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The Economic Impacts of a U.S. withdrawal from NAFTA: A CGE Analysis

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Abstract

The aim of this study is to examine the economic impacts of a U.S. withdrawal from the North American Free Trade Agreement (NAFTA) on Canada, Mexico and the United States. The shocks simulate scenarios in which the U.S instates penalizing tariff rates on NAFTA countries, a trade war between NAFTA members and a tariff reset to the WTO MFN rates. The effects of these tariff structures are analyzed under the framework of a computable general equilibrium (CGE) model with a focus on macroeconomic variables and welfare. The findings show that, in all iterations, Mexico's economy takes a substantial hit, America's economy is marginally affected and Canada's economy slightly benefits.

Keywords

International Economics, Macroeconomics, Free Trade, NAFTA

1. Introduction

For the last 20 years, NAFTA has been a quintessential pillar of North American free trade. Signed in 1994, NAFTA is a trilateral free trade agreement between Canada, the United States of America and Mexico. The original motive of NAFTA was to create a regional trade-bloc that encouraged the free movement of goods and services throughout North America, with the ultimate goal of intertwining the economies of all three nations. The hope was that freer trade would bring stronger and steadier economic growth to Mexico, providing new jobs and opportunities for its growing workforce and discouraging illegal migration. For the United States and Canada, Mexico was seen both as a promising new market for exports and as a lower cost investment location that could enhance the competitiveness of U.S. and Canadian companies. While the United States had completed a Canadian Free Trade Agreement (FTA) in 1988, the addition of Mexico, an economically isolated nation at the time, was unprecedented. After the induction of NAFTA, tariffs in virtually all sectors began to fall.

Yet NAFTA has remained a perennial target in the broader debate over free trade. U.S. president Donald Trump says the deal has shifted U.S. manufacturing production, and employment, to Mexico, and in August 2017, has reopened negotiations and threatened to dismantle NAFTA.

Among economists there is consensus that high tariff structures cause suboptimal resource allocation and create welfare loss on aggregate. Moreover, high tariffs have a distributional impact on trade for both the importing and exporting country (Kaempfer & Lowenberg, 2007). The ultimate impact on prices and quantities will depend on the import demand, supply elasticity, and the quantity of goods affected by such tariffs, as well as the substitutability of imported versus domestic production and of imports from different sources.

This study examines the economic impact of Trump's proposed tariff structures, if the U.S. withdraws from NAFTA, under three scenarios: the first shocks analyze Trump's most extreme tariff structure with the assumption that Canada and Mexico will remain idle; the second simulation similarly assumes the most extreme tariff structures, however, with added shocks to account for retaliatory tariffs from Mexico and Canada (modeling a full fledged trade war); the third model predicates its tariff structure on the MFN rates for WTO countries.

This paper aims at assessing the economic impact of the proposed tariff structures on NAFTA countries and their trading partners in the form of bilateral and total export flows, commodity prices, macroeconomic indicators, regional household income, industry output, and welfare. As a result, a multi-region, multi-sector aggregated CGE model is chosen for simulating the economic impacts of a U.S. withdrawal from NAFTA. This type of approach has been extensively utilized in assessing the impacts of tariff structures in numerous papers, such as those by the U.S. Department of Labor (1993), Francois and Shiells (1994), and the U.S. International Trade Commission (1992).

In comparison to other literature, the novelty of this paper can be attributed to the following. The study is simulated with the most relied on Global Trade Analysis Project (GTAP) database: Version 7. The modeling assessment covers all countries affected by the tariffs, i.e. the U.S., Mexico, Canada, and their respective trading partners, with the precise calibration of the sectoral shares and the shocks carried out for all these countries. Later on, the modeling results are complemented with a sensitivity analysis to determine the degree of change when elasticity parameters are changed.

This paper is organized as follows: Section 2 provides a review of related literature and studies of research mostly pertaining to the use of modeling to predict the induction of NAFTA.

Section 3 explains how the CGE model is used as a quantitative framework. Section 4 provides contextual background information on the current economic welfare of all NAFTA countries. In Section 5, the results are described. Section 6 provides results on the models given different sensitivity parameters. Finally, Section 7 concludes the findings of this paper.

2. Literature Review

Before NAFTA was signed, economists were generally in consensus of the effects a trilateral free trade agreement with Canada and Mexico would have on the American economy. Using General Equilibrium models conducted by the US Department of Labor (1993), Francois and Shiells (1994), and the U.S. International Trade Commission (1992), it was concluded that the effects of NAFTA would be positive but small for the US economy, and positive and large for Mexico. More specifically, the Congressional Budget Office (1993) forecasted that Mexico's economy would increase 6% to 12%, while the US economy would increase one fourth of 1%. NAFTA was also concluded to have little impact on trade between Canada and the US as they were already engaged in free bilateral trade from a FTA signed in 1989.

Perhaps the worst fear around NAFTA is the perceived harm to the U.S. labor market. However, the broad consensus from economists is that the threat to American jobs is largely hyperbolized. Before NAFTA was even signed, the Congressional Budget Office (1993) estimated that the total number of US workers who might have to change jobs would be less than half a million, dispersed throughout at least a decade. In addition, Gould (1998) reports that employment likely stays the same due to the increase in higher paying jobs, a result of the comparative advantage held by the U.S. in capital intensive sectors. Even though aggregate employment and aggregate wages may increase under NAFTA, economists like Faux and

Rothstein (1991) argue this approach would alienate the most economically vulnerable. Using a multi-country CGE model, they argue that U.S. welfare and employment would dramatically decrease for blue-collar manufacturing and manual labor jobs caused by a shift in production to the technologically competitive Mexican facilities.

After the induction of NAFTA, foreign investor confidence skyrocketed in Mexico, leading to a capital inflow. In 1995, Manchester and McKibbin used a dynamic macroeconomic model and found in the long run, net private capital inflows would increase Mexico's GDP by 6% to 7%. With the increase of foreign capital in Mexico, Bachrach and Mizrahi (1992) used a CGE model to simulate the effects on the U.S. economy. They found that exports from the U.S. to Mexico increased by 5.21% while imports from Mexico increased by 12.94%. As the Mexican economy grew, US exporters would benefit from the increased demand for US products. Another implication of this is the increase in aggregate real wages for American workers caused by less migration pressure on US labor markets from Mexico. Empirical studies conducted by the U.S. International Trade Commission (1992) confirmed that the aggregate real wages of US workers would rise, with the increase ranging from 0.1% to 0.3% as a result of technological advancement within certain sectors.

