

## Research Statement

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I am an economist interested in macroeconomic development and international trade. Broadly speaking, my research has addressed questions within two wide-ranging topics. First, how do technology and international trade interact to influence prices and sectoral outcomes across countries and over time, and what are the implications for cross-country income differences? Second, how does the dynamic interplay between trade policy, capital accumulation and demographics determine gains from trade and current account imbalances in the long-run? To tackle these questions, I combine economic theory with data and develop computational methods to provide quantitative answers.

**Structural Change and Economic Development** One of the longest standing questions in economics is: why are some countries so much richer than others? Modern differences in income per capita across countries primarily reflect divergence initiated after the industrial revolution. It has been well documented that, since then, structural change across broad sectors has systematically accompanied the process of economic development. As income per capita rises from low levels, economic activity shifts from agriculture into manufacturing and services. Eventually, as countries attain middle- and high-income status, manufacturing's share peaks, then declines, and service's share continues to rise. To what extent are these episodes of structural change shaped by international trade and technological change? The answer to this question is critical in the context of economic policy for all countries. For example, should policies in low-income countries aim to expand manufacturing, and if so, how should industrial policy be implemented? Is the seemingly inevitable decline of manufacturing in high-income countries a concern, and how should policy address it?

In "[Evolving Comparative Advantage, Structural Change, and the Composition of Trade](#)" I argue that international trade is an important dimension of structural change. Using South Korea's growth miracle from 1960 to 1995 as a laboratory, I find that rapid productivity growth in manufacturing generated an increase in manufacturing's share through increased net exports by improving international comparative advantage. I also find that access to international financial markets contributed to the rise in South Korea's manufacturing share. Initially, the take off in productivity was met with net inflows of capital that financed a trade deficit. Over time as South Korea's comparative advantage in manufacturing improved, rising employment and production in manufacturing generated a trade surplus to service the existing debt. Methodologically, it was the first paper to incorporate dynamics via endogenous trade imbalances into a

multicountry trade model. I did not analyze the post-1995 period when manufacturing's share declined. In my later work I explore the rise and subsequent decline (hump shape) of manufacturing's share.

In "[Evolving Comparative Advantage, Sectoral Linkages, and Structural Change](#)" (*Journal of Monetary Economics*, 2019) I study determinants of the hump shape in manufacturing's share for 41 countries. Specifically, I consider the role of cross-country differences in intermediate demand, an aspect that had largely been overlooked in the literature. Two empirical regularities stand out. First, low-income countries use intermediates less intensively than high-income countries in agricultural production. As a result, fast labor productivity growth in agriculture – a key driver of structural change – leads to a faster decline in agriculture's share in low-income countries, and consequent rise in manufacturing's share. Second, high-income countries use services more intensively than low-income countries in the production of services itself. Therefore, greater final demand for services induced by structural change amplifies the relative demand for labor in the service sector because of the indirect intermediate demand for services. Consequently mitigating manufacturing's share in high-income countries. The outcome of these two features contributes to the hump shape in manufacturing's share across levels of development. Over two-thirds of the hump shape can be accounted for by differences in input-output linkages across countries.

In "[Deindustrialization and Industry Polarization](#)" (revise & resubmit at *Econometrica*) we study why successive industrializers are increasingly likely to bypass manufacturing and shift directly from agriculture to services. In doing we examine the increased global dispersion in manufacturing shares over time. We find that global technological progress in manufacturing results in later industrializers facing lower relative prices of manufacturing than their predecessors, even at similar income levels, thereby engendering a greater share of resources allocated to the service sector. The influence of global technological change on any country's relative price is amplified by international trade, which simultaneously results in greater specialization and, ultimately, wider dispersion in manufacturing shares across countries. Therefore, the rise in global dispersion reflects a greater concentration of manufacturing production in fewer countries, facilitated by access to improved technology and declining trade costs. In turn, countries that industrialize in later years are less likely to attain high manufacturing shares in GDP.

In "[Structural Change and Global Trade](#)" (*Journal of the European Economic Association*, 2022) we explore the joint evolution of global trade flows and structural change, with a particular eye on how much the global shift from goods-producing activities to service-producing activities has impacted the volume of trade. We find that since 1970, structural change forces have held back global trade openness (the ratio of trade to GDP) by a magnitude that is roughly equal to the amount that declining trade costs have

boosted openness. The key reason is because, traditionally, growth in world trade was accounted for by growth in manufacturing trade. Over time, structural change induces expenditures to shift toward services, which are less traded than goods, engendering a headwind for global trade volumes. One implication is that integration of services trade may offer greater gains, particularly for high income countries.

