CENTER FOR ECONOMIC AND POLICY RESEARCH

Trade and Jobs:

Can We Trust the Models?

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Introduction

With the Trans-Pacific Partnership (TPP) likely to be submitted to Congress for approval in the near future, there has been a flurry of reports and articles on its likely impact on the economy. In particular, the projections from a model developed by Peter Petri and Michael Plummer have received a great deal of attention (Petri and Plummer 2016). The projections from their model, which were published by the Peterson Institute showed that the gains to the U.S. economy from the TPP would be 0.5 percent of GDP when the impact of the agreement is fully realized in 2030. This projection and other projections from the model have been widely cited. In addition, Robert Lawrence used the industry specific projections of job losses and gains to produce estimates of the transition costs that the workers displaced as a result of the agreement would experience (Lawrence 2016).

While proponents of the TPP have eagerly cited these studies to support their case, it is important to recognize that the projections are only useful insofar as the Petri and Plummer model can be seen as an accurate guide to the outcome of trade agreements. After all, it is possible to produce models that show radically different effects. For example, a model developed by Francis Cripps and Alex Izurieta showed the TPP would actually cost the United States 448,000 jobs and lead to a loss in GDP of 0.54 percent by 2025 (Capaldo and Izurieta 2016).

This paper examines the extent to which computable general equilibrium (CGE) models of the type used by Petri and Plummer, and also by the International Trade Commission (ITC), can be seen as providing useful predictions of the impact of trade agreements. The main focus will be an analysis of predictions for the impact of the recent trade agreement that the United States signed with South Korea. It compares the projections for winning and losing industries with actual outcomes. An appendix examines the Petri and Plummer projections for job-losing industries by applying their projections to a more detailed industry list.

The Track Record of Computable General Equilibrium Models

Computable General Equilibrium (CGE) models have long been the standard tool within the economics profession for predicting the impact of trade agreements. These models include a number of inherently unrealistic assumptions, most importantly that the economy is near its full employment level of output. This assumption can be justified if it is assumed that the economy generally remains close to its full employment level of output or, at least, that departures from full employment due to recessions are not long lasting.

CGE models also implicitly assume that the trade deals themselves do not directly affect macroeconomic outcomes, for example by leading to a larger trade deficit that can result in a loss of aggregate demand and higher levels of unemployment. In this respect, it is worth noting that following three of the major trade openings by the United States in the last quarter century — the North American Free Trade Agreement (NAFTA), Permanent Normal Trade Relations with China, and the Korea–U.S. Free Trade Agreement (KORUS) — there was a large increase in the U.S. trade deficit with the partner country. While the rise in the trade deficit may have been due to factors other than the agreement itself, the impact of this deficit overwhelmed the impact of reducing trade barriers projected in the CGE models. In other words, the unpredicted impact of the rise in the trade deficit was far larger than any of the predicted effects from these models.

Even if the CGE models did not capture the factors that led to the rise in the trade deficits in these cases, it is interesting to ask whether they at least correctly identified the winning and losing sectors. In this area, their track record has not been especially good either. Grinspun examined the industry-specific projections of winners and losers from the U.S.–Canada trade agreement that took effect in 1988 (Grinspun 1991). The analysis found that there was virtually no correlation between projections of gaining and losing industries across models, nor was there a strong correlation between any of the models' projections and the actual changes in industry output following the implementation of the agreement.

In a similar vein, Kehoe (2005) examined the accuracy of the projections of three frequently cited CGE models on the impact of NAFTA. This analysis found that these models hugely underestimated the overall impact of NAFTA on trade. It also found little correlation between the projections of winners and losers across industries.

The KORUS provides another opportunity to assess the accuracy of CGE models. The analysis in the next section examines the extent to which the projections of the impact of the KORUS from the CGE model used by the ITC coincided with the subsequent changes in trade patterns.[1]

The Accuracy of the ITC Projections of the Impact of the KORUS

In May of 2007, the ITC issued a report analyzing the likely impact of the KORUS on the U.S. economy. At the center of this analysis were its projections for its industry-specific impact from its CGE model. As is standard with CGE models, the projections assume no impact on aggregate demand and employment, apart from the extent to which higher productivity can lead to higher wages, which in turn induce more people to work. The model assumes that the trade agreement itself has no direct impact on aggregate demand over the time period examined.