NAFTA has been credited as a trade creator yet also a trade diverter. Gould (1998) and Krueger (1996) used gravity models to predict bilateral trade flows without NAFTA and found that NAFTA, in general, does not have a significant impact on bilateral trade flows. However, after comparing this prediction to actual trade data, Gould (1998) concluded that U.S. export growth to Mexico was 16.3% higher and that U.S. import growth from Mexico was 16.2% higher compared to without NAFTA. Gould also examined North American trade with non-NAFTA countries and found that the volume had also increased. Hufbauer (2016) confirms that trade

between the two countries has increased: U.S. trade with Mexico has more than quintupled in nominal terms between 1993 and 2013 while U.S. trade with the rest of the world increased nearly four times. This suggests that the increase in NAFTA trade was net trade-creating, opposed to simply diverting trade away from non-NAFTA countries and into Mexico like Kaemfer and Loweberg (2007) suggest.

3. Model Design

In this paper, effects of Trump's proposed tariff structures on Canada, Mexico, the U.S., and their major trading partners are carried out with the comparative-static version of the CGE model GTAP. This model is used worldwide for economic impact assessment of trade policy measures. The GTAP model is based on neo-classical behavioral relations and equilibrium quantity, and prices are determined through constrained optimization process. The model itself is based on the GTAP database, which relies on input-output tables contributions, ultimately founded in the system of national accounts. Trade flows are modeled following an Armington approach with a constant elasticity of substitution functional form (see Section 6 for more). The database version used for the modeling simulations is the GTAP 7 data set. The following paragraphs discuss how the computable general equilibrium model framework is applied to multiple scenarios of the U.S. withdrawing from NAFTA.

3.1 The Computable General Equilibrium (CGE) Model

A CGE model is structured to represent a simplified global economy that considers interactions among various economic agents such as consumers, producers, and government in order to analyze the impact of a policy change or external shock on the economy. The model's equilibrium is based on empirical data that has been observed and recorded at some point in time

(a 2011 data set is used in this paper). Once certain policy parameters are changed, the model then determines a new equilibrium. The benefit of a CGE model is that it captures a wide array of economic impacts caused by a shock or policy change, making it especially useful for sectoral and regional analysis.

3.2 The GTAP Framework

The GTAP CGE model relies on input-output tables as its database. GTAP uses a multi-sector, multi-regional, and multi-factor general equilibrium framework to analyze how an economy would react under policy changes/external shocks. To achieve this, GTAP captures the interactions of various sectors and markets in a regional, and international context. The model assumes perfect competition in agricultural sectors and imperfect competition in manufacturing and service sectors, while also following the assumption of constant returns to scale. The policy simulations will be compared to the initial equilibrium.

3.3 Aggregations and Variables

The geographic aggregation comprises of NAFTA countries, its main trading partners and countries in which trade diversion may occur with. The study separates NAFTA into three countries: Canada, Mexico, and U.S.A. The economic makeup of NAFTA can be classified as countries that are primarily service and capital intensive (i.e. U.S.A and Canada) and those with a dominant labor sector (i.e. Mexico). Since NAFTA's main trading partners are the European Union (EU) and China, these regions are considered separately for the study. South Asia, Southeast Asia, and East Asia are also considered separately to assess the diversion of trade.

The factors of production have been aggregated into six categories: capital, land, natural resources, and three different types of labor (skilled labor, unskilled labor and agriculture/manufacturing labor). The intended goal of aggregating each type of labor is to

analyze the potential shift in labor markets. The differentiation between unskilled labor and agriculture/manufacturing labor was needed in order to narrow the scope of what unskilled labor pertained to, especially in a simulation of three economies that are heavily reliant on their manufacturing and agricultural industries.

In order to simulate a U.S. departure from NAFTA, three simulations will be conducted: the instatement of harsh tariffs with no retaliation, the instatement of harsh tariffs with retaliation and the instatement of tariff structures set to the WTO MFN rate between Mexico and the U.S.

4. Descriptive Statistics and Calibration

4.1 Current Tariff Structures

Understanding the current economic situation in Canada, the United States and Mexico is crucial in contextualizing the effects of leaving NAFTA. Tables 1a, 1b, and 1c display the tariff structures (as an Ad-Valorem Percent rate) on imports into Canada, Mexico, and the United States respectively. The imports are from the other NAFTA countries along with the region's major trading partners: China, the EU, East Asia, South East Asia, South Asia, and the Rest of the World (ROW). As Canada, Mexico, and the USA are currently a part of NAFTA, tariffs for most sectors are equal to 0. However, because of certain sectoral tariff exemptions, some countries are allowed imposing tariffs to protect vital industries. For instance, the Canadian government has continued with supply management policy in order to protect dairy farmers; this explains the abnormally high import tariffs on dairy from Mexico (170%) and the USA (177%) as seen in Table 1a. In addition, the USA and Mexico have also implemented tariffs on Canadian imported dairy (14.3% and 40.3% respectively), confining Canadian dairy within its borders.

Because NAFTA is not a custom union, countries within NAFTA have the autonomy to independently set import tariffs on non-NAFTA countries.

Table 1a. Import tariffs from country X into Canada

	Mexico	USA	China	EU	East Asia	SE Asia	South Asia	ROW
Dairy	170	177	74.6	227	125	148	18.1	164
Lumber	0	0	0.857	0.552	0.391	0.936	1.54	0.494
Auto Manufacturing	0	0	4.07	3.48	4.73	2.24	1.65	4.11
Textile/Apparel	0	0	13.8	9.68	5.93	9.76	13.3	5.23
Grains/Crops	0	0	1.04	2.25	1.45	0.024	0.097	0.581
Extraction	0	0	0.002	0.014	0.174	0.054	0.002	0
Processed Food	7.23	10.1	4.28	8.43	6.98	3.26	2.52	3.59
Manufacturing	0	0	1.08	0.776	0.806	0.677	0.67	0.152
Meat Products	0.019	32.8	4.12	3.23	1.57	73.3	0.008	23.9
Other Sectors	0	0	0	0	0	0	0	0

Source: Own aggregation of the GTAP model

Table 1b. Import tariffs from country X into Mexico

	Canada	USA	China	EU	East Asia	SE Asia	South Asia	ROW
Dairy	40.3	0	0	33	0.966	30.1	4.54	20.2
Lumber	0	4	7.91	0	1.35	8.85	11.2	5.35
Auto Manufacturing	0	0	8.39	0	9.77	22.8	25.5	9.42
Textile/Apparel	0	0.175	21.2	0	16	26.5	21.7	12.7
Grains/Crops	0	0.604	12.3	0.103	7.35	13.5	3.62	7.52
Extraction	0	0	5.61	0	1.61	0.351	4.78	0.717
Processed Foods	2.32	1.67	19.7	5.74	9.58	19.1	11.8	6.41
Manufacturing	0	0.105	4.86	0.005	3.53	3.44	5.1	2.15
Meat Products	7.83	0	6.33	5.68	1.63	4.26	0	9.61
Other Sectors	0	0	0	0	0	0	0	0.001

