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SUPPLY CHAIN DISRUPTIONS DURING THE COVID-19 PANDEMIC:

Lessons for Canada

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EXECUTIVE SUMMARY

The spread of COVID-19 around the world produced significant economic turmoil. In 2020, global GDP declined by 4.3%, global trade declined by 8%, and foreign direct investment flows declined by 35%.[1] One of the main causes of economic stress was the impact that COVID-19 had on global value chains (GVCs). Like many countries around the globe, Canada also experienced its share of supply chain disruptions due to protectionism and logistical strains during the pandemic. This is largely because many multinational corporations, including Canadian ones, rely on Asian GVCs for COVID-19 related goods such as medical supplies and PPE. This interconnectedness, while important in today's globalized economy, was detrimental to supply chains, especially at the beginning of the pandemic.

This paper explores five major problems that contributed to the breakdown of supply chains during the COVID-19 pandemic and offers recommendations for how to better handle these issues in the future. We identified the following five problems:

1. The increase in demand for certain goods, which caused a manufacturing shortage. Throughout the pandemic, there was an overwhelming demand for any COVID-19-related product. Companies could not produce these goods fast enough to meet the demand, which subsequently caused supply chain issues;

2. Goods that cannot be domestically produced, through reshoring or refocusing operations, and for which there are only a few supply chains readily available, and the problems that followed in relying on specific companies for production;

3. Temporary export restrictions that were put in place by the countries that were able to produce these goods domestically;

4. The overreliance on certain economies for COVID-19-related goods, which in some cases resulted in the decision to reshore production; and

5. The logistical challenges companies faced in transporting vaccines. Once vaccines had been manufactured, the next challenge for multinational corporations was determining the best way to distribute and transport them. There were challenges in temperature requirements, transportation methods, and deliveries to remote communities.

After examining these problems and how some companies overcame them, our paper proposes the following recommendations:

- Create a supply chain task force;
- Increase access to data related to supply chains;
- Carefully assess decisions to reshore;
- Ensure due diligence to avoid supporting unsafe labour practices;
- Support collaboration between stakeholders;
- Foster an information-sharing innovation ecosystem in Canada; and
- Diversify Canada's stockpiling strategy.

RÉSUMÉ

La propagation de la COVID-19 dans le monde a provoqué des bouleversements économiques importants. En 2020, le PIB mondial a diminué de 4,3 %, le commerce mondial a diminué de 8 % et les flux d'investissements directs étrangers ont diminué de 35 %.[1] L'une des principales causes du stress économique était l'impact que la COVID-19 a eu sur les chaînes de valeur mondiales (CVM). Comme de nombreux pays, le Canada a également connu sa part de perturbations au niveau des chaînes d'approvisionnement durant la pandémie en raison du protectionnisme et de contraintes logistiques. Cela s'explique en grande partie par le fait que de nombreuses sociétés multinationales, y compris canadiennes, dépendent des chaînes d'approvisionnement asiatiques pour les produits liés au COVID-19, tels que les produits médicaux et les équipements de protection individuelle (EPI). Bien qu'importante dans l'économie mondialisée d'aujourd'hui, cette interrelation a nui aux chaînes d'approvisionnement, surtout au début de la pandémie.

Cet article explore cinq problèmes majeurs qui ont contribué à la rupture des chaînes d'approvisionnement pendant la pandémie de COVID-19 et propose des recommandations pour mieux gérer ces problèmes à l'avenir. Nous avons dégagé les cinq problèmes suivants :

1. L'augmentation de la demande de certains produits, qui a provoqué une pénurie de fabrication. Tout au long de la pandémie, la demande de tout produit lié au

COVID-19 a été massive. Les entreprises ne pouvaient pas produire ces biens assez rapidement pour répondre à la demande, ce qui a entraîné des problèmes de chaîne d'approvisionnement.

2. Les biens qui ne peuvent pas être produits au niveau national, au moyen de la délocalisation ou du recentrage des opérations, et pour lesquels il n'y a que quelques chaînes d'approvisionnement facilement disponibles, et les problèmes qui ont suivi en s'appuyant sur des entreprises spécifiques pour la production.

3. Les restrictions d'exportation temporaires mises en place par les pays qui étaient en mesure de produire ces biens au niveau national.

4. La dépendance excessive à l'égard de certaines économies pour les biens liés à la COVID-19, ce qui, dans certains cas, a entraîné la décision de délocaliser la production.

5. Les défis logistiques que les entreprises ont dû relever pour transporter les vaccins. Une fois les vaccins fabriqués, le défi que devaient ensuite relever les multinationales était de déterminer la meilleure façon de les distribuer et de les transporter. Les exigences en matière de température, les méthodes de transport et les livraisons aux communautés éloignées ont posé des problèmes.

Après avoir examiné ces problèmes et la façon dont certaines entreprises les ont surmontés, notre article propose les recommandations suivantes :

- créer un groupe de travail sur la chaîne d'approvisionnement;
- accroître l'accès aux données relatives aux chaînes d'approvisionnement;
- évaluer soigneusement les décisions de délocalisation;
- assurer une diligence raisonnable pour éviter de soutenir des pratiques de travail dangereuses;
- soutenir la collaboration entre les parties prenantes;
- favoriser un écosystème d'innovation pour le partage de l'information au Canada; et
- diversifier la stratégie de stockage du Canada.

01

INTRODUCTION

The rapid spread of COVID-19 in early 2020 caused a sudden increase in global demand for medical goods that could limit the spread of the virus or reduce its deadliness. The overwhelming demand for these products put stress on global value chains (GVCs), which encompass the full range of activities involved in bringing a product to market. It caused universal shortages of medical goods and personal protective equipment (PPE), equipment designed to protect the wearer from and limit the propagation of the COVID-19 coronavirus. Companies found themselves ill-equipped to meet the increased demand due to low stockpiles of the required goods, the difficulties involved in quickly scaling up production, and the complexity of co-ordinating the safe delivery of goods to those in need.

