

Brandeis University International Business School
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Goods Trade Under Siege: Early Indications of
Industry Shifts in Global Sourcing during
the U.S.-China Trade War

Differential Responses in Apparel, Footwear, Communications Equipment,
Semiconductors, Medical Devices, and Pharmaceuticals in 2019

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Executive Summary

The world economy has become integrated since the end of World War II and the creation of international institutions (e.g. GATT), which helped countries draw up favorable terms of trade. The inflow and outflow of intermediate goods, comparative advantage and emergence of global manufacturing hubs, role of bilateral and regional free trade agreements, and relative ease of doing business around the world have facilitated the formation of global value chains. While global value chains capitalize on each economy's area of comparative advantage (e.g. resource endowments, human capital stock etc.) that may change only gradually, they can also be impacted by factors that may change in the short to medium term, such as trade protectionism. The implications of these measures are seen by the U.S.-China trade tensions that spiked in 2018 and the tariff escalation between the two economies. The volley of import tariffs on Chinese imports and retaliatory tariffs on American imports acted as a shock in global sourcing with differential impacts dependent on industry structure, risks, and environments alongside external factors such as country-level economic development strategies. This report aims to identify early shifts in sourcing patterns to the U.S. and to describe differences between selected high-volume trade industries between 2018 and 2019. Business case studies and regional analysis of pull and push factors are utilized alongside trade data to analyze U.S. imports from top suppliers by industry.

Our study finds that China has in fact been severely affected by the series of tariffs imposed on its exports to the U.S. with the level of trade between the two economies dropping. Countries like Vietnam, Mexico and India have all increased their exports to the U.S., demonstrating that trade diversion is taking place, albeit the ramifications of trade destruction are much more dire. In combination, this analysis was able to identify how global value chains have responded to the new tariffs beyond latent shifts that would otherwise be expected. Two primary results appeared: apparel and footwear industries began shifting sourcing whereas communications, semiconductors, pharmaceuticals, and medical devices have not. Case studies about the former indicate that long-term "China plus one" strategies to diversify sourcing were in play before tariffs were imposed while case studies about the latter illustrate business strategy of doubling-down on Chinese markets and long-term investment.

I. Introduction

The United States and China are the biggest economies in today's global economy. China's growth has transformed it from a developing country in the 1980s into an absolute economic size that by 2004 that has surpassed many OECD countries, through an average growth of GDP per capita of 8.1% from 1987 through the early 2000s (Angang, 2005). Among multiple factors shaping businesses strategy, the new tariffs imposed during the U.S.-China trade-war between 2018 - 2019 are considered in this paper to identify differential responses per industry covered. This paper begins with background on the trade story behind the U.S. and China and a discussion of how the tariffs escalated. To analyze differential industry responses, trade import data to the U.S. is analyzed alongside company-specific case studies after a review of findings at the aggregate level.

Trade between China and the U.S. was underway prior to 2000 and accelerated post-2000 once the formal relationship between the two economies was approved for Permanent Normal Trade Relations by the U.S. House of Representatives, granting China most favored nation status (U.S. Department of State, 2000). Soon after, China became a member of the WTO in 2001 and emerged as the U.S' largest trading partner. The level of bilateral trade in goods and services increased from \$116bn in 2000 to \$558bn in 2018 as a result of this trade relationship (Palumbo, 2019; Lea, 2019).

However, there has been opposition to this growth by groups that have been committed to keeping U.S. manufacturing employment at a high level. Correspondingly, groups attributed the 17% reported loss of manufacturing jobs between 2000-03 to the permanent trade agreement signed with China (Pierce, 2018). Although this figure is dwarfed by the manufacturing jobs lost due to substitution by technology which accounts for 75% of the losses (Autor et. al, 2013), and

U.S. real manufacturing output is up quite significantly since 1990, this rationale has nevertheless influenced U.S. politics today. A second rationale employed by the current Trump administration, also not accepted by economists, is that a U.S. bilateral trade deficit with China indicates that the U.S. is “losing” from its trade with China. This bilateral trade deficit was a substantial \$345.6bn in 2019, albeit below its 2018 high of \$419.5bn (Palmer, 2018). However, the purpose of this paper is not to test the rationale put forth by the Trump administration but rather to test the immediate effects of the trade barriers that the administration has implemented to pursue its objectives.

Following Section 201 and 301 investigations, the U.S. imposed a series of additional import tariffs between 2018 - 19 which raised bilateral tensions and increased uncertainty in global supply chains and investment. Section 301 of the Trade Act of 1974 broadly permits the U.S. government to impose tariffs against any foreign action that is “unjustified, unreasonable, or discriminatory, and that burdens or restricts U.S. commerce” (USTR, 2018). The U.S. findings in this case (**Figure 1a**) concluded that China violated U.S. intellectual property (IP) rights in various ways and thus justified trade war tariff escalation in technological and IP intensive industries (ibid). However, tariffs were not restricted to these goods later in the trade war and, as our analysis shows, had some of their most important effects on simple manufactured products. During the trade war, \$280 bn of U.S. imports were affected and the average tariff increased by 24% (Handley et al.,2020; Amiti et al., 2019). The scale of the tariffs affected imports and spurred subsequent retaliation from China; the European Union, Russia, and Canada among others have drawn comparison to the Depression-era tariff wars of the 1930s. However, a key difference between that era and today is that the structure of world trade has become increasingly complex and interconnected across global supply chains.

Figure 1a: Section 301 Findings Behind Targeted Tariffs

USTR Section 301 Investigation Findings (2018)	
1	Restrictive Joint Venture requirements and coercive technology transfer
2	Discriminatory license requirements favoring local Chinese firms
3	Acquisition and exit of U.S. firms facilitated by Chinese government to acquire IP
4	Cyber attacks to obtain confidential business information
5	Intrusive and inadequate policies threatening U.S. national security

Source data: USTR “Findings of The Investigation Into China’s Acts, etc.” 2018

From the beginning of the trade war through Phase I in January 2020, the trade tension that was brewing during the Obama administration burst into the open under the Trump administration.¹ The intense trade relationship that China and the U.S. had built has now, in part, collapsed and this report utilizes the first available data from late 2019 to analyze how sourcing patterns have responded in consumer goods (apparel and footwear), high-tech electronics (semiconductors and communications equipment), and medicine (pharmaceuticals and medical devices). U.S. import trade data is utilized to observe results and compared against press reports about specific firm responses per industry. Previous studies have analyzed short-term price pass-through whereas the goal of this analysis is to understand the early changes in trade patterns (**Appendix 1** summarizes prior research). Outside of the trade war, non-tariff factors are considered including wage rates, improving business conditions in ASEAN economies, and long-term business strategy.

II. How Tariffs Escalated

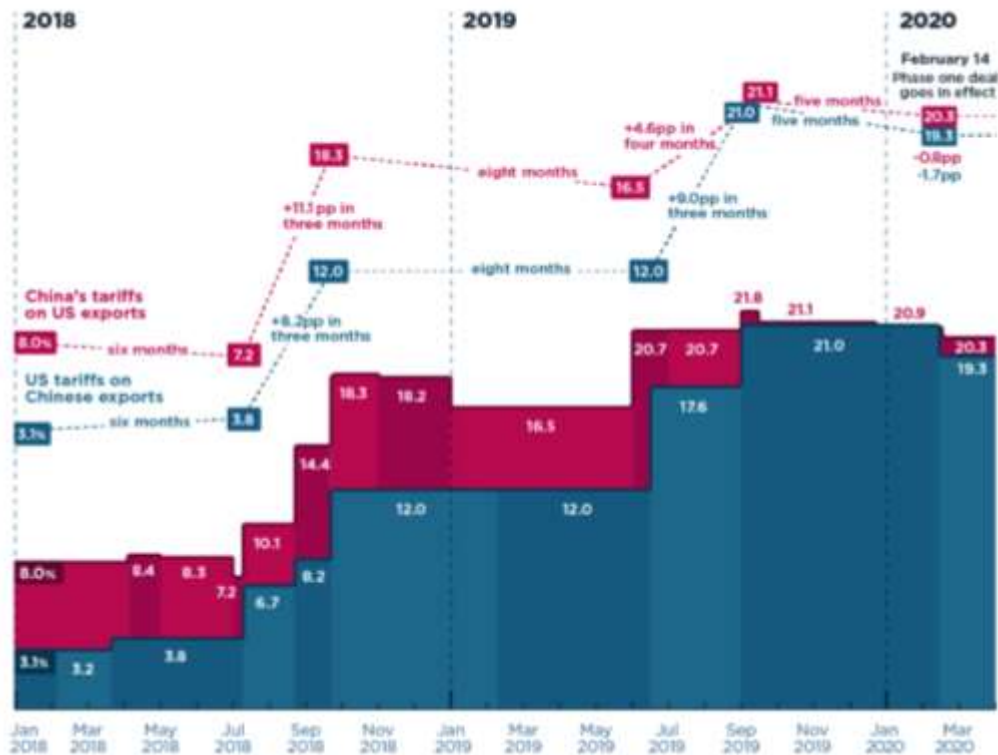
The first round of tariffs was enacted in February 2018 against approximately \$10bn solar panels and washing machines (The Economist, 2018). The second round began in March 2018,

¹ Each year by March 31st, the Office of the U.S. Trade Representative releases an annual National Trade Estimate Report and describes the trade turbulence year to year (USTR, 2020).

imposing tariffs on steel and aluminum (Bown et al, 2020). The third round targets \$506B of Chinese industrial goods (intermediate inputs and capital goods) as well as some consumer goods, motivated in part by U.S. concerns with shortfalls in Chinese intellectual property protection and forced technology transfer, among other issues (ibid, 2020). **Figure 1b** details the month to month changes in average tariff rates.

Amiti et al (2019) estimates that the rising import tariffs by December 2018 were costing U.S. customers and importers an additional \$3.2 billion per month and another \$1.4 billion per month in deadweight welfare losses. They estimate if the tariffs continue that approximately \$165 billion of trade per year will be redirected (ibid, 2019). **Figure 1c** summarizes tariff escalation between the U.S. and China.

Figure 1b: Average Tariff Rates by Percent Between 2018 - 20



Source: Peterson Institute for International Economics, "US-China Trade War Tariffs: An Up-to-Date Chart." Bown

Figure 1c: Timeline of Tariff Escalation Between 2018-20

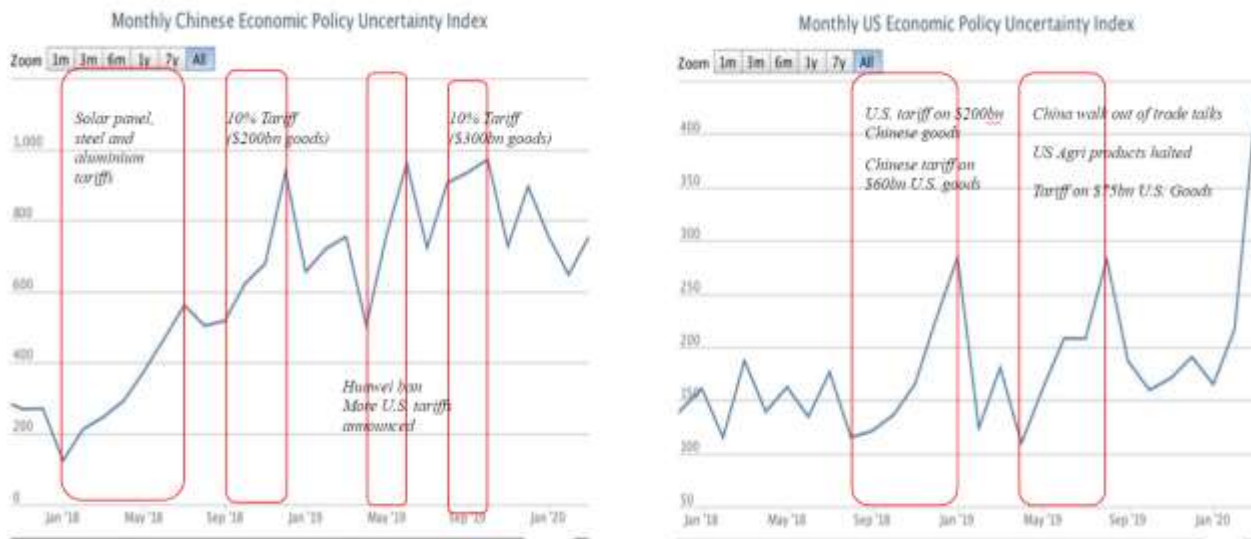


Source data: PIIE, "Trump's Trade War Timeline: An Up-to-Date Guide" Bown et al.

Economic Uncertainty Implications:

Tariff escalation and earlier risk of a trade war under the Trump administration speak to cases of policy uncertainty and alongside the microeconomic impact of tariffs on specific firms and sourcing patterns, it is important to consider uncertainty at the macroeconomic level during 2018 - 20. **Figure 2** indicates jumps in uncertainty at key points in the tariff timeline and shows an overall average rise in economic policy uncertainty in China and the U.S. between 2018 - 20.

Figure 2: Economic Policy Uncertainty in China and the U.S. (2018-20)



Source: Economic Policy Uncertainty Index

For China, periods that coincide with trade war events include: January to June 2018 (steel and aluminum tariffs, the initial round of U.S. tariffs, and retaliatory tariffs), September to December 2018 (U.S. tariffs on \$200bn Chinese goods and Chinese tariffs on \$60bn U.S. goods), May to July 2019 (trade talks falter and the inclusion of Huawei in the U.S.'s NDAA), and August to September 2019 (U.S. tariffs on \$300bn Chinese goods and Chinese tariffs on \$75bn U.S. goods). Three of the same periods are meaningful in the U.S. uncertainty index: September - December 2018 and May to September 2019. The latter indicates a steady increase in uncertainty which differs from a dip in uncertainty on China's index during the same window.

A. Tariff Rates

This section describes tariff rate growth in apparel, footwear, high tech equipment and medical devices from 2018 - 20 in order to provide background for sectors that are analyzed in Section III. This data is taken from the United States International Trade Commission (USITC) database and industries are defined in the Harmonized Tariff Schedule (HTS) classifications.

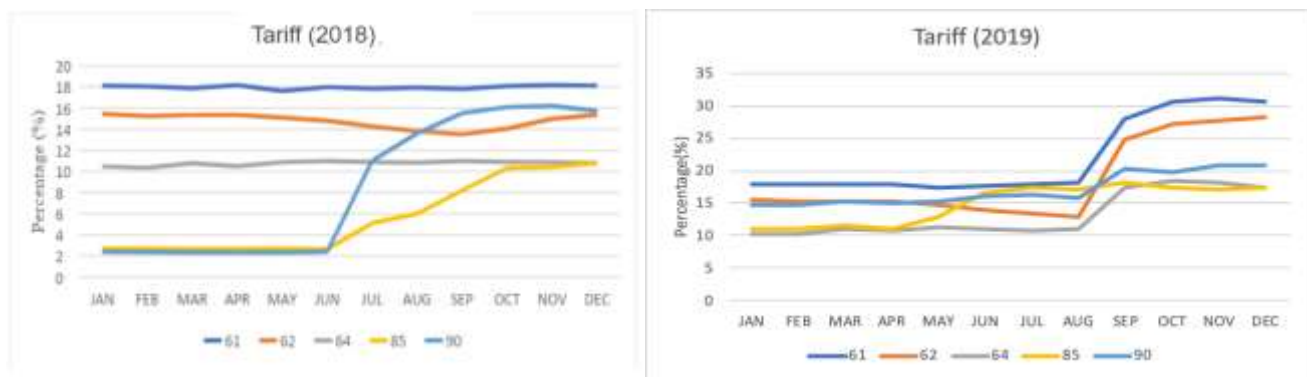
Figure 3: Industry Relevant Sub-Sectors in Harmonized Tariff System

HTS Classification	Industry Name	Description
61	Apparel and clothing accessories	Knitted and Crocheted
62	Apparel and clothing accessories	Not knitted or Crocheted
64	Footwear, gaiters etc.,	Articles relevant to footwear
85	Electrical Machinery and equipment	Articles such as sound recorders, television etc., and their parts
90	Optical, photo, medical, surgical instruments etc.	Articles which include apparatus of all kinds, including medical and surgical

The methodology used to arrive at the tariff level utilizes both “dutiable value” and “calculated duties” from the USITC database on the respective industries. This is a rough measure which calculates the duty paid as a percentage of the total value of imports on which duty is applicable in each month. The method gives a relative idea on how much duty is paid on the value of goods that come in each month. Two limitations of this method are that: 1) it does not account for whether the duty paid is under the Most Favored Nation (MFN) tariffs or a special import program, and 2) it does not account for inter-category variation in duties collected (e.g. the tariff on men’s overcoats made of cotton is 15.9% whereas overcoats made of leather are 5.6%). Instead, this method takes a weighted average based on how much volume of each good is imported each month to arrive at the aggregate duty paid and the next section attempts to deal with the first problem.

Figure 4 below shows how much duty is paid on each product code (e.g. apparel is 18.1% in January 2018). As observed, the duty paid on product code 90 (medical devices proxy) sharply increased between June - September 2018 from 2.4% to 15.5%. Similarly, the tariff on product code 90 rose in July and settled near 10.3% in October 2018. Recall that the Trump administration initially began its tariff escalation using the Section 301 rationale imposing tariffs on IP-intensive products on July 6, 2018 and that average tariffs rose by 8% for HTS 85 (electronics proxy) and 90 (medical devices proxy) by the end of September. This implies that high tech equipment and medical instruments were affected beginning in the second half of 2018 whereas apparel (61-2) and footwear (64) were not targeted initially as tariff levels remained constant during this time. The latter pair faced higher standing tariffs before new tariff imposition whereas electronics and medical devices faced the opposite.

Figure 4 & 5: U.S. Tariff Levels in 2018 and 2019 for Specific Industries



Source data: USITC

Figure 5 shows that the duty paid on all proxy categories rose sharply in the second half of 2019, beginning in August. This closely follows the announcement by the U.S. administration on August 1, 2019 to target \$300 billion worth of imports from China. Up from 16 - 20%, the average tariff on apparel rose up to 29.0% whereas the average tariffs on electronics and medical instruments proxies increased to approximately 17.5% and 22% respectively.

This data analysis shows that, on average, the duty paid on goods coming in from China rose sharply for all highlighted sectors. Electronics and medical instruments proxies were impacted by higher relative increases due to the categories' initial tariffs being around 2%. It is important to note that this analysis and the next section do not account for non-tariff trade barriers (e.g. quotas, subsidies), which contribute to elevated trade protectionism.

B. Comparing Overall Duty Paid to Chapter 99 Tariffs

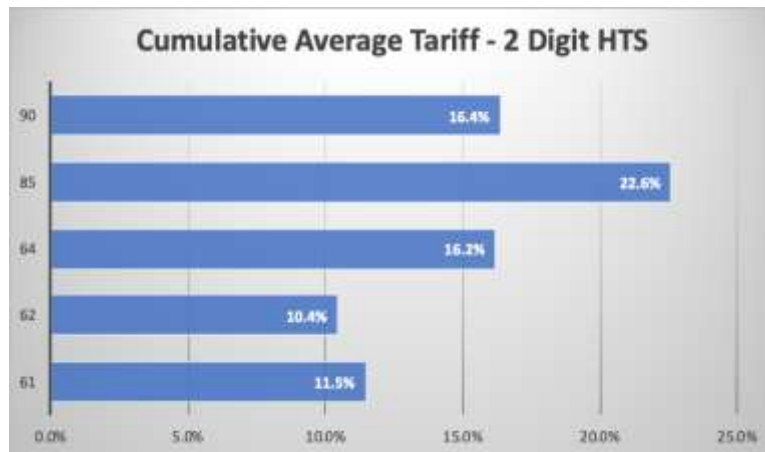
This section aims to provide a deeper understanding of tariff increases which were attributed to U.S. Chapter 99 tariffs (eg. imposed on China as a result of the trade war). The original levels of tariffs are detailed in sub-section A above; however, the MFN tariffs in place are less obvious due to change based on the quantity/weight of specific goods imported. To address this, data from the University of Iowa was utilized. This analysis relies on the University of Iowa data to aggregate tariffs imposed at the 8-digit HTS level with 2-digit HTS industries selected as proxies for apparel (61, 62), footwear (64), electronics (85) and medical instruments (90).

Figure 6 below explains the weighted average marginal increase in tariffs due to the U.S.-China trade war in these selected categories. This figure only includes the tariffs imposed since 2018 as a result of the trade war and the average does not contain the products which do not have any tariffs imposed on them. Note that this entails the averages will be upward-biased due to only representing the non-zero tariffs imposed. Also, it only includes additional tariffs after MFN or preferential tariffs which are already in place for these products.

This figure shows that the highest affected sector is HTS 85 (electronics proxy) which is synonymous to the Trump administration's claim that China was allowing intellectual property theft and that high-tech companies should be penalized - ZTE and Huawei are highlighted in this regard. This confirms that tariffs were targeted at the sub-sector level compared to an initially low

duty on electronics products as seen in the prior section; however, note that the marginal tariff increase estimate is slightly inflated owing product codes which were zero in this sector.

Figure 6: Marginal Tariffs Added Per HTS Category (Aggregated)



Source data: University of Iowa - Trade war data

Similarly, medical instruments and footwear faced an additional ~16% tariff levied on their products; the initial tariffs on medical instruments was low and the trade war tariffs raised the rate by ~22%. The tariff in footwear rose by 16.2%, although there were significant zeros in this sub-sector which skews the average upwards. Thus, a number of specific products were targeted and increased the average marginal tariff in effect.

Lastly, the marginal tariff on apparel is lower than the other industries but as seen in **Figure 4**, apparel faced a significant tariff before the imposition of new trade war tariffs; this marginal increase led to the average tariff reaching 30%. Accordingly, apparel manufacturing imports from China were already facing trade protection before the trade war and the marginal increase in tariffs raised this cost to producers to even higher rates - incentivizing the shifts discussed in Section IV.

III. Aggregate Trade Responses

The marginal spike in tariffs discussed above has contributed to both trade destruction and diversion. Trade diversion, as put forth by Viner in 1924 and 1950, leads to the welfare loss that is attributable to not importing from the country that produces a good at the lowest expense, due to a discriminatory duty imposed on its good, instead importing from a higher-cost source (Viner, 1924).² Total U.S. imports in 2019 shrank by 1.67% to \$2,498bn during the same period of new tariff imposition and protectionism, which is referred to as trade destruction. China faced severe change in total exports to the U.S in 2019 which dropped to \$452bn; for scale, this is \$16bn below the 2013 level of \$468bn, which is referred to as trade diversion. China was the largest supplier of U.S. imports at around \$540bn of goods in its peak year of 2017. To provide an overview of how severely the trade war has impacted U.S. imports from China, Section III consists of a broad manufacturing sector analysis.

Figure 7: NAICS 3-digit Manufacturing³

A. U.S. Imports in Manufacturing

This is a 3-digit analysis derived from the North American Industry Classification System (NAICS) and each code represents one manufacturing industry (**Figure 7**). Further, this analysis highlights China’s role as a powerhouse trading partner for the U.S. with China placing among the leading suppliers in most categories of manufactured goods imports. For instance, the imports from China in product code 331 are nearly 22x bigger than imports from Vietnam in the same

Industry Code	Industry name
311	Food
312	Beverage and Tobacco Product
313	Textile Mills
314	Textile Product Mills
315	Apparel
316	Leather and Allied Product
321	Wood Product Manufacturing
322	Paper
323	Printing and related support activities
324	Petroleum and Coal products
325	Chemical manufacturing
326	Plastics and Rubber Products
327	Nonmetallic Mineral Products
331	Primary Metal Manufacturing
332	Fabricated Metal Product
333	Machinery
334	Computer and Electronic Products
335	Electric equipment, appliance and components
336	Transportation equipment
337	Furniture and related products
339	Miscellaneous manufacturing

² Viner described the economic theory of trade creation and trade diversion in 1924 with *The Most-Favored Nation Clause in American Commercial Treaties* and *The Customs Union Issue* in 1950.

