Often referred as the “workhorse” of international trade, the gravity model is prominent in the empirical literature of applied international trade analysis. Among the arguments that could support the use of the gravity model, there are four that are particularly relevant for our purposes. First, the gravity model of trade is intuitive to understand. Following the metaphor of Newton’s Law of Universal Gravitation, it predicts that international trade between two countries is directly proportional to the product of their economic size, and inversely proportional to trade frictions between them. In simpler words, the bigger (smaller) the economies of two countries, and the easier (harder) it is for them to trade with each other, the more (less) we expect them to trade. Second, it is referred to as a structural model with solid theoretical foundations, which makes it appropriate for counterfactual analysis, such as measuring the effects of trade policies as we aim to do with the effects of North-South versus South-South agreements. Third, model has a flexible structure, which will allow us to construct a specification tailored to our research. Finally, fourth, it holds consistent and remarkable predictive power, both with aggregate and sectoral data (Yotov et al. 2016).

Through the decades, the gravity equation has been regularly upgraded in the theoretical and empirical literature. Of relevance, the simple intuition of the gravity model was theoretically extended by Anderson to note that, after controlling for size, the increase or decrease is *relative* to the average barriers of the two countries with all their partners, which are referred as “multilateral resistance” (Anderson 1979). The more trade barriers or resistance to trade exists with other countries relative to a given partner, the more a country is pushed to trade with said partner. Anderson also introduced the assumptions of product differentiation by place of origin, and Constant Elasticity of Substitution (CES) expenditures, or the Armington-CES assumption (Yotov et al. 2016; Chatzilazarou and Dadakas 2023), which led us to today’s generalized form of the gravity equation, as developed and popularised by Anderson and van Wincoop (Anderson and van Wincoop 2003).

Equally important, several empirical developments have strengthened the gravity model and inform our choice of methodology: Exporter-time and importer-time fixed effects are used to account for the multilateral resistance terms in a gravity estimation with panel data (Olivero and Yotov 2012); As the gravity model is often estimated with an OSL estimator, zero-trade flows were dropped from the sample when trade was transformed into a logarithmic form. Also, trade data is recognized to suffer from heteroscedasticity (Yotov et al. 2016). To solve for zero-trade flows and heteroscedasticity, the Poisson Pseudo Maximum Likelihood (PPML) estimator has been proposed to estimate the gravity model, avoiding potential biases (Silva and Tenreyro 2006; Santos Silva and Tenreyro 2011); Country-pair fixed effects has been proposed to account for the unobserved endogeneity of trade policy (Baier and Bergstrand 2007). It is worth nothing that the inclusion of exporter-time and importer-time fixed effects will absorb all observable and unobservable time-varying country-specific characteristics that could affect the dependent variable, while the country-pair fixed effects will absorb observable and unobservable bilateral time-invariant characteristics that could affect trade costs; The inclusion of intra-trade flows as well as international trade flows is proposed to correctly estimate the effects of non-discriminatory trade policy, allowing for consumers to choose products from both international and domestic sources (Dai, Yotov, and Zylkin 2014; Heid, Larch, and Yotov 2017); Year-intervals instead of data pooled over consecutive years should be used to allow for adjustment of trade flows to policies that might not have immediate effects (Baier and Bergstrand 2007; Anderson and Yotov 2016); And finally, to account for the effects of globalization forces that may biased the estimates of trade policies, a set of globalization dummies are recommended to control for the effects of globalization in the gravity model (Yotov 2012; Bergstrand, Larch, and Yotov 2015).

References

Anderson, James E. 1979. “A Theoretical Foundation for the Gravity Equation.” *The American Economic Review* 69 (1): 106–16.

Anderson, James E., and Eric van Wincoop. 2003. “Gravity with Gravitas: A Solution to the Border Puzzle.” *The American Economic Review* 93 (1): 170–92.

Anderson, James E., and Yoto V. Yotov. 2016. “Terms of Trade and Global Efficiency Effects of Free Trade Agreements, 1990–2002.” *Journal of International Economics* 99 (March):279–98. https://doi.org/10.1016/j.jinteco.2015.10.006.

