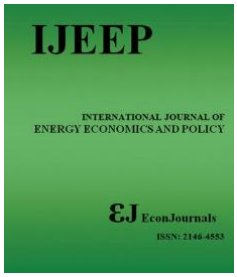

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Oil-Driven Consumption in Rentier Economies: Evidence from a Proxy-Based MPC Model in the Gulf Cooperation Council

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ABSTRACT

This study proposes a novel macroeconomic approach, formulated specifically for estimating the Marginal Propensity to Consume (MPC) in the Gulf Cooperation Council (GCC) economies, based on high-frequency commodity price and trade data. As there are no reliable household consumption datasets, U.S. imports are used as proxy for consumption, while income is instrumented by crude oil prices. Controls are included for American Consumer Price Index (CPI), bilateral exchange rates, and international uncertainty measured via the Volatility Index (VIX). Estimation via a fixed effects pooled panel regression model, covering January 1992 until April 2025, yields a 0.68 estimated MPC. Controlling for demographic variations—specifically, expatriation induced lower consumption rates—the population-weighted adjustment yields a citizen MPC close to 1.0. Also, simulation analysis fortifies model robustness by showing uniform and proportionate import responses to crude oil price shocks. These findings have significant implications for shaping fiscal policy decisions and macroeconomic forecasting in energy-exporting economies that have difficulty utilizing microdata, while also being a useful tool for policymakers and researchers. Also, this novel macroeconomic model, with its forward-looking features, has great potential to predict the demand-side effects of energy price volatility and to shape adaptive and equitable energy policy decisions in the context of the GCC region.

Keywords: Marginal Propensity to Consume, GCC, Oil Prices, Imports, Panel Data, Proxy Estimation
JEL Classification: E21, E62, F14, Q43

1. INTRODUCTION

The marginal propensity to consume is crucial for formulating effective fiscal and macroeconomic policies, particularly in resource-abundant economies such as those comprising the GCC. The GCC member states, Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman, exhibit a high degree of dependence on hydrocarbon revenues while simultaneously importing a substantial share of their consumer goods, primarily from advanced economies, including the United States. Consequently, oil revenues and trade patterns represent critical variables for analyzing consumption behavior in these economies.

In particular, oil price fluctuations serve as a primary channel through which macroeconomic volatility is transmitted to household-level consumption. In rentier states like the GCC, where the state redistributes oil income through public employment, subsidies, and transfer programs, changes in oil revenue significantly shape aggregate demand. As Elbadawi and Gelb (2010) emphasize, public expenditure in oil-exporting countries tends to be highly procyclical, thereby magnifying the economic effects of oil booms and busts.

Likewise, Fasano and Wang (2002) provide empirical evidence that fiscal revenues derived from oil exports have a direct and substantial impact on import demand, validating the use of

external trade data as a credible proxy for domestic consumption patterns. Complementing these insights, recent studies by Ebadi and Abdul Razaq (2024) and Ebadi et al. (2025) reaffirm the centrality of the oil sector in the macroeconomic structure of the GCC, strengthening the pivotal role of oil in the economic modeling of the region.

Against this backdrop, the present study introduces a novel proxy-based methodology for estimating MPC in GCC economies. This approach, which capitalizes on the unique structural characteristics of these economies, namely their dependence on hydrocarbon income and their dependence on imported consumer goods, overcomes the challenges posed by limited or inconsistent consumption data. By modeling imports from the U.S. as a function of oil prices, bilateral exchange rates, and the US Consumer Price Index (CPI), we capture the responsiveness of consumption to changes in oil-derived income, providing a new and enlightening perspective on consumption dynamics in these economies.

This methodological innovation provides a pragmatic and theoretically grounded alternative for estimating consumption dynamics in data-constrained environments. Although MPC is typically estimated using micro-level household data in advanced economies, such sources are either unavailable or unreliable in the GCC context. Using observable international trade flows and price variables, the proxy-based approach developed in this study offers a feasible pathway to capture the income-consumption nexus in rentier states.

The empirical results show an MPC of 0.68 for GCC economies as measured in a proxy model. This estimate indicates a strong, statistically significant relationship between income attributable to oil and consumption-related imports, validating the oil-linked income-consumption transmission channel in oil-based rentier states. When accounting for demographic composition, the inferred MPC for nationals approaches 1.0, implying that citizens consume nearly every dollar of marginal income. These inferences are bolstered by the simulation analysis, which showed similar responses as in direct proportions to changes in oil price levels. These estimates have important implications in macroeconomic forecasting and fiscal policy formation in GCC countries, as they serve to demonstrate the distinctions in consumption behavior across population subgroups, and the utility to better target subgroups with high MPCs when designing fiscal policy to maximize results.