Source: Own aggregation of the GTAP model

Table 1c. Import tariffs from country X into USA

	Canada	Mexico	China	EU	East Asia	SE Asia	South Asia	ROW
Dairy	14.3	0.071	5.18	11.5	18.8	12.7	0.663	9.44

Lumber	0	0	1.61	0.463	0.243	0.099	0.02	0.04
Auto Manufacturing	0	0	1.6	0.772	1.15	0.287	0.023	0.204
Textile/Apparel	0	0	11.5	7.58	9.01	12.8	9.22	5.08
Grains/Crops	0	0.021	1.4	1.82	1.87	0.69	1.64	0.943
Extraction	0	0	0.183	0.12	0.235	0.075	0	0.059
Processed Food	1.87	0.161	2.82	1.89	3.99	1.91	0.85	2.61
Manufacturing	0	0	1.15	1.13	1.09	0.379	0.676	0.508
Meat Products	0	0	0.738	1.21	0.613	0.765	0.542	2.78
Other Sectors	0	0	0	0	0	0	0	0

Source: Own aggregation of the GTAP model

4.2 Modified Tariff Structures

This study explores the effects of leaving NAFTA through the analysis of three scenarios: the implementation of harsh tariff structures without retaliation, with retaliation, and MFN duty rates.

Harsh tariff structures without retaliation calls for the re-implementation of heavy protectionist measures on Mexican imports and exports. This scenario assumes that no tariff modifications between Canada and the USA or Mexico will occur; free trade will still take place between Canada-Mexico and Canada-U.S. Harsh tariffs without retaliation would suggest the implementation of 20% import tariff on all goods exported to Mexico and a 35% tariff on goods imported from Mexico (Hufbauer, 2016).

Harsh tariff structures with retaliation assume that both Canada and Mexico will reciprocate with their own harsh tariffs on the United States. The proposed retaliation will be a 150% import tariff for all meat products from the U.S. into Canada or Mexico, a 42% import tariff for all dairy products from the U.S. into Mexico and a 270% import tariff on all dairy products from the U.S. into Canada. America will in response set 45% import tariffs on Canadian

lumber, a policy change that stays consistent with the U.S. government's recent decision in creating a 27% Canadian lumber tariff (Skeritt, 2017).

The final scenario assumes that tariff structures resets to WTO MFN Duty Rates between Mexico and the U.S, with tariff structures between Canada-U.S. and Canada-Mexico remaining the same. Based on MFN Rates by the World Trade Organization Tariff Database (2017), both Mexico and the United States would set their import tariffs to the same amount: 16% import tariff on meat products, 12.38% on dairy products, 10% on textiles, 1.82% on lumber, 7% on grains/crops, 3% on manufacturing, 10% on processed foods, 1% on extraction and 5% on auto manufacturing.

4.3 Demand Side

The United States' economy (18.57 trillion) is 12 times larger than Canada's economy (1.53 trillion) and 18 times larger than Mexico's economy (1.046 trillion). As illustrated in Table 2, U.S. household demand nearly supersedes Canada and Mexico in all sectors, with processed foods being the only exception. This can be explained by the size of the economy but also by the sheer population of each country: The U.S population is 3 times that of Mexico and 10 times that of Canada.

Table 2. Private Household Demand for domestic sectors in Canada, Mexico and U.S.A.

	Canada	Mexico	USA
Dairy	10147.93	14097.05	55619.99
Lumber	950.03	1058.81	5110.99
Auto Manufacturing	13129.07	13433.27	212725.9
Textiles and Apparel	8204.17	12321.45	144801.2
Grains and Crops	2301.25	9170.93	46390.68

Extraction	2040.12	1271.03	2378.1
Processed Food	34354.12	75558.51	316564.2
Manufacturing	41722.5	53457.25	675538.9
Meat Products	11892.44	17512.4	134856.3
Other Sectors	658687.1	459900.1	8354154

Source: Own aggregation of the GTAP model

The allocation of expenditure in millions is depicted in Table 3. The ratio of exports and imports to GDP (dependence on trade) in Canada, Mexico, and the U.S. is 53.7%, 57.6%, and 29.3% respectively. Canada and Mexico's significant dependence on trade suggests that they may be relatively more affected by changes in tariffs compared to the U.S. The United States is the only country that has a trade deficit (the value of imports far surpass the value of exports), compared to Canada and Mexico which both have trade surpluses (the value of exports surpass the value of imports). The U.S. trade deficit is the result of a net inflow of capital to the United States from the rest of the world. This inflow of capital from abroad allows American consumers and businesses to pay for imports over and above what is exported.

Table 3. Expenditure (Millions of U.S. Dollars)

	Exports	Imports	Total	Trade Balance	Trade (% of GDP)
Canada	480651	-476129	1778629	4522	53.7
Mexico	352233	-322089	1170083	30144	57.6
USA	1880767	-2676776	15533785	-769009	29.3

Source: Own aggregation of the GTAP model

4.4 Supply Side

The industry output is broken down on a sectoral basis for each country and portrays the relative importance of each sector, as illustrated in Table 4. Out of all sectors, Mexico's GDP is more dependent on auto manufacturing, processed food, and manufacturing than the Canadian or American economy; therefore, if tariffs structures are changed, these sectors should be the most adversely effected sectors in Mexico. Because of the sheer output of the U.S., coupled with the relatively low dependence on trade (29.3%) seen in Table 3, any tariff changes would have a smaller impact on the U.S. economy.

Table 4. Industry Output in Millions

	Canada	Mexico	USA
Dairy	22792.08	20491.33	140958.95
Lumber	14481.22	4045.33	23497.49
Auto Manufacturing	122334.03	120308.32	895025.06
Textile and Apparel	18548.87	29092.48	311150.28
Grains and Crops	31377.29	32144.4	242624.88
Extraction	149788.63	85068.06	381695.72
Processed Food	77639.98	103724.73	584547
Manufacturing	574976.19	426454.25	5420174
Meat Products	44042.93	28282.97	323008.81
Other Sectors	2117116.25	1126521.75	19952696

Source: Own aggregation of the GTAP model

Output is produced using a combination of six factors of production: land, unskilled labor, agriculture/agriculture, skilled labor, capital, and natural resources. Table 5 indicates the relative importance of each factor of production to manufacturing, a sector that was the most impact by the creation of NAFTA (Faux & Rothstein, 1991). In manufacturing, labor and capital are the most important factors of production. The huge abundance of unskilled and manufacture labor in Mexico explains why the factor income for those (30.5%) are much higher than the factor income of skilled labor (4.6%). However, the largest factor income for Mexico is capital (64.8%), which can be explained by the increase in foreign direct investment into Mexico after the induction of NAFTA (Manchester & McKibbin, 1995). Canada and the U.S. have a substantially higher in skilled labor (35.7% and 28% respectively), suggesting a more educated workforce in the manufacturing sector.

