# Trade War!

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**27th International Input-Output Conference**
**June 30 – July 5, 2019**
**Glasgow**

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**Abstract** *Since May 2018, the Trump Administration has proposed steep Section 301 tariffs on a large number of Chinese products. If the USA and China don't reach agreement on a trade deal, the tariffs, currently at 10 percent on about $250 billion of Chinese imports, are set to rise to 25 percent. This paper examines the economic impacts of these tariffs using the Inforum model of the USA. In the next stage, we will incorporate the model of China, with both countries linked in a bilateral trade modeling system (BTM). We also examine the impacts of the retaliatory tariffs by China. We begin by identifying the goods that are subject to the tariffs, using tables published by the US Trade Representative. Using bilateral trade data based on UN Comtrade and other sources, we then translate these tariffs into impacts by commodity sector in the US Inforum Lift model. The first round of impacts includes higher import prices and reduced imports by the US of imports of Chinese goods. The impacts show up in the Inforum China model Mudan as reduced exports. The retaliatory tariffs instituted by China increase costs of US goods to Chinese consumers, and reduce Chinese demand for US exports.*

## 1 Background

A show that opened in Hong Kong recently was plugged by its creator as "Cantonese opera diplomacy means that through Cantonese opera, it'll make the Chinese people and the American people join hands and harmoniously resolve the U.S.-China trade war"[1]. The immense popularity of this opera bespeaks a real concern on the part of Chinese people about the risks the trade dispute poses for the Chinese economy. However, the risks are also large for the US and the world economy. The recent outlook published by the IMF has reduced the global growth forecast for 2019 by 0.3 percent, partly due to the disruptive effects of trade frictions[2]. Although the current administration has raised tariffs on many countries, the interaction of the US and China is extremely important to the global economy.

The current US trade policy is marked by a sharp break with recent precedent. Whereas the US has traditionally had a relatively open economy, protectionist sentiment is rising, and protectionism was indeed one source of Trump's 2016 US Presidential election campaign. To many American voters, the challenges to China represent a fulfillment of these campaign promises.

Over the past 20 years, the US has contributed to the increased globalization in international trade in goods and services by maintaining an open economy, with origination and participation in many multilateral free trade agreements, particularly with its two largest trading partners Mexico and Canada. However, the largest source of imports to the US is China, which is also the third largest destination of US exports. The bilateral trade deficit with China has been steadily increasing, and various practices adopted by China are viewed as unfair by US companies, voters and politicians. This is particularly true in the area of intellectual property (IP).

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[1] *Washington Post*, April 7, 2019.

[2] IMF (2019), particularly chapter 4.

Since May, 2018 the Trump Administration has proposed steep Section 301[3] tariffs on a large number of Chinese products. After imposing 25 percent tariffs on about $50 billion of Chinese products in mid-June 2018, a list of tariffs of 10 percent on an additional $200 billion of imports was finalized in September, due to be raised to 25 percent in January. Starting in January 2019, 25% tariffs on up to $250 billion of Chinese merchandise import categories were scheduled to take effect. In fact, that deadline was delayed by 3 months, to March 31.

Currently the Chinese and Americans are shuttling between negotiations with some outlook for breaking the impasse. It is still not clear if the negotiations will bear fruit.

This paper examines the economic impacts of these tariffs using the Inforum model of the USA. This is a preliminary stage of the analysis. In the next stage we will link the U.S. model with that of China, with the two countries linked (along with other trading partners) in a bilateral trade modeling system (BTM). We have assumed that the tariffs actually take full effect at the beginning of 2019, and that they last for the full year. We also examine the impacts of the retaliatory tariffs proposed by China. Section 2 briefly describes the modeling framework. Section 3 describes how the initial and retaliatory tariffs were modeled. Sections 4 and 5 present simulation results.

## 2 The Modeling Framework

The two main models used for this analysis are the *Lift* model of the USA and the *Mudan* model of China. These models are called interindustry macro (IM) models, and fall within the family of econometric input-output (EIO) models[4]. The core of the model consists of the multisectoral quantity and price relationships. Detailed variables are aggregated to obtain the aggregate macroeconomic product and income versions of GDP. Figure 1 below shows a simple schematic diagram of a typical model.

< Figure 1 >

The Inforum IM can be distinguished from other EIO models by several typical characteristics. The IO tables are compiled as commodity by commodity tables, using commodity technology[5]. Outputs, final demands and intermediate inputs are deflated to constant prices. The ratio of the constant price intermediate flow divided by constant price output is the concept used as the input-output direct requirements coefficient. Value added is used solely in current prices. The dual fundamental quantity and price identities are solved using the iterative Gauss-Seidel technique, which allows for the computation of several of the econometric equations to be done in conjunction with the IO solution.

Unlike a typical CGE model, there is generally no explicit optimization by consumers and firms, and no perfect foresight or supply and demand equilibrium conditions. Import equations are demand equations, based on domestic demand and relative foreign to domestic price of each commodity. Exports may be exogenous, using a linked trade model, or endogenous, based on

[3] Section 301 refers to part of the Trade Act of 1974. This section of the legislation enables the President to take action, including retaliation, for unfair trade practices that burden or restrict U.S. commerce.

[4] West (1995) and Kratena and Streicher (2009) contain categorizations of several families of models, including EIO. The Cambridge model described in Barker and Peterson (1987) has many similarities to the Inforum approach. Grassini (2001) provides a more lengthy description of the typical Inforum model.

[5] These tables are derived as a "purified" commodity-by-commodity table using commodity technology, using the "PTP" technique outlined in Almon (2000). Some of the IM models use industry-by-industry tables.

foreign demands by commodity and relative prices. Personal consumption equations are often estimated as a system, and relate real per capita consumption to real per capita income, relative prices and other variables. A personal consumption bridge is used to translate personal consumption by category[6] to personal consumption by commodity. Equipment investment is estimated as part of a joint system of factor demand for each industry. Investment by industry is passed through an investment bridge to obtain investment by category. A typical model also includes econometric equations for construction and inventory change. Government consumption and investment are generally exogenous in constant prices, and complete the Demand Block.

Employment and hours worked are typically estimated as productivity functions, linking hours to industry output; and average hours worked equations, linking employment to hours. In the Income Block, wage equations by industry are used to obtain labor compensation. Other components of value added, such as profits, depreciation, and proprietors' income, may also be estimated depending on the data availability in any given country. Some countries have only compensation, gross operating surplus, and indirect taxes comprising total value added.

Value added is used in the IO price solution to obtain prices by commodity or by industry, depending on the type of IO table available. Some prices may be set exogenously, in which case several value added components need to be revised to maintain consistency. Alternatively, the modeling approach can focus on estimating price regressions directly, then adjusting value added to be consistent with price[7]. There is no need anywhere in the model to deflate value added, and there is no logical need to have a constant price IO table that adds up down the column. The income side of the model is calculated in nominal terms only, though several variables may be deflated by the GDP deflator or average consumption deflator to obtain the constant price versions of those variables.

The macro accounts include most of the tables used in a typical SNA presentation, or in the case of the U.S., the National Income and Product Accounts (NIPA). A typical model will also include population by demographic category; labor force and participation rates; financial variables including monetary aggregates and interest rates; and full detail on transfers, contributions, and taxes in the government accounts.

Prices calculated in the price-income side of the model are used as variables in the personal consumption, equipment and structures investment, and export/import equations. The result of the expenditure side calculation implies a certain level of GDP and of total employment (and unemployment rate) as well as sectoral outputs. All these variables may play a role in the wages and profits (or surplus) equations, so that tightness or slack in the economy affects the growth of value added and prices.

The typical model solves annually and a typical forecast interval is from 10 to 50 years, although some of the models have been developed for very long-term applications. The models are dynamic, in that many of the equations include lagged effects or relations using first differences. Although the models are "bottom-up" in that detailed data is used to form the macro-aggregates, they may be controlled from the top down if necessary, to force consistency with another macro model forecast.[8]

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[6] US NIPA categories are similar to COICOP. See U.S. BEA (2016).

