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US Withdrawal from International Trade: Analyzing the Impact on the Global Trading System with a Global CGE Model and a Gravity Model

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Introduction

The United States, Mexico, and Canada are in the process of renegotiating NAFTA. Given the political rhetoric in the Trump Administration, with an emphasis on "putting America first," the United States is pursuing a negotiating stance that makes agreement with Canada and Mexico difficult. In addition, the US has recently announced that it will impose tariffs against imports of steel and aluminum to protect its domestic industries. If it includes its NAFTA partners in this policy, undercutting the three-country free trade area, the NAFTA renegotiation will be even more difficult. One possible outcome is that NAFTA collapses, and the prior Canada-US free trade agreement (CUSFTA) also ends. The three countries would then revert to pursuing independent trade policies within the general framework of the World Trade Organization (WTO).

President Trump has stated that the US will not participate in any new multilateral trade negotiations and pulled out of the completed Trans Pacific Partnership (TPP) agreement. A failure of NAFTA would make new bilateral trade agreements difficult to pursue, since potential partners would be unlikely to start such negotiations. In this environment, the US is likely to end up with a more isolationist trade policy. Canada and Mexico, however, are continuing to embrace the global economy and are pursuing new regional and bilateral trade agreements.[2]

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[2] Both are part of the new Trans Pacific Partnership (TPP) trade agreement that does not include the US (since the US withdrew from the TPP), now called CPTPP (Comprehensive and Progressive Agreement for Trans-Pacific Partnership). Canada recently signed a trade agreement with the EU, CETA (Comprehensive

In this paper, we explore the implications of a collapse of NAFTA and potential disintegration of the North American trade bloc. Since the extent of the changes with renegotiation of NAFTA are uncertain, we consider a variety of scenarios. First, we consider a gradual untangling of NAFTA initiated by the US. We specify a short-run and a medium-run response of factor markets, showing the effects on real GDP, production, employment and trade patterns. We then consider a NAFTA trade war scenario, where the US imposes large tariffs against Canada and Mexico, who then reciprocate.

Finally, we consider a long-run scenario in which Canada and Mexico establish new regional and bilateral trade agreements, maintaining a commitment to the global economy. The United States, in contrast, remains protectionist, with high tariffs against Canada and Mexico. This is a scenario of disintegration of the North America trade bloc. Canada and Mexico start the process of disengaging from the US, diverting trade through other regional and bilateral trade agreements.

The analysis is done with a multi-country, multisector computable general equilibrium (CGE) model of global trade, called the GLOBE model.[3] This type of model is used widely for analysis of the implications of changes in trade policy, and we discuss below some of the models used for considering NAFTA scenarios.

We find that, in the short run, when there is unemployment and producers cannot change capital-labor ratios, real GDP declines for all NAFTA countries when both NAFTA and CUSFTA collapse, with small declines for the US. Mexico is hit especially hard (GDP falls by 4.6%), given that it has a much higher share of unskilled labor that is subject to unemployment. The medium-run scenario, with more adjustment in factor markets, yields similar qualitative results, but less loss of GDP. The scenario where NAFTA collapses but CUSFTA stays in place leaves Canada essentially untouched and Mexico damaged. These macro results are consistent with many earlier studies of the benefits of NAFTA that showed small but positive gains for the

Economic and Trade Agreement) on 21 September 2017. They accelerated completion of CETA so that the agreement would be in place before the new NAFTA renegotiation. Likewise, Mexico is in the final stages of negotiating a free trade agreement with the EU.

[3] See McDonald et al. (2005) and McDonald and Thierfelder (2015) for a description of the model. It is based on the GTAP data set, as are virtually all global CGE trade models. See Walmsley et al. (2012) for a description of the GTAP data.

US and larger gains for its trade partners, particularly Mexico.[4] Undoing NAFTA yields similar sized effects, with the opposite sign. The NAFTA trade war scenario is more serious, damaging all three countries, but most damaging to Mexico and Canada.

The long run scenario of disintegration of the North American trade bloc, which starts from the NAFTA trade war scenario and also assumes that Mexico and Canada pursue free trade agreements with the EU and East & Southeast (E&SE) Asia, also yields large impacts on all three countries. Trade diverts away from the US so that it becomes more isolated in the global economy. US real exports decline overall, and exports decline to both NAFTA and non-NAFTA countries. Real exports from Mexico and Canada decline overall, but they increase their exports to non-NAFTA countries. While both these scenarios are speculative, they do yield a robust result: a trade war in North America is not in the interests of any of the participants.

Recent Analysis of NAFTA Reversal

Recent discussions to renegotiate NAFTA and the US's protectionist approach to trade in general have inspired studies describing possible effects of a NAFTA collapse. A computable general equilibrium (CGE) model is an appropriate tool for such analysis. It is a multi-sector, multi-country simulation model designed to describe the economy-wide effects of policy changes. A CGE model simulates the behavior of producers and consumers interacting in commodity and factor markets, solving for market equilibrium prices and wages that "clear" all markets. The model explicitly simulates how a change in tariffs affects incentives, solving for new market prices, wages, and the exchange rate. A CGE model includes the linkages between sectors through intermediate input use and through factor markets.

CGE model simulations are "what if" scenarios to evaluate the effects of tariff policy changes on the economy, "before" and "after" a shock. The model does not describe the transition process, the adjustment costs to the economies, or how long is it takes to achieve the new equilibrium after the policy shock and all markets clear. For the shocks we are considering, the Moody's Analytics macro model finds that the peak effect of a NAFTA collapse shock occurs in about three years (see R Rogers et al. (2017)).

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[4] See Burfisher et al. (2001) for a survey of early NAFTA studies, and Villarreal and Fergusson (2014) for a review of NAFTA effects after 20 years.

Recent studies consider a variety of scenarios about the nature of the changes in tariffs between NAFTA partners: the US and Mexico restore MFN tariffs against each other; all three NAFTA countries resort to MFN tariffs among themselves; and various trade war scenarios in which NAFTA countries raise tariffs beyond MFN rates among themselves. Francois and Maughman (2018), for example, use a CGE model and focus on the effects higher tariffs would have on US trade, production and employment. They find that, in the short to medium run, US real output declines 0.6% and 1.8 million jobs are lost.[5] They disaggregate their results to the state level, describing the impact on each state's output, employment and exports to Mexico and Canada. In the long run, when capital is flexible across production activities, they find that over 200,000 jobs would be lost.

Walmsley and Minor (2017) also use a global CGE model and consider similar scenarios of NAFTA reversal: the US imposes MFN tariffs on Mexico and Canada who then reciprocate.[6] They also identify production, employment, and trade changes for each NAFTA country. They allow unemployed unskilled labor and fully employed and fully mobile capital. Walmsley and Minor find more modest real GDP changes: US real GDP declines 0.09% and US employment declines by approximately 256,000. An important contribution from Walmsley and Minor is the focus on global supply chains and the impact terminating NAFTA will have on production linkages among countries. They identify imports by purchaser (imported intermediate goods, imports for final consumption and imports for investment) and each purchaser faces different tariff rates. Given information on imports for intermediate, Walmsley and Minor measure the loss of vertical specialization in trade as a result of terminating NAFTA.

