Federal Reserve Bank of Minneapolis
Research Department Staff Report 492

November 2013

Using the New Products Margin to Predict the Industry-Level Impact of Trade Reform*

Timothy J. Kehoe

University of Minnesota,
Federal Reserve Bank of Minneapolis,
and National Bureau of Economic Research

Jack M. Rossbach

University of Minnesota
and Federal Reserve Bank of Minneapolis

Kim J. Ruhl

Stern School of Business, New York University

ABSTRACT

This paper develops a methodology for predicting the impact of trade liberalization on exports by industry (3-digit ISIC) based on the pre-liberalization distribution of exports by product (5-digit SITC). Using the results of Kehoe and Ruhl (2013) that much of the growth in trade after trade liberalization is in products that are traded very little or not at all, we predict that industries with a higher share of exports generated by least traded products will experience more growth. Using our methodology, we develop predictions for industry-level changes in trade for the United States and Korea following the U.S.-Korea Free Trade Agreement (KORUS). As a test for our methodology, we show that it performs significantly better than the applied general equilibrium models originally used for the policy evaluation of the North American Free Trade Agreement (NAFTA).

Keywords: Trade liberalization; Industry; Product
JEL classification: F13, F14, F17.

* The data used here are available at http://www.econ.umn.edu/~tkehoe/. The authors thank the National Science Foundation for support through grant SES-0962993. 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.

1. Introduction

Employing the insight from Kehoe and Ruhl (2013) that products (5-digit SITC) that are traded very little or not at all are disproportionately responsible for changes in aggregate trade following trade reform, we hypothesize that they are important for predicting changes in industry-level (3-digit ISIC) trade after trade reform. We develop a methodology to classify products as least traded and compute the share of exports in an industry accounted for by these least traded products. We predict that industries with the highest shares of exports accounted for by least traded products will experience the largest increases in trade. Using this methodology, we predict what industries will experience the largest increases in trade between the United States and Korea following the signing of their free trade agreement. We aggregate our industries in order to contrast our predictions with those from standard general equilibrium models that use alternative industry definitions.

To demonstrate the usefulness of our methodology, we compare the actual changes in bilateral industry-level trade between Canada, Mexico, and the United States during NAFTA with the predictions our methodology would have yielded had we developed our methodology before the implementation of NAFTA. We compare the accuracy of our projections with those of a standard model that was used to predict the effects of NAFTA. We show that, in the case of NAFTA, our methodology performs better in its predictions, and we use the results from our evaluation of NAFTA to develop predictions not only for the relative growth of trade by industry between Korea and the United States, but also for the absolute level of growth of trade for each industry.

2. Growth in trade on the extensive margin

In this section, we develop a methodology based on the insight from Kehoe and Ruhl (2013): Much of the growth in trade following a trade liberalization occurs within the set of products that were not traded or were traded very little. We refer to growth in trade from products that were not previously traded or were traded very little as growth on the *extensive margin* or the *new products margin*. We refer to growth in trade from products that were previously traded in large amounts as growth on the *intensive margin*. Our methodology, based on that of Kehoe and Ruhl (2013), allows our cutoff for what products we consider to be least traded to vary across country pairs in order to take into account the relative importance of each product for a country's trade.

We define a *product* to be a 5-digit SITC code, and, following Kehoe and Ruhl (2013), we sort all of the products from lowest to highest by their average value of trade over the first three years in our sample. (We average over three years to minimize the measure's dependence on any particular year.) Starting with the products with the least trade in the first three years, we then sum the value of trade in the base year until we accumulate a set of products that accounts for 10 percent of total trade in the base year. If a product is in that set, we classify it as a *least traded product*. Within the set of least traded products are products from different industries, where an industry — here a 3-digit ISIC code — is itself a collection of products. A list of our industries and their descriptions are given in table 1. Adapting a concordance developed by Muendler (2009), we map each of the 1,836 5-digit SITC codes into one of 38 3-digit ISIC codes, and then compute the share of trade accounted for by least traded products with each industry. How prevalent are these least traded products across industries? In table 2 we report the fraction of trade in an industry accounted for by least traded products in 1989. There are substantial differences across industries. For example, least traded products made up 67 percent of total textile exports (ISIC 321) from the United States to Korea in 2005, but only 7 percent of exports in the pottery, china, and earthenware industry (ISIC 361).

3. Predictions for U.S.-Korea FTA

The United States and Korea signed a free trade agreement, KORUS, in 2007, which was enacted in 2012. To make our predictions for the effects of KORUS, we look at bilateral trade at the product level between the United States and Korea from Comtrade and identify products as least traded or not using the base year of 2005. Using our concordance, we aggregate products into 3-digit ISIC industries and compute the share of least traded products in each industry. How is the level of least traded products in an industry related to the growth in trade in that industry following liberalization? Kehoe and Ruhl (2013) show that growth in the least traded products can be explosive after liberalization, so it follows that industries with more least traded products would be expected to grow faster after liberalization than industries with fewer least traded products. Therefore our prediction is that industries with higher shares of least traded products will experience more growth than industries with lower shares of least traded products.

We formulate our prediction of trade growth by industry as a simple linear function of the share of exports accounted for by least traded products in that industry. Specifically, we predict that the growth in each industry will be

$$z_j = \alpha + \beta s_j , \qquad (1)$$

where j is the industry, z_j is the growth in exports deflated by GDP growth of the exporting country, s_j is the share of exports accounted for by least traded products in that industry, and α and β are constants. Here α is the average growth rate of non–least traded products, and β is the additional growth generated by least traded products. As long as $\beta > 0$, all values for α and β give the same predictions for the relative growth across industries. One way we evaluate predictions versus observed changes in the data is to calculate correlations. Any series of predictions by industry of the form (1) generates the same correlation with a series of observations by industry if β is positive.

We use observations from the experience of NAFTA to set the parameters in equation (1) to make predictions on the impact of KORUS by industry. Using data for the United States, Canada, and Mexico over 1989–2009, which is covered in the following section, we set $\alpha = 15.55$ and $\beta = 131.39$ for Korean exports to the United States, which are the unweighted averages of α and β for Canadian and Mexican exports to the United States. Similarly, we set $\alpha = 13.885$ and $\beta = 220.64$ for Korean imports from the United States to the unweighted averages of α and β for Canadian and Mexican imports from the United States. We anticipate that future research will develop better methods of calculating α and β. For now our primary focus remains on predicting the relative levels of growth across industries, for which α and β are irrelevant as long as $\beta > 0$.

Table 2 reports our predictions for each of our 3-digit ISIC industries. Our predictions vary widely across industries: For Korean exports to the United States, our predictions range from a decrease of 3.4 percent in exports of beverages (ISIC 313) to an increase of 156.7 percent in exports of industries whose products are entirely least traded, such as glass and glass products (ISIC 362). For U.S. exports to Korea, our predictions have a similar variation. A noticeable difference between our predictions on U.S. exports compared with our predictions on Korean exports is that there are more industries in which we predict that exports will grow less than GDP. There are also fewer sectors whose products are entirely least traded.

4. Predictions from other models

We compare our predictions with those from Kiyota and Stern (2007) based on the methodology and assumptions of the Brown-Deardorff-Stern model (Brown 1992, 1994, Brown, Deardorff, and Stern, 1992, 1995, Brown and Stern, 1989) and those from Yaylaci and Shikher (2013) based on the Ricardian framework of Eaton and Kortum (2002). Kiyota and Stern (2007) predict the changes in total imports and exports for 14 industries, as well as two service industries that we ignore, for Korea and the United States following liberalization. To make our results comparable to theirs, we aggregate the ISIC industries into their industries and compute the share of least traded products in each of those industries. Kiyota and Stern do not provide an exact concordance between the ISIC codes and their industries, so we develop one.

Kiyota and Stern focus on trade flows between Korea and the World and the United States and the World, whereas our methodology predicts bilateral trade flows. To make our predictions comparable to theirs, we assume that exports from the United States to the World, not Korea, grow by the factor α and similarly for exports from Korea to the World, not the United States. This assumption allows us to keep our predictions of the form (1) using U.S.-Korea data. We use these data on trade flows to identify the set of least traded products (LTP). Mechanically, we multiply α by the fraction of trade accounted for by the United States for Korea, and by Korea for the United States. For example, in table 3, for predicting Korean exports to the World, we set α to 2.27 $(=(15.55)(0.146))$ since Korean exports to the United States account for 14.6 percent of Korean exports to the World in 2005.

Tables 3 and 4 compare our results with those of Kiyota and Stern. As we see, there are significant differences in the predictions between the two methods, especially for U.S. exports: Our predictions have correlations with theirs that range from −0.33 for U.S. exports to 0.79 for Korean exports.

Yaylaci and Shikher (forthcoming) predict the changes in bilateral trade for 15 manufacturing industries between the United States and Korea following liberalization. Yaylaci and Shikher lack predictions for the agricultural industry, so we exclude it from our predictions after classifying products as least traded. We follow the same methodology for computing the share of least traded products in each of their industries after aggregating our ISIC industries into their industries. Table 5 shows our predictions using our methodology and their industry definitions compared with the predictions of Yaylaci and Shikher. Again, there are significant differences between them, with a correlation of only 0.43 between our predictions and those of Yaylaci and Shikher for Korean exports to the United States and only 0.19 for U.S. exports to Korea.