[7] This is the approach followed by the German Inforum team, GWS, in the *Inforge* model. See Lutz, et. al. (2003).

[8] Such an exercise often reveals potential inconsistencies in the macro model, which is not required to maintain the detailed accounting consistency of an interindustry macro model.

### *2.1 The Lift Model*

The *Lift* model is a typical IM model. It is based on a time series of detailed balanced IO tables deflated to constant prices. Most of the macroeconomic variables are from the US NIPA, although the model also makes use of employment, prices, transportation and energy data from other US agencies. *Lift* incorporates an equation to model potential GDP and the gap between actual and potential. This variable and the unemployment rate are used in the value added equations to respond to tightness or slack in the economy. *Lift* currently has 121 commodities and 71 industries, related through a make matrix. Personal consumption is modeled using PADS[9] with 83 consumption categories and 12 functional groups of categories. *Lift* includes extensions to model energy flows, emissions, employment by occupation and health care accounts[10]. *Lift* also includes extensive national accounts detail, modeling over 600 variables in the household, business, foreign and government sectors. Whenever possible, aggregate variables are calculated based on the sum of detailed industry calculations.

### *2.2 The Mudan Model*

The *Mudan* model was started at Inforum USA and worked on extensively by Chinese graduate students and international partners in Nanjing and Beijing. This model has 59 commodities and 52 industries for investment and employment. *Mudan* also includes a detailed energy consumption and carbon emissions module. The Chinese database is distinguished by maintaining separate population and consumption data for urban and rural population. The consumption system in *Mudan* is PADS, with a system estimated both for urban and rural consumption. Investment equations by industry use a modified accelerator model. The import equations rely on domestic demand and relative to foreign prices.

### *2.3 The Inforum Bilateral Trade Model (BTM)*

*Lift* and *Mudan* are linked through trade flows and prices in the Bilateral Trade Model (*BTM*). The current BTM models bilateral trade flows between 18 countries and regions, classified by 66 SITC merchandise trade commodities. Time series of trade share matrices are the basis for econometric import share equations which provide the basis of the model. The equations respond to relative price indexes as well as to relative indexes of investment by country and industry.

*BTM*s solution process is iterative. For each iteration, a starting run is done of each of the country models. Imports by commodity, prices and investment are then provided to *BTM*. For each country and commodity, *BTM* determines the shares of imports by source country. These imports, are aggregated by source country to provide exogenous exports by commodity for each country. *BTM* also weights the country prices to provide an import price index to each country model. The sectoring classification of each country model is different, and they are all different from that of *BTM*. Trade flows are passed through bridge matrices to reclassify to and from *BTM* to country classifications.

[9] Perhaps adequate demand system. See chapter 20 in Almon (2016).

[10] See Meade (2013) for more detailed information.

## 3 Implementation in the *Lift* Model

The strategy used in the analysis is to first develop a base case, which represents "business as usual", or a world without the new tariff actions. This base case was developed for the Fall 2018 Inforum Outlook, using the *Lift* model. The development of the base case incorporates standard exogenous assumptions such as population and labor force growth by age group, federal and state and local government spending, taxes and contribution rates, energy prices and exports by commodity. Exports are exogenous to *Lift*, but are guided by a projection of the Bilateral Trade Model.

In developing the base, modifications are also made on many endogenous variables, such as interest rates, productivity growth, the personal savings rate and imports. These modifications are tools to steer the model on a certain trajectory, which is informed by Congressional Budget Office, OECD and other projections, as well as discussions and debates about various aspects of the base case.

The base then serves as a starting point for developing the Trade War, or tariff scenario. We introduce the tariffs as changes in import prices, but also model the additional tariff revenue collections by the federal government. Retaliatory tariffs show up as exogenous changes in exports. After making these changes, the model is run with the new scenario, allowing for macroeconomic and sectoral comparisons.

### *3.1 Imposition of Section 301 Tariffs on Chinese Imports*

The section 301 tariffs on Chinese imports described in section 1 were implemented in several stages. An initial list of 1,333 Chinese products classified by Harmonized Tariff Schedule (HTS) code was released by the US Trade Representative (USTR), in April 2018. Based on trade data available at the time, this amounted to about $50 billion of imported goods, with a proposed tariff of 25 percent. This was subsequently revised in June 2018, still targeting $50 billion, but with a revised list, with 95 percent of the products either intermediate inputs or capital goods. In September 2018, the administration finalized a list of an additional $200 billion of Chinese imports, subject to a 10 percent tariff. If no trade agreement were forthcoming, this tariff was planned to increase to 25 percent on January 1. On December 1, 2018, at the G-20 meeting in Buenos Aires, a truce was announced, giving the parties time to negotiate sticking points. The deadline was moved back to March 1, 2019, at which time the tariffs would rise to 25 percent. After further negotiations, a further delay was announced on the tariff increase. As this paper is being finalized (April, 2019) both parties are still in negotiation, with the outcome still uncertain[11]. Meanwhile, in September 2018, China finalized its retaliatory tariffs on U.S. imports, announcing a list of U.S. products totaling $60 billion, mostly on intermediate inputs and capital equipment, with tariff rates ranging from 5 to 10 percent, down from the 5 to 25 percent originally announced. Each of the announcements by the USTR and China of course are published with Annexes that provide the list of HTS codes affected.

### *3.2 Initial Implementation of the Tariffs in the Lift Model*

The *Lift* model has 121 commodity sectors, and the first 57 of these are tradeable commodities, in merchandise imports and exports. The initial implementation in the *Lift* model consisted in

[11] See Bown and Kolb (2019) for a more detailed timeline of U.S. tariff actions and responses by trading partners.

building a bridge from the 4-digit HS classification used in the United Nations Comtrade[12] database to the *Lift* NAICS sectoring, for both U.S. imports and exports.

< Figure 2 > <Table 1> < Table 2 >

We next identified which HS codes are completely or partially subject to the tariffs. Figure 2 shows an extract from the USTR Annex from the September 2018 announcement[13]. Table 1 shows a compilation of the Comtrade imports for the 4-digit codes under HS 54. Using the Comtrade data, we identified the value of imports of each commodity currently sourced from China, using 2017 data, which was the most recent data available at the time of this exercise. Table 2 shows the top 10 HS 4-digit commodities imported from China. This list is a sample from the roughly 9,300 HS 4-digit commodities. After a few additional adjustments, the total of imports subject to the two tranches of tariffs came to about $243 billion for 2017, close to the announced $250 billion.

< Table 3>

Table 3 shows the top 15 of the 57 *Lift* merchandise trade sectors, ranked by merchandise imports from China in 2017. Column 4 shows total US merchandise imports of each commodity. Column 4 shows the amount from China, and column 5 shows the share of that amount which would be subject to the 25 percent tariff. The next two columns complete the steps of determining the value of Chinese imports of that commodity subject to tariff, and the amount of the tariff. Our data for 2017 show total imports from China of about $515 billion, with a total tariff collected of about $63 billion, for an average tariff on all Chinese imports of about 12 percent. The last column shows the percent in average total import cost by commodity, from all sources. This calculated tariff is the result of a static calculation, without model feedback. The average increase in the price of total imports is about 2.7 percent.