As a practical matter, there were major macroeconomic developments between when the projections were made in 2007 and when the agreement finally took effect in 2012. The collapse of the housing bubble threw the U.S. economy into the worst recession since the Great Depression. A similar collapse in Europe pushed most of the world into a recession. As a result, the macroeconomic environment was clearly quite different in 2012 when the agreement took effect than in 2007 when the ITC made its projections.

It is also worth noting that there was a large and unpredicted increase in the size of the U.S. trade deficit with South Korea following the implementation of the KORUS. The U.S. trade deficit with South Korea more than doubled from $13.2 billion in 2011, the last year before the agreement took effect to $28.3 billion in 2015.[2] While this rise in the trade deficit may not have been a direct result of the KORUS, at the least it indicates that large factors were affecting U.S. trade with Korea that were not assumed by the ITC model.

Even if the ITC model failed to pick up this large rise in the trade deficit, it is still possible that it was at least successful in identifying the relative winners and losers by sector. To assess its accuracy

1 ITC (2007).

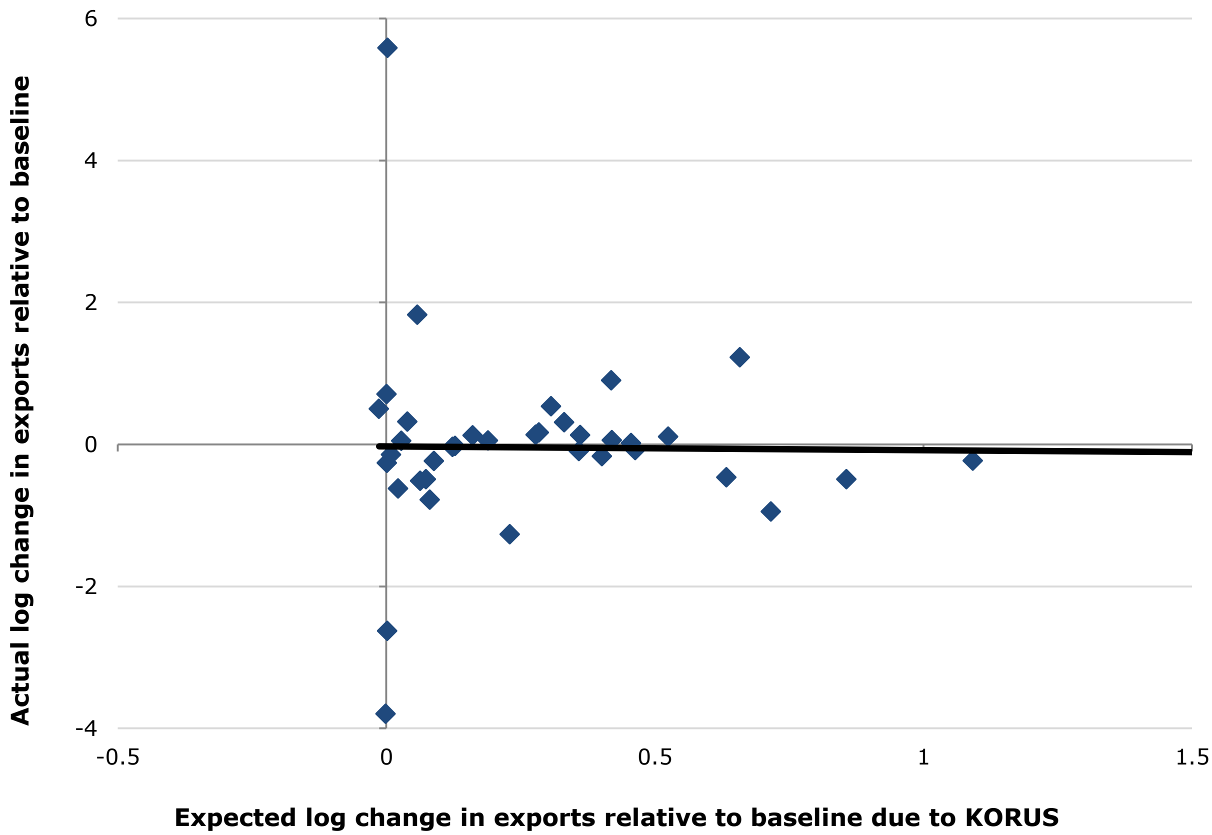
2 Bureau of the Census (2016).

in these projections, we constructed a counterfactual baseline, which assumed that imports and exports by sector both followed the trend path that they were on before the KORUS took effect for each of the 38 industries for which the ITC report made projections. Since there are substantial annual variations in reported export and import levels by industry, three-year averages were used for the years 2006–08 and 2009–11. We calculated the growth for each industry between these two periods and projected that it would continue through the years 2013–15. This was the baseline used for comparison with the actual change in exports and imports by sector.