5. Evaluating our methodology in the context of NAFTA

In this section, we evaluate the predictive power of our methodology by using it to "predict" the impact of NAFTA. We compare the proportion of trade within each industry that comes from least traded products with the results from the data showing how much each industry grew. In particular, we compute the growth for each industry normalized by GDP according to

$$z_{ij}^{k} = 100\left(\frac{x_{ijT_1}^{k} / y_{iT_1}}{x_{ijT_0}^{k} / y_{iT_0}} - 1\right), \tag{2}$$

where x_{ijt}^{k} is exports from country i to country k, in industry j at time t, and y_{it} is current price GDP in country i. We set $T_1 = 2009$ and $T_0 = 1989$. We calculate our metrics for comparing our predictions with the data on industry trade growth from the regression

$$\min_{\alpha,\beta} \sum_{j=1}^{38} \omega_j \left(\alpha + \beta s_j - z_j^{data}\right)^2. \tag{3}$$

We run this regression for each country pair (we suppress the subscripts for time and countries) where s_j is the share of least traded products in each industry. Again, α is the average growth of non–least traded products and β is the difference between the average growth rate of least traded products and that of non–least traded products. This regression is the source of our estimates for α and β for KORUS in section 3. The growth rates for each industry and the share of least traded products in each industry, as well as the regression results, are reported in tables 6–8. Notice that the squared correlation coefficient is the R^2 of this simple regression.

If β were small, it would indicate that, although the share of least traded products in an industry is still well correlated with how much that industry grew, there is actually not a large difference between the growth rates of least traded products and non–least traded products. We find that for all country pairs our estimates of β are large, however, indicating that differences in growth rates between least traded products and non–least traded products are indeed large and significant. Setting $\alpha = -28.22$ and $\beta = 112.55$ would have been the best linear prediction based on the least traded products data for U.S. exports to Canada, indicating that between 1989 and 2009, exports in the least traded set grew by 84.33 ($= -28.22 + 112.55$) percent more than U.S. GDP, while other exports grew 28.22 percent less than U.S. GDP. Had we used 1989 trade data to predict 2009 U.S. exports to Canada by simply guessing that exports in the least traded set would grow by more than other exports, we would account for 0.28 ($= 0.53^2$) of the variation in relative export patterns. Since we weight our industries by their share of trade in the base period, we recover that the weighted share of least traded products is 0.10, and so our results imply the best prediction of the growth of total exports from the United States to Canada is 16.97 ($= -28.22 + (.01)(112.55)$) percent less than the growth of U.S. GDP.

Using industry-level data, we have estimated the average growth rates of non–least traded products as the regression coefficient α and the average growth rates of least traded products as the sum $\alpha + \beta$. To test the consistency of our methodology, we derive alternative estimates for α and β using only product-level data, and we label these alternative estimates $\tilde{\alpha}$ and $\tilde{\beta}$. That is, we compute

$$\tilde{\alpha}_i^k = 100\left(\frac{x_{iT_1}^k / y_{iT_1}}{x_{iT_0}^k / y_{iT_0}} - 1 \right)$$

$$\tilde{\beta}_i^k = 100\left(\frac{x_{iT_1}^{\ell k} / y_{iT_1}}{x_{iT_0}^{\ell k} / y_{iT_0}} - 1 \right) - \tilde{\alpha}_i^k,$$

where x_{it}^k and $x_{it}^{\ell k}$ are respectively exports of all products and exports of only least traded products from country i to country k at time t, and y_{it} is current price GDP in country i, and again we set $T_1 = 2009$ and $T_0 = 1989$. Table 9 and Figure 1 show that we obtain very similar results regardless of whether we use our product-level estimates or our industry-level regression coefficients, since the weighted correlation between α and $\tilde{\alpha}$ is 0.97 while the weighted correlation between β and $\tilde{\beta}$ is 0.91. Furthermore, it follows that if $\tilde{\alpha}$ and $\tilde{\alpha} + \tilde{\beta}$ are the average growth rates of non–least traded products and least traded products, respectively, then $\tilde{\alpha} + \tilde{\beta} s_i$ is the expected growth rate in an industry with initial share s_i of least traded products.

6. Predictions of NAFTA models

To develop a baseline for judging whether our predictions for NAFTA performed well or not, we follow Fox (1999) and Kehoe (2005) and evaluate the performance of one of the most prominent of the models built to analyze NAFTA, the Brown-Deardorff-Stern (BDS) model (Brown 1992, 1994; Brown, Deardorff, and Stern, 1992, 1995; Brown and Stern, 1989). In this section, we compare the predictions made by the BDS model with the observed growth in trade following NAFTA, while in the appendix we perform similar comparisons for two alternative models of NAFTA.

The BDS model made predictions at the industry level, where each of their 23 industries is defined as an aggregate of ISIC 3-digit codes. After aggregating our ISIC industries into the BDS industries, we compute the percentage growth in exports for each industry deflated by GDP growth. We report the export growth rates for the BDS industries and the predictions of the BDS model in tables 10–12.

We select 1989 as our base year, since that is when Mexico and the United States adopted the Harmonized System (Canada adopted the Harmonized System in 1988). As Kehoe and Ruhl (2013) point out, finely disaggregated trade data are not comparable before and after the adoption of the Harmonized System. For this reason, we start our analysis in 1989 in order to have the same starting period for all countries. We use 2009 as our endpoint, since that is the actual year for full implementation of the NAFTA. Our results are robust to selecting 2007 as our endpoint, which we could do to avoid entangling the effects of NAFTA with the effects of the 2008–2009 recession and the fall in trade that accompanied it.

To compare the predictions of the BDS model with the changes in trade patterns in the data, we calculate the weighted correlation coefficient between the model prediction and the data, where the weights ω_j are the 1989 trade volumes. We also calculate the weighted regression coefficients a and b from solving

$$\min_{a,b} \sum_{j=1}^{23} \omega_j \left(a + bz_j^{model} - z_j^{data}\right)^2 \qquad (4)$$

over the 23 industries in the BDS model. The deviation of the estimated coefficient b from 1 indicates how poorly the model does in predicting the signs and the absolute magnitude of the changes in the data. Notice that these interpretations are unrelated to those from our least traded exercise. We focus on the resulting correlations from the regressions to compare their effectiveness at predicting relative changes in industry trade.

We report the calculated coefficients for exports from Canada to the United States in table 10. The BDS model does a poor job of predicting Canadian exports to the United States: The weighted correlation between the prediction and the data is negative (−0.28), and the linear function of the prediction that comes closest to the data involves multiplying all of the predicted growth rates by −3.33 and adding 21.82. The weak relationship between the predicted growth rates and actual growth rates can be seen in figure 2, which is a bubble plot showing this regression line where the bubble sizes correspond to the each industry's weight. The BDS model does somewhat better in predicting exports from the United States to Canada.

Table 13 contains the corresponding statistics for all six of the bilateral North American trade pairs. Notice that the BDS model had almost no predictive power for the impact of NAFTA by industry. In a regression on the pooled data for all six pairs, the coefficient b put on the predictions of the BDS model is 0.17, and when we allow b to differ by country pair, the weighted average is −0.94.

It is worth stressing that this failure of the BDS model is not specific to this particular model. We focus on the BDS model because it is a widely used and well-documented model built to analyze the impact of NAFTA, and it has predictions for all directions of bilateral trade between Mexico, Canada, and the United States. Kehoe (2005) argues that two other models that were very prominent in policy discussions of NAFTA, the Cox-Harris model of Canada (Cox, 1994, 1995; Cox and Harris 1985, 1992a, 1992b), and the Sobarzo model of Mexico (Sobarzo, 1992a, 1992b, 1994, 1995), also perform poorly in this sort of exercise. In the appendix, we show that we achieve similar results with the Sobarzo model and the Cox-Harris model as well. It is also important to note that the sorts of models used to analyze NAFTA are still being employed to analyze trade policies around the world, so we expect our predictions to fare similarly against those from more recent papers. See, for example, Brown, Kiyota, and Stern (2005), Ciuriak and Chen (2007), DeRosa and Gilbert (2004), Francois, Rivera, and Rojas-Romagosa (2008), Lips and Rieder (2005), U.S. International Trade Commission (2004), as well as Kiyota and Stern (2007).

To make the predictions from our methodology comparable to the BDS predictions, we compute the share of least traded products in each of the BDS industries and resolve the regression in equation (3) using the BDS defined industries. Our results are reported in tables 10 through 12 alongside the results from the BDS model. We find that the initial fraction of least traded products in an industry performs well as a predictor of future relative trade growth across industries, considerably outperforming the BDS model for each country pair. The least traded products prediction is best for exports from the United States to Canada and from Canada to Mexico. For exports from the United States to Canada, the weighted correlation between the proportions of least traded products and the changes in trade that occurred is 0.54. This implies that any prediction for increases in exports of the form $\alpha + \beta s_i$, where s_i is the fraction of exports of industry i accounted for by least traded products in 1989, would have a correlation of 0.54 with the changes that occurred in the data if β is positive. Figure 3 provides a bubble plot of the least traded product share of each industry compared with how much it grew, as well as our regression line.