In the *Lift* model, total imports by commodity are modeled using several equation forms, but the most common form relates the imports share of domestic demand to a modified time trend and a distributed lag of relative foreign to domestic prices. Note that all variables in both *Lift* and *Mudan* can be additionally modified with user assumptions. Imports are price-responsive, though not all of the response occurs in the first year. The argument for using a distributed lag on prices in the equation is that not all imports respond suddenly to price changes, but may be based on supplier relationships, brand name good will, product differentiation or constraints imposed by global value chains. However, the model will respond to an increase in import prices by reducing imports, based on the amount of the price increase, and the price elasticity estimated for each commodity. We expect to find some substitution of domestic production for imports. The additional demand, however, also puts upward pressure on domestic prices. The consumer demand equations also respond to price increases. The relevant price for these equations is the consumption price for each consumption category. These prices are formed by bridging the weighted domestic-foreign prices through a consumption bridge, which shows the share of each commodity plus margins which are included in each consumption category. For example, Figure 3 shows that the impact on the import price of Household appliances is calculated as 6.2 percent. The weighted domestic-foreign price would then increase 3.9 percent, and the consumption price for the consumption category Household appliances would increase 3.5 percent.

< Figure 3 >

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[12] See https://comtrade.un.org/.

[13] The list of September 17, 2018 can be found at https://ustr.gov/sites/default/files/enforcement/301Investigations/Tariff%20List-09.17.18.pdf.

What is the incidence of the tariffs? Figure 3 provides a rough sketch. We've assumed constant import shares and tariff rates by *Lift* commodity across the main segments of the economy, and added up the estimated total tariffs. According to this calculation, the largest part (47 percent) falls on intermediate goods purchased by business. The second largest share (28 percent) falls on consumers. Total fixed investment (equipment, buildings and IP) absorb another 23 percent, with government paying about 2 percent.

< Table 4 >

Table 4 shows a summary of the incidence of the tariffs by commodity, calculated on the 2017 data. Commodities have been aggregated to 8 major groups. The first column shows the total value of US imports, and column 2 highlights the portion from China. The 3rd column shows the percent this commodity makes up of the total tariffs collected, and the final column shows the amount of the tariff. More than a third of the tariffs ($23.4 billion) are collected on machinery and electronics.

The tariff scenarios are run from 2019 to 2025, with the tariffs assumed to begin in 2019, and to remain at the 25 percent level. Although this is not a likely outcome, it is helpful to see what the model indicates about the dynamic adjustment of the economy over a period of several years, if the tariffs were to remain in place. Within final demand, personal consumption and construction both respond to relative prices. The personal consumption equations respond to both relative prices and to total real disposable income changes. To the extent that average consumer prices rise, this increases the consumption deflator, which reduces real disposable income, all else equal.

The first version of the Section 301 tariff scenario that was run includes the imposition of the tariffs, the calculation of the price effects, and includes the dynamic response of the *Lift* model to the changes in relative prices and incomes. It would be helpful to view some results before turning to the next stage, the incorporation of the Chinese retaliatory tariffs.

< Table 5 >

Table 5 shows the percentage increases in this scenario for the 10 personal consumption categories most affected by the tariffs. The biggest increase is in category Household appliances. A large part of this consumption category (measured in purchasers' prices) consists of the commodity Household appliances. This commodity has a high import share (about 65 percent) and a large portion, almost half, comes from China. Another large increase is in Telephone and fax equipment, which is primarily smartphones. These are comprised of products supplied by the Communications and audio-video equipment commodity, which is the largest single import from China, $86.4 billion in 2017. The USA import share for this commodity is about 80 percent, with almost two thirds coming from China. In our calculations, not all of the imports are estimated to be subject to tariff, as certain exemptions were provided to several US manufacturers in which the final slice of the global value chain is added in China. The price increases, though large, are less than they would be from a static calculation that did not include substitution in response to the price changes. The bottom of table 5 shows the change in the aggregate personal consumption deflator. This is estimated to be 0.36 percent in 2019, which is significant given that about 70 percent of personal consumption in the U.S. consists of services. While the cost of many of these services will rise due the increased cost of imported intermediate inputs, these are smaller second order effects.

### *3.3 Retaliatory Tariffs*

In June, 2018 China announced its updated list of $50 billion of US imports to target for retaliatory tariffs. This was further revised several times in August and in mid-September China

announced that the newly revised list would target about $60 billion of US exports to China, assuming Trump proceeds with his recently finalized tariffs on an additional $200 billion of Chinese exports. These revised tariffs are mainly on intermediate inputs and capital equipment, and range from 5 to 10 percent, down from the 5 to 25 percent originally announced.

### *3.4 Implementation of the Retaliatory Tariffs in the Lift Model*

The scenario we constructed for this analysis assumes that the two countries fail to conclude their negotiations successfully, and that China actually raises its tariff rate on US merchandise to 25 percent. Table 6 shows a sample of the data used to revise US exports, which are exogenous in *Lift*. The table shows the top 10 commodities in terms of merchandise exports to China in 2017. The top 3 export commodities are (1) Crop production, (52) Aerospace products and parts and (50) Motor vehicles. However, as shown in column 3 (share subject to Chinese tariff), the latter two commodities are not on the Chinese tariff list. Column 4 shows the amount of export commodities in each *Lift* sector that are subject to the tariff, and column 5 shows the amount of tariff, assuming that the tariff is 25 percent on listed commodities. Column 6 shows the result of the static calculation of the price increases to China, not yet assuming any exchange rate adjustment, substitution or trade diversion. Column 7 uses the China import price elasticities to calculate the ratio of change in Chinese imports of US merchandise by commodity. Columns 8 through 10 trace the effects through to the resulting total US merchandise exports by commodity. The totals shown at the bottom of table 6 include all merchandise export commodities, not just the top 15 shown in the table. Using this static calculation on the 2017 data, we find that the tariffs affect just under $60 billion of US merchandise, with about $15 billion in tariffs collected by the Chinese government. The expected reduction of US exports to China would be about $22 billion.

The second version of the tariff scenario layers on the reduction in US merchandise exports due to the Chinese retaliatory tariffs, as an exogenous assumption. In the next section, we'll review the results at the macroeconomic level, and then look at some of the industry impacts in section 5.

## 4 Macroeconomic Impacts

The initial impact of the Section 301 tariffs, in addition to providing tariff revenue, is to increase the price of imports to all users of the affected commodity. Based on the distribution of the commodities impacted by the tariffs, shown in Figure 3, we expect a large part of the price increase to impact the business sector, in the form of increased prices of intermediate imports.[14] However, consumer prices will also increase, as we have shown in table 5, and we also expect prices of investment goods to increase. In response, we expect imports to fall, based on the price elasticity of imports for each commodity, in combination with the impacts of the full scenario on demand for each commodity. The decline in imports will provide stimulus to domestic producers of the affected commodities, with an increase in output and employment. However, the price increases on all commodities will lead to an aggregate price affect as well, which may be expected to take a year or two to reach its new level.

The retaliatory tariffs by China will reduce exports for products such as crops, chemicals, dairy products and paper. This will reduce output and employment in those sectors. The net impacts on trade, output and jobs by sector will be discussed in the next section.

[14] Our estimates probably provide only a lower bound for this price increase. To the extent that domestic competitors are able to raise their prices, prices paid by all users will increase even more.

< Table 6 >

Table 6 summarizes some differences in key macroeconomic indicators, for 2019, which is the first year the tariffs are assumed to be fully implemented. The biggest takeaway is a stark reduction in GDP growth, which real GDP growth down to 1.8 percent, versus 2.5 percent in the base case. The unemployment rate, which has fallen to historical lows in 2018, is projected to be 3.8 percent in the base case, but 4.4 percent in the trade war scenario. Real disposable income growth falls by 0.8 percent from the base, resulting in a decline in real personal consumption growth of 0.7 percent. Investment growth declines even more, by 0.9 percent. Both real imports and exports are lower by 1.7 percent from the base. The result is a slight worsening of the trade balance, by about $43 billion. The federal deficit is also worse, despite the collection of about $61 billion in additional tariff revenue (not shown).