In addition to providing empirical estimates, this study contributes to the broader literature on the effectiveness of fiscal policy and macroeconomic stabilization in oil-dependent regions. The findings not only improve our understanding of consumption behavior in these economies, but also have direct and practical implications for economic forecasting, the design of fiscal stimulus, and structural reform. Furthermore, the modeling framework proposed here may be readily adapted to other economies facing similar data limitations, thereby serving as a transferable template for assessing consumption responses in resource-rich, demographically complex settings.

The rest of the paper is organized as follows: Section 2 reviews the literature; Section 3 describes the model and the methodology; Section 4 provides empirical results; Section 5 adjusts for demographic effects; Section 6 does a simulation analysis and discusses the results; Section 7 concludes.

2. LITERATURE REVIEW

2.1. Theoretical Background

The MPC concept—the proportion of additional income consumed rather than saved—is foundational in Keynesian economics. In Keynes' General Theory of Employment, Interest and Money (1936), MPC plays a central role in the consumption function, linking changes in income to consumption expenditures. According to Keynesian logic, higher MPCs contribute to stronger multiplier effects, amplifying the impact of fiscal stimulus on aggregate demand.

Subsequent developments, such as Modigliani and Brumberg's Life-Cycle Hypothesis (LCH) (1954) and Friedman's Permanent Income Hypothesis (PIH) (1957), introduced a more dynamic view of consumption. These models propose that individuals smooth consumption over time based on expected lifetime income, not just current earnings. Consequently, consumption responses to transitory income shocks may be modest, especially for wealthier or unconstrained households.

To reconcile theoretical models with empirical realities, Hall (1978) introduced the Rational Expectations framework, suggesting that only unexpected changes in income should affect consumption. Campbell and Mankiw (1989) extended this view by proposing a hybrid model: a fraction of consumers behave as forward-looking agents, while others follow "rule-of-thumb" behavior, consuming based on current income. This duality has influenced numerous empirical estimations of MPC by recognizing household heterogeneity.

More recent theoretical contributions incorporate structural and behavioral insights. Heterogeneous-agent models, particularly the Heterogeneous Agent New Keynesian (HANK) framework (Kaplan et al., 2018) allows for meaningful differences in income, wealth, and credit constraints across households. These models predict higher aggregate MPCs than representative-agent models due to the prevalence of liquidity constraints and precautionary savings motives. Carroll (1997) further developed the notion of buffer-stock saving, showing that consumers seek to maintain a target wealth-to-income ratio under uncertainty, leading to higher MPCs when facing income volatility. Behavioral economics also reshapes our understanding of MPC. According to Thaler's theory of mental accounting (1999), individuals treat income sources differently, often spending windfalls more readily than permanent income. Present bias and limited self-control (Laibson, 1997) can cause deviations from rational consumption smoothing, especially among low-income households. These insights explain why certain groups, particularly those with limited financial literacy or credit access, display high MPCs.

MPC's central role in determining the' size and distributional effects of fiscal multipliers underscore its policy relevance. Studies

such as Christiano et al. (2011) emphasize that fiscal interventions targeting high-MPC households can yield stronger aggregate demand responses. Thus, understanding the determinants and heterogeneity of MPC is crucial for designing effective fiscal policy.

2.2. Empirical Evidence

2.2.1. United States

Empirical studies in the United States provide extensive evidence on household consumption responses to income shocks. Johnson et al. (2006) examined the 2001 tax rebates and found that households spent 20 to 40% of the rebate in the initial quarter and up to 60% within six months. Broda and Parker (2014), using scanner data during the 2008 crisis, observed even higher MPCs among liquidity-constrained households, often approaching 0.8.

Ebadi (2022) utilized data from 46 states in the US and found that the MPC is higher for durable consumption than non-durables and services. The study provided some evidence supporting the permanent income hypothesis and discussed that the MPC is higher among states when seven rich states were removed from the dataset. Although Ebadi and Are (2023) revealed the asymmetrical impact of income on US consumption, the study found a high MPC for durable consumption, but the results were still aligned with Ebadi (2022). Carroll et al.'s structural models (2017) estimate average MPCs between 0.25 and 0.35, revealing substantial heterogeneity based on income, wealth, and access to credit. High-frequency transaction data further confirms these patterns. For instance, Baker (2018) found that stimulus payments triggered immediate and sizable increases in nondurable consumption, especially among low-income and younger consumers.

Natural experiments provide robust causal estimates of MPC. Parker et al. (2013) used the timing of stimulus checks in 2008 to show rapid consumption responses. Similarly, Fagereng et al. (2021) used lottery winnings in Norway to show that low-wealth households had MPCs near 0.8, while top-decile households showed MPCs below 0.1.

2.2.2. Europe

European studies highlight institutional and cultural variation in MPC. Jappelli and Pista-Ferrari (2010) found that MPCs across European countries ranged from 0.2 to 0.4, with higher values in Southern Europe due to greater credit constraints and informal labor markets. In contrast, Northern European countries exhibit lower MPCs, supported by stronger social safety nets.

