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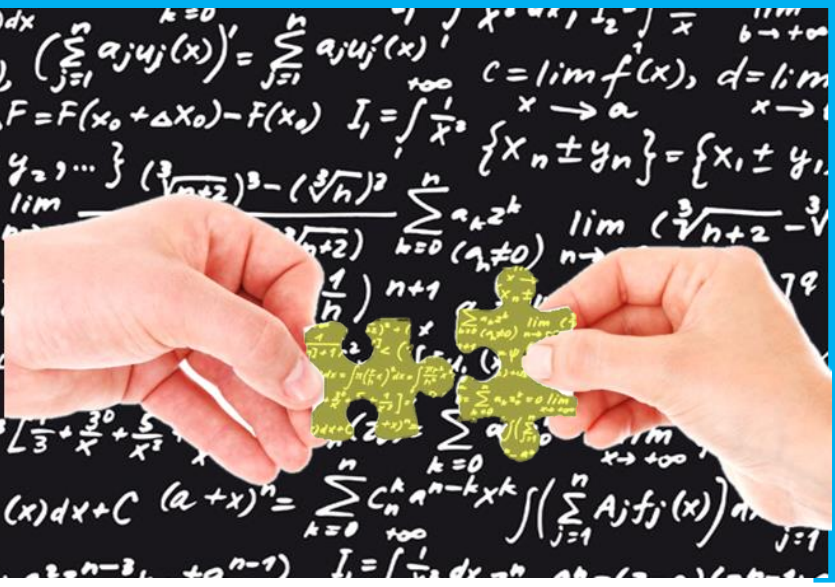
Healthcare products trade and external shocks: The US-China trade war and COVID-19 pandemics



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ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

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ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

WORKING PAPER

Healthcare products trade and external shocks: The US-China trade war and COVID-19 pandemic

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Abstract

In 2019 and the early months of 2020, global trade faced two major albeit very different shocks, namely the United States-China trade war and the cascading response of the countries around the world to the COVID-19 pandemic. While the former situation involved a pair of centrally-placed trading partners introducing tariffs and retaliatory measures across a broad swathe of tradeables that made a global trade environment highly unpredictable, the latter has seen entire production networks and supply value chains debilitated and transactions across the borders halted. This paper examines the trade impacts of these two external shocks from the perspective of the healthcare sector. The paper also analyses likely impacts of the trade tensions on the healthcare sector and the economy at large through secondary impacts on, for example, adoption rates of key technologies. We find that the trade war has led to an increase in tariffs that face several upstream inputs, such as active pharmaceutical ingredients, as well as technological components including those required for 5G adoption. While the COVID-19 policy responses based on the “Great Lockdown” have led to immediate short-term disruptions in the supply and trade of critical healthcare products, in the mid- and long-term, we posit that certain changes in consumption patterns may emerge in response and impact trade patterns. The paper draws attention to harmful effects of export restrictions and calls for a coordinated collective action in building back more robust and resilient ecosystems including in the healthcare sector.

Keywords: healthcare, trade, US-China trade war, tariffs, export ban, COVID-19, WTO, TRIPS, GATT, SPS, TBT, pharmaceuticals, PPE

JEL codes: F14, I110, O33

Contents

1. Introduction

In 2019 and the early months of 2020, global trade faced two major disruptions, namely the United States-China trade war and the cascading response of the countries around the globe to COVID-19. The former situation involved a pair of centrally-placed trading partners introducing tariffs and retaliatory measures across a broad swathe of mutually traded products but with various indirect effects on the third parties. The latter – in the absence of having effective health tools (vaccines and treatments) – opted to first focus on stopping people moving locally and internationally, followed by targeted restrictions on transport and trade of cargoes, thus resulting in entire value chains being debilitated through both supply and demand impacts.

The increased demand for medical products coupled with these early responses to the COVID-19 crisis have exposed underlying fragilities in production networks and global value chains, and have highlighted the critical nature of frictionless and contactless trade in products related to the healthcare sector, which is under unprecedented stress world-wide. In this paper, we examine these two external shocks from the perspective of the healthcare sector, and assess the impacts of tariff and quantitative restrictions that have been imposed on products critical to the sector.

We also analyse the short- and long-term impacts that these restrictive measures are likely to have on the healthcare sector and the economy at large through secondary impacts on, for example, adoption rates of key technologies in the context of the Fourth Industrial Revolution.

The paper proceeds in the following manner. We first define the scope of healthcare trade in section 2. The paper then continues in section 3 and 4 with its focus on analysing the healthcare trade impacts of the two shocks – the US-China trade war and the response to the COVID-19 pandemic. Section 5 summarizes the findings and lessons learnt. The Annex to the paper provides a short summary of the existing international rules that establish rights and obligations for trading partners in the area of healthcare trade – most of which are undermined by the trade war and through the ad-hoc responses to COVID-19, leading to the weakening of the multilateral trade

system and the absence of reliance on cooperation when seeking a solution to the global crisis.

2. Defining the healthcare sector trade and its role in sustainable development

A. Tradeable healthcare sector-related goods and services

While almost everyone understands the concept of (international) trade, many readers may have just a vague understanding of the healthcare sector trade. Obviously it may take a slightly different shape and scope in different countries, but in general the healthcare sector is described as comprising businesses that provide medical services, manufacture medical equipment or drugs (pharmaceutical industry), provide medical insurance, or otherwise facilitate the provision of healthcare to patients. While many of these are still not traded, the majority of goods (and services [4]) are tradeable. In fact, growth in trade of healthcare products and other healthcare sector-related goods and services has allowed the availability of affordable and needed medical care to countries and people who were previously without adequate healthcare. However, the current level of trade is not optimal, given (a) the ever-larger, and especially ageing, population, and (b) the frequency of regional and global epidemics and the strain they put on the healthcare sector, particularly in low-income developing countries.

A joint study by the World Health Organization, World Intellectual Property Organization and the World Trade Organization (WHO-WIPO-WTO, 2013) splits the goods that are related to healthcare, and which are tradeable, into three overarching groups, which are detailed in table 1.

As mentioned above, in addition to goods the healthcare sector involves a wide range of services. According to WTO, health services remain one of the least-committed sectors open for liberalization, with less than 50 WTO members having committed thus

[4] While much of the healthcare sector trade consists of the provision of services (see, for example, Mikic, 2007), this paper is limited to a review of goods. Nevertheless, it defines relevant services in table 2 and offers some discussion in relation to selected Mode 1 services.

far (WTO, 2019[5]). Hospital services are by far the most committed to the liberalization, with the most potential for growth seen in tele-medicine, which is expected to significantly increase cross-border supplies of services through Mode 1. Table 2 summarizes the four modes of services trade with healthcare examples for each. Of these, Mode 1 is of particular interest in the context of this paper, so we examine the impact of the trade war and COVID-19 on two particularly interconnected matters – 5G technologies and telemedicine.

Table 1. Groups of tradeable goods related to the healthcare sector

Group	Subcategory	Definition	Role in value chain
Group A	**Pharmaceutical industry**		
	A1	Formulations	Downstream goods
	A2	Bulk medicines	
	A3	Inputs specific to the pharmaceutical industry	Upstream goods
Group B	**Chemical inputs**		Upstream goods
Group C	**Medical equipment and other inputs**		
	C1	Hospital and laboratory inputs	Upstream goods
	C2	Medical technology equipment	Upstream goods

Source: WHO-WIPO-WTO, 2013; see also Helble, 2012.

Note: While the above groups have normally been understood to cover the trade of the healthcare sector (i.e., medical) products, in current analyses related to trade of COVID-19-related products, a category of personal protective products, such as hand soap and sanitizer, face masks and protective spectacles, have been added as a separate category (see WTO, 2020a).

Table 2. Examples of tradeable services in healthcare sector

Mode of supply	Example
Mode 1 Cross-border	A patient in country 1 is treated by a doctor from country 2 through the use of ICT (e.g., tele-health).

[5] Summary on health and social services on the WTO website at https://www.wto.org/english/tratop_e/serv_e/health_social_e/health_social_e.htm.

Mode 2 Consumption abroad	A patient from country 1 travels to country 2 for treatment (typically in a hospital or a clinic).
Mode 3 Commercial presence	A company (hospital, clinic etc.) from country 2 establishes a local presence in country 1 to treat the patients there.
Mode 4 Movement of natural persons	A health worker from country 2 comes to country 1 to provide services as an independent supplier (a nurse, doctor, therapist etc.).

Source: Authors' compilation based on General Agreement on Trade in Services (GATS).

The General Agreement on Trade In Services (GATS) provides multilateral rules on how healthcare services under the four modes of supply are traded.[6] However, the WTO members have opted for a very limited opening of this sector through GATS. Many prefer to retain a comfortable policy space and the freedom to apply their own regulatory and policy measures as needed. Examples of such measures include (cf. Chanda, 2017): (a) in mode 1, restrictions on the transfer of personal data under data privacy and patient confidentiality regulations and by Internet connectivity, bandwidth and costs affecting very much ability to trade by tele-health or tele-medicine channels; (b) in mode 2, limits in insurance portability, cross-border liability, visa and foreign exchange regulations; (c) in mode 3, various FDI regulations and associated conditions imposed on foreign investors but also on importation of medical equipment and supplies; and (d) in mode 4, various licensing requirements (e.g., language, citizenship) as well as immigration and labour market regulations, despite this mode not being considered part of either immigration or permanent employment schemes.

B. The healthcare sector's critical role in sustainable development

The healthcare sector stands out among tradeable goods and services, given the unique national interests involved in its outputs. As seen during the current COVID-19 pandemic, products such as personal protective equipment (PPE), including masks and gowns that have been loosely regulated in "normal" times, have suddenly become

[6] While we list the main international trade rules applicable to healthcare trade in the Annex, the rules under GATS are commented on here where healthcare-related services description is provided, because the rest of the paper will not be addressing services in detail. See also chapter 2 in Sauvé, Pasadilla and Mikic (eds)., 2011.

controlled and pre-empted from international trade by national Governments. Even in periods of less exigent demand, the healthcare sector is of pivotal importance, both to developed and developing countries alike. Accordingly, it is not surprising that countries around the world have long since sought to maximize their resources including through liberalizing business ownership regulations and the implementation of innovative export strategies (Benavides, 2002).

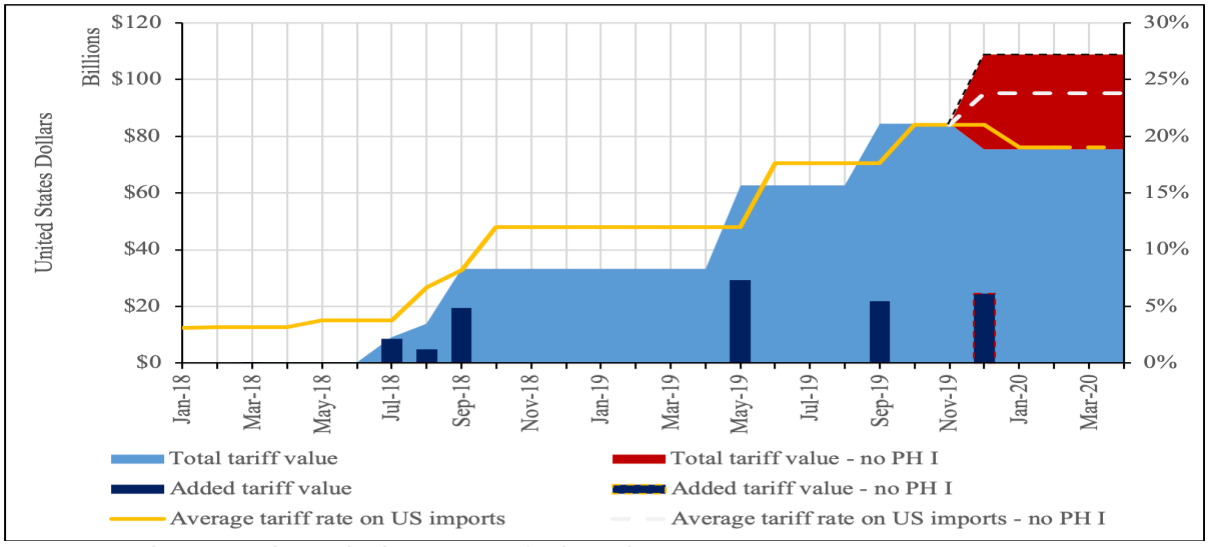
The category descriptions in the above tables further highlight the critical nature of the goods and services that the healthcare sector produces, both from a national perspective as well as from the viewpoint of global healthcare value chains. Any shocks on the supply side (affecting availability of products and services) or the demand side (increased number of people in need of access to health products and services) are likely to undermine the quality and quantity of healthcare that a population should receive, thereby having an adverse impact on their wellbeing. This will also have a negative impact on progress towards the accomplishment of sustainable development goal (SDG) 3 – “Good health and wellbeing”, which is aimed at all people globally have access to measures that ensure they live a healthy life and decent standards of wellbeing. The goal looks at not only infectious diseases but also non-communicable diseases, environmental risks, health systems and funding, and reproductive, maternal, new-born and child health. It has therefore been designated as a development priority by numerous countries globally.

