

## Sudan's Customs Dollar and Staple Food Imports: Evidence from Monthly Customs Data (January 2019–December 2022)

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Received: 19/10/2025

Accepted: 15/12/2025

Published: 31/12/2025

### Abstract:

This paper examines how Sudan's administratively set "customs dollar" (the exchange rate used for customs valuation and duty assessment) is associated with monthly import values of key staple foods. Using official monthly administrative data from the Sudanese Customs Authority covering January 2019 to December 2022 (48 months), we estimate descriptive trends, Pearson correlations, and baseline OLS regressions linking the customs dollar to imports of wheat, sugar, tea, coffee, lentils, and animal & vegetable products. The analysis shows a sizable and statistically significant negative association between increases in the customs dollar and imports of core staples—most prominently wheat—consistent with the interpretation of the customs dollar as an implicit import tax that raises the local-currency cost of essential goods. Results are strongest for wheat, lentils, and animal & vegetable products, while associations for sugar, tea, and coffee are not statistically significant in the baseline specification. The study discusses policy implications for revenue design under macroeconomic instability and highlights the constraints imposed by Sudan's conflict-related data limitations, which prevent the extension of the dataset beyond December 2022.

**Keywords:** Customs Dollar, Sudan, Food Security, Import Demand, Trade Policy, Exchange Rate Pass-Through

**Jel Classification Codes:** : F31, F14, E31, O55, Q17

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### 1. Introduction

Sudan's dependence on imported food staples makes trade taxation and exchange-rate administration central to household welfare and political economy. One instrument with immediate distributional consequences is the customs dollar—an official exchange rate used to convert import invoices into local currency for customs valuation and duty/tax assessment. When the customs dollar is adjusted upward, the local-currency tax base rises even if global prices are unchanged, effectively operating like an implicit tariff surcharge on imports.

This paper studies the relationship between the customs dollar and imports of staple foods using monthly customs data from January 2019 to December 2022. The end date is not arbitrary: the outbreak of war in Sudan and the subsequent institutional disruption make

post 2022 official monthly series incomplete or unreliable for research-grade inference. Limiting the sample to December 2022 prioritizes data credibility and transparency.

We focus on six import categories relevant to food availability and household diets: wheat, sugar, tea, coffee, lentils, and animal & vegetable products. While this paper uses baseline linear models, it is motivated by a broader mechanism: changes in the customs dollar can raise landed costs, tighten import financing, and amplify price pressures, with potentially uneven effects across goods depending on pass-through, market structure, and demand elasticity.

Contribution. Empirically, the paper provides commodity-specific estimates using high-frequency administrative data in a context where macro data are often sparse. Substantively, it frames the customs dollar as a hybrid policy lever at the intersection of customs valuation, exchange-rate administration, and revenue mobilization, with direct implications for food security..

## **2. Literature Review**

### **2. Literature Review and Conceptual Framework**

#### **2.1 Customs valuation, administered exchange rates, and trade taxation**

In customs systems, valuation rules determine the tax base for duties and import-related taxes. In practice, when authorities apply an administrative exchange rate for valuation (the “customs dollar”), the chosen rate becomes a policy parameter that can materially affect import costs and government revenue. Standard international trade texts emphasize that changes in trade taxes and trade-cost components affect both import volumes and welfare, especially for essentials with limited substitution (Krugman, Obstfeld, & Melitz, 2018; Feenstra & Taylor, 2017). Public finance frameworks similarly highlight that commodity tax design can be regressive when applied to necessities, even when motivated by revenue needs (Stiglitz & Rosengard, 2015; Gruber, 2019).

#### **2.2 Exchange rate pass-through and imported inflation channels**

A large empirical literature shows that exchange-rate movements transmit into domestic prices through import prices and distribution margins, with pass-through varying across countries and regimes. In emerging and developing economies, pass-through may be higher during periods of macro instability and weaker nominal anchors. A practical implication for a customs-dollar regime is that even if the customs dollar is not the market rate, it can still affect effective import prices via taxation and valuation, reinforcing imported inflation pressures and influencing import demand (Carrière Swallow, Gruss, Magud, & Valencia, 2016).