Relative prices play a central role in shaping sectoral allocations in models of structural change, and it is well known that prices of nontradables relative to tradables increase with income per capita. At the same time, international trade plays a key role in shaping the relative prices, not only for tradable goods, but for nontradables goods. In "[Trade Barriers and the Relative Price of Tradables](#)" (*Journal of International Economics*, 2014) I argue that the presence of trade barriers results in a misallocation of resources whereby countries produce tradable goods for which they have a comparative disadvantage. Since low-income countries face larger trade barriers than high-income countries, the cross-country productivity gap in the tradable sector is amplified, proliferating the wage gap and resulting in a relatively higher price of nontradable services in rich countries. The presence of international trade limits the cross-country dispersion in the price of tradable goods.

One important application of this result is in the context of highly traded capital goods. Previously, the literature resorted to the fact that capital goods prices are uncorrelated with levels of development to infer that barriers to trade capital goods are not an important determinant of cross-country differences in income per capita. That inference emerges from the converse of the law of one price. In "[Price Equalization, Trade Flows, and Barriers to Trade](#)" (*European Economic Review*, 2014) we argue that the converse to the law of one price does not hold. That is, there are many of combinations of trade barriers that are consistent price equalization, each yielding a uniquely different volume of trade. Using data on bilateral flows in capital goods between 88 countries together with a multi-country trade model, we estimate sizable trade barriers and simultaneously generate capital-goods prices similar to those observed in the data. In "[Price Equalization Does Not Imply Free Trade](#)" (*St. Louis Fed Review*, 2015) we provide a theoretical grounding for this finding using a two-country analysis.

An important consequence of cross-country variation in relative prices is differences in incentives to accumulate capital. In "[Capital Goods Trade, Relative Prices, and Economic Development](#)" (*Review of Economic Dynamics*, 2019) we argue that barriers to trade capital goods can help reconcile the cross-country income gap through both total factor productivity (TFP) and capital-output ratios. We observe that production of capital goods is more concentrated in high-income countries compared to production of other tradable goods. In addition, capital goods are traded more intensively than consumption goods and

capital-goods production uses tradable intermediate inputs more intensively than consumption-goods production. Both of these features imply that reductions in trade barriers reduce the price of investment relative to consumption. As a result, lower trade barriers provide low-income countries with a more efficient means to accumulate capital and also enables them to specialize more in their comparative advantage, non-capital goods, thereby improving their TFP. We find that reducing trade barriers in the capital goods sector to US levels can reduce the cross-country income gap by up to 40 percent.

**Multicountry Trade Policy and Dynamics** Until very recently most of the international trade literature has analyzed trade between multiple countries using static models. The reason is because, with more than two or three countries, the dimensionality of the models become exponentially large which prohibits computation. In my work I have developed and refined computational methods to more easily compute the exact transitional dynamics and address a variety of questions.

In [“Capital Accumulation and Dynamic Gains from Trade”](#) (*Journal of International Economics*, 2019) we introduce capital accumulation and international borrowing and lending into a multicountry trade model. To do this we develop a gradient-free algorithm to compute the exact transitional dynamics, which can be implemented quickly on a basic laptop computer. We find that dynamics via capital amplify the gains from trade, relative to a static model, although there are costs along the transition as consumption must be sacrificed to accumulate capital. With unanticipated trade shocks, access to financial markets does not improve the gains. However, if the shocks are anticipated then the dynamic gains are magnified. Small countries frontload consumption and run trade surpluses in the long run to service accumulated debt, while large countries backload consumption and run deficits in the long run. In [“TFP, Capital Deepening, and Gains from Trade”](#) (*St. Louis Fed Review*, 2023) we consider a simplified version of that model by imposing balanced trade, period-by-period. This allows us to tractably decompose how the gains from trade are split between changes in capital stock and changes in TFP. In response to a decline in trade costs, capital accumulates gradually over the transition, and the change in TFP is realized in the first few periods. In turn, the dynamic gains from trade, which include the gradual adjustment, are only about 60% of the total change in welfare between steady states. In [“Trade Liberalization Versus Protectionism: Dynamic Welfare Asymmetries”](#) (under review, *European Economic Review*) we argue that, in contrast to static models of trade, the presence of a durable factor of production leads to dynamic gains from trade to differ from the dynamic losses from protectionism. Following protectionism, the economy can cost off of previously accumulated capital stock and therefore not realize significant losses in the short run.