Table 13 summarizes the results of performing this exercise for all six of the North American trade relations, and in all cases they do better than that for the BDS model. As Kehoe (2005) explains, the models used to predict the impact of NAFTA could not pick up increases in exports on the extensive margin, or new products margin, because of the assumptions made in these models. In particular, the sorts of Armington aggregators and Dixit-Stiglitz utility functions used in these models, along with no fixed costs of exporting, allowed only increases on the intensive margin. Table 14 compares the results of our predictions using the ISIC industries with our predictions using the BDS industries, and we see that the results are similar across the two industry definitions.

Products that report zero trade in 1989 are classified as least traded products, and if they report positive trade in 2009, that is counted toward the growth rate for least traded products. Notice, however, that the number of zero traded products has no influence on our shares s_i of least traded products in each industry in 1989. This means that the essential products in terms of generating any predictive power from our exercise are not products reporting zero trade, but products that are positively traded, although with very small amounts of trade. Arkolakis (2010) shows that the importance of products with small, non-zero trade to overall trade growth can be explained by marketing costs and the number of consumers a product has. This additional margin for growth is diminishing for products with large amounts of trade and causes products with small, yet positive trade to experience higher levels of growth.

As we have mentioned, there was a decline in trade relative to GDP during the 2008–2009 recession. Additionally, it is possible to start our analysis in 1988 for trade that involves Canada, as that country switched to the Harmonized System a year earlier than did the United States and Mexico. Table 15 shows that our least traded products exercise outperforms the BDS model regardless of whether we exclude the 2008–2009 recession or start our analysis a year earlier for bilateral relations involving Canada.

To get some idea of what drives our results, let us examine an industry where the simple least traded products exercise does better than the BDS model: Canadian exports of chemicals to the United States, which grew 99.6 percent while the BDS model predicted −3.1 percent. Looking at the disaggregated trade data for this industry shows that the chemicals industry is made up of 318 5-digit SITC categories. Of the 318 categories, 296 are least traded Canadian exports. Compared with Canadian GDP, the 38 percent of 1989 exports of chemicals that are least traded increase by 187 percent, while the other 62 percent increase by only 47 percent. The growth in least traded products is far from uniform: For example, exports of the code 51571 (Sulphonamides) increases by 3,424 percent more than Canadian GDP, 58241 (Polyamides in primary forms) increases by 4 percent, and 52213 (Chlorine) decreases by 28 percent.

Although our exercises look at changes in the value of trade, our results are driven by changes in quantities rather than changes in prices. To show this, we examine all products for which we have quantity data and decompose the changes in real value into changes in price and changes in quantity, where real value is taken to be the reported level of trade converted to the exporting country's national currency and then deflated by the exporting country's producer price index. We then compute a weighted average of this decomposition, using the initial trade value as each products weight. To reduce the effect of outliers we do not include products in the top and bottom 5 percentage of products in terms of the percent of growth accounted for by changes in quantity. These results are shown in table 16, where we see that on average, nearly all changes in value are due to changes in quantities, although this share is slightly lower when Mexico is the exporter. When more than 100 percent of the change is due to changes in quantities, this indicates that prices decreased while the total value of trade increased or vice versa.

7. Conclusions

This paper provides a methodology for predicting changes in bilateral trade across industries following a trade liberalization. Using this methodology, we provide estimates for growth in trade across industries for the United States and Korea following KORUS. We also evaluate our methodology in the context of NAFTA and show that our methodology — which exclusively focuses on least traded products — would have yielded better predictions than the general equilibrium models employed at the time. Our results suggest that researchers should include the new products margin in any analysis of the impact of trade reform. We hope this finding will spur the development of models that are consistent with the expansion of trade on the new products margin so that we can improve our ability to predict the effects of trade reforms and so that we can perform counterfactual analyses of alternative reforms.

Appendix: Alternative models of NAFTA

As shown in Kehoe (2005), the poor predictions of the BDS model are not unique, and other applied general equilibrium models predicting the effects of NAFTA performed similarly poorly. To show that our results extend beyond just the BDS model of NAFTA, we examine the Sobarzo model of Mexico (Sobarzo, 1992a, 1992b, 1994, 1995) and the Cox-Harris model of Canada (Cox, 1994, 1995; Cox and Harris 1985, 1992a, 1992b).

The Cox-Harris model predicted the changes in exports and imports between Canada and the World for 14 different industries. Since a concordance from the ISIC classification to the Cox-Harris industries is not provided in the original paper, we adapt the one provided in Kehoe (2005). We use imports and exports from Canada to the World, both as reported by Canada, from Comtrade as our base data and follow the same methodology we used for evaluating the BDS model. Since the Cox-Harris predictions are for total imports and exports for Canada, we follow the same procedure as we have done for the Kiyota and Stern (2007) predictions for Korea, using the World as a trading partner. In our results shown in table A1, we see that the results are similar to what we found when evaluating the BDS model. The Cox-Harris model had very little predictive power for both imports and exports, whereas using the share of least traded products in each industry performed significantly better at matching the relative changes in industry trade; achieving a weighted correlation of the data of 0.39 for exports and 0.56 for imports compared with the weighted correlations of 0.06 and 0.04, respectively, for the Cox-Harris model.

The Sobarzo model predicted the changes in imports and exports between Mexico and North America for 21 different industries. Since Sobarzo does not provide a concordance between ISIC and its industries, we adapt the concordance given in Kehoe (2005). We use the same base 5-digit SITC data as we did for the BDS exercise, constructing the share of least traded products for imports and exports between Mexico and the United States and Mexico and Canada separately. We then use these shares to compute a weighted share of least traded products for imports and exports between Mexico and North America. After that we again follow the same methodology as we did for the BDS exercise, and we find that the Sobarzo model does poorly in predicting both imports and exports between North America and Mexico. As summarized in table A2, the weighted correlation between the Sobarzo models predictions and the data is negative (−0.12) for imports from North America to Mexico, whereas the correlation between the share of least traded products in an industry and the industry's growth is much higher (0.43). For exports to North America from Mexico, the correlation between the predictions and the data is much better (0.47) and in fact does better than using the share of least traded products (0.04), however our regression shows that in terms of magnitude the Sobarzo model drastically under predicted the actual growth that took place ($a = 81.13$ and $b = 3.06$). The poor performance of the least traded exercise seems to stem from defining the set of least traded products for Mexico with Canada and the United States jointly rather than Mexico-Canada and Mexico-U.S. separately. In particular, in table 9 we see that when we consider them separately and compute the growth rates directly from the product data, exports of least traded products grow by 476.67 percent more than non–least traded products for Mexican exports to Canada and by 123.86 percent more for Mexican exports to the United States. When considered jointly and estimated from Sobarzo industry data, however, exports of least traded products grow only by 15.73 percent more than non–least traded products for Mexican exports to its North American neighbors. How the aggregation of individual countries into regions affects the predictions from our least traded exercise is something that merits further study.

References

Arkolakis, K. (2010), "Market Penetration Costs and the New Consumers Margin in International Trade," *Journal of Political Economy*, 118: 1151–1199.

Brown, D. K. (1992), "Properties of Computable General Equilibrium Trade Models with Monopolistic Competition and Foreign Direct Investment," in U.S. International Trade Commission, *Economy-Wide Modeling of the Economic Implications of a FTA with Mexico and a NAFTA with Canada and Mexico*, USITC Publication 2508, 95–125.

Brown, D. K. (1994), "Properties of Computable General Equilibrium Trade Models with Monopolistic Competition and Foreign Direct Investment," in J. F. Francois and C. R. Shiells, eds., *Modeling Trade Policy: Applied General Equilibrium Assessments of North American Free Trade*, Cambridge University Press, 124–150.

Brown, D. K., A. V. Deardorff, and R. M. Stern (1992), "A North American Free Trade Agreement: Analytical Issues and a Computational Assessment," *World Economy*, 15: 11–30.

Brown, D. K., A. V. Deardorff, and R. M. Stern (1995), "Estimates of a North American Free Trade Agreement," in P. J. Kehoe and T. J. Kehoe, eds., *Modeling North American Economic Integration*, Kluwer Academic Publishers, 59–74.

Brown, D. K., K. Kiyota, and R. M. Stern (2005), "Computational Analysis of the US FTAs with Central America, Australia and Morocco," *World Economy*, 28: 1441–1490.

Brown, D. K., and R. M. Stern (1989), "Computable General Equilibrium Estimates of the Gains from U.S.-Canadian Trade Liberalization," in R. C. Feenstra, ed., *Trade Policies for International Competitiveness*, University of Chicago Press, 217–245.

Ciuriak, D., and S. Chen (2007), "Preliminary Assessment of the Economic Impacts of a Canada-Korea Free Trade Agreement," Foreign Affairs and International Trade Canada.

Cox, D. J. (1994), "Some Applied General Equilibrium Estimates of the Impact of a North American Free Trade Agreement on Canada," in J. F. Francois and C. R. Shiells, eds., *Modeling Trade Policy: Applied General Equilibrium Assessments of North American Free Trade*, Cambridge University Press, 100–123.

Cox, D. J. (1995), "An Applied General Equilibrium Analysis of NAFTA's Impact on Canada," in P. J. Kehoe and T. J. Kehoe, editors, *Modeling North American Economic Integration*, Kluwer Academic Publishers, 75–90.