BOX 1:

GVCs and Supply Chains

The term "GVC" refers to the complete production process of a good that has gone through various stages of manufacturing in multiple countries. Multinational corporations (MNCs) use GVCs to minimize the costs of production and take advantage of the efficiencies gained from specialization. Some MNCs can produce a desired good through GVCs at a lower cost than they could in the company's home country.

Supply chains are an integral part of many GVCs; they encompass all the steps taken to get the good to a customer. While GVCs include the manufacturing and assembly process of a good that is produced across multiple countries, supply chains refer to the sourcing and on-time delivery of finished products and their intermediary components to a customer.

Supply chains were particularly affected by the pandemic as they typically rely on a "just-in-time" model of production, meaning that goods are produced and arrive right before they are placed on the shelves or are included in the manufacturing process. The last-minute nature of this system meant that companies were left with insufficient inventory when the demand for medical goods increased.

Many Canadian MNCs rely on Asian GVCs to produce goods. Goods produced in Canada, such as automobiles, often rely on intermediary goods from Asia that then have "value" added to them through modifications made in Canada. These value-added exports highlight the interconnectedness of Canadian goods and GVCs in Asia. For example, a recent Statistics Canada report that analyzed 2016, 2017, and 2018 trade data found that almost 50% of Canada's domestic production inputs rely on some Chinese content.[2] These Canadian goods that rely on inputs from Asian GVCs are often adversely affected when a sudden external shock, such as an increase in global demand, leads to supply chain failures.

In March 2020 the Institute for Supply Management conducted a survey of 600 firms in the United States and found that 75% of the companies had experienced supply chain disruptions as a result of COVID-19.[3] Like many countries around the globe, Canada also experienced its share of supply chain disruptions due to protectionism and logistical strains during the pandemic.

Asia Pacific countries are some of the leading manufacturers of medical goods and PPE due to their large manufacturing capabilities and were among the first to experience large-scale supply chain disruptions caused by the pandemic. Firms based in Asia Pacific countries faced the same difficulties that plagued companies and MNCs around the world, but they have more experience combatting widespread airborne viruses due to the 2002 SARS outbreak in Asia and the 2015 MERS outbreak in South Korea. This experience provided many Asian countries with the tools necessary to mitigate supply chain tensions during the COVID-19 pandemic.

Methodology and Scope

This report analyzes the major causes of supply chain failures during the COVID-19 pandemic and, through the study of various cases, investigates how countries and MNCs dealt with these failures. Through a review of academic and other expert-led research on the supply chain issues faced by MNCs during the pandemic, we found that five issues were most common and tended to contribute to the breakdown of supply chains and the shortage of essential goods during the pandemic:

1. The exponential increase in demand for COVID-19-related goods, which caused a manufacturing shortage;
2. The challenges some countries faced in producing these goods domestically – and the challenges that followed in relying on specific companies for production;
3. The temporary export restrictions that were put in place by some countries that could produce these goods;
4. The overreliance on particular economies for these goods, which in some cases resulted in the decision to reshore production; and
5. The logistical challenges faced in transporting vaccines.

We then relied on desk research to explore how these problems evolved over the course of the pandemic and analyzed how MNCs in Asia responded and adjusted to them. We

use various case studies that described these problems to provide context and outline what can and has been done to address these issues. The examples were also chosen based on various criteria:

- Their relevance to the Canadian experience;
- The amount of information available to fully explore the supply chain problem faced by the firm and the conditions that hampered the disruption; and
- Their ability to represent a combination of cases where government policies were enacted, either in hampering or encouraging the functioning of supply chains, and where government policy was lacking. The various policy responses serve as the basis for the recommendations presented in the final section.

The paper ends with policy recommendations to help Canada mitigate future supply chain tensions brought on by global crises.

02

SUPPLY CHAIN FAILURES AND ADAPTATION DURING COVID-19

1. Inability to Increase Production in the Face of Increased Demand

The pandemic caused a rise in demand for PPE, test kits, and other COVID-19-related goods. This rapid rise in demand had an impact on the manufacturing of these goods. Thus, the first issue we identified was that these particular goods could not be produced fast enough to meet the world's demand, thereby causing supply chain issues.

A National Health Service report published in April 2020 stated that "demand from trusts for PPE escalated exponentially with demand for some items increasing [by] 5000% overnight."[4] At the beginning of the pandemic in March 2020, the WTO predicted that to meet the worldwide demand of PPE, industry would have to increase manufacturing by 40%.[5]

Many manufacturers struggled with demand because of the shift to just-in-time manufacturing. Prior to the pandemic, many COVID-19-related goods were purchased as needed, and manufacturing companies produced them to meet demand.[6] The problem was that when this demand increased exponentially in such a short period of time, many companies simply could not keep up. Supply cannot be increased – and manufacturing cannot ramp up – overnight.

This problem of increased demand causing a strain on manufacturing companies occurred throughout the pandemic and continues today. According to a survey conducted by Statista in February 2021, 11.5% of Canadian businesses reported that they expected shortages of respirators between February and May 2021, while 8.3% said they expected a shortage of nitrile gloves during the same period.[7]

Our first case study explores how the Samsung Smart Factory program helped various companies adapt to the sudden increase in demand.

CASE STUDY: SAMSUNG SMART FACTORY PROGRAM

As global demand for COVID-19 test kits increased, two Korean-based virus test kit manufacturers, KogeneBiotech and SolGent, struggled to keep up. South Korea implemented a successful testing regime called "K-prevention" to limit the spread of COVID-19.[8] The manufacturing process for test kits requires a tremendous amount of labour and state-of-the-art-facilities to meet regulatory requirements, so when demand for the test kits soared, these two companies found themselves short-staffed and ill-equipped.

