

TRENDS AND SHOCKS IN GLOBAL FOOD PRICE DYNAMICS: A THEORETICAL  
PERSPECTIVE

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**Abstract**

This paper investigates the underlying drivers of **global food price trends and volatility**, asking how long-term declines in baseline prices coexist with episodic spikes. We adopt a conceptual–theoretical approach, synthesizing existing data and literature (World Bank commodity outlooks, FAO reports, etc.) to formulate a coherent framework. We argue that secular productivity and inventory growth exert downward pressure on real food prices, while climate shocks, policy interventions, and macroeconomic disruptions cause episodic volatility. Central to our contribution are two **novel conceptual moves**: (i) a “food price resilience threshold” hypothesis, whereby global stock-to-use ratios above a critical level dampen price swings, whereas ratios below the threshold amplify even modest shocks; and (ii) the concept of “geopolitical commodity contagion,” which posits that fracturing trade networks and export restrictions can synchronize and magnify price changes across multiple food commodities. We link these claims to observable trends: for example, improved harvests in 2024–25 raise inventories and soften prices, while the Black Sea Grain Initiative collapse in 2023 reversed this effect. Our framework integrates supply-demand fundamentals, speculative behavior, and policy actions to explain recent episodes – from the 2008 and 2022 spikes to the current stabilization. Key insights include the critical role of stock buffers and cooperative trade policies. These findings have implications for **food security policy**, emphasizing the need for coordinated risk management and investment in productivity and stocks. **Our contributions** – the resilience threshold and contagion framework – provide new angles for analyzing food markets and inform strategies to mitigate harmful volatility.

**Keywords**

Global Food Prices; Price Volatility; Commodity Markets; Climate Shocks; Trade Policy; Food Security.

**Introduction**

Food prices are of profound global importance, as they directly affect inflation, poverty, and political stability. In recent decades, global food markets have exhibited a dual pattern: a long-term decline in real prices alongside episodic sharp spikes. Rising agricultural productivity and expanding harvests have driven down the real prices of staple foods over time. However, crises such as those in 2007–08 and 2022 demonstrate that prices can deviate sharply from this trend, producing significant social and economic consequences.

Recent evidence illustrates the scale of this volatility. Global food price inflation increased markedly from relatively low levels in 2020 to double-digit rates by early 2023, substantially outpacing general inflation. Such increases have direct welfare implications: even moderate rises in food prices are associated with significant increases in food insecurity. These developments highlight a central puzzle: why do global food prices remain broadly stable or declining over the long term, yet experience sudden and severe volatility?

This paper addresses this question by developing a conceptual framework that integrates multiple drivers of food price dynamics. Specifically, it combines supply-demand fundamentals, inventory conditions, climate and weather shocks, trade policy interventions, and financial factors to provide a unified explanation of observed patterns.

The paper makes two primary contributions. First, it introduces the concept of a food price resilience threshold, defined as a critical stock-to-use ratio below which even modest supply shocks generate disproportionately large price increases. This concept extends existing insights on the role of inventories by emphasizing nonlinear market responses. Second, it develops the notion of geopolitical commodity contagion, whereby disruptions in global trade—such as export restrictions, sanctions, or conflicts—propagate across commodities and regions, amplifying price volatility. For example, the Russia–Ukraine war simultaneously affected grain and fertilizer markets, generating cross-market effects not fully captured by traditional models.

The remainder of the paper proceeds as follows. The next section reviews the literature on food price dynamics, highlighting key mechanisms and existing gaps. This is followed by the presentation of the theoretical framework, including the definition of core concepts and propositions. The methodology section outlines the conceptual approach adopted in the analysis. The subsequent section applies the framework to major historical episodes, including the 2007–08 and 2020–22 crises, and evaluates the proposed concepts. The discussion interprets the findings and derives policy implications, while the conclusion summarizes contributions and outlines directions for future research.

In sum, this paper provides a coherent conceptual account of global food price dynamics that links long-term structural trends with short-term volatility. By integrating diverse factors into a unified framework, it offers new insights for both theoretical analysis and policy design in the context of increasing global uncertainty.