We then calculated the variation between actual exports and imports in 2013–15 and the constructed baseline. The percentage changes were then regressed against the percentage changes projected by the ITC model. The first column of **Table 1** shows the regression results for export industries. As can be seen, the coefficient of the predicted change is negative, albeit nowhere close to statistically significant. This means that the ITC model's predictions of which industries would see their exports increase the most as a result of the KORUS were of little value, and in fact predicted winners were more likely to be losers and vice versa. **Figure 1** shows the actual percent change in exports by industry against the projected percent change.

FIGURE 1

Expected and Actual Changes in Exports Relative to Baseline (Robust Regression)



Source and notes: ITC (2016), United Nations (2016), and authors' calculations.

As Figure 1 shows, there is no clear relationship between the expected effect of the KORUS on exports to Korea and the actual change in exports relative to trend. Indeed, some sectors for which the ITC did not expect large effects saw very large changes in U.S. exports. For example, sugar plant exports had been falling rapidly prior to the KORUS and rebounded much more rapidly than ITC's projection of 0.2–0.3 percent. At the other extreme, U.S. exports of coal fell rapidly and exports of oil and gas grew far less rapidly than they had prior to the KORUS.

TABLE 1

Export Regressions

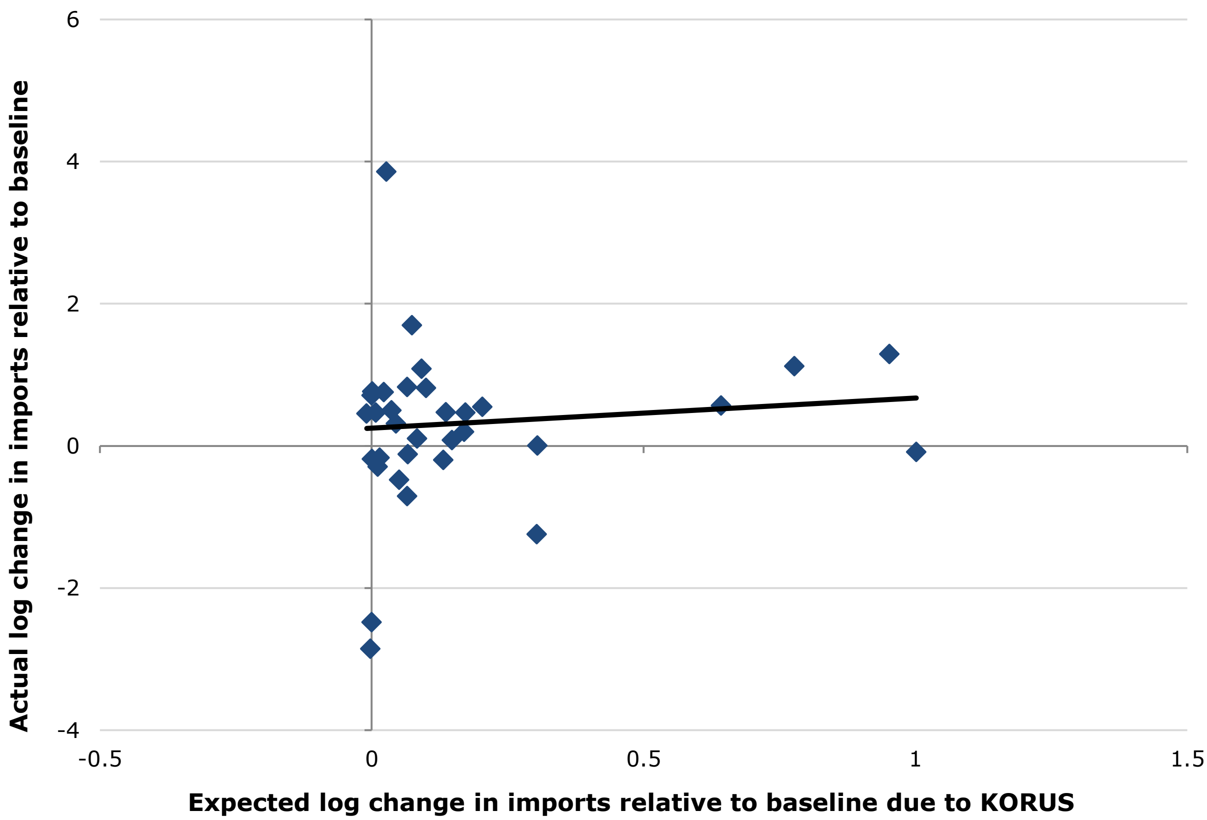
Dependent Variable	Percent Change		Log Change	
Regression Type	OLS	Robust	OLS	Robust
Expected change	-7.1 (7.6)	0.003 (0.119)	-0.04 (0.58)	-0.05 (0.26)
Constant	1026 (1013)	-8 (9)	-0.001 (0.375)	-0.03 (0.11)