Blundell et al. (2016) demonstrated that wealth inequality has a significant influence on the consumption responses of European households. The European Central Bank (2023)'s Household Finance and Consumption Survey (HFCS) consistently finds higher marginal propensities to consume among lower-income and lower-wealth households, emphasizing the redistributive potential of fiscal transfers.

2.2.3. Asia

In Asia, MPC varies widely across countries, reflecting differences in financial development, social safety nets, and demographic factors. Empirical studies in Japan and South Korea have demonstrated that MPC heterogeneity is significantly influenced by factors such as age, wealth, employment status, and housing choices. In Japan, research indicates that mortgage debtors exhibit higher MPCs, while households planning to upgrade their housing tend to have lower MPCs, highlighting the role of housing tenure and liquidity constraints in consumption behavior (Koga and Matsumura, 2020). Similarly, in South Korea, households with high leverage and low liquid assets show increased sensitivity to income changes, particularly negative shocks, underscoring the impact of financial vulnerability on consumption responses (Song, 2019). Chamon and Prasad (2010) observe similarly low MPCs in urban China, driven by high education and housing costs. Recent studies indicate that China's marginal propensity to consume is increasing as household consumption becomes a more significant driver of economic growth. In the first quarter of 2024, China's MPC reached 63.3%, the highest since 2020, reflecting a growing tendency among households to spend rather than save (National Bureau of Statistics of China, 2024).

India exhibits high MPCs, especially in rural areas with more cash-constrained households. Studies by the Reserve Bank of India indicate that agricultural income shocks and government transfers have immediate and significant effects on consumption, with estimated MPCs between 0.6 and 0.8.

2.2.4. Developing economies and cross-country patterns

Cross-country analyses by Fesseau et al. (2013) and World Bank (2021) find higher MPCs in developing countries due to weaker financial systems and lower average incomes. In Sub-Saharan Africa, for instance, Beegle et al. (2016) show that rural households consume nearly all additional income due to subsistence needs, with MPCs estimated around 0.9.

Macro-level estimates using national accounts and Vector Autoregression (VAR) models also reveal strong consumption responses to income shocks in resource-rich economies. While these are less precise than micro-level estimates, they help identify broader structural consumption patterns in data-poor contexts.

2.2.5. The GCC context

Empirical evidence on MPC in GCC countries is scarce due to the absence of detailed household consumption data. Nonetheless, macroeconomic and trade data provide valuable insights. Studies like Elbadawi and Gelb (2010) describe the procyclical nature of public expenditure in oil-exporting economies, which drives consumption patterns.

Household consumption in the GCC is closely tied to public sector dynamics, including employment, subsidies, and fiscal transfers. IMF (2015) studies on Saudi Arabia and other GCC states confirm that consumption is highly sensitive to changes in oil revenue, suggesting that oil prices serve as a meaningful proxy for income.

Due to the import-oriented nature of GCC consumption, some researchers propose using import demand as a proxy for consumer spending. Fasano and Wang (2002) and other IMF studies highlight that a substantial portion of consumer goods are imported,

particularly from advanced economies like the US. This import-consumption relationship forms the basis of the current study's methodology and presents a promising avenue for estimating MPC in data-constrained, oil-dependent settings.

3. MODEL AND METHODOLOGY

This section outlines the empirical strategy for estimating the marginal propensity to consume in the context of GCC countries. Given the absence of comprehensive household-level consumption data, this study adopts a proxy-based approach using macroeconomic indicators. In particular, imports from the United States are used as a proxy for private consumption, while oil prices are employed as a proxy for national income. This methodology is grounded in the structural features of GCC economies, which are heavily reliant on oil exports for income and on foreign imports for consumption goods.

3.1. Conceptual Framework

The theoretical underpinning of this methodology lies in the Keynesian consumption function:

$$C_t = \alpha + cY_t + \varepsilon_t \quad (1)$$

where C_t is consumption, Y_t is income, c represents the marginal propensity to consume, and
ε_t is the error term.
In this study:
C_t: Imports from the United States (used as a proxy for consumption)
Y_t: Brent oil prices index (used as a proxy for national income)
α: Autonomous component of consumption.

The central assumption is that changes in oil prices lead to proportional changes in government revenue, and thereby household income and consumption, especially in oil-exporting economies such as those in the GCC.