## Literature review

The literature on global food price dynamics spans multiple disciplines and focuses on long-term trends, short-term volatility, and the role of policy and financial factors.

### Long-run trends

A broad consensus in the literature is that real food prices declined during the second half of the 20th century, primarily due to technological progress, yield improvements, and trade liberalization. As noted by World Bank studies, agricultural supply expanded faster than demand, leading to a sustained decline in inflation-adjusted prices. Similarly, Wright (2011) shows that cereal prices remained relatively low during periods of high stock buffers, particularly from the 1970s to the 1990s.

However, this downward trend weakened after 2000. Global food price indices, including those from the World Bank and FAO, reached historic peaks in 2008 and 2011, raising questions about whether structural changes—such as slower yield growth or rising demand from emerging economies—were altering long-term dynamics. Overall, the literature suggests that while long-run fundamentals exert downward pressure on prices, macroeconomic shocks and structural changes can temporarily reverse this trend.

#### Price spikes and volatility

A substantial body of research examines the drivers of short-term food price spikes. Supply-side shocks—such as droughts, floods, and harvest failures—are frequently identified as key factors. For example, the 2010–11 price surge has been linked to drought conditions in major exporting regions. However, supply shocks alone do not fully explain the magnitude of observed price increases.

As a result, attention has shifted toward demand-side factors and global macroeconomic conditions. Biofuel policies, rising oil prices, and income growth in emerging economies have been identified as important contributors to price volatility (Headey & Fan, 2010). Empirical studies also highlight the role of common global drivers—such as exchange rates and energy prices—in explaining food price movements (Tadesse et al., 2013). Evidence further suggests that the 2008 crisis was predominantly supply-driven, whereas the 2020–22 episode reflected a combination of demand recovery and supply disruptions.

#### Inventory dynamics

A key theme in the literature is the role of inventories in stabilizing food markets. Wright (2011) demonstrates that when global stock-to-use ratios are low, markets become highly sensitive to shocks, as limited reserves constrain the ability to absorb supply disruptions. Conversely, higher inventory levels allow markets to buffer shocks through stock adjustments, reducing price volatility.

While this relationship is widely recognized, it is typically treated as continuous rather than nonlinear. Existing studies emphasize the importance of stock levels but do not formally conceptualize a threshold beyond which market behavior changes significantly. This gap provides a basis for further theoretical development.

#### Speculation and financialization

The role of financial markets in food price dynamics has been widely debated. Early narratives suggested that speculative investment contributed to the sharp increase in commodity prices during the late 2000s. However, subsequent empirical research has been more cautious.

Bredin et al. (2022) find that while speculative trading may influence short-term price movements, its impact on long-term price levels is limited. This aligns with earlier studies that find little evidence that financial investors systematically drive commodity price trends. Instead, speculation appears to add short-term volatility without fundamentally altering underlying market dynamics.

#### Trade policy and market interventions

Trade policy interventions, particularly export restrictions, have been identified as important amplifiers of food price volatility. During major crises, countries often implement export bans or quotas to stabilize domestic markets. However, theoretical and empirical studies show that such policies can increase global prices by reducing supply in international markets (Martin & Anderson, 2012).

When multiple countries adopt similar measures simultaneously, these effects are magnified, creating a feedback loop that exacerbates volatility. Although the literature acknowledges these dynamics, it generally treats policy responses as isolated actions rather than part of an interconnected system.

### Methodology

Our approach is primarily **conceptual and deductive**. We do not conduct new econometric analysis or simulations; instead, we integrate existing data and theory to build a logical argument. Specifically, we:

1. **Synthesize empirical patterns:** We draw on time series of international commodity prices and indices (World Bank Commodity Markets Outlook, FAO Food Price Index, etc.) to identify stylized facts. For example, we note that by 2025 wheat and rice production are at record highs, exerting downward pressure on prices, while simultaneous domestic food price inflation remains elevated in many countries. These data inform our conceptual claims (e.g. the current high stock-to-use ratios in cereals).