Cox, D. J., and R. G. Harris (1985), "Trade Liberalization and Industrial Organization: Some Estimates for Canada," *Journal of Political Economy*, 93: 115–145.

Cox, D. J., and R. G. Harris (1992a), "North American Free Trade and its Implications for Canada," in U.S. International Trade Commission, *Economy-Wide Modeling of the Economic Implications of a FTA with Mexico and a NAFTA with Canada and Mexico*, USITC Publication 2508, 139–165.

Cox, D. J., and R. G. Harris (1992b), “North American Free Trade and its Implications for Canada: Results from a CGE Model of North American Trade,” *World Economy*, 15: 31–44.

DeRosa, D. A., and J. P. Gilbert (2004), “Technical Appendix: Quantitative Estimates of the Economic Impacts of U.S. Bilateral Free Trade Agreements,” in J. J. Schott, ed., *Free Trade Agreements: U.S. Strategies and Priorities*, Institute for International Economics, 383–418.

Eaton, J., and S. Kortum (2002), “Technology, Geography, and Trade,” *Econometrica* 70: 1741−1779.

Fox, Alan K. (1999), “Evaluating the Success of a CGE Model of the Canada-U.S. Free Trade Agreement,” University of Michigan, Unpublished Manuscript.

Francois, J. F., L. Rivera, and H. Rojas-Romagosa (2008), “Economic Perspectives for Central America after CAFTA: A GTAP-Based Analysis,” CPB Netherlands Bureau for Economic Policy Analysis, Discussion Paper 99.

Kehoe, T. J. (2005), “An Evaluation of the Performance of Applied General Equilibrium Models of the Impact of NAFTA,” in T. J. Kehoe, T. N. Srinivasan, and J. Whalley, eds., *Frontiers in Applied General Equilibrium Modeling: In Honor of Herbert Scarf*, Cambridge University Press, 341–377.

Kehoe, T. J., and K. J. Ruhl (2013), “How Important Is the New Goods Margin in International Trade?” *Journal of Political Economy*, 121: 358–392.

Kiyota, K., and R. M. Stern (2007), “Economic Effects of a Korea-U.S. Free Trade Agreement,” Korea Economic Institute.

Lips, M., and P. Rieder (2005), “Abolition of Raw Milk Quota in the European Union: A CGE Analysis at the Member Country Level,” *Journal of Agricultural Economics*, 56: 1–17.

Muendler, M. A. (2009), “Converter from SITC to ISIC,” University of California, San Diego, Unpublished Manuscript.

Sobarzo, H. (1992a), “A General Equilibrium Analysis of the Gains from Trade for the Mexican Economy of a North American Free Trade Agreement,” in U.S. International Trade Commission, *Economy-Wide Modeling of the Economic Implications of a FTA with Mexico and a NAFTA with Canada and Mexico*, USITC Publication 2508, 599–653.

Sobarzo, H. (1992b), “A General Equilibrium Analysis of the Gains from Trade for the Mexican Economy of a North American Free Trade Agreement,” *World Economy*, 15: 83–100.

Sobarzo, H. (1994), “The Gains from Trade for the Mexican Economy of a North American Free Trade Agreement: An Applied General Equilibrium Assessment,” in J. F. Francois and C. R. Shiells, eds., *Modeling Trade Policy: Applied General Equilibrium Assessments of North American Free Trade*, Cambridge University Press, 83–99.

Sobarzo, H. (1995), "A General Equilibrium Analysis of the Gains from NAFTA for the Mexican Economy," in P. J. Kehoe and T. J. Kehoe, eds., *Modeling North American Economic Integration*, Kluwer Academic Publishers, 91–116.

U.S. International Trade Commission (2004), "U.S.-Central America-Dominican Republic Free Trade Agreement: Potential Economywide and Selected Sectoral Effects," USITC Publication 3717.

Yaylaci, O., and S. Shikher (forthcoming), "What Would KORUS FTA Bring?" *International Economic Journal*.

Table 1
ISIC industry codes and descriptions

ISIC code	industry name
111	Agriculture and livestock production
113	Hunting, trapping and game propagation
121	Forestry
122	Logging
130	Fishing
210	Coal mining
220	Crude petroleum and natural gas production
230	Metal ore mining
290	Other mining
311	Food manufacturing
312	Food manufacturing
313	Beverage industries
314	Tobacco manufactures
321	Manufacture of textiles
322	Manufacture of wearing apparel, except footwear
323	Manufacture of leather and products of leather, leather substitutes and fur
324	Manufacture of footwear
331	Manufacture of wood and wood and cork products, except furniture
332	Manufacture of furniture and fixtures, except primarily of metal
341	Manufacture of paper and paper products
342	Printing, publishing and allied industries
351	Manufacture of industrial chemicals
352	Manufacture of other chemical products
353	Petroleum refineries
354	Manufacture of miscellaneous products of petroleum and coal
355	Manufacture of rubber products
356	Manufacture of plastic products not elsewhere classified
361	Manufacture of pottery, china and earthenware
362	Manufacture of glass and glass products
369	Manufacture of other non-metallic mineral products
371	Iron and steel basic industries
372	Non-ferrous metal basic industries
381	Manufacture of fabricated metal products
382	Manufacture of machinery except electrical
383	Manufacture of electrical machinery apparatus, appliances and supplies
384	Manufacture of transport equipment
385	Manufacture of professional and scientific equipment
390	Other manufacturing industries

Table 2
Predictions for growth in Korea-U.S. trade relative to exporter's GDP (percent)

Korea to United States						**United States to Korea**					
ISIC code	**proj. growth**	**share least traded**	**ISIC code**	**proj. growth**	**share least traded**	**ISIC code**	**proj. growth**	**share least traded**	**ISIC code**	**proj. growth**	**share least traded**
111	156.7	1.00	**341**	156.7	1.00	**111**	−0.1	0.05	**341**	3.1	0.07
113	156.7	1.00	**342**	71.6	0.47	**113**	−3.2	0.04	**342**	20.4	0.16
121	156.7	1.00	**351**	51.4	0.34	**121**	−4.4	0.03	**351**	24.4	0.18
122	156.7	1.00	**352**	70.6	0.46	**122**	19.1	0.15	**352**	14.4	0.13
130	156.7	1.00	**353**	9.5	0.08	**130**	24.2	0.18	**353**	−4.2	0.03
210	156.7	1.00	**354**	156.7	1.00	**210**	−10.9	0.00	**354**	186.8	1.00
220	156.7	1.00	**355**	12.7	0.10	**220**	−7.3	0.02	**355**	101.6	0.57
230	156.7	1.00	**356**	5.2	0.05	**230**	0.8	0.06	**356**	−5.1	0.03
290	156.7	1.00	**361**	156.7	1.00	**290**	59.9	0.36	**361**	3.3	0.07
311	23.7	0.17	**362**	156.7	1.00	**311**	25.3	0.18	**362**	81.3	0.47
312	156.7	1.00	**369**	16.4	0.12	**312**	23.7	0.18	**369**	108.2	0.60
313	−3.4	0.00	**371**	13.5	0.11	**313**	73.8	0.43	**371**	107.5	0.60
314	69.7	0.46	**372**	63.0	0.41	**314**	186.8	1.00	**372**	9.1	0.10
321	47.6	0.32	**381**	61.9	0.41	**321**	121.5	0.67	**381**	20.5	0.16
322	156.7	1.00	**382**	8.9	0.08	**322**	186.8	1.00	**382**	7.7	0.09
323	156.7	1.00	**383**	0.0	0.02	**323**	27.3	0.19	**383**	−3.7	0.04
324	156.7	1.00	**384**	−2.2	0.01	**324**	186.8	1.00	**384**	−5.0	0.03
331	13.1	0.10	**385**	75.5	0.49	**331**	30.6	0.21	**385**	−0.5	0.05
332	156.7	1.00	**390**	51.2	0.34	**332**	52.8	0.32	**390**	40.4	0.26

Table 3
Predicted relative changes in Korean trade relative to Korean GDP in the Kiyota-Stern Model (Percent)

industry	Korean exports to World			Korean imports from World		
	Kiyota-Stern predictions	predictions using fraction least traded	2005 fraction least traded	Kiyota-Stern predictions	predictions using fraction least traded	2005 fraction least traded
Agriculture	−0.6	17.34	0.11	10.6	5.30	0.02
Chemicals	1.0	5.31	0.02	3.5	7.94	0.03
Food, bev., and tobacco	6.9	11.44	0.07	7.6	8.97	0.03
Leather and footwear	7.7	8.86	0.05	0.6	4.75	0.01
Machinery and equip.	−0.2	3.12	0.01	1.8	3.91	0.01
Metal products	0.4	5.67	0.03	1.7	4.46	0.01
Mining	−1.8	15.90	0.10	1.0	1.79	0.00
Misc. manufactures	5.3	5.51	0.02	4.2	5.17	0.02
Natural resources	0.6	8.75	0.05	1.3	5.17	0.02
Nonmetallic min. prod.	0.2	11.22	0.07	3.4	11.33	0.04
Textiles	8.6	7.61	0.04	3.6	8.63	0.03
Transportation equip.	2.7	2.52	0.00	2.1	3.65	0.01
Wearing apparel	27.7	21.67	0.15	−6.0	5.41	0.02
Wood products	0.2	9.30	0.05	2.0	5.91	0.02
KS-LTP weighted correlation			**0.70**			**0.55**