Table 5. Sources of Factor Income for Manufacturing by Country

Manufacturing	Canadian	Mexico	USA
Land	0	0	0
Unskilled Labor	10.2	2.9	7.5
Agriculture/Manufacture Labor	14.1	27.6	37.1
Skilled Labor	35.7	4.6	28
Capital	40	64.8	27.3
Natural Resources	0	0	0
Total	100	100	100

Source: Own aggregation of the GTAP model

4.5 The Armington Constant Elasticity of Substitution (CES)

For producers, the Armington model assumes that all goods produced use an ideal combination of domestic and foreign inputs to minimize the cost in producing the final good. On

the import side, Armington differentiates imported goods by origin, and assumes them to be imperfect substitutes for domestically produced goods. Given these assumptions, the Armington Constant Elasticity of Substitution (CES) represents the responsiveness in demand for imported goods to a change in relative price of the good. The Armington CES for the regional allocation of imports is shown in Table 6. If an imported good is defined as a substitute (a replaceable good), then it would have a high elasticity. However, if an imported good is labeled as a complement (a good that accompanies another good), then the elasticity would be low. Seen in Table 6, the Armington CES of dairy and lumber are held constant throughout all NAFTA countries (7.3 and 5 respectively); this can be explained by the interchangeable nature of these resources, irrespective of the country of origin. On the other hand, the elasticity of Mexican extraction goods (21.1) is clearly higher than the elasticity of extraction goods of United States (11.2) and Canada (11.0), signaling that Mexican extracted resources are relatively more substitutable when prices change. Examining elasticity between sectors, extraction goods, and textile/apparel goods across all countries have a high elasticity compared to other sub sectors because these imports have a stronger sensitivity to price.

Table 6. Armington CES for regional allocation of imports

	Canada	Mexico	USA	China	EU
Dairy	7.3	7.3	7.3	7.3	7.3
Lumber	5	5	5	5	5
Auto Manufacturing	6.04	5.9	6.17	6.24	6.32
Textile and Apparel	7.56	7.59	7.59	7.56	7.59
Grains and Crops	4.29	4.72	4.81	4.81	5.07
Extraction	11	21.1	11.2	6.8	13.7
Processed Food	3.51	4.14	3.83	4.85	3.91
Manufacturing	7.19	7.13	7.42	7.5	7.01
Meat Products	7.71	7.72	6.37	7.16	7.38
Other Sectors	3.83	3.82	3.82	3.82	3.87
Total	63.4	74.4	63.5	61	67.1

Source: Own aggregation of the GTAP model

5. Results

5.1 Harsh Tariffs with no Retaliation

This scenario assumes that the American government will implement the most radical tariff structure on Mexico, simulating the highest realistic tariff rates possible (35% import and 20% export tariffs). In this simulation, there will be no retaliation from Mexico or Canada; all tariff structures between Mexico-Canada and U.S.A-Canada will also remain the same.

Table 7 displays the percent change in market prices after the implementation of extreme tariffs on Mexico. In response to extremely high tariffs, market prices of all commodities in Mexico steeply declined. This is because by increasing tariffs, the volume of imports from Mexico is drastically reduced, as the price per unit of imported good is relatively more expensive. Consequently, American will replace the relatively more expensive imported good for a domestic substitute or import from another country. This leads to an immediate spike in domestic supply within Mexico, exacerbated by Mexico's economic dependence on exporting to the U.S. Because the supply of all commodities is in excess (supply exceeds demand) in domestic Mexican markets, this thereby decreases the price of all commodities. Meanwhile, prices in Canada have slightly increased for nearly all sectors. This may reflect trade diversion, as now Canadian goods are relatively less expensive than their Mexican counterparts, drawing more demand from American consumers.

Table 7. Market Price of Commodities (% Change)

	Canada	Mexico	USA
Dairy	1.63	-27.31	-0.29

Lumber	1.09	-28.72	-0.41
Auto Manufacturing	0.88	-19.37	0.18
Textiles and Apparel	1.49	-19.01	-0.11
Grains and Crops	1.49	-22.24	-0.21
Extraction	1	-24.37	0.31
Processed Food	1.46	-24.55	-0.09
Manufacturing	1.3	-22.02	0.02
Meat Products	1.59	-21.13	-0.31
Other Sectors	1.85	-31.05	-0.42

Source: Own aggregation of the GTAP model

The macroeconomic performance for all sectors is shown in Table 8. The reinstatement of harsh import and export tariffs has caused an economic crash in Mexico. The crash in GDP and trade levels in Mexico can be attributed to a negative change in the terms of trade (-22.66%), a ratio of a country's export prices to import prices. The prices of imports relative to the price of exports have risen with the modified tariff structure, therefore negatively impacting Mexico's real GDP (-31,24%). A smaller decrease in the volume of exports (-23.17%) than imports (-61.33%) leads to a trade surplus (36200.66 million American dollars). The same lines of analysis also apply to the U.S. However, because of the relatively independent nature of its economy (only 29% of GDP is based on trade), lots of potentially disastrous economics effects were curbed. This is why even though export volumes decreased, real GDP sill increased by 0.05%. It is also interesting to note that the real GDP of all other countries have increased, a possible indicator of trade diversion from Mexico and the U.S. This is especially the case with Canada, which has most likely taken advantage of the relatively low prices (reference table 7) coupled with continued free trade with both nations to import more goods (+3.5%) from Mexican and American markets. Other countries not a part of NAFTA have all showed decreasing export

volumes, a likely effect of the trade war between two of their main trading partners (Mexico and the U.S.).

Table 8. Macroeconomic Performance (% Change)

	Real GDP	Terms of Trade	Import Volumes	Export Volumes	Change in Trade Balance (in millions)
Canada	2.02	1.54	3.5	0.48	-6917.18
Mexico	-31.24	-22.66	-61.33	-23.17	36200.66
USA	0.05	1.2	-5.92	-7.18	56204.18
China	1.12	0.34	0.7	-0.38	-11760.53
EU	0.89	0.14	0.3	-0.25	-29651.25
East Asia	1.18	0.38	0.59	-0.59	-14629.16
SE Asia	0.92	0.08	0.28	-0.11	-3059.24
South Asia	1.04	0.25	0.33	-0.56	-4252.26
ROW	0.86	0.19	0.64	-0.15	-22135.93

Source: Own aggregation of the GTAP model

The percentage change in the quantity of exports from the U.S.A to country X is illustrated in Table 9. In nearly all countries analyzed, American exports have increased, with Mexico as the clear outlier. All American exports to Mexico have drastically decreased, the most severe being the extraction sector, where American exports fell by over 200%. This indicates that the implemented 20% export tariff on American goods to Mexico has proven to be effective. A high price elasticity of demand (the responsiveness of the quantity demanded of a good or service to a chine in its price) coupled with a constricted regional household income in Mexico can explain why the change was so drastic. This meant that domestic and international goods were relatively less expensive than American goods. Interestingly, as exports with Mexico fell, exports with other countries have increased. This is an example of trade diversion, where the destination of U.S. exports has been diverted away from Mexico to other countries. Some Canadian sectors,

on the other hand, have also had faced a decrease in U.S. exports, most likely from the low prices of Mexican goods (reference Table 7).

