We Can Improve the Analysis of Trade Policy

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EXECUTIVE SUMMARY

The principal tool for analyzing the economy wide impact of a trade liberalization like the North American Free Trade Agreement is applied general equilibrium (AGE) models with multiple countries and multiple industries. We show that AGE models systematically under predict the changes in trade patterns associated with more recent reforms and that Kehoe, Rossbach, and Ruhl's (2015) least traded product methodology for predicting changes in trade patterns based on disaggregated product-level trade data does much better. This alternative methodology performs better because it accounts for the rapid growth of products traded in small amounts prior to liberalizations. We propose a method for integrating this insight into an AGE model using an innovation due to Arkolakis (2010), and we argue that models that account for this additional margin of growth are likely to produce more accurate predictions for the impact of trade liberalization as well as larger estimated welfare gains.

*This paper reports on the results of a larger project that we are conducting jointly with Kim J. Ruhl of Pennsylvania State University. The data set referred to in the text and used to construct the table is available at http://www.econ.umn.edu/~tkehoe/. The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

We need better models of trade policy

Arguments over the costs and benefits of globalization play major roles in political debates in the United States and throughout the world. To inform these debates, economists have employed applied general equilibrium (AGE) models with multiple countries and multiple industries to analyze the impact of policies that change barriers to trade and foreign investment. While the impact of trade policy tends to be discussed most often at the industry level, each industry is composed of potentially hundreds of products. Kehoe (2005) and Kehoe, Rossbach, and Ruhl (KRR) (2015) show, however, that three of the most prominent AGE models used to predict the impact of the North American Free Trade Agreement (NAFTA) on the economies of Canada, Mexico, and the United States significantly under predicted the increases in trade flows that occurred for industries composed of products that were initially traded only in small amounts.

Kehoe, Pujolas, and Rossbach (KRP) (2017) provide a critical survey of AGE models of trade policy and suggestions on how to improve the predictions made by these models. We follow KRP in focusing on the impact of changes in trade policy, rather than that of changes in foreign investment policy, and in evaluating the performance of models in terms of their predictions for trade by industry, rather than other predictions for the models. We argue that the shortcomings of AGE models in predicting the impact of trade liberalization is not limited to the impact of NAFTA but extends to AGE analysis of more recent liberalization episodes. We conclude that more research is needed to develop better models of the impact of trade policy and better communicate the gains from trade liberalization, which are likely to be larger than standard models predict. We illustrate that taking into account the product composition of industries is one way to improve these models.

AGE models are designed to capture impact of policy changes

The AGE models whose predictions we analyze are based on those developed in the 1970s; see Shoven and Whalley (1984) for a survey. An AGE model includes three sorts of people in each country: consumers, producers, and governments. The consumers in the model sell the services of their factors of production, labor and capital, to producers to generate income that they use to purchase goods so as to maximize their utility. Producers purchase inputs of factor services and intermediate inputs from other producers to produce outputs so as to maximize their profits. Governments impose taxes on the income of, and the transactions made by, consumers and

producers. They follow policy rules to use this tax income to finance government spending, transfers to consumers, and subsidies to producers. In models of trade policy, the most important government policy instruments are tariffs and other trade barriers like licenses and quotas. Dynamic models emphasize the investment decisions of firms and the borrowing and lending decisions of consumers and governments. In the static models that we analyze here, investment, borrowing, and lending are modeled in simple ways.

An equilibrium of the model consists of prices for all of the goods and factor services and quantity decisions by the consumers, producers, and governments so that markets clear. An AGE modeler calibrates the parameters of the model so that, in the base case equilibrium, the choices made by the people in the model match those made by their counterparts in the data. The modeler can then change, say, trade policy parameters like tariffs and calculate the new equilibrium on a computer to predict what the impact of this change in policy would be.

To have confidence in the predictions made by AGE models, we would like to be able to go back after a policy change has been implemented and compare the predictions made with what actually occurred. Kehoe, Polo, and Sancho (1995) do this for an AGE model constructed to analyze Spain's 1986 integration into what was then the European Community. They find that the model performs well, particularly, when they modify the predictions that had been made before 1986 to account for two shocks that buffeted the Spanish economy in 1986 — a drought that lowered productivity in agriculture and a decline in the international price of petroleum. Since the major policy changes made by the Spanish government in 1986 were to domestic taxes rather than to trade barriers, however, these results show that AGE models can perform well predicting the impact of tax reforms, not necessarily that of trade reforms.

AGE models are the tool of choice for trade policy analysis

KRP (2017) argue that since the 1980s AGE models have become the tool of choice for analyzing the impact of trade policy. In 1992, for example, when the U.S. International Trade Commission (USITC) organized a conference at the request of the U.S. Congress to which it invited all economists studying the economy wide impact of NAFTA, 10 of the 12 studies presented used AGE models (USITC 1992). In recent years, government agencies have done AGE modeling of trade policy changes in house rather than relying on outside experts. The USITC, for example, uses a dynamic AGE model with 12 countries and a rest of the world aggregate to examine the

potential impact of the Trans-Pacific Partnership on the United States (USITC 2016). The European Commission's Directorate-General for Trade uses a static AGE model to analyze the impact of the Canada-European Union Trade Agreement, signed in October 2016, on the economies of European Union members (European Commission 2011). Global Affairs Canada uses a different AGE model to analyze the impact on the same agreement on the Canadian economy (Global Affairs Canada 2013).