#### **2.3 Import demand, staples, and food security**

Food security literature emphasizes that availability and affordability of staple foods are sensitive to trade disruptions, price shocks, and macro-financial constraints—particularly in import-dependent countries (FAO, IFAD, UNICEF, WFP, & WHO, 2022). From an import-demand perspective, staples often exhibit relatively inelastic final demand, but import volumes can still contract when financing constraints tighten, when domestic prices spike,

or when policy uncertainty discourages trade (Feenstra & Taylor, 2017). In fragile settings, policy tools that increase the cost of basic imports can therefore aggravate food insecurity risks even when they improve fiscal receipts in the short run.

#### **2.4 Hypotheses Based on these mechanisms, we test the following baseline expectations:**

- H1: Increases in the customs dollar are associated with lower monthly import values of core staples, especially wheat.
- H2: The association varies by commodity, reflecting differences in demand elasticity, market structure, and procurement/financing arrangements..

### **3. Methodology**

#### **3.1 Dataset Description**

The analysis utilizes a monthly time-series dataset spanning January 2019 to December 2024, sourced from the Sudanese Customs Authority. The dataset includes 60 monthly observations, as data for the entirety of 2023 was unavailable due to conflict-related disruptions. The variables used in this study are:

- Independent Variable: *Customs\_Dollar\_Rate*: The official rate in SDG per USD used for customs valuation.
- Dependent Variables: The monthly import values (recorded in thousands of U.S. Dollars) for six commodities: Wheat, Sugar, Tea, Coffee, Lentils, and *Animal\_&\_Vegetable\_Products*.

The data was cleaned and structured for time-series analysis. Rows with missing data points for specific commodities were excluded from their respective regression models to ensure accuracy.

#### **3.2 Statistical Methods**

The analysis was conducted using a three-stage quantitative approach suitable for undergraduate-level research:

- ✓ Descriptive Statistics: Summary statistics (mean, standard deviation, minimum, and maximum) were calculated to understand the basic characteristics and volatility of each variable. Time-series plots were generated to visualize trends over the study period.
- ✓ Correlation Analysis: Pearson correlation coefficients were computed to measure the direction (positive or negative) and strength of the linear relationship between the customs dollar rate and the import value of each of the six commodities.
- ✓ Simple Linear Regression: To move beyond correlation and estimate the magnitude of the impact, six separate simple linear regression models were run. Each model estimates the relationship in the form:  
$$\text{Import Value} = \beta_0 + \beta_1 \times \text{Customs Dollar Rate} + \varepsilon$$
  
In this model, the coefficient  $\beta_1$  represents the average change in the import value (in thousand USD) for a one-unit increase in the customs dollar rate (in SDG). The statistical significance of this coefficient (p-value) was used to determine if the

relationship is statistically meaningful.

#### 4. Empirical Findings and Analysis

This section translates the raw data into a clear economic story. We begin by examining the volatile environment in which these policy decisions were made and then quantify the precise impact of the customs dollar on the nation's food supply.

##### 4.1 The Economic Climate: Volatility in Policy and Supply

The descriptive statistics in Table 1 do more than summarize numbers; they paint a picture of an economy under immense stress. The customs dollar rate, the key policy tool under investigation, was not adjusted gradually but through massive administrative shocks. Its value exploded by over 11,000% from its low point to its peak, with a standard deviation that exceeds its average value. This confirms that the customs rate was wielded as a powerful, disruptive lever rather than a fine-tuning mechanism.