The impetus to significantly increase biomanufacturing capacity came when South Korea issued an emergency use authorization that prompted manufacturers to rapidly produce test kits. The Korean CDC disclosed information on testing methods that allowed manufacturers to speed up development.[9]

In 2015, Samsung, South Korea's largest technology company, developed its Smart Factory program, which focuses on providing bespoke solutions for manufacturers to increase their production volume. The goal of the program is to use emerging technologies to optimize manufacturing. Since 2015, the Smart Factory program has supported 2,161 small and medium-sized enterprises (SMEs) by providing them with the technology and expertise to improve their competitiveness in manufacturing.[10]

As the COVID-19 crisis grew, Samsung leveraged its Smart Factory program to ensure test kits were being manufactured as quickly and efficiently as possible by acting as consult and advising SolGent and KogeneBiotech. Samsung ensured the companies were taking advantage of the technologies available to them to produce as many test kits as possible. In the case of SolGent, Samsung improved productivity by 73%. KogeneBiotech's productivity improved by 79%.[11] The assessment and improvement program for SolGent and KogeneBiotech only took six weeks in total. The significant gains in productivity from the measures introduced by the Smart Factory program and the speed with which the

assessment was completed emphasize the importance of knowledge sharing between large companies and SMEs, especially during times of crisis when critical products need to be manufactured quickly and consistently.

For example, SolGent used to import the tubes used in its COVID-19 test kits from Germany, but due to supply chain disruptions it was forced to switch to a domestic supplier.[12] However, 40% of this new supplier's products were defective, which necessitated labour-intensive checks for foreign substances.[13] Upon realizing that the lack of access to quality tubes was restricting the production of test kits, Samsung, along with the Ministry of SMEs and Startups and the Korea Federation of SMEs (KBIZ), equipped SolGent with internal tube manufacturing capabilities so that it could make tubes suitable for its test kits and access them easily. Samsung's Smart Factory program eliminated the need for employees to check the tubes, saving time and money as well as increasing production capacity.

The program also assisted with boosting mask production. Four mask manufacturers saw their production increase by 51% after Samsung assisted with their production processes.[14] The conglomerate shared technical know-how, provided access to its global network of raw materials, and helped engineer factory layouts that optimized production.

Samsung also took its efforts overseas to aid a Polish company called PTAK in shifting its production from fashion to mask manufacturing by equipping it with automated production. Recently, the Ministry of SMEs and Startups brokered a collaboration between Poonglim Pharmatech, a syringe supplier, and Samsung to improve production and efficiency as vaccines began to be distributed in South Korea. As a result, Poonglim increased capacity from 4 million to 10 million low dead space syringes.[15] While the pandemic led to manufacturing shortages and supply chain issues, collaboration between firms took off in South Korea, which insulated the country from increased vulnerability in domestic supply chains for PPE.

2. Challenges With Domestic Production

Governments and MNCs tend to rely on three major strategies to overcome goods shortages: reshoring, refocusing operations, and diversifying supply chains. All three strategies are meant to increase the supply of critical goods and ensure that these goods are easily accessible. The first strategy, reshoring, achieves this goal by relocating factories within domestic jurisdictions to protect companies from foreign policy changes, political conflicts, and other external forces. Reshoring has the additional benefit of

keeping transport relatively straightforward. The second strategy, refocusing, is adopted by companies that make a similar product to the one that's in demand to shift their operations so they can meet increased demand. One example of this is the decision of a Canadian hosiery company, Threads, to start producing non-medical-grade face masks early in the pandemic. The final strategy, diversifying supply chains, is to ensure there are multiple suppliers for particular goods, so that if one production site is unable to deliver the product on time there are still others that can supply it. This strategy also ensures that companies avoid overreliance on one supplier. While these strategies have proven effective in many cases, there are some goods for which none of these options is available. Sometimes, as it was the case with some PPE products, supply problems arise for goods that cannot be domestically produced through reshoring or refocusing operations, and for which there are only a few supply chains readily available.

CASE STUDY: THE PRODUCTION OF NITRILE GLOVES

Nitrile gloves are a prime example of this type of good. The raw materials needed for manufacturing nitrile gloves are only available in Asia, which severely limits the ability to diversify suppliers and mitigate the risk of shortages. This also means that it is inefficient to produce nitrile gloves in Canada, since the materials would have to be shipped and cannot be extracted on site. Refocusing operations is also an unattractive option because there are almost no cases where the equipment needed to make the gloves is sufficiently similar to the machinery in any other factory, so the costs to adapt operations to be able to produce the gloves is high.

The case of Top Glove, a Malaysian rubber glove manufacturer, illustrates the difficulties that arise when global supply of a good is heavily dependent on a few companies and domestic production is not an option. Top Glove supplies 26% of the world's nitrile gloves, with 47 production facilities across the Asia Pacific. Countries all over the world have relied on the company to supply them with nitrile gloves during the pandemic. However, in March 2021 it came to light that Top Glove had been employing forced and illegal labour practices in its Malaysian factories.[16] The discovery was accompanied by reports of verbal and physical abuse against employees. In response to these findings, the United States cancelled its contract with Top Glove.[17] Furthermore, the poor working conditions led to massive outbreaks of COVID-19 among Top Glove workers. In December 2020, Top Glove announced that approximately 5,000 employees had been infected with COVID-19 after an outbreak in one of its factories and dormitories.[18] The close working conditions and small living spaces made it particularly difficult to contain the huge outbreak.

For goods that cannot be easily manufactured domestically, such as nitrile gloves, Canada remains particularly vulnerable during supply shocks. However, it is important that the country take an active role in ensuring suppliers are reliable, employ ethical and inclusive labour practices, and can meet the demand of a global crisis.