3.2. Empirical Specification

To account for other economic variables influencing import demand, the model includes three control variables: the US Consumer Price Index less energy (CPI), the exchange rate between each GCC country and the US dollar, and the VIX (CBOE Volatility Index). The log-log regression specification is as follows:

$$M_{it} = \beta_0 + \beta_1 OP_t + \beta_2 CPI_t + \beta_3 E_{it} + \beta_4 VIX_t + \varepsilon_{it} \quad (2)$$

Where:
M_{it}: Imports from the US to country i at time t
OP_t: Brent oil price (e.g., Brent crude) at time t
CPI_t: US Consumer Price Index less energy at time t
E_{it}: Exchange rate of country i relative to USD at time t
VIX_t: The Chicago Board Options Exchange (CBOE) at time t
ε_{it}: An independently and identically distributed error term with zero mean and constant variance σ^2

All variables are log-transformed to allow interpretation of coefficients as elasticities (Table 1). The coefficient β_1 captures the elasticity of consumption with respect to income (i.e., oil price), and is interpreted as the MPC proxy.

Table 1: Descriptive statistics of the variables

Variable	Count	Mean	Standard	Min	Max	Skewness	Kurtosis
M	2400	5.136	1.418	2.015	8.002	−0.031	−0.881
OP	2400	3.795	0.688	2.284	4.888	−0.300	−1.232
CPI	2400	5.358	0.215	4.966	5.790	0.083	−0.876
E	2400	−0.127	1.181	−1.322	1.327	0.016	−1.979
VIX	2400	2.905	0.337	2.316	4.138	0.683	0.381

3.3. Data and Variable Construction

The empirical analysis is based on a balanced panel of six GCC countries (Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman) covering the period from January 1992 to April 2025.

3.3.1. Imports from the US

In the GCC region, where domestic production of consumer goods is limited, imports play a central role in meeting household demand. The United States is one of the region's top trading partners, particularly for high-value consumption goods such as vehicles, electronics, pharmaceuticals, and food products. As a result, U.S. imports closely track shifts in domestic consumption, especially for non-energy, final-use goods. Their composition and stable pricing—due in part to dollar-pegged exchange rate regimes—make them a more accurate proxy for real demand than total imports, which may be distorted by capital goods or re-exports. Imports from the U.S. is sourced from the Federal Reserve Economic Data (FRED).

Moreover, bilateral trade data from the U.S. is available at high frequency and with consistent categorization, offering a reliable alternative in contexts where official GCC consumption data is sparse or delayed. Using U.S. import volumes allows researchers to indirectly capture consumer behavior trends in the region, particularly under conditions of global shocks, income variation, or uncertainty. Therefore, imports from the U.S. serve as a practical and credible proxy for GCC household consumption in empirical macroeconomic modeling.

3.3.2. Brent oil prices

To examine the relationship between oil price fluctuations and economic activity in the GCC countries, it is essential to select an oil price benchmark that accurately reflects the income generated from oil exports. In this study, Brent crude oil prices are used as a proxy for GCC oil income. This choice is motivated by several institutional and market-based considerations. The data is sourced from the FRED.

Brent is the most widely used global benchmark for crude oil, pricing approximately two- thirds of internationally traded oil. It serves as the reference price for exports from Europe, Africa, and the Middle East, including the majority of crude oil exports from GCC member states such as Saudi Arabia, the United Arab Emirates, Kuwait, and Qatar. In practice, the official selling prices (OSPs) set by national oil companies in the GCC are often linked to Brent prices, particularly for exports to European markets,

while pricing to Asia is typically benchmarked to Dubai or Oman crude, which are themselves closely correlated with Brent. Furthermore, Brent reflects global demand and supply dynamics relevant to the markets in which GCC countries operate. Given that GCC economies are highly reliant on hydrocarbon exports, movements in Brent prices translate directly into fluctuations in government revenues, fiscal space, and ultimately aggregate income. Therefore, Brent serves as an effective proxy for capturing exogenous changes in oil-related income across the region. While West Texas Intermediate (WTI) is another major benchmark, it primarily reflects U.S. domestic market conditions and is less relevant for the international export pricing structure that GCC producers face. The choice of Brent over WTI thus ensures greater alignment with the revenue streams and macroeconomic exposure of GCC oil exporters.

In summary, Brent crude prices provide a globally relevant and regionally accurate indicator of the oil income earned by GCC countries, making it the most suitable benchmark for investigating the oil price–income–consumption transmission mechanism in this context.

3.3.3. Exchange rates

The exchange rate is defined as the local currency per U.S. dollar and sourced from the International Monetary Fund (IMF)'s International Financial Statistics (IFS) database. Given that this study uses imports from the United States as a proxy for consumption in GCC countries, it is important to include the bilateral exchange rate between local currencies and the U.S. dollar. While most GCC currencies are pegged or tightly managed against the U.S. dollar, and thus exhibit limited variation, the inclusion of the exchange rate is still justified on both theoretical and empirical grounds.

First, exchange rates influence the local currency cost of imported goods. Since U.S. exports (i.e. GCC imports) are dollar-denominated, even minor deviations from the peg—through inflation differentials, monetary adjustments, or liquidity pressures—can affect domestic import prices and, indirectly, consumption. Including the exchange rate variable allows the model to control for price-level effects, separating real consumption behavior from nominal price responses.