Trade in the outputs of the healthcare sector is one way of assisting countries to meet SDG 3 together with other goals that concern improved health outcomes. As a result, trade should not be viewed only as a form of commercialization of health services, but instead as a meaningful way of making critical goods and services available to a wider range of consumers at a higher quality and more affordable price (Chanda, 2017). Shepherd (2015) argues strongly for liberalizing trade in these products stressing also that improving trade facilitation performance could be linked to improved handling of health-related products such as vaccines, which in turn would boost usage.

3. The impacts of the United States-China trade war on healthcare sector-related trade

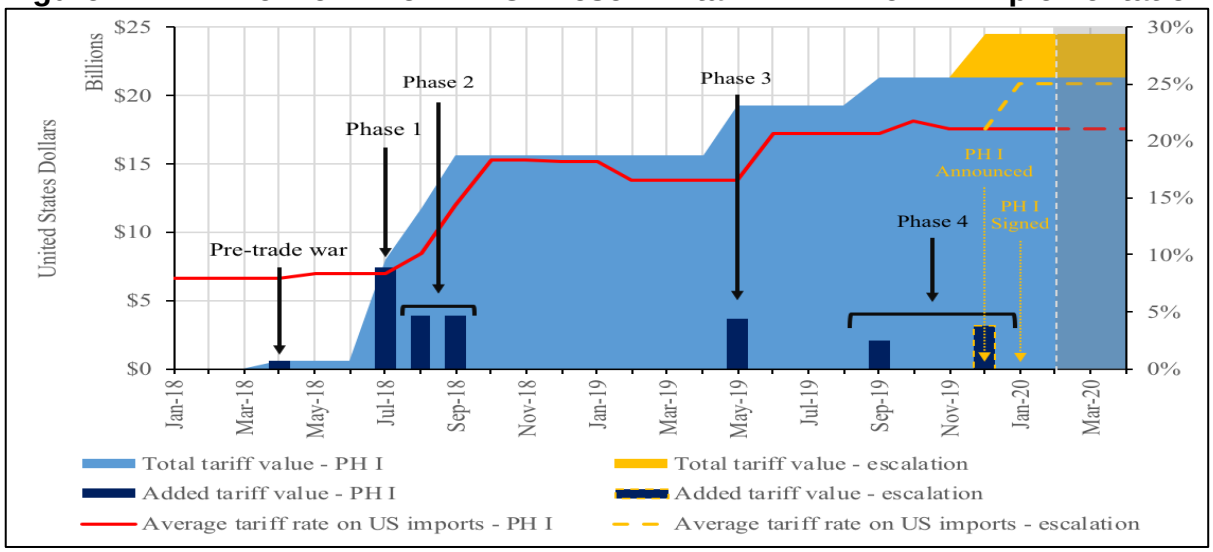
The trade war between the United States and China, which started in earnest in mid-2018, evolved in phases. Figures 1 and 2 depict the different dates and average tariff rates that have been applied by these two countries during the "tit-for-tat" tariff increase rounds. The dynamics shown in the figures point to a timeline when the tariffs on different goods actually occurred and whether these specific goods have been targeted further in the course of the trade war.

Figure 1. Timeline of the United States tariff hike implementation



Source: Anukoonwattaka and others, 2020, forthcoming.

Figure 2.Timeline of Chinese tariff hike implementation



Source: Anukoonwattaka and others, 2020, forthcoming.

As trade war deliberately goes against and undermines the multilateral system of rules that have been put in place to govern trade, it increases the level of policy uncertainty and adversely affects investment, production and trade decisions globally. There are also consequential impacts from this bilateral trade war on the rest of the Asia-Pacific region. Taking into account economic linkages through regional production networks and global value chains, an ESCAP (2018) analysis highlighted direct and indirect exposures of Asia and the Pacific economies. The direct exposure has an impact on exports produced by Asian economies that face tariffs when entering the United States. Indirect exposure affects suppliers of raw materials, intermediate goods and semi-finished products to China where demand for such products declines. The production networks and supply chains that were built through the "factory of Asia" rise made all economies interconnected and co-dependent, thus experiencing an impact from the same shocks, even if they are not directly exposed.

As it turns out, healthcare sector products are widely produced and traded through the regional and global supply chains. During its lifetime, a typical pharmaceutical product goes through the four main stages of manufacturing, distribution, dispensation and consumption in several different countries, given the complex networks of backward and forward integration that exist today. According to WHO and Health Action International, the price of medications is ultimately composed of the manufacturer's selling price, cost of insurance, freight and tariffs, importer's margins, distributor's margins, retailer's margins and taxes (WHO/HAI, 2008). Of these, this paper focuses on the effect that rising tariffs can have on prices, trade flows and ultimately on the operational health of value chains and national healthcare systems at large.

Any price increase of pharmaceutical goods inputs will put a strain on the producers of final goods if they choose to keep the price of the final goods the same as before; it is expected that sooner or later, they will give in and increase their output prices. This will lead to knock-on effects to consumers globally in two ways. The direct link described above will be that the producers will shift the burden onto consumers by increasing the price, meaning some people will no longer be able to afford the quantity of medicines that they require. The indirect link to the health of consumers is that pharmaceutical companies will reduce the amount of spending they put into costly activities such as research and development (R&D). If pharmaceutical firms reduce

their spending on R&D, then the levels of innovation in new drugs and medicine may also decrease, possibly hindering the advancement in this sector; this, in turn, means that the level of availability of new and more effective medicines may be reduced.

The reason why it is useful to choose the United States-China trade war as the lens through which to examine the healthcare sector is simple – the recent disruption in the trade relationship of these two partners constitutes a significant dilemma for the global healthcare trade, due to the dominance that these two countries have in the sector. The United States has always been the front runner in the healthcare sector, pushing forward innovation and production. During recent past decades China has become the fourth largest exporter of medical goods globally, fuelled by greenfield investments and tremendous commitments to R&D and building home-grown capacity, especially in upstream production of components and active ingredients (WHO-WIPO-WTO, 2013). More particularly, China has achieved a globally dominant role in the export of active pharmaceutical inputs (APIs), which are chemical inputs in pharmaceutical goods, and which essentially form the foundations of the healthcare sector (Haran, 2018). As the two giants began erecting barriers to trade, new levels of uncertainty struck the markets with the ripples spreading quickly into the global healthcare sector. While the United States-China trade war has affected a myriad of sectors, the impacts of the tariff tussle are particularly pernicious in the healthcare sector, in light of how supply shocks put affordable and accessible healthcare across the globe at immediate risk.[7]

Due to the extremely long list of goods that have been targeted by the trade war, multiple parts of the healthcare sector have been drastically affected. This section analyses two of the most important sections of the healthcare sector – pharmaceuticals (including generic drugs) and medical technology. As show below, these two groups are also among the products that recorded the heaviest impact in terms of tariff rises during the trade war.

[7] Chad Bown, PIIE, has published a series of papers analysing the United States-China trade war in general as well as the links to the COVID-19 related trade. See, for example, 13 March 2020 and other commentaries available at www.piie.com. Bown (2020b**)** also wrote about an adverse affect of recent American (and European Union) export restrictions on developing countries.

A. Pharmaceutical industry

According to the recently released WTO report on trade in medical goods (WTO, 2020a), medicines make up about 56% of the total global trade of the medical products defined in the context of COVID-19-related trade (cf. tables 1 and 3, 2019 data, in the cited WTO report). The United States is listed as the largest importer, absorbing almost 20% of total imports of medical goods, of which almost 60% comprises medicines (11% of medicine imports globally). On the other hand, the United States is the second-largest exporter, accounting for about 12% of global medical exports, 35% of which consists of medicines and drugs, resulting in its 4% global share (cf. Workman, 2019, who provides similar numbers on the United States share in trade of medicines and drugs).

Large quantities of these final pharmaceutical goods are produced at home which may lead to an erroneous conclusion that the United States pharmaceutical industry is not affected by the current trade war. However, the ingredients that are used to produce these goods are predominantly imported, with 80% of the API coming from China (Huang, 2019) and the remainder supplied by India and others. Reliance on Chinese inputs to final pharmaceutical products leaves the United States vulnerable to supply restrictions that can have significant impacts on the cost and availability of drugs, both nationally and globally, given the United States' role as a major exporter. Fears of 'weaponizing' pharmaceuticals are certainly not unfounded. In fact, the notion of restricting exports of antibiotics[8] to the United States has been suggested by numerous Chinese economists as a bargaining chip in the trade war (Tang, 2019) even if it has not been used to date.

As noted above, China plays a leading role in the upstream production and trade of the inputs that are then used to create final pharmaceutical goods. In fact, China has been among the Asia-Pacific region's most successful exporters of APIs for decades, with the majority of its trading volume aimed at developed markets, including the

[8] The United States currently imports 96% (Tang, 2019) of its antibiotics from China, meaning it is highly dependent upon China for this product and will likely be unable to create a sufficient domestic supply in a timely manner if the situation regarding the supply of antibiotics from China is changed dramatically. See also WTO, 2020a.

United States, where they are further refined and distributed (WHO, 2004[9]). In the context of the COVID-19 related trade, it has been found that China supplies 17% of the global exports of personal protective products and related commodities. Despite the fact that its share of total medical product exports is only 5%, it plays an extremely strategic role in the supply of certain components for medical equipment, medicines and general medical supplies.

Because the United States-China trade war covers the entire spectrum of upstream and downstream goods, the impact of tariff escalations will have consequences for bulk medicines, APIs and generics alike. As table 3 and subsequent figures show, these categories have had quite dissimilar trajectories during the trade-war.

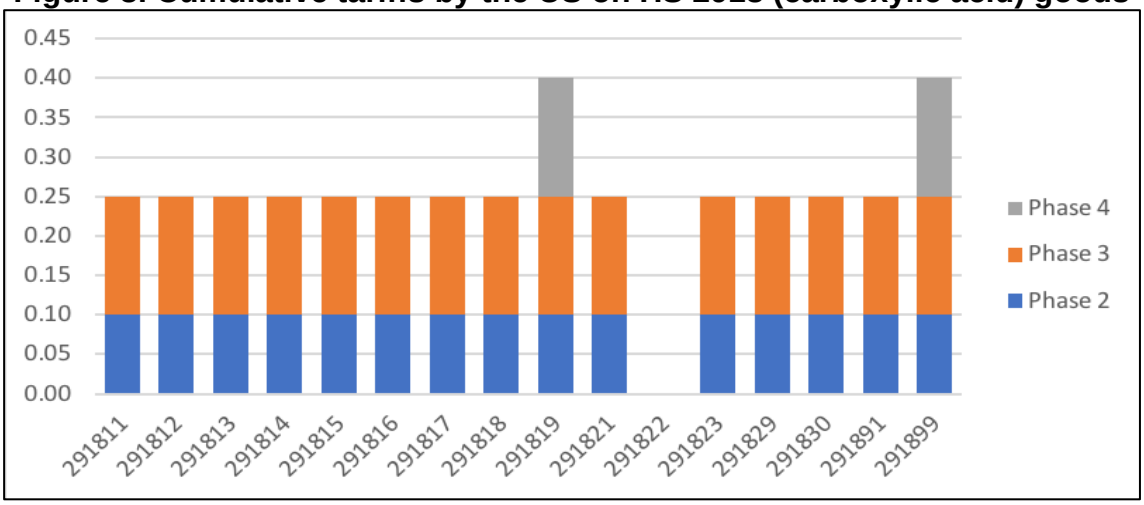
Table 3. Goods targeted by US tariffs, HS4 codes, 2019

HS4	Description	Use
2918	Carboxylic acids with additional oxygen function and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives.	Used for numerous purposes as production of anti-microbials.
2922	Oxygen-function amino-compounds.	Used for numerous purposes such as pH adjusters, surfactants and counter-ions.
2923	Quaternary ammonium salts and hydroxides; lecithins and other phosphoaminolipids, whether or not chemically defined.	Used for numerous purposes such as stabilizing emulsions.
2927	Diazo-, azo- or azoxy-compounds.	Used for numerous purposes such as catalysing reactions.
2928	Organic derivatives of hydrazine or of hydroxylamine.	Used for numerous purposes such as reducing chemical compounds.
3507	Enzymes; prepared enzymes not elsewhere specified or included.	Used for numerous purposes such as catalysing reactions.

[9] https://apps.who.int/medicinedocs/en/d/Js6160e/5.html.