3. Temporary Export Restrictions

The third problem we identified was the export restrictions that some countries imposed at the beginning of the COVID-19 pandemic in response to the shortage of critical goods. Export restrictions are defined as any restriction that a country imposes on its exports of specific goods. Restrictions are not necessarily always outright bans but can also be specific licensing requirements or an exporting country's government imposing a right of first refusal.[19]

Export restrictions have a negative effect on supply chains because they limit the supply of goods to other countries. When imposed temporarily, they may not have major consequences beyond temporary supply chain disruptions, short-term goods shortages, and global price increases caused by the shortages.[20] But export restrictions can also lead to a permanent realignment of supply chains away from the country that imposed restrictions, as other countries find more reliable exporters.[21] In the long-term, export restrictions risk reducing overall confidence in the international market and lead to market inefficiencies through a domino effect, whereby other countries also choose to rely on domestic goods rather than imports.[22]

Likely because of these negative long-term effects, export restrictions and prohibitions have been banned among WTO members since the 1994 General Agreement on Tariffs and Trade (GATT), which states in Article XI that quantitative restrictions be generally eliminated. However, the GATT does allow the use of export restrictions in specific instances, most notably when "[e]xport prohibitions or restrictions are temporarily applied to prevent or relieve critical shortages of foodstuffs or other products essential to the exporting [Member]."[23] In other words, export restrictions are permitted among WTO members as long as they are *temporary, targeted, and transparent*.[24] The problem is that temporary, targeted, and transparent were never clearly defined by the GATT or the WTO.[25] The consequences of this became clear at the beginning of the COVID-19 pandemic.

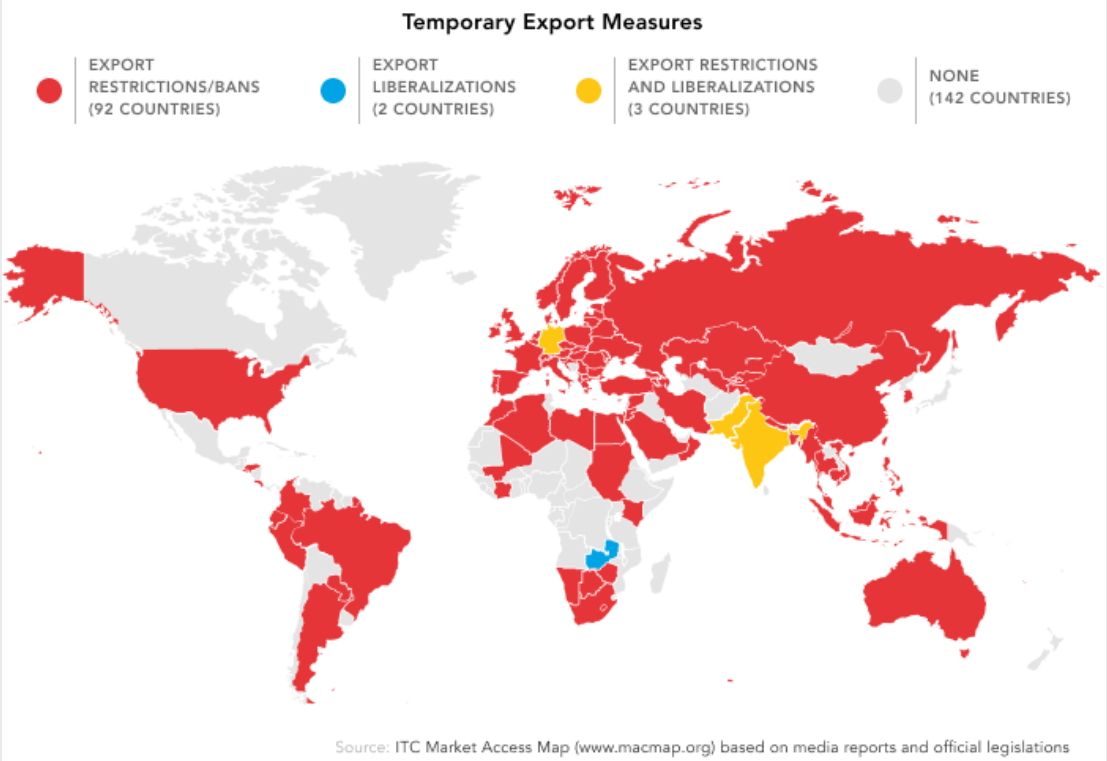
According to the WTO, export bans accounted for over 90% of pandemic-related trade restrictions in G20 countries.[26] In April 2020, the WTO reported that 80 countries had imposed export restrictions or prohibitions on goods to combat the effects of COVID-19.[27]

As highlighted in Figure 1, the number of countries imposing export restrictions or bans has since grown even higher, reaching upwards of 90 countries as of August 2021.[28] As of June 2021, the International Trade Centre reports that 98 countries still have export restrictions in place. According to the Congressional Research Service, most export restrictions were in one of two categories of goods: either medical goods (such as pharmaceuticals, or medical equipment and supplies) or foodstuffs.[29]

FIGURE 1

COVID-19 temporary export measures

Affected products include personal protective equipment (e.g. masks, gloves), pharma products, hand sanitizer, food, and certain other products.



Source: ITC Market Access Map (www.macmap.org) based on media reports and official legislations

Overall, between January 2020 and April 2021, there were more than 220 actions taken by countries either banning or limiting exports of certain goods, citing COVID-19-related reasons.[30] That being said, the real number of restrictions is likely much higher as it is

difficult to ascertain the exact number of restrictions, as many countries did not notify the WTO of their restrictions – many countries still refuse to admit to restricting the export of essential goods during the pandemic.