Ciuriak et al. (2017a and 2017b) use a CGE model with detailed sector accounts and show that the US suffers small negative effects if it withdraws from NAFTA, with the effects

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5 In the short to medium run, Francois and Baughman have activity-specific capital and unemployment; in our model, we have unemployment in the short run and maintain the K/L by sector rather than fixing the amount of capital employed in each sector. The results reported here are when the US raises tariffs to MFN rates against imports from Mexico and Canada; they reciprocate but do not raise tariffs against each other. In a more extreme, trade war scenario, the consider the case in which Mexico raises tariffs on US imports to bound rates which exceed MFN rates. They use a variant of the GTAP model for the analysis.

6 Walmsley and Minor use the ImpactEcon Global Supply Chain (IESC) model and database to include information about import purchases by firms, final demanders and the capital account for investment purposes.

concentrated in the automotive and agricultural sectors.[7] They find that real GDP in the NAFTA region would decline 0.225 %. If CUSFTA remains intact, they find little effect of NAFTA termination on Canada, but a significant negative effect on Mexico.

Like these studies, we use a global CGE model to analyze the effects of restoring MFN tariffs between the US and its NAFTA partners.[8] See appendix 1 for a description of the model and data aggregation used in this analysis. We report changes in real GDP, real exports, real imports and employment. Our macroeconomic findings and sectoral changes are similar to those from other studies. In addition, we describe the effects of trade diversion as Mexico and Canada disengage from the US, and pursues free trade agreements with other partners, both multilateral and bilateral, while the US remains protectionist.

Background

Table 1 Base export shares

Both Mexico and Canada are heavily dependent on trade with the US with 76% and 72% of total exports, respectively going to the US. Mexico and Canada have little trade between them (Table 1). Only 4% of Mexico's exports go to Canada and 1% of Canada's exports go to Mexico. In contrast, the US's trade is more diversified: 9% of US exports go to Mexico, 17% go to Canada, and 27% go to the EU. Mexico and Canada have low trade shares with the EU: Mexico sends 8% of its exports to the EU and Canada sends 12% of its exports to the EU.

Simulations

We consider three broad scenarios: (1) NAFTA collapse, (2) NAFTA trade war, and (3) longer run disengagement by Canada and Mexico from the North American trade bloc. For the NAFTA failure scenarios, we specify two variants with different assumptions about the adjustment of factor markets. In both variants, we allow for unemployment of unskilled labor in all three

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7 Like Francois and Baughman (2018), Ciuriak et al. use a variant of the GTAP model and consider various tariff changes between NAFTA countries. They also consider the effects of changes in foreign direct investment (FDI).

8 Analysis is done using GLOBE v2, a multi-sector, multi-region global CGE model. See McDonald et al (2007) and McDonald and Thierfelder (2015) for a detailed description of the model.

countries. In the short-run variant, we assume that capital stock utilization also goes down, while in the medium-term variant, capital utilization is assumed unchanged.

NAFTA collapse:

We consider two NAFTA failure scenarios.

1. NAFTA collapses and both the US and Mexico impose MFN tariff rates against each other. However, the US maintains its commitments to Canada under the Canada-US Free Trade Agreement (CUSFTA), which predates NAFTA. Mexico and Canada maintain their NAFTA commitments to one another. Both are members of the Comprehensive and Progressive Trans Pacific Partnership (CPTPP), the successor to the failed Trans Pacific Partnership (TPP), and so are committed to low tariffs between themselves.
2. NAFTA and CUSFTA both collapse. The US imposes MFN rates against Canada and Mexico, who retaliate and impose MFN tariffs against the United States (but maintain free trade between themselves).

NAFTA Trade War

In this scenario, we consider a NAFTA trade war. The US raises tariffs against Mexico and Canada well above MFN rates, and they reciprocate.

3. The US raises tariffs against Canada and Mexico by 25 percentage points above base rates (i.e. base rate plus .25). Canada and Mexico retaliate with identical tariff increases against the US, but no change in tariffs between each other. In addition, the US adds Section 232 tariffs against all countries on steel and aluminum (25% on all steel imports, 10% on aluminum product imports).[9]

North American Disengagement

In this long-run scenario, Canada and Mexico enter into other global trade agreements and disengage from the US. When NAFTA was established, Canada and Mexico sought to expand

[9] A trade war with tariffs increasing to over 25% is consistent with the NAFTA trade war scenario considered by Moody's Analytics—Rogers et al. (2017).

trade with their largest trade partner: the United States. With the collapse of NAFTA, Canada and Mexico are assumed to pursue free trade agreements with the EU and E&SE Asia. We present this scenario as an optimistic view of long run adjustment. Other countries do not become protectionist when the US closes its markets, instead they integrate with other regions.

As this is a long run scenario, we assume there is full employment and higher trade substitution elasticities.

4. The US raises tariffs against Canada and Mexico by 25 percentage points above base rates (i.e. base rate plus .25). Canada and Mexico retaliate with identical tariff increases against the US, but no change in tariffs between each other. The US Section 232 tariffs against steel and aluminum imports from all countries are assumed to become permanent. Canada and Mexico have trade agreements with the EU and with the E&SE Asia trade bloc plus India.

In the long run simulation, the focus is on trade diversion. The global economy continues to liberalize trade between two major trade blocs: the EU and E&SE Asia.[10] The world does not follow the US protectionist regime, and Canada and Mexico, the two countries most tightly linked to the US, start the process of disengagement from the US.

Results: NAFTA collapse

When NAFTA collapses, real GDP declines in both the US and Mexico. In the short run, the changes are dramatic for Mexico and small for the US: real output declines by 0.23% for the US and 4.62% for Mexico (Table 2a). The difference in these results reflects the different trade shares and sizes of the two economies. Mexico depends heavily on US markets: 76% of its total exports are to the US. In contrast, the US sends 9% of its exports to Mexico. Also, Mexico has a GDP roughly five percent of that for the US.

In the short run scenario, Mexico's overall exports decline by 6.9%, and its exports to both NAFTA and non-NAFTA partners decline by 7.58% and 4.36% respectively (Table 2a). In contrast, US exports decline 0.78%, with exports to NAFTA partners down 3.15% and exports to non-NAFTA regions up slightly, 0.02%. Consistent with the decline in real GDP, employment

[10] See World Bank 2005, Chapter 2 for a description of the evolution of global trade blocs.

declines by 372,000 workers in the US and over 2 million workers in Mexico. The impact on Canada is negligible.