Table 9. Quantity of Exports from U.S.A to Country X (% Change)

	Canada	Mexico	USA	China	EU	East Asia	SE Asia	South Asia	ROW
Dairy	9.02	-187.52	5.06	7.84	8.12	7.51	6.96	8.31	7.48
Lumber	2.45	-106.09	4.93	5.57	5.55	4.65	5.9	6.31	5.34
Auto Manufacturing	-2.33	-110.99	15	3.63	3.35	4.06	4.12	4.15	2.48
Textile Apparel	6.3	-146.69	8.57	7.48	7.41	7.8	7.72	7.65	6.89
Grains and Crops	-3.98	-70.45	19.44	3.84	4.8	2.62	4.45	5.51	4.39
Extraction	-1.4	-216.23	10.73	0.31	1.55	1.97	2.5	1.65	2.12
Processed Food	2.56	-92.81	5.97	3.6	3.58	3.4	3.39	3.84	2.98
Manufacturing	0.89	-115.13	9.81	5.59	5	5.41	5.49	5.17	3.92
Meat Products	5.48	-110.38	12.7	7.29	8.12	3.54	7.78	8.32	7.07
Other Sectors	6.03	-121.29	2.99	4.68	4.59	4.83	4.57	4.76	4.44

Source: Own aggregation of the GTAP model

Table 10 displays the percentage change in the industry output for each NAFTA country. With no access to efficiently produced goods as a result of inflated prices from high tariffs, countries are forced to produce more of all goods, irrespective of how inefficient the production process is. Virtually all-Mexican sectors ramp up output to meet domestic demand, since tariffs make domestically produced goods relatively cheaper than heavily taxed imported goods from the United States. Auto manufacturing faces a decline in output for Mexico (-8.56%) and a slight decrease in the U.S. (-0.58%), likely due to the reallocation of auto manufacturing output to Canada (+4.91%). The inverse can be observed in many other industries, like the extraction sector. Because Mexican and American extraction output increases (+3.65% and +0.41% respectively), the need for Canadian extraction goods decreases, consequently leading to the decrease of extraction output (-0.5%).

Table 10. Industry Output (% Change)

	Canada	Mexico	USA
Dairy	-0.3	11.77	-1.7
Lumber	-1.19	10.56	0.06
Auto Manufacturing	4.91	-8.56	-0.58
Textile and Apparel	-1.98	3.14	0.12
Grains and Crops	-0.44	8.19	0.33
Extraction	-0.5	3.65	0.41
Processed Food	-0.57	1	-0.19
Manufacturing	-1.45	14.39	-0.86
Meat Products	-1.33	15	-1.09
Other Sectors	0.17	-3.28	0.14

Source: Own aggregation of the GTAP model

The effects on equivalent variation and regional household income are displayed in Table 11 and Table 12. Equivalent variation is a measurement of economic welfare changes associated with changes in prices. In other words, it is the change in wealth, at current prices, that would have the same effect on consumer welfare, as would the change in prices, with income unchanged. In GTAP, a positive figure indicates welfare improvement. Canada and U.S.A. experience welfare gains (+8409.63 and +34169.73 millions of U.S. dollars respectively), while Mexico undergoes a decline in economic welfare (-80256.52 millions of U.S. dollars). An extreme tariff structure with no retaliation is also devastating to Mexican regional household income (-32.59%), a clear sign of increased poverty and a lower standard of living. This also exacerbates the excess supply of domestic goods as it lowers domestic consumption.

Table 11. Change in welfare measured by Equivalent Variation (Millions of U.S. dollars)

	Equivalent Variation
Canada	8409.63
Mexico	-80256.52
USA	34169.73

Source: Own aggregation of the GTAP model

Table 12. Regional Household Income (% Change)

	Regional Household Income (% Change)
Canada	2.1
Mexico	-32.59
USA	0.04

Source: Own aggregation of the GTAP model

5.2 Harsh Tariffs with Retaliation

The second simulation will utilize the same shocks as the first simulation but will assume both Canada and Mexico will reciprocate with their own harsh tariffs on the United States. This will consist of a 150% import tariff for all meat products from the U.S. into Canada or Mexico, a 42% import tariff for all dairy products from the U.S. into Mexico and a 270% import tariff on all dairy products from the U.S. into Canada. America will in response set 45% import tariffs on Canadian lumber (Skeritt, 2017). Canada-Mexico tariff rates will remain constant.

The effect of the proposed tariff structure on the market price of commodities is shown in Table 13. Prices in Mexico have held relatively constant compared to the previous tariff structure. However, some sectors like grains/crops and meat products have a higher price under the current simulation, as a result of import tariffs on American goods like meat. Meanwhile, American market prices marginally decrease, which can be explained by the decrease in Canadian and Mexican demand for American goods.

Table 13. Market Price of Commodities (% Change)

	Canada	Mexico	USA
Dairy	2.9	-26.31	-0.67
Lumber	0.44	-28.46	-0.33

Auto Manufacturing	1.16	-19.05	0
Textiles and Apparel	2.25	-15.86	-0.29
Grains and Crops	2.85	-19.3	-0.85
Extraction	1.05	-24.32	0.39
Processed Food	2.62	-23.8	-0.32
Manufacturing	1.64	-21.69	-0.15
Meat Products	10.41	-9.71	-0.87
Other Sectors	2.4	-30.65	-0.67

Source: Own aggregation of the GTAP model

Table 14 shows the percentage change in macroeconomic performance. Mexico remains the country that is the most adversely affected. The terms of trade declines in Mexico (-22.08%) as prices fall and cheaper imports from other countries become more attractive which lowers Mexico's GDP (-30.29%). Under NAFTA, Mexico reaped the most benefits in terms of GDP growth from an FTA, but is now worse off under high tariffs with the U.S. Since America's dependence on trade was minute to begin with, the effects on its terms of trade are not as adverse. In fact, the terms of trade increases by 0.85%. On the import side, declining prices may lead to reduced income levels in certain sectors, and hence result in a lower demand for imports relative to the previous scenario. Moreover, there is an increasing trade deficit for countries not enthralled in the trade war, a likely sign that they are importing more from Mexico and the U.S. as a result of relatively cheaper goods.