Most restrictions were adopted early on in the pandemic, and while some have since been rescinded, many remain in place today. In fact, the United Nations Conference on Trade and Development reports that 60% of export restrictions related to medical and personal protective goods that were implemented at the beginning of the pandemic remain in place today.[31] For example, one of the United States' export restrictions initially imposed in April 2020 was "allocating certain scarce resources or threatened health and medical resources to domestic use … due to the COVID-19 pandemic." This included N-95 filtering masks, respirators, surgical masks, and surgical gloves. This specific restriction has since been extended multiple times and is still in place today.[32]

There are also new vaccine-related export restrictions that have since been implemented – the United States, the European Union, and India, three large vaccine-producing entities, have all imposed export restrictions on either the vaccines themselves or on materials that are necessary to produce the vaccine.[33]

The lack of transparency around what was defined as temporary or targeted export restrictions meant that for many countries, there was – and still is – no information available concerning how long the restrictions will last or which products they might be extended to include.

The following example clearly demonstrates the effects of export restrictions on PPE supply chains, and the ways in which the unclear definition around "temporary" export restrictions negatively impacted Canadian companies and consumers.

CASE STUDY: MEDICOM

In early 2020, when the virus had not yet been declared a pandemic, the Chinese government acquired all face masks that had been, and were being, produced in China. China is one of the largest suppliers of face masks and the shortage was quickly noted by companies with production facilities in the country. One of these was Medicom, a Canadian manufacturing and distribution company that has three production facilities in China. In early March 2020, the company's COO noted that its products had been requisitioned by the Chinese government and none of the goods were being exported.[34]

The nationalization of face mask production in China did not last long. Face mask exports from China increased drastically by May 2020, but by then a global mask shortage had already erupted. Even short-term restrictions can be damaging when the relevant agencies aren't notified. When a country registers certain export restrictions with the WTO, it gives the affected parties the opportunity to consult with the country imposing the restrictions to determine the ways in which their imports will be affected and how the effects can be mitigated. For example, according to Article 12 of the 1994 GATT, export restrictions or prohibitions on foodstuffs require members to "give due consideration to the effects of such prohibition or restriction on importing members' food security."[35] The article further states that the member imposing the restriction will consult with any member that has a significant interest in the decision to restrict or prohibit exports of the foodstuff on request.[36] Such mechanisms encourage members to consider the effects of their restrictions on others and provide the means for them to be held accountable for their decisions.

China's decision to not announce their restriction on mask exports, whether it was an official export restriction or not, is representative of the tactics some countries have used during the pandemic to ensure they have sufficient goods for their citizens. The lack of transparency promotes distrust and individualism at a time when international co-operation is necessary to address the global pandemic. The Chinese government's decision to requisition Medicom's products also highlights the risks of producing essential goods in other countries. During a global crisis, the location of the products matters more than the location of the company's headquarters.

4. Trade Dependencies and Reshoring

The fourth problem we identified was countries' dependency on one economy – in many cases, China. It is well known that the world is dependent on China for manufacturing. According to the United Nations Statistics Division, China was responsible for 28.7% of global manufacturing output in 2019.[37]

In terms of PPE specifically, in 2018 China was producing 60% of the world's protective garments, 59% of the world's respirators and surgical masks, and 51% of the world's medical goggles.[38] When the COVID-19 pandemic began, China's exports of PPE declined substantially. For example, just in the first two months of 2020, China exported 22.8 million fewer kilograms of masks than it did during the same period in 2019 – and the demand was exponentially higher in 2020.[39] That being said, it should be noted that during the second quarter of 2020, China did significantly increase its exports of PPE.[40]

When one economy plays such a crucial role in the manufacturing of PPE supplies, reduced exports from that country impact the supply chain and create shortages of those supplies in other countries – which is exactly what occurred at the beginning of the COVID-19 pandemic.

While the world's dependency on China for medical supplies disrupted supply chains, certain countries' attempts to break from this dependency engendered even further disruptions. In response to China's role as a manufacturing superpower, some countries decided to reshore. Reshoring is defined as when manufacturing corporations that were previously located in foreign jurisdictions move back within domestic borders – essentially, redirecting any corporations that were abroad back to the home market.[41]

Reshoring can have benefits, such as increasing manufacturing jobs in the domestic market, reducing production costs for the company through reduced transportation expenses, and helping to balance trade and budget deficits.[42] However, reshoring can also have significant drawbacks. Reshoring aggravates the WTO principle of reciprocity, which encourages equitable trade and investment interactions, and is typically against the principle of supply chain diversification that has become axiomatic for proponents of the rules-based trading system. Reshoring disrupts GVCs by attempting to localize supply chains. Reshoring may also invite long-term costs, such as labour and capital costs, as well as opportunity costs that eliminate gains from trade.[43]

Reshoring has been a noticeable trend since 2019, due to a large variety of factors, such as the shift to just-in-time manufacturing, increasingly automated manufacturing processes, and geopolitics. That being said, reshoring has accelerated significantly during the COVID-19 pandemic. A survey of over 3,400 North American manufacturing companies published by Thomasnet, an online product sourcing and supplier platform for North American manufacturers, found that 69% of companies surveyed in May and June 2020 were considering bringing production back to North America.[44] A more recent survey of 120 US manufacturing executives, conducted by Kearney in 2021, found that 41% of companies have already reshored some of their manufacturing operations back to the United States in the past three years and that 22% plan to reshore some manufacturing in the next three years.[45]

Reshoring from China specifically is a reoccurring phenomenon among companies. The Kearney survey also found that 41% of US companies said they would try to reduce their dependence on China specifically for manufacturing.[46] A survey of 346 US companies conducted by PwC and the American Chamber of Commerce in Shanghai found that around 18% of companies surveyed are planning on moving production out of China, either to other non-US locations or back to the United States.[47]

