# Research Statement and Main Contributions

I am an applied international trade economist who firmly believes in theoretically-founded empirical work. I enjoy developing structural methods to address specific policy-relevant questions and I find it very rewarding to translate rigorous academic research to wider audiences, e.g. students and policy makers. My main research interests and contributions are in two interrelated areas: (i) structural gravity modeling and applications; and (ii) gravity estimation and measurement, decomposition and aggregation of partial and general equilibrium (GE) trade costs. In addition, I have ventured into several other trade-related topics (described below) that I find intellectually stimulating.

## 1. Structural Gravity: Modeling and Applications

My main research efforts thus far aim to develop structural methods that can be used to translate trade policy changes and shocks to trade costs into changes in various economic outcomes at the national and at the sectoral level. On that front, I have learned from and have contributed to the influential and successful structural gravity literature.[1] Anderson and Yotov (2010) has been an instrumental paper for my development as a researcher for the following reasons: First, the significant investment in this paper enhanced my understanding of the structural channels through which changes in trade costs translate into economic effects and my appreciation of the gravity theory of trade. Second, the fact that the paper was received well by the academic profession was very stimulating for me as a young researcher. Finally, the three main contributions of Anderson and Yotov (2010) set the stage for several of my future research efforts.

- First, Anderson and Yotov (2010) propose consistent methods to decompose the incidence of trade costs (partial and general equilibrium) on consumers and producers in the world trade system. The realization that the multilateral resistances (MRs) are vehicles that consistently aggregate the universe of bilateral trade costs and decompose them into just two structural indexes (per country) stimulated a series of subsequent papers. Anderson and Yotov (2016) explore these properties of the MRs to develop operational *Global Efficiency* and *Terms of Trade* (ToT) measures that change in response to trade liberalization. Baier, Yotov and Zylkin (2016) employ a version of the ToT index of Anderson and Yotov (2016) to test and offer support for the influential 'market power' and 'bilateral opportunism' theories of Bagwell and Staiger (1999) and Bagwell and Staiger (2004), respectively. Anderson, Larch and Yotov (2015*a*) capitalize on the MR properties, in combination with the additive property of the PPML estimator (c.f. Arvis and Shepherd (2013) and Fally (2015)) to develop computational procedures for general equilibrium trade policy analysis that can be performed with built-in commands directly in Stata, thus complementing the popular 'exact hat algebra' methods of Dekle, Eaton and Kortum (2007, 2008). Finally, I have used the

[1] Pioneered by Anderson (1979) and popularized by the seminal contributions of Eaton and Kortum (2002) and Anderson and van Wincoop (2003), the structural gravity system obtains from a series of microeconomic foundations, c.f. Arkolakis, Costinot and Rodrguez-Clare (2012). Owing to solid theoretical grounds and remarkable predictive power, the gravity model is the workhorse in the empirical trade literature. Anderson (2011), Head and Mayer (2014), and Costinot and Rodrguez-Clare (2014) offer excellent surveys of the literature.

multilateral resistances to 'nest' the structural gravity model into a series of superstructures in order to study the relationships between trade and various economic and political outcomes. I elaborate on some of these projects later on in this document.

- Second, Anderson and Yotov (2010) introduce the *Constructed Home Bias* index, as the ratio of predicted to hypothetical frictionless internal trade within a given country. Intuitively, CHB is a comprehensive (i.e. including partial and GE effects) trade cost measure of how far the economy is from a frictionless trade equilibrium. As such, CHB is a complementary index to the popular sufficient welfare statistic of Arkolakis, Costinot and Rodrguez-Clare (2012). In subsequent work, Anderson, Milot and Yotov (2014) introduce the complementary *Constructed Domestic Bias* and *Constructed Foreign Bias* indexes, while Agnosteva, Anderson and Yotov (2014) propose the *Constructed Trade Bias* index as a generalization of the family of trade bias indexes. Theory allows for consistent aggregation and decomposition of the trade bias indexes into various components. Furthermore, these indexes are straightforward to construct using estimation or calibration techniques. These properties have made them attractive for policymaking purposes to governments (e.g. Canada) and to international organizations (e.g. WTO).