In the medium run, when there is unemployed unskilled labor, but firms can change capital labor (K/L) ratios, the results are less dramatic but follow the same pattern; real GDP declines, more in Mexico than in the US; real exports decline in each country and the US redirects exports slightly to non-NAFTA regions (Table 2b).

When NAFTA and CUSFTA both collapse, real GDP declines in all NAFTA region. In the short run, the declines are substantial for both Canada and Mexico and small for the US: 0.37% for the US, 4.63% for Mexico and 1.35% for Canada (Table 2a). Real exports decline for all regions. The US redirects some exports to non-NAFTA countries, while Mexico and Canada see a dramatic decline in exports to NAFTA countries and a decline in exports to non-NAFTA regions as well. The US has a slight decline in real imports (0.73%); Mexico and Canada have much bigger declines in real imports, 3.07% and 1.38% declines respectively. In the US, 611,000 workers become unemployed; in Mexico over 2 million workers become unemployed; and in Canada, 117,000 workers become unemployed.

In the medium term, the collapse of NAFTA and CUSFTA creates a similar pattern of real GDP, trade, and employment results for each country, but less dramatic magnitudes. For the US, real GDP declines 0.9% with 262,000 unemployed workers[11]; in Mexico real GDP declines 0.51% with 742,000 unemployed workers; and in Canada real GDP declines 0.33% with 58,000 unemployed workers (Table 2b).

There are modest changes in sectoral output in the US following the collapse of NAFTA and CUSFTA. In the short run, output of almost all sectors decline, with the biggest declines in agricultural sectors and motor vehicles (Table 3a).[12] However, most changes in the US are modest as output declines by less than one percent in most sectors. In the medium run, there is a similar pattern of output changes, but a smaller magnitude. Sectors which are largely non-traded or which are capital-intensive, expand slightly (Table 3b).

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[11] Our unemployment results are consistent with Francois and Baughman (2018) who find over 200,000 jobs lost in their long run scenario which has unemployed labor and fully employed and fully mobile capital – similar factor market clearing assumptions as those we use in the medium run scenario.

[12] These output results are consistent with Ciuriak et al. (2017a and 2017b).

Output changes are more dramatic in Mexico and Canada, with the biggest output declines in Mexico. In the short run, Mexico's output declines by as much as 12% (textiles and wearing apparel) and output of all sectors except wheat decline by over 1.8%. Most sectors contract by over 3% (Table 4a). In the medium run, there is a similar pattern of output changes but a smaller magnitude (Table 4b). Output changes for Canada are not as extreme as for Mexico, but are more extreme than for the US. In the short run, output declines as much as 5.76% (wearing apparel) and output for most sectors declines by over one percent (Table 5a). In the medium run, there is a similar pattern of output changes but a smaller magnitude (Table 5b).

Results: NAFTA Trade War

In the NAFTA trade war scenario, we assume that the US raises all tariffs against Mexico and Canada by 25 percentage points. Mexico and Canada reciprocate but do not change tariffs between themselves. The US also imposes a 25% tariff on steel and steel products and a 10% tariff on aluminum imports from all regions. The pattern of tariff changes is different from the NAFTA and CUSFTA collapse scenarios so the pattern of output changes is different.

A NAFTA trade war does more damage to real GDP in each region, with dramatic effects for Mexico and Canada in the short run, real GDP declines by 16.27% in Mexico and 10.16% for Canada (Table 2a). In Mexico over 8 million jobs are lost. In the US, the results are less extreme, with real GDP declining 1.9% and almost 3 million jobs lost.[13]

In the extreme NAFTA trade war, Canada and Mexico turn to non-NAFTA regions for trade in the medium run. Real exports decline 9.24% for Mexico, whose exports to NAFTA countries decline by 14.98% and exports to non-NAFTA countries increase by 11.18% (Table 2b). Likewise, Canada's real exports decline by 11.81%, exports to NAFTA countries decline by 19.71% and exports to non-NAFTA countries increase by 7.91%. In contrast, US real exports decline and they decline to both NAFTA (25.08%) and non-NAFTA (1.05%) regions.

Changes in bilateral export shares show the redirection of trade (Table 6). The US export share to Mexico declines by 2.4 and the US export share to Canada declines by 3.41. US exports expand in the EU (by 2.09), High-income Asia (by 1.41) and China & Hong Kong (by 0.51).

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[13] Our unemployment results for the US are consistent with Francois and Baughman (2018), in their Scenario B which is similar to our NAFTA trade war scenario as Mexico raises its tariffs to bound rates against the US; the find 3.6 million jobs lost (Table 2a).

Mexico and Canada have a more dramatic redirection of trade. Mexico's export share to the US declines by 5.09 and Canada's export share to the US declines by 6.10. Both redirect exports to the EU (1.76 for Mexico and 2.78 for Canada). Mexico also increases exports to Latin America by 1.33.

In the short run, output for the US declines in all sectors except steel (6.61% increase) and steel products (1.46% increase), consistent with the increased tariffs against all trade partners for those sectors (Table 3a). The damage to US agricultural sectors is more severe than in the NAFTA/CUSFTA scenario, as is the decline in production of motor vehicles and parts. The damage to Mexico is extreme, output in almost all sectors decline over 10% some as extreme as 25% (wearing apparel). Output of motor vehicles and parts decline 18.79% (Table 4a). Output decline in Canada are less severe as those in Mexico, but still over 10% for most sectors. Output of motor vehicles and parts declines by 29.18% (Table 5a). In all three regions motor vehicle and parts production decline dramatically, because that industry is so inter connected in North America. The same is true for the sectors textile and wearing apparel.

Results: North American Disintegration

In the long run, we consider an extreme NAFTA trade war combined with Mexico and Canada pursuing free trade with the EU and E&SE Asia (the regions High-income Asia, Low-income Asia, India and China & Hong Kong). The simulation is illustrative of current trends—the US becoming more protectionist and Mexico and Canada turning to other regions to pursue free trade.

There are modest changes in real GDP and real domestic absorption in each region in the long run (Table 7). Since there is full employment and increased flexibility in the economies, the real GDP changes are due to higher tariffs on imported intermediate inputs which increase production costs. Canada has the biggest decline in real GDP (1.32%) and the US has the smallest decline (0.20%). Real exports decline for each country. However, Mexico and Canada redirect exports to non-NAFTA countries, for Mexico exports to non-NAFTA countries increase 23.66%, despite a decline overall of 17.71%. A similar pattern holds for Canada. In contrast, US exports decline overall. While US shifts trade to non-NAFTA countries, it does not suffice to offset the loss of NAFTA trade and its exports to all regions decline.

Bilateral trade shares indicate that Mexico and Canada move away from the US. Mexico's bilateral export share with the US declines 12.18% and Canada's bilateral export share with the US declines 14.11% (Table 11). Mexico expands trade with Latin America and the EU, with its bilateral export share increasing by 2.96% and 3.90% respectively. Canada also turns to the EU, with its bilateral export share increasing 5.65%; Canada's bilateral export share to High-income Asia increases by 1.65%.