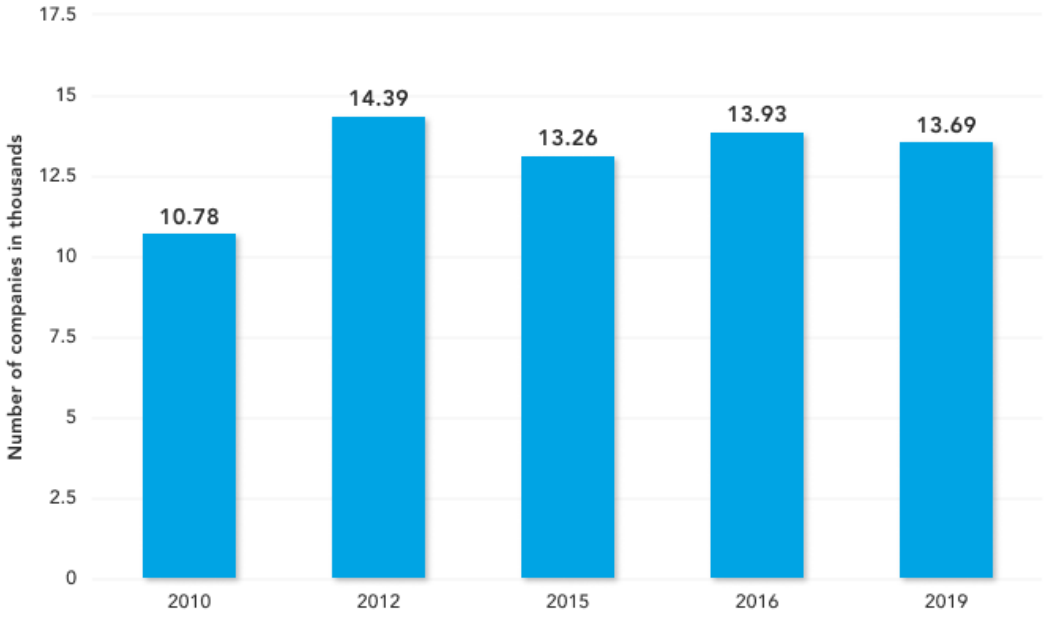
Evidently, the need to decrease manufacturing dependency on China proved salient for many economies during the pandemic – and reshoring was a decision that many considered as a solution. Next, this paper provides an example of how one Japanese company dealt with its reliance on China by reshoring – and explains why many other Japanese companies chose not to reshore.

CASE STUDY: JAPAN'S SUBSIDIES PROGRAM

Japan's economy has been particularly reliant on China. In February 2020, Japanese imports from China were cut in half, resulting in profound supply shocks reverberating throughout the economy, as many finished goods produced in Japan rely on Chinese inputs. In 2018, Japan relied on China for about 20% of its parts and materials, and much of Japan's face mask imports (80% of masks are imported) came from China.[48] Additionally, 60% of Japan's antibiotic components came from China.[49]

FIGURE 2

Number of Japanese companies operating in China between 2010 and 2019 (in 1,000s)



Source: Statista, https://www.statista.com/statistics/1024308/japan-companies-operating-china-number/

Considering how this dependency impacted Japan's economy and supply chains, Japan has become a proponent of reshoring during the pandemic. Japan's 2020 budget, expanded to deal with the pandemic, included a subsidy program aimed at bringing Japanese firms back home to protect Japanese products from unilateral trade-related policy decisions by foreign governments. The program covers up to two-thirds of costs for major companies to reshore and three-quarters for SMEs.[50] Then Prime Minister Shinzo Abe stated at the time that the plan was earmarked for high value-added products and goods for which Japan has a particular reliance on a single economy.

Iris Ohyama, a Japanese consumer plastics manufacturer, was the first recipient of this subsidy. Iris Ohyama shifted its operations in 2020 to produce masks made of nonwoven fabric. The subsidy was initially earmarked for shifting production to produce PPE, but given supply chain concerns, the Japanese government increased the subsidy to provide the company with the means to shift its facilities out of Dalian and Shanghai in China to Miyagi, a prefecture in northern Japan. Since Iris Ohyama's use of the subsidy, more than 1,600 companies have applied to the program, with 56 firms using funds to increase domestic production as of September 2020.[51]

And yet many other firms refuse to take advantage of the program. Some Japanese firms are stating that reshoring back home would be "impractical and uneconomical."[52] Many firms argue that what they produce in China is ultimately going to the Chinese consumer – meaning moving production to Japan would only increase costs and delivery times. A spokesperson for Yorozu Corporation, a Japanese company that produces auto components, told Reuters that most of its customers were in China, and that "the parts we make are so big we need to be near our customers to control our costs."[53]

While reshoring might mean less dependence on one particular economy, it also means greater dependence on a country's own domestic production. The OECD has found that this reliance on one's own local production actually leads to more vulnerability to supply chain shocks.[54] Japan's key problem at the beginning of the pandemic was overreliance on one economy and a lack of diversity in its supply chain. Reshoring all its manufacturing to its own economy will eventually recreate the problem of low diversity in its supply chains.

Ultimately, general reshoring of all manufacturing companies is not the solution to the dependency problem. Specific risk-based reshoring based on certain critical sectors, such as what Iris Ohyama did, can be helpful for diversification and for reducing dependence – but it must be done carefully, and it will not (and should not) be an option for all companies.