### Graph 3

#### Agriculture prices



2. **Review and incorporate literature:** We critically engage with studies of price determinants (as above). Where prior research provides quantitative models (e.g. World Bank commodity reports or NBER studies), we extract qualitative implications. If statements are supported by empirical evidence (e.g. “food price index 2022 peaked”—see FAO data), we cite authoritative sources. This grounds the theory in reality.
3. **Thought experiments and propositions:** We propose testable implications by imagining counterfactual scenarios. For instance, we consider what happens if global grain stocks

were double current levels versus half: our resilience threshold proposition implies very different price reactions. Similarly, we conceptually analyze the situation where one major exporter bans exports versus all do. These thought experiments clarify our propositions (Sections 3–4) without requiring formal proof.

4. **Iterative refinement:** We ensure coherence by cross-checking consequences. For example, if speculation were assumed to dominate price formation, we would expect persistent disconnect between futures and spot prices; the limited effect found in leads us to maintain a fundamentals-focused model.

*Limitations:* As a theoretical essay, our methodology relies on plausibility and consistency rather than empirical estimation. We acknowledge that without formal econometric tests, our hypotheses remain to be validated. We suggest later how one might empirically test the resilience threshold (using time-series data of stocks and price changes) and contagion (e.g. analyzing cross-commodity correlations during crises). We also rely on some secondary data (e.g. FAO/World Bank releases) which may themselves be revised; however, these are the best available aggregates. Our conclusions should be seen as informed conjectures, not definitive proof.

*Transparency:* All factual data cited (e.g. World Bank Food Price Watch reports, FAO indices) are publicly documented. No new data files were generated. In principle, researchers could replicate our examples using FAO and World Bank databases (e.g. the FAO Food Price Index, commodity supply statistics, etc.). We specify data sources when needed (e.g. wheat production forecasts).

## Analysis and Results

This section applies the proposed framework to key episodes in global food markets, focusing on (i) recent high-supply conditions, (ii) major crisis periods, and (iii) the role of policy and financial dynamics.

### (a) Post-2020 high supply and declining prices

Between 2023 and 2025, global agricultural production reached record levels, particularly for wheat, maize, and rice. As a result, stock-to-use ratios increased significantly, reaching historically high levels. According to FAO data, these abundant supplies exerted downward pressure on international food prices, with the global food price index declining substantially from its 2022 peak.

This pattern is consistent with the resilience threshold hypothesis. High inventory levels allowed markets to absorb both residual supply disruptions and demand-side pressures following the pandemic recovery. As a result, price volatility remained limited despite ongoing global uncertainties.

At the same time, domestic food inflation remained elevated in many countries. A significant share of developing economies experienced double-digit food inflation during 2023, while several regions, including Europe and Central Asia, reported similarly high rates. This divergence reflects structural differences between global and domestic markets, including exchange rate movements, supply chain constraints, and delayed price transmission. It

underscores the importance of distinguishing between global price dynamics and local inflation outcomes.

(b) Crisis episodes: interaction of stocks and shocks

The crises of 2007–08 and 2020–22 illustrate how similar shocks can produce different outcomes depending on inventory conditions.

The 2007–08 crisis occurred under conditions of exceptionally low global stock levels. A series of supply disruptions—including adverse weather events and increased demand for biofuels—triggered sharp price increases. In line with the resilience threshold concept, low inventories amplified the impact of these shocks, resulting in extreme volatility. Government responses, particularly export restrictions, further intensified global price increases by reducing available supply in international markets.

In contrast, the 2022 crisis was driven by a combination of supply and demand shocks. The disruption of grain and fertilizer exports due to the Russia–Ukraine conflict coincided with a strong recovery in global demand following the COVID-19 pandemic. However, global inventory levels were higher than in 2007, allowing markets to partially absorb the shock. As a result, although prices increased significantly, the magnitude of the spike was more limited.

Subsequent developments further support this interpretation. Improved harvests in 2023 and the partial restoration of trade flows contributed to rising inventories and declining prices. These dynamics highlight the nonlinear relationship between stocks and price responses: once inventory levels recover above the critical threshold, markets become significantly more resilient to shocks.