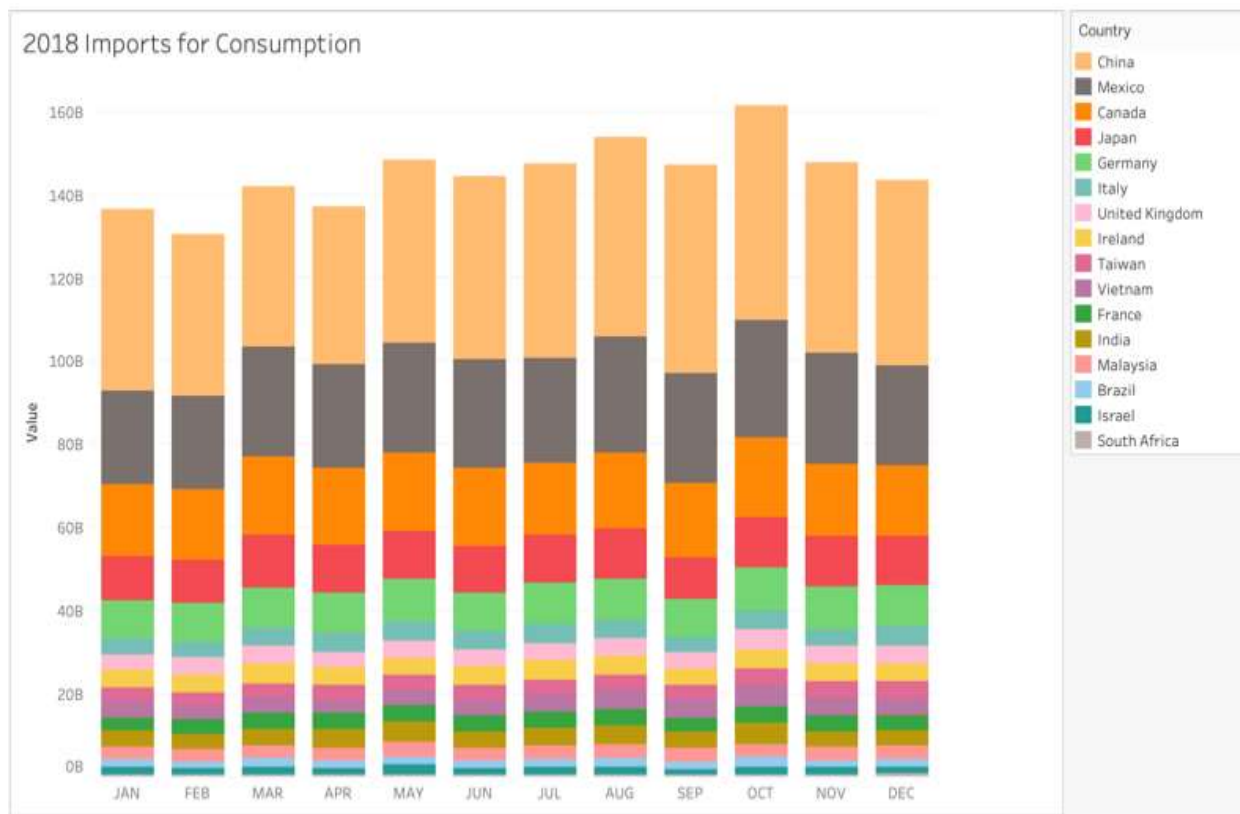
³ Source data: USITC

product code. The analysis stays at this level of aggregation for Section III because it provides a comparative view between countries and insight into how the new tariff impositions affected not only China, but other countries as well.

B. Global Imports in Manufacturing

It is prudent to note that the Trump administration tariffs on almost all imports from China were counterintuitive due to China’s role as the U.S.’ biggest trading partner, primarily in limited manufacturing goods. **Figure 8** showcases China’s relative size with a snapshot of the share of all manufacturing imports that are received from each country for each month in 2018.

Figure 8: Monthly Manufacturing Imports for Consumption from Selected Countries⁴



Source data: USITC

⁴ In USITC data, “Imports for Consumption” indicates all imports that have cleared U.S. customs for use in the U.S. market as either intermediate or final goods (USITC Trade Measure Definitions, 2018). **Appendix 2** details the flow and categorization of U.S. imports under this definition in more detail.

China led with the largest contribution in manufacturing imports and Mexico and Canada followed close behind. **Figure 9** shows negative effects felt in the manufacturing sector during 2019 when new tariffs escalated to their highest points; simultaneously, it is important to note that U.S. imports grew very slowly from 2018 to 2019. This figure showcases the annual change of imports between 2018 – 19 for each country in each sub sector where the red highlighted cells represent a decrease in imports from the previous period. The primary takeaway from this table is that Chinese imports have decreased in 19 out of the 20 manufacturing subsectors. None of the other countries were as adversely affected as China and it serves as a stark reminder that, although the U.S.-China trade war was tit-for-tat tariff imposition, U.S. tariff imposition had far-reaching implications - including acting as a driver of policy uncertainty discussed in Section II.

Figure 9: Annual Change in U.S. Manufacturing Imports in all NAICS Codes

Top suppliers of U.S Manufacturing Import % Change in 2019								
NAIC	Industry	China	Vietnam	India	Mexico	Taiwan	Canada	Malaysia
324	Petroleum and Coal products	-67%	-99%	27%	16%	-19%	3%	-44%
311	Food	-31%	8%	2%	6%	14%	4%	4%
321	Wood Product Manufacturing	-31%	44%	30%	24%	2%	-18%	-1%
313	Textile Mills	-30%	38%	8%	-4%	0%	-5%	86%
331	Primary Metal Manufacturing	-29%	-31%	-15%	-4%	-15%	-5%	-6%
312	Beverage and Tobacco Product	-28%	26%	-1%	13%	-3%	13%	-41%
337	Furniture and related products	-26%	42%	10%	6%	16%	5%	35%
325	Chemical manufacturing	-24%	35%	16%	3%	-5%	-3%	-8%
327	Nonmetallic Mineral Products	-23%	53%	34%	5%	14%	1%	49%
334	Computer and Electronic Products	-21%	47%	20%	2%	40%	4%	-2%
336	Transportation equipment	-19%	20%	4%	6%	9%	1%	15%
322	Paper	-17%	108%	49%	-8%	10%	-5%	243%
333	Machinery	-17%	42%	7%	5%	10%	3%	7%
335	Electric equipment, appliance and components	-15%	115%	16%	2%	24%	2%	58%
316	Leather and Allied Product	-13%	13%	10%	1%	27%	11%	-2%
332	Fabricated Metal Product	-12%	45%	9%	3%	1%	2%	33%
315	Apparel	-10%	10%	7%	-4%	3%	-6%	4%
326	Plastics and Rubber Products	-8%	41%	15%	3%	7%	-1%	18%
339	Miscellaneous manufacturing	-2%	42%	-7%	7%	8%	3%	6%
314	Textile Product Mills	0%	32%	3%	4%	11%	-12%	2%
323	Printing and related support activities	1%	38%	16%	-3%	15%	3%	50%

* Red if change from 2018 to 2019 is less than zero

Source data: USITC

Notably, Vietnam has observed an increase in its exports to the U.S. in all manufacturing subsectors except two (petroleum and coal products and primary metal manufacturing). The

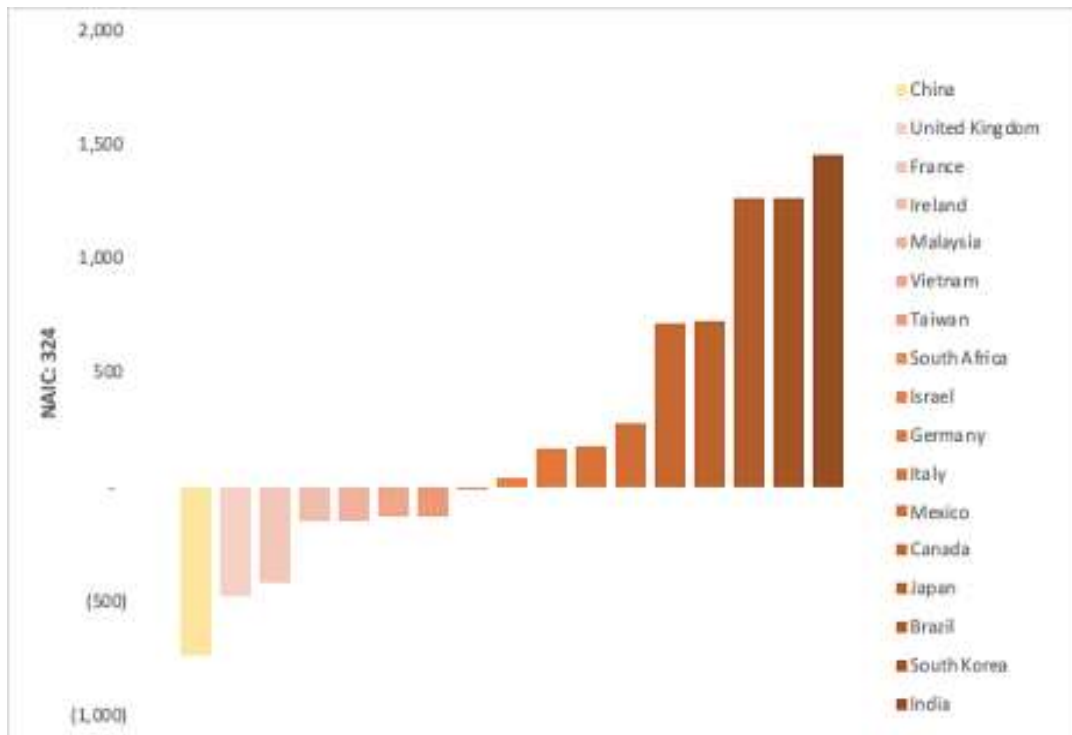
magnitude of change differed based on how much Vietnam exported to the U.S. in 2018 though there is enough evidence to conclude that Vietnam has gained in a macroeconomic sense due to trade diversion from China. Further, Vietnam has exact or near exact 1:1 growth parallel to China's losses in: apparel, leather and allied products, transportation equipment and beverage and tobacco products; for this analysis, apparel is a paramount observation for Vietnam. Similarly, countries like Mexico, India, Taiwan and Malaysia observed a rise in their exports to the U.S. in 2019. Importantly, 1:1 gains should not be expected when limited to top suppliers alone because domestic U.S. supply substitutions or year over year market growth may have also played roles.

To dive deeper into the largest percent decreases, three subsectors were analyzed: petroleum and coal products (324), food (311) and wood product manufacturing (321). **Figure 10a** visualizes gross loss/gain of top suppliers of petroleum and coal products to the U.S. in millions USD in 2019 whereas **Figure 10b** highlights the relative percent changes for these suppliers (**Appendix 3** describes input data). Subsequent figures describe similar gains/losses for food and wood products and clear linkages to ASEAN countries were found in petroleum and wood products. Before concluding this section with food manufacturing where no clear linkages are observed, a discussion of improving ASEAN business conditions helps to contextualize these linked third-country effects.

In petroleum and coal products, Mexico is one of the leaders in imports with a 15.6% increase equivalent to a \$300 million increase from its \$1.7 billion share of imports in 2018. India dominates in absolute terms since imports increased by \$1.46 billion, followed by South Korea (\$1.263 billion) and Brazil (\$1.261 billion). One does not expect India to be such a big exporter of energy products but the country had a good year in 2018 with an overall increase in petroleum

product exports to the rest of the world (India Department of Commerce, 2019).⁵ China dropped from ninth place in 2018 to eleventh during 2019 after its share of U.S. relevant imports fell by 67.4%, the equivalent of approximately \$738 million. Interestingly, imports from Vietnam also fell sharply with a \$131 million drop from an initial \$132 million import value in 2018. Malaysia observed a similar drop in exports of \$147 million from an initial \$330 million value in 2018. This shows losses in this subsector were not isolated to China and impacted other ASEAN countries. In wood products manufacturing, there are also clear linkages to ASEAN and southeast Asian countries experiencing third-country effects while China’s share of U.S. imports dropped.

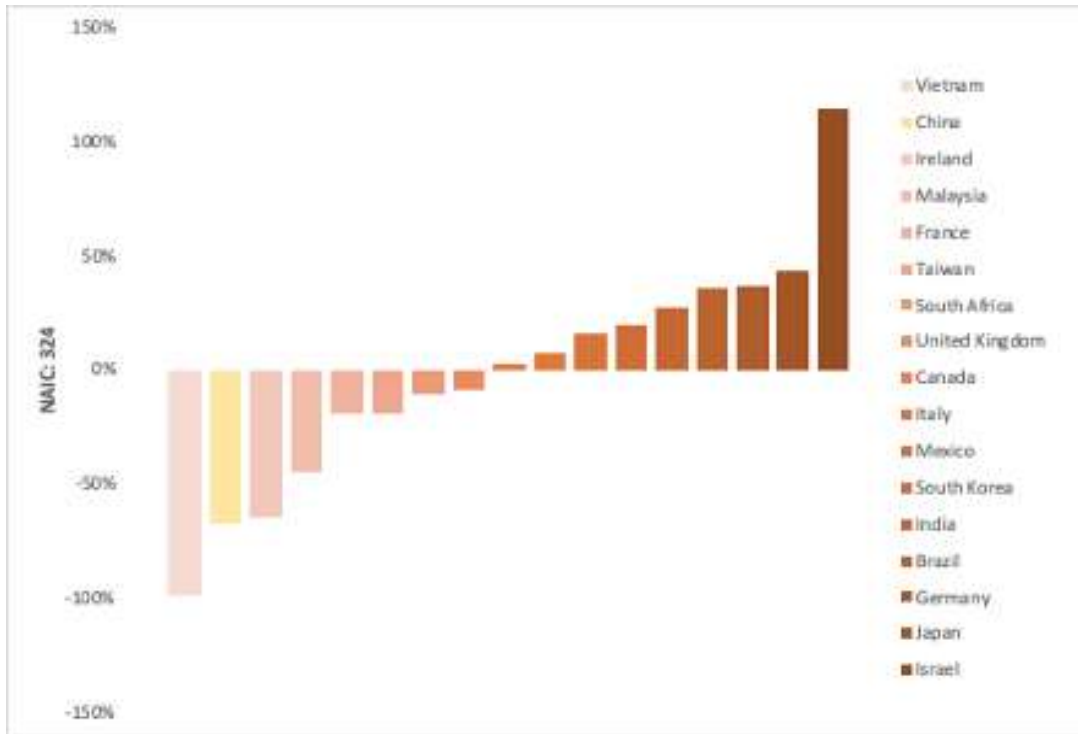
Figure 10a: Changes in Millions USD for Petroleum & Coal Suppliers to U.S. in 2019



Source data: USITC

⁵ An Indian Chamber of Commerce report highlights that India’s exports in this sector increased by \$32.22 billion from an initial \$1.086 trillion (India Department of Commerce, 2019).

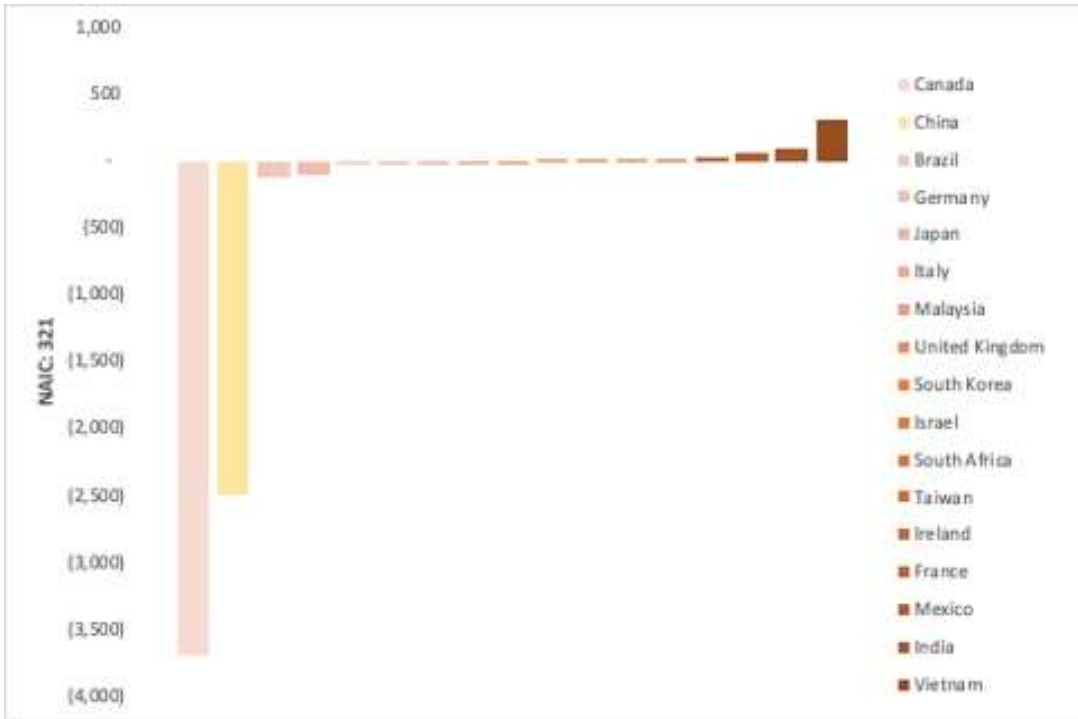
Figure 10b: Percent Change for Top Petroleum & Coal Suppliers to U.S. in 2019



Source data: USITC

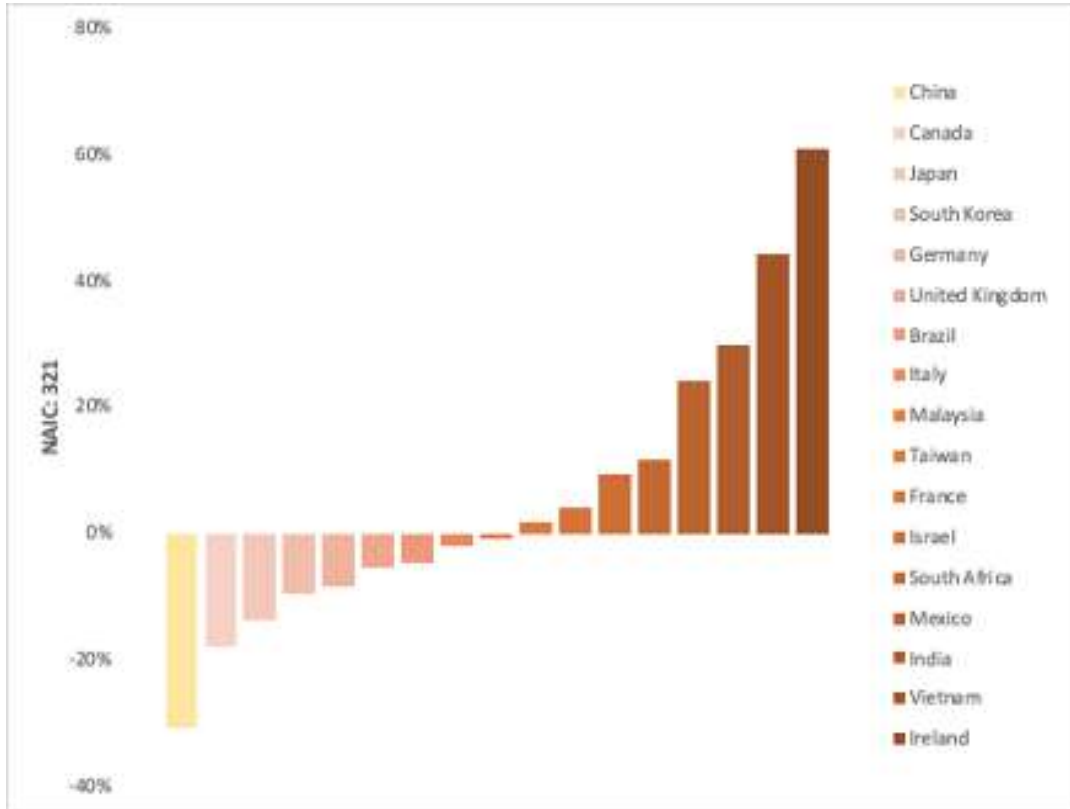
In wood product manufacturing, China is second in terms of the magnitude. Surprisingly, both Canada and China had an annual decline in supply of U.S. imports with China’s exports decreasing by around \$2.5 billion in 2019 from 2018 level of \$8.15 billion. The loss in U.S. imports from China were recovered through three countries, namely Vietnam, India and Ireland. Vietnam crossed the billion-dollar mark and its imports increased by \$300 million. Similarly, India observed a rise in its exports to the U.S. in wood products by \$100 million. Ireland’s percentage change was high but the absolute increase in exports to the U.S. was low in magnitude at \$6 million. **Figure 11a** describes the gross loss/gain of top suppliers of wood products to the U.S. in millions USD in 2019 whereas **Figure 11b** highlights the relative percent changes for these suppliers (**Appendix 3** describes input data).

Figure 11a: Changes in Millions USD for Wood Suppliers to U.S. in 2019



Source data: USITC

Figure 11b: Percent Change for Top Wood Suppliers to U.S. in 2019

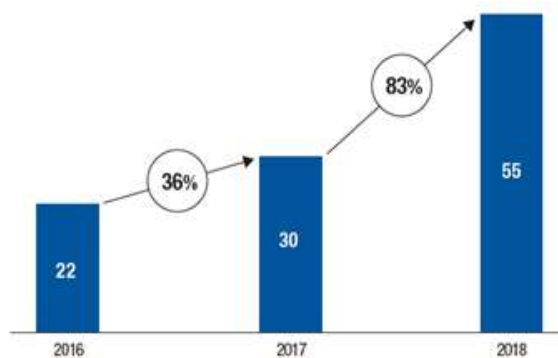


Source data: USITC

In wood products, petroleum and coal products, apparel, and many of the industries summarized in **Figure 9**, gain/loss linkages to Vietnam and Malaysia need to be contextualized within regional non-trade-war factors that likely impacted industrial organization and trade economics. Generally, these non-tariff factors within the ASEAN region act as pull factors and evidence of improving business conditions and relative comparative advantages facilitate positive gains for countries that are targets for companies in response to the push factor of the trade war. However, it is pertinent to remember that how fast supply chains adjust depends on the nature of the industry (e.g. raw material requirements, cost of acquiring capital etc.) and can increase the time required to adjust fully. Regardless, pull factors are being quantified and potential countries can be assessed with regard to FDI, human capital, free-trade agreements, wage rates, and EDB ratings among other factors.

ASEAN countries appear to be a major winner of new investments with respect to the push factor created by the trade war and as discussed below, pull factors as well. ASEAN has witnessed an increasing influx of FDIs in 2018 to \$155bn up from \$147bn in 2017 - capturing 11.5% of global FDI inflows. Member states including Cambodia, Indonesia, Singapore and Vietnam received record levels of inflows in 2018 (UNCTAD, 2019). This jump in FDI was fueled significantly by an increase in FDI in the manufacturing sector: \$55bn in 2018 up from \$30bn in 2017; this 83% increase provides insight for Vietnam, Malaysia, and other member country

Figure 12: FDI to ASEAN: 2016 - 2018⁶



⁶ Source: UNCTAD, ASEAN Investment Report 2019, FDI in Services: Focus on Healthcare

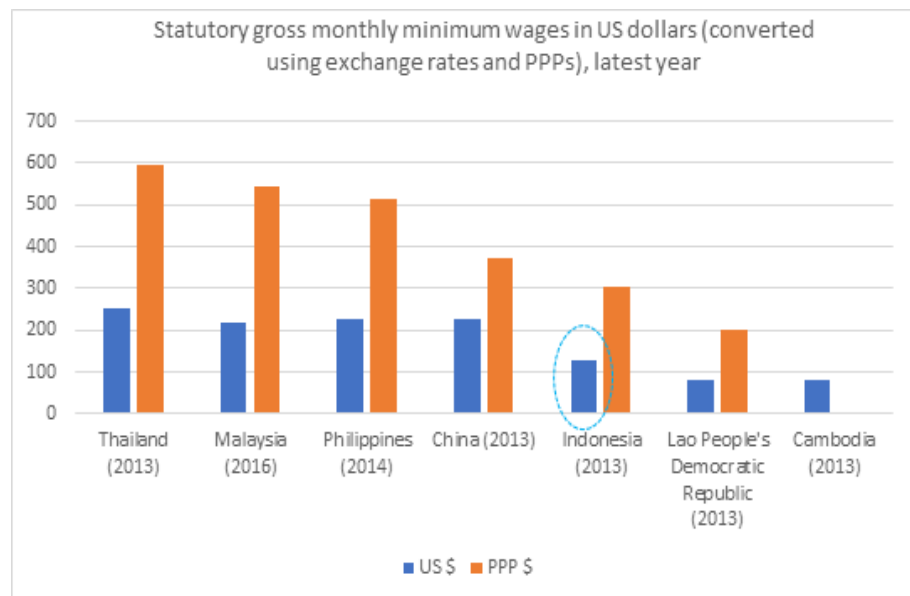
gains (**Figure 12**). The majority of increased flows came from the EU, Japan, Hong Kong (China), India and Korea (UNCTAD, 2019).

