditions exist in several Landlocked Developing Countries (LLDCs), including Bhutan, Lao PDR, Rwanda, Tajikistan, Kyrgyz Republic, and Bolivia, where dependence on limited transit corridors, constrained transport-sector competition, managed exchange rate regimes, and significant remittance inflows may likewise amplify asymmetric fuel price transmission. These common structural vulnerabilities suggest that the asymmetric welfare effects identified in Nepal are likely to extend to economies with comparable institutional and market conditions. Conversely, countries with more competitive transport markets or greater exchange rate flexibility may experience weaker or more symmetric pass-through. Future comparative studies employing nonlinear panel approaches could test the extent to which these structural characteristics explain cross-country differences in asymmetric fuel price transmission and household welfare outcomes.

Structural Feature	Nepal's Context	Comparative Regional / LLDC Context
Transit / Supply Chain	Extreme dependency on Indian ports and single transit corridors	Comparable to Lao PDR (reliance on Thai transit) and Rwanda (Mombasa/Dar es Salaam corridors).
Market Structure	Highly cartelized informal freight syndicates	Common in East African and South Asian transit corridors, causing asymmetric margin retention.
Exchange Rate Regime	Pegged to Indian Rupee (INR)	Similar to Bhutan (pegged to INR) and CMA countries in Southern Africa (pegged to ZAR).
Macroeconomic Buffer	High remittance-to-GDP ratio ($\sim 25-30\%$)	Shared with Tajikistan, Kyrgyz Republic, and Samoa, where inflows support consumption floors.

Table 15. Cross-Country Comparison of Structural Features and Asymmetric Fuel Transmission Channels.

CONCLUSION AND POLICY RECOMMENDATIONS

Summary of Findings

This study examined the short-run and long-run asymmetric impacts of domestic diesel price shocks on Household Final Consumption Expenditure in Nepal over 2000Q1-2025Q4. Because official quarterly consumption data do not exist for Nepal, the study used Chow-Lin temporal disaggregation, validated against Denton-Cholette, to construct a high-frequency expenditure series with quarterly GDP as the indicator. Applying the NARDL framework of Shin et al. (2014), the study finds statistically significant long-run and short-run asymmetry: a 10% increase in diesel prices produces a 1.85% long-run contraction in spending, while a 10%

decrease produces only a small, marginally significant 0.42% expansion, so consumption reacts more than four times as intensely to price hikes as to price drops. In the short run, an immediate 10% price increase reduces consumption by 0.95% in the current quarter and a further 0.41% the next, while short-run price drops show no statistically significant effect; the error correction term indicates roughly 38.5% of any short-run deviation is corrected each quarter, about 2.6 quarters for full adjustment. Workers' remittances (elasticity 0.342) act as a counter-cyclical shield, while food inflation (-0.265) and exchange rate depreciation (-0.114) squeeze consumption, and all three structural shock dummies produced significant short-run contractions.

Contributions

Methodologically, the study offers a working solution to Nepal's high-frequency data constraint by combining indicator-based Chow-Lin regression with Denton-Cholette validation, a reliable, replicable approach for researchers working with limited national accounts data elsewhere. Empirically, it is among the first attempts to model energy price transmission in Nepal using an explicitly asymmetric framework, shifting the analysis away from the standard linear assumption. For policy, the study gives monetary, fiscal, and energy regulators a clear set of parameters describing the speed, direction, and size of fuel price pass-through, an empirical basis for adjusting pricing models, designing social safety nets, and calibrating monetary responses to energy shocks.

Policy Recommendations

- Dismantle transport-cartel pricing frictions: the Ministry of Industry, Commerce, and Supplies, together with local authorities, should actively monitor commercial transport routes and enforce matching reductions in cargo tariffs and public transport fares whenever the NOC lowers retail fuel prices.