One robust feature of modern globalization is that different stages of production have been increasingly fragmented across countries. In [“Trade Integration, Global Value Chains, and Capital Accumulation”](#) (*IMF Economic Review*, 2021) we explicitly analyze how the presence of global supply chains (GVCs) affect the dynamic gains from trade. One key observation is that upstream stages of production tend to be more capital intensive than downstream activities. This implies that countries with initially low capital-to-labor ratios will tend to specialize in downstream stages of production. In turn, countries that specialize in downstream stages production tend to have lower returns to investment and less capital accumulation. These results helps explain why GVC participation increases more rapidly in the faster growing countries, as they accumulate capital and take on a growing share of the upstream stages of production.

Incorporating dynamics into multicountry trade models also provides a basis to study current account imbalances. Traditionally, two separate strands of literature offer distinct perspectives on the determinants of imbalances. One is an international macro/finance perspective emphasizing intertemporal considerations—saving minus investment—where trade imbalances stem from frictions on cross-border financial transactions and investment returns. Much of this literature uses models with one good focusing on *net* trade flows and has been silent on the *gross* trade flows between countries by assuming frictionless intratemporal trade. The other is an international trade perspective emphasizing the pattern of trade between countries—exports minus imports—where comparative advantage and trade costs determine trade flows. With a few exceptions, multicountry trade models have been silent on aggregate dynamics. These different perspectives yield disparate implications for whether demographic-induced changes in saving end up in investment or net exports. In [“Demographics and the Evolution of Global Imbalances”](#) (*Journal of Monetary Economics*, 2022) I study how different age distributions across countries interact with international trade and cross-country lending to determine the world distribution of both bilateral and aggregate trade imbalances. I find that a one-percent increase in a country’s mean age increases its current account by 0.4 percent of GDP. In addition, the cross-country incidence of a change in one countries international lending is determined by its bilateral trade costs. As such, the nature of gross bilateral trade patterns is highly informative for the patterns of saving and capital flows across countries.

Most of my prior research on international trade takes countries as the unit of observation. However, within the US, states differ across several dimensions including geography, productivity and endowments, yet face common external tariffs due to being part of a customs union. Each of these distinct attributes generate winners and losers in response to common tariff changes. In [“What Determines State Heterogeneity in Response to US Tariff Changes?”](#) (under review, *International Economic Review*) we find that protection favors sectors in which the United States has comparative disadvantage vis-à-vis

foreign countries, and states that have comparative advantage vis-à-vis other states in these sectors reap most of those gains. When the union benefits as a whole from moderate tariff increases through positive terms of trade effects, cross-state transfers can be used to align state preferences over policy changes. Since the United States is also a fiscal union, in principle such transfers are feasible, and our findings provide a basis for incorporating cross-state transfers as a part of trade policy proposals.

### **Work in Progress**

In terms of structural change, I am working on a project that examines why countries in Sub-Saharan Africa have underperformed other countries that had similar income levels as of 1990. With grant funding from the Structural Transformation and Economic Growth initiative, we explore data on sectoral factor usage across countries to identify potential distortions affecting aggregate investment and growth.

In terms of trade policy and dynamics, I am exploring the implications of recent protectionist trends in trade policy. Specifically, I am working on a paper that quantitatively explores whether the magnitudes of losses from an increase in trade costs is equal to the gains from a symmetric decrease in trade costs. The answer from workhorse static models of trade is yes. However, our preliminary results show that in a dynamic setting with a durable, depreciating factor of production, the answer is no. The gains from liberalization exceed the losses from protectionism. Regions grow relatively fast following liberalization, and decay relatively slowly following protectionism.

### **Future Research Plans**

In terms of economic development, I am working on incorporating uncertainty into dynamic, multicountry models of trade. Currently, computational limitations prohibit such types of analyses. Yet, there remain important issues that require incorporating uncertainty. One issue is thinking about uncertainty in the context of global supply chains, both in terms of uncertainty in trade policy and in productivity along nodes in the supply chain. Another important issue relates to modelling stochastic returns to incorporate bilateral trade in financial assets across countries, which is critical to identifying financial distortions and to what extent they hinder economic growth and development.

Along the lines of trade policy, I am working on quantitatively characterizing optimal tariffs for customs unions. Existing quantitative literature focuses on sectoral heterogeneity within a country and abstracts

from spatial heterogeneity across member states within a customs union. The different aspects of heterogeneity may require different forms of subsidies or transfer in conjunction with tariffs.

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15. Sposi, M., Zhang, J. "Cross-Country Differences in Sectoral Output, Employment, and Income"