

Research Statement

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The past few decades have seen two unprecedented evolutions in the global economy: the emergence of global value chains, in which production has become increasingly complex and fragmented across countries; and China's miraculous economic growth, which has been an immense economic shock to many nations. My research explores these two interdependent trends and the resulting consequences and implications.

More specifically, my research explores three themes in the field of International Economics: (1) What explains a country's structure and evolution of global value chains and domestic production networks? (2) How do firms in emerging markets penetrate into foreign markets? (3) How do domestic institutions and politics shape international trade? In answering these research questions, I usually develop micro-founded models and examine their predictions using large-scale micro data. While a fair fraction of my work relies on data from China for empirical analyses, the lessons learned offer general insights for understanding not only the Chinese economy, but also other countries' trade and macroeconomic performance. My ongoing research in the three themes has used firm or buyer-seller linked data from the US, Japan, India, and Portugal.

Global Value Chains and Production Networks

The first theme of my research adopts a micro approach to studying the global value chains using firm and transaction-level data. The approach is a significant departure from the existing research that relies on aggregate data and input-output tables. It permits analyses of the granular origins of the pattern and evolution of a country's participation in global value chains. My research in this area highlights some overlooked aspects of firms' optimal responses to market imperfections and policy changes as important determinants of an economy's aggregate trade patterns.

In the paper "[Domestic Value Added in Exports: Theory and Firm Evidence from China](#)" (*American Economic Review*, 2016), Kee and I ask how China moved up the value chain, as revealed by its rising domestic content in exports since its accession to the World Trade Organization in 2001. There are several reasons for why China defied the global declining trend in value added exports for most countries, despite the country's gradually declining import tariffs and other liberalization policies. The phenomenon could be due to China's shifting its comparative advantage from low value-added industries

to high value-added industries. It could also be a result of its increasing domestic production costs. Another possibility is that Chinese firms may have shifted their sourcing of intermediate inputs from foreign to domestic suppliers.

Using comprehensive firm- and customs transaction-level data for the period 2000-2007, we eliminate the first two hypotheses and supports the third as potential reasons--that is, China's growing domestic content in exports is due to its exporting firms gradually substituting domestic for imported inputs. To guide empirical and quantitative exercises, we develop a heterogeneous-firm model of global outsourcing, which pins down the structural relationship between prices of domestic materials and the domestic content in firms' exports. We then empirically show that China's tariff and foreign direct investment liberalizations, by expanding the variety of domestic materials, lower the domestic material prices and raise firms' domestic value added in exports. We quantitatively show that declining domestic material prices, rather than the changing elasticities of substitution between domestic and foreign inputs in different industries, explain most of the country's ascent in domestic value added in exports at the firm, sector, and aggregate levels. Methodologically, our approach incorporates firm heterogeneity to reduce aggregation bias in the existing estimates of value added in trade, which rely on national input-output tables.

The micro approach also permits an analysis of the organization structure of firms' global production. An extensive literature explores how contractual frictions affect firms' choices of organizational modes in global sourcing (see Antràs's "Global Production: Firms, Contracts, and Trade Structure" (2015) for a book-length synthesis of the topics). Contributing to this literature, my paper "[Determinants of Vertical Integration in Export Processing: Theory and Evidence from China](#)" with Fernandes (*Journal of Development Economics*, 2012) asks how foreign firms can use control over imported material as an alternative to asset ownership to alleviate the hold-up problem in international trade. The paper exploits the coexistence of two export processing regimes in China, which designate by law who owns and controls the imported components for the empirical analysis. We extend the Antràs-Helpman (JPE 2004) model by considering controls over imported components for assembly, which affect the tradeoff between firms' vertical integration and outsourcing. Empirical results show that when Chinese plants control the use of components, the export share of foreign-owned plants is positively correlated with the intensity of inputs provided by the headquarter (e.g., R&D and capital). These results are consistent with the property-rights theory of intra-firm trade. However, when foreign firms own and control the components, there is no evidence of a positive relationship between the intensity of headquarter inputs and the prevalence of vertical integration.