## 5 Industry Impacts

This section presents results for imports, exports, output and employment by sector, comparing the trade war scenario with the base case. Table 7 shows total merchandise imports by commodity (not just from China), and the top 15 are shown, ranked by the size of the difference in 2019. Reduction in total merchandise imports from the base is shown at the bottom of the table. The total reduction was 1.9 percent compared with the base in 2019, or a reduction of about $43 billion, in 2009 dollars. The largest reductions are in (20) Apparel and leather, (42) Communication and audio-video equipment and (51) Motor vehicle parts. The reductions in imports occur through two channels. The first is from the direct impact of the tariffs, making certain Chinese merchandise commodities more expensive. The second is through the demand effect. A combination of price increases and export reductions leads to slower growth of GDP, as discussed in the previous section. Reductions in domestic demand for imports by commodity come from intermediate, personal consumption, investment and government demand. This demand impact causes imports of some commodities to fall even further than would be suggested by the tariffs and the import price elasticities. If overall demand had not declined, and prices had not increased, then purchasers would substitute domestically produced goods for imported ones. In this case, domestic production and employment could increase in those sectors.

< Table 7 >

The only conditions affecting exports by commodity in the trade war scenario are the Chinese tariffs and their effects on consumer and business demand. Table 8 ranks changes in exports by commodity. The largest reduction, of $3.9 billion (8 percent) is in exports of crops, of which a significant component is soybeans. Following that are (27) Other chemicals, (22) Paper and (15) Dairy products, meat and seafood. Total exports are down 2.35 percent, or about $25 billion in 2009 dollars.

< Table 8 >

Output by commodity results from a combination of influences, the most obvious being the changes in imports and exports just discussed. In addition, higher import prices raise prices in the economy generally, dampening real growth, especially personal consumption growth. Slower consumption growth results in declines from the base in many large sectors which are not directly affected by the trade war. Table 9 summarizes changes in output by the top 20, ranked by change in real output in 2019. Note that of these top 20 declines, only 5 (shaded) are directly involved in merchandise trade. Reductions in output lead to reductions in employment and labor income, resulting in slower real disposable income growth and slower personal consumption growth. This leads to lower output in wholesale and retail trade, personal services, telecommunications services and housing services. Lower business and household spending leads to lower residential

and non-residential construction. The top declines in output are in (58) Wholesale trade, (62) Other retail, (83) Other real estate and (13) New construction.

< Table 9 >

Employment by industry in *Lift* is determined partly by industry output growth, and partly by labor productivity growth. The equations also have a smoothing feature that is used to capture pro-cyclical labor productivity growth. Table 10 shows the comparison of employment by industry in the base case with the trade war scenario. The sectors with the most jobs lost are Other retail, Other services and Construction. Together, these three industries make up nearly half of the total 760 thousand fewer jobs in the trade war scenario.

< Table 10 >

The discussion of industry level impacts will end where we began, with an examination of prices. Table 11 shows the top changes in import prices by commodity, with the changes in the weighted price and the domestic output price. The weighted price is the effective average price paid by consumers, business and government for the products they buy. It is a weighted average of the domestic product price and the import price, reflecting the share of supply met by imports for each commodity. The table shows the top changes in import price by commodity, led by (19) Textiles, (55) Furniture and (47) Household appliances. The change in the weighted price is shown in column 2, with the change in the domestic price in column 3. The average price impacts over all commodities and for total manufacturing are shown at the bottom of the table. The average increase in the import price (including non-merchandise imports) is 1.85 percent, within manufacturing it is 2.46 percent. The weighted price increase is only 0.26 percent for all commodities, and 0.77 percent for manufacturing. In reality, domestic prices should increase more than we are showing, as domestic producers raise prices to capture the margins protected by tariffs. Therefore, the domestic and weighted price impacts found in this scenario should be viewed as a lower bound.

< Table 11 >

## 6 Conclusions, Comparison Studies and Next Steps

This paper reports on our initial analysis of the trade war, using the *Lift* model. The next stage of our research will be to undertake a similar exercise for China. Finally, we will link the two models using the new version of the Bilateral Trade Model. Although the analysis is not complete, we have probably captured the main impacts on the U.S. of the section 301 tariffs on China and the retaliatory tariffs.

To recap, the results are mostly negative. It appears that with these trade actions, we are not identifying winners and losers, but only which industries suffer the most. GDP growth is down by 0.6 percent, the unemployment rate is up by 0.6 percent, and real income, personal consumption and investment growth are down compared with the base case in 2019.

There have been a handful of other studies, some academic, some by commercial modeling firms to gauge the impact of the US China trade dispute.

Amiti, Redding and Weinstein (2019) examine price and welfare effects of the tariffs imposed during 2018. Their study is backward looking, focusing on price effects and welfare effects that can be calculated with historical imports, exports and price data by detailed HTS commodity. Unlike this study, they examine the impacts of the solar and washing machine tariffs, as well as the Section 232 steel and aluminum tariffs. They find that the tariffs increased the prices charged by domestic producers through two channels: 1) the increased cost of imported imports; and 2)

price increases from reduced competition. They find that domestic prices of US manufacturing increased 1.1 percent on average. In contrast, the *Lift* model is showing only 0.15 percent average increase in domestic manufacturing prices, driven mostly by increases in intermediate costs through input-output linkages. *Lift*'s dynamic response will tend to be greater over a period of 2-3 years, as the capital income and wage equations both respond positively to increases in demand. In another short paper, Amiti, Heise and Kwicklis (2019) find that the domestic price increases in 2018 were rather swift in responding to the imposed tariffs.

Fajgelbaum, Goldberg, Kennedy and Khandelwal (2019) also take a retrospective look at the 2018 trade war. They use the opportunity of the tariff actions and retaliation as a natural experiment to estimate import demand and export supply elasticities using changes in U.S. and retaliatory tariffs. They find that imports from targeted countries fell 31.5 percent within products, and targeted U.S. exports fell 11 percent. These results are not strictly comparable to the *Lift* scenarios, which compare a base and a trade war case, and consider a different tariff regime. The decline in total imports in *Lift* in 2019 was $44.2 billion in 2019 prices, with imports from China at just over $500 billion. This indicates a reduction of about 9 percent, if all of the import reduction were assumed to be from China[15]. In table 7 (data for 2017) targeted US exports fall by about 37 percent. However, our analysis is assuming larger tariff rates than occurred in 2018.

Bolt, Mavromatis and Wijnbergen (2019) use the EAGLE model to study the impacts of the U.S. and China tariffs. This model is a multiregional, general equilibrium model developed by the European Central Bank (ECB). The authors find that while global output contracts, the euro area benefits from the trade war due to trade diversion. They assume that the U.S. sets a 10 percent across the board tariff on Chinese imports. China retaliates with a similar tariff on all US exports. Note that model has no sectoral detail, but distinguishes between final and intermediate production, and between tradeable and nontradeable commodities. The authors find a full one point percentage loss in GDP for several years, with slightly milder effects on China. In contract, we have found a 0.6 percent reduction in U.S. GDP for 2019[16].

Francois and Baughman (2019) use a modified version of the GTAP model to estimate GDP and jobs impacts in the U.S. of four tariff scenarios. The most extreme version, called 'trade war' includes are tariffs contemplated, plus retaliation by trading partners. This scenario is more extensive than the one considered in this study, although the dispute with China certainly makes up the largest part by dollar value. They find that GDP falls relative to the base by just over 1 percent, and that US exports decline by 8.7 percent. They find a decline in employment of 2,235 thousand jobs. In contrast, the difference in GDP in our scenario is -0.6 percent, the difference in exports is -2.3 percent (table 7), and employment is lower by 761 thousand jobs. Similar to our study, the authors find that most of the job loss is in the nontradeable sectors.

Walmsley and Minor (2018) use another modified GTAP modeling system to model the impacts of both the section 232 and section 301 trade actions using a supply chain framework. They assume, somewhat pessimistically, that the trade dispute will last through 2030, and they incorporate retaliation by all trading partners. They find a reduction of US GDP of 1.78 percent in 2019, with a long-run reduction of 1.25 percent still present by 2030. They find a loss of jobs of 2.75 million in 2019. The model, called IESC-Dyn has detail for 24 sectors, of which 11 are

[15] Imports in *Lift* are also lower due to lower GDP in the trade war scenario. This means that part of the import reduction is from all other US trading partners.

