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My research studies economic growth and inequality (either across or within countries) and how openness to trade factors into the equation. More specifically, my research has focused on answering three questions: (i) how elastic are trade/productivity/welfare with respect to changes in openness (ii) what are the distributional effects (within a country) of international trade and (iii) what are the aggregate consequences of agriculture and the rural/urban divide for economic development. In answering these questions, I use theory and data to provide quantitative answers to these questions.

Post tenure, my research agenda on the distributional effects of trade is new and hence, I discuss this agenda first. I then describe the themes behind my pre-tenure research and highlight new work in these areas.

Quantifying the Distributional Consequences of Trade and Policy Responses. What are the distributional impacts of trade? And what can policy do to alleviate the negative consequences of trade? Recent evidence suggests that trade has had important distributional effects on the labor market. From a welfare perspective, however, labor market outcomes may not reflect how economic welfare is allocated across those who are differentially impacted by trade. My work (much of it in collaboration with Spencer Lyon) tries to (i) measure the distributional impacts that trade has had on welfare and (ii) suggest policies that can improve outcomes relative to the status quo.

There are two ways to measure the distributional impacts trade has had on welfare. The first approach uses a model—disciplined by data—to infer welfare. The second approach is to directly use data (e.g., consumption) which would correlate with welfare.

Lyon and I employ the first approach in [“Quantifying the Losses from Trade”](#). In this paper we develop a framework to study trade and its distributional effects and ask: Did trade with China harm the US economy in the 2000s? The framework is a model of Ricardian trade and frictional labor markets but makes a significant advance relative to previous work as it is a stochastic environment where insurance markets are incomplete. In contrast to essentially all models of trade and labor market dynamics, this advance allows for the partial—but not complete—pass through of income shocks into consumption. This provides a middle ground between a situation where the gains and losses from trade are shared equally and where households have no opportunities to adjust. Moreover, our framework provides a structural interpretation behind the research design and quasi-experimental evidence of Autor, Dorn, and Hanson (2013) and we use their evidence on regional labor market outcomes as disciplining device.

Surprising results abound. Despite being consistent with evidence suggesting trade with China harmed the US economy, we find that rising trade exposure induces a boom: an increase in GDP and employment, a modest increase in consumption, and an improving trade deficit. While some labor markets experience large losses in labor income; in welfare terms, very few lose as many are able to smooth out the shock. The reason is simple: the “China Shock” was not a shock, but a drawn out process for which households

have time to adjust and mitigate the negative consequences. And the surprising aggregate effects arise from the change in behavior at the micro-level as households adjust to the shock.

In “[The Consumption Response to Trade Shocks: Evidence from the US-China Trade War](#)”, I employ a direct approach to study how welfare is allocated across those who are differentially impacted by trade. I study the response of consumption to trade shocks by exploiting changes in US and Chinese trade policy between 2017 and 2018. The analysis uses a data set with the universe of new auto sales at the US county level, at a monthly frequency, and a simple difference-in-difference approach to measure the effect of changes in trade policy on county-level consumption. As a lower bound, I estimated that counties in the upper quartile of the retaliatory-tariff distribution experienced a 3.8 percentage point decline in consumption growth and that this decline corresponds with between 1 and 1.5 percentage point decline in employment growth. This paper makes two important contributions: This paper is the first to directly measure the labor-market-induced consumption effects of trade. Second, it provides a unique perspective on *the* macroeconomic event over the past four years—the US-China trade war.

Is there anything policy can do to improve outcomes? Do we just have to accept the fact that the benefits and costs of trade will be spread unequally? In “[Redistributing the Gains From Trade Through Progressive Taxation](#)” (Journal of International Economics, 2019) Lyon and I show that the government does have effective tools to address these concerns. Lyon and I propose and evaluate the idea that increasing the progressivity of the tax system as an economy becomes more open to trade would improve outcomes. This is not as obvious as the government faces a trade-off between providing social insurance (i.e., transfer resources from the winners from trade to the losers) versus incentivizing workers to move, reallocate, and reap the productivity gains from reallocation. Using the framework that we developed in Lyon and Waugh (2019), we find that the optimal level of progressivity should increase with exposure to trade. In contrast, a tariff is never welfare improving and that the optimal policy mix is a zero tariff and a more progressive tax system as the economy becomes more exposed to trade.

Quantitative Implications of Trade. This research originated in my dissertation and the paper “[International Trade and Income Differences](#)” (American Economic Review, 2010). The motivating question was: What are the consequences of trade frictions for the distribution of output per worker across countries? Using both trade and price data in a standard trade model, I showed that the trade frictions between rich and poor countries must be systematically asymmetric, with poor countries facing higher costs to export relative to rich countries. This result distinguishes itself because asymmetries had been ignored/undisciplinable, and it’s the new price implications of the model that I brought into the analysis which pins down this result. These asymmetries matter; removing them in the model (while keeping geography in place) reduced cross-country income inequality by nearly a third.