Second, from a methodological standpoint, the inclusion of the exchange rate—even if its coefficient is statistically insignificant—helps avoid omitted variable bias and ensures that the estimated impact of oil income or other macro variables on imports is not conflated with exchange-rate-induced cost effects. Given the theoretical role of relative prices in consumption and the dollar pricing of both oil exports and imports, exchange rate inclusion remains analytically sound and contributes to a more robust specification.

3.3.4. US CPI less energy

We include U.S. CPI less energy to control for the non-energy price level of U.S. goods, which directly affects the nominal value of GCC imports. Excluding energy from the CPI measure avoids conflating the CPI effect with oil-driven variables (e.g., Brent), while still accounting for the inflation channel affecting U.S. export prices. The data is sourced from the FRED.

3.3.5. VIX

Following Ebadi (2022) and Ebadi & Are (2023), the inclusion of the CBOE Volatility Index (VIX) in consumption and import models is motivated by its role as a global barometer of uncertainty and financial market sentiment. While traditional measures of uncertainty (e.g., policy or interest rate volatility) are often backward-looking or localized, the VIX captures forward- looking market expectations of volatility in the U.S. equity market, with global spillover effects. The data is sourced from the FRED.

The results from the Levin et al. (2002) panel unit root tests, as summarized in Table 2, indicate mixed evidence of stationarity in levels across the variables. Specifically, oil price, CPI, and VIX are found to be stationary in levels at conventional significance levels ($P < 0.05$), as their ADF statistics reject the null hypothesis of a unit root. However, imports and exchange rates appear to be non-stationary in levels, failing to reject the null with P-values of 0.339 and 0.426, respectively.

Upon first differencing, all variables become strongly stationary, with $P = 0.000$, confirming that any non-stationary series are integrated of order one, I(1). This finding justifies the use of these variables in levels within a fixed-effects or pooled ordinary least squares (OLS) framework, especially when country and time fixed effects are included, as they help to absorb deterministic trends.

3.4. Estimation Strategy

We estimate a pooled OLS regression model with country and time fixed effects to examine the macroeconomic determinants of monthly import volumes in GCC countries. This specification includes dummy variables for each country and each month to control for unobserved, time-invariant heterogeneity across countries (e.g., fiscal policy frameworks, institutional environments) and common shocks over time (e.g., global commodity price movements, geopolitical events). By incorporating both sets of fixed effects, the model allows for consistent estimation of the impact of key variables such as oil prices, U.S. inflation, and exchange rates, while holding constant any confounding variation that does not change over time or across entities.

Although pooled OLS is not a formal panel estimator like Fixed Effects (FE) or Random Effects (RE), it has been widely adopted in empirical macroeconomic applications where the fixed effects are included as controls rather than transformed out. Importantly, we use clustered standard errors by country to correct for potential

Table 2: Panel unit root test results (ADF - Levin, Lin, and Chu)

Variable	ADF stat (Level)	P-value (Level)	ADF stat (1st difference)	P-value (1st difference)
M	−1.885	0.339	−11.407	0.000
OP	−3.820	0.003	−11.411	0.000
CPI	−4.271	0.000	−49.012	0.000
E	−1.709	0.426	−48.988	0.000
VIX	−7.449	0.000	−11.719	0.000

within-country serial correlation and heteroskedasticity—common issues in macro panel data. This approach provides reliable inference and mitigates the risk of underestimating standard errors due to correlated shocks over time within each GCC economy.

$$M_{it} = \alpha_i + \gamma_t + \beta_1 OP_t + \beta_2 CPI_t + \beta_3 E_{it} + \beta_4 VIX_t + \varepsilon_{it} \quad (3)$$

Where:

- α_i: Country fixed effects
- γ_t: Year fixed effects
- ε_{it}: Error term

4. EMPIRICAL RESULTS

The pooled OLS regression results with country and time fixed effects, shown in Table 3, indicate a set of coefficient estimates that are both economically intuitive and statistically robust. The coefficient on oil price (0.679) is positive and statistically significant, aligning with expectations for oil-exporting economies such as those in the GCC. Rising oil prices increase fiscal revenues, household liquidity, and public-sector spending, all of which stimulate import demand. This coefficient can be interpreted as a composite elasticity capturing how oil-driven income translates into increased consumption of imported goods. Given the high import share in GCC household consumption baskets, the magnitude of 0.679 suggests a strong income-consumption-import transmission channel.

However, to interpret this coefficient in terms of marginal propensity to consume, one must consider the population structure. A large portion of oil windfalls in the GCC is distributed through wages to expatriate workers, who tend to remit a large share of their income rather than spend it locally. While 0.679 captures the aggregate marginal import response, it likely understates the domestic consumption response of nationals and overstates the leakage from expatriate savings behavior. This nuance is critical for fiscal policy targeting and general equilibrium modeling.