Table 14. Macroeconomic Performance (% Change)

	Real GDP	Terms of Trade	Import Volumes	Export Volumes	Change in Trade Balance (in millions)
Canada	2.6	2.13	1.83	-1.86	-7450.17
Mexico	-30.29	-22.08	-63.85	-26.01	36380.1
USA	-0.23	0.85	-5.57	-7.21	65368.85
China	1.16	0.34	0.71	-0.43	-12793.14
EU	0.93	0.14	0.32	-0.28	-32697.11

East Asia	1.21	0.38	0.62	-0.64	-15965.88
SE Asia	0.96	0.09	0.29	-0.13	-3345.43
South Asia	1.09	0.26	0.34	-0.61	-4537.85
ROW	0.95	0.23	0.72	-0.18	-24960.67

Source: Own aggregation of the GTAP model

The percentage change in the quantity of exports from U.S.A to country X is illustrated in Table 15. In Canada and Mexico, American exports decrease as a result of increased retaliation. In the case of meat products, Canada and Mexico have set 150% import tariffs, resulting in a -498.48% and -463.73% change respectively. Trade diversion occurs as America is exporting more goods to other areas of the world where American goods are not subject to high tariffs. Interestingly, some sectors in which free trade still occurs between the U.S. and Canada have seen increased exports from the U.S. into Canada (+5.11% change in processed food).

Table 15. Quantity of Exports from U.S.A to Country X (% Change)

	Canada	Mexico	USA	China	EU	East Asia	SE Asia	South Asia	ROW
Dairy	-179.74	-289.24	6.54	10.71	11.25	10.17	9.71	11.33	10.65
Lumber	-0.36	-106.75	33.6	5.34	5.45	4.08	5.73	6.22	5.25
Auto Manufacturing	-1.62	-110.45	16.25	4.89	4.67	5.24	5.31	5.41	3.83
Textile and Apparel	8.85	-144.11	10.39	9.14	9.12	9.44	9.4	9.29	8.61
Grains and Crops	-0.07	-58.3	23.61	6.51	8.47	4.84	7.53	9.27	7.87
Extraction	-2.67	-216.97	10.89	0.05	1.2	1.67	2.19	1.3	1.73
Processed Food	5.11	-90.13	6.93	4.74	4.77	4.43	4.48	4.93	4.18
Manufacturing	1.95	-114.36	11.12	6.94	6.42	6.74	6.82	6.58	5.32
Meat Products	-498.48	-463.73	30.38	12.75	12.97	12.64	13.11	12.88	12.92
Other Sectors	7.8	-58.93	3.66	5.81	5.67	5.84	5.67	5.82	5.59

Source: Own aggregation of the GTAP model

Table 16 presents the percentage change in industry output. When a trade war is in place, total output increases in more of Canada's sectors than under the previous simulations, evident

from the positive growth in dairy (+3.45%) and meat products (+35.09%). Furthermore, Canada's and Mexico's entire meat products sector has been forced to expand as a result of the 150% export tariffs on U.S. meat products, containing the largest percent change (+35.09% and +60.86%) out of all other sectors. As a result, the U.S. meat product sector has shrunk (-13.76%), due to the lack of Canadian and Mexican demand. In the U.S., lumber output increases by the most (+0.88%) while meat products contract the most (-13.76%). Lumber sectors in the U.S. were forced to expand after American import tariffs of 45% were put in place, making imported Canadian lumber more expensive. However, overall, many American sectors only changed marginally, displaying no drastic output shifts. The increased output across sectors that have negative trade balances (import-heavy), to compensate for expensive imported goods, can hamper the long term productivity of North America, causing all countries to be less efficient in the production of goods while deterring specialization.

Table 16. Industry Output (% Change)

	Canada	Mexico	USA
Dairy	3.45	16.51	-3.3
Lumber	-3.76	9.93	0.88
Auto Manufacturing	3.54	-10.01	-0.16
Textile and Apparel	-4.28	-7.52	0.82
Grains and Crops	-2.13	5.7	0.8
Extraction	-0.76	3.33	0.6
Processed Food	-0.34	1.76	-0.69
Manufacturing	-2.76	12.88	-0.4
Meat Products	35.09	60.86	-13.76
Other Sectors	0.08	-3.37	0.15

Source: Own aggregation of the GTAP model

The changes in output have a significant effect on welfare and household income, as observed in Table 17 and Table 18. Similar to harsh tariffs with no retaliation, the current

scenario has a negative effect on welfare in Mexico (-78760.71 million U.S. dollars) and a positive effect on Canada (+6705.15 million U.S. dollars) and U.S.A (25364.68 million U.S. dollars). Similar to the prior simulation, Mexico's welfare suffers the most out of the NAFTA countries, which in turn also causes a decline in Mexico's household income (-31.56%). Meanwhile, Canada's welfare (+6705.15 millions of U.S. dollars) and household income (+2.7%) still increases under the current scenario, as a result of an increase in real GDP. On the contrary, because U.S.A. real GDP decreased by 0.23%, the regional household income also decreases (-0.25%) as a result.

Table 17. Change in welfare measured by Equivalent Variation (Millions of U.S. dollars)

	Equivalent Variation
Canada	6705.15
Mexico	-78760.71
USA	25364.68

Source: Own aggregation of the GTAP model

Table 18. Regional Household Income (% Change)

	Regional Household Income (% Change)
Canada	2.7
Mexico	-31.56
USA	-0.25

Source: Own aggregation of the GTAP model

5.3 Most Favored Nation (MFN) Rates

In this simulation, all tariff structures between the U.S. and Mexico will reset to WTO MFN rates. Tariff structures between Mexico-Canada and U.S.A.-Canada will remain the same.

Table 19 displays the percent change in market prices after the implementation of MFN rates between Mexico and the U.S. In response to the WTO's milder tariffs, the change in price across all NAFTA countries is less drastic than the previous simulations. Canadian prices have increased marginally, suggesting that the demand for Canadian goods has stayed relatively constant in international markets. This can be attributed to more facile tariffs, which results in less of a price hike, keeping trade diversion to a minimum. This can also explain why U.S.A and Mexico did not face steep declines in their commodity prices, as consumers are still inclined to import from each other compared to importing from other countries. Mexico may be more price sensitive than the U.S. (prices have decreased more in all Mexican sectors), a result of a lower quality of life and worse social welfare.