The existing literature typically focuses on the determinants of intra-firm trade versus arms-length trade, but the reality is more complicated. In work in progress, Kamal and I in "[Relational Contracts in](#)

[Global Sourcing: Theory and Evidence from the United States](#)” (2016) explore an overlooked reality that firms often rely on repeated interactions as an alternative to vertical integration to alleviate the hold-up problems in international commerce. We build a relational contracting model to study under what circumstances repeated interactions can substitute for or complement formal contracts (vertical integration) in trade when complete contracts cannot be written to specify investment levels. Our parsimonious model shows that first-best investments can be achieved through repeated interactions, and are more likely to be sustained for global production that involves an intermediate level of headquarter intensities and if both buyers and input suppliers are sufficiently patient. Empirical evidence based on 15 years of US Census Bureau’s importer-exporter matched data support the main theoretical predictions. We also find that short-term buyer-supplier relationships more likely to be terminated in response to export supply shocks from China, while long-term relationships more likely to last. The higher instability in buyer-supplier relationships due to the China shock can partially explain the rising share of related-party trade in US imports.

While my “Relational Contract” paper focuses on explaining the effect of foreign export supply shocks on firm-to-firm foreign trade relationships, my recent paper “[Global Sourcing and Domestic Production Networks](#)” (2018) with Furusawa, Inui, Ito, and I exploit the unique buyer-seller linked data from Japan to directly assess how firms’ offshoring affects a country’s domestic production networks. The paper develops a model in which heterogeneous firms source inputs from multiple industries located in different domestic regions and foreign countries. Input sourcing entails communication with suppliers, which is endogenously increasing in the differentiation of inputs. The model predicts that firms are less likely to source differentiated inputs, especially from distant domestic and foreign suppliers, due to costly communication. Triggered by foreign export supply shocks, firms start offshoring inputs from foreign suppliers, which displace the less productive domestic suppliers in the same industry (the direct displacement effect). The resulting decline in marginal costs induces firms to start sourcing from the more productive and distant domestic suppliers within industries (the within-industry restructuring effect), but possibly also from nearby suppliers that produce inputs that are more differentiated than those supplied by existing suppliers (the industry composition effect). The net effect of offshoring on a firm's domestic production networks depends on the relative strength of the three effects, which we verify using data for 4.5 million buyer-seller links in Japan. Based on a firm-level instrument, we find that after offshoring, firms tend to add nearby suppliers producing differentiated inputs, which potentially increase the spatial concentration of domestic production in Japan.

Beyond studying the micro-foundation of global value chains, in “[Production Networks, Trade and Misallocation](#)” (2018), Krishna and I estimate the aggregate TFP loss due to policy-distorted allocation of resources across firms in the presence of intermediate input trade. Different from most

existing work on misallocation, we pay close attention to both allocative efficiency between sectors and amplification through industry input-output (IO) linkages. We extend the model of Hsieh and Klenow (2009) to study firms' decisions to source inputs both domestically and globally from multiple industries. Using Chinese and Indian establishment-level data over the period of 2000-2007, we find that despite large amplification through IO linkages, the estimated aggregate TFP losses due to resource misallocation is smaller than the value-added approach adopted by Hsieh and Klenow. This surprising result is due to the fact that the estimated sectoral TFP losses are on average half of the size of the estimates based on the value-added approach, as for both countries, distortions on input sourcing appear to be much smaller than those on labor and capital. We also show that trade liberalization, by raising the input-output multiplier for a country, can increase the macroeconomic costs of resource misallocation in the second-best world.

While my research on global value chains emphasizes the merits of the micro approach, I have conducted research linking it to the conventional macro approach. In "[Domestic Segment of Global Supply Chains in China under State Capitalism](#)" (2018) Wang, Wang and I develop a method to estimate an extended input-output (IO) table that tracks inter-sector transactions between different types of firms in a domestic economy. The method is an application of constrained optimization, which relies on basic information from a country's national IO table, as well as sector- and firm-level data. We also discuss how to construct bootstrapped standard errors for such extended IO tables. We then apply the extended IO table to study the evolution of the domestic segment of global value chains in China. We find not only that state-owned enterprises' (SOE) domestic value-added to gross exports ratio (DVA) is much higher than those of other firms, its DVA ratio has also increased significantly in recent years. Our findings suggest that SOE still play an important role in shaping China's exports after years of privatization.