[16] The scenario was run to 2025, but we expect the tariffs to last for a year or less, if the parties don't reach agreement. Our results for China will be presented in the next version of this paper.

agricultural. The model is also multiregional, including detail for 11 countries and regions, one of which is the EU.

These studies certainly provide food for thought. Undoubtedly, there will be more studies on this important topic as the year progresses. Our research program is informed by critical analysis of our own preliminary analysis, as well as insights gained from the literature.

Some key questions which we will pursue in our subsequent analysis with *Mudan* and BTM are:

1. President Trump claimed at the outset that a trade war was easy to win with China, since they were so much more dependent on US purchases of their exports than the US was on theirs. How big, in fact, are the losses to the Chinese economy compared with the losses to the US economy?
2. By how much can we expect the negative impacts to be ameliorated through trade diversion? BTM will shift US imports to alternative sources than China. Unfortunately, BTM does not directly address the question of how much more these imports cost in relation to the Chinese imports before tariffs.
3. By how much should U.S. domestic producer prices respond to an increase in import prices with tariffs? The price equations in *Lift*, unlike some CGE models, do not take into account the prices of competing imports. They do move upward in response to an increase in demand, such as would occur with a tariff on competing imports, but evidence from Amiti, et al. in several papers is that the response should be larger.
4. What exchange rate adjustment do we expect in response to the trade war? How will this affect our results?
5. How much of the tariff increase is passed through to consumers and business, and how much results in the Chinese reducing their export prices?

As this paper is being written, U.S. Trade Representative Robert Lighthizer and Treasury Secretary Steven Mnuchin are in Beijing to continue negotiations with Chinese Vice Premier Liu He. Although all indications are for a positive outcome, there is real danger that the talks will fail. If they do, this study aims to provide an estimate of the cost of that failure.

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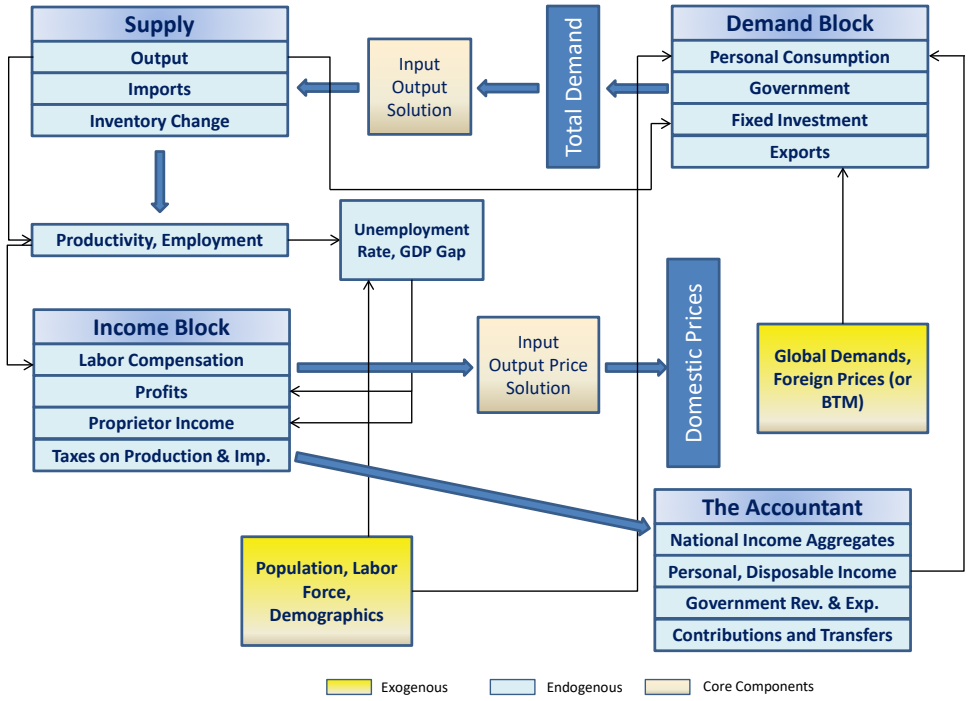
## Tables and Figures

### Figure 1. Summary Diagram of Representative Model




### Figure 2. Sample of List of Products Subject to Tariff, 8-digit HTS

| HTS Subheading | Product Description |
|---|---|
| 5402.34.60 | Multiple or cabled textured polypropylene yarn (except sewing thread), not put up for retail sale |
| 5402.39.31 | Single textured yarn, nesoi, not put up for retail sale |
| 5402.39.61 | Multiple or cabled textured yarn (except sewing thread), nesoi, not put up for retail sale |
| 5402.44.00 | Single elastomeric yarns, monofil, untwisted or with a twist not exceeding 50 turns per meter, not for retail sale |
| 5402.45.10 | Synth filament yarn, for doll wigs, of colored multifil, untwisted/with twist < 5 turns/meter, of nylon or other polyamide, not retail sale |
| 5402.45.90 | Syn filament yarn (not for doll wigs), of colored multifil, untwisted/with twist < 5 turns/meter, of nylon or o/polyamides, not retail sale |
| 5402.46.00 | Non-textured yarn of polyesters, partially oriented, single, untwisted or with a twist not exceeding 50 turns/m, not put up for retail sale |
| 5402.47.10 | Single yarn, twist of 0-50 turns/m, wholly polyester, 75-80 decitex, 24 filaments, nesoi, not put up for retail sale |
| 5402.47.90 | Single yarn, twist of 0-50 turns/m, other than wholly of polyester, nesoi, not put up for retail sale |
| 5402.48.00 | Non-textured polypropylene yarns, monofil, untwisted or with a twist not exceeding 50 turns per meter, not for retail sale |
| 5402.49.11 | Colored multifilament yarn to be used to make wigs for dolls, of modacrylic, untwisted or twisted, < 5 turns per meter, not for retail sale |
| 5402.49.91 | Other yarns, monofil; multifil, untwisted or twisted > or = to 5, not exceeding 50 turns per meter of other synthetic, not for retail sale |
| 5402.51.00 | Nylon or other polyamide yarns, single, with a twist exceeding 50 turns/m, not put up |

## Table 1. Sample Extract of US Imports from 2017

**Units: Millions of Dollars**

| HS 4-digit | Commodity | US Imports from China |
|---|---|---|
| 5401 | Sewing thread of man-made filaments, whether or not put up for retail sale | 5.1 |
| 5402 | Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic monofilament of less than 67 decitex | 287.9 |
| 5403 | Artificial filament yarn (other than sewing thread), not put up for retail sale, including artificial monofilament of less than 67 decitex | 1.1 |
| 5404 | Synthetic monofilament of 67 decitex or more, of which no cross-sectional dimension exceeds 1mm; strip and the like (e.g. artificial straw) of synthetic textile materials of an apparent width not exceeding 5mm | 17.0 |
| 5405 | Artificial monofilament of 67 decitex or more, no cross-sectional dimension exceeds 1mm; strip and the like (e.g. artificial straw), of artificial textile materials of a width not exceeding 5mm | 0.1 |
| 5406 | Man-made filament yarn (other than sewing thread), put up for retail sale | 5.5 |
| 5407 | Woven fabrics of synthetic filament yarn, including woven fabrics obtained from materials of heading no. 5404 | 232.3 |
| 5408 | Woven fabrics of artificial filament yarn including woven fabrics obtained from materials of heading no. 5404 | 5.4 |