5. Logistics of Vaccine Distribution

The development of a vaccine effective against COVID-19 led to optimism among many that the end of the pandemic was in sight, but it also led to another set of supply chain issues. The next challenge for MNCs was determining the best way to distribute and transport vaccines. Vaccines may be less potent if they are not transported using complex cold chain systems to meet temperature requirements. Additionally, there are significant logistical challenges as vaccines must be delivered overseas and to remote communities quickly to prevent the further spread of COVID-19 and put an end to the health crisis. This is especially difficult considering the decrease in air cargo capacity due to the COVID-19 pandemic – global air cargo capacity decreased approximately 35% from 2019 to 2020.[55]

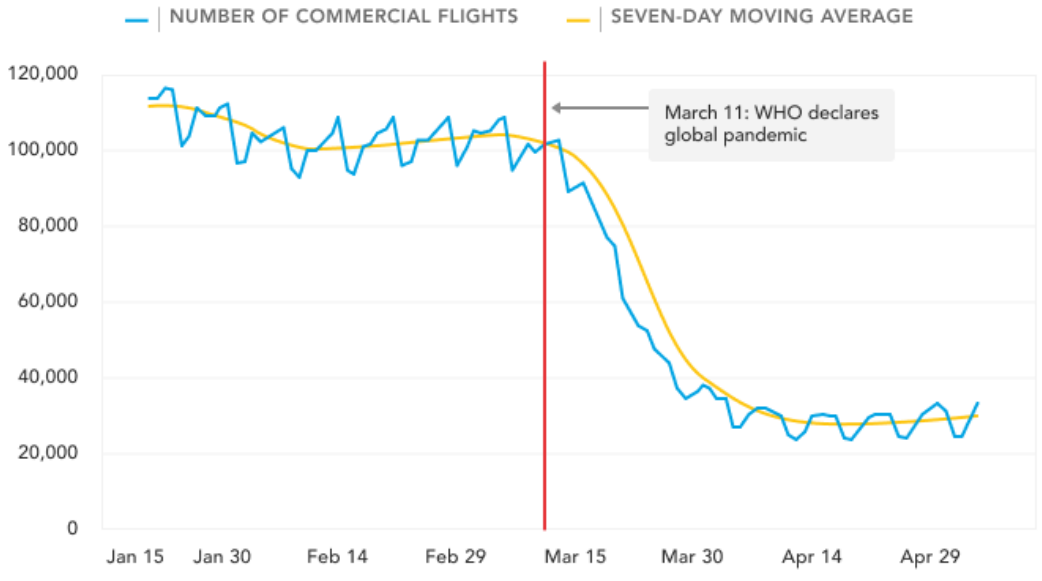
CASE STUDY: YUSEN LOGISTICS

One company that emerges as a success story is Yusen Logistics. Owned by a Japanese shipping company called Nippon Yusen Kabushiki Kaisha, Yusen formed a unique logistics network that combines air, ground, and sea transport.

FIGURE 3

Coronavirus pandemic hits global travel

The number of commercial flights has been falling since the start of 2020.



Source: Flightradar24. Data as of May 5, 2020

Yusen leverages multiple modes of transportation from air, land, and coastal marine freight transportation. Like many others, Yusen had to deal with the challenge of adapting to the shortage in air cargo capacity as a result of the massive decline in air travel after the outbreak of the pandemic (Figure 3). Because Yusen can only use airports certified to receive pharmaceutical goods, shipments of products using air travel was significantly limited.[56] As a result of restricted air cargo, Yusen invested in technologies like real-time GPS and temperature tracking for road and sea freight to optimize diverse cargo transport.

Yusen Logistics also refined their South East Asia Link (SEAL), which uses cross-border trucking connecting Singapore, Malaysia, Thailand, Cambodia, and Vietnam.[57] There is a high-demand corridor between the Thai and Vietnamese capitals that the cross-border trucking service was able to employ as an alternative to less-efficient air and ocean transport. Air freight is about 50% more expensive and ocean freight is about 10 days longer than the SEAL trucking system in transporting goods in this corridor, so the SEAL provided a viable and cost-effective alternative. The fleet of trucks runs from Singapore to Malaysia five times a week and between Malaysia, Thailand, and Vietnam about three times a week. The result of the enhanced less-than-truckload system cut lead times at a cheaper rate in a corridor experiencing high growth rates in terms of volume.[58] Yusen is planning to expand the system into a pan-regional trucking network. This will be part of the planned railway expansion between Kunming and Singapore.

Yusen is also expanding its involvement in Malaysia vaccine logistics through its subsidiary Tasco. Tasco took on the challenge of ultra-low temperature storage when it acquired two major cold chain service providers in Malaysia in 2021. Tasco's Cold Supply Chain Logistics is currently the largest cold chain provider in Malaysia. Yusen provides an example of innovative approaches to transportation and regional connectivity that has proven to be helpful for the region during the pandemic. Bolstering private companies to optimize trading routes and transportation modes can fortify a country's response to future crises.

03

CONCLUSION

This paper has described five key problems that exacerbated supply chain disruptions during the pandemic: manufacturing shortages; challenges with domestic production; temporary export restrictions; trade dependencies and reshoring; and logistics of vaccine distribution. To overcome these issues, we propose the establishment of a supply chain task force that will promote transparency, research, and funding of initiatives that will increase our understanding of GVCs, public-private discussion and collaboration, identification of critical goods, and cultivation of a diversified stockpiling strategy. These measures could ensure that Canada is better prepared to weather any future global crises that have a significant impact on supply chains.

Recommendations

The supply chain tensions examined in this paper are often intertwined. Export restrictions can lead companies to decide to reshore or encourage firms to hire logistics companies to determine the viability of diversifying their supply chains. Due to this interconnectedness, the following policy recommendations address issues from multiple case studies.