- The third contribution of Anderson and Yotov (2010) is related to its focus on *intra-national* trade costs. Traditionally, the trade literature has treated countries as point masses and intra-national trade barriers have been measured (estimated or calibrated) with a *uniform* effect relative to international trade costs. Consistent with structural gravity theory, Anderson and Yotov (2010) allow for heterogeneous (region-specific) internal trade costs and study the implications of Canada's Agreement on Internal Trade. Anderson and Yotov (2012) apply the idea to a cross-country dataset and obtain country-specific estimates of internal trade costs, which, as expected, vary significantly across countries. Building on this agenda, Agnosteva, Anderson and Yotov (2014) propose methods to simultaneously identify intra-regional, inter-regional and international trade costs within the structural gravity model. It is rewarding to see that the idea of proper measurement and implications of heterogeneous intra-national trade cost has found support in the literature, as captured by a series of prominent papers, e.g. Atkin and Donaldson (2015), Ramondo, Rodrguez-Clare and Saboro-Rodrguez (2016), Cosar and Demir (2016) and Cosar and Fajgelbaum (2016), which study the issue from different perspectives. My appreciation of the importance of intra-national trade costs has lead to contributions to the empirical gravity literature, which I summarize below.

The improved understanding of the structural links within the gravity system allowed me to expand the gravity framework in various directions, thus gaining new knowledge about topics of interest to me while capitalizing on my earlier investments in gravity modeling. Baier, Yotov and Shikher (2017) is a recent example. This paper incorporates and builds on the contributions of Eaton and Kortum (2002), Costinot, Donaldson and Komunjer (2012), and Caliendo and Parro (2015) in order to develop a multi-sector general equilibrium model with intermediate goods and *heterogeneous workers*. Our framework has already generated significant interest among policy makers in light of recent political events (e.g. Brexit and the election of Donald Trump as President of the United States) due to its ability to capture the differential impact of trade and globalization on different groups of workers.

Head and Mayer (2014) point to the fact that, despite numerous theoretical foundations, an important deficiency of the existing gravity models is that they are static. "This raises the econometric problem of how to handle the evolution of trade over time in response to changes in trade costs." (Head and Mayer, 2014, p. 189). Developing a dynamic gravity framework has been an important item on my research agenda. The following papers, which have been influenced by the work of Jonathan Eaton and Samuel Kortum (see Eaton and Kortum, 2001, 2002, 2005) and complement more recent related efforts, e.g. Eaton et al. (2016), are representative efforts in this direction.

- Olivero and Yotov (2012) propose theoretical foundations for a dynamic gravity model, where dynamics arises via country-specific asset accumulation. The primary objective of the paper is to provide guidance for gravity-type estimations with panel data. In addition, Olivero and Yotov (2012) offer a simple (two-country) calibration of the model and a simulation exercise that demonstrates the importance of allowing for dynamic forces in gravity models.

- Anderson, Larch and Yotov (2015*b*) combine a standard N-country gravity model with a capital accumulation model *a la* Lucas and Prescott (1971). Theory delivers a tractable structural system that captures the relationships between trade and growth. The theoretical model translates into an econometric system that is used to obtain all key structural parameters and to establish causal relationships between trade liberalization and income, thus offering a structural foundation for the seminal work of Frankel and Romer (1999), as well as between trade liberalization and growth. Counterfactual experiments suggest that the static gains from trade are magnified by a *dynamic path multiplier* of around 1.6.

- Anderson, Larch and Yotov (2016) extend the dynamic gravity framework of Anderson, Larch and Yotov (2015*b*) to accommodate foreign direct investment (FDI). The non-rival nature of technology capital, which is used for foreign investment, preserves tractability while unveiling new dynamic links between trade, growth (via domestic capital accumulation) and FDI. A potentially important byproduct of this work, especially in light of the fact that a new comprehensive panel bilateral FDI dataset was recently released by UNCTAD, is that theory delivers a structural FDI-gravity system that closely resembles the well-known gravity system of trade.

- Finally, and most recently, Anderson and Yotov (2017) propose a theory that improves the static gravity model to accommodate *bilateral* dynamics. *"Short Run Gravity"* is a geometric weighted average of the familiar gravity model, [**Long Run Gravity** $(\cdot)$], and a bilateral capacity variable, $\lambda(\mathbf{i},\mathbf{z})$, for shipments from origin $i$ to destination $z$:

$$[\textbf{Long Run Gravity}(\mathbf{i},\mathbf{z})]^{\rho}\,\lambda(\mathbf{i},\mathbf{z})^{\mathbf{1}-\rho},$$

  where the weight $\rho$ is a combination of the elasticity of substitution in demand and the elasticity of supply. The short run gravity theory offers solutions to some major empirical puzzles in the international trade literature including "the distance puzzle in trade", c.f. Disdier and Head (2008), "the missing globalization puzzle", c.f. Coe et al. (2002), and "the international elasticity puzzle", c.f. Ruhl (2008). A series of empirical applications and tests offer robust support for the short run gravity theory.