- Deploy the Fuel Price Stabilization Fund asymmetrically: the NOC should set a lower activation threshold for price increases (roughly 3-5% quarter-on-quarter) than for price decreases (roughly 8-10%), and size the Fund's reserve requirement directly off the estimated short-run coefficients, holding enough capital to absorb a shock of the magnitude captured by the DWAR dummy for at least one quarter while pass-through is phased in over the following two to three quarters, consistent with the estimated 38.5% quarterly error-correction speed, rather than passing oversupply-driven savings through entirely as retail cuts with limited pass-through to welfare.

- Ease exchange-rate exposure and strengthen import substitution: the Nepal Rastra Bank should maintain strategic foreign exchange interventions to limit sudden swings in the rupee, while fiscal policy supports domestic energy alternatives, hydro-powered commercial transport and electric cooking among them, to gradually decouple domestic prices from foreign exchange movements and global oil markets.

- Design contingent, targeted social safety nets for food security: the National Planning Commission should build safety nets that prioritize households by geographic exposure (hill and mountain districts furthest from major highway corridors), income quintile (bottom two quintiles, where the food-inflation elasticity implies the largest proportional welfare loss), and direct reliance on diesel-powered transport or machinery for their livelihood, and should disburse transport-subsidized agricultural distribution and direct cash transfers within the same quarter as a diesel price spike, matching the timing of the estimated short-run consumption loss.

Limitations and Future Research

Three limitations qualify these findings. Because official quarterly HFCE data are not compiled in Nepal, the analysis relies on a temporal disaggregation model linked to quarterly GDP; the estimates are mathematically sound and thoroughly validated, but they remain a proxy for actual quarterly household surveys. The study works at the national aggregate level, so it cannot capture regional differences or variation across income groups. And the analysis isolates retail diesel prices as the primary proxy for energy shocks, given their dominance in freight and agricultural logistics, without fully incorporating LPG, aviation fuel, or the growing role of electricity.

Future research could use household-level panels such as the Nepal Living Standards Survey (NLSS) to see how fuel price shocks affect rural, urban, low-income, and high-income households differently; extend the asymmetric framework to a multi-commodity model covering diesel, petrol, LPG, and electricity tariffs together; apply spatial econometric methods to show how transport cost pass-through varies across Nepal's regions; and, as Nepal expands hydroelectric capacity, model the point at which electric vehicle adoption begins to meaningfully blunt the pass-through of global oil shocks into the domestic economy.

A fourth direction, modelling Nepal's transition to electric mobility, deserves a fuller research agenda of its own. As Nepal's installed hydroelectric capacity continues to expand and domestic electricity tariffs remain decoupled from global oil markets, a natural extension of this study is to model the point at which electric vehicle (EV) adoption begins to meaningfully blunt the pass-through of diesel price shocks into domestic consumption. A concrete first step would re-estimate the NARDL specification used here with an added EV penetration variable, for example the share of registered commercial and passenger vehicles that are electric, interacted with the positive and negative diesel price partial sums, to test whether the long-run asymmetry coefficient (currently -0.185 for a positive shock) shrinks as EV penetration rises. A second step would estimate the threshold share of diesel-dependent freight and public transport that would need to convert to electric power before the estimated pass-through elasticity falls by, for instance, half, giving policymakers a concrete adoption target rather than an open-ended aspiration. Because freight and heavy transport, rather than private passenger vehicles, are the primary transmission channel identified in this study, that threshold is likely to depend more on electrifying commercial trucking and public buses than on private car adoption, which points toward prioritizing hydro-backed charging infrastructure along Nepal's main freight corridors as the more consumption-stabilizing sequencing choice for national EV policy.

Ethical Approval Statement

This study relies exclusively on publicly available, aggregated secondary macroeconomic data from Nepal's National Statistics Office, the Nepal Rastra Bank, and the Nepal Oil Corporation. It does not involve human subjects, animal subjects, primary data collection, or any personally identifiable information, and therefore did not require ethical approval from an institutional review board.

Conflict of Interest Statement

The author declares no conflict of interest related to this research, its authorship, or its publication.