* $\alpha = (15.55)(0.146) = 2.27$ for Korean exports and $\alpha = (13.885)(0.121) = 1.68$ for Korean imports

Table 4
Predicted relative changes in United States trade relative to U.S. GDP in the Kiyota-Stern Model (Percent)

industry	U.S. exports to World			U.S. imports from World		
	Kiyota-Stern predictions	predictions using fraction least traded	2005 fraction least traded	Kiyota-Stern predictions	predictions using fraction least traded	2005 fraction least traded
Agriculture	4.4	0.98	0.00	0.2	0.64	0.00
Chemicals	0.4	1.53	0.00	0.0	1.13	0.01
Food, bev., and tobacco	2.0	1.80	0.01	0.1	0.85	0.00
Leather and footwear	0.4	2.34	0.01	−0.1	0.79	0.00
Machinery and equip.	0.3	0.86	0.00	0.0	0.66	0.00
Metal products	0.3	1.78	0.01	0.0	1.06	0.00
Mining	0.1	0.84	0.00	0.0	0.43	0.00
Misc. manufactures	0.5	1.06	0.00	0.0	0.92	0.00
Natural resources	0.4	3.14	0.01	0.0	1.06	0.00
Nonmetallic min. prod.	0.6	4.39	0.02	0.0	0.92	0.00
Textiles	−0.1	2.18	0.01	−0.4	2.54	0.02
Transportation equip.	0.0	0.54	0.00	−0.1	0.45	0.00
Wearing apparel	−0.1	2.71	0.01	−0.5	1.11	0.01
Wood products	0.1	1.48	0.00	0.0	0.80	0.00
KS-LTP weighted correlation			**0.12**			**−0.35**

* $\alpha = (15.55)(0.026) = 0.41$ for U.S. imports and $\alpha = (13.885)(0.031) = 0.43$ for U.S. exports

Table 5
Predicted relative changes in Korean trade relative to Korean GDP in the Yaylaci-Shikher Model (Percent)

industry	Korea to United States			United States to Korea		
	Yaylaci-Shikher predictions	predictions using fraction least traded	2005 fraction least traded	Yaylaci-Shikher predictions	predictions using fraction least traded	2005 fraction least traded
Chemicals	28.2	54.00	0.36	30.3	20.70	0.16
Electrical machinery	15.5	−0.44	0.02	41.0	−3.02	0.04
Food	70.1	86.03	0.56	422.3	26.63	0.19
Other machinery	8.9	9.17	0.08	31.9	6.86	0.09
Medical	9.9	74.82	0.49	45.0	−1.05	0.05
Metals	9.3	17.18	0.13	17.0	28.61	0.20
Nonmetals	20.5	39.59	0.27	38.7	80.00	0.46
Other	11.8	50.80	0.34	28.5	40.47	0.26
Paper	1.4	105.24	0.68	5.5	6.86	0.09
Petroleum	2.2	15.57	0.12	7.2	−5.00	0.03
Metal products	14.2	62.01	0.41	33.8	20.70	0.16
Rubber	19.8	10.77	0.09	48.0	22.68	0.17
Textile	56.3	58.81	0.39	63.5	117.56	0.65
Transportation equip.	23.3	−2.04	0.01	33.9	−5.00	0.03
Wood	7.9	29.99	0.21	21.1	38.49	0.25
Chemicals	28.2	54.00	0.36	30.3	20.70	0.16
KS-LTP weighted correlation			**0.43**			**0.19**

Table 6
Changes in Canada-U.S. trade relative to exporter's GDP (percent)

Canada to United States						United States to Canada					
ISIC code	growth	share least traded	ISIC code	growth	share least traded	ISIC code	growth	share least traded	ISIC code	growth	share least traded
111	63.6	0.38	**341**	−65.9	0.04	**111**	−3.1	0.17	**341**	13.7	0.15
113	−19.2	1.00	**342**	0.7	0.12	**113**	−64.1	0.56	**342**	−19.6	0.05
121	−4.5	1.00	**351**	42.1	0.35	**121**	7.1	1.00	**351**	16.7	0.29
122	−17.8	1.00	**352**	502.8	0.58	**122**	−10.3	0.05	**352**	116.6	0.16
130	−35.8	0.03	**353**	−80.3	0.07	**130**	−12.3	0.21	**353**	−43.1	0.13
210	38.5	1.00	**354**	318.6	1.00	**210**	−53.6	0.00	**354**	−89.9	1.00
220	291.3	0.00	**355**	19.8	0.10	**220**	457.6	0.04	**355**	7.1	0.05
230	−52.6	0.13	**356**	77.6	0.09	**230**	−15.4	0.08	**356**	62.5	0.06
290	−14.1	0.46	**361**	−79.9	1.00	**290**	−38.9	0.71	**361**	−11.0	1.00
311	145.3	0.26	**362**	−45.7	0.40	**311**	96.7	0.27	**362**	−20.0	0.23
312	217.2	0.48	**369**	1.6	0.37	**312**	174.3	0.18	**369**	−0.8	0.54
313	−39.8	0.09	**371**	−12.7	0.36	**313**	350.4	0.22	**371**	53.5	0.28
314	−16.8	0.07	**372**	−20.9	0.07	**314**	−6.5	1.00	**372**	−20.8	0.11
321	42.4	0.77	**381**	17.7	0.20	**321**	−35.9	0.52	**381**	−5.3	0.16
322	50.2	0.59	**382**	−8.4	0.21	**322**	−3.0	1.00	**382**	−38.9	0.08
323	−67.7	1.00	**383**	−16.4	0.15	**323**	−64.0	0.61	**383**	−42.6	0.05
324	−49.9	1.00	**384**	−44.3	0.01	**324**	−67.2	0.34	**384**	−37.8	0.01
331	−54.5	0.01	**385**	91.9	0.42	**331**	−30.6	0.07	**385**	−6.0	0.14
332	−46.6	0.00	**390**	−14.9	0.51	**332**	22.5	0.00	**390**	−48.1	0.17
weighted correlation with data					0.23	**weighted correlation with data**					0.28
regression coefficient α					−16.89	**regression coefficient** α					−28.22
regression coefficient β					149.92	**regression coefficient** β					112.55

Table 7
Changes in Canada-Mexico trade relative to exporter's GDP (percent)

Canada to Mexico						Mexico to Canada					
ISIC code	growth	share least traded	ISIC code	growth	share least traded	ISIC code	growth	share least traded	ISIC code	growth	share least traded
111	415.2	0.03	**341**	214.7	0.04	**111**	109.6	0.08	**341**	46.1	0.14
113	-	-	**342**	1887.8	1.00	**113**	−94.8	1.00	**342**	2412.5	1.00
121	360.1	1.00	**351**	953.9	0.20	**121**	64.8	1.00	**351**	248.5	1.00
122	-	-	**352**	2122.2	0.39	**122**	-	-	**352**	304.0	0.80
130	247.4	0.07	**353**	489.2	1.00	**130**	−26.3	1.00	**353**	-	-
210	-	-	**354**	-	-	**210**	-	-	**354**	2814.8	1.00
220	-	-	**355**	2709.5	0.44	**220**	140.1	0.00	**355**	899.7	1.00
230	242.8	0.26	**356**	3707.4	0.00	**230**	199.2	1.00	**356**	145.6	0.11
290	−41.9	0.01	**361**	1924.5	1.00	**290**	−77.6	0.01	**361**	−13.0	0.10
311	163.3	0.02	**362**	519.7	1.00	**311**	128.8	0.45	**362**	140.9	1.00
312	1343.9	0.15	**369**	1491.8	1.00	**312**	1262.6	1.00	**369**	52.3	1.00
313	4799.7	1.00	**371**	190.2	0.02	**313**	175.6	0.00	**371**	−50.9	0.07
314	-	-	**372**	442.0	0.07	**314**	668.1	1.00	**372**	276.9	0.45
321	656.4	0.49	**381**	2843.9	0.73	**321**	−39.2	0.29	**381**	124.0	0.05
322	3553.9	1.00	**382**	1360.5	0.19	**322**	703.5	1.00	**382**	263.7	0.08
323	165.1	1.00	**383**	2293.0	0.23	**323**	71.5	1.00	**383**	119.3	0.00
324	23.6	1.00	**384**	6352.2	0.27	**324**	−41.2	0.15	**384**	2784.4	1.00
331	16636.0	0.97	**385**	1333.9	0.44	**331**	419.1	1.00	**385**	−7.3	0.44
332	12913.0	1.00	**390**	29.1	0.07	**332**	1402.1	0.01	**390**	46.1	0.14
weighted correlation with data					0.55	**weighted correlation with data**					0.32
regression coefficient α					273.01	**regression coefficient α**					107.47
regression coefficient β					4253.33	**regression coefficient β**					363.23

Table 8
Changes in Mexico-U.S. trade relative to exporter's GDP (percent)