Further, the role of countries pursuing change impacts international supply chain decisions and progress in this change can be measured through metrics including World Bank’s Ease of Doing Business and Human Capital Index. Lastly, increasing wage rates in China and relatively lower wage rates in ASEAN countries is important to note as an additional push factor for industries with sensitive cost curves, such as apparel which faces the ~30% cumulative tariff discussed in Section II when producers source from China. Push and pull factors in combination can provide compelling motivations for sourcing to shift in such industries.

As **Figure 13** shows,

countries including Indonesia, Lao PDR and Cambodia had significantly lower minimum wages compared to China; though, it is important to note that the time of

Figure 13: Gross Minimum Wages of ASEAN & China⁷

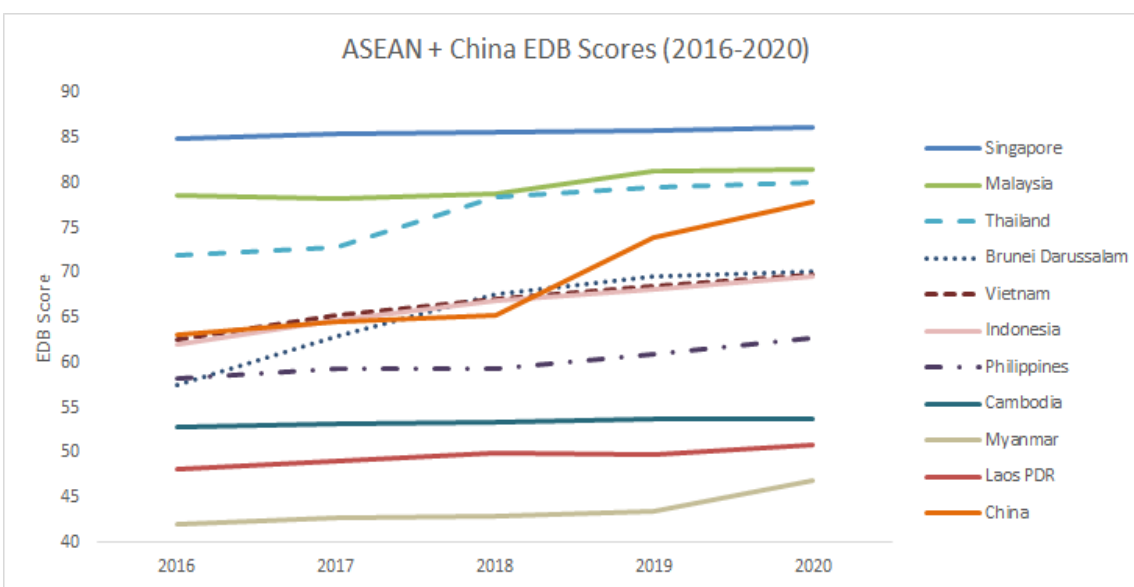


measurement of this data varies per last available data and that the statutory regimes in place for minimum wage likely differ between countries. ASEAN’s position relative to China is further described in **Figure 14** which shows that Thailand, Malaysia and Singapore have better EDB scores compared to China as of 2020 and over the last few years (2016-2020). The EDB score is a

⁷ Source: International Labor Organization, ILOSTAT DataBase

cumulative score out of 100 that accounts for factors such as how long it takes to acquire a new business permit and the average cost of starting a new business (eg. 100 indicates high ease). A final metric investigated is the relative level of human capital development in countries (**Figure 15**) which shows that Singapore performed well over China and that Malaysia, Thailand and Vietnam are not far away from China - this is significant for companies considering where higher-tech manufacturing can be conducted, such as for semiconductors and communications equipment.

Figure 14: Ease of Doing Business Scores Among ASEAN and China



Source Data: World Bank Ease of Doing Business

Figure 15: Human Capital Index for ASEAN & China in 2018

<i>Lowest Five Among ASEAN & China</i>		<i>Highest Five Among ASEAN & China</i>	
Laos PDR	0.452	Singapore	0.884
Myanmar	0.473	China	0.673
Cambodia	0.493	Vietnam	0.666
Indonesia	0.535	Malaysia	0.622
Philippines	0.548	Thailand	0.604

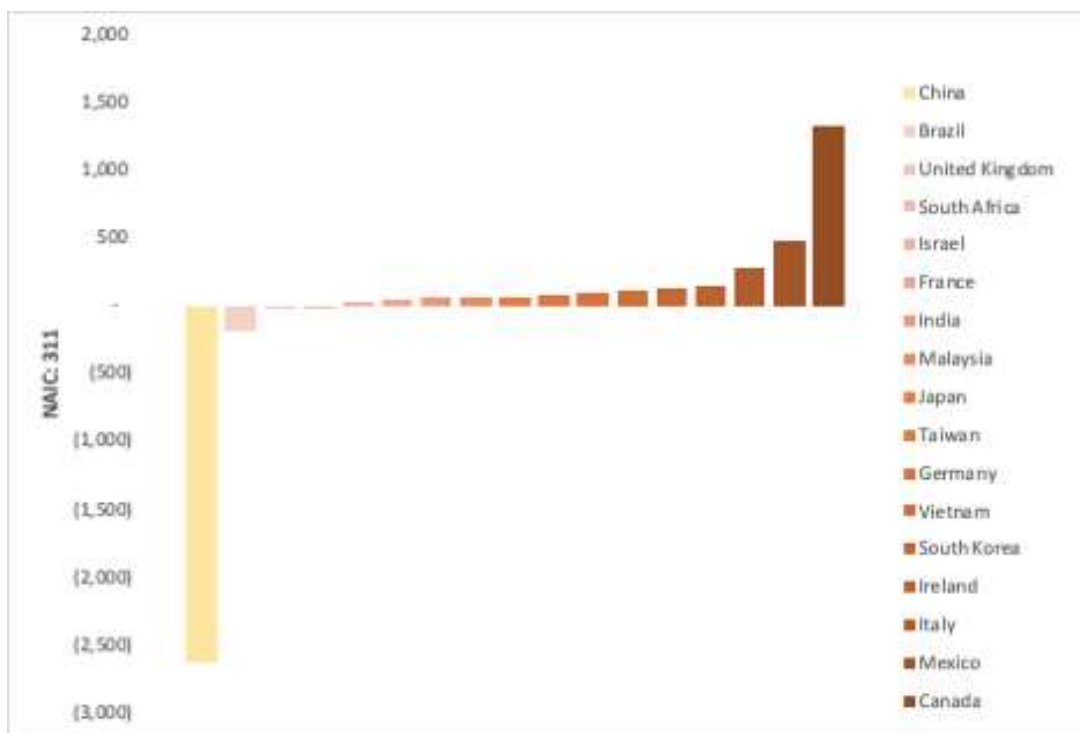
Source data: Human Capital Index, World Bank Development Indicators

ASEAN push and pull factors are significant for understanding the regional trade story in ASEAN, China, and southeast Asia as a whole. Meanwhile, the trade war and external factors should also be considered in terms of the U.S.-based suppliers and their levels of production, particularly in industries where China lost volume but there were no clear winners in countries that

gained volume. This presents a third case that may have occurred in the case of food manufacturing though the data on U.S.-based suppliers was not available at the time of this analysis. Briefly, the food manufacturing data available is discussed before this report continues into industry-specific analyses in the final section, Section IV.

In food manufacturing, Mexico and Canada are leaders and the dramatic fall in China’s imports (31.1%) was worth \$2.63 bn from an \$8.46 bn share of U.S. imports in 2018. There is no country that is a clear winner from China’s loss in terms of trade volume though smaller volume countries including Vietnam, South Korea, Ireland and Taiwan have seen a steady rise in their exports to the U.S.⁸ **Figure 16a** describes the gross loss/gain of top suppliers of food manufacturing products to the U.S. in millions USD in 2019 whereas **Figure 16b** highlights the relative percent changes for these suppliers (**Appendix 2** describes input data).

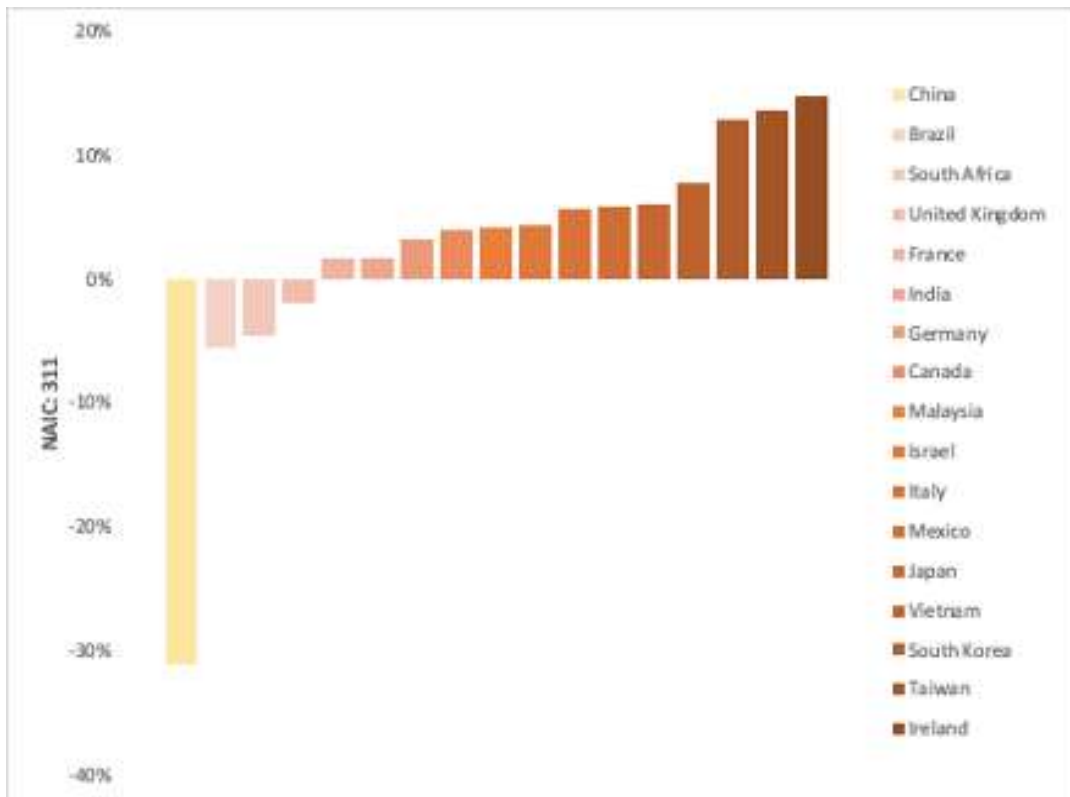
Figure 16a: Change in Millions USD for Top Food Manufacturing Suppliers to U.S. in 2019



Source data: USITC

⁸ Interestingly, food manufacturing imports declined from Brazil in 2019 too.

Figure 16b: Percent Change for Top Food Manufacturing Suppliers to U.S. in 2019



Source data: USITC

In conclusion, this analysis shows that there has been trade destruction and diversion in 2019. The observed trade destruction was larger than diversion, which may be attributable to gains in U.S.-based production, economic uncertainty in investment, and U.S. tariff imposition on other trading partners in addition to China. Manufacturing industries faced these variable tariff rates and changing business conditions in China, the U.S., and neighboring third countries, where improving business conditions stood in contrast to rising wage rates in Chinese manufacturing. To further investigate, Section IV describes early shifts in global sourcing of U.S. imports for six selected industries.

IV. Sectoral Trade Responses: How and Why They Varied

This section analyzes U.S import data and company case studies to understand how trade patterns changed and differed between industries in late 2019.⁹ The six industries analyzed range from apparel and footwear in consumer goods, semiconductors and communications equipment in high-tech electronics, and pharmaceuticals and medical devices within medicine.¹⁰ Industries were selected due to high levels of trade, U.S.-China linkages pre-trade war, and anecdotal evidence that responses between industries differed. Expected differences have to do with varying levels of complexity in product manufacturing required, sensitivity to highly-specialized inputs (including human resources), and varying cost-curves per industry. Per industry, the differences and similarities are discussed and business strategy becomes an important consideration among others; namely, pursuit of a China plus one strategy appears in industries that faced less friction to relocating manufacturing. Pairs of industries are grouped per subsection and each follows a common structure: i) exposure to new and existing tariffs by trade volume, ii) year-over-year analysis of shifts amongst top suppliers between 2017 - 19 to explain how and when industries responded, and iii) how trade data links to business strategy with a company case study.¹¹

A. Consumer Goods: Apparel & Footwear

i) Apparel Exposure to New & Existing Tariffs

Trade volume under Chapter 99, which has a section for Chinese imports targeted during the trade war, illustrate apparel's steep exposure in **Figure 17**.¹²

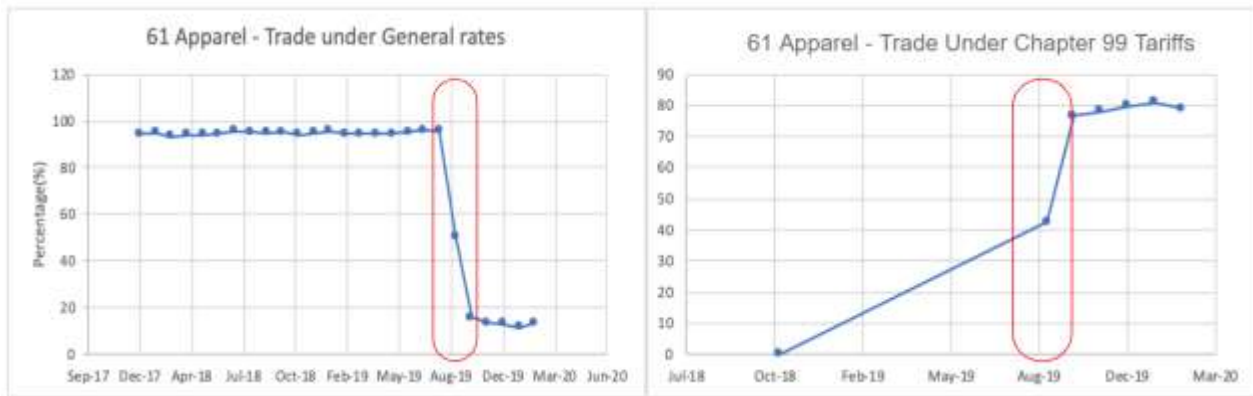
⁹ Identical HTS classifications discussed in Section II are used in this trade data analysis, as taken from The United States Census Bureau. The timeline that is included follows the announcements made by the U.S. administration in regard to the tariffs on Chinese goods (2018 - 19).

¹⁰ Corresponding NAICS codes are: apparel (3152), footwear (3162), semiconductors (3344), communication equipment (3342), medical devices (3391), and pharmaceuticals (3254).

¹¹ Where relevant, non-tariff factors are discussed in components ii) and iv); in the high-tech electronics category, a comparative case study follows the completion of both industries' analyses to illustrate parallel items.

¹² The Harmonized Tariff Schedule for Chapter 99 has a special section for Chinese imports that have been included as a result of the trade war. This report measures the volume of Chinese imports in each sector that falls under Chapter

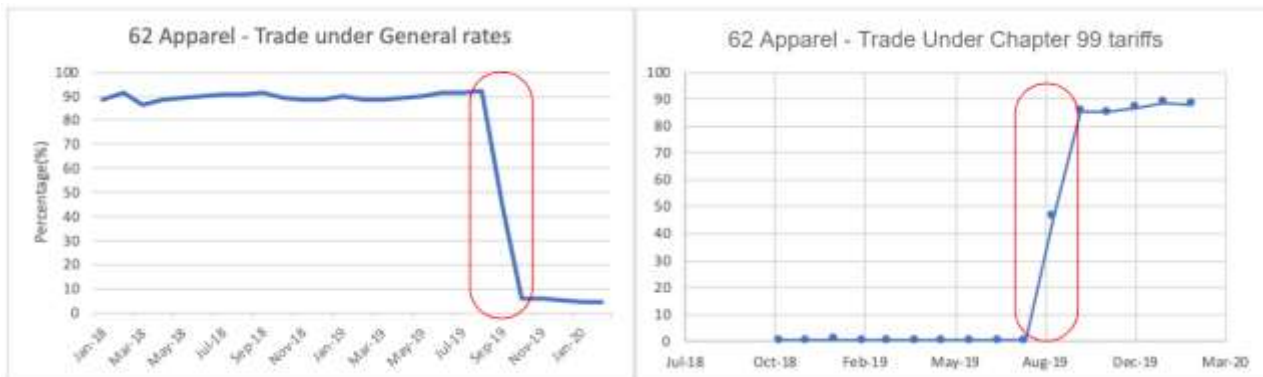
Figure 17: Knitted Apparel Trade Volume Under General Rates and Chapter 99 (% Total)



Source data: USA Trade Online

On the left, imports of knitted or crocheted apparel traded under general rates, rates that do not fall under a preferential trade agreement, such as the USMCA, show a steep drop in percent of total trade under general rates. On the right, the volume of this apparel that falls under Chapter 99, the temporary restrictions on Chinese imports, illustrate a simultaneous increase in goods traded when the volume drops under general rates. This volume change is attributed to the imposition of the U.S.-China trade war tariffs in late 2018 with steep escalation post July 2019. An identical shift and timeline are observed with the volume of non-knitted apparel (**Figure 18**).

Figure 18: Non-Knitted Apparel Volume Under General Rates and Chapter 99 (% Total)



Source data: USA Trade Online

99 as a percentage of total trade in that sector. Chapter 99 is temporary legislation used by the U.S. to add import restrictions before being characterized under Chapter 1 - 97 or discontinued.

Approximately 90% of imported apparel volume from China before the trade war was falling under general rates. Then, the second round of tariffs in August 2019 severely impacted the apparel sector with around 85% of the incoming trade now falling under Chapter 99 restrictions. Though the marginal apparel tariff increase was lower (discussed in Section II), the total tariff neared ~30% and the volume of goods impacted was very high, which showcases that this industry was heavily impacted.

ii) Year-over-Year Analysis of Top Suppliers: How & When Apparel Responded

Described in **Figure 19**, apparel constitutes 60% of the apparel, textile, and footwear sectors with steady U.S. import levels of \$152bn, \$161bn, and \$162 billion in 2017, 2018, and 2019 respectively. Imports increased moderately by 1% in 2019 from 2018 and 7% from 2017. The suppliers have remained stable and concentrated; the top 20 suppliers took 92.25% of all apparel import volume in 2019. The top five suppliers were consistent from 2017 – 2019 with China, Vietnam, Bangladesh, Indonesia, and India. The largest supplier, China, experienced severe declines in both absolute value and percentage of total in 2019 (**Figures 20a and 20b**). Vietnam, the second largest supplier, has steadily closed the gap between itself and China since 2017 which suggests that the driving factors pre-dated the new trade war tariffs - already high tariffs as of 2017 are an important factor here.

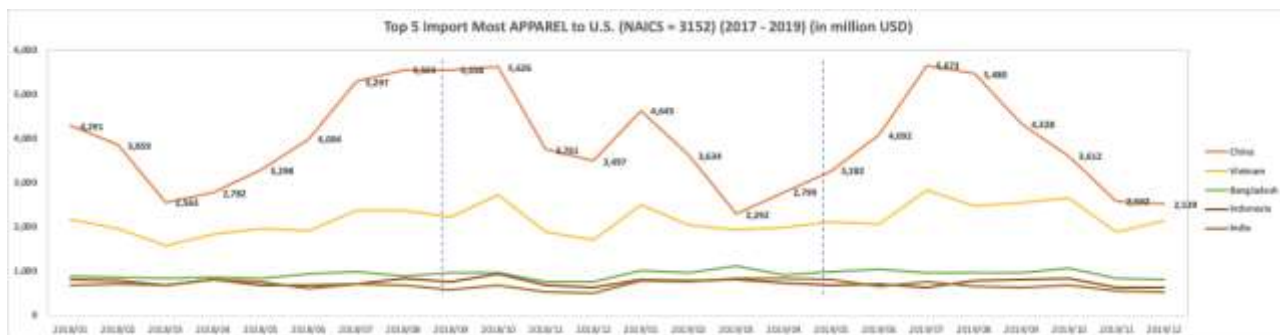
Figure 19: Top 10 Apparel Suppliers to U.S. (Annual Value in Millions USD, % of Total)

Row Labels	2017		2018		2019			
China	48,893	32.07%	China	50,100	31.09%	China	44,957	27.69%
Vietnam	22,543	14.79%	Vietnam	24,759	15.37%	Vietnam	27,258	16.79%
Bangladesh	9,696	6.36%	Bangladesh	10,592	6.57%	Bangladesh	11,698	7.21%
Indonesia	9,064	5.95%	Indonesia	9,074	5.63%	Indonesia	8,905	5.49%
India	7,394	4.85%	India	7,972	4.95%	India	8,483	5.23%
Mexico	6,922	4.54%	Mexico	6,506	4.04%	Mexico	6,067	3.74%
Honduras	4,547	2.98%	Honduras	4,912	3.05%	Cambodia	5,344	3.29%
Cambodia	4,261	2.80%	Cambodia	4,825	2.99%	Honduras	5,326	3.28%
Sri Lanka	3,707	2.43%	Sri Lanka	3,859	2.39%	Sri Lanka	4,010	2.47%
El Salvador	3,303	2.17%	El Salvador	3,341	2.07%	Jordan	3,595	2.21%
Total	152,434	100.00%	Total	161,131	100.00%	Total	162,348	100.00%

Source Data: USITC

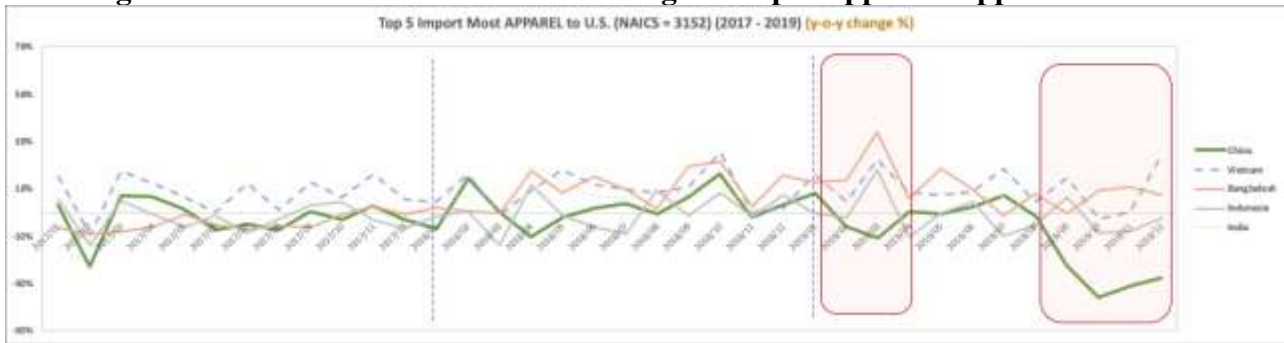
Typically, China has supplied about \$50 bn of apparel to the U.S in 2017 and 2018 - 31% of the U.S. apparel imports in 2018 - and it experienced a loss in share of apparel imports in 2019 instead of continuing its modest upward growth (Figure 19). This dramatic drop of apparel imports from China, \$5 bn (10%) less than that in 2018, illustrates the impact of the 15% new tariffs applied to \$112 billion of Chinese imports of apparel and textiles took effect on September 1, 2019 which hit 91.6% of Chinese apparel, 68.4% of home textiles and 52.5% of footwear imports (American Apparel and Footwear Association, 2019). The shock of the imposed additional tariffs led to an abnormal and shorter peak in U.S. imports of apparel from China; this abnormality accompanied the drastic drop of volume in August 2019 (Figure 20b). Whereas, Vietnam, the second largest exporter, increased its exports to the U.S. with an always positive y-o-y increase from 2017 to 2019 and generated a \$2.5 billion (10%) increase in 2019 compared with 2018. Instead of China maintaining its share and modest growth, Chinese imports dropped to three year low and this loss is not fully captured by the most likely substitute candidates, Vietnam and Bangladesh. The other seven suppliers out of the top 10 took a total \$1.2 bn increase. The imposition of new trade war tariffs had accelerated sourcing shifts away from China that were already happening in the sector. Still, Vietnam was far from catching up to total volume from China and would have needed to more than double its apparel exports to reach the current level from China.