Source and notes: Authors' estimates using ITC (2016) and United Nations (2016). "OLS" is ordinary least squares with robust standard errors; "Robust" is regression with screening for outliers. Standard errors in parentheses: ** 1 percent; * 5 percent; # 10 percent.

We did the same exercise with imports. In this case also the coefficient on the predicted change was negative, as shown in the first column of **Table 2**. As was the case with exports, the ITC predictions that an industry would see a sharp rise in imports was likely to indicate the opposite, although again the result is nowhere near being statistically significant. **Figure 2** shows the actual percent change in imports from baseline by industry against the percent change projected by the ITC report.

FIGURE 2

Expected and Actual Changes in Imports Relative to Baseline



Source and notes: ITC (2016), United Nations (2016), and authors' calculations.

As with U.S. exports to Korea, imports from Korea looked very different than what pre-KORUS trends would suggest — even accounting for the predicted effects of the agreement. Imports from forestry and logging were falling prior to KORUS coming into effect, yet doubled in the years that followed. The ITC predicted no effect on sugar imports from the KORUS but actual imports fell after rapid import growth in the years leading up. Similarly, the ITC predicted KORUS would shrink coal imports by as much as 0.3 percent, but after years of increases, coal imports from Korea fell by a factor of 10 in the years after the agreement.

TABLE 2

Import Regressions				
Dependent Variable	Percent Change		Log Change	
Regression Type	OLS	Robust	OLS	Robust
Expected change	-1.0 (1.7)	0.7 (0.3)*	0.6 (0.6)	0.4 (0.5)
Constant	218 (179)	24 (18)#	0.2 (0.3)	0.2 (0.1)#

Source and notes: Authors' estimates using ITC (2016) and United Nations (2016). "OLS" is ordinary least squares with robust standard errors; "Robust" is regression with screening for outliers. Standard errors in parentheses: ** 1 percent; * 5 percent; # 10 percent.

In short, in the case of both exports and imports, the ITC model not only missed the large rise in the trade deficit that followed the implementation of the KORUS, it also misidentified the winning and losing industries. It clearly was not a useful guide as to the expected impact of KORUS on U.S. trade with Korea.

Conclusion

This paper notes the poor track record of CGE models like the ones used by the Peterson Institute and the ITC in projecting the changes in patterns of trade following recent trade deals. These models failed to project the large rise in the U.S. trade deficit with Mexico following the implementation of NAFTA or with South Korea following the implementation of KORUS. Past research has shown that these models also failed to correctly identify the winning and losing industries in trade with Mexico following NAFTA. This analysis shows that the ITC model similarly failed to identify winning and losing industries following the implementation of the KORUS.

This history should raise questions about the accuracy of projections from CGE models being used to project the impact of the TPP, such as the Petri and Plummer model or the CGE model that the ITC will be using for its forthcoming analysis. These models have not only failed to predict major changes in the trade balance, they also have been largely unsuccessful in identifying the industries that win and lose following the implementation of recent trade pacts. For this reason, it is very questionable whether these models can provide useful insight into the effects of the TPP and its impact on the labor market and the economy.