Mexico to United States						United States to Mexico					
ISIC code	growth	share least traded	ISIC code	growth	share least traded	ISIC code	growth	share least traded	ISIC code	growth	share least traded
111	−10.0	0.05	**341**	−61.0	0.23	**111**	48.5	0.08	**341**	29.4	0.07
113	31.2	1.00	**342**	212.3	1.00	**113**	1.8	1.00	**342**	194.9	0.13
121	−8.1	1.00	**351**	−5.7	0.62	**121**	−36.8	0.30	**351**	177.7	0.21
122	−94.7	1.00	**352**	150.2	0.48	**122**	−71.2	1.00	**352**	336.5	0.27
130	−66.2	0.08	**353**	−98.0	0.12	**130**	63.9	0.18	**353**	−71.5	0.06
210	−99.9	1.00	**354**	50.8	1.00	**210**	1457.8	1.00	**354**	−95.3	1.00
220	35.5	0.00	**355**	110.4	1.00	**220**	109.1	0.00	**355**	242.2	0.16
230	−75.3	0.25	**356**	173.3	0.03	**230**	37.6	0.19	**356**	138.4	0.02
290	−78.3	0.10	**361**	82.0	0.41	**290**	26.3	0.51	**361**	39.0	0.47
311	86.5	0.37	**362**	12.1	0.16	**311**	98.2	0.17	**362**	53.8	0.39
312	279.7	1.00	**369**	−37.2	0.24	**312**	504.4	0.07	**369**	66.5	0.61
313	161.1	0.01	**371**	18.5	0.28	**313**	179.9	0.32	**371**	84.0	0.24
314	−61.8	1.00	**372**	53.8	0.12	**314**	504.2	1.00	**372**	104.6	0.12
321	89.6	0.72	**381**	80.4	0.30	**321**	125.7	0.43	**381**	84.7	0.14
322	449.4	0.42	**382**	171.3	0.14	**322**	63.9	0.24	**382**	102.8	0.09
323	−66.8	0.53	**383**	46.5	0.02	**323**	58.4	0.67	**383**	59.5	0.01
324	−62.1	0.03	**384**	127.0	0.02	**324**	−58.5	0.10	**384**	79.3	0.02
331	−74.8	0.12	**385**	235.3	0.24	**331**	−21.6	0.09	**385**	122.5	0.11
332	64.9	0.00	**390**	−59.8	0.24	**332**	6.6	0.00	**390**	51.0	0.17
weighted correlation with data					0.09	**weighted correlation with data**					0.37
regression coefficient α					54.92	**regression coefficient α**					65.96
regression coefficient β					43.54	**regression coefficient β**					228.93

Table 9
Changes in North American trade relative to exporter's GDP: Estimates from industry data versus estimates from product data

			industry data		product data	
exporter	**importer**	**period**	α	β	$\tilde{\alpha}$	$\tilde{\beta}$
Canada	Mexico	89–09	273.01	4253.33	452.67	2483.99
Canada	United States	89–09	−16.89	149.92	−14.57	126.73
Mexico	Canada	89–09	107.47	363.23	96.13	476.67
Mexico	United States	89–09	54.92	43.54	46.89	123.86
United States	Canada	89–09	−28.22	112.55	−21.61	46.48
United States	Mexico	89–09	65.96	228.93	78.46	103.92
weighted correlation $\alpha, \tilde{\alpha}$			0.97			
weighted correlation $\beta, \tilde{\beta}$				0.91		

Table 10
Changes in Canada-U.S. trade relative to exporter's GDP (percent)

industry	Canada to United States			United States to Canada		
	1989–2009 data	BDS model growth rate	1989 fraction least traded	1989–2009 data	BDS model growth rate	1989 fraction least traded
Agriculture	12.5	3.4	0.26	−6.4	5.1	0.19
Mining and quarrying	237.6	0.4	0.05	51.3	1.0	0.16
Food	101.2	8.9	0.24	124.1	12.7	0.25
Textiles	42.4	15.3	0.77	−35.9	44.0	0.52
Clothing	50.2	45.3	0.59	−3.0	56.7	1.00
Leather products	−67.7	11.3	1.00	−64.0	7.9	0.61
Footwear	−49.9	28.3	1.00	−67.2	45.7	0.34
Wood products	−54.5	0.1	0.01	−30.6	6.7	0.07
Furniture and fixtures	−46.6	12.5	0.00	22.5	35.6	0.00
Paper products	−65.9	−1.8	0.04	13.7	18.9	0.15
Printing and publishing	0.7	−1.6	0.12	−19.6	3.9	0.05
Rubber products	45.8	9.5	0.10	30.2	19.1	0.05
Chemicals	99.6	−3.1	0.38	50.2	21.8	0.24
Petroleum products	−79.8	0.5	0.07	−43.1	0.8	0.13
Glass products	−45.7	30.4	0.40	−20.0	4.4	0.23
Nonmetal mineral prod.	−0.4	1.2	0.38	−1.9	11.9	0.59
Iron and steel	−12.7	12.9	0.36	53.5	11.6	0.28
Nonferrous metals	−20.9	18.5	0.07	−20.8	−6.7	0.11
Metal products	17.7	15.2	0.20	−5.3	18.2	0.16
Nonelectrical machinery	−8.4	3.3	0.21	−38.9	9.9	0.08
Electrical machinery	−16.4	14.5	0.15	−42.6	14.9	0.05
Transportation equip.	−44.3	10.7	0.01	−37.8	−4.6	0.01
Misc. manufactures	56.1	−2.1	0.45	−19.2	11.5	0.15
weighted correlation with data		−0.28	0.30		0.39	0.54
regression coefficient $a \backslash \alpha$		21.82	−20.42		−26.62	−34.54
regression coefficient $b \backslash \beta$		−3.33	185.24		1.34	175.84
BDS-LTP weighted correlation			−0.11			0.70

Table 11
Changes in Canada-Mexico trade relative to exporter's GDP (percent)

industry	Canada to Mexico			Mexico to Canada		
	1989–2009 data	**BDS model growth rate**	**1989 fraction least traded**	**1989–2009 data**	**BDS model growth rate**	**1989 fraction least traded**
Agriculture	410.8	3.1	0.04	105.5	−4.1	0.11
Mining and quarrying	6.9	−0.3	0.03	77.8	27.3	0.03
Food	181.2	2.2	0.02	175.3	10.8	0.22
Textiles	656.4	−0.9	0.49	−39.2	21.6	0.29
Clothing	3553.9	1.3	1.00	703.5	19.2	1.00
Leather products	165.1	1.4	1.00	71.5	36.2	1.00
Footwear	23.6	3.7	1.00	−41.2	38.6	0.15
Wood products	16636.0	4.7	0.97	419.1	15.0	1.00
Furniture and fixtures	12913.0	2.7	1.00	1402.1	36.2	0.01
Paper products	214.7	−4.3	0.04	46.1	32.9	0.14
Printing and publishing	1887.8	−2.0	1.00	2412.5	15.0	1.00
Rubber products	3185.0	−1.0	0.23	1416.2	−6.7	1.00
Chemicals	1249.4	−7.8	0.25	272.7	36.0	0.91
Petroleum products	489.2	−8.5	1.00	0.0	32.9	0.00
Glass products	519.7	−2.2	1.00	−13.0	13.3	0.10
Nonmetal mineral prod.	1497.6	−1.8	1.00	143.8	5.7	0.45
Iron and steel	190.2	−15.0	0.02	52.3	19.4	1.00
Nonferrous metals	442.0	−64.7	0.07	−50.9	138.1	0.07
Metal products	2843.9	−10.0	0.73	276.9	41.9	0.45
Nonelectrical machinery	1360.5	−8.9	0.19	124.0	17.3	0.05
Electrical machinery	2293.0	−26.2	0.23	263.7	137.3	0.08
Transportation equip.	6352.2	−4.4	0.27	119.3	3.3	0.00
Misc. manufactures	409.9	−12.1	0.18	523.4	61.1	0.55
Weighted correlation with data		−0.10	0.55		0.06	0.33
Regression coefficient $a \setminus \alpha$		645.29	254.23		135.79	115.16
Regression coefficient $b \setminus \beta$		−7.94	4468.37		0.16	286.39
BDS-LTP weighted correlation			−0.12			0.02

Table 12
Changes in Mexico-U.S. trade relative to exporter's GDP (percent)

industry	Mexico to United States			United States to Mexico		
	1989–2009 data	BDS model growth rate	1989 fraction least traded	1989–2009 data	BDS model growth rate	1989 fraction least traded
Agriculture	−20.1	2.5	0.07	46.6	7.9	0.10
Mining and quarrying	27.0	26.9	0.01	86.2	0.5	0.18
Food	119.5	7.5	0.27	129.5	13.0	0.17
Textiles	89.6	11.8	0.72	125.7	18.6	0.43
Clothing	449.4	18.6	0.42	63.9	50.3	0.24
Leather products	−66.8	11.7	0.53	58.4	15.5	0.67
Footwear	−62.1	4.6	0.03	−58.5	35.4	0.10
Wood products	−74.8	−2.7	0.12	−21.6	7.0	0.09
Furniture and fixtures	64.9	7.6	0.00	6.6	18.6	0.00
Paper products	−61.0	13.9	0.23	29.4	−3.9	0.07
Printing and publishing	212.3	3.9	1.00	194.9	−1.1	0.13
Rubber products	147.1	−5.3	0.43	165.9	12.8	0.06
Chemicals	27.9	17.0	0.59	208.2	−8.4	0.23
Petroleum products	−98.0	34.1	0.12	−71.6	−7.4	0.06
Glass products	12.1	32.3	0.16	53.8	42.3	0.39
Nonmetal mineral prod.	−19.5	3.7	0.26	57.8	0.8	0.57
Iron and steel	18.5	30.8	0.28	84.0	−2.8	0.24
Nonferrous metals	53.8	156.5	0.12	104.6	−55.1	0.12
Metal products	80.4	26.8	0.30	84.7	5.4	0.14
Nonelectrical machinery	171.3	18.5	0.14	102.8	−2.9	0.09
Electrical machinery	46.5	178.0	0.02	59.5	−10.9	0.01
Transportation equip.	127.0	6.2	0.02	79.3	9.9	0.02
Misc. manufactures	92.8	43.2	0.24	96.6	−9.4	0.13
weighted correlation with data		−0.13	0.19		−0.06	0.47
regression coefficient $a \setminus \alpha$		66.64	51.52		88.47	62.31
regression coefficient $b \setminus \beta$		−0.11	77.54		−0.24	265.44
BDS-LTP weighted correlation			-0.32			0.21