Figure 20a: Top 5 Apparel (NAICS = 3152) Suppliers to U.S. in Million USD



Source Data: USITC

Figure 20b: Year over Year Percent Change in Top 5 Apparel Suppliers to U.S.



Source Data: USITC

iii) Business Strategy Linkages for Apparel

The pattern observed indicates a long-term China plus one business strategy to move sourcing that can move outside of China to suitable neighbors such as Vietnam and Bangladesh. These shifts alleviate the high-tariff burden that apparel suppliers face when exporting to the U.S. from China by a minimum of 15% tariff added as a result of the trade war and reduces long-term uncertainty in sourcing mix based on country-specific exposure to risk. The pattern observed during 2017-2018 confirms that the U.S. apparel sector has become less dependent on Chinese imports which can be jointly attributed to high-tariffs and changing business environments including the increasing labor cost in Chinese cities and relatively lower labor costs among ASEAN neighbors such as Vietnam. When Donald Trump was elected U.S. president in 2017, this decoupling trend accelerated and was in-part attributable to increased uncertainty about international manufacturing relationships, especially with China, as referenced in Section I & II. This effect became dramatically visible in China's drop in 2019 and Vietnam's jump up when the new tariffs went into effect in late 2019.

In a case study of Gap, there is evidence of this sourcing shift where its sourcing from China went down from 22% in 2017 to 16% in 2019 and its Vietnamese sourcing went up to 32%, up from 25% in 2017. Further, there is likely price sensitivity to the effect of tariffs when Gap's

former long-term CEO indicated that “in some cases, we’ll have no choice but to pass the impact of these tariffs through our consumers” (Chang, 2018). This case study provides a consolidated picture of how it navigated uncertainty and rising tariffs in 2018 - 20 which shows the role of non-tariff and tariff factors alike on business strategy. For Gap, a long-term China plus one strategy to shift sourcing away from China to neighboring countries was already playing an important role and, for some products, there was low friction to switching sourcing due to comparable industry development in Vietnam.

GAP, INC.

INDUSTRY NEWS COVERAGE SPANS CEO DURING PERIOD, IN ORDER OF MOST RECENT
Apparel 2018 - 2020 Sonia Syngal, Robert Fisher (interim), Art Peck

COMPANY OVERVIEW

Headquartered in San Francisco, Gap Inc. is a leading global retailer offering clothing, accessories, and personal care products for men, women, and children under the Old Navy, Gap, Banana Republic, Athleta, Intermix, Janie and Jack, and Hill City brands. In the fiscal year 2019, it had a net sales revenue of \$16.4 billion with private label and non-private label merchandise coming from about 800 vendors (as of 2019) who have factories in about 30 countries as of 2019 (GPS 10-K, 2019).

RISKS & LINKAGES

Industry: highly competitive. Competition exists between local, national, and global apparel retailers like Zara, H&M, Forever 21 etc. Peak sales during year-end holidays. Sourcing and inventory management crucial. Industry risks include import restrictions, taxes on, or, at foreign sourcing destinations, and vendor problems due to political, financial or regulatory issues alongside exchange rate fluctuations (GPS 10-K, 2019).

Gap: In 2019, products are available in over 90 countries through 3,345 company-operated stores, 570+ franchise stores, and e-commerce sites (GPS 10-K, 2019). Up from 25% in 2017, 32% of its merchandise comes from Vietnam in 2019 while only 16% comes from China in 2019 (decreased from 22% in 2017) (GPS 10-K, 2017; ibid, 2018; ibid, 2019).

NON-SHOCK CONSIDERATIONS

Restructuring & Brand Revitalization: Restructuring the specialty fleet and revitalizing the Gap brand includes closing about 230 Gap specialty stores during fiscal years 2019 and 2020 (GPS 10-K, 2019; ibid, 2020). Reducing the number of vendors from 800 vendors in 2017 to 700 in 2018 and, the number of countries from 50 in 2017 to 40 in 2018 and 30 countries in 2019 (ibid, 2017; ibid, 2018; ibid, 2019).

CEO Turn-over: Gap was led by three different CEOs during this period; long-term CEO Peck was fired prior to Old Navy spin-off (Meyersohn, 2019).

Long-term strategy: Prior to 2019, Gap has begun moving apparel and overall sourcing out of China (Friedman, 2019).

UNCERTAINTY & SHOCKS

New Tariffs: On September 1 2019, a 15% tariff was applied on \$112bn of consumer goods from China followed by the next round on Dec 15, 2019. Created uncertainty in terms of sourcing strategy and price margins (Reed, 2019).

COVID-19: Temporary closures or reduced store hours across company operated and franchise stores globally (GPS 10-K, 2019). Inability to reasonably estimate the length or severity of this pandemic and the demand post pandemic (ibid).

THE BOTTOM LINE

Due to rising costs, Gap will continue divesting from Chinese sourcing for all product lines with apparel decoupling most quickly to lower-cost sources outside of China. E-commerce has become essential - though not a full substitute - for revenue during COVID-19 and resultant drop in demand.

TIMELINE

● ● ● February 2019: Gap Announces Old Navy Spin-Off

Gap announces its intention to separate into two independent publicly-traded companies: Old Navy will be separated from the Gap brand, Athleta, Banana Republic, Intermix and Hill City to form a New company through a spin-off with a targeted completion date in 2020 (GPS 10-K, 2019).

● ● ● Broad Restructuring & Brand Revitalization Announced

The company announced plans to restructure the specialty fleet and revitalize the Gap brand, including closing about 230 Gap specialty stores during fiscal 2019 and fiscal 2020 (GPS 10-K, 2019).

● ● ● March 2019: Gap Acquires Janie and Jack

Gap acquires Janie and Jack, a leader in premium children's fashion from Gymboree Group Inc. (GPS 10-K, 2019)

● ● ● May 2019: Gap Further Slashes China Sourcing

"We've been migrating sourcing out of China for the last several years, and we'll continue to do this responsibly going forward", said Art Peck then President & CEO (Friedman, 2019). "As recently as three years ago, about 25% of our product was manufactured in China. In our most recent disclosure, that number was down to 21%. And if you include only apparel, our penetration is approximately 16%, which is significantly lower than relevant portions of Industry" (ibid).

● ● ● September 2019: Gap - No Choice But To Raise Some Prices

"We are watching it very, very carefully," said then CEO Art Peck, indicating that past duties on imports have yet to affect the company's prices (Parmar et. al., 2018). Nevertheless, "in some cases, we'll have no choice but to pass the impact of these tariffs through to our consumers," he says (ibid). Gap plans to continue shifting sourcing from China and to other countries; however, there are certain items, like sweaters, where China has a competitive advantage according to Peck (ibid).

● ● ● November 2019: Long-Term CEO Fired, New Interim CEO

With pressure from the board, Art Peck stepped down as president and CEO, and resigned from his position as director of the Company (Meyersohn, 2019). Robert J. Fisher, becomes the Company's chairman of the board of directors, and CEO on an interim basis (GPS 10-K, 2019).

● ● ● January 2020: Gap Switches Course on Old Navy Spin-Off

Gap announced that they would no longer pursue the announced separation of Old Navy (GPS 10-K, 2019)

● ● ● March 2020: Gap Stores Temporary Closures & Reduced Hours

COVID-19 is declared a global pandemic with containment and mitigation measures urged by WHO. Gap stores globally impacted by temporary closures or reduced store hours (GPS 10-K, 2019).

● ● ● April 2020: Summer Season Supply Chain Halted & Furloughs

Except for e-commerce designated merchandise, Gap asks suppliers to halt shipments of completed summer merchandise and to hold off on Fall season production (Donaldson, 2020). All of its company-operated stores in North America and Europe are closed and the majority of its retail staff in the U.S. and Canada have been furloughed (ibid). Additionally, its corporate headcount has been reduced and pay has been temporarily cut for its entire leadership team and board of directors (ibid). "Stores are the lifeblood of our business and while we are still operating our e-commerce channels, they simply cannot make up for having our stores closed," (ibid).

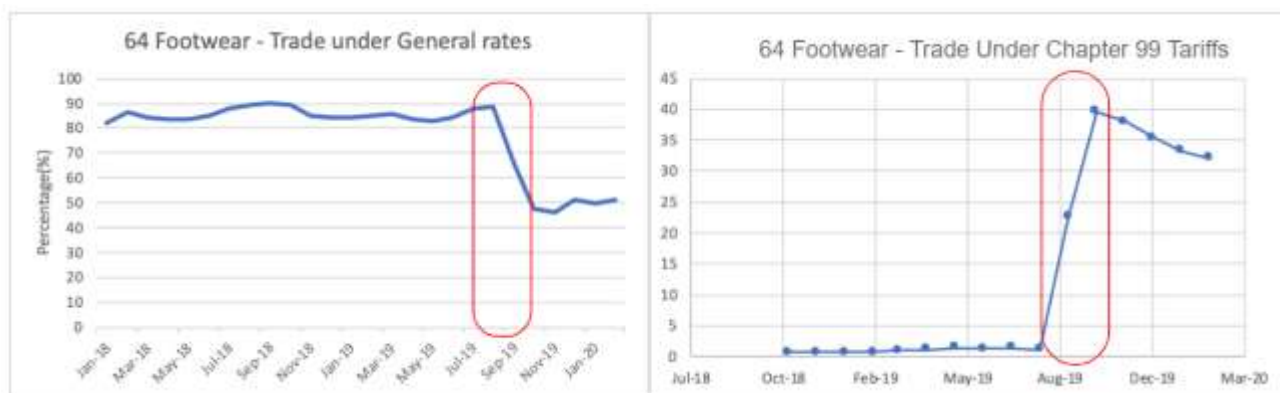
In summary, apparel trade data about U.S. imports and the case of Gap support the same conclusion: rising costs and political uncertainty affecting China are leading to shifting apparel outside of China and into substitutable countries, including Vietnam. The Trump administration’s tariffs further catalyzed these shifts that were already occurring prior to the trade war; notably, the shifts observed and accelerated are evidence of a China plus one strategy. Then in 2020, sourcing from all countries became more volatile due to the COVID-19 pandemic as Gap retail stores closed, demand slumped, sourcing of summer products planned for in-store sales were held abroad, and fall production was asked to halt.

B. Consumer Goods: Footwear-Specific Analysis

i) Footwear Exposure to New & Existing Tariffs

This section extends the analysis from apparel to how footwear was impacted by the trade war in late 2019. By volume, footwear imports falling under Chapter 99 grew sharply in August 2019 and peaked at 40%, which was lower than apparel’s exposure by volume. The volume of footwear traded fell and imports under general rates stabilized at 60% of total trade in this industry at the end of January 2020. This indicates that only a small fraction of trade in footwear fell under preferential agreements. Though, a similar trend of tariff and non-tariff factors played a role in supply chain movements out of China as illustrated in the case of Crocs, Inc.

Figure 21: Trade Volume Under General Rates and Chapter 99 (as % of total)



Source data: USA Trade Online

ii) Year-over-Year Analysis of Top Suppliers: How & When Footwear Responded

Total U.S imports of footwear reached \$26 bn, a slow increase of 2% compared to that in 2018 and 7% increase compared to \$25 billion in 2017. The top suppliers for U.S footwear, China and Vietnam, supply 76% of the total imports while the remaining top eight suppliers account for 19%. Among the top 10 suppliers, China and Spain were the only two countries that experienced negative growth rates in both 2018 and 2019; Vietnam, Indonesia, India, and Cambodia rapidly increased their supply of imports with growth rates between 11% - 81%.

Figure 22: Top Suppliers of Footwear (NAICS: 3162) for U.S

	Rank			Absolute Value in \$mm			Growth Rate			% in total		
	2017	2018	2019	2017	2018	2019	2017-2019	2018	2019	2017	2018	2019
China	1	1	1	14,011	13,880	13,316	-5%	-1%	-4%	56%	53%	50%
Vietnam	2	2	2	5,412	6,157	6,905	28%	14%	12%	22%	24%	26%
Indonesia	3	3	3	1,481	1,547	1,648	11%	4%	7%	6%	6%	6%
Italy	4	4	4	1,361	1,532	1,575	16%	13%	3%	5%	6%	6%
India	5	6	6	448	433	467	4%	-3%	8%	2%	2%	2%
Mexico	6	5	7	372	462	403	8%	24%	-13%	1%	2%	2%
Cambodia	7	7	5	263	328	475	81%	25%	45%	1%	1%	2%
Spain	8	8	8	232	241	221	-5%	-4%	-8%	1%	1%	1%
Dominican Rep	9	9	9	215	214	214	0%	-1%	0%	1%	1%	1%
Brazil	10	10	10	204	192	207	1%	-6%	7%	1%	1%	1%
Total	-	-	-	25,105	26,194	26,763	7%	4%	2%	100%	100%	100%

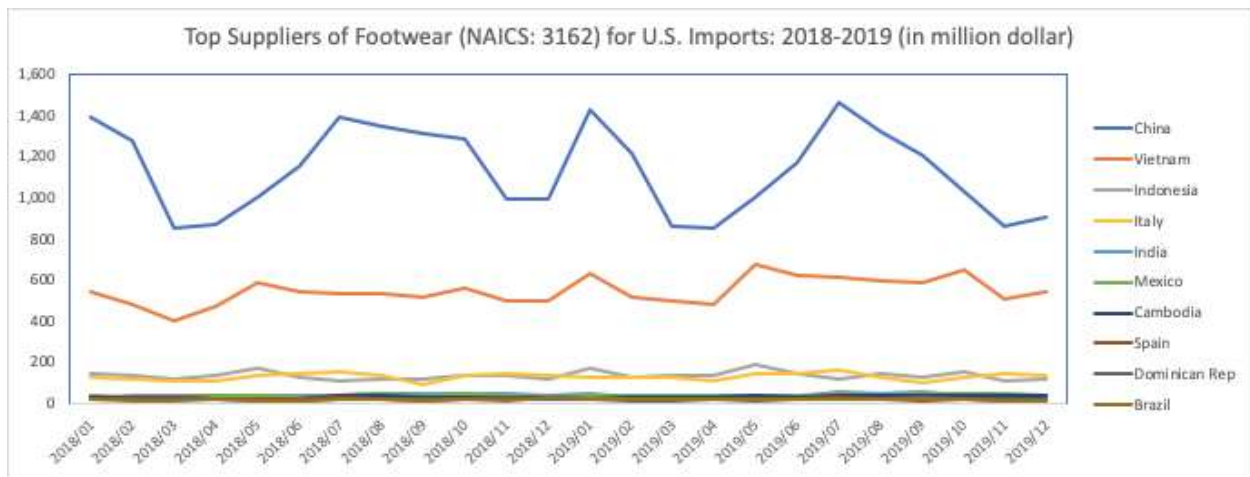
* For growth rate, green represents that is greater than the overall import growth; red represents that is lower than the overall growth
 * For percentage in total, increase is in green and decrease is in red

Source data: USITC

China supplied about \$13bn of goods in the footwear sector each year during 2017 – 2019, which accounted for over half of the total import from outside the U.S. and steadily declined in growth rate year to year in 2018 and 2019. This shrinkage accelerated in 2019 with a -4% shrinkage up from -1% in 2018. Affected by 15% Section 301 tariffs, 52.5% of footwear imported from China was hit which caused the monthly growth rate (y-o-y change) of Chinese imports dropped down to -20% in October 2019 (American Apparel and Footwear Association, 2019). Similar to apparel, it was visible from the trade data that the peak for Chinese footwear imports from during the summer ended earlier in August 2019; before this decline, there was a small bump of increasing supply in July 2019 which may indicate that stockpiling occurred in anticipation of tariffs. Both peaks proceeded to negative growth rates after the 15% tariffs took effect in September 2019.

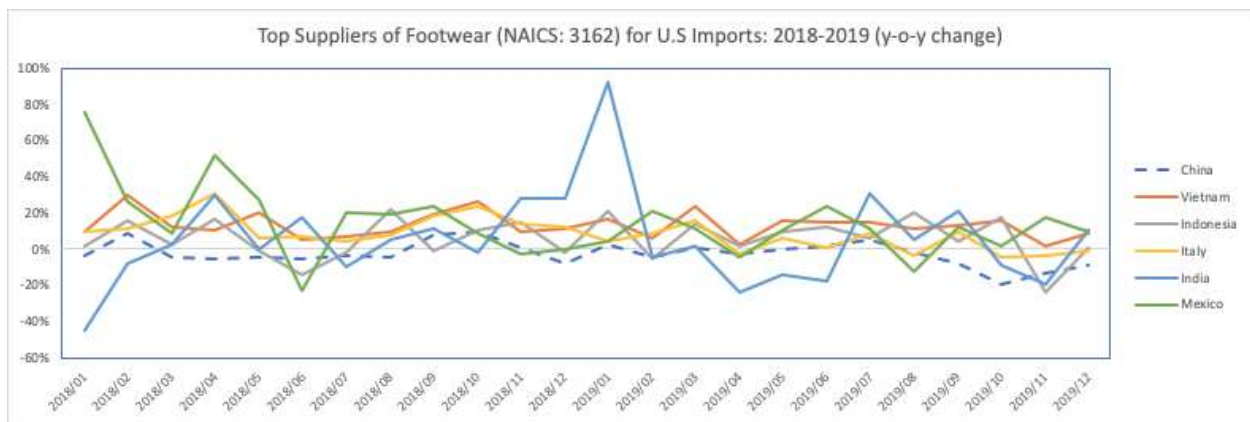
While Chinese supply suffered, major competitors including Vietnam, India, and Indonesia experienced increases of over 10% monthly, which indicated a pattern of searching for substitution of Chinese suppliers in the industry. However, given the large proportion of footwear imports from China, in the short run it was difficult to observe other competitors gaining significant market share comparable to China's predominant position.

Figure 23: Top Suppliers of Footwear for U.S. Imports: 2018-19



Source data: USITC

Figure 24: Top Suppliers of Footwear for U.S. Imports: 2018-19 (Y-o-Y Changes)



Source data: USITC

iii) Business Strategy Linkages for Footwear

In the case of Crocs, Inc., the reduction of U.S. imports from China is evidenced through long-term business strategy to diversify supply chains out of China due to rising costs and relative

ease of substituting alternative countries in the region. This provides preliminary evidence that the imposition of tariffs further affected cost-curves which suggests that the tariffs have driven diversification out of China more quickly than otherwise might have been seen. Further, the combination of U.S. import data analysis, Crocs' case, and non-tariff factors discussed in Section II suggest that Vietnam and other economies in the ASEAN region have become the alternative destination of choice for both footwear and apparel brands alike – evidencing a China plus one strategy.

CROCS, INC.

INDUSTRY

Footwear

NEWS COVERAGE SPANS

09/2018 - 02/2020

CEO DURING PERIOD

Andrew Rees

COMPANY OVERVIEW

Founded in 2002, Crocs, Inc. is a casual lifestyle footwear and accessories company headquartered in Colorado with \$1.5bn in market capitalization (YCharts, 2020). The business engages in full product development and sales including design, development, manufacturing, marketing, distribution, and sales. Its products are sold to women, men, and children in the Americas, Asia Pacific, and Europe through retail, wholesale, and e-commerce distribution channels (CROX 10-K, 2019).

RISKS & LINKAGES

Industry: 69.3% of shoes sold in the U.S. are imported from China as of 2019 (Cheng, 2020).

Crocs, Inc: Relies solely on third-party manufacturers with two largest manufacturers in China and Vietnam accounting for approximately 59% of product in 2019 - down from 66% in 2018 (ibid). Production at largest manufacturer, which operates in China and Vietnam, fluctuated but dropped in 2017 - 19: 41% (2017), 45% (2018), 38% (2019) (CROX 10-K, 2019). Second largest manufacturer, which is in Vietnam, increased: 19% (2017) to 21% (2018 and 2019) (ibid).

NON-SHOCK CONSIDERATIONS

Appointed in 2017, CEO Rees has pursued a strategy to strengthen "flexible, globally-diversified, low-cost third-party manufacturing" which has included reducing sourcing from China in favor of Vietnam (CROX 10-K, 2019). Additional strategies included: "cleaning up excess distribution" in overstocked distributors; refocusing on digital retail and wholesale channels; closing 170+ underperforming stores between 2017 - 2018; and revamping to all digital marketing (Butler-Young, February 2019). Consolidated revenues from Asia Pacific as a percent of total dropped an average of 1.25% per year between 2016 to 2018; in 2018, 36 of 186 Asia Pacific stores were closed compared to 8 of 175 Americas stores and 24 of 86 EMEA stores (CROX 10-K, 2017; ibid, 2018; ibid, 2019).

UNCERTAINTY & SHOCKS

New Tariffs: Sensitive to adverse U.S.-China relations, Crocs would have downsized third-party sourcing of U.S. products from China by 66% if the full 25% tariffs had come into effect - an effective drop from 30% to less than 10% by 2020 (Venugopal, 2019). Estimated \$5 million in new costs if full 25% new tariffs were imposed - 0.95% of 2018 cost of sales (ibid; CROX 10-K, 2019).

COVID-19: As of February 2020, many Crocs stores in China had shut down temporarily, reduced hours to limited operations, and faced below average customer visits - this was following record high sales in 2019 (Cheng, 2020). COVID-19 indicated as material risk for supply chains, new product releases, operations, and cash flows if closures continue for extended period (CROX 10-K, 2019).

THE BOTTOM LINE

Highly sensitive to changing costs, Crocs will continue multi-year China plus one strategy to diversify sourcing away from China; company faces acute risk of extended COVID-19 related closures and disruptions to supply chain.

TIMELINE

● ● ● August 2018: Manufacturing: 100% Outsourced

Announced that final owned manufacturing facility (in Italy) will be closed in favor of lower cost third-parties with increased manufacturing capacity to fit growing demand; third parties in Vietnam and China produce approximately 60% of Crocs' global product in 2018 and 2019 (Butler-Young, 2018). At the end of FY 2019, Crocs had \$150+ million in short-term inventory purchase commitments to third-party manufacturers - all contracts were for less than one year timeframes (CROX 10-K, 2019).

● ● ● February 2019: Revamped Strategy Successful

Spurred with the 2017 appointment of CEO Rees, Crocs retrospectively describes the success of driving top-line growth through an overhaul strategy (Butler-Young, Feb. 2019). Crocs streamlined distribution and manufacturing to trim underperformance, meet increased demand, and refocus on their core product and channels (ibid). To elevate the brand, investments were made into trends in customization, celebrity collaborations, and all digital marketing (ibid). Looking forward in 2019, "this brand can be far bigger than it is today — globally," states Rees (ibid).

● ● ● May 2019: 170+ U.S. Shoe Companies Sign Anti-New-Tariffs Letter

Crocs joins industry petition to remove footwear from the fourth tranche of 25% tariffs (McDonald, 2019). The industry's position is that tariffs will directly pass onto consumer prices (Reuters, 2019).