Appendix: Projected Job Losses by Industry from the TPP

Table A1 uses the Petri and Plummer projections for employment as a result of the TPP and translates them into more narrow industry groups. The projections assume that within each of the industry groups identified in the Petri and Plummer analysis, job gains or losses are spread proportionately across industries.

TABLE A1

Projected Changes in Industry Employment Due to Trans-Pacific Partnership

BEA line number	BEA item description	Wage and salary per FTE in 2014	BEA persons employed in 2014 (thousands)	BEA persons employed in 2030 (PP baseline)	BEA persons employed in 2030 (PP with TPP)	Change in 2030 due to TPP
5	Farms	$38,114	2734	1362.0	1362.3	0.3
6	Forestry, fishing, and related activities	$33,568	581	581.0	581.5	0.5
7	Mining	$116,022	758	1063.1	1064.7	1.7
11	Utilities	$101,545	543	560.1	559.0	-1.1
12	Construction	$56,217	7843	10657.5	10691.4	34.0
15	Wood products	$43,516	374	412.5	409.9	-2.6
16	Nonmetallic mineral products	$55,308	391	431.2	428.5	-2.7
17	Primary metals	$66,870	395	420.0	413.2	-6.7
18	Fabricated metal products	$55,509	1465	1557.8	1532.5	-24.9
19	Machinery	$69,013	1108	1081.0	1059.3	-21.3
20	Computer and electronic products	$108,602	1038	1012.7	992.4	-20.0
21	Electrical equipment, appliances, and components	$66,041	375	287.5	295.4	8.1
22	Motor vehicles, bodies and trailers, and parts	$61,200	872	975.3	979.1	3.8
23	Other transportation equipment	$89,885	679	759.4	762.4	3.0
24	Furniture and related products	$42,505	395	435.7	432.9	-2.7
25	Miscellaneous manufacturing	$62,380	620	683.8	679.5	-4.2
27	Food and beverage and tobacco products	$47,468	1666	1671.3	1694.9	23.9
28	Textile mills and textile product mills	$43,078	488	233.0	202.1	-26.8
29	Apparel and leather and allied products	$41,029	350	167.1	145.0	-19.2
30	Paper products	$68,431	359	395.9	393.5	-2.5
31	Printing and related support activities	$48,650	468	516.2	512.9	-3.2
32	Petroleum and coal products	$113,344	108	151.5	151.7	0.2
33	Chemical products	$94,406	809	887.2	879.1	-8.1
34	Plastics and rubber products	$51,352	669	733.7	726.9	-6.7
35	Wholesale trade	$73,078	5917	6945.3	6955.2	9.9
38	Retail trade	$30,614	15655	18375.6	18401.8	26.2
43	Transportation and warehousing	$60,180	4367	5125.9	5133.2	7.3
53	Publishing industries (includes software)	$115,800	810	866.9	869.0	2.1
54	Motion picture and sound recording industries	$72,960	440	470.9	472.1	1.2
55	Broadcasting and telecommunications	$87,907	1082	1158.0	1160.8	2.9
56	Information and data processing services	$120,213	355	379.9	380.9	0.9
57	Finance and insurance	$100,734	5990	6548.9	6539.2	-9.7
62	Real estate and rental and leasing	$57,255	2333	2550.7	2546.9	-3.8
66	Legal services	$93,709	1279	1457.5	1462.9	5.4
67	Computer systems design and related services	$110,408	1814	2067.2	2074.9	7.7
68	Miscellaneous professional, scientific, technical services	$85,768	5989	6824.9	6850.2	25.5
69	Management of companies and enterprises	$123,282	2008	2288.2	2296.8	8.5
71	Administrative and support services	$39,162	8428	9214.3	9200.7	-13.6
72	Waste management and remediation services	$57,831	400	412.6	411.8	-0.8
73	Educational services	$44,628	3281	3681.0	3681.9	0.9
74	Health care and social assistance	$51,373	17331	19443.6	19448.5	4.8
79	Arts, entertainment, and recreation	$46,229	2194	2461.4	2462.1	0.6
82	Accommodation and food services	$26,451	10348	11609.4	11612.3	2.9
85	Other services, except government	$39,737	6951	7798.3	7800.3	1.9
86	Government	$61,478	20125	22578.2	22583.9	5.6

Source and notes: Petri, Peter (2016), U.S. Bureau of Economic Analysis (2016), and authors' calculations.

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