The coefficient on U.S. CPI excluding energy (0.886) is also positive and statistically significant. Since the dependent variable represents nominal imports, an increase in U.S. prices mechanically raises the dollar value of imports, even if import volumes remain constant. This coefficient thus reflects a price pass-through effect rather than a behavioral response. The exchange rate variable enters with a negative sign (–1.836), as expected, but is statistically insignificant—likely due to the limited variability in GCC exchange rates, most of which are pegged or tightly managed against the U.S. dollar. Finally, the VIX index—representing global financial risk—enters the model with a negative and significant coefficient (–0.113), suggesting that increased global uncertainty dampens import demand. This aligns with theoretical expectations that uncertainty leads to postponed consumption and investment, particularly in economies with high exposure to global capital flows.

Table 3: Pooled OLS regression results with clustered SEs

Variable	Coefficient	Clustered SE	P-value
Oil price (OP)	0.679	0.226	0.003
CPI	0.886	0.245	0.001
Exchange rate (E)	−1.836	1.309	0.161
VIX	−0.113	0.036	0.002

Diagnostics (Table 4) further support the reliability of the model. All explanatory variables have variance inflation factors (VIFs) well below the conventional threshold of 5, with the highest below 2.7, indicating no concern of multicollinearity. Although the Durbin–Watson statistic is 0.66, suggesting positive serial correlation, this does not undermine the validity of inference, as standard errors are clustered at the country level—an approach that corrects for both within-country autocorrelation and heteroskedasticity. The combination of fixed effects, clustered standard errors, and theoretically consistent coefficient signs supports the model's robustness and appropriateness for analyzing the macroeconomic determinants of GCC imports.

5. ADJUSTING FOR EXPATRIATE POPULATION BIAS

In the GCC region, expatriates represent the majority of the labor force and account for a substantial portion of household-level demand. However, their consumption behavior differs markedly from that of nationals due to structural and institutional factors. Expatriates tend to remit a large share of their earnings, have limited access to financial and consumer credit, and often reside on temporary contracts that discourage long-term spending or investment in the host country. These conditions lead to a lower in-country marginal propensity to consume relative to nationals. Based on observed remittance flows—over $130 billion from the GCC in 2023—and evidence from labor migration studies, we assume a realistic expatriate MPC of 0.4 for modeling purposes.

This assumption has direct implications for interpreting the oil price coefficient in the import demand model. With an estimated coefficient of 0.679 on oil prices, the aggregate response captures a weighted average across both national and expatriate spending patterns.

5.1. Population Composition in the GCC

Table 5 shows the mid-2022 breakdown of nationals and foreign nationals in each GCC country, based on national statistics.

As shown, non-nationals account for an average of 54.6% of the total GCC population. This group primarily consists of unskilled

Table 4: Diagnostic tests for model robustness

Diagnostic metric	Result	Interpretation
Multicollinearity (VIF)	VIFs < 2.7	No evidence of multicollinearity among explanatory variables.
Durbin–Watson Statistic	0.66	Indicates positive serial correlation; however, the use of clustered standard errors by country
Robustness	✓	Corrects for this. The model includes fixed effects and clustered SEs, making it statistically sound for inference.

Table 5: GCC population composition (Mid-2022)

Country	Nationals	Foreign nationals	Foreign nationals (%)
Bahrain	714,011	810,682	53.2
Kuwait	1,502,896	3,086,747	67.3
Oman	2,835,864	1,894,784	40.1
Qatar	348,839	2,529,362	87.9
Saudi Arabia	18,792,262	13,382,962	41.6
UAE	1,331,683	8,957,263	87.1
Total GCC	25,525,555	30,661,800	54.6

National institutes of statistics and the Gulf Labor Markets and Migration (GLMM) estimates based on data published by National Statistical Institutes (mid-2022)

or semi-skilled laborers who remit most of their income abroad and exhibit significantly lower consumption levels within the domestic ecoomy. Recognizing this heterogeneity is essential for accurately assessing the consumption response to oil windfalls and for designing fiscal or labor market policies in open economies like the GCC.

5.2. Counterfactual Estimate of Citizen-Only MPC

The observed MPC can be understood as a population-weighted average of the MPC of nationals and foreign workers:

$$MPCall = pcitizen \cdot MPCcitizen + pexpat \cdot MPCexpat \quad (4)$$

Solving for the citizen-only MPC:

$$MPC_{citiz} = \frac{MPC_{all} - P_{exp} \times MPC_{exp}}{P_{citiz}} \quad (5)$$

Assume the following values based on validated data:

$MPC_{all} = 0.679$

$p_{citizen} = 0.454$, $p_{expat} = 0.546$ (from Table 5)

$MPC_{expat} = 0.40$ (assumed based on remittance and low domestic consumption behavior)

Then:

$$MPCcitizen = \frac{0.679 - 0.546 \cdot 0.40}{0.454} = \frac{0.679 - 0.1638}{0.454} \approx \frac{0.4162}{0.454} \approx 1.015 \quad (6)$$

This result suggests that, given the oil price coefficient of 0.679, an expatriate MPC of 0.40, and a population share of 54.6%, the implied marginal propensity to consume among nationals is approximately 1. This estimate both theoretically sound and empirically consistent with consumption behavior in high-income, oil-rich economies.