Source: UN Comtrade

## Table 2. Top 10 USA Imports from China, 2017

**HS 4-Digit**

**Units: Millions of Dollars**

| Commodity Code | Commodity Title | Import Value (US$) | Subject to Tariff |
|---|---|---|---|
| 8517 | Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data (including wired/wireless networks), excluding | 72,741 | 72,741 |
| 8471 | Automatic data processing machines and units thereof, magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included | 51,187 | 51,187 |
| 8473 | Machinery; parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines of headings 84.70 to 84.72 | 15,549 | 15,549 |
| 9503 | Tricycles, scooters, pedal cars and similar wheeled toys; dolls' carriages; dolls; other toys; reduced-size (scale) models and similar recreational models, working or not; puzzles of all kinds | 12,877 | 0 |
| 9403 | Furniture and parts thereof, n.e.c. in chapter 94 | 12,370 | 12,370 |
| 8528 | Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus | 11,701 | 11,701 |
| 9401 | Seats (not those of heading no. 9402), whether or not convertible into beds and parts thereof | 11,292 | 11,292 |
| 8708 | Motor vehicles; parts and accessories, of heading no. 8701 to 8705 | 9,945 | 9,945 |
| 9405 | Lamps, light fittings; including searchlights, spotlights and parts thereof, n.e.c.; illuminated signs, name-plates and the like, having permanently fixed light source and parts thereof n.e.c. or included | 7,610 | 7,610 |
| 4202 | Trunks; suit, camera, jewellery, cutlery cases; travel, tool, similar bags; wholly or mainly covered by leather, composition leather, plastic sheeting, textile materials, vulcanised fibre, paperboard | 6,650 | 6,650 |

Source: UN Comtrade

## Table 3. Calculation of Increase in Average Import Cost
### Top 15 *Lift* Sectors, Ranked by Merchandise Imports from China in 2017
### Units: Millions of Dollars

| Rank | Sec # | Commodity | Total Merchandise Imports | Merchandise Imports from China | Share subject to 25% tariff | Value subject to tariff | Amount of Tariff | Percent Increase in Average Import Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | 42 | Communications and audio-video equipment | 145,056 | 86,424 | 0.258 | 22,297 | 5,574 | 3.8 |
| 2 | 20 | Apparel and leather | 130,693 | 54,392 | 0.148 | 8,050 | 2,012 | 1.5 |
| 3 | 41 | Computers and peripheral equipment | 87,041 | 49,869 | 0.206 | 10,273 | 2,568 | 3.0 |
| 4 | 57 | Miscellaneous manufacturing | 73,162 | 39,043 | 0.200 | 7,809 | 1,952 | 2.7 |
| 5 | 55 | Furniture | 54,086 | 26,907 | 0.647 | 17,409 | 4,352 | 8.0 |
| 6 | 33 | Fabricated metal products | 63,674 | 23,630 | 0.140 | 3,308 | 827 | 1.3 |
| 7 | 51 | Motor vehicle parts | 119,680 | 22,706 | 1.000 | 22,706 | 5,677 | 4.7 |
| 8 | 49 | Other electrical equipment and components | 52,895 | 22,657 | 0.720 | 16,313 | 4,078 | 7.7 |
| 9 | 24 | Petroleum and coal products | 70,223 | 13,810 | 1.000 | 13,810 | 3,452 | 4.9 |
| 10 | 47 | Household appliances | 29,148 | 13,191 | 0.550 | 7,255 | 1,814 | 6.2 |
| 11 | 28 | Plastic products | 39,503 | 13,173 | 0.676 | 8,905 | 2,226 | 5.6 |
| 12 | 19 | Textiles and textile products | 30,649 | 12,496 | 1.000 | 12,496 | 3,124 | 10.2 |
| 13 | 27 | Other chemicals | 94,163 | 12,381 | 0.955 | 11,824 | 2,956 | 3.1 |
| 14 | 40 | Other general purpose machinery | 49,089 | 11,358 | 0.850 | 9,654 | 2,414 | 4.9 |
| 15 | 43 | Semiconductors and other electronic components | 68,531 | 10,862 | 0.130 | 1,412 | 353 | 0.5 |

Source: UN Comtrade, and Lift Calculations

## Table 4. Projected Breakdown of Merchandise Imports Affected by China Tariffs

| Summary Category | Value of Imports (Billions) | Value of Imports from China (Billions) | Percent of 301 Tariffs | Additional Cost, with Tariffs (Billions) |
|---|---|---|---|---|
| Food and agricultural products | 166.9 | 6.3 | 1.9 | 1.2 |
| Minerals, chemicals, plastics and rubber | 602.6 | 60.1 | 21.4 | 13.3 |
| Wood and paper | 76.5 | 14.1 | 5.1 | 3.2 |
| Textiles, apparel and leather | 194.4 | 66.9 | 8.2 | 5.1 |
| Nonmetallic minerals, metals and metal products | 198.9 | 34.4 | 5.6 | 3.5 |
| Machinery, appliances, electrical, computer and communication equipment | 673.7 | 230.1 | 37.5 | 23.4 |
| Vehicles, aircraft and other transportation equipment | 461.5 | 33.8 | 9.8 | 6.1 |
| Other merchandise trade | 169.0 | 69.7 | 10.4 | 6.5 |
| **Total** | **2,543.5** | **515.4** | **100.0** | **62.3** |

## Table 5. Increases in Personal Consumption Price Indexes, 2019
### Top 10, Ranked by Percent Change

| # | Personal Consumption Category | Base | Tariffs | Percent Difference |
|---|---|---|---|---|
| 6 | Household appliances | 0.77 | 0.80 | 3.52 |
| 9 | Video and audio equipment | 0.42 | 0.43 | 2.51 |
| 18 | Telephone and fax equipment | 0.55 | 0.56 | 2.42 |
| 5 | Furniture and furnishings | 0.80 | 0.82 | 2.38 |
| 27 | Other clothing | 1.06 | 1.08 | 2.37 |
| 10 | Photographic equipment | 0.65 | 0.66 | 2.03 |
| 4 | Tires, tubes, accessories and other parts | 1.10 | 1.13 | 2.01 |
| 33 | Games, toys, hobbies, photo supplies | 0.57 | 0.58 | 2.00 |
| 35 | Household supplies | 0.94 | 0.96 | 1.54 |
| 12 | Sporting equipment, supplies, guns, ammunition, musical instruments | 0.82 | 0.83 | 1.51 |
| | **Aggregate Consumption Deflator** | **1.16** | **1.17** | **0.36** |

