

Research Statement

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My research lies at the intersections of supply chain management, food economics, business data science, disruptive technology, and fintech, with a focus on how market dynamics, policy interventions, and technological innovations influence food supply chains, pricing mechanisms, and financial decision-making.

More specifically, my work examines how transportation infrastructure and logistics shape food prices and market efficiency. My dissertation, *Managing Food Crises through Transportation Analytics*, investigates how transportation factors (i.e., fuel prices, driver availability, road infrastructure, and tariffs) affect food price volatility in the U.S., particularly in the context of rising grocery and food inflation. Drawing on large-scale datasets, econometric modeling, and transportation network analysis, I quantify how operational constraints, infrastructure challenges, and policy shocks propagate through supply chains, providing a comprehensive framework for managing food price crises.

In my recently published work in Transportation Research Part E: Logistics and Transportation Review (ABDC: A*), *Food Transportation and Price Impacted by Diesel Price and Truck-driver Shortage pre-, amid and post Pandemic*[1] (co-authored with Dr. Jasmine Chang, Dr. Nesreen El-Rayes, and Dr. Jim Shi, and funded by USDA), we study the U.S. fresh fruit and vegetable market. Specifically, we examine how diesel prices and truck driver shortages influence the market across different pandemic periods. Using panel data on major commodities including apples, potatoes, onions, and tomatoes from 2017 to 2022, we find that rising diesel costs and driver scarcity significantly increase food transportation margins. Among these commodities, potato prices are the most sensitive to changes in transportation costs, while tomato prices are the least affected. Overall, fresh produce prices increased

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between 1.82% and 7.76% in the period after COVID-19. This study identifies key logistical drivers of food prices and provides policy insights for transportation and food security.

In my recently manuscript prepared for submission to Decision Sciences Journal (ABDC: A*), *Food on Road: A Novel County-Level Analysis of Road Density and its Impact on Food Prices in the U.S. Market* (co-authored with Dr. Jasmine Chang and Dr. Jim Shi), I serve as the leading author, contributing to research idea formulation, data collection, methodology development, and initial drafting. Building on the previous study of variable transportation costs on labor and fuel, this second paper examines how fixed infrastructure influences regional food prices through its impact on food access and mobility. Although prior studies have examined determinants of food prices, the role of local and regional road networks remains underexplored. To address this gap, the empirical challenge is to isolate the effect of road density from other geographic, demographic, and temporal factors influencing pricing. Consequently, we construct a county-level road infrastructure measure using comprehensive U.S. roads data and compile a unique dataset spanning 2010 to 2020. Our analysis shows that higher road density significantly reduces the cost per meal, with a one mile/mile² increase lowering meal costs by 1.3%, *ceteris paribus*. Further, mechanism analysis indicates that this effect weakens as store availability increases and even turns positive in densely populated areas. In addition, using spatial econometric models, we identify geographic spillover effects of road density on food prices. Overall, these findings demonstrate how transportation infrastructure influences food mobility and price equity, providing evidence-based insights for planners and policymakers. By creating a novel county-level road density dataset, the study offers spatially and temporally grounded contributions to understanding local food markets.

In addition, I am currently leading a project titled *Ripple Effects of Tariff Shocks: Estimating Supply Chain Disruptions and Transportation Cost Spillovers in the U.S. Tomato Market* with Dr. Jasmine Chang and Dr. Jim Shi. This project is motivated by our published finding that tomato prices are relatively insensitive to transportation costs but to external factors, including tariffs and agreements. Building on this, the proposed study examines the

indirect effects of import tariffs on food prices, focusing on how policy-induced tariff shocks propagate through the fresh produce transportation network. To identify the causal impact of tariffs on prices, we employ a Difference-in-Differences (DiD) approach. In addition, we construct a U.S. tomato transportation network model to estimate the resulting changes in transportation costs. By linking trade policy interventions to supply chain dynamics, this research provides a deeper understanding of how tariffs generate ripple effects across the food system. The findings are expected to contribute to my broader research agenda on food price dynamics, supply chain efficiency, and the economic implications of policy interventions.

In addition to my core research on food prices and transportation, I have also explored innovative directions at the intersection of disruptive technology and food systems. For example, in the project *Integrating AI-Powered XR Wearables for Real-Time Shelf-Life Estimation and Pricing Optimization* (with Dr. Jasmine Chang), we investigate how disruptive technologies such as AI and extended reality (XR) can be combined to address challenges in fresh food retail. While this project remains exploratory, it reflects my curiosity about technological innovation and my capability to embrace and adapt emerging tools to create new opportunities for improving efficiency and decision-making in food markets.

Beyond food systems research, I have also explored the FinTech domain as part of my broader curiosity to apply innovative methods across disciplines. For example, in my paper published in Finance Research Letters (ABDC: A), *How the Economic Policy Uncertainty (EPU) impacts FinTech: The implication of P2P lending markets* [2] (co-authored with Dr. Jasmine Chang and Dr. Jim Shi), we examine how policy uncertainty shapes P2P lending platforms such as LendingClub and Prosper. This project reflects my capability to analyze complex multi-source datasets, apply machine learning techniques, and integrate explainable AI methods—demonstrating my ability to embrace new technologies and adapt them to emerging research contexts.

I have gained substantial experience in securing and managing research funding through projects supported by USDA and the NSF I-Corps program. For the USDA-funded project,

I led data collection and analysis, presented findings at conferences, and contributed to peer-reviewed publications, gaining first-hand experience in translating grant support into impactful research outcomes. As the Entrepreneurial Lead in the NSF I-Corps program, I prepared and submitted proposals, completed entrepreneurial training, and conducted over 100 customer interviews, building a well-established network across academia and industry. These experiences have shaped my future research funding plan. I aim to leverage USDA grants to advance research in food systems and supply chain analytics, while pursuing NSF I-Corps and NSF SBIR/STTR programs to further develop and potentially commercialize AI-driven solutions in food.

Looking ahead, my research agenda aims to expand on these themes, continuing to bridge gaps between food supply chain management, food economics, and business data science. By investigating how transportation, food market dynamics, and economic policy interact to influence food networks, I seek to contribute to a more comprehensive understanding of how these forces shape the food business and inflation. For my in-progress work, I am targeting top-tier journals at the intersection of supply chain, operations, and AI applications. They are suitable for journals such as Manufacturing & Service Operations Management (MSOM), Production and Operations Management (POM) and Decision Science Journal(DSJ). Looking forward, I plan to pursue NSF and USDA grants to support these projects, including commercialization efforts for the AI-XR food system through NSF I-Corps and SBIR/STTR programs. These efforts, together with recognition such as the MTSM Award for Excellence in Research, underscore my commitment to advancing innovative, data-driven, and impactful research that bridges theory and practice.

References

- [1] Aichih Jasmine Chang, Fuqin Zhou, Nesreen El-Rayes, and Jim Shi. Food transportation and price impacted by diesel price and truck-driver shortage pre-, amid and post pandemic. *Transportation Research Part E: Logistics and Transportation Review*, 192:103794, 2024.
- [2] Fuqin Zhou, Aichih Jasmine Chang, and Jim Shi. How the economic policy uncertainty (epu) impacts fintech: The implication of p2p lending markets. *Finance Research Letters*, 70:106268, 2024.