## 2. Gravity Estimation & Measuring Trade Frictions

Proper measurement of trade frictions is crucial for reliable analysis of the impact of international trade and trade policy on welfare and all other economic outcomes of interest to academics and policy makers. Consistent with my strong belief in theory-founded empirical work, my goals on this front have been to develop methods and applications for improved estimation[2] of trade costs within the structural gravity framework. I have written a series of papers concerned with the estimation of international trade costs, however, I view the agenda to promote and emphasize the importance of *intra-national/domestic* trade costs as my main contribution in this area. The inclusion of intra-national trade data[3] and proper treatment of intra-national trade costs in structural gravity estimations is desirable for several reasons.

- First, it allows for identification of (region-specific) intra-national trade frictions, which is consistent with gravity theory where consumers choose among domestic as well as foreign varieties. Using a detailed trade, production and expenditure dataset, Agnosteva, Anderson and Yotov (2014) demonstrate that trade frictions vary widely within and between Canada's provinces, even after controlling for geography.

- Second, it leads to improved estimation of the effects of bilateral trade policies. The intuition is that the inclusion of intra-national trade flows in gravity estimations allows for estimation of the trade diversion impact of trade liberalization from domestic sales. Consistent with this story, Dai, Yotov and Zylkin (2014) demonstrate that the estimates of the effects of free trade agreements are significantly larger when intra-national trade flows are taken into account.

- Third, it allows for identification of the effects of non-discriminatory trade policies. Heid, Larch and Yotov (2015) demonstrate that, in the presence of intra-national trade flows, one can directly identify the impact of MFN tariffs as well as country-specific export promotion policies (e.g. export subsidies) within the same, theory-consistent structural gravity model, and in the presence of the full set of importer-time and exporter-time fixed effects that control for the unobservable multilateral resistances.

- Fourth, it leads to a simple solution to "the distance puzzle" in trade, i.e. the constancy of the estimates of the effects of distance over time in gravity estimations, c.f. Disdier and Head (2008). Using intra-national trade flows, Yotov (2012) and Borchert and Yotov (2017) offer robust evidence that when the effects of international distance on international trade are measured relative to the effects of distance on internal trade, the famous distance puzzle disappears.

- Finally, more broadly, the use of intra-national trade data addresses the critique from Coe et al. (2002) that globalization is everywhere but in structural gravity estimations. Bergstrand, Larch and Yotov (2015) estimate that international borders to manufacturing trade have fallen by more than 25 percent during the period 1990-2002.

[2]The two standard methods to measure trade frictions are calibration and estimation. While recognizing the advantages of calibration, I prefer estimating trade costs. In the spirit of Anderson, Larch and Yotov (2015*a*), who construct "estibrated" trade frictions, I believe that there is significant scope and potential benefits from reconciling the calibration and estimation methods and I plan on pursuing this agenda.

[3]Intra-national trade flows are constructed either as apparent consumption, i.e. as the difference between gross production and total exports, or by taking the full input-output economy structure into account.

In addition to focusing on the estimation and implications of intra-national trade frictions, I have developed and currently work on a series of projects concerned with the estimation and determinants of international trade costs. Without going into details, I have proposed methods and adjustments to existing procedures in order to: account for dynamic forces in panel structural gravity settings Olivero and Yotov (2012) and Anderson and Yotov (2017); estimate the effects of regional trade agreements Dai, Yotov and Zylkin (2014), Bergstrand, Larch and Yotov (2015), Anderson and Yotov (2016) and Baier, Yotov and Zylkin (2016); allow for scale economies of trade costs and to estimate the real exchange rate effects on international trade Anderson, Vesselovsky and Yotov (2016); estimate the impact of national institutions, Beverelli et al. (2017), and the effect of value added taxes, Bradley, Larch and Yotov (2017), on international trade; study the impact of *bilateral* reputation on trade costs and trade flows Dimitrova, Korschun and Yotov (2017); and estimate trade costs in services Anderson, Milot and Yotov (2014) and Anderson et al. (2015).