● ● ● June 2019: Cost of Proposed New Tariffs

If the full 25% new tariff rate is imposed, Crocs estimates it would cost \$5 million (0.95% of cost of sales) and further downsize sourcing from China from approximately 30% to 10% by 2020 (Butler-Young, June 2019; Venugopal, 2019; CROX 10-K, 2019).

● ● ● August 2019: Growth Streak

"[Americas' sales] up by double digits across wholesale, retail and e-commerce...Across all regions, [Crocs'] revenues [increased] 12.5% to \$358.9 million, even as store closures knocked about \$6 million from the top line" (George-Parkin, 2019). As of June 2019, their sourcing mix reflected the need to meet increasing demand and "continuing our multi-year effort to reduce [their] sourcing from China" (Venugopal, 2019).

Tariffs Change to 15%

In August, the planned 25% tariffs were changed to 15% (Reuters, 2019). This new tariff faced adds onto a prior average 11% tariff and up to 67% prior tariffs on some non-Crocs shoes in the industry (ibid).

● ● ● February 2020: COVID-19 Shock

Broad fallout in sales as shopper traffic in China and many of its key Asian markets are down (Cheng, 2020).

Note: Crocs' seasonality often results in lower revenues during Q4 compared against Q1 - Q3 (warmer quarters in N. Hemisphere).

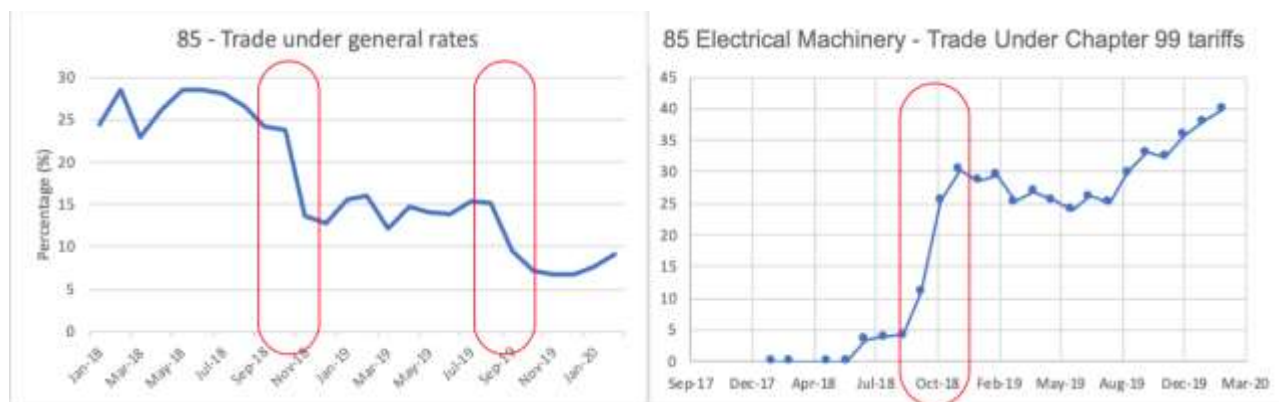
To quickly recap, this section dissects the trend of trade volume and the U.S imports in apparel and footwear sectors and confirms the negative shock of Trump’s tariffs on U.S.-China linkages in the apparel and footwear sectors. Further, the case studies of Gap and Crocs confirm the pursuit of China plus one strategies to respond to the acceleration of rising costs through the new tariffs and rising costs that pre-date the trade war as Chinese labor costs rose and business conditions improved favorably in neighboring countries. This trend has been accelerated by Trump’s tariffs and suppliers were further affected by the COVID-19 pandemic in early 2020.

C. Electronics: Communications & Semiconductors

i) Electronics Exposure to New & Existing Tariffs

Electronics is a key sector for U.S-China industrial linkages with one third of the total supply to the U.S. being computer and electronic products (Vietor et al., 2016). In this industry, trade volume under general rates was already very low at 25% at the start of the period. This implies that electronics trade with China occurred under special import programs with low tariffs before the trade war. However, there is a rise in volume trade under Chapter 99 restrictions that happened in May 2018, earlier than apparel and footwear. By the end of the period, 40% of electronics imports fell under the Chapter 99 restrictions which suggests that electronic equipment may not have been as negatively impacted as apparel and footwear by volume.

Figure 24: Trade Volume under General Rates and Chapter 99 (% of total)



Source data: USA Trade Online

Monthly U.S. electronics import data covers a wide range on a 4-digit level from 3341 to 3346. Among those, communications equipment (NAICS: 3342) took almost one third in 2018, and was at the center of key debates in cases like Huawei. Semiconductors (NAICS: 3344) was similarly in the spotlight with Qualcomm’s case and was directly affected by Section 301 tariffs. These two industries are linked as part of the same supply chain for telecommunications and related emerging technologies in 5G. Thus, in this section, the analysis of semiconductors and communications equipment industries are considered sequentially before side by side cases of Qualcomm and Huawei at the end of this section.

Figure 25: 4-digit Categories of Electronics Sector

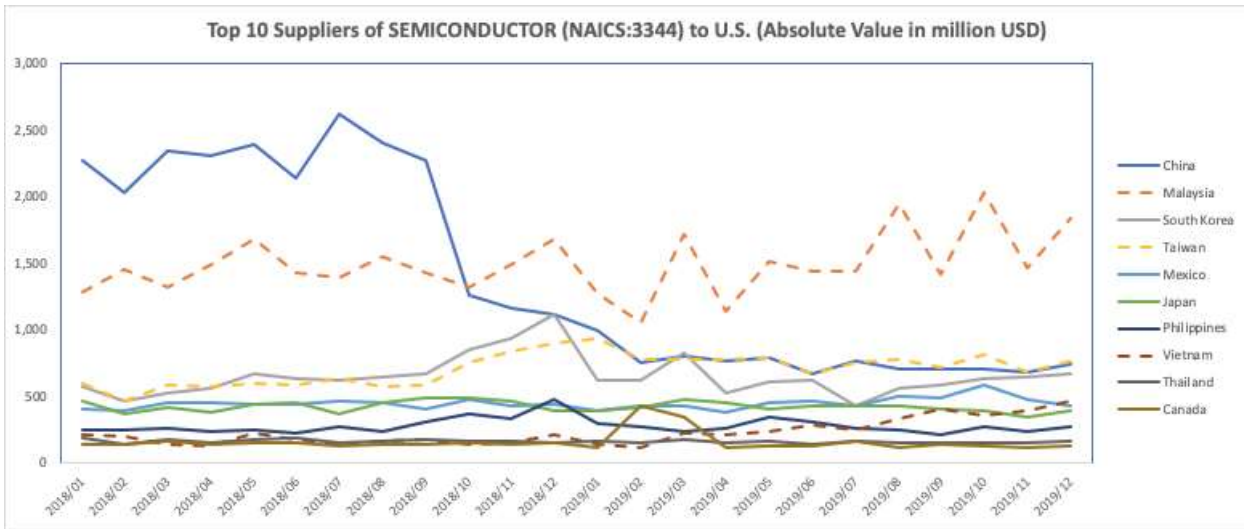
Row Labels	Sum of Annual	% of Column	Description
3342	124,668.99	31%	COMMUNICATIONS EQUIPMENT
3341	96,891.15	24%	COMPUTER EQUIPMENT
3344	81,127.18	20%	SEMICONDUCTORS & OTHER ELECTRONIC COMPONENTS
3345	53,747.31	13%	NAVIGATIONAL/MEASURING/MEDICAL/CONTROL INSTRUMENT
3343	31,754.06	8%	AUDIO & VIDEO EQUIPMENT
3346	10,613.12	3%	MAGNETIC & OPTICAL MEDIA
Grand Total	398801.81	100%	

Source data: USITC

ii - a) Year-over-Year Analysis of Top Suppliers: How & When Semiconductors Responded

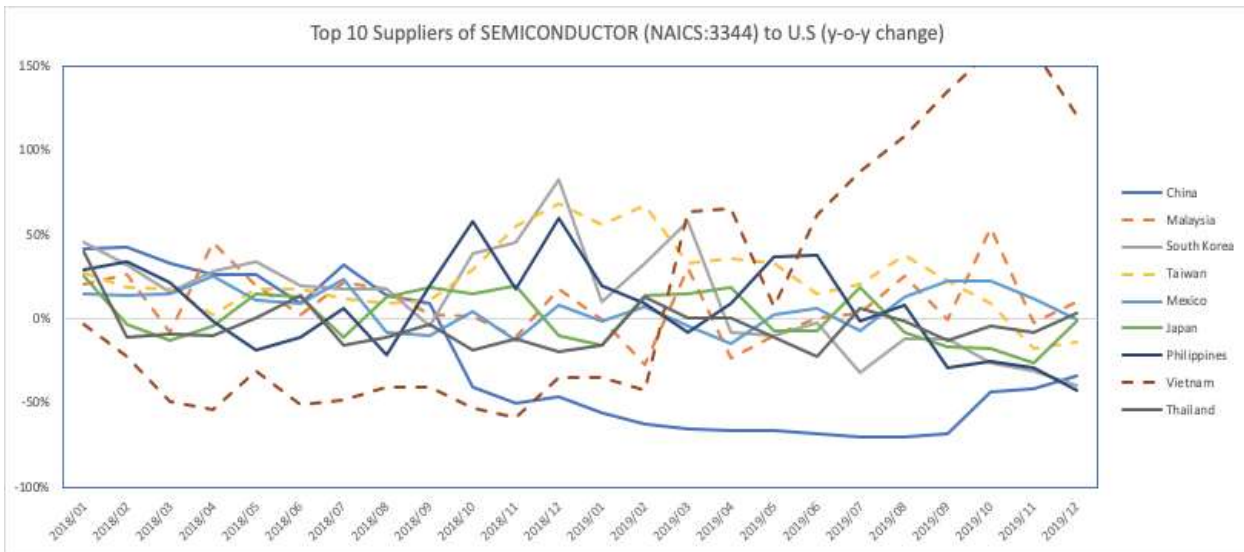
U.S. imports in semiconductors shrank by 15% in 2019 when only \$73bn of goods was imported, compared with \$85bn in 2018 and \$81bn in 2017 - a loss of over \$10bn in semiconductor imports. Affected by the Section 301 tariffs, imports from the largest supplier, China, dropped sharply by 167% in 2019 to \$9bn, down from \$23bn and \$24 bn in 2017 and 2018 respectively. China drops to third place in 2019 after front-runners Malaysia (1st) and Taiwan (2nd). It is visibly shown in **Figure 26a** when the second round of tariffs hitting semiconductor products was enacted on August 23, 2018; the monthly imports dropped from over \$2.2bn to \$1.25bn in only one month. During 2019, monthly imports from China remained at a low level of less than \$1bn and were on average 70% less than the same numbers in 2018.

Figure 26a: Top Suppliers of Semiconductors to U.S: 2018-19 (in Million U.S.D)



Source Data: USITC

Figure 26b: Top Suppliers of Semiconductors to U.S: 2018-19 (Y-o-Y Changes)



Source Data: USITC

Who benefits from the tariffs?

Looking at the suppliers in 2019 who surpassed China, Malaysia jumped to the top in 2019 by remaining at a 4% growth rate of annual supply which translates to about \$18bn. The previous third place, Taiwan, experienced a 17% annual increase: a jump from \$7.6bn in 2018 to \$9.2bn in 2019 which raised Taiwan to the position of second largest supplier. During 2019, Vietnam and Taiwan were those countries with extremely high y-o-y increases of 60 - 159% and 20 - 30%

respectively. Alongside China, countries like South Korea, Japan, Philippines, and Canada also experienced reductions in their prior shares of supplied semiconductors.

Undoubtedly, China suffered a severe loss in 2019 for semiconductors supply to the U.S. market due to the imposition of new tariffs and relevant trade war politicization of telecommunications. However, none of the competitors in the data analyzed have been able to capture the size of the pie lost from China, since a \$15bn decrease of Chinese imports in 2019 led to a drop of \$12bn in total U.S. semiconductor imports. Among the top ten suppliers who take 88% of the pie, only Taiwan and Vietnam took over \$1bn increases each in 2019; \$1.6bn for Taiwan and \$1.4bn for Vietnam. Suppliers outside the top ten only contributed \$62 million of increased supply to U.S. imports in 2019. A preliminary reason for this is that it is not easy to build and expand complex semiconductor manufacturing in the short term when confronted with an unexpected shock, like a trade war. It also suggests the possible external factor of U.S.-based firms supplementing U.S. supply that was referenced in Section II may play a role.

ii - b) Year-over-Year Analysis of Top Suppliers: How & When Communications Equipment Responded

Semiconductors are an intermediate good for multiple goods within the communications equipment industry. This analysis provides insight into whether the changes in semiconductor imports bear on communications equipment. U.S. imports of communication equipment (NAICS: 3342) shrank 11% in 2019. Compared with the \$124bn in imports from outside the U.S in 2017, the imports value in 2019 reduced to only \$113.7bn, which is 11% less than that in 2018 (\$127.5 bn) and 9% less than that in 2017 (\$124.7bn).

Figure 27: Top 10 Suppliers U.S Imports of Communication Equipment (NAICS: 3342)

	Rank			Absolute Value in \$mm			Growth Rate			% in total		
	2017	2018	2019	2017	2018	2019	2017-2019	2018	2019	2017	2018	2019
China	1	1	1	78,070	80,554	69,561	-11%	3%	-14%	63%	63%	61%
Mexico	2	2	3	12,504	11,626	9,154	-27%	-7%	-21%	10%	9%	8%
South Korea	3	4	5	6,231	5,922	3,455	-45%	-5%	-42%	5%	5%	3%
Malaysia	4	5	6	5,705	4,283	3,040	-47%	-25%	-29%	5%	3%	3%
Vietnam	5	3	2	5,401	8,252	12,270	127%	53%	49%	4%	6%	11%
Thailand	6	6	7	3,878	3,426	2,708	-30%	-12%	-21%	3%	3%	2%
Taiwan	7	7	4	3,726	2,905	4,003	7%	-22%	38%	3%	2%	4%
Canada	8	8	8	1,452	1,637	1,536	6%	13%	-6%	1%	1%	1%
Japan	9	9	9	1,306	1,408	1,281	-2%	8%	-9%	1%	1%	1%
Germany	10	10	10	639	744	683	7%	16%	-8%	1%	1%	1%
Total Import	-	-	-	124,669	127,535	113,748	-9%	2%	-11%	100%	100%	100%

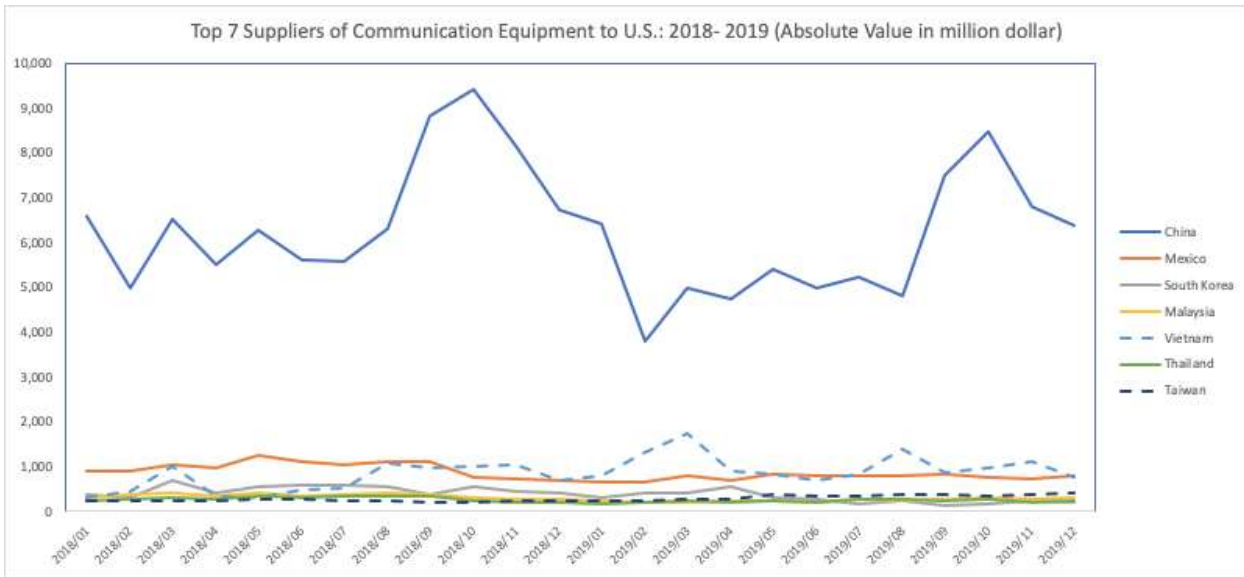
* The growth rate outperforming the sector growth is in green, otherwise in red

* The percentage of total: increase in green and decrease in red

Source data: USITC

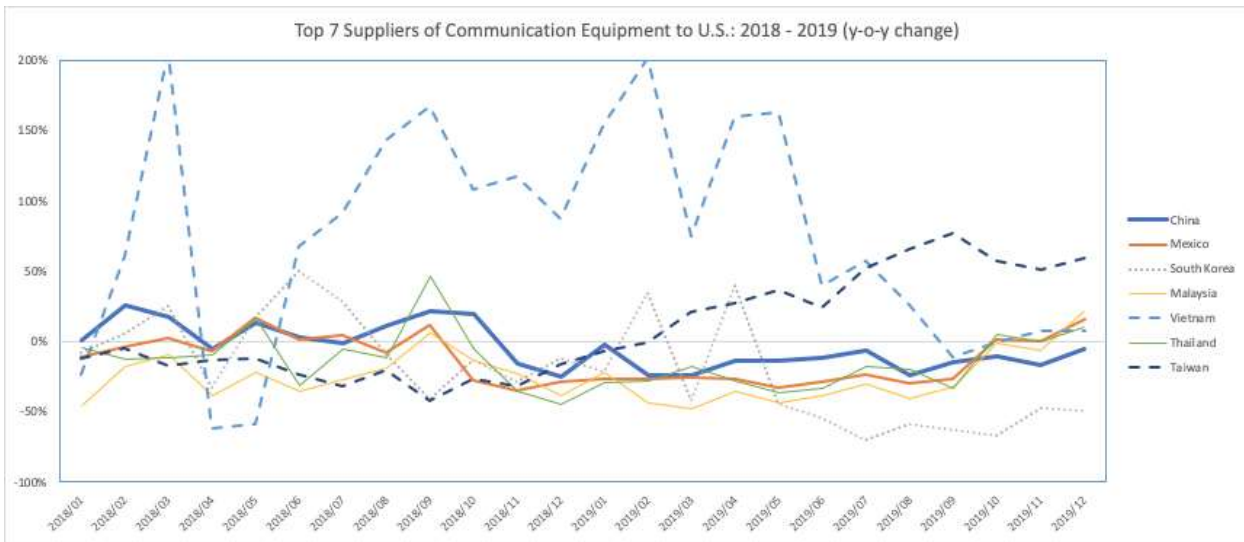
Six out of the top ten suppliers of communication equipment provided at least 10% less in 2019 than amounts supplied in 2017. Among main competitors, only Vietnam and Taiwan experienced a rigorous increase of imports supplied, 49% and 38% respectively, in 2019; this occurred alongside total imports from outside the U.S. declined 11%. China, the largest supplier, taking up over 60% of total U.S. imports for communication equipment, provides only \$69.6 bn, which is 11% less than the \$78bn in 2017. Other main players included Mexico, China's runner-up in 2017 – 2018 that dropped to third position in 2019, Malaysia, which held fourth - sixth position in 2017-2019, and Thailand which held sixth position in 2017-18 and seventh in 2019. However, others also experienced negative growth when comparing months on a year to year scale for 2018 and 2019. South Korea, which was the third largest supplier in 2017, was the country jumping up and down since 08/2018 and dropped to fifth position in 2019 with \$3.5bn supplied, 45% less than that in 2017. Apart from China and South Korea, other suppliers recovered to an increase in growth since 12/2019.

Figure 28a: Top Suppliers of Communication equipment for U.S: 2018-19



Source Data: USITC

Figure 28b: Top Suppliers of Communication equipment for U.S: 2018-19 (Y-o-Y Changes)



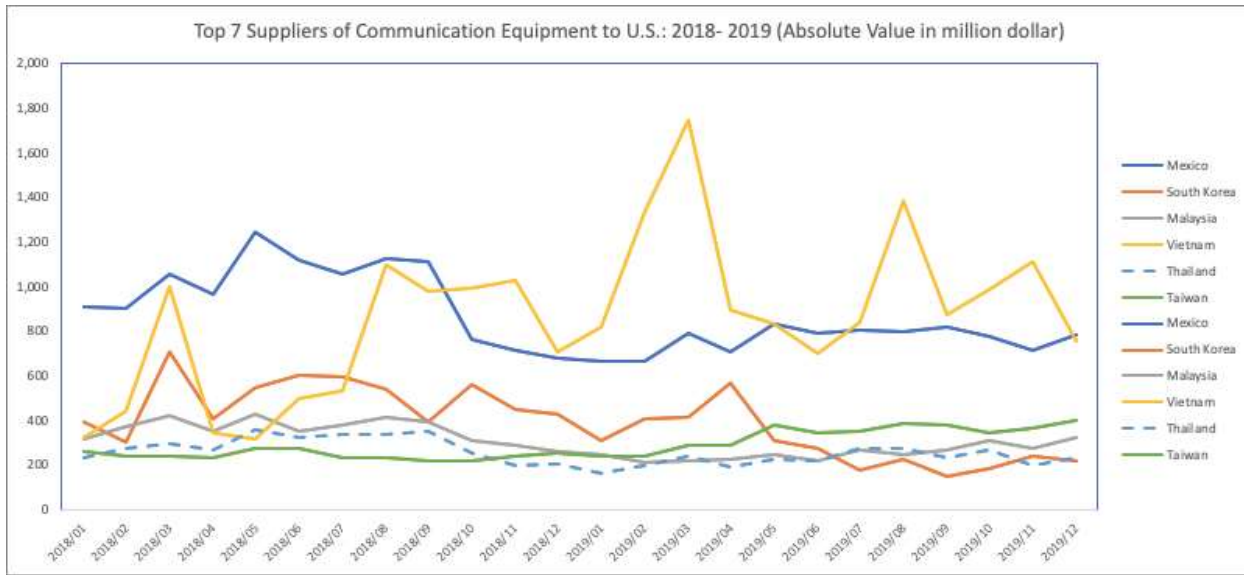
Source Data: USITC

Hit by the Section 301 tariffs accusing a threat to national security, the import of communications equipment from China plummeted during 10/2018 – 02/2019. A 10% additional tariff took effect on September 24, 2018 and was imposed on a broad range of Chinese supplies including \$23.5bn of telecommunications equipment; this is shown in **Figure 28b** where Chinese

suppliers responded quickly in 10/2018 and 11/2018 before which there was a bump of over 20% increasing supply but after which the y-o-y growth dropped to be negative (Bown, 2018).

On the other hand, Vietnam was the beneficiary and substitution in the communication equipment sector during the trade war. The imports from Vietnam increased at 53% and 49% annually in 2018 and 2019. It started to increase the supplies of communication equipment from 06/2018, when the approximate 10% Section 301 tariffs were announced, and grew rapidly at a monthly rate of over 200% during 10/2018 – 06/2019. The total imports from Vietnam in 2019 climbed to the second position, surpassing Mexico, South Korea, and Malaysia, with \$12bn of goods which was more than double of the supplies in 2017. Apart from Vietnam, Taiwan also increased its supply rapidly from the beginning of 2019 and jumped from the seventh to the fourth position in major competitors. However, given that over 60% of the communication equipment import was still from China and other players in the top ten account for only 34% of the total U.S. imports, it was impossible for any one of the other countries described to be the substitution of Chinese supply. Apart from only a few major players (Vietnam and Taiwan), many suppliers suffered decreases in 2019 and the total sectoral import declined 11%. In this way, the impact of the high tariffs hitting the communication equipment sector in this short period turned out to shrink overall U.S. imports which, unless substituted by U.S.-based production, could have led to potential shortages, tight supply, and hiking prices in the end market.