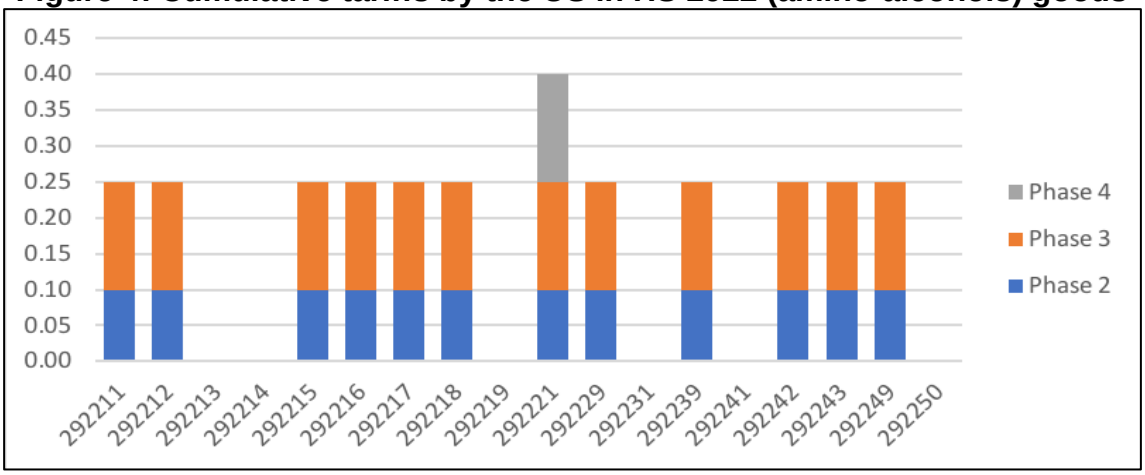
The most targeted group out of those shown in figure 3 is 2918, along with 2922 (figure 4), with almost every good under this category being subjected to tariffs by the United States, reaching up to a value of 40% in the case of 291819 and 291899 for carboxylic acids with alcohol functions.

Figure 3. Cumulative tariffs by the US on HS 2918 (carboxylic acid) goods



Source: Created by the authors from using United Nations Comtrade and MRIO data, 2019.
Note: The numbers along the vertical axis should be multiplied by 100 to be expressed as tariff levels in percentages, i.e. 0.25=25% tariff level.

Figure 4: Cumulative tariffs by the US in HS 2922 (amino-alcohols) goods



Source: Compiled by the authors, using United Nations Comtrade and MRIO data, 2019.
Note: The numbers along the vertical axis should be multiplied by 100 to be expressed as tariff levels in percentages, i.e. 0.25=25% tariff level.

Figures 3 and 4 demonstrate that the majority of goods included in these product groups have become subject to United States tariffs, with most being taxed at 25%. However, three groups of goods are subjected to tariffs that had reached 40% as of the September 2019 round of the tariff war.

Overall, 33% of traded goods that are used in the production of pharmaceuticals and medicine have been targeted by United States tariffs. The sheer number of APIs that have been targeted implies that the price of the components used in the production of medicines will rise and be passed on in the final price of the goods, as the pharmaceutical companies attempt to retain as much of their revenue as possible. In addition, if these increased costs are absorbed by the United States firms that drive pharmaceutical innovation, their funding for R&D may be affected, leading to a potential slowdown in the discovery of new medicines and health products as well as an increase in the price of their products further down the road. At the same time, companies from the United States are likely to begin shifting their production and sourcing patterns in response to the increased input costs. However, such effects may take several months (or longer) to manifest, largely due to the bulk transport and warehousing of APIs, which enables standing inventories as well as the lengthy timelines for R&D projects.

A.1. Effects on generic drugs

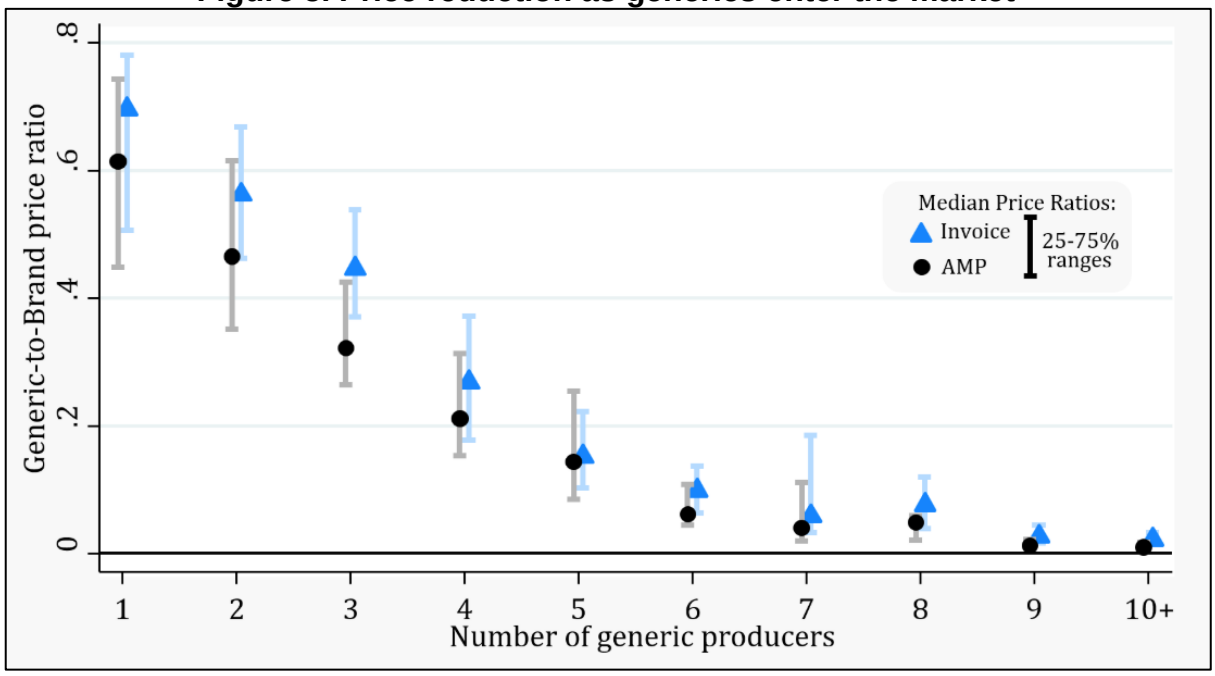
Generic drugs or generics are final pharmaceutical products with equivalent active ingredients and functions but with non-brand trademarks. Developing countries as well as lower income groups of society in developed countries are particularly reliant upon generics, which are considerably cheaper than ‘brand-name’ pharmaceuticals.

For decades a lively debate has been ongoing over generic drugs, which are essentially built upon the intellectual property of prior investors and firms to create cheaper versions of the same drug. This is seen as affecting the original patent owners by losing market power and potentially facing losses in profits as well as hampering their incentives to innovate. On the other hand, the production and trade of generics increases the availability of affordable medicines for a greater number of people globally due to increased competition and supply at lower prices. In fact, price reductions as generics enter the market can be drastic, as shown in figure 5.

Recent research has found that when six or more competitors enter a market, the price of the drug concerned drops by up to 95% compared with brand prices (Conrad and Lutter, 2019). This shows the importance of generics to developing countries (and to

SDG3), who benefit greatly from these massively reduced prices. Understandably, the owners of patents have not been standing idly while the number of generic medicine producers have been increasing. In the Annex, we have addressed some of the global and other rules that have been put in place related to trade in patent-protected products.

Figure 5. Price reduction as generics enter the market



Source: Conrad and Lutter, 2019.

A brief examination of the channels through which the tariffs and disruptions that form the trade war are affecting the pharmaceutical sector, shows that the generics sector outside the United States and China will also be affected. In principle, as pharmaceuticals face increasing input prices, generic firms may have bigger difficulties in accessing affordable inputs due to their lack of intellectual property portfolios which can be used in tight negotiations. The dropping out of generic producers would affect developing countries, both in Asia and the Pacific and globally, which are very reliant upon generics. For example, in Thailand around 90% of trade value in pharmaceuticals is made up of generics, amounting to US$1.8 billion in 2015 (Srinakharinwirot University, 2016). Also, given that increases in costs may slow down innovation, coupled with potentially higher IP protection, the creation of new generics

would also be slowed down dramatically. Therefore, as the trade war is also seen as damaging the strength of the multilateral rules and agreements (as explained in the Annex) that govern trade in the healthcare sector, the effects may be multiplied, thus delaying access to important and needed medicines and the achievement of SDG 3.

B. Medical technology

The future of medical technology looks brighter than ever. As the Fourth Industrial Revolution (4IR) looms on the immediate horizon, big tech firms (so-called GAFA or Big 4: Google (Alphabet), Apple, Facebook and Amazon) and other technology leaders are making unprecedented contributions and commitments in areas such as digital health. The products that these global giants will create are helping to track health issues. In addition, they are going into the supply side of the sector, with Amazon having a licence to supply medical supplies to providers in 43 States in the United States (Huynh, 2019).

Innovative products and technologies are expected to reduce the pressure on healthcare systems globally, which is going to become increasingly strained due to both increasing and ageing populations.[10] Frontier technologies are also expected to aid the healthcare sector immensely, bringing vast advances in drug development speeds, increased treatment choice, more efficient diagnoses, predicting disease outbreaks (which would have been very useful in tackling the current coronavirus outbreak) and facilitate medical consultations with patients in rural areas (Thompson, 2018; ESCAP 2020).

The 4IR is anticipated to bring a number of new technologies to the forefront of day-to-day manufacturing, including big data, artificial intelligence (AI), and machine and remote learning. With regard to health, the upcoming roll-out of 5G connectivity is expected to have particularly significant impacts and it has key potential fields in which it is expected to greatly benefit the healthcare sector by (a) enabling transmission of large imaging files; (b) expanding telemedicine; (c) improving AR, VR and spatial

[10] Global healthcare spending projected to reach 13% of GDP in OECD countries by 2050 (De la Maisonneuve and Martins, 2014).

computing; (d) allowing reliable, real-time remote monitoring; and (e) providing artificial intelligence (AT&T Business Editorial Team, 2019). Of the above, perhaps the most acutely relevant category is telemedicine, also known as telehealth. As the explosive spread of COVID-19 has overburdened national health systems and forced countries into lockdown, telehealth has been upgraded from a potential solution to the only answer available. The urgent need to establish alternative and off-site medical capacities has led to the ad hoc loosening of regulatory limitations on telehealth, with countries such as the United States greatly increasing the scope of telehealth services that can legally be provided under the social welfare system as of early March (CMS, 2020).[11] The rapid expansion of the telehealth sector is likely to have secondary impacts on Mode 1 services trade, which covers medical services provided at distances, as shown in table 2. The rollout of 5G technologies will further increase the magnitude of these effects and we can expect to see cross-border telehealth services trade increase in volume and importance.

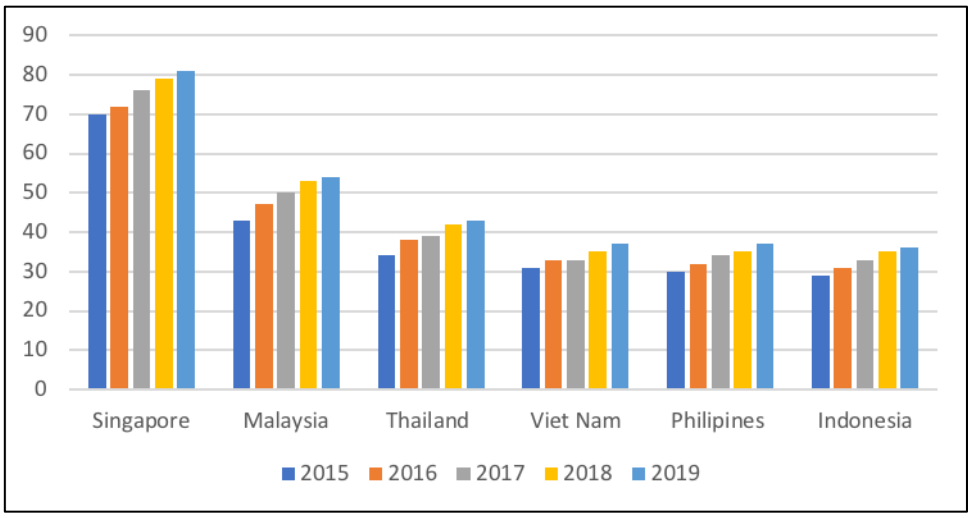
While 5G and other 4IR technologies have great promise, for them to be used efficiently (and effectively) in the healthcare sector the quality of connectivity must be high with broad access. In fact, the readiness of the healthcare sector to adopt new technologies is a key determinant in whether a country will be successful in generating value-added tradeable goods and services in the 4IR, with developing nations largely playing catch-up to date. Using ASEAN as an example, we can see that an attempt must be made to close the connectivity gap; although many people are connected to the Internet, there is still a large number of people who are left out. Therefore, in order for the 4IR to have deep and lasting impact, there needs to be greater emphasis on digital infrastructure in ASEAN. ASEAN members are steadily moving towards this goal, as shown in figure 6, but they still lag behind many developed countries. This is very similar to the situation in most developing countries in Asia and the Pacific.[12]

All in all, this sector has been the most highly targeted by the trade war, with the United States implementing tariffs of 30% on the products of this sector (Anukoonwattaka and Lobo, 2019). Products under this category are used in the creation of many important

[11]Available at https://www.cms.gov/newsroom/press-releases/president-trump-expands-telehealth-benefits-medicare-beneficiaries-during-covid-19-outbreak
[12] See, for example, ESCAP, 2020, figure 12 on page 21.

medical machines and devices. Moreover, it encompasses products that are used to create the hardware required for full implementation of the 4IR technologies. The effects on more traditional healthcare sector equipment (MRI, cameras, x-rays etc.) is equally worrying, with the tariff-induced price increases jeopardizing the availability of such equipment and with developing countries being hit the hardest.