In “[Measuring Openness to Trade](#)” (Journal of Economic Dynamics and Control), Ravikumar and I take an alternative approach to measuring how open or not a county is to trade. Within a wide class of trade models, we show how one can infer—from trade and output data alone—how close a country is to being

completely open. This provides a novel benchmark relative to standard measures of openness which are comparisons between a country's observed status and a closed economy benchmark.

A key issue in these papers—and in any quantitative model of trade—is how elastic trade is with respect to changes in trade frictions. The parameter controlling this elasticity is *the* critical input to quantifying the welfare and productivity consequences of trade. In “[The Elasticity of Trade: Estimates and Evidence](#)” (Journal of International Economics, 2014) Ina Simonovska and I developed new methods to measure this elasticity using trade and micro-level price data. Fifteen years ago, Anderson and Van Wincoop (2004) summarized the existing evidence and found the trade elasticity was “likely between five and ten”—a wide range for such an important parameter. Today, our work has improved the measurement of this elasticity. And this was recognized by the profession. In December of 2015, we received the [The Bhagwati Award](#) which the JIE Editorial Board selected as the best article published in the JIE during 2013 and 2014.

Simonovska and I continue to work on related issues in “[Trade Models, Trade Elasticities, and the Gains from Trade](#),” (R&R at The Journal of Political Economy) This work is ambitious and time-consuming in that it shows how model specification matters for estimating trade elasticities. In particular, we have undertaken an effort to address common criticisms of our approach by expanding the types of data used to estimate trade elasticities including: new and updated cross-county micro-level prices, and bilateral measures of tariffs and non-tariff barriers.

In “[Equilibrium Technology Diffusion, Trade, and Growth](#)” (Resubmitted to the American Economic Review) with Jesse Perla and Chris Tonetti, we explore the growth consequences of opening to trade in a model of idea flows. In this model, a firm's dynamic decision to adopt a new technology boils down to a comparison of the profits from continuing to operate its old technology versus the expected profits of adopting a new technology; and the larger this gap, the sooner a firm will adopt. Opening to trade increases this profit gap because import competition erodes the operating profits of the worst performing firms. This, in turn, incentivises the worst performing firms to adopt new technologies/ideas and, thus, speed economic growth. An important aspect of this result is its empirical content—it provides a rationalization for the large body of empirical evidence that finds import competition results in within-firm productivity growth or gains in X-efficiency.

Another important aspect of this paper is the quantitative analysis which makes two contributions to the literature. First, we extended our model to include firm-specific productivity shocks to incumbents and exit. Thus, the dynamics of the firm are now driven by two forces: an exogenous stochastic component and the endogenous component that works through the adoption process. This modeling enrichment allows us to calibrate the model to match moments regarding micro-level firm dynamics and, in turn, provide quantitative discipline on the results. Second, our main quantitative exercise focuses on transition paths—not across steady states as in our theoretical analysis. This is an important detail as (i) it presented many technical challenges to implement (for which our solutions were turned into public

goods and [publicly posted](#)) and (ii) we find that from a welfare perspective, the gains from trade are large and the transition path amplifies them.

[“International Trade and Intertemporal Substitution”](#) (Journal of International Economics, 2019) with Fernando Leibovici, models the dynamic, time-intensive nature of international trade and we show that the variation in the rate at which agents are willing to substitute across time changes one’s inference about how trade will respond to changes in output and prices. Moreover, this economic mechanism exactly resembles the time-varying residuals or “wedges” emphasized in accounts of the collapse of trade during the 2008-2009 recession. When we discipline the variation in the intertemporal marginal rate of substitution using U.S. asset price data, we find that our model quantitatively accounts for properties of U.S. cyclical import fluctuations where traditional static models of trade fail.

Related to the question of dynamics is the role of information (or lack thereof). Conventional wisdom suggests that information frictions impede trade, yet the literature lacks little theoretical evidence on the role information frictions in general equilibrium. [“Can Global Uncertainty Promote International Trade?”](#) with Issac Baley and Laura Veldkamp, studies information frictions in a simple Armington model of trade in which countries receive noisy signals about each others endowment. Surprisingly, the conventional wisdom does not hold up; the more severe the information frictions are, countries trade *more*. Despite the many subtleties behind the result, the story is simple: Higher uncertainty increases trade because agents receive improved terms of trade, particularly in states of nature in which consumption is most valuable. Trade creates value, in part, by offering a mechanism for risk sharing, and risk sharing is most effective when both parties are uninformed.

