



# The State of Healthcare Supply Chains in APEC

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## About this report

This report was commissioned by the National Center for the Asia Pacific Economic Cooperation (NCAPEC) and prepared by Access Partnership as part of broader work on building supply chain resilience in APEC under the United States of America's (US) chairmanship of APEC in 2023.

NCAPEC is a business association based in the US dedicated to advancing private sector policy priorities in the Asia Pacific region. Its members consist of approximately 50 US Fortune 500 companies. NCAPEC collaborates with business associations across APEC, including the APEC Business Advisory Council (ABAC), which has been a key stakeholder in this study.

Access Partnership is a global policy consulting firm, with integrated expertise across many areas including technology, government affairs, multilateral organizations, and sustainability. The company's Economics Strategy (ES) Team, a global practice with experienced economists and management consultants, researched and prepared this report.

Preliminary insights from this report were presented at the 2nd APEC Business Advisory Council (ABAC) meetings in May 2023 (ABAC-II), covering broader supply chain trends across four product segments in the APEC region: (1) consumer goods, (2) consumer technology, (3) food, and (4) healthcare. A complete set of insights will be published in November 2023.

This report takes a closer look at the healthcare segment with its unique characteristics and needs. Drawing on an analytical framework spanning five key dimensions and 27 indicators, it prompts fresh recommendations for policymakers and businesses to create stronger, more resilient healthcare supply chains in times of ongoing disruption and change.

The insights contained in this report do not include any commercial information from NCAPEC or its members unless explicitly permitted. NCAPEC does not endorse any estimates made in this report. Any information from third parties or proprietary sources is clearly referenced in the footnotes.

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For more information related to this study, please contact us using the details below.



**National Center for APEC**  
601 Union St Suite 1701, Seattle,  
WA 98101, United States  
ncapecoffice@ncapec.org  
+1 (206) 441-9022



**AA Access Partnership Pte. Ltd.**  
12 Marina View, Asia Square  
Tower 2 #11-21, Singapore 018961  
singapore@accesspartnership.com  
+65 8323 7855

# CONTENT

- 04** **Top takeaways: The state of healthcare supply chains in APEC**
- 05** **1. Healthcare supply chains in APEC need to build resilience**
- 06 1.1 Healthcare supply chains in APEC are highly integrated
- 08 1.2 Recent supply chain disruptions had an outsized impact on healthcare supply chains
- 12 1.3 Healthcare firms in APEC are largely resilient, but key gaps remain
- 17** **2. Lessons learned from the pandemic**
- 18 2.1 Lessons for policymakers
- 21 2.2 Lessons for business leaders
- 23** **3. Building resilient healthcare supply chains**
- 24 3.1 Five strategies for APEC to foster resilient supply chains
- 28 3.2 Five ways for healthcare firms to bolster supply chains
- 30** **Appendix A: Supply chain resilience framework**
- 31** **Appendix B: State of resilience survey**
- 32** **Appendix C: Lead firm case study - Johnson & Johnson**

# Top takeaways: The state of healthcare supply chains in APEC

01

**Healthcare supply chains in the Asia-Pacific Economic Cooperation (APEC) group are complex and are susceptible to disruptions.** Supply chains in the healthcare segment are unique with strong vertical integration, often with a limited number of suppliers, and located within a network of highly specialized economies. Recent disruptions have had an outsized impact on healthcare supply chains, particularly the COVID-19 pandemic. The uneven pandemic response across APEC economies hampered the movement of goods and people, exacerbated supply chain issues, constrained vaccine production and distribution, and limited the supply of other essential healthcare goods.

02

**Healthcare supply chains in APEC are resilient – but they show cracks.** Most healthcare firms appear fairly robust after adopting sustainable business practices or creating more real-time visibility over their supply chains. However, most have limited flexibility to adjust business models and sourcing, as most firms rely heavily on one product for revenue or appear overly dependent on a key supplier for critical inputs.