Figure 6. The Global Connectivity Index score of ASEAN countries in the database



Source: Compiled by the authors, based on the Huawei GCI database.[13]

In terms of new frontier technologies, rising tariffs will lead to a reduction in progress towards their implementation and roll-out. It should be noted that many of these technologies are still at an early stage and are not yet able to be fully applied and rolled out. This means that the companies involved in the incubation of such technologies are still required to put in place a large amount resources in R&D, which by its nature is risky and uncertain of recouping sunk costs. As the price of components for such technologies increase, we will likely see a secondary effect in R&D with a reduction in activities that are deemed most risky or which are most reliant on external and imported inputs. A slowing down of R&D will have profound effects in the long term, with fewer innovative and frontier technologies becoming available.

Which goods are particularly relevant to the discussion at hand and what impact has the trade war had on them? Looking at category C2 in table 1, several medical

[13] The score is derived from ICT investment, ICT maturity and digital economic performance.

technology-related goods can be discerned, as listed below in table 4, which are particularly susceptible to the ill-effects of the United States-China trade war.

Table 4. Goods targeted by US tariffs for medical technology equipment, HS4 codes

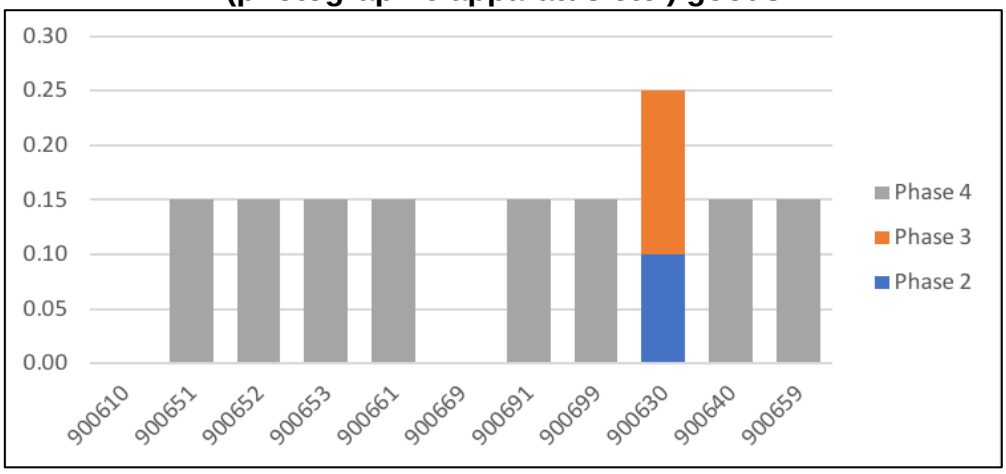
HS4	Description
9006	Photographic (other than cinematographic) cameras; photographic flashlight apparatus and flashbulbs other than discharge lamps of heading 85.39.
9018	Instruments and appliances used in medical, surgical, dental or veterinary sciences, including scintigraphic apparatus, other electro-medical apparatus and sight-testing instruments.
9021	Orthopaedic appliances, including: crutches, surgical belts and trusses, splints and other fracture appliances, artificial parts of the body, hearing aids and other appliances that are worn or carried, or implanted in the body, to compensate for a defect.
9022	Apparatus based on the use of X-rays or of alpha, beta or gamma radiation, whether or not for medical, surgical, dental or veterinary uses, including radiography or radiotherapy apparatus, X-ray tubes and other X-ray generators, and high-tension generators.

The proportion of goods that are classified as being traded under the medical technology equipment group and subject to increased tariffs is 63%, almost double the number of goods used in the production of pharmaceutical goods production under tariffs. The United States started targeting this sector very early in the trade war, with tariffs appearing on some goods under this category as early as July 2018. This is a different pattern to what was found for the pharmaceutical sector, which was targeted in later rounds on the whole. The highest individual tariff rates are at 50% and are on machinery, specifically for machinery that is used to liquify gases.

However, the category of goods that are predominately used in medical technology equipment is electrical and optical goods. These goods have been extensively targeted by the United States as can be seen by the increases in tariffs in figures 7 and 8.

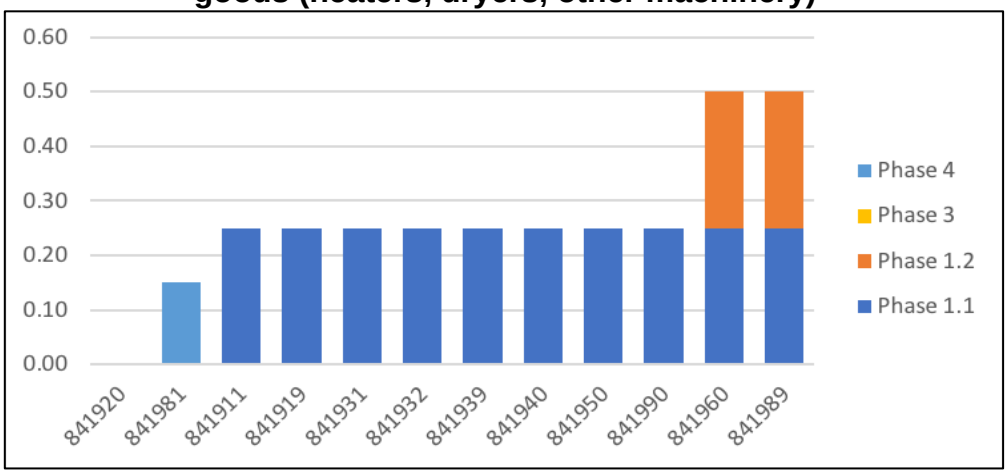
For the remainder of the goods in this category the tariffs were imposed by the United States in the initial phase with a single rate of 25%. The effects are similar to those vis-à-vis pharmaceuticals, with immediate price increases following suit. Again, developing regions lack the production capacity for such equipment and are therefore forced to face international market prices for these goods if not total inaccessibility due to unaffordability.

Figure 7. Cumulative tariffs by the United States on HS 9006 (photographic apparatus etc.) goods



Source: Compiled based on United Nations Comtrade and MRIO data, 2019.

Figure 8.Cumulative tariffs by the United States on HS 8419 goods (heaters, dryers, other machinery)

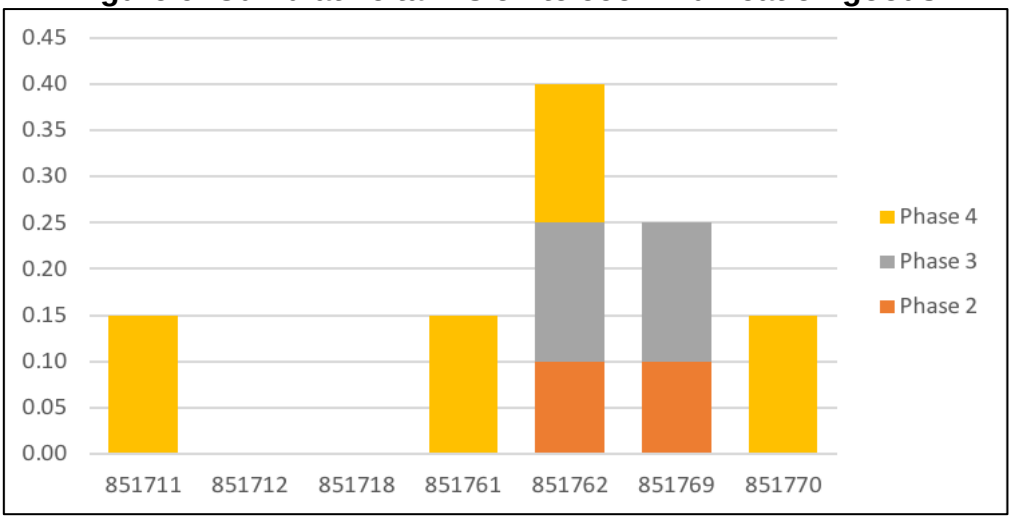


Source: Compiled based on United Nations Comtrade and MRIO data, 2019.

In the first instance, these tariff rates will affect the more traditional forms of medical technology (e.g., x-ray machines). In addition, the tariffs will also increase the prices

of components that are necessary for reaping the benefits of the 4IR and for rolling out the technologies expected for aiding healthcare sectors in particular. Using the example of 5G, we can see that the trade war is already hampering the move forward to its universal roll-out. In fact, 5G is predominantly dependent on telecommunication components and equipment; in order for some of the uses to be applied effectively, large portions of the population in a country must have access to a device that is connected to the 5G network, such as a mobile phone. However, telecommunication goods have also been targeted by the trade war and have had tariffs put in place on multiple key goods involved in their production as shown in figure 9.

Figure 9. Cumulative tariffs on telecommunication goods



Source: Compiled based on United Nations Comtrade and MRIO data, 2020.

These goods do not encompass all goods that will be used in the production, development and spread of 5G technology but they are an important part of the process for this technology without which it cannot be successfully rolled out in service of the healthcare sector. Moreover, the leading firm in China on 5G products, and a dominant supplier, is Huawei, which has been banned from exporting to the United States[14] based on security threats. This is greatly affecting many United States firms that rely on Huawei to supply inputs for their technology; the sudden halt of supplies has massively reduced their progression. It is also having adverse effects on Huawei's ability to push forward 5G development due to a loss of revenue from reduced

[14] Huawei was placed on the Bureau of Industry and Security Entity List in May 2019 (together with 68 non-United States affiliates), effectively banning the importation of its products into the United States. Since then, 46 more companies that are affiliates of Huawei have been added to the list (document Citation: 84 FR 43493).

exports,[15] with the United States ban potentially costing Huawei US$10 billion (Keane, 2020). A similar mechanism, where making a subset of components or inputs prohibitively expensive or otherwise inaccessible via tariffs leads to a total inability to roll out entire product systems, can also occur in other categories of goods, including APIs.

When 5G does eventually become available on a wide scale, countries must be prepared to implement it, and to do so in an efficient fashion. The Philippines, for example, is among ASEAN countries attempting to increase its healthcare sector's use of technology. The Philippines has approved an Act that will enhance the level of ICT participation in the country's healthcare sector via an eHealth system, which is part of their Uniform Health Care Act,[16] as the benefits that can be realised from technology will aid in the success of this plan to provide quality healthcare to all. However, the creation and implementation of an efficient eHealth system will rely on the free flow of affordable technologies, which under the current trade climate is looking like a more challenging achievement. As discussed above, the trade war may put these plans at immediate risk.

The trade war remains an important factor, together with the coronavirus outbreak, in hindering the roll-out of 5G. This is likely putting a dampener on the pace of progress, given how significantly it has reduced the production and manufacture of high-tech goods due to factory closures in China.

C. Selected statistics on trading of key healthcare products during the trade war

While the public eye has focused on other areas (e.g., soybeans), the trade war has had undoubted effects on the healthcare sector. In particular, when looking further into the specific categories that are critical inputs to the supply chains that drive the health care sector trade, as shown in the previous sections, it is clear that this is not true.

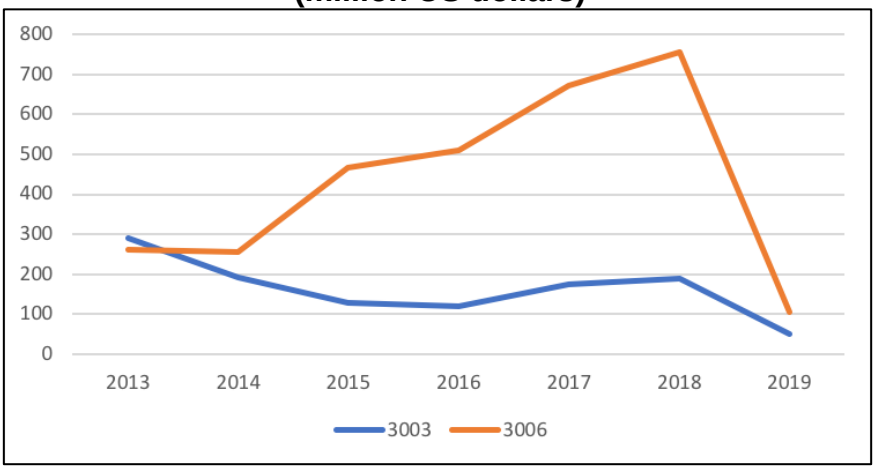
[15] Huawei was also been banned from Australia together with its provision of 5G to the country, on 11 July 2018 (Keane, 2020).
[16] Philippines, House of Representatives, 2018.