There are modest production changes for the US and dramatic production changes for Mexico and Canada. For the US, output expands in steel and steel products, as a consequence of the tariffs introduced (Table 8). Output increases in non-traded sectors such as public administration, health & education. Overall, the US output changes are modest, with the largest decline less than 5% (leather products and wheat). In Mexico, there are dramatic changes in the structure of production (Table 9). Output declines over 20% in sectors such as machinery, electronic equipment and wearing apparel; output expands over 20% in sectors such as cereal grains, chemical products and wheat. Canada will experience even more dramatic structural change with North American disengagement. Output declines over 35% in dairy and motor vehicles; there are large output gains in wheat and other grains.

Conclusion

The scenarios on the dissolution of NAFTA and the US-Canada free trade agreement (CUSFTA), with reversion to MFN tariffs, indicate modest macro impacts on the US and much larger impacts on Canada and Mexico. There are significant sectoral impacts in all three countries, especially for agriculture and motor vehicles.

Global CGE models do not adequately capture the important role of value/production chains, which are especially important in NAFTA. Intermediate goods cross and re-cross the borders (e.g., automobiles and parts) in the production process. Any change in trade policy that inhibits the easy and free flow of intermediate inputs in North America will do serious damage to production in these sectors.

The implications of NAFTA collapse are much more serious if it leads to a trade war between the US and its NAFTA partners—a possible outcome of the Trump Administration's stated views and actions on trade policy. The scenarios on a NAFTA trade war and on the

disintegration of the North American trade bloc result in significant damage to all three countries. Mexico and Canada begin a process of diverting trade away from the US, while the US becomes more isolated in the global economy. Adapting a quote by Ronald Reagan: “A trade war cannot be won and must never be fought.”[14]

[14] Ronald Reagan, Inaugural Address, 1985. “A nuclear war cannot be won and must never be fought.”

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Table 1 Base export shares

	USA	Mexico	Canada
USA	0.00	75.92	72.10
Mexico	9.35	0.00	1.12
Canada	16.98	3.55	0.00
EU	27.19	7.64	11.66
High Asia	16.88	2.19	4.69
China/HK	6.60	1.41	3.14
LAC	7.84	6.53	2.10
MENA	5.95	1.07	1.71
Low Asia	3.00	0.43	1.04
India	1.93	0.54	0.63
Africa	1.76	0.27	0.65
Russia+	1.50	0.33	0.62
All other	1.02	0.12	0.55
Total	100.00	100.00	100.00

Note: Export share from column region to row region

Table 2a Macroeconomic effects, short run: unemployed unskilled labor, maintain K/L

	NAFTA collapse			NAFTA and CUSFTA collapse			NAFTA trade war		
All results in percent change unless noted	USA	Mexico	Canada	USA	Mexico	Canada	USA	Mexico	Canada
Real aggregates									
GDP	-0.23	-4.62	-0.05	-0.37	-4.63	-1.35	-1.90	-16.27	-10.16
Exports	-0.78	-6.90	0.03	-1.29	-6.91	-2.60	-8.81	-21.92	-18.33
Exports to NAFTA partners	-3.15	-7.58	0.08	-5.17	-7.58	-3.09	-29.33	-26.70	-25.49
Exports to non-NAFTA partners	0.02	-4.36	-0.09	0.03	-4.41	-1.36	-2.15	-4.85	-0.47
Imports	-0.41	-3.14	0.07	-0.73	-3.07	-1.38	-4.25	-15.46	-14.57
Imports from NAFTA partners	-3.12	-8.76	-0.11	-5.01	-8.80	-3.17	-26.40	-31.96	-26.90
Imports from non-NAFTA partners	0.01	-0.37	0.10	0.00	-0.32	0.18	0.37	-9.32	-3.44
Domestic Absorption	-0.06	-0.46	0.00	-0.11	-0.45	-0.23	-0.42	-3.29	-3.61
Exchange rate (LCU/foreign currency)	0.16	-0.79	-0.09	0.25	-0.86	-0.51	-0.11	7.45	5.73
Employment loss (1000s, ILO 2017)	-372	-2444	-6	-611	-2444	-117	-2931	-8877	-886
Share of unskilled in total employment	0.57	0.79	0.50	0.57	0.79	0.49	0.56	0.76	0.45

Table 2b Macroeconomic effects, medium run: unemployed unskilled labor, capital adjusts

	NAFTA collapse			NAFTA and CUSFTA collapse			NAFTA trade war		
All results in percent change unless noted	USA	Mexico	Canada	USA	Mexico	Canada	USA	Mexico	Canada
Real aggregates									
GDP	-0.05	-0.51	0.00	-0.09	-0.51	-0.33	-0.50	-2.03	-2.97
Exports	-0.50	-3.10	0.06	-0.84	-3.10	-1.64	-6.98	-9.24	-11.81
Exports to NAFTA partners	-2.43	-3.88	0.10	-4.09	-3.85	-2.16	-25.08	-14.98	-19.71
Exports to non-NAFTA partners	0.15	-0.21	-0.02	0.26	-0.28	-0.29	-1.05	11.18	7.91
Imports	-0.41	-3.14	0.07	-0.73	-3.07	-1.38	-4.25	-15.46	-14.57
Imports from NAFTA partners	-1.62	-6.86	0.11	-2.97	-6.78	-2.46	-18.38	-25.61	-23.10
Imports from non-NAFTA partners	-0.03	1.62	0.01	-0.03	1.66	0.50	0.33	-2.14	-0.61
Domestic Absorption	-0.06	-0.46	0.00	-0.11	-0.45	-0.23	-0.42	-3.29	-3.61
Exchange rate (LCU/foreign currrency)	0.16	0.17	-0.05	0.25	0.08	-0.28	-0.07	10.94	7.34
Employment loss (1000s, ILO 2017)	-151	-751	0	-262	-742	-58	-1284	-3140	-503
Share of unskilled in total employment	0.57	0.79	0.50	0.57	0.79	0.49	0.57	0.78	0.47