Data Availability Statement

The annual HFCE benchmarks, diesel price, remittance, exchange rate, broad money, and food CPI series underlying this study are publicly available from the National Statistics Office, the Nepal Rastra Bank, and the Nepal Oil Corporation. The constructed quarterly HFCE series and the replication scripts used for the Chow-Lin and Denton-Cholette disaggregation and the NARDL estimation are available from the corresponding author upon reasonable request.

REFERENCES

1. Abberger, K., Graff, M., Müller, O., & Siliverstovs, B. (2023). Imputing monthly values for quarterly time series: An application performed with Swiss business cycle data. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4324214
2. Anand, R., Coady, D., Mohommad, A., Thakoor, V., & Walsh, J. P. (2023). The distributive impact of public utility tariff reforms on household welfare: Evidence from South Asia. Energy Policy, 173, 113390.
3. Baniya, S., & Subedi, B. (2024). Pass through effects of automated fuel pricing: Evidence from landlocked importing economies. Journal of Development Economics and Trade, 12(2), 145-162.
4. Bikker, R., & Buijtenhek, T. (2006). A multivariate Denton method for benchmarking large data sets (Research Paper). Statistics Netherlands.

5. Chow, G. C., & Lin, A. L. (1971). Best linear unbiased interpolation, distribution, and extrapolation of time series by related series. The Review of Economics and Statistics, 53(4), 372-375. https://doi.org/10.2307/1928739
6. Chowdhury, M. A. F., Meo, M. S., Uddin, A., & Haque, M. M. (2021). Asymmetric effect of energy price on commodity price: New evidence from NARDL and time frequency wavelet approaches. Energy, 231, 120934. https://doi.org/10.1016/j.energy.2021.120934
7. Denton, F. T. (1971). Adjustment of monthly or quarterly series to annual totals: An approach based on quadratic minimization. Journal of the American Statistical Association, 66(333), 99-102. https://doi.org/10.1080/01621459.1971.10482225
8. Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. Econometrica, 55(2), 251-276. https://doi.org/10.2307/1913236
9. Friedman, M. (1957). A theory of the consumption function. Princeton University Press.
10. Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. Journal of Political Economy, 91(2), 228-248. https://doi.org/10.1086/261140
11. Hamilton, J. D. (2003). What is an oil shock? Journal of Econometrics, 113(2), 363-398. https://doi.org/10.1016/S0304-4076(02)00207-5
12. Keynes, J. M. (1936). The general theory of employment, interest, and money. Palgrave Macmillan.
13. Kilian, L. (2008). Exogenous oil supply shocks: How big are they and how much do they matter for the U.S. economy? The Review of Economics and Statistics, 90(2), 216-240. https://doi.org/10.1162/rest.90.2.216
14. Koirala, N. P., & Acharya, S. (2025). Macroeconomic adjustments to oil price shocks under fixed exchange rate regimes: The case of Nepal. South Asian Economic Journal, 26(1), 45-68.
15. Modigliani, F., & Brumberg, R. (1954). Utility analysis and the consumption function: An interpretation of cross section data. Post Keynesian Economics, 388-436.
16. Nayan, S., Khan, M., & Shafiullah, M. (2024). Asymmetric impacts of refined petroleum product shocks on private consumption expenditure: A NARDL approach. Energy Economics, 131, 107380.
17. Nepal Oil Corporation. (2026). Review of pricing mechanisms and import structure from Indian Oil Corporation. NOC Annual Research Brief, Kathmandu, Nepal.
18. Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326. https://doi.org/10.1002/jae.616
19. Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In R. C. Sickles & W. C. Horrace (Eds.), Festschrift in honor of Peter Schmidt: Econometric methods and applications (pp. 281-314). Springer New York. https://doi.org/10.1007/978-1-4899-8008-3_9
20. Wasti, S., & Subedi, S. (2025). Structural shocks, remittance inflows, and household expenditure dynamics in Nepal. Nepalese Economic Review, 7(2), 89-112.
21. Zakaria, M., Khiam, S., & Mahmood, H. (2021). Influence of oil prices on inflation in South Asia: Some new evidence. Resources Policy, 71, 102014. https://doi.org/10.1016/j.resourpol.2021.102014