As explained above, China is a dominant supplier of ingredients to the pharmaceutical sector, and therefore any disruptions to these trade lines will leak into the global pharma industry. Moreover, two of the largest producers of pharmaceutical goods, India and the United States, are massively reliant on China for their pharmaceutical inputs. The United States is itself affected by its own protectionist tariffs that it has been implementing on the goods during the rounds of the trade war. With tariffs on such inputs being at levels of up to 40%, the short-term effects will be increased prices on end products (cf. Bown, 2020a) with the long-term effect being a reduction in innovation. However, it is unlikely that firms will be able to pass on all price increases to consumers, given that the demand for all pharmaceuticals or medical equipment is not perfectly inelastic. As firms begin to lose revenue, they will make cuts in other sections of their business, leading to a potential fall in R&D. This will reduce the advancement of the global pharmaceutical sector, including that of generics, further down the road.

This brings us to India, the largest exporter of generic goods. India is not in the direct line of fire from the United States-China trade war, but in turn their pharmaceutical sector is being hampered by the coronavirus disrupting production in China and therefore shrinking the supply of available inputs (see more in section 5, cf. Joseph, 2020). This, too, is affecting the United States' ability to produce pharmaceutical goods on top of the trade war. As the flow of APIs is choked by protectionist measures and the closing of factories in the face of the coronavirus, the pace at which generic drugs will become available will be reduced. There is already a delay between when new innovative medicines are invented and when generics are able to reduce prices, allowing greater access by developing nations; there is a risk that this will now increase further, which is of great concern for developing regions and those living in lower socio-economic communities.

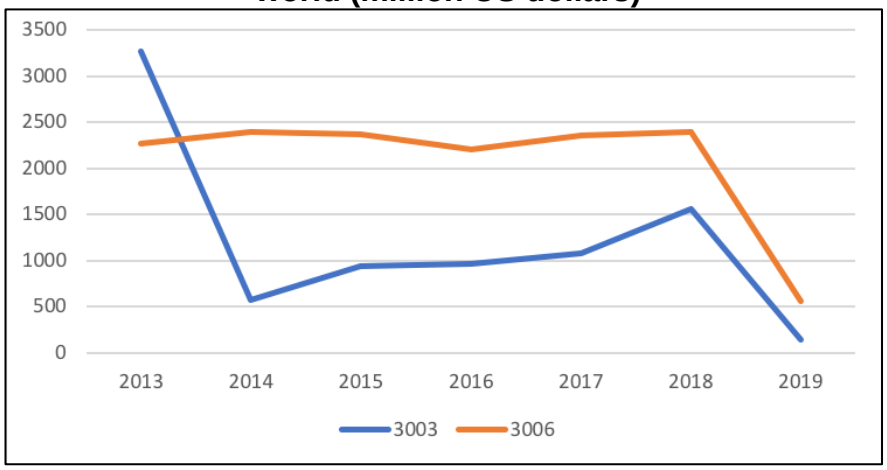
Our empirical findings support the above interim conclusions. With regard to the global flow of bulk medicines coming out of China and the United States, a huge decrease in the flows between 2018 and 2019 can be seen, which marks the start of the trade war. The trends in the bulk medicine flow out of these two countries are shown in figures 10 and 11.

Figure 10. Chinese exports of bulk medicine to the world (million US dollars)



Source: Compiled by the authors using United Nations Comtrade data, accessed in March 2020.

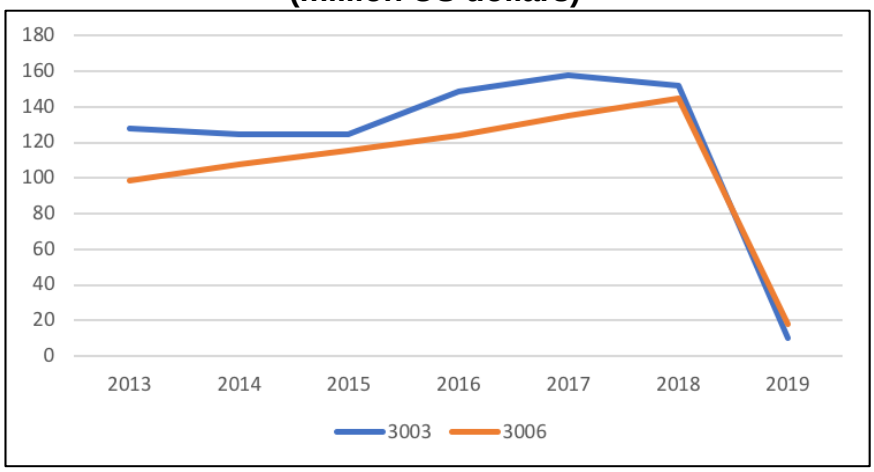
Figure 11. United States exports of bulk medicine to the world (million US dollars)



Source: Compiled by the authors using United Nations Comtrade data, accessed in March 2020.

As can be seen in the figures, after the initiation of the trade war, the value of bulk medicine exports dropped dramatically; this could be a direct effect of the barriers that have been implemented. Moreover, similar trends can be observed for other major pharmaceutical exporters that are not directly involved in the trade war. For example, India also saw enormous reductions in the export value of bulk medicines between 2018 and 2019, as shown in figure 12.

Figure 12. Indian exports of bulk medicine to the world (million US dollars)



Source: Compiled by the authors using United Nations Comtrade data, accessed in March 2020.

These reductions may be due to a myriad of reasons outside the trade war (although the data end with 2019, so the outbreak of the coronavirus and the supply chain disruptions linked to it have not been counted in yet). However, given the timing, magnitude and categories affected, it is more than likely that the trade war is a major contributor to the reduction of the outflows of medical goods from major exporters. Regarding the medical technology sector, the effects are similar. However, in this category, both final goods and inputs are being targeted significantly by the trade war.

The damage to supply chains that the trade war and the coronavirus have inflicted has not been solely suffered by China and the United States, as countries on the periphery have also facing their share of the fallout (cf. Bown, 2020b).

4. Healthcare sector-related trade and COVID-19[17]

The COVID-19 virus pandemic has commandeered the global community's attention since early 2020. The fast pace of spread, despite its relatively low mortality rate compared to other respiratory syndromes, has sparked fears and caused market meltdowns everywhere.[18] The measures local and state Governments have taken to

[17] COVID-19 related measures known as the "Great Lockdown" will affect trade through demand as well as supply changes in all sectors. As much as possible, this section focuses on tradeable producs and services of the healthcare sector.

[18] The average mortality rate for COVID-19 is 3%-4% (WHO, 2020c). However this rate differs across different demographics. For example, "the fatality rate in China for those aged over 80 is an estimated 21.9%. For ages 10 to 39 years, however, the fatality rate is roughly 0.2%", according to a

contain the virus have led to widespread travel restrictions, ranging from bans to entry to mandatory quarantine periods, first for travellers coming out of mainland China (Hong Kong, China and Macao, China included) and soon encompassed countries such as the Republic of Korea, the Islamic Republic of Iran, Italy, Spain and others. By 30 April 2020, 208 national and similar authorities had either sharply restricted or suspended passenger air travel in an attempt to protect their domestic population (IATA, 2020[19]). With countries such as the United Kingdom, Spain and the United States being declared as risk zones, not only was passenger travel almost completely halted, but also many countries introduced mandatory isolation of arriving passengers in their homes even if they were not showing any symptoms of COVID-19. These restrictions have been accompanied by various forms of limits on their populations' mobility, including mandatory "work from home", closure of all non-essential businesses and, in many places, complete "lock-down". On 24 March 2020, the world's most populous country, India, issued a full quarantine, completely closing the country off.

In addition to the social effects, the economic effects of so many people being withdrawn from their daily activities have still to be figured out more precisely (see, for example, IMF, 2020; World Bank 2020; ADB 2020; and ESCAP 2020 among others). What is clear is that the COVID-19 pandemic will affect the global economy through both supply and demand shocks simultaneously, while the duration of these shocks is still not easy to predict.

Initially, the economic costs were associated with the supply shocks originating from China where numerous factories were shut down in order to prevent the virus from spreading out of Hubei province. According to the EIU (2020[20]) while Hubei province accounted for just 1% of China's exports in 2019, it is home to several industries,

separate study drawing on patient records of 44,672 confirmed cases. Fatalities and severe symptoms are almost non-existent at even younger ages (Wan and Achenbach, 2020). On the other hand, Euronews reports a fatality rate for Italians aged 80-89 years of over 42%. While at present the United States has the largest absolute number of infections and deaths, the overall fatality rate is just below 6%. However, these estimates are being reassessed as the virus spreads to more countries.

[19] IATA coronavirus updates on 30 April 2020 are available at www.iatatravelcentre.com/international-travel-document-news/1580226297.htm

[20] EIU, 2020: "Coronavirus: The impact on global supply chains", 19 March 2020, available at www.eiu.com/industry/article/479237431/coronavirus-the-impact-on-global-supply-chains/2020-03-19.

including automotives, electronics, biopharmaceuticals and steel, which play a significant role in China's place as the factory of the world.

The ramping down of production capacities in China were felt very quickly in all countries linked to China through production networks and supply chains. Many firms in those other countries had to shut down or run at minimum capacity so that a contagion effect ran from China to economies linked in backward or forward ways to Chinese producers as well as the companies providing trade-related services, such as shipping, insurance and financial services etc. The sudden supply shock has proven particularly detrimental to companies employing "just-in-time" or lean methods of production where inventories are held at minimum levels. For example, Nissan had to temporarily close down its production factories in Japan and the Republic of Korea due to a lack of parts required to operate coming out of China (BBC, 2020).

These disruptions of supply chains were not limited to the automotive industry and electronics; they also spread to the healthcare sector where holding significant inventories is not feasible due to expiry and carrying cost issues. Given that COVID-19 is affecting different countries at different times with the peaks of restrictive measures (i.e. lockdowns) occurring independently of one another, we may expect to see a cascade of supply shocks as essential upstream inputs are choked by restrictions in one country after another.

The other way in which COVID-19 has an impact on the global economy and trade flows is its freezing effect on demand. While certain sectors – such as telehealth, delivery logistics and digital commerce – are likely to see an uptick in demand, a significant portion of tradeable goods and services will see a decrease in demand as the global population takes shelter from the pandemic. The effects of a global cooldown of trade are visible at the level of port activity, which is running at record lows (*Financial Times*, 2020a).[21] The short-term effects are best explained by the lack of consumption opportunities caused by quarantines and self-imposed changes to consumption routines. While the long-term effects on consumption remain to be seen, it is clear that lost income, mounting liabilities and extraneous expenses imposed by

[21] See https://www.ft.com/content/1071ae50-6394-11ea-b3f3-fe4680ea68b5.

quarantines are likely to significantly disrupt typical consumption patterns for the foreseeable future.

In the following subsection, we examine supply chain risks, trade barriers and consumption pattern changes in further detail from a perspective of the healthcare products trade.

A. Supply chain risks of COVID-19

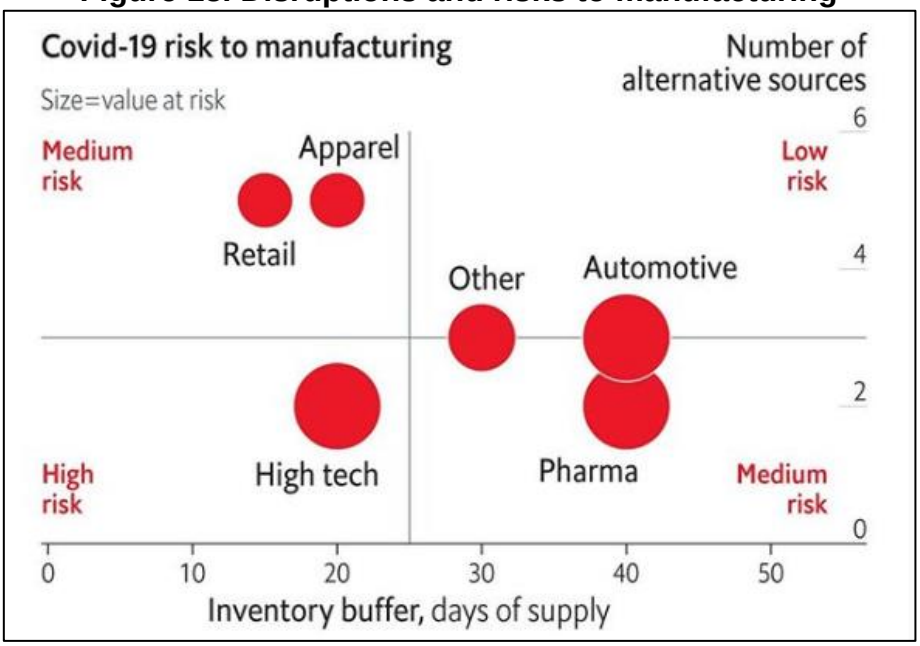
Modern manufacturing is largely organized through vast and complex supply chains that produce upstream inputs and add value to interim products, typically on several continents and countries for each given product. A typical manufacturer will have several tiers of suppliers, many of which it will never interface with directly but all of which can potentially disrupt its operations if it ceases to produce inputs. At the same time, most modern production methods rarely call for redundant supplier relationships and deep buffer stocks, and instead opt for lean inventories and contingency plans that are drafted but never tested in real-life scenarios. The vast geographical spread of COVID-19, and the fact that it has hit some of the world's most important exporters very hard, has highlighted country risks of an unprecedented scale (MIT, 2020).[22] This has led to calls for a reorganization of supply chains with regionally duplicated capacities.