One of the reasons for the popularity of AGE models as a tool for analyzing trade policy is the Global Trade Analysis Project (GTAP), which has developed data sets and easy-to-implement models; see Hertel (1997). In fact, the models used by the USITC, the European Commission's Directorate-General for Trade, and Global Affairs Canada cited above are all variants of the GTAP framework.

The least traded product methodology performs better than AGE models

AGE models are popular for analyzing trade policy because they provide answers to a variety of questions, among them: In which industries will trade expand as a result of a policy change? In which industries will trade contract? As Kehoe (2005) and KRR (2015) show, the AGE models used to predict the impact of NAFTA predicted changes in exports and imports by industry that were uncorrelated with the changes that subsequently occurred. We expand their critique by demonstrating that standard AGE models fail to capture the changes in trade by industry that occurred following four recent bilateral trade liberations (with year of implementation): Australia-United States (2005), Chile-China (2006), Chile-United States (2004), and China-New Zealand (2008). We argue that predicting changes in trade by industry is not a hopeless task, by showing that the least traded products (LTP) methodology developed by KRR (2015) performs much better in predicting changes in trade by industry.

To generate predictions for changes in trade flows as a result of the four liberalizations, we use the standard GTAP model calibrated to 2004 data and eliminate all of the observed tariffs for each bilateral pair of countries one pair at a time; see KPR (2017) for details. Table 1 reports the correlations between the predictions for changes in trade for the 42 GTAP industries with the changes that actually occurred between 2002, chosen to capture anticipatory responses to the reforms, and 2015 weighted by average trade value. Notice that the average correlation is 0.0.

Table 1

Comparisons of GTAP and LTP predictions with data for recent trade liberalization episodes

Exporter	Importer	Correlation of GTAP predictions with data	Correlation of LTP predictions with data
Australia	United States	–0.14	0.53
United States	Australia	0.27	0.55
Chile	China	0.04	0.07
China	Chile	0.14	0.61
Chile	United States	0.03	0.48
United States	Chile	0.08	0.55
China	New Zealand	–0.36	0.61
New Zealand	China	–0.09	0.48
Average		–0.00	0.49

KRR (2015) argue that the models performed poorly because they failed to take into the fact documented by Kehoe and Ruhl (2013) that, following trade liberalization, products that are exported in small, but positive, amounts before liberalization tend to experience much higher trade growth much faster than products that are traded more heavily. To understand the LTP predictions reported in table 1, consider the case of exports from China to New Zealand. We start by dividing the 5224 Harmonized System 6-digit products into a most traded group of 589.5 products that accounted for 90 percent of trade in 2002 and a least traded group of 4634.5 products that accounted for 10 percent. We then assign the 5224 products to the 42 traded industries in the GTAP model. Following Kehoe and Ruhl (2013) and KRR (2015), we predict that sectors that have more initial exports of LTPs will experience faster export growth; see KPR (2017) for details. This was indeed the case after trade reform, as exports of LTPs grew from being 10.0 percent of exports from China to New Zealand in 2002 to 29.9 percent in 2015. Since the large increases in exports of LTPs seem to have been distributed more or less randomly across products in different industries, the correlation of predictions of the LTP methodology with the subsequent changes in the data is 0.61, compared with the correlation of −0.39 for the GTAP model. These results suggest that the welfare gains of trade reforms are larger than previously expected, as they failed to predict the significant growth that occurred in least traded products following liberalization.

More research can improve AGE models

Our analysis indicates that an AGE model that can capture the faster growth in trade in industries composed of products that are traded in small, but positive amounts before liberalization is likely to produce far more accurate predictions of the impact of the liberalization, at least on trade by industry. Embedding the LTP methodology in an AGE model would also allow us to make predictions about a wider set of variables like consumer welfare and the components of real GDP.

To introduce the LTP methodology into an AGE model, we propose adapting the model of Arkolakis (2010), who introduces marketing costs into a trade model with heterogeneous firms. A firm has access to a small set of consumers if it pays a small cost; for each new group of consumers the firm want to reach, this cost increases disproportionately. A trade liberalization reduces the cost of transporting goods equally for all firms — to large firms that sell to many consumers and to small firms that sell to few consumers. The relevant trade cost that firms face — the sum of the cost of reaching new consumers and the cost of physically transporting goods — decreases more for small firms, however, than for large firms. This implies that firms with smaller foreign market shares increase trade more after trade liberalization.

We have explored one example of the sort of progress that can be made in improving AGE models of trade policy. Researchers need to introduce new theoretical mechanisms into their models, testing these innovations by comparing the predictions that they generate with the data for trade liberalizations that have already occurred, as we do in this paper. Equally as important, by better predicting which industries will experience the most growth following liberalization, we can develop models that do a better job communicating where we should expect the welfare gains from trade liberalizations to materialize — which are likely to be larger than standard models predict once we account for welfare gains due to the additional growth of least traded products.

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