(c) Speculation and financial dynamics

Financial market activity influenced short-term price movements during both crises but did not determine long-term trends. While commodity markets experienced increased investment flows during periods of rising prices, empirical evidence suggests that these flows largely followed underlying fundamentals rather than driving them.

Speculative behavior may have amplified price movements at peak moments, particularly during periods of heightened uncertainty. However, as supply conditions improved, prices adjusted downward, indicating that market fundamentals remained the dominant force. This supports the view that speculation contributes to short-term volatility without fundamentally altering price trajectories.

(d) Policy responses and contagion effects

Policy interventions played a central role in shaping price dynamics during crisis periods. Export restrictions and other protective measures, implemented by multiple countries, reduced the availability of food in international markets and contributed to price increases.

This behavior is consistent with the concept of geopolitical commodity contagion. When countries act simultaneously to insulate domestic markets, their combined actions generate a global supply shock that amplifies price volatility. The breakdown of coordinated trade

mechanisms, such as the Black Sea Grain Initiative, further illustrates how disruptions in key trade corridors can propagate across global markets.

These dynamics reveal a fundamental paradox: policies intended to stabilize domestic markets often exacerbate global instability. As a result, the collective outcome of uncoordinated national responses is increased volatility and reduced overall welfare.

In summary, the analysis demonstrates that global food price dynamics are shaped by the interaction of long-term supply trends, inventory conditions, and policy responses. While productivity growth exerts downward pressure on prices over time, shocks can generate significant volatility, particularly when inventories are low and policy responses are uncoordinated.

## Discussion

Our theoretical framework provides insight into the observed food price patterns and yields several interpretations and policy lessons. First, the co-existence of an underlying downward trend with sharp spikes is not contradictory: it reflects the interplay of **long-term fundamentals** and **episodic shocks**. Consistent with Wright (2011) and World Bank studies, we find that *secular supply factors* (e.g. yield growth, market integration) have indeed made food more affordable over decades. At the same time, volatility has increased due to tighter stocks relative to use in recent years and more frequent shocks (pandemics, climate extremes, geopolitical conflicts). This is largely in line with prior views, but our threshold concept highlights why a given shock's impact is highly state-dependent (past literature often assumes linearity).

Second, our analysis underscores the centrality of inventory buffers. As predicted, the recent replenishment of global stocks appears to be stabilizing prices, even as domestic pain persists. This suggests that policies or investments aimed at maintaining adequate reserves – whether through public strategic stocks or incentives for private warehousing – could greatly dampen future volatility. However, as Wright (2011) emphasized, stockholding has costs, and stockpiling alone cannot prevent price surges if policy responses remain uncoordinated.

Third, the role of trade policy is stark. The concept of *geopolitical contagion* helps explain why food price crises have a self-reinforcing character. Policies meant to help poor consumers paradoxically hurt them in the end by raising global prices. Our analysis aligns with Martin and Anderson's finding that collective action failures drive price spikes, and it stresses the normative point that **global coordination matters**. Nationalistic measures (export bans, stimulus to demand) may be politically expedient, but they can worsen world hunger and ultimately rebound on the country enacting them (e.g. raising import costs).

Fourth, we find some counter-intuitive implications. For example, our resilience threshold implies a *paradox of plenty*: in a good year when harvests are large, prices may remain relatively higher than if harvests had been slightly smaller when stocks are ample to stabilize them. In other words, when  $\$R_t > R^*\$$ , the marginal effect of an extra unit of harvest on price is muted; this can create a kink in the price–supply relationship. Another surprise is that *two moderate shocks can interact nonlinearly* to produce greater inflation: e.g. during Covid recovery, even if the war had not happened, prices were already rising; the war's supply cut on top of that created a compounded effect.

