5

Conclusion: Using the Gravity Model for Policy Research

5 Conclusion: Using the Gravity Model for Policy Research

As noted at the outset, various versions of the gravity model have been widely used in the applied international trade literature for over half a century. The model represents the standard starting point for much empirical work in international trade, and for that reason is of particular interest to applied policy researchers. However, as the previous sections have noted, the gravity literature has undergone a series of major changes in the last decade or so. To produce policy research that is credible and robust, it is necessary to take full account of those changes when undertaking research using the gravity model. Increasingly, research that does not use the latest models and techniques does not represent a sound basis for drawing policy conclusions.

The first point for applied researchers to take away from this user guide is that the gravity model is no longer just an intuitive way of summarizing the relationship among trade, economic size, and distance. A variety of theoretical gravity models now exist, which provide firm micro-foundations for gravity-like models. As demonstrated by the "gravity with gravitas model", the inclusion of theory can make a major difference to the way the dataset is set up, the way in which the model is estimated, and most importantly, to the results and policy conclusions that flow from the model. It is therefore important that research based on the gravity model make explicit reference to theory, and incorporate in so far as possible the insights that flow from it. Policy conclusions are only as robust as the model behind them, and it is increasingly necessary to use a theory-consistent gravity model to convince readers that model results are meaningful. As a starting point, all gravity model research should now include appropriate dimensions of fixed effects, or otherwise correct for the multilateral resistance terms introduced by Anderson and Van Wincoop (2003), for example using the Baier and Bergstrand (2009) methodology.

A second point of particular importance to policy researchers, but which is often overlooked, relates to the inclusion of policy variables in gravity models. There is a long tradition of augmenting gravity models in that way, and there is an increasingly large body of literature that uses policy variables, including behind-the-border barriers. However, the possible endogeneity of these measures is always a serious issue in the gravity context. Since endogeneity can introduce serious bias into the model's results – and thus affect policy conclusions – it is important that researchers attempt to correct for it whenever possible. The simplest way to do so is using the TSLS estimator, with at least as many exogenous and excludable instruments as potentially endogenous variables. Although not technically difficult to implement, the TSLS estimator is

challenging for researchers because of the need to identify appropriate instruments: they must be strong, exogenous, and excludable. If one of these conditions is not met, the TSLS estimator is no longer valid, and results can even be worse than with OLS. It is therefore important to pay attention to the standard diagnostic statistics, and to report them systematically when the TSLS estimator is used.

Another way in which econometrics is important in the applied gravity modeling context relates to the recent literature on the appropriate estimator to use to estimate gravity models. The literature in this area remains particularly unsettled, with two major contributions focusing on the Poisson estimator as a way of overcoming heteroskedasticity, and the Heckman sample selection estimator as a way of modeling zero trade flows. The bottom line for applied researchers is that it is important to ensure that results are robust to estimation using different techniques. Much of the empirical literature now presents results using Poisson and/or Heckman at least as a robustness check, if not as a first line approach. It is therefore important to ensure that policy conclusions are robust to the estimation of the model using these techniques, as well as others that may be developed in the literature subsequently.

More fundamental than all of these points, however, is the need for applied researchers to focus on questions where gravity modeling has a comparative advantage. In particular, the gravity model describes the behavior of trade flows, but not economic welfare as such. For applications that focus on economic welfare, it would be more appropriate to use other methodologies, such as computable general equilibrium modeling, rather than gravity. The same applies to reallocations of labor and capital across sectors as a result of trade liberalization: gravity is very poorly placed to answer such questions, and alternative methodologies, such as computable general equilibrium modeling, need to be considered. Gravity's comparative advantage lies in the use of data to assess the sensitivity of trade to particular trade cost factors, including policies. To the extent that policy data are available, they can be combined with the gravity model to provide useful information on the likely response of trade flows to reforms. Indeed, in an extension of the approaches presented here, gravity modeling can also be used to perform counterfactual evaluations of the behavior of trade flows following reforms. However, counterfactuals need to be performed very carefully: see Baier and Bergstrand (2009) for a simple way of performing them while taking proper account of the impact of multilateral resistance. Taking account of multilateral resistance is important because it allows counterfactual simulations to properly capture third-country effects such as trade creation and trade diversion. Counterfactual simulations using the intuitive or fixed effects gravity model only measure pure impact effects, and do not consider the general equilibrium implications of policy changes, which is a very significant disadvantage.

If these points are kept in mind, the gravity model can be a useful tool for applied trade policy researchers. As the richness of applications over the last half-century demonstrates, there is enormous scope for adapting the model to changing circumstances and policy priorities. It continues to provide valuable insights in a policy context, and appears likely to remain the workhorse of the applied international trade literature for some time to come.