Research Statement - Tianyu Fan

My research examines issues at the intersection of macroeconomics, political economy, and international trade. Currently, I focus on three interconnected areas: **technological change and labor markets**, **geopolitics and geoeconomics**, and **unequal growth and development**. Through both theoretical modeling and empirical analysis, my work investigates how technological progress, geopolitical forces, and structural transformation shape economic outcomes across countries and within societies.

Technological Change and Labor Markets

My research in this area explores how new technologies transform labor markets and affect workers differently. The rapid emergence of generative AI presents an unprecedented challenge: AI affects creative and analytical occupations traditionally considered automation-proof. Understanding these distributional impacts is critical for predicting which workers benefit versus suffer from AI adoption and designing appropriate policy responses.

1. **The Labor Market Incidence of New Technologies** *(Job Market Paper)*
   This paper develops a new framework to analyze the incidence of labor market shocks, focusing particularly on automation and artificial intelligence. Central to our theory is the distance-dependent elasticity of substitution (DIDES), where worker mobility between occupations declines with their distance in skill space. Mapping 306 occupations into cognitive, manual, and interpersonal skill dimensions, we estimate a low-dimensional latent skill model that preserves granular substitution patterns. We show that both automation and artificial intelligence cluster within skill-adjacent occupations, constraining employment adjustment and amplifying wage effects. The clustering nature of technologies generates unequal outcomes: 20-50% of labor demand shocks translate to wages (versus 30% under standard models), while mobility recovers only 20% of losses (versus 30% from standard estimates).
2. **Partial Automation** (with Pascual Restrepo, *Work in Progress*)
   In this ongoing project, we study the effects of partial automation (i.e., the creation of technology capable of automating some but not all components of a job) on within- and across- job wage inequality and the allocation of workers.

Geopolitics and Geoeconomics

This strand of my research investigates how geopolitical relationships shape economic growth, trade patterns, and idea flows in an increasingly fragmented global economy. I develop a novel event-based measure of bilateral geopolitical alignment by leveraging large language models to systematically analyze 833,485 political events spanning 193 countries (1950–2024), capturing both the precise timing and continuous intensity of international relations essential for causal identification. This methodological innovation enables me to trace how international alignment drives economic outcomes across three complementary projects: establishing geopolitics as a first-order growth determinant, quantifying its role as a barrier to global trade, and uncovering the fundamental forces that shape geopolitical relations themselves.

1. **The Geopolitical Determinants of Economic Growth, 1960-2019** *(Working Paper)*
   This paper establishes geopolitical relations as a first-order determinant of economic growth. Exploiting

within-country temporal variation, we find that a one-standard-deviation improvement in geopolitical relations increases GDP per capita by 10 percent over 15 years. These persistent effects operate through multiple reinforcing channels: enhanced political stability, increased investment, expanded trade, and productivity gains. Geopolitical factors account for GDP variations ranging from -35 to +30 percent across countries over our sample period, with developing nations exhibiting particularly severe penalties from international isolation.

2. **Geopolitical Barriers to Globalization** (with Mai Wo and Wei Xiang, *Working Paper*)
   This paper systematically estimates and quantifies how geopolitical alignment shapes global trade across three distinct eras: the Cold War, globalization, and recent fragmentation. Our analysis reveals that trade flows systematically track geopolitical alignment in both bilateral relationships and aggregate patterns. Using local projections within a gravity framework, we estimate that a one-standard-deviation improvement in geopolitical alignment increases bilateral trade by 20 percent over ten years. Integrating these elasticities into a quantitative general equilibrium model, we find that deteriorating geopolitical relations have reduced global trade by 7 percentage points between 1995 and 2020.
3. **Anatomy of Geopolitical Dynamics** (with Jizhou Liu and Wei Xiang, *Work in Progress*)
   In this ongoing project, we seek to identify the fundamental determinants of geopolitical relations. We empirically test foundational theories in international relations including the clash of civilizations hypothesis. Beyond bilateral factors, we develop and estimate models of geopolitical networks to understand how alliance formations trigger realignments among third parties and how bilateral tensions cascade through the international system.

Unequal Growth and Development

My work on unequal growth examines how structural transformation and economic policies generate heterogeneous effects across regions, sectors, and income groups. Understanding both the causes and consequences of inequality is crucial: growth strategies can create unequal distributions of benefits, while the resulting inequality may constrain future growth.

1. **Growing Like India: The Unequal Effects of Service-Led Growth** (with Michael Peters and Fabrizio Zilibotti, *Econometrica*, 2023)
   This paper provides a novel framework to structurally estimate productivity growth in service industries that circumvents the notorious difficulties in measuring quality improvements. We find that productivity growth in non-tradable consumer services such as retail, restaurants, or residential real estate was an important driver of structural transformation and rising living standards between 1987 and 2011. However, the welfare gains were heavily skewed toward high-income urban dwellers.
2. **Measuring Inflation Inequality with Incomplete Prices** (with Olivia Ding and Kan Yao, *Work in Progress*)
   Poor U.S. households have faced higher inflation rates than rich households over the last four decades, but do unmeasured quality improvements offset this inequality? This paper develops a novel Engel curve approach to measure inflation inequality when official prices incompletely capture quality changes. Applying this method to U.S. data (1984-2019), we find that unmeasured quality improvements exacerbate observed inflation inequality, implying official statistics understate inflation's regressivity.