Figure 28c: Top Suppliers of Communication Equipment (Except China)



Source Data: USITC

iii) Business Strategy Linkages for Semiconductors & Communications Equipment

The U.S. import data indicates a drop in communications equipment coming from China and other countries and a huge drop in China’s supply of semiconductors and unclear gains amongst other countries that experienced fluctuation in 2019 - except Vietnam and Taiwan for both sectors. The pulling factor behind this can partly fall to the industry transition and shift of the hub of semiconductor manufacture, moving from Japan to South Korea in the late 20th century, currently Taiwan and Malaysia, and in the future maybe Vietnam. On the other hand, this suggests that the development of industry-specific manufacturing ecosystems in Vietnam and Taiwan are better suited for the electronics supply chain than other countries - this can include intellectual property rights, software engineering capacity, time in developing chips, government support, and company strategy for outsourcing and FDI. A look at Qualcomm Incorporated and Huawei Technologies illustrates the further interconnectedness of these industries in telecommunications supply chains.

QUALCOMM INCORPORATED

INDUSTRY

Semiconductors

NEWS COVERAGE SPANS

2018 - 2020

CEO DURING PERIOD

Steve Mollenkopf

COMPANY OVERVIEW

Founded in 1985 in California, Qualcomm Incorporated is a technology-first, multinational semiconductor and telecommunications equipment company with just over \$88 Bn in market capitalization; this value is primarily derived from their businesses in CDMA and OFDMA semiconductors and technology IP licensing (Zacks, 2020; QCOM 10 - K, 2019). Their objective is to develop the breakthrough technologies that underline the newest and the soon to come innovations in the wireless industry - effectively building the market for high-growth industries such as 5G and driving end-user demand from behind the scenes (QCOM10-K, 2019).

RISKS & LINKAGES

Industry: U.S. semiconductors are among the most advanced for mobile equipment, including 5G and AI (Ernst, 2020). High levels of trade between U.S. and rest of world (EC, 2019).

Qualcomm: among the most competitive U.S. manufacturers for 5G market with strong import/export ties to China; lower IP protection and trade-war risks (ibid; Zacks, 2020).

NON-SHOCK CONSIDERATIONS

Substitutability: relative global leadership in semiconductors for high-tech applications is highly relevant to Qualcomm and often takes years of R&D to refine before commercial use (Ernst, 2019).

U.S. NDAA & Blacklisting Partners: U.S. Executive Order blocks use of foreign telecommunications equipment and restricts U.S. business with newly black-listed Chinese companies on national security grounds - affecting Qualcomm's import/export businesses with Huawei and ZTE (Albergotti, 2019).

UNCERTAINTY & SHOCKS

U.S. Blacklisting & New Tariffs: Qualcomm's leadership as an ecosystem enabler requires access to/from China and company leadership remains optimistic about maintaining partnerships (CNBC, 2019).

COVID-19: Demand for ecosystem products that use/license Qualcomm has dropped as a result by 50%+ (Gartenberg, 2020). Qualcomm beats revenue targets but year-over-year net income has dropped 29% between 2018 and 2019 (ibid). COVID-19, not the trade war, is attributed by Qualcomm.

THE BOTTOM LINE

Qualcomm will maintain a competitive position as an ecosystem enabler with strong Chinese presence and, likely face increased competition from advances in Chinese manufacturing of more advanced semiconductors in the medium term due to legacy of today's trade barriers (including U.S. politicization of Huawei).

HUAWEI TECHNOLOGIES

INDUSTRY

Telecommunications

NEWS COVERAGE SPANS

2018 - 2020

CEO DURING PERIOD

Ren Zhengfei

COMPANY OVERVIEW

Founded in 1987, Huawei Technologies is the world's largest telecommunications equipment manufacturer and a private, multinational company offering software and devices for wireless, wireline, and IP technologies in over 100 countries (Yahoo Finance, 2020). Headquartered in Shenzhen, China, its devices and software have served 45 of the 50 largest telecom operators in the world and consequently, one-third of the world's population (Crunchbase, 2020). Its 2019 sales are estimated at \$108Bn and it ranks behind Samsung as the world's largest smartphone seller at 20% market share; its 5G devices and network solutions are competitively priced at times quoted at 30-40% less than competitors (Forbes, 2019; Economist, 2019). Net sales rank in top 7 globally (EC, 2019).

RISKS & LINKAGES

Industry: few, large players dominate the industry (Apple, Samsung, Huawei, ZTE, and Intel) with high levels of intermediate and final goods traded between countries (EC, 2019).

Huawei: semiconductors, a key input, from the U.S. are most competitive in the 5G market; trade-war risks market access in both their input and final good markets.

NON-SHOCK CONSIDERATIONS

Substitutability: maturity of the semiconductor industry in China limits substitutability of U.S. semiconductors, a key input good (Ernst, 2019; Duberstein, 2019).

Made in China 2025: Government campaign to support Chinese companies into more advanced technology markets includes semiconductors (Simonite, 2019). Some Huawei products already include their processors and modems (ibid).

UNCERTAINTY & SHOCKS

U.S. Blacklisting & New Tariffs: 2019 revenues hit all-time high but miss target; Chairman Eric Xu anticipates challenges to meet revenue targets due to no change anticipated in trade war and blacklisting treatment in 2020 (Strumpf, 2019).

COVID-19: Contraction in Chinese market may harm Huawei's growth streak where China accounted for ~25% of total revenues in 2018 and ~60% in 2019 - particularly if U.S. growth is stunted (Doffman, 2020).

THE BOTTOM LINE

Though CEO Ren Zhengfei is unphased, the impacts of the trade-war on both intermediate and final goods will likely accelerate Chinese semiconductor industry development and Huawei presence outside of U.S.

TIMELINE: QCOM & HUAWEI

● ● ● **March 2018: Beijing Disapproves Qualcomm - NXP Deal**

● Qualcomm required the final of nine approvals from global trade and commerce regulators from China's SAMR (State Administration for Market Regulation) in Beijing and did not receive it (Pham, 2018). All regulators assess economic and anti-trust analyses in making a decision and without approval, QCOM's planned acquisition of Netherlands' NXP (a automobiles chip producer) failed (Anjie, 2019; Pham, 2018).

● ● ● **January 2019: U.S. Fraud & Conspiracy Charges Against Huawei**

● A New York City court filed charges of bank fraud, wire fraud, obstruction of justice, and violating U.S. sanctions on Iran through Huawei's alleged misrepresentations of their relationship with Skycom (Iran) in discussion with U.S. investment banks. Simultaneously, a Washington state court's fraud and trade-secret conspiracy charges against two Huawei affiliates were made public for allegations about stealing information from T-Mobile about a phone testing robot's technology (Nakashima, 2019).

● ● ● **May 2019: U.S. Blacklists Huawei & Google Relinks**

● A U.S. Executive Order is signed which bans U.S. companies from doing business with Huawei among other foreign telecommunications and services that may present a national security threat (Albergotti, 2019). This initial order is loosened to a 90-day restriction period intended for strengthening telecommunications infrastructure and addressing potential security risk; Google announces it will re-establish business after (RTT, 2019).

● ● ● **July 2019: Huawei Leak - Potential U.S. Sanctions Violation in N. Korea**

● Three former employees leaked documents on the condition of anonymity to The Washington Post which bring into question whether Huawei was involved in building and maintaining North Korea's commercial wireless network. If true, it risks violating U.S. export control sanctions barring the provision of U.S. technology to the country (Nakashima, 2019)

● ● ● **September 2019: Qualcomm Optimistic about Partners & Business in China**

● Qualcomm president Cristiano Amon believes strong China - Qualcomm partnership will continue despite trade-war tensions and political environment due to business model as technology licensing and ecosystem fostering company (CNBC, 2019).

● ● ● **November 2019: Qualcomm's Earnings Exceed Expectations**

● Fourth quarter revenues exceed forecasts and anticipated revenues on target to beat forecasts due to IP licensing deal with Apple, Inc (Cramer, 2019). Qualcomm outperformed in November 2018 as well due to Chinese mobile phone makers servicing low-end Southeast Asian markets (Mourdoukoutas, 2018).

● ● ● **December 2019: Huawei's Revenues Hit Record High**

● Despite U.S. blacklisting and entanglement in the trade war, Huawei's revenues hit newfound high at \$122Bn in 2019 and CEO Zhenfei remains confident that Huawei will persist irrespective of politicization of the company similarly to how it did during trade tensions under the Obama administration (Strumpf, 2019). Despite record high, growth slightly behind target and chairman Eric Xu predicts continued challenges in 2020 (ibid).



- ● ● **February 2020: U.S. Federal Judge Rules Against Huawei in Texas**

● Huawei filed a constitutional challenge against the 2019 U.S.' NDAA for restricting business with federal contractors and agencies - ultimately being rejected by Judge Mazzant in the Eastern District of Texas (Reuters, 2020).

- ● ● **March 2020: Huawei's 5G UK Network Contract At Risk**

● UK House of Commons narrowly votes down a Tory amendment proposed to ban Huawei from mobile networks in the UK (Bicheno, 2020). Huawei responds "The industry and experts agree that banning [our] equipment would leave Britain less secure, less productive, and less innovative" (Bicheno, 2020).

- ● ● **April 2020: Qualcomm Expects Dip in Phone Shipments**

● Qualcomm expects additional 30% drop in smartphone sales on top of 21% reduction in smartphone demand announced last quarter (Gartenberg, 2020). Despite beating Q2 revenue targets, the company's net income dropped 29% in 2019 compared to 2018 (ibid). All dips are attributed to COVID-19, not trade-war tariffs, with three areas affected: business and consumer confidence, demand for smartphones and/or licensees using Qualcomm technologies, and the "global wireless supply chain, distribution networks, and workforces" (ibid).

For the electronics sectors, semiconductors and communication equipment sectors were examined. By analyzing the U.S. imports data from USITC, clear drops not only in the imports from China hit by the new tariffs but also drops in the total size of the sectoral imports. Nevertheless, Vietnam and Taiwan are the main beneficiaries experiencing increasing demand from the U.S. and it is possible that U.S.-based production supplemented supply. The countries that gained were in the position to benefit due to the strength in development of industry-specific manufacturing ecosystems. The comparative case of Qualcomm and Huawei illustrates the interconnectedness of these industries and persistence to maintain business partners amidst high politicization. The U.S. - China politicization of high-tech industries such as semiconductors and telecommunications between countries requires specific attention as a non-tariff factor.

D. Medicine: Pharmaceuticals & Medical Devices

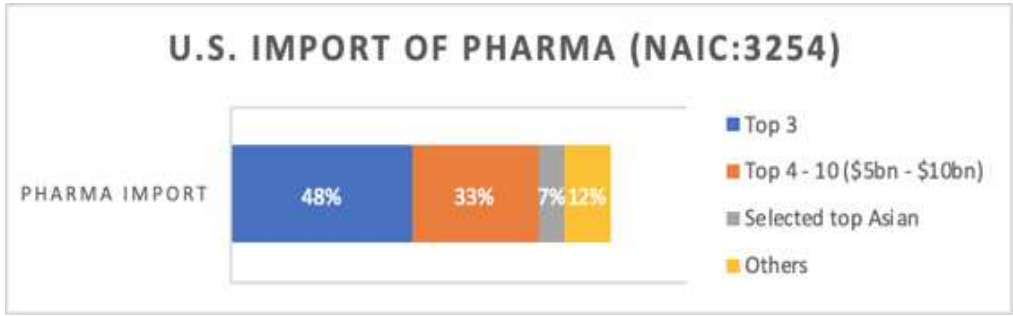
i) Pharmaceuticals Exposure to New Tariffs

Similar to semiconductors and telecommunications, pharmaceuticals is an industry that is sensitive to the Section 301 findings on intellectual property protection and national security politicization that must be considered with respect to non-tariff factors. The Trump administration has raised overreliance on Chinese drug supplies as a perceived national security threat which generates uncertainty about whether the industry will incur tariff treatments in the near future (Edney, 2019). Though pharmaceutical products (HTS 30) were not directly targeted under the Chapter 99 tariffs, this industry's trade data in combination with a case study on Pfizer provides insight into how intellectual property, joint-ventures, and FDI have been managed in real-time during the uncertainty of 2018-19. Lastly, this industry has become increasingly more critical today during the COVID-19 pandemic and provides a complement to a medical industry that did face Chapter 99 tariffs, medical devices and supplies.

ii) Year-over-Year Analysis of Top Suppliers of Pharmaceuticals

U.S. imports of pharmaceuticals have grown rapidly in recent years as shown through in-depth analysis of pharmaceuticals (NAICS:3254). The total value of U.S. imports of pharmaceutical and medicine was \$150bn in 2019, which was an 11% increase over 2018 and 33% increase over 2017 (**Figure 30**). Among top suppliers, the top three are all in Europe and fairly stable with Ireland at \$37bn, Germany at \$18bn, and Switzerland at \$16.5bn (**Figure 30**). As seen in **Figure 29**, these three together constitute 48% of total U.S. imports of pharmaceuticals. In the fourth to tenth positions, India and Singapore are Asian countries that provided significant amounts of supplies while Belgium and Denmark experienced faster growth rates in 2018 and 2019. The fourth to tenth top suppliers constituted 33% of total imports in 2019, with annual values of supply for each ranging between \$5bn to \$10bn and variable positions in 2018-19 (**Figure 29 - 30**).

Figure 29: The Contribution of Pharma Supplies by Tiers



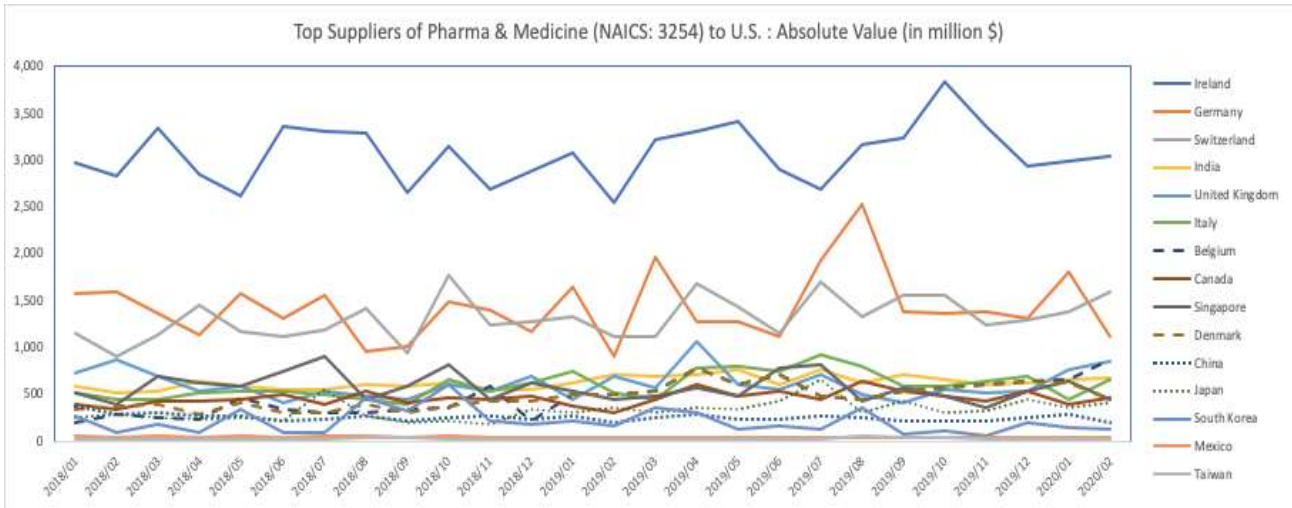
Source data: USITC

Figure 30: Top Suppliers of Pharmaceuticals for U.S: 2017-19

Top 10 and Selected Suppliers of Pharma (NAICS 3254): Rank & Absolute value							
		2017 rank	2017	2018 rank	2018	2019 rank	2019
Top 3	Ireland	1	31,839	1	35,891	1	37,616
	Germany	2	12,715	2	16,137	2	18,026
	Switzerland	3	12,301	3	14,715	3	16,480
Top 4-10: 5000 - under10,000	India	4	6,633	6	6,837	5	8,068
	United Kingdom	5	5,846	5	7,084	6	7,093
	Italy	6	5,779	7	6,125	4	8,228
	Canada	8	4,146	8	5,251	10	5,804
	Singapore	9	4,006	4	7,359	9	6,443
	Belgium	14		10	3,829	7	6,876
	Denmark	11		9	4,325	8	6,876
Selected top Asian suppliers	China	12	2,709	14	3,174	14	2,880
	Japan	13	2,550	13	3,221	11	4,506
	South Korea	17	1,604	15	2,913	16	2,253
	Mexico	22	443	22	535	23	434
	Taiwan	24	245	23	265	24	295
Total Import			113,614	20%	136,172	11%	150,931

Source Data: USITC

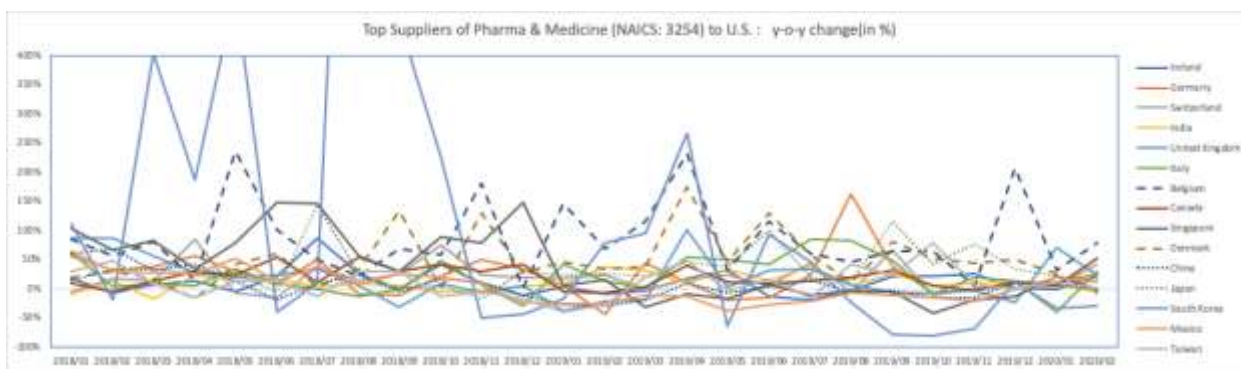
Figure 31: Top Suppliers of Pharmaceuticals & Medicine to U.S: 2018-19



Source Data: USITC

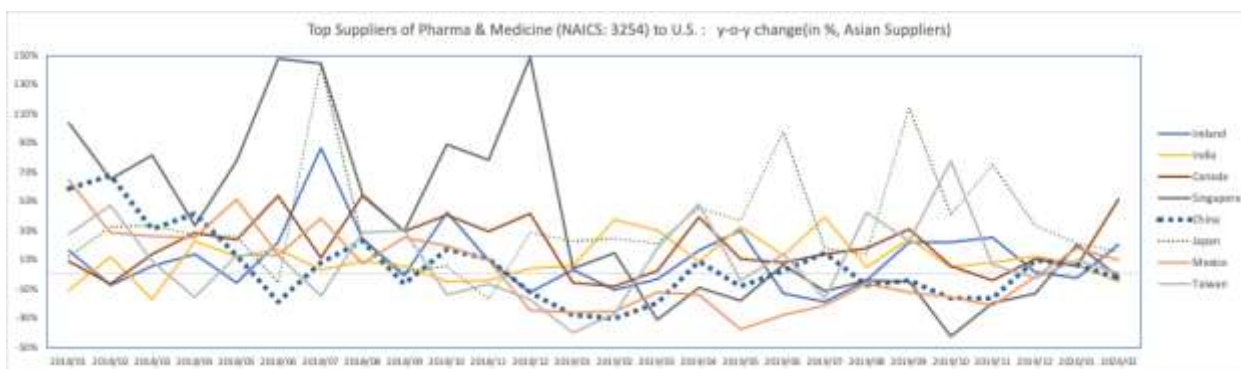
During 2018, Singapore, Canada, Mexico, Belgium, and Denmark experienced fast growth and during 2019, the latter four along with Japan and Italy experienced fast growth rates as suppliers. However, the imports from Singapore remained flat and moderately decreased in 2019 whereas Italy's supply was affected in 01/2020, perhaps due to COVID-19 disruptions. In all of the years studied in **Figure 30**, Ireland was the biggest supplier of pharmaceutical products to the U.S. due to its tax haven advantages for business operations and intellectual property registration (Setser, 2019; Houlder, 2014).

Figure 32a: Top Suppliers of Pharmaceuticals to U.S.: 2018-19 (Y-o-Y Changes)



Source Data: USITC

Figure 32b: Top Asian Suppliers of Pharmaceuticals to U.S.: 2018-19 (Y-o-Y Changes)



Source Data: USITC

For comparison, China and neighboring countries to both China and the U.S. are examined; Canada ranked highly already and so, Mexico in addition to Japan, China, South Korea, and Taiwan are selected. Imports from Japan, which ranked 11th in 2019, increased rapidly from

\$2.5bn in 2017 to \$4.5bn in 2019 with an annual growth rate of 26% in 2018 and 40% in 2019. China ranked 14th in 2019 and experienced a fast growth period that ended in the second half of 2018; monthly y-o-y change in 2019 fluctuated between -10% and 10%. Imports from South Korea, which ranked 16th in 2019, were volatile as well with y-o-y increases over 300% from Spring 2018 to Spring 2019. However, South Korea's share plummeted in the second half of 2019, which hints at volatility in this industry.

iii) Business Strategy Linkages for Pharmaceuticals

U.S. based pharmaceuticals experienced significant uncertainty, with both active pharmaceutical ingredients (APIs) and excipients being switched on and off the proposed tariff lists of either 10% or 25%. However, changing sourcing of critical inputs (APIs) from China or establishing plants elsewhere risks a complex and expensive multi-year transition for businesses that does not appear to align with companies' best interests.¹³ APIs are utilized in medicines ranging from antibiotics to antidepressants and vaccines and, in 2018, almost 88% of the manufacturing sites that produce APIs for use in the formulation of U.S. medicines were located overseas - mainly within the EU, India and mainland China (U.S. FDA, 2019). Though inconsistent with economic welfare analysis and trade models, the Trump administration has considered a "Buy American" executive order to incentivize pharmaceutical companies and medical suppliers to relocate to the U.S. to reduce high utilization of foreign suppliers; this would impact government procurement by limiting waivers for government purchases of foreign medical goods (Reinsch, 2020). Looking ahead, this is a risk to supply chains but the data available to date did not indicate significant movement in supply chains.

¹³ This shift would endanger generics manufacturing as well due to its high use of Chinese produced APIs and supplies.

In the case with Pfizer Inc. below, the company has derived a large portion of its revenues at an increasing rate from China, a major market for Big Pharma after the U.S. While expiring patents and enhanced competition at home placed downward pressure on revenues, China became an important market for Pfizer and other big pharmaceutical companies due to its tremendous scale, government healthcare policies, and thus far positive response to IP protection concerns.¹⁴

¹⁴ S&P Global reports that China will establish a resolution mechanism for drug patent disputes and increase IP protection through patents as of January 2020 (Huang, 2020).

PFIZER INC

INDUSTRY

Pharmaceuticals

NEWS COVERAGE SPANS

2018 - 2020

CEO DURING PERIOD

Albert Bourla

COMPANY OVERVIEW

Headquartered in New York, Pfizer is a world's leading biopharmaceutical company started in 1849 by cousins Charles Pfizer and Charles Erhart. It has a market cap of \$209 billion (PFE, NYSE) with a sales revenue of \$51.8 billion in 2019 (PFE 10-K, 2019). Products sold span diversified biologic and small molecule medicine and vaccines that are produced in 58 global manufacturing sites and sold in 125 countries (ibid). Nine of the company's products have a turnover of over \$1 billion (Pfizer, 2020).

RISKS & LINKAGES

Industry: highly competitive, regulated industry dominated by top firms like Novartis, Roche, Merck, Eli Lilly, Sanofi, AstraZeneca etc. Regulatory approvals or price caps have been the big challenges to the global industry. The U.S. is the largest market by value while China is the major supplier of Active Pharmaceutical Ingredients in the supply chain (Edney, 2019).