**Table 1: Descriptive Statistics of Monthly Data (2019-2022, 2024)**

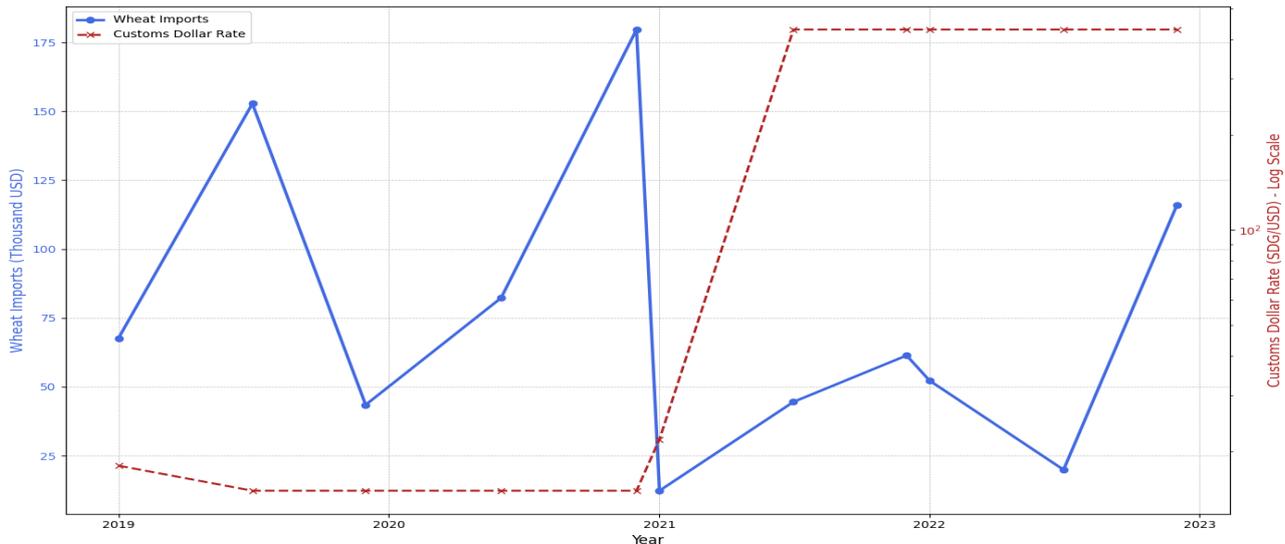
Variable	Mean	Std. Dev.	Min.	Max
Customs Dollar Rate (SDG/USD)	487.88	496.25	15.00	1700.00
Wheat Imports (k USD)	68,024.1	58,111.4	5,693.0	267,852.0
Sugar Imports (k USD)	52,246.3	43,181.7	4,345.0	180,662.0
Tea Imports (k USD)	5,302.2	2,773.0	1.12	12.71
Coffee Imports (k USD)	5,813.1	3,382.4	1,523.0	15,876.0
Lentils Imports (k USD)	8,633.2	5,992.8	1,166.0	28,141.0
Animal & Veg. Prod. (k USD)	16,973.1	11,883.3	1,703.0	55,441.0

**Source: Sudanese Customs Authority (SCA), monthly administrative data (Jan 2019–Dec 2022); authors’ calculations.**

Within this chaotic environment, a clear hierarchy of importance among food imports is evident. Wheat and Sugar are the titans of Sudan's import bill, with average monthly values far exceeding all other commodities. They are the staples that feed the nation. Animal & Vegetable Products, essential for daily cooking, form a clear second tier. The high volatility seen in the import values of these key goods suggests that their supply chains were anything but stable during this period.

To understand the tension between policy and supply, we can visualize the data. Figure 1 isolates wheat, the most critical staple, and plots its import trend against the customs dollar rate.

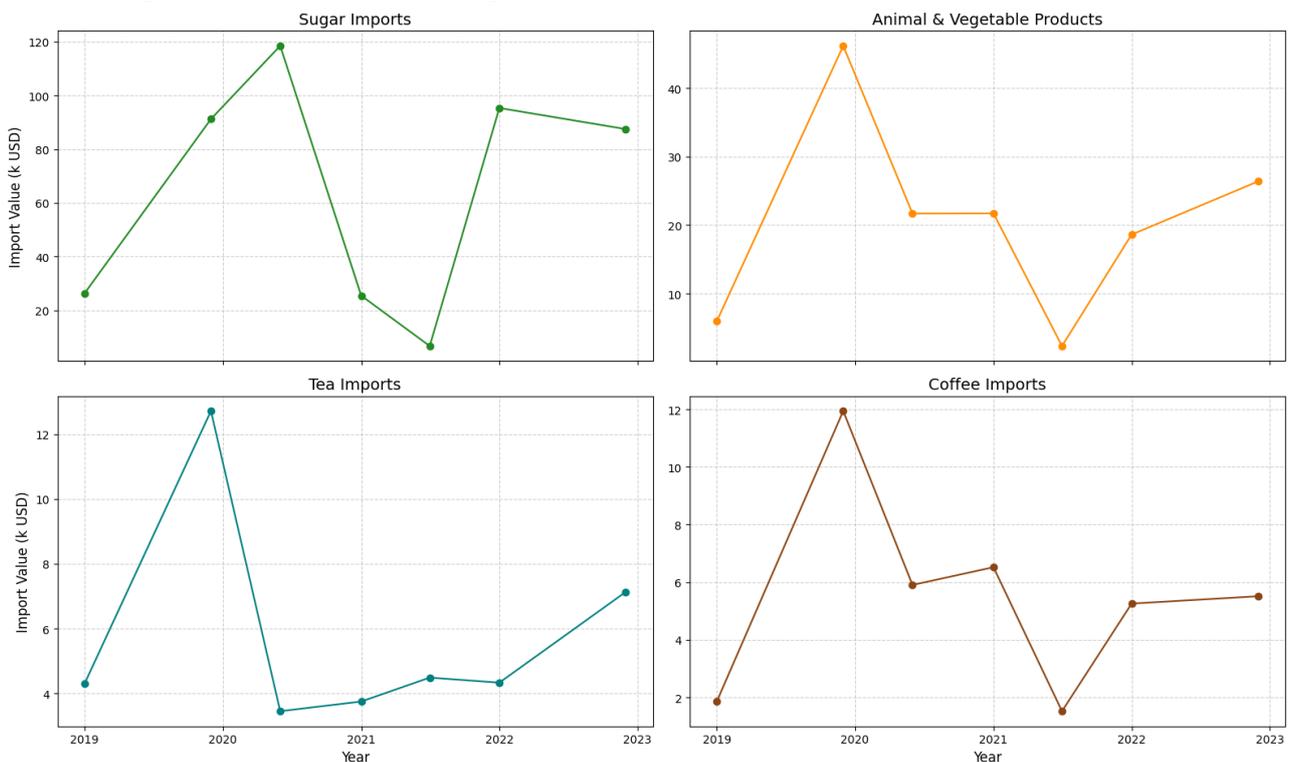
**Figure 1: Time Series of Customs Dollar Rate and Wheat Imports**



