***ENERGY PRICE SHOCKS: THE CASE OF THE DIESEL MARKET IN THE BRAZILIAN ECONOMY.***

### Alexandre Scarcioffolo, Denison University, scarcioffoloa@denison.edu

###  Xiaoli Etienne, University of Idaho, xetienne@uidaho.edu

**Overview**

Understanding the impact of fuel price fluctuation in the economy, especially food prices, is vital for effective policy-making, considering the broad economic and societal ramifications. Recent global events such as the COVID-19 pandemic, the war in Ukraine, and new International Maritime Organization (IMO) regulations have all put pressure on energy prices, consequently generating inflationary pressures on other sectors of the economy. Indeed, Killian and Zhou (2022) suggest that oil price changes present a sizable impact on inflation in the short run.

This paper aims to understand how fuel price changes affect food price fluctuations at both the wholesale and retail levels in Brazil. Understanding this issue is crucial for Brazil because food expenditure constitutes a large portion of household budgets, particularly for low-income households.; The precise calibration of economic policies to mitigate inflation, therefore, often needs a nuanced understanding of food price dynamics in relation to energy price fluctuations.

The interconnection between energy and food markets manifests predominantly through the costs associated with agricultural production and transportation. Energy expenditure constitutes a considerable share of the total input costs in agricultural practices, including machinery, transportation, and operation of food processing units. Hence, changes in fuel costs pressure producers to adjust farmgate and wholesale prices to offset increased operational expenditures. Additionally, rising fuel prices increase transportation and logistic expenses, subsequently affecting retail prices through distribution and retail firms’ pricing models. Given the different structures in the food supply chain, changes in fuel prices should impact both down and upstream food prices, although the specific magnitude impact should vary.

The economic literature has devoted considerable attention to the pass-through of fuel and food prices. Yet, studies often isolate retail or wholesale costs without examining their interplay. Similar to Zingbagba et al. (2020), this study aims to bridge this gap by assessing wholesale and retail pricing across food segments. Further, unlike previous studies that focus on oil prices, we instead consider diesel prices. Since domestic oil prices in Brazil are regulated by Petrobras, changes in crude oil might not capture the whole dynamic of fuel prices in Brazil. Additionally, diesel fuel accounts for more than 50% of the entire fleet of transportation in Brazil[[1]](#footnote-1), and the large majority of agricultural cargoes in bulk are transported via trucks (Pera and Caixeta-Filho, 2017). Lastly, we consider an extended sample size to capture the most recent geopolitical events such as the Covid-19, the Russian-Ukraine War, and the IMO policy change. This allows us to understand better how these events impact the relationship between fuel prices and food prices.

**Methods**

We consider the average monthly retail diesel prices (R$/liter) in the state of São Paulo as a proxy of fuel price. The price sequence is obtained from the Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (ANAP). For food prices, we consider the average monthly retail and wholesale prices for several food groups, such as oil, produce, dairy, meat, eggs, and grains. The price sequences are obtained from the Instituto de Economia Agrícola (IEA). All prices are adjusted to inflation. Our sample spans from March 2004 to December 2023, covering almost twenty years of monthly data.

To capture the price transmission between fuel prices and food prices, we first employ the Vector Error Correction Model (VECM) to derive the impulse response functions (IRFs) and to estimate short-run and long-run dynamics between the price series, focusing on the whole sample analysis. Additionally, to capture the time-varying impact from fuels to food prices, we employ two methodologies: (1) a novel econometric approach based on time-varying Granger causality tests to estimate the directional connectivity as in Hurn et al. (2022), and (2) the well-established Diebold and Yilmaz (2012)’ connectedness methodology based on time-varying VAR (TVP-VAR) as in Antonakakis et al. (2020).

**Results**

The initial findings of our study indicate that fluctuations in the diesel market have a cascading effect on food prices, both downstream and upstream, with the upstream sector experiencing more significant effects. Among the various products analyzed, coffee and chicken meat are notably affected by diesel price volatility. In contrast, the milk price seems to be insulated from these shocks, which may be due to less fluctuation in its market. When examining how these market shocks affect food pricing over time, it's clear that recent years have seen a pronounced impact, particularly during the Covid-19 pandemic and the Russian-Ukraine conflict. This impact is most striking with perishable goods and in regions where the logistics infrastructure plays a crucial role, underscoring a direct connection between the unpredictability of energy markets and the prices consumers pay for food.

**Conclusions**

The goal of this paper is to provide comprehensive insights into the intricate dynamics between diesel prices and food pricing structures within Brazil, emphasizing the critical impact of fuel cost volatility on the broader economy. The differentiated effect on food categories underscores the importance of sector-specific analysis for policy intervention. From our initial findings, products such as coffee and chicken meat show significant price sensitivity to diesel fluctuations, while others do not. This nuanced understanding is paramount for fiscal and monetary policymakers who seek to develop targeted strategies to stabilize market conditions and protect consumers, especially during periods of geopolitical stress and global economic upheaval. Ultimately, this study reinforces the importance of continuous monitoring and analysis of fuel and food price trends to facilitate timely and effective policy measures. By doing so, policymakers can not only address immediate inflationary concerns but also promote long-term economic stability and safeguard the welfare of consumers, particularly in developing economies where food expenditure represents a substantial portion of household budgets.

We expect this research to generate considerable interest among ELAEE participants. Looking at the Brazilian economy, the transportation sector is important to the agribusiness and services in the country. The diesel market holds a pivotal role in the Brazilian economy, serving as the backbone of its transportation sector and a key component of its energy matrix. Empresa de Pesquisa Energética (EPE) reports that diesel consumption in Brazil hit a new high in 2023, with an estimated 67 billion liters used, a significant amount of which fueled road transport. Additionally, diesel demand in Brazil is expected to surge by over 3% in 2024. This rise is attributed to robust agribusiness output and a resurgence in civil construction, bolstered by the New Growth Acceleration Program. Therefore, our findings will serve as a potent reminder of the interconnectedness of global commodity markets and the domestic economy. They stress the need for agile and informed policy responses to cushion the effects of energy market disruptions on food prices. In particular, the pronounced effects during the recent Covid-19 pandemic and the Russian-Ukraine conflict highlight the necessity for preemptive policy frameworks that can mitigate the risks associated with such volatile events.

Top of Form

1. See [Demanda Energética do Setor de Transportes](https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-607/topico-591/Caderno%20de%20Demanda%20de%20Transportes_PDE%202031_2022.02.09.pdf), accessed on 02/26/2024 [↑](#footnote-ref-1)