Pfizer: U.S. is its largest market (46% revenue in 2019) followed by China (9% revenue in 2019) (PFE 10-K, 2019). Pfizer is also a top pharma group by revenue in China alongside AstraZeneca. It operates four state of the art manufacturing facilities in China with business operations in 300 Chinese cities (Pfizer, 2020). Strong generic competition (due to procurement programs enacted by Chinese government) hurt sales in China; patent expiries for its products like Lyrica causes stiff competition, in the US (Liu, 2019; Chang, 2019).

NON-SHOCK CONSIDERATIONS

Healthy China 2030: plan announced to increase cancer survival rates, improve management of chronic diseases, and lift public-health services to developed-country levels (WHO, 2020). The government has made it easier for foreign companies to bring new drugs to China by reducing approval times.

Joint Ventures: Created a new bio pharma company named 'Cerevel' with Bain Capital in Sep 2018 with a focus on central nervous system disorders like Parkinsons, epilepsy, and Alzheimers (PFE 10-K, 2018). Combined the Consumer healthcare business with that of GSK's under the name of GSK Consumer Healthcare in July 2019, with a 32% equity stake (PFE 10-K, 2019). Announced the formation of a new company 'Viatris', a planned combination of Mylan and Upjohn, anticipated to occur in mid-2020 (ibid).

UNCERTAINTY & SHOCKS

Trade Deal: The Phase 1 trade deal promised to set up patent protections, but China might renege on the IP protection commitments, and also target big pharma with tariffs, if trade war goes out of hand. Uncertainties caused by tariffs may force companies to make difficult decisions about strategic supply-chain planning.

THE BOTTOM LINE

Pfizer will continue to invest across the Chinese market through joint ventures and expects the market to drive growth to come for both new and existing medicines in their portfolio.

TIMELINE

- ● ● **March 2018: USTR Announces Proposed Tariff Lists, Including Biopharma**
 - Testifying in front of the Senate Committee on Finance, U.S.T. R. Robert Lighthizer said his agency would pursue tariffs on 10 industries, which the Chinese government had laid out in "Made in China 2025," its 10-year plan to transform China into a world tech leader (Liu, 2018).
 - This was meant to address the acts, policies, and practices of China, which the U.S. states coerces U.S. companies into transferring their technology and IP, to domestic Chinese enterprises (ibid). Biopharmaceuticals and advanced medical devices companies are included.
- ● ● **June 2018: Pfizer Ventures Launches**
 - Pfizer ventures is created an investment vehicle, to invest up to \$600mn in biotech and emerging growth companies (PFE 10-K, 2018).
- ● ● **December 2018: Pfizer and GSK Joint Venture Created**
 - Pfizer and GlaxoSmithKline plc (GSK) agreed to combine both their respective consumer healthcare businesses into a new consumer healthcare JV that will globally operate under the name GSK Consumer Healthcare (PFE 10-K, 2019).
- ● ● **January 2019: Pfizer Raises Drug Prices**
 - Pfizer increases list price of certain products (~10% of entire drug portfolio) (Hopkins, 2019)
 - **Pfizer Initiates Pay-for-Performance Program in China**
 - Pfizer inaugurated pay-for-performance in China with a money-back Ibrance deal. Pfizer has launched the country's first pay-for-performance program in oncology with its blockbuster breast cancer drug Ibrance to reimburse up to 33.5% of Ibrance costs if an enrolled patient's disease progresses within four months. The U.S. pharma set up the project in a collaboration with one of China's largest commercial insurers, People's Insurance Company of China (PICC) and MediTrust Health, a Shanghai-based firm that offers healthcare financing services (Liu, 2019).
- ● ● **May 2019: Pfizer Establishes Upjohn Headquarters in Shanghai**
 - Pfizer launched the global headquarters of its generic and off-patent drug unit Pfizer Upjohn in Shanghai (PFE 10-K, 2019). Last year, Upjohn's China sales accounted for \$2.4bn of global revenues of \$12.5bn and sales grew at over 20%, the division's biggest global increase (Chang, 2019).
 - **Growing Shanghai Team & Impact of Purchasing Program**
 - Pfizer hires 600 new staff for effort outside 11 major cities, as the Country's purchasing program drives down prices, hurts sales (Chang, 2019). The program forces companies to bid for contracts to sell generic copies of branded drugs that have lost patent protection, pushing down prices by as much as 90%. While China stands to save tens of billions of dollars on medications, big pharma companies are getting hurt (ibid).
- ● ● **August 2019: Pentagon Sees Security Threat in Chinese Drug-Supply**
 - U.S. imports 80% of APIs from China and India (Edney, 2019). And, Christopher Priest, the acting deputy assistant director for health care operations and Tricare for the Defense Health Agency, told a U.S.-China advisory panel that "the national security risks of increased Chinese dominance of the global API market cannot be overstated" (ibid).



- ● ● **September 2019: China Exempts Cancer Drugs from Retaliatory Tariffs**

Twelve cancer drugs are among a short list of U.S. goods to be exempted from the 25% retaliatory tariffs levied by China last year, the Ministry of Finance announced. While the monetary value of these drug imports is likely to be minimal, the exemptions will come as a relief for Pfizer Inc., which invested heavily in the Chinese market and expect it to be a driver of growth for their innovative medicines (Lyu, et. al., 2019).

- ● ● **December 2019: Joint Venture Formed in China: Pfizer's Upjohn & Mylan N.V.**

Pfizer and Mylan N.V. (Mylan) announced the formation of Viatrix. The company is set to be formed by the planned combination of Mylan and Upjohn, upon completion of the transaction, which is anticipated to occur in mid-2020 (PFE 10-K, 2019). Ian Read, Pfizer's former Chairman and Chief Executive Officer, and James Kilts, a Pfizer director since 2007, will join the board of directors of Viatrix (ibid).

- ● ● **March 2020: Pfizer and BioNTech SE Co-Developing Coronavirus Vaccine**

Pfizer Inc. and BioNTech SE announced to work on a coronavirus vaccine (Pfizer, 2020). Both the companies agreed to a letter of intent to co-develop and distribute (excluding China) a potential mRNA-based coronavirus vaccine aimed at preventing COVID-19 infection (ibid).

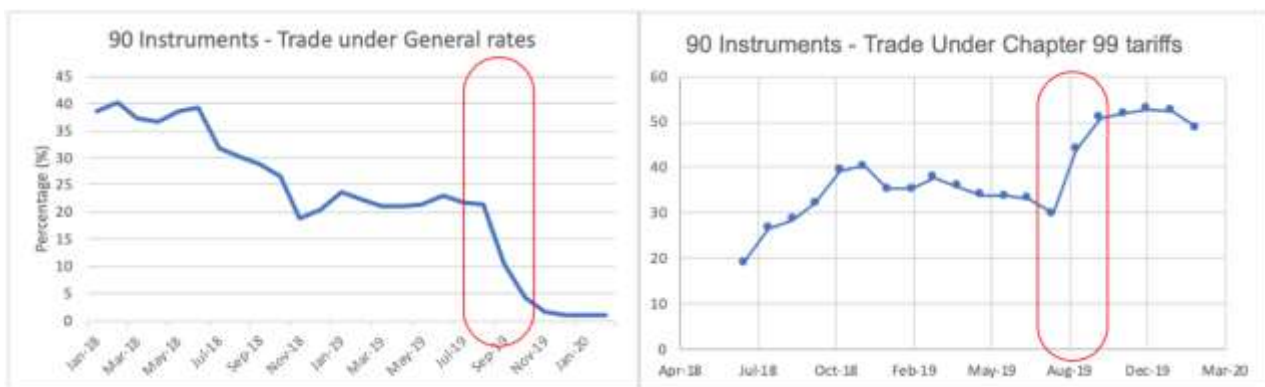
In conclusion, China continues to be viewed as a strong growth market in pharmaceuticals and a player in producing APIs for the global industry. In Pfizer's case, pharmaceuticals demonstrated a high-level of business interconnectedness between U.S. and Chinese companies and there is no evidence of the company moving APIs away from China despite the USTR's national security concerns about reliance on Chinese supply chains. Rather, Pfizer demonstrates a strong long-term strategic commitment to China as a growth market and manufacturing partner. Despite the uncertainty of future tariffs, there was compelling evidence of pharmaceuticals continuing to invest and grow in China.

E. Medicine: Medical Device Specific Analysis

i) Medical Devices Exposure to New & Existing Tariffs

Medical equipment and supplies were brought under tariffs through imposition of a 25% tariff and similar to electronics, faced lower rates of exposure by trade volume. However, this industry - like pharmaceuticals - has increased in urgent demand and necessity in 2020 with COVID-19. The impact of the new trade war tariffs is considered in both 2019 and in early 2020 as negatively limiting U.S. preparedness for responding to the COVID-19 pandemic.

Figure 33: Trade volume under General rates and Chapter 99 (as a % of total)



Source data: USA Trade Online

The fraction of trade under general rates was low at 40% starting in January 2018 which meant that medical devices fell under special import programs. Subsequently, trade under Chapter 99 restrictions increases up to 50% and completely drains the trade volume under general rates. This means that half of the U.S. imports are being traded under the new trade war tariffs and the remaining 50% fall under a special import program. Correspondingly, the trade war has not impacted the 50% of instruments being imported by the U.S. under special import programs, which may be a silver lining for the industry.

ii) Year-over-Year Analysis of Top Suppliers: How & When Medical Devices Responded

Unlike pharmaceuticals, U.S. imports of medical equipment and supplies (NAICS: 3391) from other countries have been vigorously increasing. The total import of medical equipment and

supplies in 2019 reached \$44bn, which was an 8% increase from the \$41bn in 2018 and slight slowdown compared with the 10% growth between 2017 to 2018. The top ten medical equipment suppliers were: Mexico, Ireland, China, Germany, Switzerland, Malaysia, Costa Rica, Italy, Japan, and Singapore (**Figure 34**). Imports from the top three accounted for 45% of total imports and imports from the top ten took up 78% of total imports.

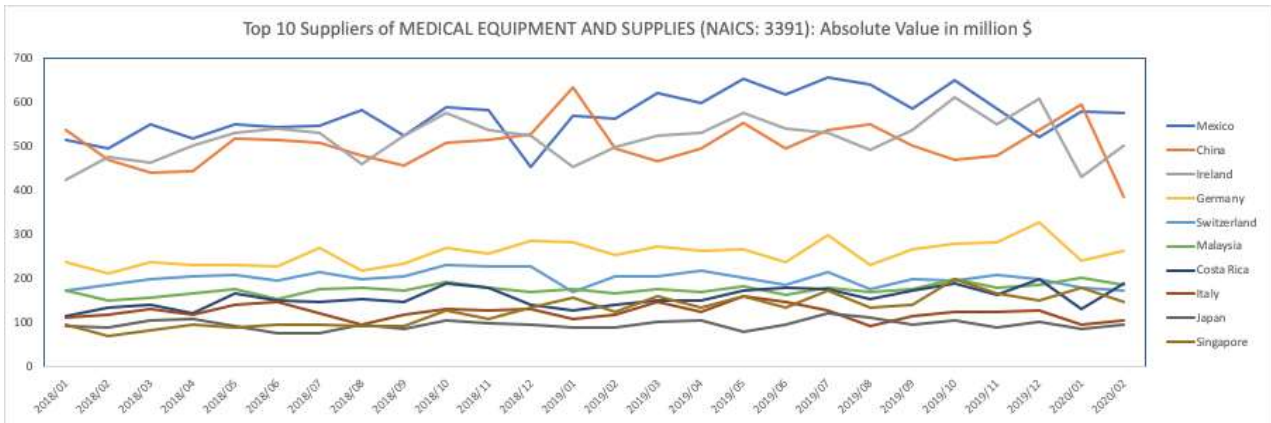
Most of the major suppliers experienced a rapid increase in 2018 and 2019 as seen in **Figure 34**. Six out of the top ten increased their supplies in 2018 more than 10%, which is equivalent to the total growth rate for this sector in 2018; these countries were China, Ireland, Germany, Switzerland, Malaysia, and Costa Rica. Four - Mexico, Germany, Costa Rica, and Singapore - increased by more than 10% in 2019. Although, there was fluctuation where Germany and Costa Rica reduced in growth between 2018 and 2019 whereas Mexico and Singapore accelerated growth in 2019 compared to 2018 rates (**Figure 34**). Singapore increased most dramatically with 56% y-o-y growth in 2019. Throughout 2017-19, Germany and Costa Rica kept y-o-y growth above 10% in all years (**Figure 34**).

Figure 34: Top Suppliers of Medical Equipment (NAICS: 3391) for U.S: 2017-19

Top 10 Suppliers on MEDICAL EQUIPMENT AND SUPPLIES (NAICS 3391) for U.S Import											
	Rank			Absolute Value in \$mm			% y-o-y change			% in total	
	2017	2018	2019	2017	2018	2019	2018	2019	2017-2019	2018	2019
Mexico	1	1	1	5,924	6,444	7,256	9%	13%	22%	16%	16%
China	2	3	3	5,332	5,910	6,209	11%	5%	16%	14%	14%
Ireland	3	2	2	5,128	6,078	6,446	19%	6%	26%	15%	15%
Germany	4	4	4	2,564	2,903	3,254	13%	12%	27%	7%	7%
Switzerland	5	5	5	2,211	2,463	2,366	11%	-4%	7%	6%	5%
Malaysia	6	6	6	1,752	2,046	2,118	17%	4%	21%	5%	5%
Costa Rica	7	7	7	1,555	1,777	1,966	14%	11%	26%	4%	4%
Italy	8	8	9	1,398	1,481	1,511	6%	2%	8%	4%	3%
Japan	9	11	10	1,163	1,109	1,181	-5%	6%	2%	3%	3%
Singapore	10	10	8	1,127	1,166	1,824	3%	56%	62%	3%	4%
total import	-	-	-	37,395	41,160	44,336	10%	8%	19%		

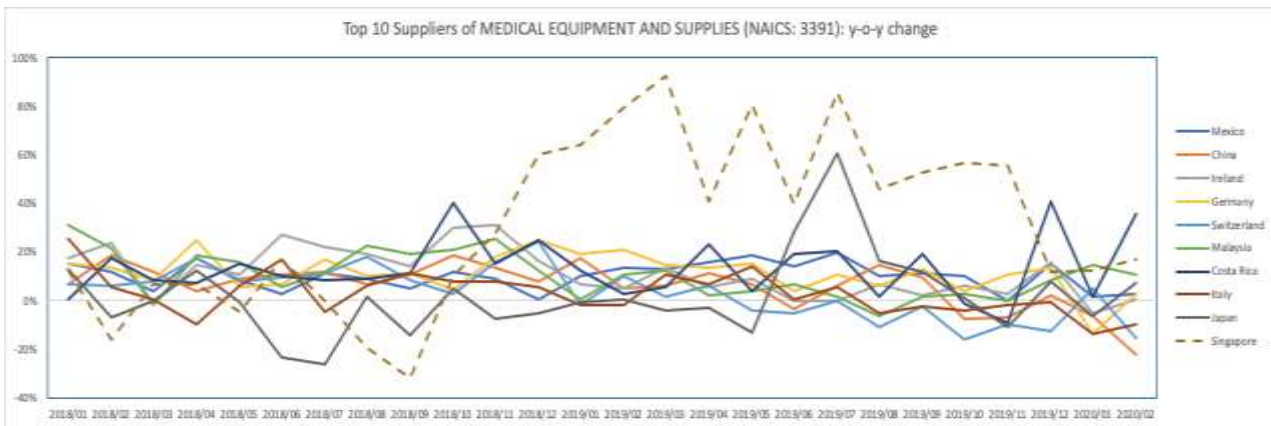
Source Data: USITC

Figure 35a: Top Suppliers of Medical Equipment (NAICS: 3391) for U.S: 2018-19



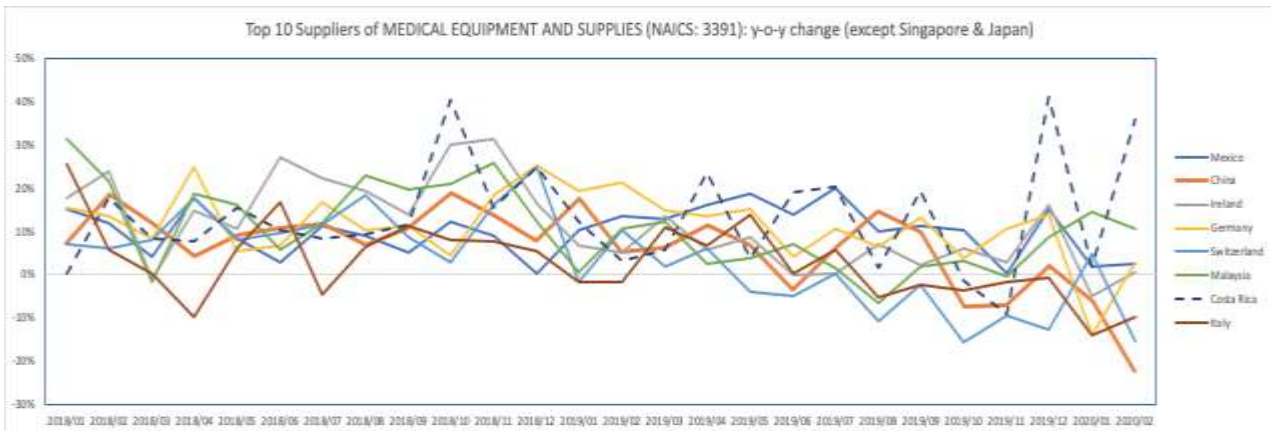
Source Data: USITC

Figure 35b: Top Suppliers of Medical Equipment for U.S: 2018-19 (Y-o-Y Changes)



Source Data: USITC

Figure 35c: Selected Suppliers of Medical Equipment for U.S: 2018-19 (Y-o-Y Changes)



Source Data: USITC

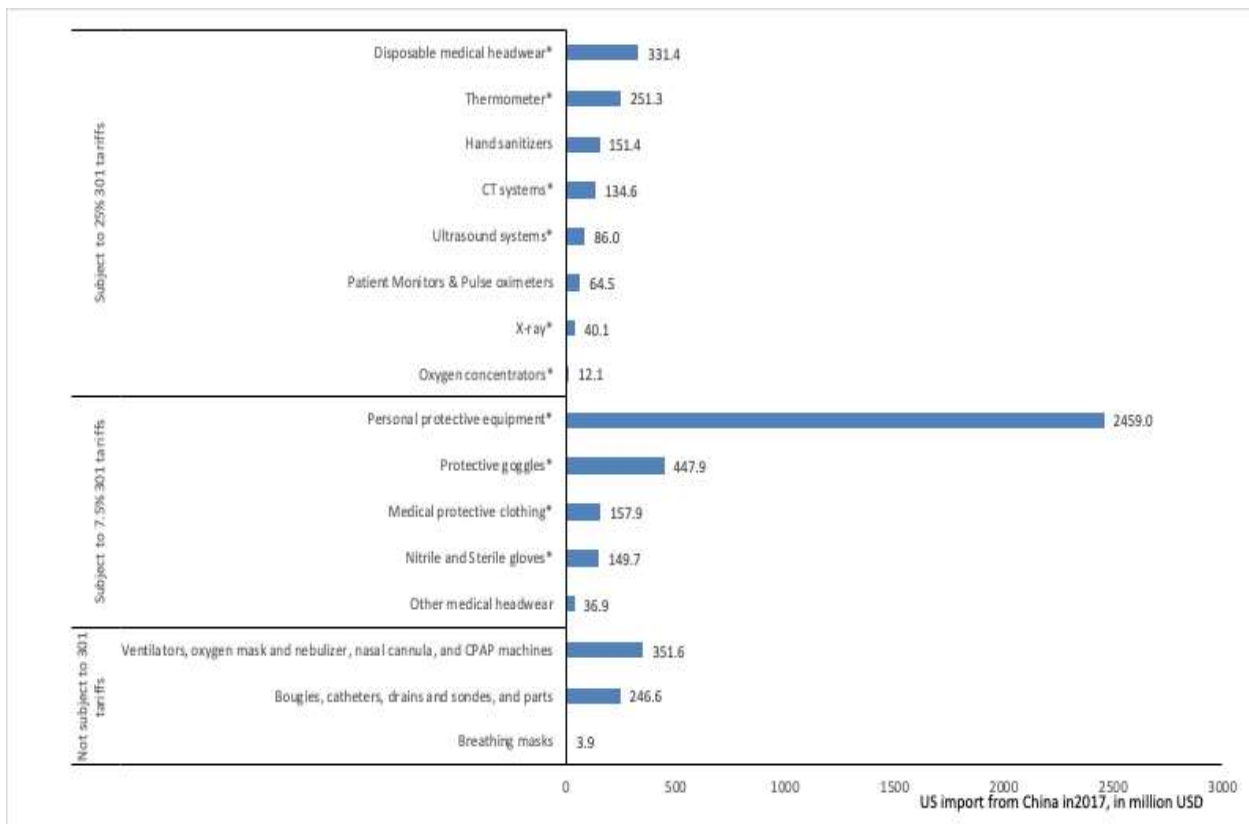
Tariffs & Imports Changes from China

China, one of the top three suppliers of medical equipment, experienced a slow increase during 2018 – 2019. Among the top three suppliers with supply over \$5bn since 2017, China had the lowest growth rate of 16% during 2017 – 2019; whereas, the annual increase of Mexico and Ireland, which were the largest and second-largest ahead of China in 2018, were 22% and 26% respectively (**Figure 34**). In **Figure 35a**, the value of medical equipment imported from outside the U.S. fluctuated moderately without seasonality; however, the amount imported from China experienced a bump at the beginning of 2019 and visibly decreased from August 2018 when the y-o-y change of monthly import started to drop. This y-o-y change has not recovered as of yet through 02/2020 and rather, has experienced decreases compared to the same month in the last year.

The increasing tariffs imposed under Section 301 served as one cause of decreasing Chinese supply of medical equipment. One billion dollars worth of medical equipment was affected by 25% Section 301 tariffs imposed between July 2018 and June 2019; in September 2019, another \$3bn of medical equipment was added to the list and subjected to an incremental 15% tariff. The change of monthly growth in Chinese supply slowed down earlier than other suppliers between 07/2018 and 08/2018, and the impact of the 15% tariffs imposed from September 2019 is starkely visible in the negative monthly growth rates of China compared to the rest of the world's growth rates in medical devices in **Figure 36b**. Although, the growth rates for four goods in **Figure 36b** differ from this trend which speaks to the coronavirus pandemic; amid the crisis, U.S. trade officials have removed tariffs on urgently-needed medical supplies imported from China such as protective gowns, exam gloves, patient bags, surgical drapes, and medical waste disposal bags (Zumbrun et al, 2020).

Still, the high tariffs on medical equipment appeared to be a ‘lose-lose’ game which hampered the U.S. fight against COVID-19.¹⁵ Before the trade war, 26% of U.S. imports (approximately \$5bn) of personal protective equipment, disposable equipment, and high-tech medical equipment such as CT systems, ultrasound systems, x-ray devices came from China and faced very low tariffs (Bown, 2020). However, about \$4bn of Chinese medical supplies were subjected to Section 301 tariffs, which resulted in U.S. purchasers paying higher prices to buy from China because of the difficulty of switching to other supplies based on U.S. safety demand for FDA certification (**Figure 36a**). The lack of change in the percentage of imports from China provides preliminary confirmation of this conclusion.