- **Creation of a supply chain task force:** The shortages and delays caused by supply chain tensions are one of the key problems highlighted in this paper. Export restrictions, logistics problems, and labour tensions have all contributed to huge

delays in the delivery of medical goods during the pandemic. To combat these issues, we propose the creation of a supply chain task force that is committed to developing and implementing rapid response mechanisms that can quickly address sudden shocks to supply chains. The purpose of the task force will not only be to respond to crises, but also to prepare preventive mechanisms that can identify potential disruptions and provide a framework that can be used to respond to these issues. The task force will provide support to the government and private companies in the form of technical assistance or consulting services and funding to support the implementation of any programs deemed necessary;

- **Increase access to supply chain data:** The primary services offered by the supply chain task force would be related to research and funding. At the beginning of the pandemic, it became clear that companies did not have easy access to their supply chain data. Companies that invested in creating supply chain maps were better prepared to respond to the pandemic early on. The maps are able to facilitate a co-ordinated response to crises, as different divisions of an MNC have access to the same information and the shareholders can make educated decisions about how best to ensure production is unaffected. The map also enables companies to respond quickly to foreign government policies that may affect their production, such as export restrictions or reshoring subsidies. Furthermore, mapping makes it easy to identify areas of tension that might require additional help from a third source, such as a logistics company, to reorganize supply chains. However, the mapping process can be incredibly expensive and difficult to maintain. The supply chain task force could therefore provide a valuable service by identifying critical goods that need to be easily accessible during a crisis and key suppliers, and then later providing these companies with a subsidy to encourage them to map their supply chains. Another policy option would be to grant companies that use supply chain mapping preference in government contracts to encourage other companies to do the same and ensure that in the event of a crisis supply chain data will be readily available;

- **Carefully assess decisions to reshore:** The government of Canada can also use the supply chain task force to address decisions to reshore. In addition to identifying the criticality of goods, and the vulnerability of supply chains, the task force can also be used to assess the feasibility of reshoring or near-shoring critical and vulnerable supply chains. To achieve this goal, the task force will consult members of the business community, producers, health-care representatives, scientists, trade specialists, and economists, among others. Once the imperative for reshoring is determined, a security mandate from the federal government would be necessary to

enforce reshoring. It is important that the imperative for reshoring be thoroughly scrutinized, as restructuring entire supply chains may eliminate gains from trade;

- **Ensure due diligence to avoid supporting unsafe labour practices:** As noted in the Top Glove case study, manufacturers will occasionally employ unsafe labour practices that lead to delays, in this case due to COVID-19 outbreaks and human rights violations. Therefore, it is useful to have a body that can ensure companies are doing their due diligence with regard to labour conditions and practices, either by facilitating their investigations into working conditions or prompting companies that provide critical goods to review the labour conditions at their factories. This is especially important for goods like nitrile gloves, that cannot be produced domestically either by refocusing operations or reshoring. The German government has recently adopted a bill that makes it the responsibility of any company located in Germany with 3,000 employees or more to monitor and eradicate human rights violations within the company.[59] This is another approach that encourages companies to ensure that no part of their supply chain is jeopardized by labour abuses or poor working conditions;

- **Support collaboration between stakeholders:** Another way in which the task force could ease supply chain tensions is by providing a forum for discussion. One of the key takeaways from the COVID-19 pandemic is that responses were not organized quickly enough and did not always involve the right actors. It is therefore important to have a body whose role it is to ensure the relevant personnel, whether that be trade ministers or local businesspeople, are meeting with one another in a timely fashion to address supply chain problems during a crisis. The case of Yusen Logistics revealed that the private sector must be consulted in the development of supply corridors and infrastructure. The task force can encourage discussion by offering stakeholder roundtables, workshops, and direct consultations. These can provide an impetus for collaboration to identify the challenges and potential solutions to problems with freight movement in Canada;

- **Foster an information-sharing innovation ecosystem in Canada:** The Samsung case study is a great example of a large conglomerate aiding SMEs in South Korea through sharing technical know-how and key networks to optimize their production processes. As part of the supply chain task force's mandate to promote discussion, we suggest that it foster an innovation ecosystem in Canada and encourage large corporations to connect with SMEs. This will not only build resilience during massive global supply shocks and demand surges, but it will also allow companies to increase their productivity. Intentionally creating linkages between universities, the

science base, civil society, and industry, as well as fostering knowledge sharing between firms, can be achieved through a systems of innovation approach. This can begin by offering fundamental research and applied R&D funding support for the Canadian research landscape to explore areas of industrial improvement. Canada has expanded existing programs such as granting councils with funding that is earmarked for areas to improve industrial capacity, like automation applications in manufacturing processes. The government of Canada can also engender partnerships through the Superclusters Initiative and the National Research Council; and

- **Diversify Canada's stockpiling strategy:** Canada already has a stockpiling protocol in the form of the National Emergency Strategic Stockpile (NESS), but this is only one form of stockpiling. The NESS relies on the management of a public stock of critical goods by a public authority and requires adequate funding during the interim periods. While a good starting point, Canada would also benefit from expanding stockpiling strategies beyond the NESS, particularly to guard against the strain and product expiry risks as experienced during the pandemic[60]. Other forms of stockpiling include requiring producers to maintain pre-defined stocks of critical products and/or intermediate goods, like active pharmaceutical ingredients. This can be achieved via fiat, preferential sourcing (granting companies that comply with stockpiling requirements coveted procurement contracts with the government), or financial incentives like subsidies or tax breaks. It is necessary to do a review of the costs imposed on private companies with mandatory stockpiling requirements. Cost analyses will have to be completed to ascertain the degree to which the added costs limit the supply of critical goods, rendering the stockpiling requirement counterproductive. A feasibility study should be conducted to compare the just-in-time inventory model that has become ubiquitous in global value chains with a "just-in-case" model where inventory exceeds demand in the event of a demand surge. In some instances, added inventory may present only a marginal cost to firms for which the government can compensate either through subsidies or tax breaks.

ABOUT APF CANADA

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The Asia Pacific Foundation of Canada (APF Canada) is a not-for-profit organization focused on Canada's relations with Asia. Our mission is to be Canada's catalyst for engagement with Asia and Asia's bridge to Canada.

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ENDNOTES

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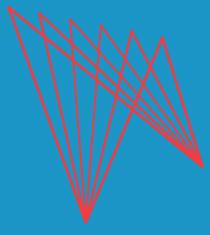

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