Internationalization Strategies of Firms in Emerging Markets

The second theme of my research is about how firms in emerging markets penetrate into foreign markets. In this area, I have written papers to empirically identify the importance of learning to export; to examine how firms exploit their own competitive advantage by either specializing in their core products or engaging in outward direct investment; and to study the role of trade intermediaries in facilitating exports when consumers are concerned about product quality.

In "[Learning to Export from Neighbors](#)" (*Journal of International Economics*, 2014), Fernandes and I study whether new exporters learn from neighboring firms about export opportunities in new markets. We develop a statistical decision model in which a firm updates its prior belief about demand in a foreign market based on several factors, including the number of neighbors currently selling there, the level and heterogeneity of their export sales, and the firm's own prior knowledge about the market. A positive signal about demand inferred from neighbors' export performance raises the firm's probability of

entry and initial sales in the market but, conditional on survival, lowers its post-entry growth. These learning effects are stronger when there are more neighbors to learn from or when the firm is less familiar with the market. We find supporting evidence for the main predictions of the model from transaction-level data for all Chinese exporters. In ongoing research “Learning from Neighbors about Export Opportunities”, Kasahara and I (2018) build a dynamic model of learning and structurally estimate the option value of waiting and quantify the value of information provided by neighboring firms.

Another paper in this research theme is my 2014 *Journal of International Economics* paper with Ma and Zhang “[Factor Intensity, product switching, and productivity: Evidence from Chinese exporters](#)”. The paper analyzes how a firm's specialization in its core products after exporting affects its factor intensity and productivity. Using Chinese manufacturing firm data for the period of 1998–2007, we find that firms become less capital-intensive but more productive after exporting, compared to non-exporters that share similar ex ante characteristics. To rationalize these findings that contrast with the existing literature, we develop a model to consider firms producing multiple products with varying capital intensity. The model predicts that when a firm in a labor-abundant country starts exporting, it specializes in its core competencies by allocating more resources to produce labor-intensive products. We find in detailed customs data that Chinese new exporters add products that are less capital-intensive than their existing products and drop those that are more capital-intensive in subsequent years. Consistent with the model's predictions, we find that ex ante more productive firms experience a smaller drop in capital intensity after exporting, while firms that churn products in the direction to increase labor intensity enjoy a larger (measured) total factor productivity gain after exporting.

In “[Quality Differentiation and Trade Intermediation](#)” (*Journal of International Economics* R&R, 2017), Zhang and I study both theoretically and empirically whether intermediaries alleviate the quality problem in international trade. We develop a heterogeneous-firm model that features vertical and horizontal differentiation of products, a coexistence of direct exporting and indirect exporting through intermediaries, and firms' investment in marketing. When complete contracts are not available, intermediaries underinvest in marketing from the perspective of the producer. For products that are more horizontally differentiated, weaker competition permits even the low-quality firms to export, but via intermediaries. These two mechanisms yield a negative (positive) cross-product relation between vertical (horizontal) differentiation and the prevalence of trade intermediation. Intermediation is more prevalent in the more (both physically and culturally) distant destinations, especially for the more differentiated (vertically and horizontally) products. We find supporting evidence using Chinese product-level data.

In ongoing work “[Fast Fashion: Theory and Evidence from Portuguese Textile and Clothing Firms](#)” (2016), Fernandes and I use exceptionally rich data on Portuguese firms to study how import competition from China, both at home and in third markets, induces firms in high-wage economies to

exploit their competitive advantage in fast trade and quality production. For identification, we exploit the exogenous increase in competition at the fine product level following the removal of Multi-Fibre Arrangement quotas on Chinese textile and clothing (T&C) exports in 2005. We find no evidence of changes in employment, wages, value added, output, for sales among the Portuguese T&C firms despite the sharp increase in competition, contrary to existing evidence from many developed countries. We find that firms respond to the China shock by upgrading quality and increasing the frequency of exports, especially to nearby destination countries. We rationalize these findings by a simple heterogeneous-firm model that features endogenous quality choices and time-sensitive demand.