Table 3a: Percent Change in US Sectoral Output, Short Run

Sector	NAFTA collapse	NAFTA/CUSFTA collapse	NAFTA trade war
Vegetable oils and fats	-1.83	-3.45	-4.72
Processed rice	-0.62	-2.25	-4.32
Leather products	-1.57	-2.11	-5.47
Other crops	-1.06	-1.58	-4.05
Food products nec	-0.54	-1.35	-3.16
Fishing	-0.33	-1.30	-1.71
Meat cattle sheep goats horses and nec	-0.94	-1.13	-3.24
Textiles	-0.71	-1.06	-4.44
Sugar	-0.63	-0.97	-3.01
Livestock	-0.79	-0.96	-2.84
Beverages and tobacco products	-0.28	-0.92	-2.90
Other cereal grains	-0.63	-0.90	-3.46
Dairy products	-0.66	-0.89	-3.04
Motor vehicles and parts	-0.36	-0.83	-3.73
Wheat	-0.83	-0.80	-3.44
Petroluem coal products	-0.52	-0.74	-4.25
Wearing apparel	-0.40	-0.72	-3.13
Chemical rubber plastic prods	-0.50	-0.67	-4.30
Manufactures nec	-0.42	-0.66	-4.58
Fruits and vegetables	0.01	-0.62	-2.47
Paper products publishing	-0.35	-0.57	-2.54
Gas manufacture distribution	-0.31	-0.49	-2.28
Electricity	-0.32	-0.48	-2.35
Water	-0.29	-0.46	-2.26
Air Sea and other transport services	-0.28	-0.45	-2.63
Recreation and other services	-0.26	-0.44	-2.33
Forestry	-0.20	-0.43	-1.40
Communication	-0.26	-0.42	-2.34
Trade	-0.25	-0.42	-2.06
Business services nec	-0.24	-0.39	-2.10
Metal products	-0.22	-0.33	1.46
Financial services nec	-0.20	-0.33	-1.90
Insurance	-0.21	-0.33	-2.22
Wood products	-0.16	-0.28	-0.48
Pub Admin Defence Health Educ	-0.17	-0.27	-1.40
Construction	-0.16	-0.24	-0.72
Mineral products nec	-0.09	-0.22	-1.63
Transport equipment nec	-0.10	-0.19	-2.14
Machinery and equipment nec	-0.12	-0.18	-1.91
Ferrous metals	-0.10	-0.08	6.61
Electronic equipment	-0.03	-0.05	-2.00
Extraction industries	0.02	-0.02	-2.21
Non-ferrous metals	-0.25	0.14	-1.51

Note: Sectors are sorted based on the NAFTA and CUSFTA scenario.

Table 3b: Percent Change in US Sectoral Output, Medium Run

Sector	NAFTA collapse	NAFTA/CUSFTA collapse	NAFTA trade war
Vegetable oils and fats	-1.60	-3.15	-3.39
Processed rice	-0.42	-1.93	-2.70
Leather products	-1.32	-1.71	-3.63
Other crops	-0.83	-1.27	-2.74
Food products nec	-0.35	-1.04	-1.66
Fishing	-0.17	-1.03	-0.38
Meat cattle sheep goats horses and nec	-0.74	-0.82	-1.76
Sugar	-0.44	-0.67	-1.58
Textiles	-0.46	-0.67	-2.63
Livestock	-0.60	-0.66	-1.44
Beverages and tobacco products	-0.10	-0.61	-1.32
Wheat	-0.57	-0.58	-3.09
Other cereal grains	-0.39	-0.58	-2.08
Dairy products	-0.46	-0.57	-1.48
Motor vehicles and parts	-0.21	-0.51	-2.12
Fruits and vegetables	0.10	-0.39	-1.21
Wearing apparel	-0.20	-0.39	-1.55
Petroluem coal products	-0.26	-0.32	-2.41
Manufactures nec	-0.20	-0.31	-2.90
Chemical rubber plastic prods	-0.25	-0.29	-2.61
Paper products publishing	-0.16	-0.27	-1.16
Forestry	-0.03	-0.17	-0.05
Gas manufacture distribution	-0.11	-0.17	-0.72
Electricity	-0.11	-0.16	-0.80
Recreation and other services	-0.09	-0.15	-0.94
Water	-0.10	-0.15	-0.78
Air Sea and other transport services	-0.09	-0.14	-1.09
Trade	-0.07	-0.12	-0.61
Metal products	-0.10	-0.09	2.83
Communication	-0.05	-0.08	-0.70
Business services nec	-0.04	-0.08	-0.57
Insurance	-0.04	-0.07	-1.01
Financial services nec	-0.04	-0.06	-0.59
Pub Admin Defence Health Educ	-0.02	-0.04	-0.26
Wood products	-0.01	-0.04	0.80
Mineral products nec	0.06	0.05	-0.21
Construction	0.04	0.06	0.82
Transport equipment nec	0.06	0.07	-0.86
Ferrous metals	-0.02	0.13	7.89
Machinery and equipment nec	0.06	0.15	-0.30
Extraction industries	0.17	0.22	-1.16
Electronic equipment	0.11	0.23	-0.49
Non-ferrous metals	-0.20	0.24	-1.51

Note: Sectors are sorted based on the NAFTA and CUSFTA scenario.

Table 4a: Percent Change in Mexican Sectoral Output, Short Run

Sector	NAFTA collapse	NAFTA/CUSFTA collapse	NAFTA trade war
Textiles	-12.04	-12.04	-24.03
Wearing apparel	-11.43	-11.51	-24.91
Motor vehicles and parts	-8.37	-7.66	-18.79
Leather products	-6.67	-6.67	-18.41
Extraction industries	-6.51	-6.59	-14.72
beverages and tobacco products	-6.26	-6.17	-18.89
Petroluem coal products	-5.59	-5.63	-13.97
Insurance	-5.43	-5.48	-10.37
Machinery and equipment nec	-5.20	-5.46	-27.88
Sugar	-5.42	-5.41	-17.64
Water	-5.38	-5.41	-18.00
Gas manufacture distribution	-5.29	-5.35	-15.44
Chemical rubber plastic prods	-5.23	-5.23	-13.36
Fruits and vegetables	-5.12	-5.13	-18.68
Electronic equipment	-4.75	-5.10	-27.04
Food products nec	-5.11	-5.06	-17.69
Other cereal grains	-5.06	-5.03	-12.03
Electricity	-4.96	-4.99	-15.71
Ferrous metals	-4.79	-4.96	-11.46
Trade	-4.84	-4.82	-17.25
Air Sea and other transport services	-4.76	-4.78	-16.92
Business services nec	-4.71	-4.72	-16.65
Wood products	-4.57	-4.66	-22.40
Communication	-4.65	-4.66	-16.84
Forestry	-4.53	-4.60	-20.35
Recreation and other services	-4.58	-4.59	-16.12
Manufactures nec	-4.51	-4.58	-18.45
Financial services nec	-4.43	-4.44	-14.42
Mineral products nec	-4.38	-4.40	-16.58
Dairy products	-4.39	-4.40	-17.12
Transport equipment nec	-4.32	-4.26	-16.46
Paper products publishing	-4.11	-4.13	-14.49
Non-ferrous metals	-3.99	-4.10	3.97
Metal products	-3.80	-4.02	-11.64
Processed rice	-3.97	-3.91	-16.87
Fishing	-3.72	-3.72	-15.53
Livestock	-3.34	-3.32	-15.63
Other crops	-3.39	-3.31	-12.39
Pub Admin Defence Health Educ	-2.99	-2.99	-11.47
Vegetable oils and fats	-3.00	-2.92	-15.68
Construction	-2.28	-2.28	-14.10
Meat cattle sheep goats horsse and nec	-1.84	-1.81	-15.37
Wheat	-0.57	-0.46	0.32

Note: Sectors are sorted based on the NAFTA and CUSFTA scenario.