In the context of the GCC, where nationals benefit from high and stable incomes, generous public transfers, and minimal precautionary saving needs, an MPC of 1 reflects the tendency to consume nearly all marginal income. This assumption aligns with observed fiscal and household spending dynamics in the region and supports the plausibility of the model's import elasticity estimates.

Table 6: Simulated U.S. imports at different oil price scenarios

Oil price change	Oil price index	Predicted % change in imports
–25%	0.75	–18.2
–10%	0.90	–7.2
Baseline	1.00	0.0
+10%	1.10	+6.5
+25%	1.25	+15.3
+50%	1.50	+28.2

6. SIMULATION ANALYSIS AND DISCUSSION

To evaluate the implications of the regression results, we conduct counterfactual simulations that isolate the effect of oil price changes on imports from the United States. These simulations quantify how income shocks, proxied by oil prices, translate into changes in nominal imports while holding other covariates constant. This exercise is particularly valuable in the GCC context, where consumption data are limited and imports—especially from the U.S.—serve as a credible proxy for household and government demand.

This simulation approach builds on methodologies used in the macroeconomic literature. For example, Ramey (2011) uses consumption elasticities to simulate fiscal multipliers, and Blanchard and Gali (2007) simulate oil shock responses in DSGE models. In the context of resource-dependent economies, Auerbach and Gorodnichenko (2013) emphasize the amplifying role of commodity-linked income on domestic demand. We extend these insights to a pooled panel setting, using a trade-based framework to simulate import responses in oil-exporting economies.

The simulation is based on the following estimated log-linear model:

$$M_{it} = \alpha_i + \gamma_t + \beta_1 OP_t + \beta_2 CPI_t + \beta_3 E_{it} + \beta_4 VIX_t + \varepsilon_{it} \quad (7)$$

To isolate the impact of oil prices, we vary oil prices (OP) around the sample mean and compute predicted changes in imports, holding CPI_t, E_{it}, and VIX_t at their mean values.

The oil price elasticity is set at $\beta_1 = 0.68$, as estimated in the baseline regression. For each scenario, we apply:

$$\Delta (I\,mport) = \beta b\, \Delta (Oil\ Price) \quad (8)$$

The simulation results (Table 6) are fully consistent with our empirical findings and reinforce the reliability of the estimated oil price elasticity. The baseline regression produced an oil price coefficient of 0.68, indicating that a 1% increase in oil prices is associated with a 0.68% increase in imports. The simulation

analysis replicates this behavior across a range of counterfactual scenarios: a 10% rise in oil prices results in a 6.5% increase in imports, while a 25% drop leads to an 18.2% contraction. These outcomes match the predicted log-linear response implied by the regression model, validating both the magnitude and direction of the estimated coefficients.

This alignment also justifies the use of simulations as a complementary tool to empirical estimation. While the regression establishes statistical relationships, the simulations translate these into economically meaningful predictions under plausible oil price scenarios. Moreover, the results highlight the model's policy relevance by quantifying how import demand—serving as a proxy for consumption—responds to fluctuations in global commodity prices. This is particularly important in GCC economies, where oil revenues are central to both government spending and private sector liquidity, and where the effects of income shocks propagate rapidly through import demand. The consistency between estimated coefficients and simulated outcomes strengthens the credibility of the model and supports its application in forecasting and fiscal policy analysis.

The regression results yield compelling evidence that the fluctuations in oil prices exert a significant and measurable impact on consumption in the GCC economies, as indicated by imports from the United States. The estimated elasticity of imports with respect to oil prices, standing at approximately 0.68, aligns with the anticipated outcomes for oil-exporting nations, where public revenues and consumption are intricately linked to hydrocarbon income.

However, further analysis reveals that this aggregate MPC (marginal propensity to consume) is likely influenced by the unique demographic structure of GCC countries. The aggregate MPC represents the overall tendency of a population to spend a given percentage of any additional income on consumption. A substantial proportion of the population consists of expatriate workers who remit large portions of their income and consume relatively little domestically. When adjusting for this demographic effect through weighted simulations, the implied MPC for nationals alone may be as high as 1. This citizen-only estimate aligns more closely with consumption behavior observed in advanced economies and underscores the importance of disaggregating consumption responses in mixed-population economies.

These insights carry significant policy implications. Fiscal interventions designed to stimulate consumption should take into account the distributional effects across various demographic segments. Given that nationals typically benefit more from government transfers, subsidies, and employment, directing these interventions towards this group could lead to more robust and immediate consumption responses. Conversely, aggregate models that overlook population composition risk underestimating the true effectiveness of fiscal stimulus.