03

**Recent disruptions offer lessons for the future.** APEC and policymakers in member economies can learn from the experience of healthcare firms to improve their crisis response. They could: (1) Harmonize regulation across APEC economies; (2) Prioritize flexibility across healthcare supply chains; (3) Remove regulatory hurdles to fast track cross-border flows of goods and people; and (4) Shore up trade infrastructure to ensure a robust supply of healthcare goods. Businesses can equally learn from crisis-hardened peers, who weathered the pandemic by investing in resilience and transparent supply chains, by reorienting distribution models, and by becoming more flexible to meet pressing demand.

04

**Five strategies for APEC to foster resilient supply chains:** (1) Establish trade flows and movement of essential services personnel as key priorities during disruptions, (2) Create APEC-level guidelines for supply chain crisis response; (3) Speed up trade connectivity, digitalization, and regulatory harmonization efforts, (4) Encourage the establishment of economy-wide task forces dedicated to supply chain flexibility; and (5) Develop a framework for capacity building for MSMEs.

05

**Five ways for healthcare firms to bolster supply chains:** (1) Measure your supply chain's resilience and identify gaps; (2) Focus on flexibility and being more diversified; (3) Create more visibility over your supply chain; (4) Align with leading or larger businesses to emulate industry best practice; and (5) Join discussions with chambers of commerce, associations, and international fora.





# 1 Healthcare supply chains in APEC need to build resilience

How did the recent COVID-19 pandemic and other events disrupt healthcare supply chains in APEC – and how resilient are they now? This chapter provides an overview, based on interviews with lead firms, literature research and a mass business survey.

## 1.1

# Healthcare supply chains in APEC are highly integrated

The deepening globalization over the past decade has spurred more and more businesses in APEC economies to engage in an increasingly complex network of global trade. Today, their supply chains follow an intricate choreography of steps – from the extraction of raw materials and manufacturing of goods to the distribution of finished products at the last mile. Within healthcare supply chains, around 36% of the traded value of pharmaceutical goods and chemicals used in healthcare is generated in APEC economies, the 21 largest in the world.<sup>1</sup>

Supply chains for healthcare products are long and relatively rigid. Firms trading healthcare goods such as pharmaceuticals and medical equipment are exemplary for this trend. Many firms interviewed for this report, including global healthcare leaders, import raw materials from around the world, base their production in Asia for scale benefits and distribute their goods widely. While spanning across the world, the healthcare manufacturing industry also has a relatively limited network of suppliers, factories, and supply chains – the result of strict regulatory requirements and the fact that producing healthcare goods tends to be more cost-efficient at scale. Manufacturers also grapple with the task of having to supply a large volume of healthcare goods that are critical to domestic security and public interests. These factors play a part at every stage of the healthcare supply chain, from sourcing and production to distribution and sales.



## Stage of supply chain



**Significant vertical integration across manufacturers.** As producers of goods that are critical to health and public welfare, firms in this sector must meet high safety and quality standards across all stages of production. Lead firms interviewed for this study typically own their raw material providers or at least exercise significant oversight over them. Their manufacturing and packaging facilities must also comply with strict safety controls.

**Significant influence by governments.** Governments take an outside interest in goods that sustain their citizens' quality of life, often directing a healthcare supplier's production and trade within their borders. The pandemic gave a clear example of the healthcare sector's critical role in crisis response. Governments heavily intervened to secure stockpiles of personal protective equipment (PPE), vaccines and essential drugs to ensure public safety. This special status can help healthcare firms gain attention, investment and logistics capacity. However, it can also put them under significant pressure to meet additional demand without commensurate support from governments.

**Strict safety controls limit the network of alternative suppliers.** The higher regulatory standards make it harder for healthcare goods producers to swap out suppliers. Firms in the US, for instance, often have to comply with Food and Drug Administration (FDA) requirements before they can change their supply chain, and these requirements tend to differ across economies.<sup>2</sup> Compliance requires a certain level of scale and investment from suppliers, particularly for pharmaceutical ingredients or medical-grade components. The result: a fairly small group of certified suppliers and partners work with a number of large manufacturers. In the survey for this report, 29% of healthcare firms said they rely on only one supplier each for half of their essential inputs. This creates a concentration risk if partners are vulnerable to disruptions.