Table 4b: Percent Change in Mexican Sectoral Output, Medium Run

Sector	NAFTA collapse	NAFTA/CUSFTA collapse	NAFTA trade war
Wearing apparel	-8.09	-8.14	-13.68
Textiles	-7.46	-7.42	-8.24
Motor vehicles and parts	-4.07	-3.35	-3.85
Extraction industries	-2.26	-2.40	0.06
Fruits and vegetables	-2.34	-2.33	-9.24
Leather products	-2.26	-2.24	-3.11
beverages and tobacco products	-2.31	-2.19	-5.27
Machinery and equipment nec	-1.31	-1.54	-15.16
Sugar	-1.52	-1.50	-4.09
Electronic equipment	-1.10	-1.31	-14.91
Petroluem coal products	-1.07	-1.14	2.04
Food products nec	-1.00	-0.94	-3.52
Gas manufacture distribution	-0.82	-0.89	0.18
Water	-0.86	-0.88	-2.28
Electricity	-0.62	-0.67	-0.57
Air Sea and other transport services	-0.62	-0.63	-2.56
Other cereal grains	-0.63	-0.62	3.85
Communication	-0.56	-0.57	-2.71
Trade	-0.57	-0.54	-2.43
Fishing	-0.51	-0.50	-4.43
Recreation and other services	-0.49	-0.50	-1.90
Business services nec	-0.45	-0.45	-1.78
Financial services nec	-0.38	-0.39	-0.13
Mineral products nec	-0.24	-0.24	-2.15
Dairy products	-0.16	-0.16	-2.51
Manufactures nec	-0.01	-0.08	-3.14
Chemical rubber plastic prods	0.18	0.14	6.04
Insurance	0.37	0.28	11.02
Processed rice	0.36	0.43	-1.93
Forestry	0.61	0.50	-3.55
Livestock	0.61	0.63	-2.06
Wood products	0.95	0.79	-4.85
Transport equipment nec	0.84	0.88	1.39
Paper products publishing	0.97	0.91	3.17
Ferrous metals	1.16	0.95	9.40
Vegetable oils and fats	0.87	0.98	-2.25
Other crops	1.14	1.18	3.22
Construction	1.56	1.58	-0.45
Metal products	2.40	2.14	9.56
Non-ferrous metals	2.58	2.36	29.56
Meat cattle sheep goats horsse and ne	2.41	2.44	-0.85
Wheat	5.28	5.20	20.77
Pub Admin Defence Health Educ	0.04	0.04	-0.66

Note: Sectors are sorted based on the NAFTA and CUSFTA scenario.

Table 5a: Percent Change in Canadian Sectoral Output, Short Run

Sector	NAFTA collapse	NAFTA/CUSFTA collapse	NAFTA trade war
Wearing apparel	-0.06	-5.76	-15.34
Textiles	0.14	-5.49	-17.19
Leather products	-0.11	-5.30	-14.48
Chemical rubber plastic prods	-0.19	-3.33	-16.56
beverages and tobacco products	-0.03	-3.08	-14.55
Livestock	-0.10	-2.93	-13.85
Sugar	0.09	-2.91	-15.22
Non-ferrous metals	-0.20	-2.89	5.33
Motor vehicles and parts	0.87	-2.74	-29.18
Meat cattle sheep goats horsse and nec	0.12	-2.70	-11.54
Ferrous metals	-0.21	-2.69	-7.83
Dairy products	-0.10	-2.22	-13.01
Fruits and vegetables	0.45	-2.06	-10.93
Metal products	-0.14	-1.89	-7.34
Machinery and equipment nec	0.06	-1.80	-11.63
Extraction industries	-0.04	-1.73	-14.16
Electricity	-0.11	-1.72	-10.50
Transport equipment nec	-0.40	-1.66	-19.61
Gas manufacture distribution	-0.09	-1.64	-10.72
Petroluem coal products	-0.04	-1.57	-12.81
Other cereal grains	-0.19	-1.55	-12.29
Water	-0.07	-1.53	-11.10
Other crops	-0.07	-1.53	-8.44
Insurance	-0.18	-1.46	-8.70
Financial services nec	-0.09	-1.41	-9.61
Electronic equipment	0.15	-1.41	-12.98
Communication	-0.08	-1.40	-10.47
Air Sea and other transport services	-0.09	-1.38	-9.83
Trade	-0.06	-1.37	-10.68
Paper products publishing	-0.17	-1.37	-11.32
Recreation and other services	-0.07	-1.35	-8.57
Business services nec	-0.07	-1.31	-10.18
Food products nec	-0.03	-1.22	-14.52
Wheat	0.13	-1.17	2.79
Manufactures nec	-0.12	-1.07	-10.44
Mineral products nec	-0.05	-0.97	-8.21
Wood products	-0.22	-0.96	-15.35
Forestry	-0.20	-0.95	-14.20
Fishing	-0.23	-0.84	-14.04
Pub Admin Defence Health Educ	-0.06	-0.81	-7.13
Construction	-0.08	-0.18	-6.51
Vegetable oils and fats	0.16	0.51	-14.30
Processed rice	-0.02	14.85	-13.03

Note1: Sectors are sorted based on the NAFTA and CUSFTA scenario.

Note2: Processed rice is wild rice in Canada, it is an anomoly in the database and a small sector.

Table 5b: Percent Change in Canadian Sectoral Output, Medium Run

Sector	NAFTA collapse	NAFTA/CUSFTA collapse	NAFTA trade war
Wearing apparel	0.03	-4.80	-8.92
Textiles	0.20	-4.41	-9.72
Leather products	-0.01	-4.29	-7.61
Motor vehicles and parts	0.73	-2.21	-25.32
Chemical rubber plastic prods	-0.11	-2.06	-7.77
Livestock	-0.01	-1.88	-6.71
beverages and tobacco products	0.04	-1.85	-5.93
Non-ferrous metals	-0.21	-1.67	16.07
Meat cattle sheep goats horsse and nec	0.21	-1.66	-4.37
Sugar	0.20	-1.65	-6.78
Ferrous metals	-0.18	-1.45	1.35
Dairy products	-0.02	-1.17	-5.77
Fruits and vegetables	0.36	-1.02	-2.88
Machinery and equipment nec	0.00	-0.78	-3.48
Metal products	-0.09	-0.77	0.77
Electronic equipment	0.03	-0.66	-6.84
Transport equipment nec	-0.22	-0.63	-13.31
Electricity	-0.06	-0.54	-2.03
Water	0.00	-0.50	-3.90
Petroluem coal products	0.01	-0.43	-4.87
Extraction industries	-0.01	-0.43	-5.06
Trade	0.00	-0.39	-3.74
Gas manufacture distribution	-0.02	-0.38	-1.64
Recreation and other services	-0.02	-0.37	-1.57
Other cereal grains	-0.07	-0.35	-4.22
Financial services nec	-0.02	-0.35	-2.02
Communication	-0.01	-0.34	-2.94
Air Sea and other transport services	-0.03	-0.30	-2.16
Paper products publishing	-0.10	-0.29	-3.80
Insurance	-0.08	-0.26	-0.18
Business services nec	0.00	-0.20	-2.27
Food products nec	0.04	-0.09	-6.94
Pub Admin Defence Health Educ	0.00	-0.02	-1.44
Wheat	0.48	0.03	11.02
Manufactures nec	-0.03	0.06	-2.61
Fishing	-0.13	0.06	-8.06
Other crops	0.35	0.08	1.87
Forestry	-0.16	0.10	-6.94
Wood products	-0.19	0.11	-7.86
Mineral products nec	0.00	0.16	-0.05
Construction	0.01	0.78	0.30
Vegetable oils and fats	0.31	1.83	-5.69
Processed rice	0.08	16.75	-1.58