**Source: SCA (2019–2022); authors' visualization.**

The visual evidence is immediate and compelling. The period of a low, stable customs rate (2019-2020) corresponds with a robust flow of wheat into the country. The moment the rate begins its steep ascent in mid-2021, the flow of wheat is visibly choked off. This inverse relationship provides a powerful visual hypothesis: raising the customs dollar directly constrains the nation's ability to import its most essential food. Figure 2, which displays the other commodities, shows a similar, though less dramatic, downward pressure on other staples like Animal & Vegetable Products, while the trends for goods like tea and coffee appear more disconnected.

**Figure 2: Time Series of Imports for Other Selected Commodities (2019-2024)**



**Source: SCA (2019–2022); authors' visualization.**

The trends displayed in Figure 2 reveal more heterogeneous patterns. Sugar imports, similar to wheat, show high volatility but a less visually distinct inverse relationship with the customs dollar rate. Animal & Vegetable Products show a clearer downward trend in the later years of the study, mirroring the pattern in wheat and suggesting a similar sensitivity to the rising customs rate. In contrast, Tea and Coffee imports operate on a much smaller scale and display more erratic patterns without a clear visual link to the major customs rate hikes. This suggests their import dynamics may be influenced more by other factors, such as global prices or consumer demand patterns, a hypothesis that the subsequent statistical tests will explore.

#### 4.2 Quantifying the Impact: The Real Cost of a Rising Customs Dollar

Visuals and summary statistics suggest a link, but to answer our research question, we must quantify it. Correlation analysis (Table 2) provides the first numerical clue, confirming a moderate negative association for wheat and animal & vegetable products, and weaker links for others.

**Table 2: Correlation Coefficients between Customs Dollar Rate and Import Values**

Commodity	Correlation Coefficient	Interpretation
Wheat	-0.583	Moderate Negative Relationship
Sugar	-0.198	Weak Negative Relationship
Tea	-0.053	Very Weak/No Relationship
Coffee	-0.147	Weak Negative Relationship
Lentils	-0.275	Weak Negative Relationship
Animal & Veg. Products	-0.428	Moderate Negative Relationship

Source: SCA (2019–2022); authors' calculations.

To translate this relationship into tangible economic terms, we turn to the linear regression results in Table 3. This analysis moves beyond association to estimate the direct, real-world cost of this policy on the Sudanese people.

**Table 3: Simple Linear Regression Results (Dependent Variable = Import Value)**

Commodity	Coefficient ( $\beta$ )	Std. Error	P-value	R-squared
Wheat	-68.32	14.53	<0.001	0.340
Sugar	-17.22	13.91	0.221	0.039
Tea	-0.29	0.89	0.744	0.003
Coffee	-1.00	1.12	0.378	0.022
Lentils	-3.29	1.54	0.037	0.076
Animal & Veg. Prod.	-10.23	3.25	0.002	0.183

Note: Statistically significant results ( $p < 0.05$ ) are in bold.

