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

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Overview

Understanding the impact of fuel price fluctuation in the economy, especially food prices, is vital for effective policymaking, considering the broad economic and societal ramifications. In 2016, the Brazilian government enacted a major policy shift that linked domestic diesel prices more closely to fluctuations in the international market. Previously, the government played a strong role in regulating diesel prices, aiming to shield consumers and producers from short-term volatility in global oil markets. This event has 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 policy changed 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 logistics 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], 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 and the Russian-Ukraine War. 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

[1] See Demanda Energética do Setor de Transportes, accessed on 02/26/2024

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 change due to policy changing, we employ two novel methodologies. We first employ the Structure Vector Autoregression (SVAR) with a data-driven identification approach as in Herwartz et al. (2022) to identify the restrictions based on change of variances. This approach allows to derive the impulse response functions (IRFs) and to estimate short-run and long-run dynamics between the price series. Additionally, to capture the time-varying impact from fuels to food prices, we rely on time-varying Granger causality tests to estimate the directional connectivity as in Hurn et al. (2022).

Results

The initial findings of our study underscore a significant transmission effect of diesel price fluctuations on food prices, particularly in the upstream segments of the supply chain. Using the SVAR framework with data-driven identification, we find robust short- and long-run linkages between diesel prices and staple goods such as rice, beans, and potatoes, indicating that these items are especially sensitive to cost shocks. The impulse response functions confirm that upstream food producers react more acutely to diesel price changes, whereas downstream sectors exhibit a more gradual and muted response. In parallel, the time-varying Granger causality analysis reveals evolving feedback loops over time, suggesting that the magnitude of diesel price pass-through to food prices has shifted significantly since the 2016 policy adjustment. Moreover, we observe that milk and protein products exhibit weaker and shorter-lived responses to diesel price shocks, highlighting the heterogeneous nature of these impacts across different food categories.

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, shocks on the diesel price impact the upstream and downstream of the food supply across the food market, with upstream food sector being more reactive. Additionally, the prices from staple goods appears to be more sensitive and longer lasting to change on diesel price than other food categories such as milk and protein product. 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 IAEE 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.