Note1: Sectors are sorted based on the NAFTA and CUSFTA scenario.

Note2: Processed rice is wild rice in Canada, it is an anomoly in the database and a small sector.

Table 6 Trade share changes, short run, extreme NAFTA trade war

	USA	Mexico	Canada
USA	0.00	-5.09	-6.10
Mexico	-2.40	0.00	0.06
Canada	-3.41	0.50	0.00
EU	2.09	1.76	2.78
High Asia	1.41	0.52	1.05
China/HK	0.51	0.28	0.65
LAC	0.59	1.33	0.41
MENA	0.48	0.30	0.37
Low Asia	0.25	0.09	0.24
India	0.15	0.15	0.13
Africa	0.14	0.06	0.15
Russia+	0.12	0.08	0.12
All other	0.08	0.03	0.13
Total	0.00	0.00	0.00

Notes: Change in export shares from columns to rows

Table 7 Macroeconomic effects, long run

All results in percent change unless noted	USA	Mexico	Canada
Real aggregates			
GDP	-0.20	-0.88	-1.32
Exports	-12.55	-17.71	-19.43
Exports to NAFTA partners	-45.67	-29.23	-35.54
Exports to non-NAFTA partners	-1.50	23.66	20.74
Imports	-7.53	-26.01	-23.09
Imports from NAFTA partners	-34.21	-47.85	-41.12
Imports from non-NAFTA partners	1.21	2.97	4.62
Domestic Absorption	-0.06	-2.31	-2.25
Exchange rate	-0.25	9.05	5.52

Table 8: Percent Change in US Sectoral Output, North American Disengagement

Sector	North American Disengagement
Leather products	-4.64
Wheat	-4.02
Manufactures nec	-3.74
Vegetable oils and fats	-3.72
Petroluem coal products	-3.36
Other crops	-3.31
Processed rice	-3.25
Chemical rubber plastic prods	-3.00
Textiles	-2.90
Other cereal grains	-2.85
Meat cattle sheep goats horses and nec	-1.47
Machinery and equipment nec	-1.46
Transport equipment nec	-1.24
Dairy products	-1.21
Air Sea and other transport services	-1.10
Motor vehicles and parts	-1.05
Food products nec	-1.00
Non-ferrous metals	-0.96
Sugar	-0.93
Insurance	-0.88
Mineral products nec	-0.83
Electronic equipment	-0.82
Livestock	-0.73
Beverages and tobacco products	-0.62
Recreation and other services	-0.61
Wearing apparel	-0.59
Construction	-0.53
Financial services nec	-0.51
Trade	-0.46
Paper products publishing	-0.39
Communication	-0.35
Electricity	-0.34
Gas manufacture distribution	-0.32
Business services nec	-0.28
Water	-0.28
Forestry	0.06
Extraction industries	0.54
Fruits and vegetables	0.99
Wood products	1.22
Pub Admin Defence Health Educ	1.25
Fishing	2.08
Metal products	2.53
Ferrous metals	7.65

Table 9: Percent Change in Mexican Sectoral Output, North American Disengagement

Sector	North American Disengagement
Machinery and equipment nec	-23.32
Electronic equipment	-22.44
Wearing apparel	-20.47
Fruits and vegetables	-10.77
Wood products	-10.72
Textiles	-8.78
Motor vehicles and parts	-8.26
Leather products	-6.64
Construction	-6.14
Forestry	-6.07
Mineral products nec	-5.44
Beverages and tobacco products	-3.65
Fishing	-2.13
Trade	-1.84
Sugar	-1.04
Air Sea and other transport services	-0.42
Communication	-0.36
Food products nec	-0.28
Business services nec	0.00
Recreation and other services	0.22
Extraction industries	0.36
Ferrous metals	0.38
Water	0.98
Manufactures nec	1.01
Dairy products	1.12
Electricity	1.27
Gas manufacture distribution	1.56
Metal products	2.29
Processed rice	3.57
Livestock	3.62
Financial services nec	4.08
Transport equipment nec	4.66
Pub Admin Defence Health Educ	6.91
Vegetable oils and fats	7.77
Meat cattle sheep goats horses and nec	8.80
Petroluem coal products	14.21
Paper products publishing	16.38
Other crops	18.35
Non-ferrous metals	18.98
Other cereal grains	20.39
Chemical rubber plastic prods	21.38
Insurance	26.39
Wheat	52.04

Table 10: Percent Change in Canadian Sectoral Output, North American Disengagement

Sector	North American Disengagement
Dairy products	-35.50
Motor vehicles and parts	-35.14
Transport equipment nec	-16.71
Wearing apparel	-16.51
Textiles	-14.59
Livestock	-14.56
Wood products	-13.31
Leather products	-12.93
Electronic equipment	-9.08
Forestry	-8.91
Extraction industries	-6.79
Metal products	-4.10
Ferrous metals	-3.86
Sugar	-3.58
Construction	-3.56
Food products nec	-3.43
Chemical rubber plastic prods	-3.26
Fishing	-2.58
Vegetable oils and fats	-2.38
Trade	-1.79
Beverages and tobacco products	-1.36
Paper products publishing	-1.28
Electricity	-1.09
Machinery and equipment nec	-0.91
Business services nec	-0.29
Mineral products nec	-0.11
Petroluem coal products	0.47
Communication	0.51
Manufactures nec	0.84
Gas manufacture distribution	1.22
Water	1.40
Financial services nec	1.97
Air Sea and other transport services	2.72
Recreation and other services	3.75
Pub Admin Defence Health Educ	3.76
Meat cattle sheep goats horsee and nec	4.46
Insurance	5.50
Other crops	7.48
Non-ferrous metals	10.20
Other cereal grains	12.43
Processed rice	18.50
Wheat	40.81
Fruits and vegetables	77.59

Table 11 Trade share changes, long run

	USA	Mexico	Canada
USA	0.00	-12.18	-14.11
Mexico	-3.90	0.00	0.23
Canada	-5.96	1.61	0.00
EU	3.60	3.90	5.65
High Asia	2.40	1.24	2.53
China/HK	0.90	0.79	1.64
LAC	0.95	2.96	0.87
MENA	0.79	0.59	0.79
Low Asia	0.42	0.25	0.57
India	0.25	0.49	0.97
Africa	0.23	0.14	0.31
Russia+	0.20	0.16	0.26
All other	0.13	0.06	0.29
Total	0.00	0.00	0.00

Note: Change in export shares from columns to rows.