In a series of perhaps more policy-oriented research papers (Chen and Tang 2014, forthcoming; Dollar, Chen, and Tang, 2015), I use unique project-level data on outward direct investment (ODI) by Chinese firms to portray the increasing and controversial China's overseas investments. In "[Why is China Investing in Africa: Evidence from the Firm Level](#)" (*World Bank Economic Review*, forthcoming), Chen, Dollar and I focus on Chinese investment in Africa. We find that China's attraction to resource-rich countries is no different from Western investment. China's ODI is uncorrelated with a measure of property rights and rule of law, whereas Western investment favors the better governance environments. Contrary to common perceptions, there are few projects in natural resource sectors. Most projects are in services, with a significant number in manufacturing as well. In the country-sector-level regressions based on firms' transaction-level data, we find that Chinese ODI is profit-driven, just like investors from other countries. In particular, our regressions show that Chinese ODI is relatively more concentrated in skill-intensive sectors in skill-abundant countries, but in capital-intensive sectors in capital-scarce countries.

Domestic Institutions, Politics, and Globalization

My third research theme offers insights to the understanding of the relations between nations' domestic institutions, politics, trade, and foreign investment. I have written papers about how a country's labor market institutions shape its comparative advantage, how foreign direct investment transfers culture across border, and how countries' political affinity affects their trade patterns.

In "[Labor Market Institutions, Firm-specific Skills, and Trade Patterns](#)" (*Journal of International Economics*, 2012), I study how a country's labor market institutions, by affecting workers' skill acquisition, can shape its export patterns. I develop an open-economy model in which workers undertake non-contractible activities to acquire firm-specific skills on the job. In the model, labor market protection raises workers' incentives to acquire firm-specific skills relative to general skills, turning labor laws into a source of comparative advantage. In particular, the model shows that countries with more protective labor laws export relatively more in firm-specific skill-intensive sectors at both the intensive and extensive

margins. By estimating sector-level gravity equations for 84 countries, I find evidence supporting the predicted effects of labor market institutions at both margins of exports.

In “[International Politics and Import Diversification](#)” (*Journal of Law and Economics*, 2013), Mityakov, Tsui and I examine how international politics affects trade in the absence of empires or wars. We first show that deterioration of relations between the United States and another country, measured by divergence in their United Nations General Assembly voting patterns, reduced U.S. imports from that country during 1962–2000. Though statistically significant, the magnitude of the effect of political distance on trade is small. Indeed, we show that except for petroleum and some chemical products, U.S. imports are not affected by international politics. American firms, however, diversify their oil imports significantly away from political opponents of the United States. In contrast to the usual claim that oil is a strategic commodity, we provide suggestive evidence that trade in products when rents are appropriable is more likely to be affected by international politics.

In “[Do Multinational Firms Transfer Culture? Evidence on Female Employment in China](#)” (2018), Zhang and I study the global diffusion of culture through multinationals, focusing on gender norms. Using data on manufacturing firms in China over 2004-2007, we find that foreign affiliates from countries with a more gender-equal culture tend to employ proportionally more women and appoint female managers. They also generate cultural spillovers, increasing domestic firms' female labor shares in the same industry or city. Based on a multi-sector model with firm heterogeneity in productivity, gender biases, and learning, we perform counterfactual exercises. Hypothetically eliminating firms' gender biases raises China's aggregate total factor productivity by 5%, of which spillovers from multinationals account for 19%.

Research Impact

As of February 2018, my research has received over 700 citations according to Google Scholar. My most cited two papers each has over 100 citations. My research has been quoted in flagship publications in policy institutions, such as IMF's *World Economic Outlook* 2015 and 2016, IMF's official magazine *Finance and Development*, testimonies before the U.S.-China Economic and Security Review Commission, and policy papers by Brookings Institutions and Peterson Institution for International Economics, respectively. It has also been featured in the press, including *Financial Times*, *Washington Post*, and *Foreign Policy*, among others.

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