

# Research Statement

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Economic exchanges between regions and countries through trade, migration, and the activities of multinational firms have had tremendous impacts on the well-being of people. My research, evolving along two lines, aims to understand the aggregate and distributional consequences of these exchanges. The first line of my research focuses on firms' innovation and investment in the global economy. The second focuses on domestic spatial frictions and their implications for inter-regional disparities and the welfare effects of economic shocks.

## **Firm innovation and investment in the global economy**

Multinational Corporations (MNCs) play an important role in global R&D and production. Traditionally, MNCs carry out much of their R&D at headquarters and engage mostly in production in foreign affiliates. Over the past decades, however, a growing share of R&D in MNCs has been conducted in foreign affiliates. Motivated by this trend, in the paper '**Talent, Geography, and Offshore R&D**' (RESTUD, 2024), I examine what determines firms' decisions to offshore R&D activities and quantify the benefits of offshore R&D for individual countries and the world economy. I make two main contributions. First, I construct a new dataset linking the universe of world patents to global firms, with which I document patterns in firms' global R&D and production allocation. Second, I construct a model of multinational firms that rationalizes these patterns. The model highlights accessing talent in the host country and co-locating R&D and production as the main motivations for offshore R&D. Model-based counterfactual exercises suggest that the gains from offshore R&D are large but uneven, and substantially higher for developed countries than for developing countries. Thus, overlooking offshore R&D leads to underestimating the value of global integration for all, but especially so for developed countries.

An alternative to offshore R&D for firms and talented researchers from different countries to work together is for researchers to migrate internationally. In the paper '**Offshore R&D, High-Skill Immigration, and Firm Dynamics**' (Revise and Resubmit at RESTUD), my coauthors and I study firms' decisions to hire immigrant researchers and the interaction between this decision and offshore R&D. Our analysis takes advantage of rich administrative records from Denmark, which allow us to measure the information of both workers and firms. Our empirical and quantitative analysis demonstrates that offshore R&D and high-skill immigration play crucial yet complementary roles in firm R&D. Without these two options, both R&D participation

and the aggregate return to R&D would decrease substantially.

When MNCs enter a country, they bring in both technology and financial capital. Existing studies, however, either follow the tradition of international trade to model MNCs as merely a vehicle for technological transfer or follow the tradition of international finance to model MNCs as just another form of global capital flows. In the paper '**Financing Multinationals**' (**Revise and Resubmit at RESTAT**), my coauthor and I develop a quantitative model of firm dynamics that incorporates both perspectives. The model is tractable and can be used to analyze the transitional dynamics of many asymmetric countries. The model delivers an empirically consistent relationship between MNC activities and financial market conditions. Our main finding is that financing factors that are overlooked in existing quantitative models of MNCs can account for important aspects of MNC activities and lead to new insights on how much host countries benefit from the entry of foreign MNCs.

Recent world events have led major economies to adopt strategies aimed at reducing economic dependence on geopolitical rivals.<sup>1</sup> These shifts lead to a growing concern: the risk of not being able to access key foreign inputs may push firms towards domestic technologies, potentially dividing the world into blocs with incompatible technologies. Our recent working paper ('**Trade and Technology Compatibility in General Equilibrium**') develops a tractable model to formalize this consideration and quantify its implications. In the model, firms choose among different technological paths and suppliers for their inputs. The efficiency of an input is higher if the technology path of the supplier is compatible with that of the downstream firm. The model implies that a decrease in trade dependence between two countries can result in more diverse technology choices, leading to efficiency losses due to lower compatibility. Our quantitative application studies the welfare cost of trade decoupling between the U.S. and China. We find that an embargo on semiconductor exports to China leads to a decoupling in the technologies of the two countries and a realignment of the technologies of the rest, doubling the costs for both the U.S. and China.

## **Domestic Spatial Frictions and Implications**

My second line of research focuses on domestic spatial frictions and their implications for welfare and spatial disparities. Although researchers have increasingly recognized the relevance of within-country trade costs, the attempt to estimate the level of such costs and the extent to which they can be alleviated through infrastructure upgrades has been constrained by the lack of inter-regional trade data in many countries. In the paper '**Valuing Domestic Transport Infrastructure: A View from the Route Choice of Exporters**' (**RESTAT, 2023**), my coauthors and I propose a new way to conduct such estimation. Our central idea is that because exporters have an incentive to ship goods via the least-cost route, the port of exit of exports contains information

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<sup>1</sup>For example, the European Union is actively diversifying its sources of essential goods to mitigate risks associated with supply chain disruptions. The U.S. has also sought to curb the technology of China by restricting the exports of advanced chips and to decrease its reliance on critical goods from China by adopting strategies such as 'near-shoring' and 'friend-shoring.'

on the cost of shipment along different routes. In turn, the over-time changes in the choice of port of exit can reveal how route costs are shaped by the construction of domestic transport infrastructure. Our empirical implementation focuses on China. However, as the type of data necessary for our method is available in many other countries, our method can be used to answer policy-relevant questions in these countries as well.