**Figure 3. Tariff Distribution**

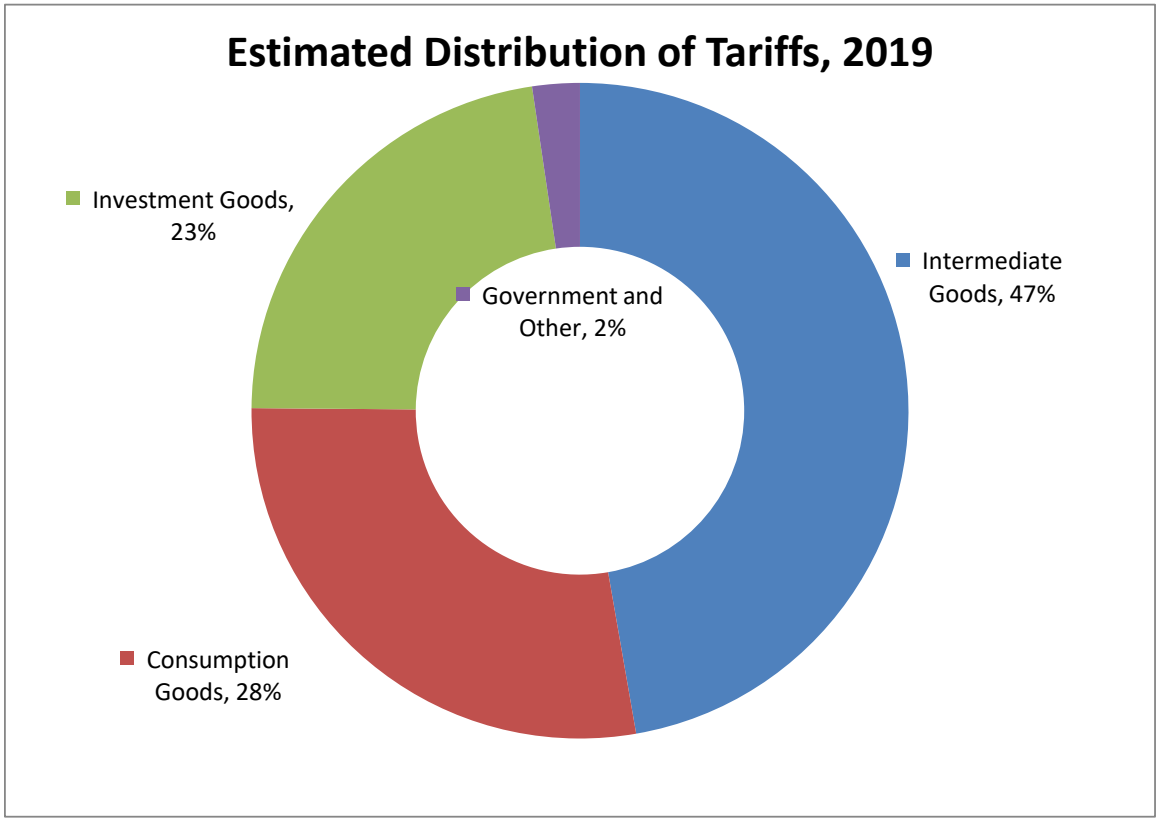



**Table 6. Calculation of Reduction of US Exports from China Retaliation**
**Top 15 *Lift* Sectors, Ranked by Merchandise Exports to China in 2017**
**Units: Millions of Dollars**

| | | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rank | | Commodity | Total US Merchandise Exports | Merchandise Exports to China | Share subject to Chinese tariff | Value subject to tariff | Amount of Tariff | Price increase to China | Ratio Change in Chinese Imports | New Imports | Import Reduction | Resulting US Merchandise Exports |
| 1 | 1 | Crop production | 55,377 | 17,512 | 0.630 | 11,033 | 2,758 | 0.1575 | -0.236 | 13,375 | 4,137 | 51,240 |
| 2 | 52 | Aerospace products and parts | 154,554 | 12,781 | 0.000 | 0 | 0 | 0.0000 | 0.000 | 12,781 | 0 | 154,554 |
| 3 | 50 | Motor vehicles | 75,004 | 9,350 | 0.000 | 0 | 0 | 0.0000 | 0.000 | 9,350 | 0 | 75,004 |
| 4 | 24 | Petroleum and coal products | 86,080 | 7,781 | 1.000 | 7,781 | 1,945 | 0.2500 | -0.375 | 4,863 | 2,918 | 83,162 |
| 5 | 27 | Other chemicals | 93,549 | 7,360 | 0.955 | 7,029 | 1,757 | 0.2388 | -0.358 | 4,724 | 2,636 | 90,914 |
| 6 | 43 | Semiconductors and other electronic components | 34,629 | 7,131 | 0.130 | 927 | 232 | 0.0325 | -0.049 | 6,783 | 348 | 34,281 |
| 7 | 15 | Dairy products, meat and seafood | 34,368 | 4,187 | 1.000 | 4,187 | 1,047 | 0.2500 | -0.375 | 2,617 | 1,570 | 32,798 |
| 8 | 22 | Paper | 24,250 | 4,167 | 1.000 | 4,167 | 1,042 | 0.2500 | -0.375 | 2,605 | 1,563 | 22,687 |
| 9 | 25 | Resin, synthetic rubber and fibers | 36,950 | 4,165 | 0.721 | 3,003 | 751 | 0.1803 | -0.270 | 3,039 | 1,126 | 35,824 |
| 10 | 42 | Communications and audio-video equipment | 20,952 | 3,840 | 0.143 | 549 | 137 | 0.0358 | -0.054 | 3,634 | 206 | 20,746 |
| 11 | 46 | Measuring and control instruments, and media | 23,691 | 3,514 | 0.734 | 2,579 | 645 | 0.1835 | -0.275 | 2,547 | 967 | 22,724 |
| 12 | 32 | Nonferrous metals | 22,587 | 3,194 | 0.584 | 1,865 | 466 | 0.1460 | -0.219 | 2,494 | 699 | 21,887 |
| 13 | 57 | Miscellaneous manufacturing | 23,791 | 2,984 | 0.200 | 597 | 149 | 0.0500 | -0.075 | 2,760 | 224 | 23,567 |
| 14 | 35 | Industrial machinery | 20,209 | 2,521 | 0.546 | 1,376 | 344 | 0.1365 | -0.205 | 2,004 | 516 | 19,693 |
| 15 | 40 | Other general purpose machinery | 35,266 | 2,507 | 0.850 | 2,131 | 533 | 0.2125 | -0.319 | 1,708 | 799 | 34,467 |
| | | **Total** | **1,253,549** | **129,271** | | **59,187** | **14,797** | | | **104,176** | **22,195** | |

Source: UN Comtrade and Lift Calculations

**Table 6. Macroeconomic Summary**

| Year: 2019 | Base Case Scenario | Trade War Scenario | Difference |
|---|---|---|---|
| Real GDP Growth | 2.5% | 1.8% | -0.7% |
| Unemployment Rate | 3.8% | 4.4% | 0.6% |
| Real Disposable Income Growth | 2.8% | 2.0% | -0.8% |
| Real Personal Consumption Growth | 2.5% | 1.8% | -0.7% |
| Real Gross Private Fixed Investment Growth | 4.3% | 3.4% | -0.9% |
| Real Imports Growth | 5.3% | 3.6% | -1.7% |
| Real Exports Growth | 4.2% | 2.5% | -1.7% |
| Trade Balance (Billion$) | -$733.0 | -$775.6 | -42.6 |
| Federal Deficit (Billion $) | -$1,002.3 | -$1,031.5 | -29.2 |

**Table 7. Merchandise Imports Summary, 2019**
**Units: Millions of 2009 Dollars**
**Ranked by Change in Imports from the Base Scenario in 2019**

| Rank | Sec # | Lift Commodity Title | Base | Trade War | Percent Difference | Difference |
|---|---|---|---|---|---|---|
| 1 | 20 | Apparel and leather | 175,121 | 170,129 | -2.9 | -4,992 |
| 2 | 42 | Communications and audio-video equipment | 202,845 | 198,840 | -2.0 | -4,005 |
| 3 | 51 | Motor vehicle parts | 122,571 | 118,981 | -2.9 | -3,591 |
| 4 | 55 | Furniture | 48,786 | 46,199 | -5.3 | -2,586 |
| 5 | 57 | Miscellaneous manufacturing | 70,507 | 68,129 | -3.4 | -2,378 |
| 6 | 24 | Petroleum and coal products | 92,866 | 90,509 | -2.5 | -2,357 |
| 7 | 27 | Other chemicals | 80,150 | 77,877 | -2.8 | -2,273 |
| 8 | 28 | Plastic products | 32,462 | 30,889 | -4.8 | -1,573 |
| 9 | 40 | Other general purpose machinery | 49,471 | 47,990 | -3.0 | -1,481 |
| 10 | 47 | Household appliances | 32,683 | 31,209 | -4.5 | -1,475 |
| 11 | 32 | Nonferrous metals | 46,255 | 44,782 | -3.2 | -1,473 |
| 12 | 33 | Fabricated metal products | 80,282 | 79,102 | -1.5 | -1,180 |
| 13 | 43 | Semiconductors and other electronic components | 77,056 | 75,888 | -1.5 | -1,168 |
| 14 | 49 | Other electrical equipment and components | 41,756 | 40,700 | -2.5 | -1,056 |
| 15 | 19 | Textiles and textile products | 33,795 | 32,802 | -2.9 | -992 |
| | | **Total Merchandise Imports** | **2,347,953** | **2,304,113** | **-1.9** | **-43,840** |