Table 19. Market Price of Commodities (% Change)

	Canada	Mexico	USA
Dairy	0.27	-2.76	-0.11
Lumber	0.12	-2.77	-0.1
Auto Manufacturing	0.14	-1.73	-0.02
Textiles and Apparel	0.22	-1.04	-0.05
Grains and Crops	0.34	-3.08	-0.15
Extraction	0.03	-0.9	-0.01
Processed Food	0.23	-2.31	-0.04
Manufacturing	0.18	-2.15	-0.08
Meat Products	0.28	-1.28	-0.1
Other Sectors	0.28	-3.34	-0.13

Source: Own aggregation of the GTAP model

The macroeconomic performance for all sectors is shown in Table 20. As a result of milder tariffs, the change in performance indicators have also become more minute. The terms of trade in Mexico (-2.01%) has decreased as prices fall and imports become relatively more expensive compared to domestic goods. Because the U.S. is Mexico's main trade partner, making

up over 81% of its exports) the imposition of even a slight tariff has caused the real GDP of Mexico (-2.95%) to decline. On the other hand, Mexico is only one of the many trade partners of the U.S., explaining why the U.S. real GDP (-0.08%) only weakened marginally. This is reflected in the import and export volumes of each country: U.S. imports and exports decreased by -0.91% and -0.88% respectively compared to Mexico's imports and exports which decreased by -8.42% and -4.16% respectively. Canadian import volumes (0.53%) increase as a result of decreased Mexican and U.S. prices that make domestic goods relatively more expensive and goods from Mexico and the U.S. more appealing. Canadian export volumes (0.07%) also marginally increase as a result of trade diversion. Mexico and the U.S. may be more inclined to trade with Canada compared to other non-NAFTA countries (Canada is the only country with a positive change to its export volumes) due to continued free trade with Canada.

Table 20. Macroeconomic Performance (% Change)

	Real GDP	Terms of Trade	Import Volumes	Export Volumes	Change in Trade Balance (in millions)
Canada	0.3	0.22	0.53	0.07	-1114.49
Mexico	-2.95	-2.01	-8.42	-4.16	5383.29
USA	-0.08	0	-0.91	-0.88	8619.5
China	0.15	0.05	0.09	-0.06	-1600.93
EU	0.12	0.02	0.05	-0.04	-4448.24
East Asia	0.17	0.07	0.09	-0.1	-2325.47
SE Asia	0.13	0.02	0.05	-0.02	-479.35
South Asia	0.15	0.05	0.05	-0.1	-620.14
ROW	0.11	0.01	0.08	-0.02	-3414.34

Source: Own aggregation of the GTAP model

The percentage change in the quantity of exports from the U.S.A to country X is shown in Table 21. Surprisingly, even with milder tariffs, the decrease in U.S. exports to Mexico is radical.

This is a likely indication that Mexican consumers are very price sensitive, where even a small change in price will cause them to purchase from countries that have lower prices. In response to this steep drop in Mexico's demand, U.S. sectors have diverted exports from Mexico to other countries, explaining the increase in American exports in nearly all sectors in the rest of the world. Besides Mexico, the only decrease in U.S. exports has been Canada's grain/crop and extraction sectors. This indicates that Canada is either producing more domestic goods from those sectors or is importing relatively cheaper goods from other countries, thereby decreasing the demand for U.S. goods in those sectors.

Table 21. Quantity of Exports from U.S.A to Country X (% Change)

	Canada	Mexico	USA	China	EU	EastAsia	SEAsia	SAsia	ROW
Dairy	1.82	-68.93	1.87	1.55	1.62	1.47	1.42	1.69	1.52
Lumber	0.21	2.59	0.36	0.86	0.89	0.72	0.94	1.04	0.88
Auto Manufacturing	0.31	-23.58	3.14	0.79	0.78	0.9	0.83	0.84	0.68
Textile Apparel	1.23	-61	2.5	1.33	1.24	1.32	1.48	1.33	1.19
Grains and Crops	-0.03	-19.31	4.93	1.06	1.3	0.73	1.28	1.45	1.21
Extraction	-0.14	-8.79	0.54	0.24	0.47	0.38	0.37	0.51	0.45
Processed Food	0.58	-26.44	2.56	0.61	0.6	0.57	0.61	0.66	0.53
Manufacturing	0.52	-14.53	1.22	1.22	1.16	1.2	1.19	1.16	1
Meat Products	1.59	-52.65	7.72	1.46	1.55	1.08	1.61	1.63	1.44
Other Sectors	1.09	-6.07	0.37	0.89	0.86	0.9	0.87	0.9	0.84

Source: Own aggregation of the GTAP model

Table 22 displays the percentage change in the industry output for NAFTA countries. Many export heavy sectors in Mexico like textiles and auto manufacturing have decreased their industry output (-11.45% and -5.1 % respectively) in order to compensate for the loss in demand from U.S. consumers. On the other hand, many import heavy sectors like dairy and lumber have increased industry output (3.3% and 2.03% respectively) as domestic demand for these goods has increased. This is attributed to the higher prices of U.S. goods, meaning that there is more

demand for cheaper domestic goods. This would also explain why industry output for select sectors in Canada has decreased, a result of less expensive Mexico or U.S.

Table 22. Industry Output (% Change)

	Canada	Mexico	USA
Dairy	-0.03	3.3	-0.73
Lumber	-0.29	2.03	0.07
Auto Manufacturing	1.14	-5.1	-0.04
Textile and Apparel	-0.11	-11.45	-0.38
Grains and Crops	0.27	-0.09	0.01
Extraction	-0.15	1.86	0.06
Processed Food	0.31	-1.59	-0.08
Manufacturing	-0.38	2.85	-0.02
Meat Products	1.11	2.3	-0.69
Other Sectors	0.02	-0.19	0.01

Source: Own aggregation of the GTAP model

The changes in equivalent variation and regional household income are displayed in Table 23 and Table 24. Unlike harsh tariffs in the previous two simulations, MFN tariffs have a smaller impact on welfare and household income. There is a negative effect on welfare in Mexico (-6402.49 million U.S. dollars), but a positive effect on the U.S. (562.71 million U.S. dollars) and Canada (1211.44 million U.S. dollars). Canada and the U.S. are the beneficiaries of any of the three tariff structure analyzed in this paper. Mexico's change in welfare is still negative, but to a lesser degree than the last two simulations. Regional household income increases in Canada (+0.31%) and decreases in the U.S. (-0.08%) and Mexico (-3.07). As real GDP decreases and population stays constant for the U.S. and Mexico, GDP per capita subsequently also decreases, leading to a decrease in regional household income.

Table 23. Change in welfare measured by Equivalent Variation (Millions of U.S. dollars)

	Equivalent Variation
Canada	1211.44
Mexico	-6402.49
USA	562.71

Source: Own aggregation of the GTAP model

Table 24. Regional Household Income (% Change)

	Regional Household Income (% Change)
Canada	0.31
Mexico	-3.07
USA	-0.08

Source: Own aggregation of the GTAP model

6. Macro-Economic Projections for MFN Rates

As economies in the real world undergo dynamic changes in production, it becomes important to consider the growth of technology, capital, and labor. Since the GTAP CGE model operates in a static paradigm, the analysis in the study does not account for growth in productivity. To adjust for this, technology, capital, and labor growth will be modified to more accurately simulate annual growth in NAFTA countries. Long term projections will be set to ten years for this experiment. To test macro-economic projections, the third simulation with MFN rates will be used.