The Macroeconomics of Agriculture Productivity. Any attempt to understand why some countries are rich and others poor is incomplete without a discussion of agriculture. In collaboration with David Lagakos, we’ve contributed to this discussion by focusing on both measurement and theory. In [“The Agricultural Productivity Gap”](#) (The Quarterly Journal of Economics, 2014) with David and Doug Gollin, we compiled new, cross-country micro evidence to better measure the gap between value added per worker in agriculture relative to non-agriculture (which is evidence of the misallocation of labor across sectors). This gap matters because there are very large cross-country productivity differences in agriculture and, thus, the reallocation of workers out of agriculture in developing countries can yield huge productivity gains. [“Agricultural Productivity Differences Across Countries”](#) (American Economic Review P&P, 2014) provides evidence from micro-level data that these cross-country productivity differences are real.

In [“Selection, Agriculture, and Cross-Country Productivity Differences”](#) (American Economic Review, 2013) Lagakos and I provide an explanation for these productivity gaps across sectors and across countries. The idea is selection; subsistence food requirements induce workers that are relatively unproductive at agricultural work to nonetheless select into the agriculture sector in poor countries. This mechanism can reconcile why cross-country productivity differences in agriculture are much larger than in aggregate *and* why value added per worker across sectors may not be equalized. Subsequent research by Young (2013)

found strong evidence that selection is at work in his study urban-rural inequality; Hicks, Kleemans, Li, and Miguel (2017) provide evidence that selection is *the* driver of sectoral productivity gaps.¹

Lagakos and I continue to work on related questions. The key outstanding question regards the relative importance of various mechanisms behind these agriculture/non-agriculture or rural/urban wage gaps and the limited mobility of people across sectors/regions seen in poor countries. This question is important because understanding which mechanisms are more important is critical to understand the role that policy can (or can not play) in facilitating an economy's structural transformation.

In "[The Welfare Effects of Encouraging Rural-Urban Migration](#)" (Resubmitted to *Econometrica*) (along with Mushfiq Mobarak) we attempt to evaluate the relative importance of various mechanisms by taking an innovative approach: we combine experimental and survey evidence with a structural model to measure the welfare of migrants. In particular, we build off of Mobarak's earlier work in Bangladesh (Bryan, Chowdhury, and Mobarak (2014)) which provided monetary incentives for workers to seasonally migrate. Mobarak found significant increases in migration rates and consumption for induced migrants. While the evidence is clear, the experiment left open questions: Why did households migrate? Where did the gains in consumption come from? If migrations was so beneficial, why did these households not migrate in the first place?

We fill in these holes by combining Mobarak's evidence with a dynamic, incomplete-markets model of migration in which heterogeneous agents face seasonal income fluctuations, stochastic income shocks, and disutility of migration that depends on past migration experience. Endowing the model with multiple, competing mechanisms (selection, credit constraints, spatial amenity differences) means that the model is flexible and, thus, the experimental data has the opportunity to push the model to say one mechanism is more important than the other. Moreover, an explicit model allows us to quantitatively evaluate the importance of general equilibrium effects, welfare, and normative policy prescriptions.

Two features of the data and model drive the model's welfare predictions: first, induced migrants tend to be negatively selected on income and assets; second, the model's non-monetary disutility of migration is substantial (which we validate using newly collected survey data). These predictions are surprising because they run counter to the conventional interpretation of the Mobarak's experiment. The conventional story is that rural households want to move, but can't (this could arise from a poverty trap scenario where moving costs and credit frictions interact as a barrier to prosperity). In contrast, the results show that rural households don't want to move, but do so out of desperation. In other words, migration is not desirable activity (the non-monetary disutility of the urban area), but those that do it face desperate circumstances (negative selection on income and assets). This interpretation then tells

¹More broadly, this paper has influenced a growing group of papers focusing on the aggregate, quantitative effects of labor market selection. In addition to Young (2013), Young (2014) uses this idea as an alternative explanation for Baumol's Cost Disease; Hsieh, Hurst, Jones, and Klenow (2019) study selection's contribution to US aggregate growth; Burstein, Morales, and Vogel (2019) use similar ideas to measure changes in between-group inequality. Galle, Rodriguez-Clare, and Yi (2017) introduce the labor market selection channel into a multi-country Ricardian model of international trade to study the aggregate and distributional effects from trade.

us *why* there are welfare gains from the BCM intervention—because it allocates resources to those who need it the most.

Summary. What are the distributional impacts of trade? How elastic are trade/productivity/ welfare with respect to changes in openness? What are the aggregate consequences of agriculture for economic development? At the heart of these questions are common themes—is the allocation of goods or factors across space (e.g. countries or sectors/regions) efficient, what are the frictions preventing reallocation, and how large are the welfare gains from reallocation? And much of this work starts from careful measurement and the theoretical perspective that comparative advantage (in either goods or labor markets) drives the allocations of resources across space.

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