At the time of writing this report, the impact of COVID-19 on manufacturing has been limited, with the main issues being supply chain disruptions, difficulties in returning to productive capacity as well as issues with delivery and distribution due to travel restrictions (Deloitte, 2020).[23] However, the situation is shifting on a day-to-day basis due to the effects of low inventories, delayed shipments and lack of human resources manifest in different countries at different times. As a result, it is extremely likely that the manufacturing sector will see a significant decrease in activity due to COVID-19. However, the negative effect is unlikely to be uniform across the entire sector.

[22] https://sloanreview.mit.edu/article/is-it-time-to-rethink-globalized-supply-chains/.
[23] https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/finance/Supply-Chain_POV_EN_FINAL-AODA.pdf.

Figure 13 shows the disruption levels of different manufacturing sectors resulting from the coronavirus and how it will affect the supply of goods in these sectors, which depend on high intensity cross-border production linkages.

Figure 13. Disruptions and risks to manufacturing



Source: The Economist, 2020a.

Figure 13 also demonstrates how the sectors vary in the level of disruptions and risks they are facing in the wake of the pandemic.[24] Thus far, the primary source of these risks has been reduced production in China, as factories and firms been closed in order to dampen the spread of the outbreak and contain it as "provinces accounting for more than 90% of Chinese exports have kept factories either shut or running at low capacity since 31 January" (*The Economist*, 2020b). However, as similar restrictions are rolled out in other parts of global supply chains, the locus of disruptions is bound to shift from China to other countries.

It should be noted that the pharmaceutical and technology sectors analysed earlier are categorised under medium risk and high risk, respectively. Overall, these two sectors combined have a significant influence on the healthcare sector, which is under

[24] "At least 51,000 (163 Fortune 1000) companies around the world have one or more direct or Tier 1 suppliers in the impacted regions, and at least 5 million companies (938 Fortune 1000) around the world have one or more Tier 2 suppliers in the impacted regions" (Dun and Bradstreet, 2019).

particular risk of disruptions caused by the COVID-19, both in terms of increased demand for goods and lower supply capacity due to supply chain breakages.

EIU (2020) reports that China has replaced India as the world's leading producer and exporter of API by volume, giving China a crucial role in global supplies of medicines. In particular, it dominates global supplies of antibiotics, vitamins and anticoagulants (heparin). While the United States is the largest producer of some healthcare products, it depends on imports to meet local demand. On top of the trade war, which caused reduced imports in 2019, the “Great Lockdown” around the world has disrupted trade and undermined the capacity of health systems to deal with the pandemic. In the light of the disruptions caused by the pandemic, senior political leaders in the United States have called for a reduction in dependence on medical goods coming from China and the rest of the world (*Financial Times*, 2020b).

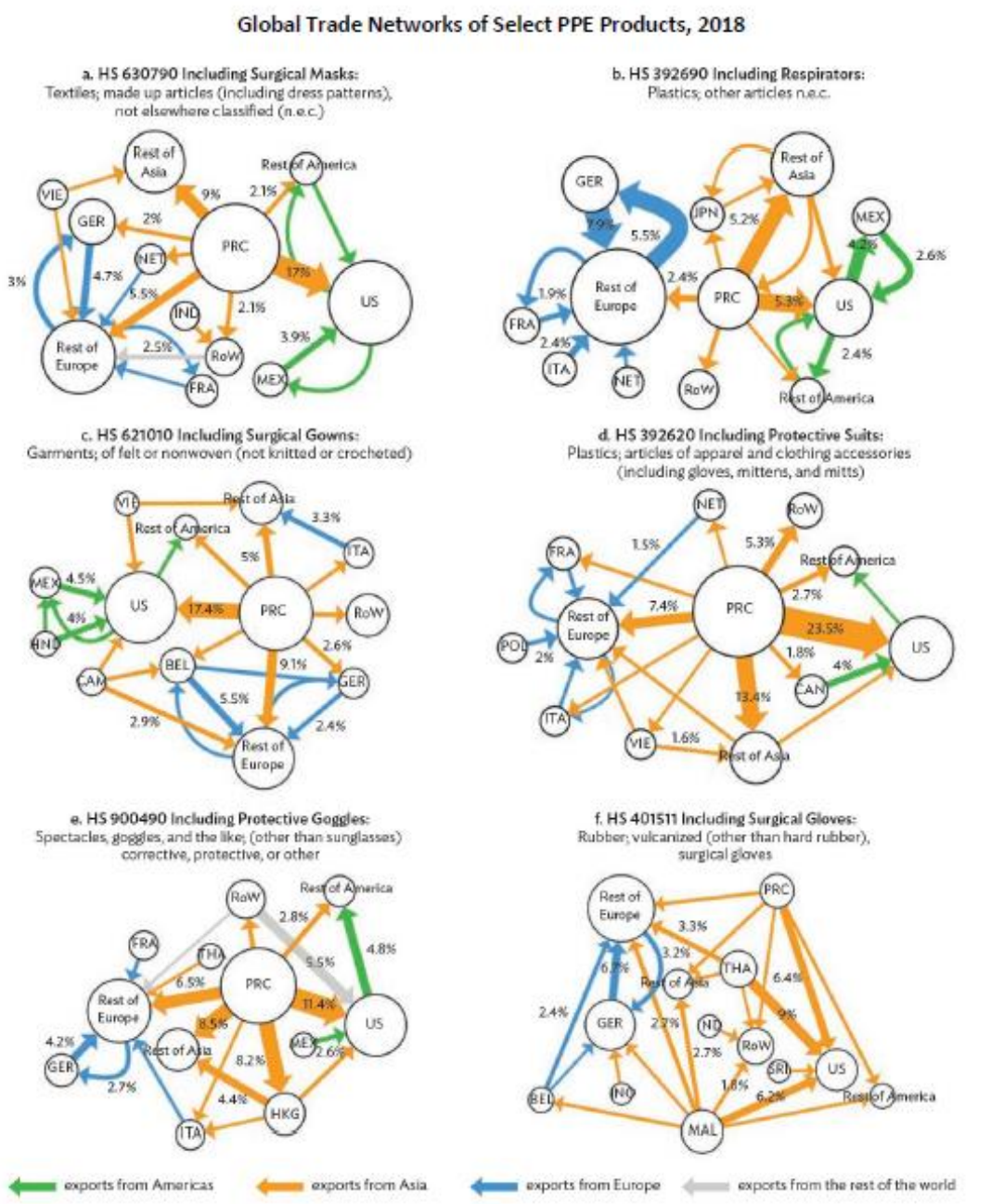
In addition, there are similar worries about availability across the pharmaceutical supply chains that involve India due to the drastic lockdown implemented in that country at present. The fact that China is the biggest exporter to India, with up to 85% of API imports coming from China as of 2019 (Kumari, 2019), India’s pharmaceutical market (the third-largest by volume) will also be put under strain. Given that India is are the largest supplier of generics globally (20-22% of global export volume) (IBEF, 2019), the Indian lockdown will add additional pressure on healthcare sectors, especially in developing countries that rely on generics. In addition to supply side issues, the significant increases in demand for specific goods, such as masks, gowns, gloves (or PPE overall)[25] and ventilators, is likely to cause spot-price increases and unavailability in the short term and productive-capacity diversions in the medium term, which will add to the tally of supply chain disruptions. The box text below summarizes the findings of the ADB (2020) analysis of the PPE supply chain.

[25] For example, WHO (2020) has estimated a monthly need for 89 million medical masks, 76 million examination gloves and 1.6 million medical googles.

PPE trade networks*

The trade network maps shown in the figure below reflect a high regional concentration in the PPE supply chain. As is the case with other sectors, three regional clusters emerge: Asia, Europe and the United States. China is joined by Germany and the United States as the main producers, but China plays the central role in production and export to Asia and the rest of the world. There are other Asian countries with a leading or significant role in production of some of the PPE items; Malaysia is the top exporter of surgical gloves in the world, followed by Thailand.

Within Europe, major PPE suppliers are Belgium, France, Germany, Italy, the Netherlands and Poland. Although the United States is the largest buyer of PPE produced in China (and gloves from Malaysia), it is still the major producer and at the core of the regional supply value chain for many PPE products in North and South America. Abrupt, large supply disruptions in China, as the major supplier in the trade network, will have a spill-over impact throughout the world. Given China's leading place in the regional PPE supply chain, disruption of supplies from China will likely have a substantial impact on regional supplies.



BEL = Belgium; CAM = Cambodia; CAN = Canada; FRA = France; GER = Germany; HKG = Hong Kong, China; HND = Honduras; HS = Harmonized System; IND = India; INO = Indonesia; ITA = Italy; JPN = Japan; MAL = Malaysia; MEX = Mexico; NET = Netherlands; POL = Poland; PPE = personal protective equipment; PRC = People's Republic of China; RoW = rest of the world; SRI = Sri Lanka; THA = Thailand; US = United States; VIE = Viet Nam; n.e.c. = not elsewhere classified.

Notes: The size of the nodes represents the economy's total trade (exports plus imports) of the concerned commodity group. The thickness of the lines represents the value of the flow of goods between economies. Some lines show the share of exports to the total global exports of the commodity group. For clarity, only exports with high values are represented by the lines.

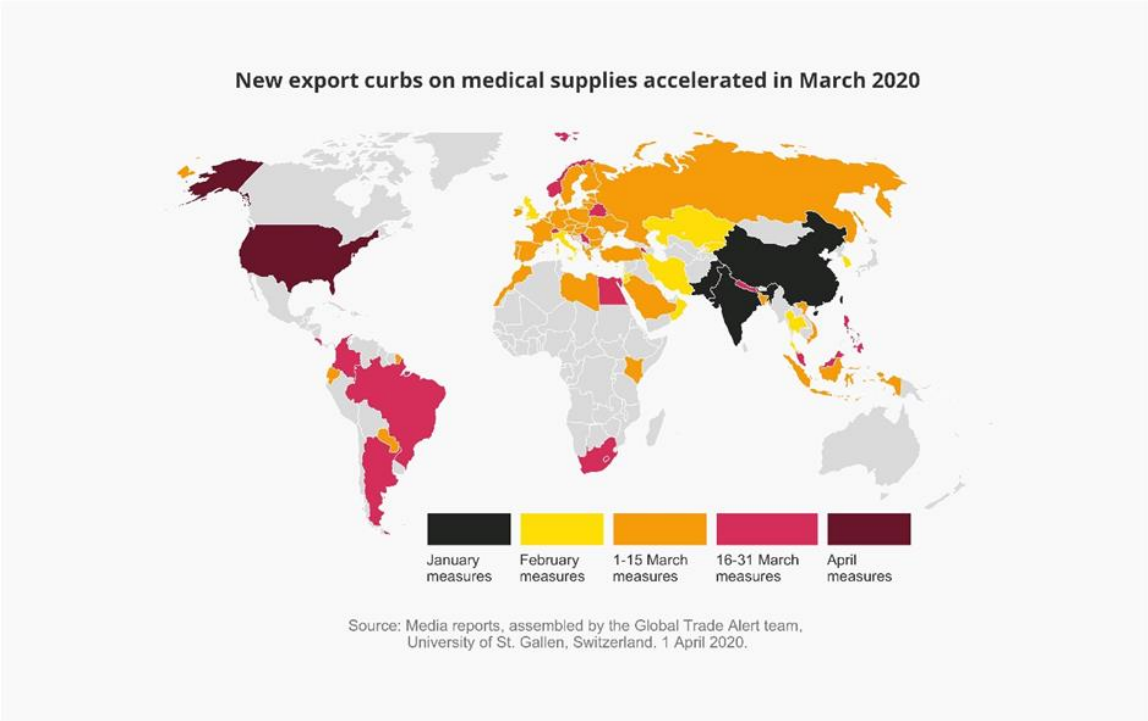
Source: ADB calculations using data from United Nations. Commodity Trade Database. https://comtrade.un.org (accessed 22 March 2020).

* Source: The figure is reproduced from ADB (2020).