My contributions to structural gravity modeling and to the empirical gravity literature, along with relevant contributions from the existing literature, are summarized in two monographs. Larch and Yotov (2016) focuses on gravity theory and GE analysis with the structural gravity model, while Piermartini and Yotov (2016) discusses the challenges with structural gravity estimations, reviews the solutions to these challenges, and proposes best practices for estimation of empirical gravity equations. Versions of the two surveys served as the core for my book on trade policy analysis with the structural gravity model, Yotov et al. (2016). Recently, I also contributed a gravity chapter, Baier, Kerr and Yotov (2017), to the *"Handbook of International Trade and Transportation"* with editors Bruce Blonigen and Wesley Wilson. Currently, I am writing a chapter on the impact of trade, growth and FDI in the Asia-Pacific region, Larch and Yotov (2017), for the United Nations' *"Asia-Pacific Trade and Investment Report 2017"*. Finally, and most recently, I joined a team of researchers whose task is to construct a comprehensive trade cost database, which will be hosted and maintained by the World Trade Organization and will be updated on a regular basis.

### 3. Other Research Interests

In addition to my main research interests, I have studied several other topics related to international trade including embargoes and sanctions, international cartels, security and trade, trade and labor market interactions at the firm level, and political economy of trade policy. I am at the early stages of the sanctions, embargoes and security agenda, but I have already made some progress and contributions to the following three topics.

- **Trade and Labor at the Firm Level.** In addition to studying the interactions between international trade and labor market outcomes at the sectoral level within the structural gravity framework, I have published two papers on the links between trade and labor at the firm level. Dinopoulos et al. (2011) builds a model of intraindustry trade in which trade affects the skill bias and the skill premium through changes in plant-level output. Using firm-level Mexican data, we find that trade does not affect the relative demand for skilled labor *directly*. However, we estimate economically and statistically significant effects of trade on the skill bias when these effects are channeled through changes in plant-level output, which is exactly in accordance with our theory.

Uysal, Yotov and Zylkin (2015) employs U.S. firm-level data, which directly identifies trade-induced layoffs, to study the impact of trade on employment and productivity within the seminal Melitz (2003) framework. In addition to establishing a robust negative link between trade liberalization and trade-induced layoffs at the firm level, our estimates reveal that trade liberalization leads to a decrease in the export productivity cutoff and to an increase (but smaller in absolute value) in the zero-profit productivity cutoff for domestic production, just as predicted by Melitz's theory. An intuitive result, which is not captured explicitly in the Melitz model is that the relationship between productivity and layoffs is positive for non-exporters but it is negative for exporters.

- **Political Economy of Trade Policies.** I have written several papers on the political economy of trade policies. Yotov (2013) introduces trade-induced unemployment and trade adjustment costs as active determinants of trade policy within the protection-for-sale framework of Grossman and Helpman (1994). Using U.S. trade adjustment assistance (TAA) data, I find that trade-induced unemployment and trade-adjustment costs may induce an incumbent politician to grant protection to an unorganized industry, even in the presence of political pressure by organized sectors. In related work, Yotov (2010) builds a model that captures government's sympathy to trade-affected workers and allows for a decomposition of the channels through which unemployment affects the level of protection. Structural estimates reveal that the weight that the U.S. government attaches to the welfare of trade-affected workers is *four times* larger than the weight on the welfare of those who are not affected by trade. Most recently, Laincz, Matschke and Yotov (2016) capitalize on the rich TAA data to quantify the effects of political influence on the TAA certification decision. We find that political factors such as party affiliation of the President, voting outcomes at the state level, and whether a petition was certified in an election year inluence the TAA certification outcome.

- **Trade, Welfare, and International Cartels.** Legal evidence from prosecuted international cartels reveals that their activities have significant economic impact not only on the own markets of the offenders but on third markets too. In an exciting research agenda, Agnosteva, Syropoulos and Yotov (2017) builds a three-country duopoly model with segmented-markets to study the relationships between trade, cartel discipline, output, and welfare when firms collude implicitly. We derive an endogenous index of cartel discipline by solving the cartel's constrained optimization problem in the context of repeated interactions, and we demonstrate how markets that appear to be segmented become strategically linked through firms' incentive compatibility constraint. As a result, economic shocks (e.g. trade liberalization) affect equilibrium outcomes both directly and indirectly, through cartel discipline. Using a newly created extensive data on international cartels, we test some of the key predictions of our model. Consistent with our theory, we find that trade costs exert a negative and significant effect on cartel discipline. Moreover, cartel discipline has a negative and significant impact on trade, again in line with the model. Even though our theory does not specifically model cartel formation, our estimates reveal that the presence of cartels has a positive and significant effect on both internal and external cartel trade. This result implies that international cartels may actually enhance welfare, through trade, and we view it as a promising direction for future work.

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