**Greater specialization and reliance on manufacturing locations.** Strict safety and compliance rules also push firms to become specialist producers with manufacturing bases in a few specific economies. This creates scale benefits but can also breed import reliance. Data shows that healthcare trade in APEC economies exceed average import concentration ratios, with HHI scores<sup>i</sup> of above 2,000 for medical devices and pharmaceuticals (scores of above 1,500 usually imply significant concentration).<sup>3</sup> Switzerland alone, one of the world's top producers of pharmaceuticals, accounts for 16% of APEC's total healthcare.<sup>4</sup> A significant share of healthcare manufacturing destined for APEC also takes place in the US (10%), Japan (4%) and India (3%).<sup>5</sup>

**The need for specialized logistics.** To distribute their goods, healthcare firms closely work with trusted logistics partners who can provide specialized logistics services. Such services include cold chain transport solutions for vaccines and robust transportation of fragile and sensitive laboratory equipment. In our study, 90% of surveyed healthcare firms said they engage specialized logistics providers.<sup>6</sup> Other firms manage their goods distribution in-house, which requires them to specialize further. Some manufacture their own dry ice for storage.<sup>7</sup>

**Selling to large buyers.** Most healthcare firms in APEC also produce goods for hospitals and large medical providers. Higher-income economies dominate the demand for these products.

i. The HHI helps to measure an economy's level of trade concentration with its partners – the higher the figure, the higher the market concentration. Values represent a sum of squared concentration ratios across all trade partners. The figure ranges from the highest possible figure of 10,000 (i.e., if a single partner that takes up 100% of trade, the HHI would be 100 squared) toward a value of zero (i.e., many trade partners all with very low concentration ratios). Practitioners typically regard a HHI of above 1,500 as a sign of some level of concentration.

## Box 1: Case study on Johnson & Johnson



Image credit: <https://www.jnj.com/latest-news/johnson-and-johnson-moves-up-eight-spots-on-gartner-top-25-supply-chain-index-2017>

## Johnson & Johnson

Johnson & Johnson (J&J), a leading healthcare products company, displays all the characteristics that are common across large healthcare manufacturers in APEC. The company runs its research and development across the world and has an extensive but limited network of raw material suppliers. J&J works closely with governments to ensure its supply chains can deliver critical goods. A detailed case study on the company's experience during the pandemic, including its response to disruptions, can be found in the Appendix of this report.

## 1.2

## Recent supply chain disruptions had an outsized impact on healthcare supply chains

Major disruptions have impacted all global supply chains in recent years. Notable events include the COVID-19 pandemic with its restrictions on movement of labor and cross-border trade in early 2020, geopolitical tensions between trade partners, and shortages of freight capacity. All of these events left firms grappling with permanent changes and capacity issues in their supply chains that lasted well into late 2022. The Global Supply Chain Pressure Index (GSCPI), which records the shifts in average transportation and logistics costs of key economies, peaked in late 2021 at over four standard deviations above the mean and eased only towards the end of 2022.<sup>9</sup>

The long and highly integrated healthcare supply chains were particularly affected. The COVID-19 pandemic placed unprecedented expectations on healthcare firms. They had to work closely with governments in an effort to create a coordinated response to tackle the virus. Supply chains had to be quickly reoriented. Healthcare firms were tasked to stockpile key goods and divert all available production to vaccines. They were grappling with security demands, international cooperation needs, frequent lockdowns, uneven regulation across borders, surging demand for healthcare products at home and abroad, as well as unprecedented coordination challenges at every stage of manufacturing and distribution. Many of these supply chain challenges were a result of ineffective policies or poor coordination – that is, they were “man-made”, not “virus-made” as put by a lead firm interviewee.