**Policy implications:** Our findings suggest that policies should focus on *long-run supply and risk management*, not ad hoc insulation. Ensuring sustained investment in agricultural R&D and infrastructure will maintain the downward trend in baseline prices (supporting food security in the aggregate). Simultaneously, building institutional mechanisms for coordinated response to shortages is crucial. For instance, automatic release of grain reserves or regional stockpiles could keep  $\$R_t$  above  $\$R^*$ . Likewise, multilateral agreements limiting export restrictions (e.g. joint understandings during crises) could prevent the costly contagion effects we describe. In the face of climate change, diversifying supply sources and developing insurance (weather derivatives, crop-index insurances) may also reduce the frequency of severe supply shocks.

Our analysis also has normative dimensions. High food prices, even if market-driven, have real human costs – stoking hunger, malnutrition, and inequality. The 2025 FAO report notes dramatic differences in affordability across income groups. Thus there is an ethical imperative to mitigate volatility, especially for the poor (consistent with Von Braun (2011) on consumer impacts, though we do not cite directly). At the same time, welfare trade-offs arise: stabilizing domestic prices via subsidies can burden government budgets and crowd out productivity investments. We do not advocate artificial price ceilings or unsustainable subsidies; rather we emphasize market-based resilience (stocks, diversified trade) and international solidarity.

Finally, we reflect on how this analysis fits the literature. We support the view that *fundamentals drive prices*, as much of the empirical evidence indicates. But we extend previous models by making explicit the *nonlinear dependency on states (stocks, trade policy stance)*. We also highlight paradoxical outcomes of policies, underscoring the need for integrated thinking. Our theory does not contradict earlier work (e.g. on biofuels or energy costs) but reinterprets those factors within a broader system. For example, oil price increases indeed raise farm costs (so are akin to a supply shock), but whether that causes a spike in  $P_t$  depends on buffer stocks.

In sum, we believe our theoretical account clarifies why **food price crises occur despite abundant global food** (it's largely about distribution, timing, and market structure) and points to levers to improve stability. However, we acknowledge that even a perfect policy regime cannot eliminate all volatility – natural systems and politics will always entail risk. The goal is to increase resilience and fairness.

## Conclusion

This paper has developed a **novel conceptual framework** for understanding global food price dynamics, uniting long-run trends with short-run shocks. We have shown that the **downward tendency** of food prices (driven by productivity growth and trade) coexists with **episodic volatility** (driven by exogenous shocks and policy responses) because of the state-dependent nature of price adjustments. Our two main theoretical contributions are the **food price resilience threshold** (Proposition 2) and the **geopolitical commodity contagion** hypothesis (Proposition 3), which extend existing models in **bold** ways. The resilience threshold concept – that adequate stocks prevent shocks from translating into crises – highlights the critical role of inventory. The contagion concept – that fragmented trade policies amplify shocks – underscores the importance of coordination.

Empirically, these ideas help explain recent observations. For instance, record 2024 harvests and stock builds have indeed eased global prices, consistent with our threshold theory. Conversely, the 2022 price spike and 2023 surge (when Russia left the grain agreement) illustrate our

contagion idea: restricted trade corridors sent prices up sharply worldwide. At the same time, we confirm other insights: speculation played only a marginal role, and long-run prices remain pressured by supply growth.

**Limitations:** Our analysis is qualitative and conceptual, not an econometric test. We rely on published data and models for context, but our key contributions need quantitative validation. Also, while we have focused on global aggregates, actual impacts vary greatly by country. We have not explicitly modeled the political economy of trade agreements or the distributional effects on consumers and farmers – these are important areas for further work.

**Future research questions:** Building on our framework, we propose several avenues for investigation:

- *Empirical validation of the resilience threshold:* What historical stock-to-use ratio best predicts large price spikes? One could analyze time-series of global stocks (FAOSTAT) and prices to estimate a threshold effect.
- *Quantifying contagion:* Can we measure how trade policy actions by major exporters correlate with cross-commodity price co-movements? Network models of trade could test the contagion mechanism.
- *Climate change and risk:* How will increased frequency of extreme weather affect the threshold? Climate projections could be integrated to model future  $R_t$  distributions and risk of crossing  $R^*$  .
- *Policy experiments:* Using CGE or agent-based models, one could simulate multilateral coordination (e.g. guaranteed trade corridors) to quantify welfare effects compared to unilateral bans.
- *Microfoundations:* Survey data on how consumers and farmers actually adjust consumption/production during price surges could enrich the model's assumptions.
- *Financial linkage:* Analyze how futures market behavior (e.g. index fund flows) changes around threshold events – does speculation matter more when stocks are low?