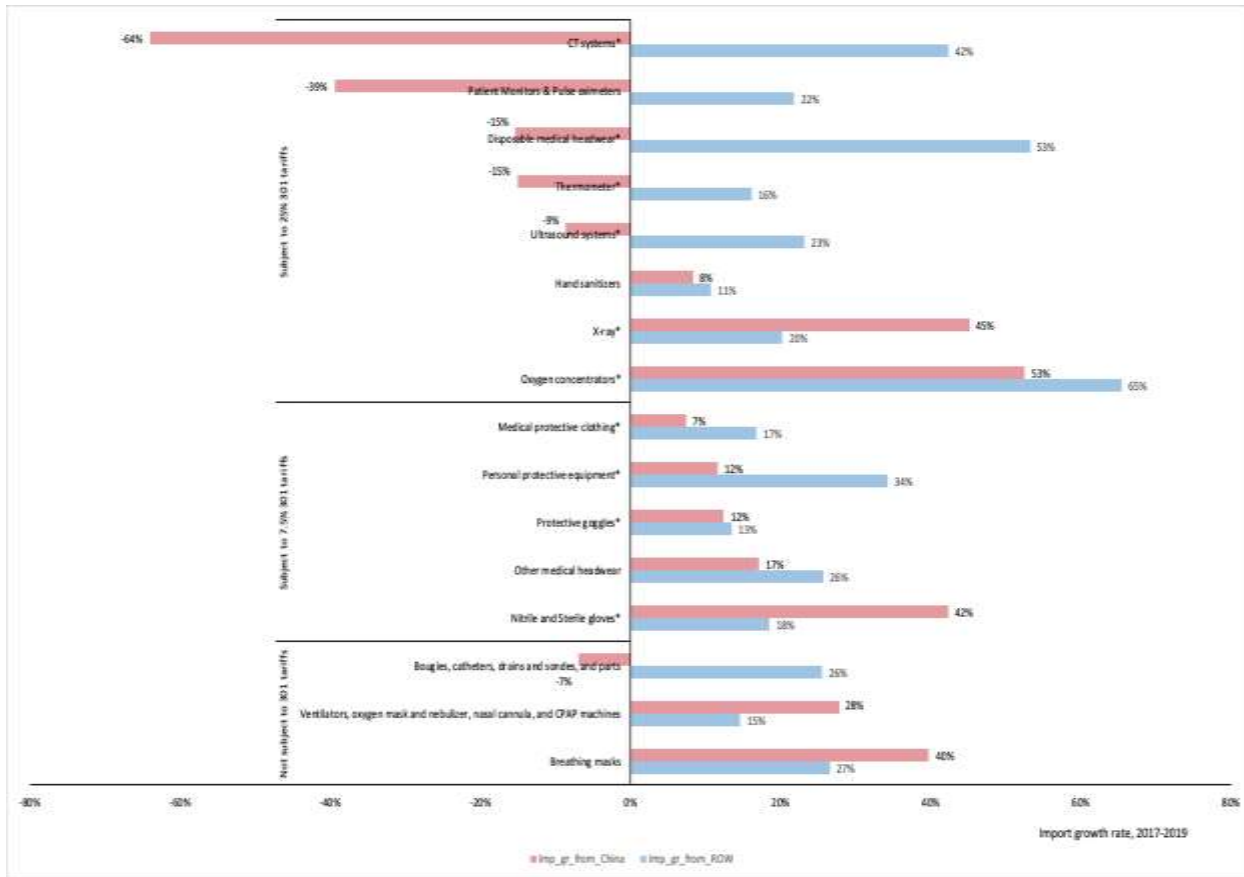
Figure 36a: Medical Equipment Import from China Subjected to tariffs (in Million USD)



Source: Bown, 2020, Peterson Institute for International Economics (PIIE)

¹⁵ Notably, the impact of the tariffs on medical devices and supplies is farther reaching the U.S. response to COVID-19 and touches all major U.S. trading partners - including China that responded with retaliatory tariffs that further limited medical trade and other trading partners with diminished access to goods (Bown, 2020).

Figure 36b: Imports Growth of Medical Equipment from China (2017-19)



Source: Bown, 2020, Peterson Institute for International Economics(PIIE)

iii) Business Strategy Linkages for Medical Devices

In the case of Medtronic, the company has taken a hit in earnings because of the retaliatory tariffs imposed from China in response to the U.S. tariffs on Chinese medical exports to the U.S. However, Medtronic has chosen to absorb the tariffs because its historic double-digit growth and higher margins in China’s market outweighs the cost of the tariffs. Further, Medtronic’s case demonstrates a strong commitment to the Chinese market and continued investment for future growth despite raised costs to U.S. producers. Finally, a unique consideration to medical devices and pharmaceuticals alike is the social and medical impact of consumer losses at home - be it increased costs to hospitals and group purchasers or direct to consumer costs of healthcare services.

MEDTRONICS PLC

INDUSTRY

Medical Devices & Equip.

NEWS COVERAGE SPANS

2018 - 2020

CEO DURING PERIOD

Dr. Omar Ishrak

COMPANY OVERVIEW

Headquartered in Ireland, Medtronic plc is a medical technology, solutions, and services company with \$127.50Bn in market capitalization that competes in 150+ countries' markets (Yahoo, 2020; MDT 10-K, 2019). Their primary business lines are focused on cardiac and vascular products, minimally invasive therapies, restorative therapies, and diabetes treatment (MDT 10-K, 2019). Three strategies drive their objective to benefit human welfare through biomedical engineering research, design, and manufacturing: 1) therapy innovation, 2) growing market share in emerging markets, and 3) outperforming in value-based health care (ibid).

RISKS & LINKAGES

Industry: Prior U.S. tariffs on most affected goods were 0 - 8% max and in 2017, 26% of U.S. imports in this industry were imported from China (\$5Bn) (Bown, 2020). Section 301 tariffs increased healthcare cost of services and damaged preparedness (HIDA, 2020).

Medtronics: high-growth business and third-largest location (843 sq. ft. manufacturing and research facilities) in China (MDT 10-K, 2019). Lower IP protection outside of U.S. and trade protectionism (tariffs, other taxes, licensing requirements) for import/export (ibid).

NON-SHOCK CONSIDERATIONS

Divestiture from three businesses stabilized COGs to remain steady at 30 - 31.3% of net sales in 2017, 2018, and 2019 because divested products were lower-margin products used in patient care, deep vein thrombosis, and nutritional insufficiency (MDT 10-K, 2019).

Other: \$2.3Bn up in net cash flows from operations in 2019 from 2018 - attributed to extended supplier payment terms, tax treatment, decreased interest payments, lower U.S. pension plan contributions. Increase follows a \$2.2Bn net decrease from operations in 2017 to 2018 (ibid).

UNCERTAINTY & SHOCKS

New Tariffs: Q4 costs rose by \$200Mn but commitment to Chinese market, long-standing business of 30+ years, and long-term investment (Spencer, 2019).

COVID-19: Anticipated negative effect on Q4 earnings due to slowing medical device procedure rate and potential interruptions to supply chain - contraction in Chinese market may impact as well (MDT 10-A, 2020).

THE BOTTOM LINE

Though lower IP protection and uncertain trade protectionism are considered risks to Medtronic's business, the company derives its only double-digit growth from emerging markets of which China is a large part. Medtronics will continue investing in the market and manufacturing in China.

TIMELINE

● ● ● June 2018: Industry Concern about Tariff Impact on Customers & Employees

Referring to Chinese retaliation on tariffs, the CEO of a Minnesota health technology trade group (Medical Alley Association) is concerned that U.S. exporters will need to absorb Chinese tariff costs in order to access the Chinese market (Carlson, 2018). With China as the largest buyer of medical devices and supplies from MN, this concern puts 30,000 Minnesotans, a \$7.5Bn state market, and increased customer costs at risk (ibid).

Medtronic's China Projections Unphased

With \$30Bn in total sales, Medtronic does not anticipate the tariffs will be material for their operations and fully expects to continue driving "double-digit revenue growth" in the China market (Carlson, 2018).

● ● ● May 2019: Industry Group Resists Relisting of Products on 4A & 4B Lists

HIDA (Health Industry Distribution Association) submits comments and testifies against gloves, gowns, wipes, and other products included in Lists 4A and 4B after being removed from earlier Section 301 tariff lists (HIDA, 2020). Exemptions are permitted for 4A and 4B list items (ibid).

● ● ● October 2019: Medtronic Costs Up & Strategy Steadfast in China

"We have not changed our footprint or business strategy for China," says company spokesperson - aligned with 83% of companies from the U.S. - China Trade Council to maintain existing Chinese investment strategies (Spencer, 2019). Despite \$200Mn increased costs in Q4 2019, "we do not want to dismantle a business that took more than 30 years to build," says Medtronic (Spencer, 2019).

Industry Costs Up But Margins Higher in China

"[American companies] do see increasing costs" but when surveyed, 90%+ of surveyed companies from the aforementioned trade council said their firms are profitable in China and just under 50% said their margins are higher in China relative to overall operations (Spencer, 2019).

● ● ● February 2020: Double-Digit Growth in Emerging Markets

Medtronic continues to realize double-digit growth in emerging markets at 12% and 10% for three and nine month ended on 01/24/2020; their only market geography with aggregate positive growth across all business segments compared against the U.S. market and non-U.S. developed markets (MDT 10-Q, 2020). Total net income (all regions) increased 51% from Q1 '19 to Q1 '20 and 20% for nine months ended on 01/24/2019 compared to 01/2020 (MDT 10-Q, 2020).

● ● ● March 2020: Anticipating Slowed Growth from COVID-19

U.S., China, and global demand for Medtronic's respiratory therapies ramp up to help meet rise in COVID-19 cases (CNBC, 2020). Internal response teams are activated to care for employees globally and the company expects that COVID-19 will negatively impact Q4 results due to slowing medical device procedure rate; indicates supply chains may be interrupted (MDT 10-Q, 2020).

By digging into U.S. imports of pharmaceuticals and medical devices, companies in this sector are found to respond differently compared to the cases of apparel and footwear and somewhat similarly to semiconductors and communication equipment. Case studies on pharmaceuticals and medical devices companies are alike to the semiconductors and communications equipment case studies in that there are firm outlooks for continued manufacturing partnerships and growth markets in China. Undoubtedly, there are companies in both countries with strong ties and reliance on U.S. and Chinese goods traded across borders whereas the medical industries covered have not responded like apparel and footwear industries that have sought out a China plus one strategy. The reasons why are multifaceted; however, it is clear that non-tariff factors played important roles in the medical industries and disincentivized decoupling due to friction whereas the non-tariff factors for apparel and footwear industries likely incentivized shifts in sourcing. Further, the U.S.-China trade linkages and wider pools of trading partners have been uniquely burdened due to tariffs on medical devices directly prior to the COVID-19 pandemic because the increased costs stunted not only preparedness purchases from the U.S. healthcare market but also further trade flows into and out of the U.S. and China for trading partners.

V. Conclusion

A large takeaway from this study is that there are significant deadweight losses which arose from the U.S.-China trade war. Through data analysis, the tariff timeline of the trade war is mapped against U.S. industry import levels and coupled with industry-specific company case studies to illustrate the overall decrease in imported goods that faced tariffs; even after accounting for trade diversion, this decrease is evident for apparel, footwear, semiconductors, telecommunications, and medical devices. Key players like Vietnam, Taiwan, and Mexico have gained in some sectors, but

the overall size of the pie has diminished. For the specific sectors covered in this paper, there are differential responses from the various industries to the increasing tariffs. This is attributable to the fact that some industries are more capital intensive than others and the movement of supply chains is rigid for these industries where there are higher sunk costs. Additional factors include existing industry-specific manufacturing capacity in potential third countries like Vietnam and Taiwan which impact the ease and cost of shifts. Further, there is a possibility that some trade was diverted from foreign sources to U.S. producers as might have been the case in semiconductors where significant import shrinkage was observed - albeit this analysis was beyond the scope of this study.

Regardless, it is apparent from the trade data that imports from China are severely affected by the escalation and uncertainty of the new trade war tariffs. **Figure 37** visually summarizes the key findings per sector. In the apparel and footwear sectors, where China was the lead supplier, the pursuit of a China plus one strategy led to countries such as Vietnam gaining in its share of imports while China's share decreased; importantly, this strategy was taking place before the trade war but the new tariff escalation led to strikingly high tariffs in the industry and accelerated shifts away from China. Similarly in the electronics sector, countries like Vietnam and Taiwan benefited from an increase in share of imports though there was an overall decline in both industries' imports from all exporters to the U.S. For medical devices and pharmaceuticals, shifting away from one's original suppliers is very difficult, due to higher costs and FDA clearance processes; in the case of medical devices, there is preliminary evidence that companies are willing to shoulder the cost of intermittent tariffs and keep the long-view of investing in China's growth market in perspective. All sectors were impacted by COVID-19 with apparel, footwear, pharmaceutical, and medical devices most acutely.

Figure 37: Summary by Industry



In response to this evolving trade scenario, business decision making witnessed an uptick in pursuit of a China plus one strategy where feasible to improve their supply chain resiliency through regional diversification. These strategies consider the neighboring business environments and regulatory environments such as robust legal systems, industry specific human capital, effective property rights enforcement, wage rates, reduced red tape and ease of doing business etc. Overall, the trade war serves as a dangerous precedent for the global community since such stringent protectionism in the name of national security and intellectual property can chip away at decades of coordination between the global community. Even with these protectionist measures, this report finds that China still continues to play an important role in the global supply chains by being a key supplier of inputs/intermediates to these other economies even if final assembly in some industries does increasingly relocate out of China.

Appendix 1: Summary of Literature Review

To assess the impact of tariffs in today's context, this report acknowledges the considerable amount of research studying the effect of 2018 - 2019 U.S. import tariff on price increases and welfare losses (Amiti et al., 2019), manufacturing employment and producer price (Flaen et al., 2019), and U.S exports (Handley et al.). Both Flaen et al. (2019) and Amiti et al. (2019) found that the tariff increase has driven up the U.S. producer price. On the one hand, U.S. producers passively increase the price because of the increased input cost (Flaen et al., 2019); on the other hand, producers may also actively raise prices and markups due to the decline of foreign competitiveness driven by the tariff increase (Amiti et al., 2019). Measured by Amiti et al. (2019), the average price of U.S. manufacturing has risen by 1% in 2018-19, in comparison to prices increasing by 2% inflation between 1990 - 2018. This showcases one avenue through which consumers are hurt as a result of the tariff imposition.

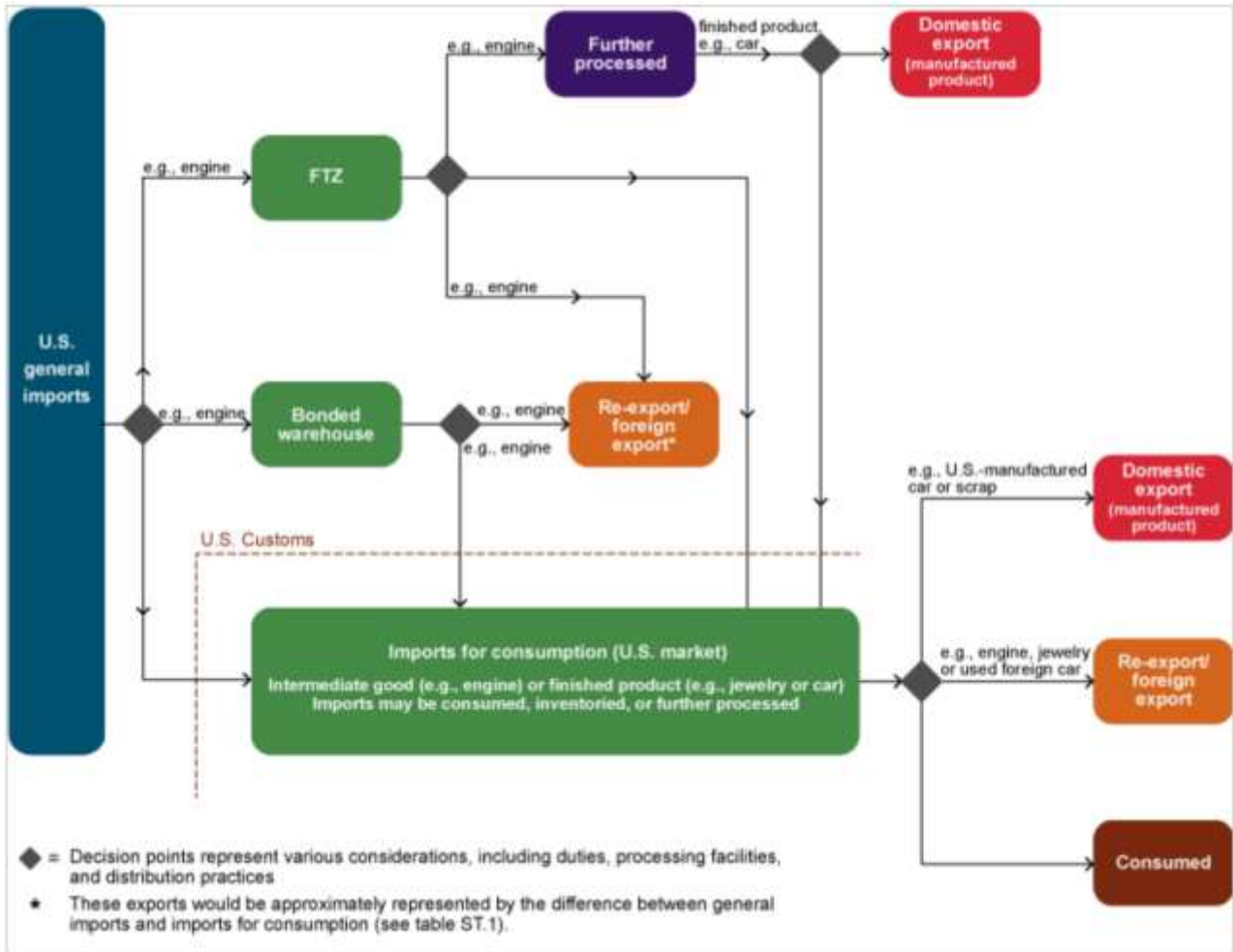
The paper by Amiti. et al. (2019) uses a traditional tariff model to explain how the impact of the tariff ends up hurting the U.S. economy. It highlights that the tariff measures have had counterintuitive effects since the U.S. is not considered a “large country” in the realm of international trade theory and the increase in U.S. import prices from China showcase this since the terms of trade effect (a decrease in Chinese export prices) does not take place. Instead, there is an almost one-to-one relationship between the import price and tariffs imposed and this puts the burden on U.S. importers instead. Implicit in this, China's magnitude in international trade plays a role. They calculate that the deadweight losses in 2018 alone were \$8.2 billion, without incorporating the transfer payments to the U.S. government (Amiti et al., 2019). This is because of allocative inefficiencies and the lack of varieties available to the U.S. importers. After incorporating the transfer payments, the total cost to importers rose to \$23.8 billion in 2018 (ibid, 2019). The deadweight loss per job created is equivalent to \$232,000 and that cost is four times the wage rate of an average steel worker, which shows how damaging these measures have been (ibid, 2019).

Sturgeon (2011) tried to map the global value chain (GVC) by analyzing the intermediate and final goods imports and found the features of today's world economy - geographic fragmentation, dispersion, and long-distance cooperation. The growing imports of intermediate goods serve as evidence of the deeper integration of the global value chain (Sturgeon, 2011). Among those, developing countries participate with an increasing share up from 25.5% in 1992 to 35.2% in 2006 (Sturgeon et al, 2011). China and Mexico were the fastest growing countries among the group of developing countries with a 17.1% per year growth rate (Sturgeon et al, 2011). In terms of different sectors, electronics and automotive industries are extremely important drivers of GVC development, which took 43% and 21.4% separately of top 50 products in 2006 (Sturgeon et al, 2011).

Most existing studies focus on the impacts of increasing tariffs on U.S. production, the U.S. domestic market, and then the U.S. exports cycle, which serves as a solid theoretical foundation of this report's analysis and provides evidence of the new tariffs' impact on producer price. However, seldom has the shifting pattern of global value chains because of increasing tariffs been analyzed, which is the primary goal of this report. Furthermore, this report aims to describe the trend for specific industries beyond what is observed in overall aggregate trade flow data and how individual companies react, from which one could conclude the potential opportunities and risk of doing business in the involved countries for that industry.

Appendix 2: U.S. Imports for Consumption

This flow chart from USITC defines the categorization of U.S. imports for consumption as including both intermediate and final goods that enter the U.S. market (Lundquist, 2014). Imports from bonded warehouses and FTZ can be recategorized under imports for consumption once withdrawn from either type of location for use in the U.S. market (USITC Trade Measure Definitions, 2018).



Source: USITC “Special Topic: Trade Metrics” by Kathryn Lundquist

Appendix 3: Summary of Input Data for Aggregate Analysis

Annual Change in Petroleum & Coal Products (2018-19)

Country	NAIC Num	2018	2019	%change18-19	\$change18-19 (in \$)
Vietnam	324	132,095,968	1,606,882	-98.8%	-130
China	324	1,094,094,754	356,935,534	-67.4%	-737
Ireland	324	240,159,306	83,987,446	-65.0%	-156
Malaysia	324	330,752,134	183,903,940	-44.4%	-147
France	324	2,163,006,974	1,742,985,236	-19.4%	-420
Taiwan	324	671,613,108	542,615,116	-19.2%	-129
South Africa	324	37,216,565	33,174,629	-10.9%	-4
United Kingdom	324	5,592,186,582	5,106,666,646	-8.7%	-486
Canada	324	26,730,934,394	27,451,580,336	2.7%	721
Italy	324	2,296,991,108	2,473,380,616	7.7%	176
Mexico	324	1,782,573,368	2,060,118,250	15.6%	278
South Korea	324	6,480,214,916	7,743,594,774	19.5%	1,263
India	324	5,389,345,940	6,848,004,034	27.1%	1,459
Brazil	324	3,563,122,526	4,824,454,774	35.4%	1,261
Germany	324	473,945,204	646,985,532	36.5%	173
Japan	324	1,687,171,830	2,418,115,418	43.3%	731
Israel	324	35,883,836	76,831,126	114.1%	41

Annual Change in Wood Product Manufacturing (2018-19)

Country	NAIC Num	2018	2019	%change18-19	\$change18-19 (in \$)
China	321	8,154,881,670	5,649,486,580	-30.7%	-2,505
Canada	321	20,733,950,636	17,034,780,920	-17.8%	-3,699
Japan	321	54,946,760	47,307,942	-13.9%	-8
South Korea	321	11,107,564	10,025,958	-9.7%	-1
Germany	321	1,157,563,880	1,056,755,376	-8.7%	-101
United Kingdom	321	30,764,498	29,105,386	-5.4%	-2
Brazil	321	2,586,428,040	2,466,075,000	-4.7%	-120
Italy	321	318,743,908	311,756,376	-2.2%	-7
Malaysia	321	436,488,496	431,741,194	-1.1%	-5
Taiwan	321	80,731,506	82,055,650	1.6%	1
France	321	548,884,560	569,804,134	3.8%	21
Israel	321	5,019,162	5,491,304	9.4%	0
South Africa	321	9,086,377	10,122,392	11.4%	1
Mexico	321	270,815,128	336,469,479	24.2%	66
India	321	337,336,082	437,236,718	29.6%	100
Vietnam	321	717,392,846	1,034,311,876	44.2%	317
Ireland	321	10,245,350	16,494,636	61.0%	6

Annual Change in Food Manufacturing (2018-19)

Country	NAIC Numl	2018	2019	%change18-19	\$change18-19 (in \$r)
China	311	8,459,222,544	5,829,238,310	-31.1%	-2,630
Brazil	311	3,326,424,698	3,143,415,236	-5.5%	-183
South Africa	311	111,043,618	106,040,506	-4.5%	-5
United Kingdom	311	1,052,255,926	1,031,739,658	-1.9%	-21
France	311	2,337,692,196	2,376,017,244	1.6%	38
India	311	3,349,034,002	3,404,614,022	1.7%	56
Germany	311	2,676,883,580	2,765,166,994	3.3%	88
Canada	311	33,403,183,286	34,733,777,244	4.0%	1,331
Malaysia	311	1,564,712,374	1,631,016,844	4.2%	66
Israel	311	462,922,488	483,312,036	4.4%	20
Italy	311	4,944,779,200	5,227,732,396	5.7%	283
Mexico	311	7,972,931,122	8,446,592,733	5.9%	474
Japan	311	1,138,215,810	1,206,326,680	6.0%	68
Vietnam	311	1,491,782,662	1,606,798,476	7.7%	115
South Korea	311	1,030,966,820	1,164,518,890	13.0%	134
Taiwan	311	635,387,278	721,792,098	13.6%	86
Ireland	311	932,583,498	1,070,130,840	14.7%	138

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