Furthermore, the substantial negative coefficients on US CPI and exchange rates underscore the influence of both international price levels and exchange rate movements on import behavior. These findings not only validate the proxy-based approach to modeling consumption but also underscore the interconnectedness of oil income, trade, and domestic demand in the GCC region.

7. CONCLUSION AND IMPLICATIONS FOR FORWARD-LOOKING ENERGY POLICY

This study introduces a novel, proxy-based methodology for estimating the marginal propensity to consume in Gulf Cooperation Council countries using high-frequency trade and commodity price data. In the absence of reliable household consumption data, we use U.S. imports as a proxy for consumption and oil prices as a proxy for income. A pooled panel regression model with fixed effects produces a robust aggregate MPC estimate of 0.68. The inclusion of additional controls—such as the U.S. CPI (excluding energy), exchange rates, and global risk sentiment (as measured by the VIX)—further strengthens the credibility and relevance of the model for open, oil-exporting economies.

Beyond traditional estimation, the study incorporates counterfactual simulations and adjusts for demographic heterogeneity to refine the interpretation of the results. In GCC countries, where a majority of the labor force consists of expatriates who remit a significant portion of their income and exhibit relatively low domestic consumption, the aggregate MPC is likely to be downward-biased. By assuming a realistic expatriate MPC of 0.40, our demographic-aware simulations suggest that the effective MPC for nationals is approximately 1.00. This aligns with the high consumption propensities typically observed in resource-rich economies with generous fiscal transfers, stable employment, and minimal saving constraints. The empirical and simulation-based findings have significant implications for macroeconomic modeling, fiscal forecasting, and the design of energy policy. They underscore the importance of tailoring economic analyses and interventions to the institutional and demographic realities of hydrocarbon economies. Specifically, the results demonstrate how demographic composition can obscure underlying consumption behavior and how proxy methods can compensate for data gaps in national accounts.

The methodological contribution of this study lies not only in offering a scalable and empirically grounded tool for estimating MPC in data-constrained, resource-dependent settings, but also in its potential for broader application. The framework can inform short-run fiscal multiplier estimates, the design of equitable compensation mechanisms under subsidy reform, and policy responses to oil price volatility. Future research may enhance this approach by incorporating household survey data, extending the import proxy to include non-U.S. trading partners, and exploring the distributional effects of macro-fiscal tools across population subgroups. Ultimately, this demographic-sensitive, trade-based framework offers a replicable template for macroeconomic analysis in other developing or oil-rich economies facing similar data limitations.

The empirical findings of this study carry important implications for designing forward- looking energy and fiscal policy in the

GCC. As economies highly dependent on hydrocarbon exports, GCC nations are exposed to volatility in oil markets that directly affects national income and, by extension, domestic demand. Our results show that a 1% increase in oil prices leads to an estimated 0.68% increase in nominal imports from the United States, suggesting a strong and immediate transmission from commodity prices to consumption-related imports. Given the absence of high-frequency household consumption data in most GCC states, our framework provides policymakers with a scalable proxy tool for monitoring consumption responses to energy market shocks in real time. This is particularly relevant for energy- exporting governments attempting to calibrate their budgetary policies, subsidy regimes, and stabilization funds in response to commodity price cycles. By linking oil prices to import behavior—adjusted for population heterogeneity—governments can more accurately assess the consumption impact of fiscal measures and forecast multiplier effects of energy price windfalls or slumps.

Moreover, the estimation of differentiated MPCs across population segments enhances the targeting potential of policy tools. Nationals, with an implied MPC near 1.00, contribute more directly to the domestic spending channel, while expatriates with lower in-country MPCs primarily generate external leakages through remittances. This suggests that energy- related income transfers or price reforms may have differential consumption and import effects, depending on how they are distributed across the population. Policymakers can use this insight to design more efficient and equitable compensation schemes in response to fuel subsidy reforms, carbon pricing, or revenue shifts from oil diversification strategies.

In the context of energy transition and fiscal reform, our simulation framework also serves as a decision-support tool. For example, scenarios involving gradual oil price declines—due to reduced global fossil fuel demand—can be mapped to anticipated reductions in consumption and imports. This can inform the sizing of sovereign wealth fund withdrawals, VAT rate adjustments, or green investment pacing. The predictive capacity of our model makes it adaptable for use in energy policy dashboards that require near-term sensitivity analysis of consumption under energy market fluctuations.

Ultimately, linking energy income to consumption through import behavior—especially in data-constrained environments—offers a practical, empirically grounded foundation for anticipating macroeconomic and social responses to energy policy reforms. This is critical for GCC governments striving to balance fiscal sustainability with economic stability in a post-hydrocarbon global economy.

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