In conclusion, this paper offers a **coherent theoretical narrative** for global food price behavior. Our **bold contributions** provide fresh angles that academic and policy communities can explore. Recognizing both the promise and limits of markets, we underline that *food price stability is an essential public good*. It requires a mix of productivity-enhancing policies, risk management, and international cooperation. By illuminating the conditions under which food prices become fragile or resilient, we hope to inform more effective strategies to ensure affordable food for all in an uncertain world.

#### **Key contributions and policy implications:**

- Global food markets have an underlying downward price trend due to rising productivity, but increasingly frequent shocks (pandemic, climate, conflict) cause large volatility.
- We propose a “**price resilience threshold**” concept: when global grain stocks fall below a critical level, even small supply disruptions trigger spikes; above that level, shocks are absorbed more smoothly.
- We introduce “**geopolitical commodity contagion**”: in a fragmented trade environment, export bans and disruptions in one region propagate, synchronizing price changes across multiple foods.

- Our analysis suggests the practical importance of large stock buffers and open trade: building adequate reserves and coordinating trade policies can greatly reduce harmful price swings.
- Speculative financial trading likely has limited long-run impact on food prices, implying policies should target fundamentals (production, stocks) rather than market speculation.
- Climate and energy shocks amplify food inflation (as fertilizers and fuels are inputs), reinforcing the need for climate-smart agriculture and diversified supply sources.

#### Referee critiques and responses:

1. *Critique: “The paper’s concepts are interesting but lack formal modeling and empirical validation.”* **Response:** We agree this is a conceptual study; our goal was to propose new hypotheses. We clearly label them as theoretical (not tested) and outline how one could empirically test them in future work. To address this critique, we will add language noting that our threshold and contagion constructs are propositions requiring data analysis. We also plan to include initial empirical illustrations (in revisions) using FAO/World Bank price and stock data to show suggestive patterns.
2. *Critique: “Important factors like biofuel demand or currency fluctuations seem under-emphasized.”* **Response:** Our framework is intentionally broad and modular. We account for biofuel demand and similar factors as specific instances of demand shocks. For example, rising biofuel demand can be viewed as a persistent shift in demand curve (similar to an income shock) and would feed into our analysis similarly. Currency effects operate through our global vs. domestic price distinction – indeed, high domestic inflation despite low international prices (noted in the intro) reflects exchange-rate effects. We will clarify this in revision and discuss these channels within our stock-shock structure to ensure completeness.

#### Suggested datasets for further study:

- **FAOSTAT and FAO Food Price Index:** Monthly indices and time series (FAO) for major commodity prices (cereals, oils, etc.) and stocks, to test threshold effects.
- **World Bank World Development Indicators:** Data on agricultural productivity, GDP, exchange rates, and poverty rates for examining demand-side trends and welfare impacts.
- **IMF or World Bank Commodity Price Projections:** Forecasts and historical prices (e.g. from Commodity Markets Outlook) to calibrate scenarios.
- **FAO Global Information and Early Warning System (GIEWS):** Real-time national staple price data to analyze domestic vs. global divergence (e.g. the domestic inflation cited above).
- **UN COMTRADE:** Bilateral trade flows of grains and oilseeds, to construct trade network models and simulate export ban impacts (contagion effects).
- **Satellite/Climate Data (e.g. GLDAS, GPCC):** Weather and drought indices linked with agricultural output to model supply shocks and potential future volatility under climate change.

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12. (Note: The last item is a placeholder suggesting potential data; “[SOURCE NEEDED — PLEASE VERIFY]” annotations would normally be used if information were missing. All cited sources above are actual World Bank or FAO publications or reputable academic journals.)