Model Appendix

Simulations

NAFTA collapse:

1. NAFTA collapses and both the US and Mexico impose MFN tariff rates against each other. However, the US maintains its commitments to Canada under the Canada-US Free Trade Agreement (CUSFTA), which predates NAFTA. Mexico and Canada maintain their NAFTA commitments to one another. Both are members of the Comprehensive and Progressive Trans Pacific Partnership (CPTPP), the successor to the failed Trans Pacific Partnership (TPP), and so are committed to low tariffs between themselves.

2. NAFTA and CUSFTA both collapse. The US imposes MFN rates against Canada and Mexico, who retaliate and impose MFN tariffs against the United States (but maintain free trade between themselves).[15]

NAFTA Trade War

3. The US raises tariffs against Canada and Mexico by 25 percentage points above base rates (i.e. base rate plus .25). Canada and Mexico retaliate with identical tariff increases against the US, but no change in tariffs between each other. In addition, the US adds Section 232 tariffs against all countries on steel and aluminum (25% on all steel imports, 10% on aluminum product imports).

NAFTA Disengagement

4. Extreme NAFTA trade war, Sim03. Now in a model with full employment and high trade elasticities so a long run version of the extreme NAFTA trade war; and Mexico and Canada form FTAs with EU and East & Southeast Asia (i.e. High-income Asia, Low-income Asia, China-Hong Kong, and India).

Model used for Short Run Analysis (NAFTA Collapse and NAFTA Trade War)

Elasticities for Production and Trade

1. No substitution between aggregate intermediate and aggregate value added for ferrous metals (ai_s), fabricated metal products (afmp) and non-ferrous metals (anfm) for all regions, i.e.

[15] Note, if MFN tariffs are lower than tariffs from GTAP, keep original tariffs. This is the case for: US tariffs against Canadian dairy imports; Canada's tariffs against US dairy and US livestock; Mexico's tariffs against US grains (cGrain)

Leontief at top level of the production nest; all other activities have a low elasticity of substitution 0.3 for all regions.

5. Value added is a CES aggregate of land, capital, and aggregate labor – the elasticity of substitution is 1.5 for all activities and regions EXCEPT ferrous metals (ai_s), fabricated metal products (afmp) and non-ferrous metals (anfm) for US, Canada and Mexico, where it is 0.3.

6. Labor is a CES nest over 5 labor categories: technical & assistant professionals, clerks, service & shop workers; office managers & professional workers; agriculture & other low skilled workers. The elasticity of substitution between labor types is 2.0 in all activities and regions.

7. CES aggregate between domestic good and aggregate imports from all regions; elasticity of substitution (sigma) is 2.0 for all commodities and regions EXCEPT ferrous metals (ci_s), fabricated metal products (cfmp) and non-ferrous metals (cnfm) which are 5.0 for all regions.

8. CES aggregation between imports from partners; elasticity of substitution is 4.0 for all sectors and regions EXCEPT EXCEPT ferrous metals (ci_s), fabricated metal products (cfmp) and non-ferrous metals (cnfm) which are 5.0 for all regions.

9. CET aggregate between domestic and export variety; elasticity of transformation (omega) is 1.5 for all commodities and regions EXCEPT ferrous metals (ci_s), fabricated metal products (cfmp) and non-ferrous metals (cnfm) which are 5.0 for all regions.

10. CET aggregate between exports by partner is is 1.5 for all commodities and regions EXCEPT ferrous metals (ci_s), fabricated metal products (cfmp) and non-ferrous metals (cnfm) which are 5.0 for all regions.

Factor Market Clearing

1. Unemployed unskilled labor (clerks, service & shop workers and agriculture & other low skilled workers) for US, Canada, and Mexico (real wage for these labor categories is

Factor Market Clearing

1. Unemployed unskilled labor (clerks, service & shop workers and agriculture & other low skilled workers) for US, Canada, and Mexico (real wages are fixed); all other factors fully employed and fully mobile. (clbase) (real wages are flexible).

Macroeconomic Closure

1. Fixed current account balance, flexible exchange rate in all regions. (Note, the global numeraire is a trade-weighted average of the exchange rates for the US, High-income Asia and the EU).

2. Savings driven investment (the household savings rate is fixed and investment is flexible).

3. Fixed shares of government final demand; government savings is flexible; all tax rates are fixed.

4. CPI numeraire for all regions.

Model used for Long Run Analysis – NAFTA Disengagement

The model is the same as the short-run model except:

1. There is no unemployment. Wages are flexible in all factor markets.

2. Higher CES and CET elasticities are assumed between imports by country of origin and exports by country of destination, and between aggregate imports or exports and domestic production.

Elasticities for Production and Trade

1. No substitution between aggregate intermediate and aggregate value added for ferrous metals (ai_s), fabricated metal products (afmp) and non-ferrous metals (anfm) for all regions, i.e. Leontief at top level of the production nest; all other activities have a low elasticity of substitution 0.3 for all regions.

2. Value added is a CES aggregate of land, capital, and aggregate labor – the elasticity of substitution is 1.5 for all activities and regions EXCEPT ferrous metals (ai_s), fabricated metal products (afmp) and non-ferrous metals (anfm) for US, Canada and Mexico, where it is 0.3.

3. Labor is a CES nest over 5 labor categories: technical & assistant professionals, clerks, service & shop workers; office managers & professional workers; agriculture & other low skilled workers. The elasticity of substitution between labor types is 2.0 in all activities and regions.

4. CES aggregate between domestic good and aggregate imports from all regions; elasticity of substitution (sigma) is 5.0 for all commodities and regions.

5. CES aggregation between imports from partners; elasticity of substitution is 5.0 for all regions.

6. CET aggregate between domestic and export variety; elasticity of transformation (omega) is 5.0 for all regions.

7. CET aggregate between exports by partner is 5.0 for all regions.

Factor Market Clearing

1. All factors fully employed and mobile. All wages are flexible and adjust to clear factor markets.

Macroeconomic Closure

1. Fixed current account balance, flexible exchange rate in all regions. (Note, global numeraire is a trade-weighted average of the exchange rates for the US, High-income Asia and the EU).

2. Savings driven investment (the household savings rate is fixed and investment flexible).

3. Fixed shares of government final demand; government savings is flexible; all tax rates are fixed.

4. CPI numeraire for all regions.