B.Barriers to trade linked to the COVID-19 pandemic

The pandemic is not just affecting trade in the healthcare sector by choking off the supply of necessary goods coming out of China and other affected countries, which many firms in the sector rely on, but also through countries' responses to the threat that pandemic poses for them. At the time of writing, a total of 80 countries have placed export restrictions on the six main groups of products (ranging from test kits to disinfectants and soap) that have been identified by the World Customs Organization as an indicative list of medical supplies used to fight COVID-19 (Global Trade Alert, 2020; WTO, 2020b).[26] The restrictions themselves have ranged from export authorization requirements, licence censure threats, mandatory single national purchaser schemes to full export bans (see figure 14). Export restrictions have multiple harmful effects – they undermine capacity of import-dependent countries to fight the pandemic, harm producers in the exporting countries,[27] and likely compromise recovery prospects because they destroy trust and the spirit of collaboration among nations. (cf. Baldwin and Evenett, eds., 2020)

Figure 14. Spread of export restrictions during the COVID-19 pandemic



Source: Global Trade Alert, April 2020b.

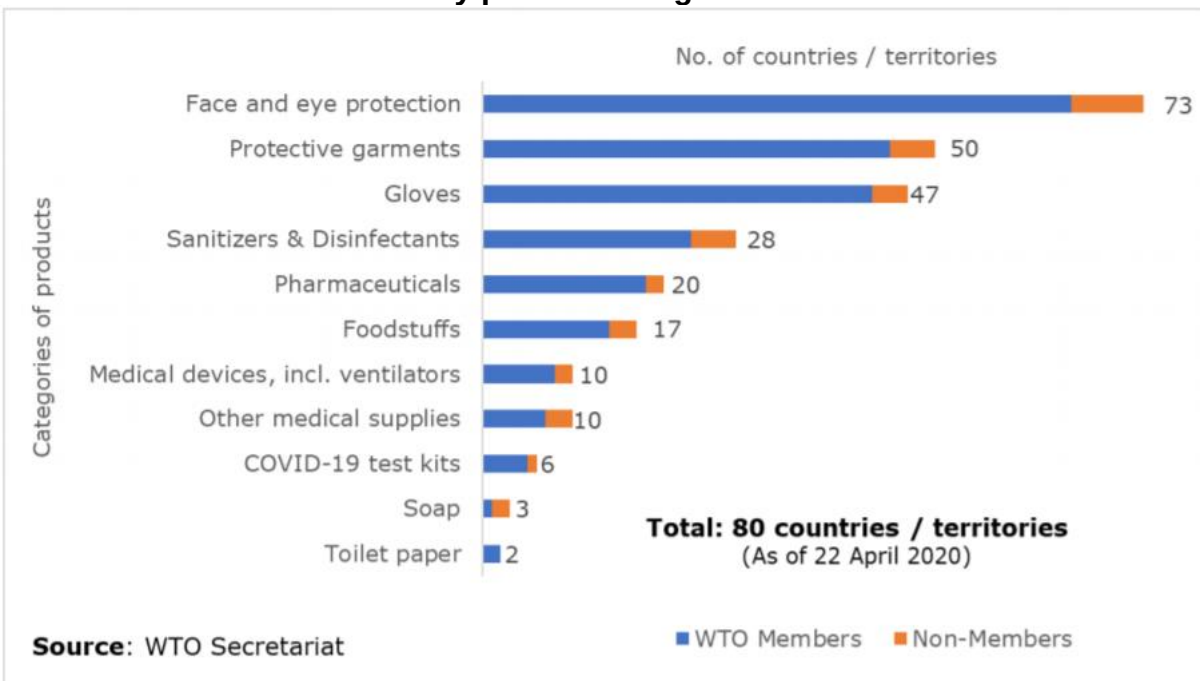
[26] See https://www.globaltradealert.org/reports/51 and subsequent updates

[27] Thacker (2020) explains that producers in India, who rely on exports of the N95 masks, also produce masks that are mostly used in industry and not mainly for public health use.

The export bans that are being imposed with a view to securing strategic supplies for national consumption and to avoid locally produced goods being influenced by spiking global market demand that would otherwise raise prices. However, export bans are widely considered counter-productive and poorly fitting instruments to serve the policy goal of securing affordable stocks of essential goods (Global Trade Alert, 2020a; ESCAP, 2020; WTO, 2020a; Baldwin and Evenett, eds., 2020). Instead, the export bans are an example of the overreaction of some nations trying to protect themselves and taking precautions that are too extreme and which end up further distorting markets and creating price surges.

The report of Global Trade Alert (GTA) in early March counted 23 countries globally as having introduced some form of export restrictions (GTA, 2020a). By end of April 2020, according to both GTA (2020b) and WTO (2020b), this number had increased to 80 countries. This number is probably going to increase. Figure 15 shows a breakdown of restrictions by product category, with various PPE attracting the most protection.

Figure 15. Countries and separate customs territories introducing export prohibitions and restrictions as a result of COVID-19, by product categories



Note: The figure is reproduced from the WTO, 2020b, page 7.

Alongside the direct barriers being put up in order to protect domestic interests and reduce the spread of the coronavirus, as mentioned above, the trade war is also having a lingering effect on the situation. For example, the tariffs that the United States has implemented on healthcare products (including US$5 billion of imports of medical goods from China) has led to potential shortages in the United States as the demand has now spiked due to the outbreak of COVID-19. Accordingly, the initial support for such tariffs is beginning to reverse as the measures have been found to ultimately become self-harming (Bown, 2020a).

Many countries have realized that trade is not a problem, but a part of the solution. According to WTO (2020b) and GTA 2020, 77[28] nations have reduced import barriers on medicines and medical supplies. Although this liberalization so far includes mostly tariff measures, some non-tariff measures have also been implemented.

All in all, the fight against COVID-19 is indeed leading to more intensive use of direct trade measures at the border as well as efforts to improve trade facilitation in the health sector in an attempt to meet the rapidly increasing demand for healthcare sector goods. We hope that countries involved in the production of APIs and bulk medicine will consider lowering tariffs in order to facilitate a globally effective response to COVID-19.

C. Consumption pattern changes related to COVID-19

In addition to manufacturing and trade, COVID-19 is also disrupting consumption patterns globally. In the short term, restrictions on travel and movement, such as shelter-at-place and quarantine requirement (in short, the “Great Lockdown”), significantly limit the consumption opportunities in every sector of the economy that is not able to deliver goods or services directly to the consumer, e.g., through digital means. In addition, social distancing requirements and restrictions placed on non-

[28] Number of countries liberalizing and relaxing trade measures in healthcase secor is also stadiuly increasing and in early May 2020 stands at 81.

essential workers have forced several sectors to close down or have made it non-viable to keep open.

For the healthcare sector both demand-reducing and demand-increasing changes in consumption patterns are likely to arise; consumers with non-critical care requirements and high-risk aversion are likely to postpone or avoid physical healthcare encounters, leading to a decrease in demand in certain portions of the sector.[29] The COVID-19 crisis is also diverting and transforming demand within the healthcare sector itself. For example, the demand for telehealth, eHealth and other digitally delivered services is increasing as consumers seek alternative venues to meet their needs. This demand surge will have immediate ripple effects on, for example, the communications sector, which will need to accommodate and adjust to increased bandwidth requirements. At the same time, countries may find themselves newly incentivized to allow Mode 1 trade in healthcare services to move forward. Indeed, once this pandemic is put under control, and we return to economic recovery, part of "building back better" must be much more attention given to building resilient and robust healthcare systems.

The most tangible impact of the COVID-19 pandemic is the significant increase in the demand for in-person healthcare services for those afflicted by the virus. The sheer number of patients that require urgent and intensive care has resulted in ad hoc investments in additional facilities, with China building new hospitals within the span of one working week at the peak of the crisis (*Wall Street Journal*, 2020).[30] As a result, the hospital and urgent care system is seeing tremendous increases in demand for its services.

The abrupt and uncontrolled increase in demand has not only overwhelmed healthcare systems across the world – it has also diverted human and financial resources from elsewhere in (and outside) the sector. This unexpected demand for investment has largely been focused on establishing additional healthcare capacity and setting up

[29] In fact, private (and other) health facilities in many countries have started to report huge revenue losses and pointing to a long and difficult recovery. See, as an example of early warnings Leventhal, 2020.
[30] https://www.wsj.com/articles/how-china-can-build-a-coronavirus-hospital-in-10-days-11580397751.

manufacturing capabilities for healthcare related products.[31] These ad hoc investments will not fully displace planned investment patterns, but we will more than likely see significant public financing gaps and deferred investments as a result of going forward once budget reconciliation begins.

5. What have we learnt?

We have examined the ongoing trade war between the United States and China, and the more recent outbreak and rapid spread of the coronavirus in the context of the healthcare related trade. While at first it seemed that healthcare sector trade had remained outside the reach of the trade war due to the absence of tariffs slapped on bulk medicines trade, a closer analysis has shown that much of the sector has not been spared, as components needed to create these drugs as well as for medical equipment and technologies that can be applied to the healthcare sector are among the goods facing higher tariffs due to the trade war. These tariffs will are continue to affect the Asia-Pacific region's healthcare sector through one channel or another in the coming years unless the trade tensions are resolved.

Aside from the pharmaceutical segment of the healthcare sector, we have also shown that the trade war is jeopardizing access to critical technology used in the medical field, as inputs into final goods are being hit with tariffs. Moreover, we expect that critical 4IR technologies, which would provide huge benefits for the healthcare sector, will be delayed due to restrictions on the trading of related goods and components as well as services.

We have also discussed how COVID-19 has further damaged the global economy, its numerous supply chains, including those related to the healthcare sector. Due to the COVID-19 pandemic there have been large-scale shutdowns of production plants, which have severely reduced the supply of goods in the global economy. Some of the

[31] See for example a report on Thailand's agro-industrial giant, the Charoen Pokphand Group, opening its first own factory for face masks. Particularly newsworthy is that this capacity was built in five weeks and is fully automated manned by only three supervisors, and production is undertaken in a sterile environment. It has a production capacity of three million face masks per month. See details in https://www.thaipbsworld.com/cp-group-launches-its-first-face-mask-factory/.

global supply chains already began to reconfigure their structure and length due to costs imposed by the trade war. However, economic losses (in addition to other costs) due to a near-complete stoppage of the production of key components in several countries within the production networks is cited as a likely cause for much more widespread and radical changes in future value chains.

For the healthcare sector, these closures have meant that producers faced additional monetary and time costs. On top of the damage to manufacturing capability, countries are imposing multiple rules in order to protect themselves, including export bans on specific healthcare goods. While these bans seemingly protect domestic public policy objectives, they place a strain on the global healthcare sector and are ultimately counter-productive for all involved.

Despite the existence of multilateral rules (see the Annex), both shocks (the trade war and the pandemic) have shown that countries are not shy of using unilateral actions (at least temporarily), which are more often (at least in first reactionary cycle) intended to restrain than liberalize trade.

Many of the tactics being used in the United States-China trade war and as a reaction to the COVID-19 pandemic are having detrimental effects on the healthcare sector and are undermining the multilateral trade agreements that are in place to ensure that healthcare sector trade continues efficiently and that health and well-being of people are protected.

Our main conclusion is that the United States-China trade war and the strong reactions of countries in the face of the COVID-19 pandemic are creating ripples that will continue to spread to the global healthcare sector. Until the final effects of the trade war and COVID-19 pandemic are felt, supply chain disruptions, demand diversions and the overall breaking down of the multilateral order are more than likely to jeopardize the continued ease of access and availability of healthcare sector goods across the world. From the past, we know that it takes time to revert to the collaborative policy-making as envisaged by existing multilateral agreements. Thus, there is no time to waste.

Annex

International rules guiding the healthcare products trade

A. Agreement on Sanitary and Phytosanitary Measures

The SPS agreement aims to ensure that goods traded are of a certain standard of hygiene and quality in order to ensure that goods that are exported and imported are not a threat to public health. The agreement does not entail bound levels that all countries must adhere to but instead sets out a benchmark level of international standards. If a country wishes to raise the levels of its standards above this international level, then it must provide scientific proof that supports its implementation. If a situation arises whereby there are alternate options that provide the same level of health safety in a country then the nation must pick the one that restricts trade the least (WTO, 2019a). This rule is in place in order to limit the use of the SPS agreement as a tool for protectionism as countries who wish to restrict flows from foreign producers in order to provide unfair advantages to domestic producers or to otherwise prohibit foreign entry into local markets. The SPS agreement also aims to generate regional harmonized policy areas, which would facilitate trade between neighbouring countries as the goods produced in each would be to the same standard.

SPS has four key objectives – (1) to protect human or animal life or health from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs; (2) to protect human life or health from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests; (3) to protect animal or plant life or health from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms; and (4) to prevent or limit other damage from the entry, establishment or spread of pests (WTO, 2019b). The aim of these objectives is to facilitate trade by decreasing the risk to health when importing goods from other countries where similar or satisfactory standards are followed and upheld. As a consequence, SPS is extremely relevant to the trade in healthcare sector goods.