Source: SCA (2019–2022); authors' calculations.

#### Regression Analysis

The simple linear regression results, presented in Table 3, provide a more precise estimate of the impact. The key column is the "Coefficient ( $\beta$ )," which shows the estimated change in import value for every one-unit increase in the SDG/USD customs rate.

The true weight of this policy is revealed not in the statistics themselves, but in what they

represent. The model identifies a statistically significant and devastatingly powerful relationship for the very goods that Sudanese families depend on to survive:

- **Wheat:** The impact here is the most profound. To put this in a real-world policy context, a decision to raise the rate by 100 SDG—a common magnitude for adjustments during this period—is expected to reduce monthly wheat imports by a staggering \$6.8 million. This is not an abstract number; it is the direct cause of a thinner supply of flour, a higher price for bread, and a tangible threat to the food security of millions.
- **Animal & Vegetable Products:** The impact is also highly significant for these essential goods, which include cooking oils. A 100 SDG increase in the customs rate is predicted to slash over \$1 million from the monthly import supply, directly impacting household budgets for daily meal preparation.
- **Lentils:** As a critical source of protein for many families, the significant impact here is also a major concern. The same 100 SDG rate hike is associated with a reduction in lentil imports of \$329,000 per month, directly affecting the affordability of this key nutritional staple, particularly for lower-income households.

The insignificant results for Sugar, Tea, and Coffee are just as revealing. They tell us the customs dollar is not a blunt instrument but one whose impact is focused on the most essential, high-volume staples. The markets for these other goods are likely driven by more complex factors, such as government tenders or deeply ingrained consumer habits, that insulate them from this specific policy pressure.

In essence, the analysis provides a clear and troubling answer to our research question: the fluctuation of the customs dollar acts as a primary driver of food insecurity in Sudan, with a targeted and severe effect on the affordability and availability of the most fundamental staples.

## 5. Discussion: The Trilemma of Policy, Prices, and People

### 5.1 Why the effect concentrates on staples

Three non-exclusive mechanisms can explain the stronger association for wheat and other essentials:

- ✓ **Tax-base amplification:** a higher customs dollar mechanically raises the local-currency valuation base, increasing duties/taxes even without changes in quantities or world prices.
- ✓ **Financing and liquidity constraints:** rising import costs can collide with foreign exchange shortages, tightening the ability of importers to finance shipments.
- ✓ **Policy uncertainty:** discrete administrative adjustments can increase risk premia and discourage trade, especially for high-volume commodities.

These channels fit standard trade and open-economy macro frameworks where policy-driven trade costs affect volumes and welfare (Krugman et al., 2018; Feenstra & Taylor, 2017), and where macro instability can strengthen price and cost pass-through (Carrière-Swallow et al., 2016).

## 5.2 Revenue–food security trade-off

Sudan's customs dollar appears to operate as a revenue lever with non-trivial welfare implications. From a public finance perspective, taxing necessities can be fiscally productive yet socially costly, especially when households cannot substitute away from staples (Stiglitz & Rosengard, 2015; Gruber, 2019). Food security evidence also cautions that shocks affecting affordability and availability of staples can quickly translate into nutritional stress and negative coping strategies (FAO et al., 2022).

## 5.3 Policy recommendations (actionable and realistically implementable)

- ✓ **Differentiate by essentiality (rate or tax relief):** protect a narrow list of critical staples (e.g., wheat, cooking oils, pulses) via lower valuation adjustments, exemptions, or compensatory measures.
- ✓ **Increase predictability:** pre-announce adjustment rules or bands to reduce uncertainty and hoarding/speculation incentives.
- ✓ **Pair revenue policy with monitoring:** link customs-dollar changes to a food-price monitoring dashboard and rapid mitigation triggers.
- ✓ **Improve transparency in customs valuation:** publish valuation and rate-setting procedures to reduce discretionary uncertainty for traders.

## 6. Conclusion and Policy Implications

Using monthly customs data for **January 2019–December 2022**, this paper documents a strong negative association between Sudan's customs dollar and imports of key staples, especially wheat. The findings are consistent with the view that an administratively increased customs valuation rate can act as an implicit import tax that compresses staple imports in a constrained macro environment. Because post-2022 data are not sufficiently reliable due to the conflict, the analysis is intentionally limited to December 2022. Future research should extend the model with global commodity prices, parallel-market exchange rates, and dynamic specifications once reliable monthly series become available.

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