Table 13
Changes in North American trade relative to exporter's GDP:
BDS model versus least traded products exercise

			BDS model			fraction least traded		
exporter	**importer**	**period**	**correlation with data**	***a***	***b***	**correlation with data**	α	β
Canada	Mexico	89–09	−0.10	645.29	−7.94	0.55	254.23	4468.37
Canada	United States	89–09	−0.28	21.82	−3.33	0.30	−20.42	185.24
Mexico	Canada	89–09	0.06	135.79	0.16	0.33	115.16	286.39
Mexico	United States	89–09	−0.13	66.64	−0.11	0.19	51.52	77.54
United States	Canada	89–09	0.39	−26.62	1.34	0.54	−34.54	175.84
United States	Mexico	89–09	−0.06	88.47	−0.24	0.47	62.31	265.44
weighted average			−0.00	19.83	−0.94	0.39	−5.74	87.29
pooled regression			0.06	10.54	0.17	0.24	−5.30	181.18

Table 14
Changes in North American trade relative to exporter's GDP:
Least traded products predictions at the 3-digit ISIC level and BDS industry level

			3-digit ISIC industries			BDS industries		
exporter	**importer**	**period**	**correlation with data**	α	β	**correlation with data**	α	β
Canada	Mexico	89–09	0.55	273.01	4253.33	0.55	254.23	4468.37
Canada	United States	89–09	0.23	−16.89	149.92	0.30	−20.42	185.24
Mexico	Canada	89–09	0.32	107.47	363.23	0.33	115.16	286.39
Mexico	United States	89–09	0.09	54.92	43.54	0.19	51.52	77.54
United States	Canada	89–09	0.28	−28.22	112.55	0.54	−34.54	175.84
United States	Mexico	89–09	0.37	65.96	228.93	0.47	62.31	265.44
weighted average			0.25	−1.29	141.12	0.39	−5.74	87.29
pooled regression			0.18	−0.97	137.93	0.24	−5.30	181.18

Table 15
Changes in North American trade relative to exporter's GDP:
BDS model versus least traded products exercise with different time period

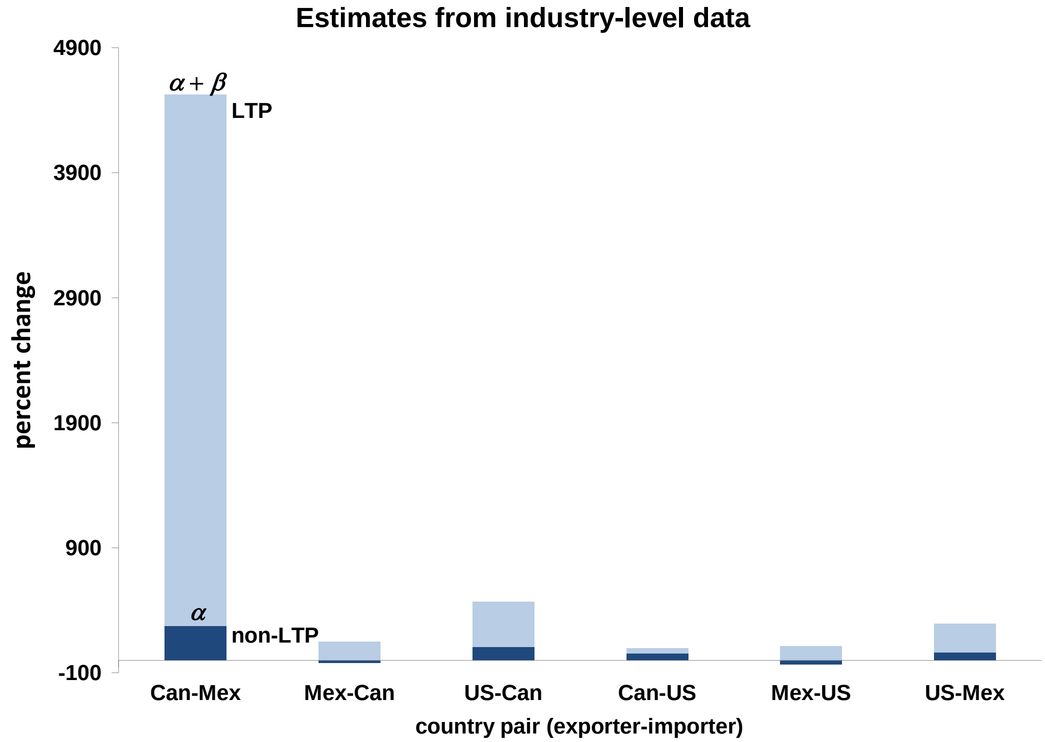
			BDS model			fraction least traded		
exporter	**importer**	**period**	**correlation with data**	***a***	***b***	**correlation with data**	α	β
Canada	Mexico	88–07	−0.38	204.31	−13.76	0.35	191.25	758.85
Canada	United States	88–07	−0.15	39.77	−1.82	0.26	11.73	154.16
Mexico	Canada	88–07	0.22	110.33	0.89	0.26	113.38	350.61
Mexico	United States	89–07	−0.16	73.15	−0.15	0.09	58.64	44.38
United States	Canada	88–07	0.36	−6.58	1.30	0.58	−17.77	195.08
United States	Mexico	89–07	0.02	104.16	0.07	0.33	83.32	207.25
weighted average			0.05	36.27	−0.32	0.36	16.82	162.61
pooled regression			0.04	31.94	0.08	0.25	17.67	154.20

Table 16
Changes in North American trade deflated by exporter's PPI:
Growth due to quantities versus change due to prices

			average share of total growth (%)	
exporter	**importer**	**period**	***P***	***Q***
Canada	Mexico	89–09	3.2	96.8
Canada	United States	89–09	0.1	99.9
Mexico	Canada	89–09	32.5	67.5
Mexico	United States	89–09	19.0	81.0
United States	Canada	89–09	−9.0	109.0
United States	Mexico	89–09	5.5	94.5
weighted average			0.1	99.9
pooled			1.1	98.9

Figure 1

Estimated growth rates from industry-level and product-level data:



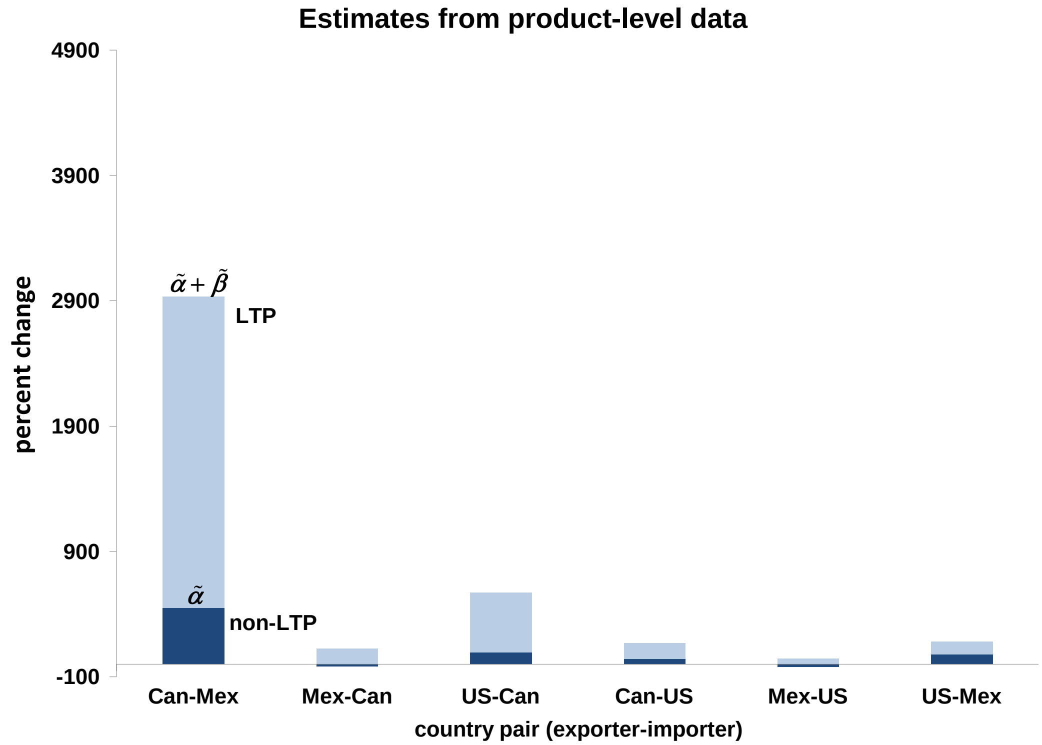


Figure 2

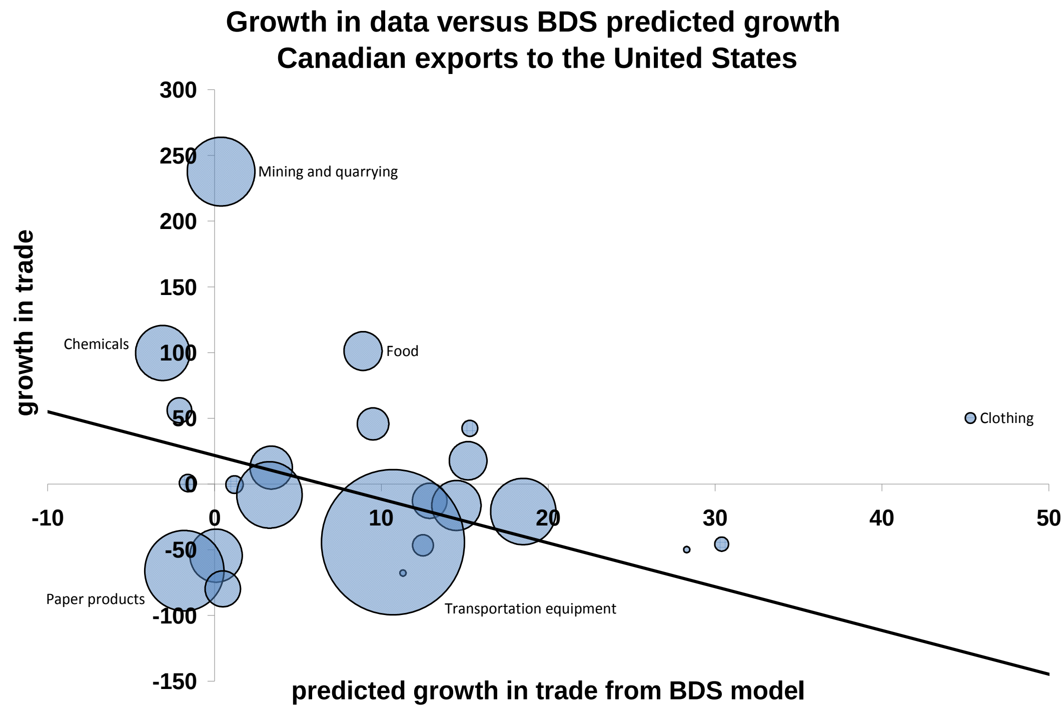


Figure 3

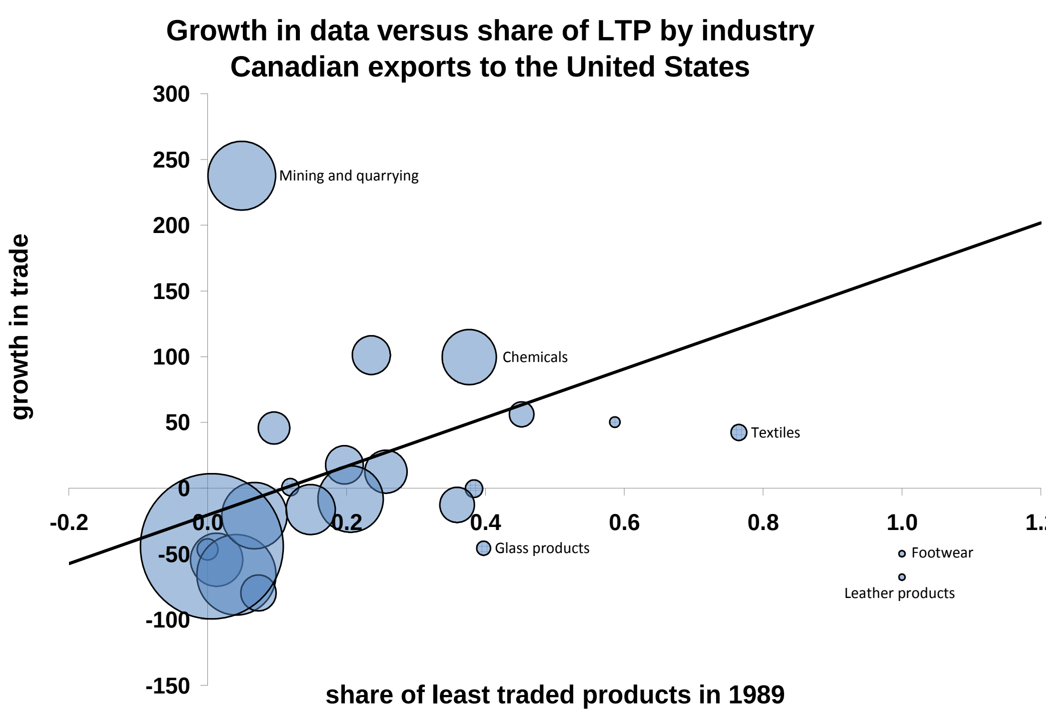


Table A1
Changes in Canadian trade relative to Canadian GDP
in the Cox-Harris Model (Percent)

	exports to World			imports from World		
industry	**1989–2009 data**	**C-H growth rate**	**1989 fraction least traded**	**1989–2009 data**	**C-H growth rate**	**1989 fraction least traded**
Agriculture	39.1	−4.1	0.09	−7.6	7.2	0.12
Chem. & misc. man.	70.9	28.1	0.24	29.7	10.4	0.15
Fishing	−30.9	−5.4	0.02	8.3	9.5	0.12
Food, bev., and tobacco	95.5	18.6	0.14	52.0	3.8	0.12
Forestry	−24.8	−11.5	0.26	−14.8	7.1	0.14
Machinery and appl.	11.7	57.1	0.14	−23.9	13.3	0.05
Mining	117.0	−7.0	0.02	65.4	4.0	0.05
Nonmetallic minerals	20.9	31.8	0.39	−15.8	7.3	0.29
Refineries	−67.8	−2.7	0.05	−77.1	1.5	0.06
Rubber and plastics	107.3	24.5	0.20	27.1	13.8	0.04
Steel and metal products	6.6	19.5	0.12	8.5	10.0	0.11
Textiles and leather	18.4	108.8	0.55	−20.1	18.2	0.15
Transportation equip.	−37.5	3.5	0.01	−34.6	3.0	0.00
Wood and paper	−58.5	7.3	0.02	−8.1	7.2	0.07
weighted correlation with data		0.06	0.39		0.04	0.56
regression coefficient $a \backslash \alpha$		2.00	−14.70		−10.57	−29.22
regression coefficient $b \backslash \beta$		0.16	256.64		0.24	311.10
CH-LTP weighted regression			0.75			0.44

Table A2
Changes in Mexican trade relative to Mexican GDP in the Sobarzo Model (Percent)

	exports to North America			imports from North America		
industry	**1989–2009 data**	**Sobarzo growth rate**	**1989 fraction least traded**	**1989–2009 data**	**Sobarzo growth rate**	**1989 fraction least traded**
Agriculture	−15.3	−11.1	0.07	61.0	3.4	0.09
Beverages	161.8	5.2	0.01	189.0	−1.8	0.32
Chemicals	34.1	−4.4	0.60	218.5	−2.7	0.23
Electrical machinery	54.7	1.0	0.02	66.3	9.6	0.01
Food	100.8	−6.9	0.41	128.8	-5.0	0.15
Iron and steel	19.6	-4.9	0.30	92.0	17.7	0.23
Leather	-64.6	12.4	0.54	60.0	-0.4	0.67
Metal products	86.2	-4.4	0.30	94.8	9.5	0.14
Mining	27.7	-17.0	0.01	79.4	13.2	0.16
Nonelectrical machinery	166.5	-7.4	0.13	115.8	20.7	0.09
Nonferrous metals	36.8	-9.8	0.11	113.9	9.8	0.12
Nonmetallic min. prod.	-16.0	-6.2	0.27	64.3	10.9	0.57
Other manufactures	88.4	-4.5	0.23	96.7	4.2	0.16
Paper	-35.9	-7.9	0.30	49.7	-4.7	0.07
Petroleum	−98.0	−19.5	0.12	−71.2	−6.8	0.06
Rubber	158.9	12.8	0.44	178.2	−0.1	0.06
Textiles	69.5	1.9	0.65	131.3	−1.2	0.43
Tobacco	−61.3	2.8	1.00	575.5	−11.6	1.00
Transportation equip.	126.1	−5.0	0.02	97.7	11.2	0.02
Wearing apparel	197.2	30.0	0.24	29.2	4.5	0.20
Wood	30.8	−8.5	0.04	2.9	11.7	0.05
weighted correlation with data		0.43	0.04		−0.12	0.47
regression coefficient $a \backslash \alpha$		81.13	62.13		104.22	71.32
regression coefficient $b \backslash \beta$		3.06	15.73		−0.77	271.10
Sobarzo-LTP weighted correlation			0.20			−0.32