Baier, Scott L., and Jeffrey H. Bergstrand. 2007. “Do Free Trade Agreements Actually Increase Members’ International Trade?” *Journal of International Economics* 71 (1): 72–95. https://doi.org/10.1016/j.jinteco.2006.02.005.

Baier, Scott L., Yoto V. Yotov, and Thomas Zylkin. 2019. “On the Widely Differing Effects of Free Trade Agreements: Lessons from Twenty Years of Trade Integration.” *Journal of International Economics* 116 (January):206–26. https://doi.org/10.1016/j.jinteco.2018.11.002.

Bastos, Paulo, and Joana Silva. 2010. “The Quality of a Firm’s Exports: Where You Export to Matters.” *Journal of International Economics* 82 (2): 99–111. https://doi.org/10.1016/j.jinteco.2010.07.001.

Bergstrand, Jeffrey H., Mario Larch, and Yoto V. Yotov. 2015. “Economic Integration Agreements, Border Effects, and Distance Elasticities in the Gravity Equation.” *European Economic Review* 78 (August):307–27. https://doi.org/10.1016/j.euroecorev.2015.06.003.

Chatzilazarou, Lazaros Antonios, and Dimitrios Dadakas. 2023. “Trade Potential in European Union Manufacturing.” *Journal of Economic Studies* 51 (5): 1144–63. https://doi.org/10.1108/JES-06-2023-0292.

Dahi, Omar S., and Firat Demir. 2017. “South-South and North-South Economic Exchanges: Does It Matter Who Is Exchanging What and with Whom?” *Journal of Economic Surveys* 31 (5): 1449–86. https://doi.org/10.1111/joes.12225.

Dai, Mian, Yoto V. Yotov, and Thomas Zylkin. 2014. “On the Trade-Diversion Effects of Free Trade Agreements.” *Economics Letters* 122 (2): 321–25. https://doi.org/10.1016/j.econlet.2013.12.024.

Dür, Andreas, Leonardo Baccini and Manfred Elsig. 2014. “The Design of International Trade Agreements: Introducing a New Database.” The Review of International Organizations. https://www.designoftradeagreements.org/downloads/.

Heid, Benedikt, Mario Larch, and Yoto V. Yotov. 2017. “Estimating the Effects of Non-Discriminatory Trade Policies within Structural Gravity Models.” SSRN Scholarly Paper. Rochester, NY. https://doi.org/10.2139/ssrn.3100014.

Latzer, Hélène, and Florian Mayneris. 2021. “Average Income, Income Inequality and Export Unit Values.” *Journal of Economic Behavior & Organization* 185 (May):625–46. https://doi.org/10.1016/j.jebo.2021.03.002.

Manova, Kalina, and Zhiwei Zhang. 2012. “Export Prices Across Firms and Destinations.” *The Quarterly Journal of Economics* 127 (1): 379–436.

Olivero, María Pía, and Yoto V. Yotov. 2012. “Dynamic Gravity: Endogenous Country Size and Asset Accumulation.” *Canadian Journal of Economics/Revue Canadienne d’économique* 45 (1): 64–92. https://doi.org/10.1111/j.1540-5982.2011.01687.x.

Santos Silva, J. M. C., and Silvana Tenreyro. 2011. “Further Simulation Evidence on the Performance of the Poisson Pseudo-Maximum Likelihood Estimator.” *Economics Letters* 112 (2): 220–22. https://doi.org/10.1016/j.econlet.2011.05.008.

Silva, J. M. C. Santos, and Silvana Tenreyro. 2006. “The Log of Gravity.” *The Review of Economics and Statistics* 88 (4): 641–58.

Thierry Mayer, Gianluca Santoni, Vincent Vicard. 2023. “The CEPII Trade and Production Database (TradeProd).” http://www.cepii.fr/CEPII/en/bdd\_modele/bdd\_modele\_item.asp?id=5.

Yotov, Yoto V. 2012. “A Simple Solution to the Distance Puzzle in International Trade.” *Economics Letters* 117 (3): 794–98. https://doi.org/10.1016/j.econlet.2012.08.032.

Yotov, Yoto V., Roberta Piermartini, José-Antonio Monteiro, and Mario Larch. 2016. *An Advanced Guide to Trade Policy Analysis​: The Structural Gravity Model*. WTO. https://doi.org/10.30875/abc0167e-en.