An important by-product of large domestic trade costs is differential access to consumption goods across regions. In particular, consumers in smaller and more remote cities tend to have fewer but more expensive product varieties. In the paper, **'The Alibaba Effect: Spatial Consumption Inequality and the Welfare Gains from e-Commerce'** (JIE, 2018), my coauthors and I show that by enabling residents from these cities to shop online, the rise of e-commerce can alleviate this inequality. Our analysis is based on new patterns we document with data from Alibaba, the dominant e-commerce platform in China. Our finding speaks to the inequality-alleviation effect of e-commerce, which was previously overlooked in the debate on the social costs and benefits of taxing online sales.

In addition to high domestic trade costs, workers in many developing countries also face migration barriers. In such settings, how do tariff cuts at the border affect the welfare of workers from different parts of a country? In the paper **'Internal Geography, Labor Mobility, and the Distributional Impacts of Trade'** (AEJ: Macro, 2019), I answer this question using firm- and individual-level data from China. I show that the increase in international trade in the past 20 years generates large welfare gains for China, but that these gains are distributed unevenly. I also explore how reforms in domestic labor markets (the relaxation of 'hukou' restriction), by encouraging migration, can help the economy cope with the increase in inequality due to international trade liberalization. A by-product of my analysis is a city-level panel on local hukou policies. This dataset is being actively used and extended by other researchers for a deeper understanding China's hukou policies.

Trade liberalization not only affects the incentive to migrate, but also the incentive to acquire education. In the paper **'Skill-Biased Imports, Skill Acquisition, and Migration'** (Revise and Resubmit at JIE), my coauthor and I study empirically and quantitatively how China's rising capital goods imports over 2000-2010 shape the spatial distribution of skills. Based on a shift-share design, our empirical analysis shows that capital goods imports increase local skill share. Two margins—education and migration—both play a role, but the education margin matters only for the younger cohort. We devise a model that incorporates these features. Conducting counterfactuals using the estimated model, we find that capital goods imports have a modest positive effect on the aggregate skill supply and a larger effect on the spatial distribution of skill.

Given the large estimated migration costs, one attractive idea of increasing the standard of living for workers in poor areas is to encourage productive firms to enter these areas. Empirically evaluating this idea is challenging, however, because firms self-select into regions with better economic prospects. In the paper **'Industrialization from Scratch: The "Third Front" and Local Economic Development in China's Hinterland'** (JDE, 2021), my coauthor and I overcome this

challenge by studying an industrialization campaign in China during 1964-1978, which relocated industrial plants and skilled workers from the coast to the remote and agrarian hinterland. The national defense consideration underling the campaign leads to exogenous variations in the geographic distribution of these industrial plants, which allows us to identify how the entry of large manufacturing plants affects long-run regional development. Our analysis reveals that there are local spillovers from these plants. Still, by reallocating plants to where productivity is low, the campaign led to aggregate efficiency losses.

Recent works examining the impacts of various events (such as China's entry into the WTO or climate change) on the disparities between regions have relied on simulations of dynamic spatial models. Common to these studies is the assumption that agents in the model perfectly foresee the event and make decisions accordingly. Although this assumption brings tractability, it is at odds with the reality. In the working paper '**Learning and Expectations in Dynamic Spatial Economies**', my coauthors and I deviate from recent spatial dynamic models that assume perfect foresight. Our main contribution is to develop a methodology to study the spatial effects of shocks to fundamentals in a general stochastic dynamic spatial framework, allowing the beliefs about future fundamentals to be evolving, uncertain, or heterogeneous across groups of agents. We then apply our methodology to two settings—an ex-ante study of the economic impacts of climate change, and an ex-post evaluation of the China productivity shock on the U.S. economy. In both cases, we study the impact of deviations from perfect foresight on different outcomes.

In the working paper '**The Dual Local Markets: Family, Jobs, and the Spatial Distribution of Skills**', my coauthor and I develop the first general equilibrium spatial model with endogenous marriage markets. The model highlights the interaction between the local labor market and the local marriage market. We use the model to explore the impacts of the changing marriage institution on the location choice of workers. We find that the decline in the taste for marriage can explain a third of the skill divergence among U.S. cities since 1960.

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