From a modern healthcare perspective, the SPS is not without its problems however. In order to obtain the acceptance and compliance of developing nations, who are often

found to have lower standards surrounding such health issues, the level of international standards is lower than they would be otherwise (Rafeeque and others, 2017). In addition, the SPS can give developing country manufacturers perverse incentives to produce and distribute poor quality products locally while saving up-to-standard goods for exporting purposes, unless they are avoiding trading altogether. Finally, the strict enforcement of SPS may lead to incentives to avoid reporting of issues with quality or outbreaks of disease/pests (AECSP, 2018). However, it should be noted that SPS requirements may not be directly relevant for the majority of pharmaceuticals as well as that countries can opt to go above the internationally set minimum standard.

B. Agreement on Technical Barriers to Trade

The Agreement on Technical Barriers to Trade (TBT) ensures that technical regulations, standards and conformity assessment procedures put in place by nations on goods are not done so in a discriminatory manner and that they do not create unnecessary barriers to trade in order to protect and favour domestic producers (WTO, 1995). The objective of the TBT is to ensure that regulations are not more trade-restrictive than absolutely necessary and that they are justified in their application. Broadly (an incorrectly)[32] called as non-tariff measures, technical barriers can take numerous forms such as bureaucratic requirements, extraneous standards and licences, unnecessary testing or burdensome certifications.

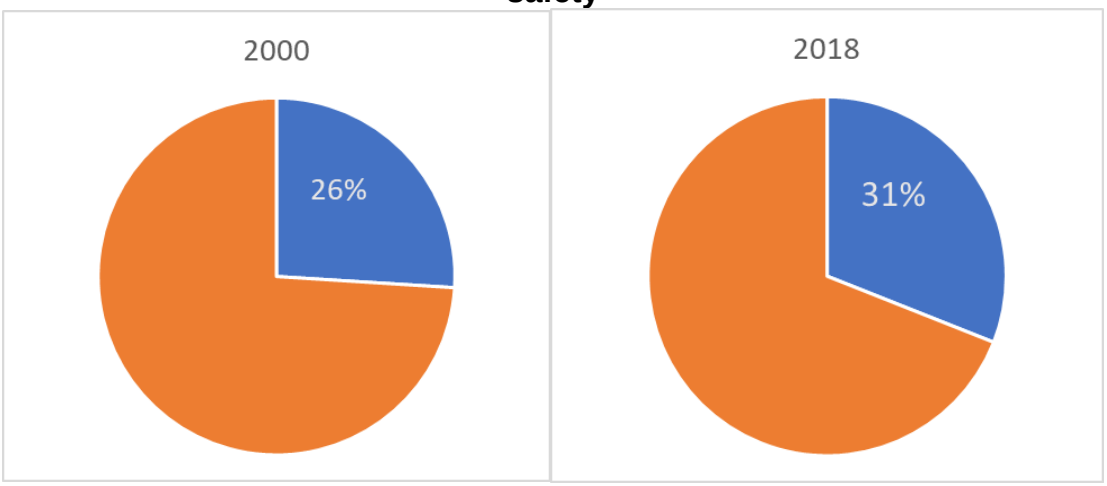
The healthcare sector is closely linked to the TBT agreement, with measures relating to human health and safety being notified in great number to the WTO. For example, in 2000 a total of 254 notifications or 26% of the overall 725 notifications that were received that year concerning human health or safety (WTO, 2019c and WTO & WHO, 2002). In 2018, that share climbed to 31%.

As the below figure shows, the volume of regulation notifications issued to the WTO relating to health and safety has remained consistently high, making up almost a third of all TBT notifications. The reason why health and safety are so often cited as the

[32] See, for example, ESCAP and UNCTAD, 2019, for further explanations of the definition and typology of non-tariff measures.

basis for a technical barrier is simple – countries place significant importance to ensuring the health and safety of their population. However, these measures can also be easily misused and evoked at times where the fundamental aim of the regulation is to restrict trade or to benefit local producers by ensuring that they have a larger domestic market share.

Proportions of WTO regulation notifications relating to human health and safety



Source: Compiled by the authors based on the WTO Technical Barriers to Trade Information Management System, 2019.

C. Agreement on Trade-Related Aspects of Intellectual Property Rights

Intellectual property rights (IPRs) are vital driver of modern economies and a key contributor to the healthcare sector. In fact, as the United States-China trade was evolving, many commentators argued that the one of the real causes for such war was a different approach of these two countries to the commitments on IPR protection.[33] Today, IPRs come in numerous different forms all of which contribute to the healthcare sector in different ways (*WIPO Magazine*, 2013) as shown in the table below.

[33] Another reason mentioned was related to supremacy in digital technology (i.e. 5G).

Role of IPRs in the healthcare sector

IPR instrument	Examples of how it is used in the healthcare sector
Patents	Gives exclusive rights to manufacture, sale and distribution of pharmaceuticals, safeguards processes against use by competitors
Trademarks	Used in branding pharmaceuticals and services, main driver of differentiation between brand-name drugs and generics
Copyrights	Protects disclosure and marketing materials, databases etc.
Trade secrets	Protects processes and information that has not been disclosed to the public

Source: WIPO, 2013.

The common thread across all IPRs is that they grant exclusive rights for the owner. For example, the owner of a patented pharmaceutical compound can sell, use or deny the use of the compound at her discretion. The reason why IPRs are pivotal to the healthcare sector is that much of the sector's activities are based on R&D or other sunk cost intensive outputs. For instance, in the pharmaceutical sector the costs for producing a new drug and bringing it to market are very high, with "a company hoping to get a single drug to market can expect to have spent $350 million before the medicine is available for sale" (Herper, 2013) with others pointing to estimates as high as 2.8 billion (Tufts, 2016). Without patents, which allow for sole ownership over a set period, it would be unlikely that any firm would undertake the necessary fieldwork to bring the pharmaceutical to the market if it could be freely copied. As a result, patents are often considered as one of the most important regulatory instruments that enable drive innovation in the healthcare sector and as a key mechanism for driving R&D (Antoñanzas and others, 2011).

Trademarks are another important form of IPRs for the health care sector. With trademarks, manufacturers of both patented and generic pharmaceuticals are able to differentiate their goods through marketing and branding. As opposed to patents, trademarks do not have set expiry dates and numerous manufacturers have been able

to continue commanding premium prices for pharmaceuticals which are no longer exclusive to them, such as Aspirin or Viagra.

While IPRs are generally accepted as having positive effects on the economy, in particular in helping avoid the tragedy of the commons, there has always been a tension between IPRs and international trade. Because IPRs are national instruments, they do not have legal status or implications in a different jurisdiction than in which it has been granted in (or extended to as in e.g. the case of the European Union). This in turn creates opportunities for a crude form of arbitrage where the processes and products that are protected by IPRs in one country are taken and utilized in another where they do not enjoy of similar protections. It is due noting that as national instruments, IPRs are only as strong as the will to enforce them on the ground. Differences in the interest and appetite to enforce IPRs, in particular when granted to foreign companies, between trading partners have further extenuated the tensions leading up to the point where countries like the United States maintain a dedicated watchlist for IPRs infringements called the ‘Special 301 report’. In fact, IPRs and accusations of intellectual property theft are one of the major progenitors of the current tensions between the United States and China with similar tensions between the developed producers of IPRs and developing end-users and upstream contributors.

It is widely held that the original Trade-Related Aspects of intellectual Property Rights (TRIPS) agreement, signed in 1995 alongside other new world trade rules, was a skewed deal in favour of the interests of the IPRs producing countries. After several years of discussions (and protest by civil society around the world) 2001 saw WTO establish and reaffirm so called flexibilities in the agreement, especially for the purposes of increasing and protecting public health. Known as the Doha declaration (WTO, 2019c), the WTO members stated that “the TRIPS Agreement does not and should not prevent Members from taking measures to protect public health" and hence upholds the values of the WHO (WHO, 2020a).

In 2003, an agreement concerning compulsory licences was agreed upon. Compulsory licences allow countries with limited or no manufacturing capability easier access to the importing of generic drugs as long as certain guidelines were followed,

a prime example of which was the engagement between Rwanda and Canada in 2004, explained in the box below.

To date, TRIPS remains as the most ambitious and overarching multilateral agreement on IPRs. However, as ESCAP's database shows, virtually all trade agreements entered into by the United States and other developed countries such as the EU member states contain provisions that are considered 'TRIPS-plus', i.e. more stringent in either wording or implementation (Puutio and Parisotto, 2015). These TRIPS-plus provisions can range from commitments to exchange resources and information to ambitious commitments on enforcement and criminal penalties, making the concept and its application contentious among many commentators. At times, these provisions can be detrimental to a countries healthcare sector in many ways, including by limiting access to 'grey market' goods that are exported from another country legally without the prior approval of the patent owner and by keeping the price levels of pharmaceutical goods high as competition is stemmed by evergreening patents, patent linkages, term extensions and test data protection (Mercurio, 2016). However, one should avoid hailing parallel imports as a panacea – noting in particular that local labelling and packaging requirements can be critical for proper use and safety.

Use of compulsory licence for ARV from Canada to Rwanda

The process began in 2004 when Médecins Sans Frontières (MSF) approached a Canadian company to produce the triple combination ARV (zidovudine, lamivudine and nevirapine), however this was done without any specific request from an importing country. The company obtained marketing approval within six months of application. In order to produce the drug Canada's Access to Medicine Regime (CAMR), the body that implements paragraph 6, needed to be amended to cover the product because of the limitations to Canada's scope in its laws to a specified list of products. The three individual components of ARV were covered by a separate patent to separate companies. Then in July 2007, the company sought voluntary licences from these three companies; however, they were unsuccessful in obtaining them.

At the same time as this failure to gain voluntary licences for the drugs, in July 2007, Rwanda notified WTO of its intention to import 260,000 packs of the triple combination ARV. They also reserved the right to modify the estimated quantity in their notification brief. This led to the company applying for a compulsory licence in Canada in September 2007, which under the system would allow for the exports of 15,600,000 individual tables, which is equivalent to 260,000 packs, over a two-year period. Two weeks after this request was made, the compulsory licence was granted by the Canadian Government, allowing for the company to manufacture and export the ARV. In October, the Canadian Government notified WTO that it was using the system in the capacity as an exporting country.

In October 2007, the Rwandan Government issued a public tender for the ARV. Originally the Canadian firm had offered the ARV at the no-profit price of US$ 0.39 per tablet. However, there was indication that Rwanda could have obtained ARV from at least four Indian firms. This would have meant that if Rwanda procured ARV from India it would not have needed to use the system as the drugs were not under a patent in India. Through the tender process the Canadian company halved its price to US$ 0.195 per tablet, leading to the company winning the tender in May 2008.

Due to the CAMR system and the TRIPS system, the ARV that were shipped would be distinguished from versions used in the domestic market, such as giving them a white colour instead of the standard blue. A total of 6,785,000 tablets were shipped to Rwanda in September 2008 and 7,628,000 tablets in September 2009, complying with the quantity and time frame set out by the system.

Source: WTO, 2013.

D. Export controls under GATT[34]

Article XI of GATT (1994) requires that WTO members eliminate all export controls with the exception of temporary measures needed to prevent or relieve critical

[34] For a more elaborate discussion on export restrictions relevant to pandemics, see Baldwin and Evenett, eds., 2020 and, in particular, a chapter by Joost Pauwelyn (2020) discussing export restrictions from the perspective of regional trade agreements.

shortages of foodstuffs or other products essential to exporting as well as measures that are necessary for the application of standards or regulations for the classification, grading or marketing of commodities in international trade.[35] Further exceptions can be found in Articles XX and XXI which allow for exceptions that are necessary to protect public morals, health and life and for security reasons. While WTO regulation in the area of export restrictions is sparse in relative terms (ch. WTO, 2010), these exceptions empower member states to issue quantitative restrictions on e.g. trade in drugs, weapons, nuclear materials and ozone depleting substances. In addition, the above articles provide sufficient grounds for WTO members to react to global pandemic such as the COVID-19 with the measures explained above. However, as prior research shows, these exceptions are not blanket approvals for quantitative restriction with China making an unsuccessful case to limit exports of raw minerals in order to protect the environment (Jiang, 2018). Nevertheless, as documented in section 4 of this report, government responses to the COVID-19 pandemic have included introducing numerous export restrictions, hopefully also with striving to meet the “4T” legitimacy requiring that such export restrictions are temporary, targeted, time-limited and transparent.

[35] In fact, Article XI:1 of the GATT 1994 prohibits WTO members from introducing or maintaining any form of export prohibition or restriction other than duties, taxes or other charges. However,as always, there are exceptions. Specifically, Article XI:2(a) of GATT 1994 allows "export prohibitions or restrictions temporarily applied to prevent or relieve critical shortages of foodstuffs or other products essential to the exporting contracting party" (see more in WTO, 2020b).

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