## Table 8. Merchandise Exports Summary, 2019
**Units: Millions of 2009 Dollars**
**Ranked by Change in Exports from the Base Scenario in 2019**

| Rank | Sec # | Lift Commodity Title | Base | Trade War | Percent Difference | Difference |
|---|---|---|---|---|---|---|
| 1 | 1 | Crop production | 49,112 | 45,192 | -7.98 | -3,920 |
| 2 | 27 | Other chemicals | 86,814 | 83,898 | -3.36 | -2,916 |
| 3 | 22 | Paper | 20,477 | 19,052 | -6.96 | -1,425 |
| 4 | 15 | Dairy products, meat and seafood | 24,227 | 22,991 | -5.10 | -1,235 |
| 5 | 25 | Resin, synthetic rubber and fibers | 29,717 | 28,651 | -3.59 | -1,066 |
| 6 | 51 | Motor vehicle parts | 45,955 | 44,905 | -2.28 | -1,050 |
| 7 | 32 | Nonferrous metals | 26,671 | 25,701 | -3.64 | -970 |
| 8 | 46 | Measuring and control instruments, and media | 18,285 | 17,442 | -4.61 | -843 |
| 9 | 16 | Other foods | 29,674 | 28,881 | -2.67 | -793 |
| 10 | 40 | Other general purpose machinery | 26,834 | 26,080 | -2.81 | -754 |
| 11 | 52 | Aerospace products and parts | 117,910 | 117,256 | -0.55 | -653 |
| 12 | 5 | Natural gas extraction | 12,180 | 11,606 | -4.71 | -574 |
| 13 | 30 | Nonmetallic mineral products | 9,313 | 8,751 | -6.04 | -563 |
| 14 | 3 | Forestry, fishing and agriculture support activities | 6,142 | 5,608 | -8.69 | -534 |
| 15 | 24 | Petroleum and coal products | 94,431 | 93,908 | -0.55 | -523 |
| | | **Total Merchandise Exports** | **1,059,386** | **1,034,541** | **-2.35** | **-24,844** |

## Table 9. Real Output Summary, 2019
**Units: Millions of 2009 Dollars**
**Ranked by Change in Real Output from the Base Scenario in 2019**

| Rank | Sec # | Lift Commodity | Base | Trade War | Percent Difference | Difference |
|---|---|---|---|---|---|---|
| 1 | 58 | Wholesale trade | 1,523,069 | 1,502,276 | -1.4 | -20,793 |
| 2 | 62 | Other retail | 675,780 | 663,604 | -1.8 | -12,176 |
| 3 | 83 | Other real estate | 1,102,480 | 1,090,985 | -1.0 | -11,495 |
| 4 | 13 | New construction | 726,606 | 716,019 | -1.5 | -10,587 |
| 5 | 27 | Other chemicals | 469,521 | 461,781 | -1.6 | -7,740 |
| 6 | 77 | Banks, credit cards and finance | 613,069 | 605,444 | -1.2 | -7,625 |
| 7 | 92 | Management of companies and enterprices | 678,730 | 671,873 | -1.0 | -6,856 |
| 8 | 110 | Automotive repair and maintenance | 208,936 | 202,095 | -3.3 | -6,841 |
| 9 | 93 | Administrative and support services | 849,562 | 842,754 | -0.8 | -6,809 |
| 10 | 51 | Motor vehicle parts | 281,833 | 275,221 | -2.3 | -6,612 |
| 11 | 66 | Truck transportation | 322,100 | 316,345 | -1.8 | -5,756 |
| 12 | 75 | Telecommunications | 770,258 | 764,595 | -0.7 | -5,664 |
| 13 | 33 | Fabricated metal products | 367,682 | 362,118 | -1.5 | -5,564 |
| 14 | 111 | Other repair and maintenance, personal services | 351,936 | 346,449 | -1.6 | -5,487 |
| 15 | 50 | Motor vehicles | 396,712 | 391,589 | -1.3 | -5,123 |
| 16 | 109 | Food services and drinking places | 807,358 | 802,663 | -0.6 | -4,695 |
| 17 | 32 | Nonferrous metals | 116,268 | 111,886 | -3.8 | -4,383 |
| 18 | 61 | General merchandise stores | 214,409 | 210,030 | -2.0 | -4,379 |
| 19 | 82 | Housing services | 1,819,514 | 1,815,531 | -0.2 | -3,983 |
| 20 | 90 | Advertising | 444,215 | 440,287 | -0.9 | -3,929 |

## Table 10. Employment Summary, 2019

**Units: Thousands of Jobs**

| Rank | Sec # | Industry Title | Base | Trade War | Percent Difference | Difference |
|---|---|---|---|---|---|---|
| 1 | 31 | Other retail | 8,580 | 8,430 | -1.8 | -150 |
| 2 | 66 | Other services, except government | 8,369 | 8,244 | -1.5 | -125 |
| 3 | 7 | Construction | 9,216 | 9,109 | -1.2 | -106 |
| 4 | 55 | Administrative and support services | 10,042 | 9,974 | -0.7 | -68 |
| 5 | 27 | Wholesale trade | 6,254 | 6,201 | -0.8 | -52 |
| 6 | 65 | Food services and drinking places | 12,336 | 12,288 | -0.4 | -47 |
| 7 | 44 | Federal Reserve banks, credit intermediation, and related activities | 2,745 | 2,711 | -1.2 | -34 |
| 8 | 30 | General merchandise stores | 3,219 | 3,187 | -1.0 | -33 |
| 9 | 52 | Miscellaneous professional, scientific, and technical services | 7,025 | 6,996 | -0.4 | -30 |
| 10 | 35 | Truck transportation | 1,820 | 1,796 | -1.3 | -24 |
| 11 | 28 | Motor vehicle and parts dealers | 2,090 | 2,067 | -1.1 | -23 |
| 12 | 54 | Management of companies and enterprises | 2,408 | 2,389 | -0.8 | -19 |
| 13 | 19 | Fabricated metal products | 1,493 | 1,476 | -1.2 | -17 |
| 14 | 38 | Other transportation and support activities | 1,559 | 1,542 | -1.1 | -17 |
| 15 | 39 | Warehousing and storage | 1,029 | 1,014 | -1.4 | -15 |
| | | **Total** | **78,184** | **77,424** | **-1.0** | **-761** |

## Table 11. Comparison of Commodity Prices, 2019

**Percent Change from Base**

| Rank | Sec # | Lift Commodity Title | Import Price | Weighted Price | Domestic Price |
|---|---|---|---|---|---|
| 1 | 19 | Textiles and textile products | 10.19 | 4.26 | 0.72 |
| 2 | 55 | Furniture | 8.05 | 3.21 | 0.25 |
| 3 | 47 | Household appliances | 6.22 | 3.91 | 0.44 |
| 4 | 54 | Other transportation equipment | 5.89 | 1.20 | 0.40 |
| 5 | 45 | Search, detection and navigation equipment | 5.80 | 1.26 | 0.42 |
| 6 | 49 | Other electrical equipment and components | 5.76 | 2.52 | 0.36 |
| 7 | 28 | Plastic products | 5.64 | 0.76 | -0.06 |
| 8 | 22 | Paper | 5.14 | 0.54 | -0.05 |
| 9 | 21 | Wood products | 5.11 | 1.35 | 0.58 |
| 10 | 3 | Forestry, fishing and agriculture support activities | 5.10 | -0.12 | -1.46 |
| | | **Total** | **1.85** | **0.26** | **0.12** |
| | | **Manufacturing** | **2.46** | **0.77** | **0.15** |