The ten year (2007-2016) GDP growth average for Canada, the U.S., and Mexico are 1.553%, 1.333%, and 2.16% respectively (World Bank, 2016). The ten year (2006-2015) population growth for Canada, the U.S., and Mexico are 1.159%, 0.894%, and 1.619%

respectively. As non-NAFTA countries are not the focus of this study, the growth rate and population rate will be a general world projection. All non-NAFTA countries will be categorized as developed and developing countries. The annual projected world population growth for developing regions (China, South Asia, South East Asia, and ROW) is 1.62% (Department of Economic and Social Affairs, 2012) while the annual projected world GDP growth is 2% (World Bank, 2016). The annual projected world population growth for developed regions (EU and East Asia) is 0.7% while the projected GDP growth is 1.25%.

To calculate for the growth rate of technology, the production function below can be used:

$$Y_t = K_t \left(A_t L_t\right)^1$$

In this Cobb-Douglas production function, technology (A_t) becomes an augmenting factor in the overall GDP output of a certain country. From this model, if we assume that the growth in augmented technology is *g* and the growth of labor is *n*, by simplifying this equation, we arrive at the conclusion total output (Y_t) and capital (K_t) both grow at *n*+*g*. Therefore, the change in technology for Canada, the U.S., Mexico, developing countries and developed countries are 0.394%, 0.439%, 0.541%, 0.38%, and 0.55% respectively.

An increase in productivity growth over the long term leads to more efficient production of goods which in turn results in a decrease in commodity prices (Table 25). This positively affects consumers, who can now buy goods for less than before.

Table 25. Market Price of Commodities (% Change)

	Canada	Mexico	USA
Dairy	-13.95	-17.13	-11.22
Lumber	-10.01	-11.14	-9.59
Auto Manufacturing	-13.97	-17.31	-10.91
Textiles and Apparel	-11.87	-14.98	-10.34
Grains and Crops	-8.02	-5.87	-5.75
Extraction	-11.86	-12.25	-12.2
Processed Food	-13.2	-15.84	-9.82
Manufacturing	-13.2	-16.61	-10.5
Meat Products	-13.48	-13.44	-10.67
Other Sectors	-10.12	-14.81	-6.31

Source: Own aggregation of the GTAP model

Greater productivity also encourages a higher growth in GDP, as the ratio of outputs to inputs rise. Table 26 shows a consistent pattern of positive GDP growth in NAFTA countries, led by Mexico (7.24%) and U.S.A (5.18%), with Canada (2.02%) showing the least real GDP growth. Economic growth can also be seen through the robust demand for imports and exports. Due to the uneven growth in imports and exports, the trade balance in NAFTA countries does not stay constant. The trade balance of Canada (+33759.15 millions of U.S. dollars) and Mexico (+21641.76 millions of U.S. dollars) has risen while the trade balance of the U.S. (-188624 millions of U.S.) has fallen. This can be attributed to the change in the terms of trade; Canada and Mexico both have negative terms of trade, indicating that they purchase less imported goods for every exported good while the terms of trade of the U.S. has increased.

Table 26. Macroeconomic Performance (% Change)

	Real GDP	Terms of Trade	Import Volumes	Export Volumes	Change in Trade Balance (in millions)
Canada	2.02	-1.56	5.13	13.77	33759.15
Mexico	7.24	-4.84	3.16	14.81	21641.76
USA	5.18	3.05	10.84	-2.88	-188624
China	7.41	-2.24	6.49	18.18	188193.9
EU	9.21	1.1	10.57	2.52	-473684
East Asia	13.09	1.78	9.2	-4.06	-226239
SE Asia	6.84	-1.3	11.23	17.22	56934.02
South Asia	5.62	-0.81	8.63	17.72	38077.12
ROW	2.3	-1.69	5.01	18.73	549940.4

Source: Own aggregation of the GTAP model

Industry output in nearly all sectors rise do to the increased efficiency in the production process, as displayed in Table 27. Interestingly, Mexico has the largest increase in production, even though it was the most impacted by tariffs before accounting for long term macroeconomic projections. This can be attributed to its faster growth rate compared to already developed countries like the U.S. and Canada. The rise in output can also be correlated with the increase in population. That is, since the population of all NAFTA countries was increased, there is also an increase in domestic demand. This means that industry output must also increase to meet that demand.

Table 27. Industry Output (% Change)

	Canada	Mexico	USA
Dairy	11.56	23.77	8.28
Lumber	6.7	18.42	2.82
Auto Manufacturing	19.26	21.79	7.32
Textile and Apparel	9.8	10.92	4.28
Grains and Crops	20.87	8.35	9.12
Extraction	4.83	9.32	2.3
Processed Food	14.86	18.21	9.82
Manufacturing	10.25	23.54	1.25
Meat Products	15.98	21.21	8.7
Other Sectors	9.23	18.89	9.23

Source: Own aggregation of the GTAP model

As mentioned, productivity growth stimulates economic activity including industry output and trade. This increased output translates into higher wages for worker's in the U.S. (+5.82%), Mexico (+7.81%), and Canada (+2.16%). Furthermore, the welfare situation in Canada (+206540.1 millions of U.S. dollars), Mexico (+239159 millions of U.S. dollars), and the U.S. (+1772859 millions of U.S. dollars) improves drastically from the initial MFN tariff scenario (Table 23). This can be attributed to the large contribution of long term technological which encourages productivity growth.

Table 28. Equivalent Variation (Millions of U.S. Dollars)

	Equivalent Variation
Canada	206540.1
Mexico	239159
USA	1772859

Source: Own aggregation of the GTAP model

Table 29. Regional Household Income (% Change)

	Regional Household Income (% Change)
Canada	2.16
Mexico	7.81
USA	5.82

Source: Own aggregation of the GTAP model

7. Conclusion

This paper uses the GTAP CGE model to analyze the economic effects of the U.S. leaving NAFTA on all current NAFTA countries (U.S.A, Canada, and Mexico). The results have varied, but all come to the conclusion that Mexico's economy will be worse off under any of the three simulations. Under any simulation with harsh tariff structures, Mexico's economy suffers significant impacts in all sectors. While the effects are slightly less grave with the implementation of MFN rates, Mexico is still negatively affected. Canada in all scenarios will experience economic benefits, primarily acting as the beneficiary to trade diversion. Although barely impacted, the U.S. economy faces mixed economic effects. Broadly speaking, the U.S. is economically benefited by the first simulation and economically harmed by the last two simulations. However, when productivity growth is accounted for in the MFN scenario, all NAFTA countries are benefited. The results suggest that the implementation of MFN import rates would be the least damaging scenario, yet damaging nonetheless. All NAFTA countries must seriously consider preserving free trade as it currently exists: it has proven to be mutually beneficial for all countries involved. The varying impacts across all sectors of the economy signify that policymakers should not base their decisions solely off of one indicator or variable.

This paper suggests that policy decisions should be decided after thorough analysis on a multitude of indicators, including the long-term development of all NAFTA countries.

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