Some of the more prescient challenges highlighted by lead healthcare firms include:

- **Policies tended to be economy-centric, which constrained healthcare supply chains.** As an immediate response to the coronavirus outbreak, governments across APEC sought to secure the domestic supply of key healthcare products such as personal protective equipment (PPE) and drugs to combat COVID-19. Their actions involved reshoring and nearshoring strategies to protect the immediate ecosystem of finished goods from policies that restricted labor movement and market access, including key factories, logistics providers and trade partners (i.e., Tier 1 suppliers). Early on, policymakers also moved to restrict exports of medical supplies.<sup>10</sup> These facilitation measures often overlooked the intricate and complex ecosystem of modern healthcare supply chains, where a geographically dispersed network of inputs and intermediate goods suppliers (Tier 2 suppliers) feed factories and finished goods. These challenges were compounded further when governments required the production of healthcare goods to be localized to ensure adequate domestic supply of PPE. The reality was that meeting a spike in demand of PPE goods that was 20-40 times above normal was impossible to meet even when leveraging global PPE industry capacity at the time, as reported by 3M.<sup>11</sup> The policies that were meant to secure production ultimately limited healthcare firms from meeting domestic needs.
- **Healthcare resources were rapidly diverted to vaccine production.** As COVID-19 vaccines were developed in late 2020 and early 2021, healthcare firms along the value chain were compelled to redirect all available capacity to vaccine production. Firms also had to secure supplies of inputs quickly, which became all the more complex when lockdowns made regular sources of materials harder to reach. Companies such as Johnson & Johnson had to set up a global network to produce vaccines and track production in real-time. Yet they could not cease production of other necessary life-saving goods such as medical supplies, equipment and medicines (both over the counter and prescription therapies).<sup>12</sup> A preliminary report by the Organisation for Economic Cooperation and Development (OECD) suggests that public health strategies during the crisis lacked clarity in roles and responsibilities in the public and private sector, leading to duplication or confusion in the provision of essential services.<sup>13</sup>



■ **Movement of labor and goods was restricted, slowing down production and logistics.** Border closures and controls impacted the movement of labor and goods, which in turn slowed down production in specialized facilities and the supply of essential healthcare products. The logistics industry, an essential player in transporting medical goods, experienced labor bottlenecks: many workers had to undergo strict quarantine restrictions when crossing borders or were contaminated with the virus due to significant exposure from constant travelling. These restrictions added to existing labor and skills shortages in the sector from years before the pandemic. Vaccine producers such as J&J, Moderna, and Pfizer reported labor shortages internally and among their production partners during the crisis, creating constraints across their manufacturing sites.<sup>14</sup> Air capacity restrictions particularly impacted the flow of goods within the healthcare sector, even as value of shipments rose and they were given ‘top priority’ status amid the spike in demand. While lead firms such as J&J were able to “raid their own cabinets” in terms of inventory, finances, and capacity buffers, many smaller firms across healthcare supply chains suffered significant loss of revenues due to these shortages.

■ **Firms had to focus on “connecting the supply chain dots”, rather than on production or fulfilment.** Healthcare firms had to quickly adapt to constant changes in trade regulations and production environments during the crisis. Lack of clarity in regulations for producing, distributing and transporting vaccines also hindered progress toward widespread inoculation against COVID-19. Lead firms cited how uneven lockdown laws blocked their product flow between ports and production sites, creating significant challenges and delays. Firms were forced to devote additional resources to “connecting the supply chain dots”, needing to consistently communicate with federal and state governments across multiple economies throughout the pandemic to ensure products could move past key bottlenecks. Decade-old customs challenges, including outdated analogue technology, an ongoing need for physical inspections, and a lack of standards harmonization, were exacerbated by the pandemic and proved detrimental to supply chain costs and time. While some firms were able to innovate and find alternative forms of supply and distribution, other firms were forced to set up entirely new manufacturing bases from scratch, which delayed product delivery.



■ **Micro-, small- and medium-sized firms faced significant challenges.**

MSMEs are key suppliers, customers, and partners at every stage of the product value chain. Almost all lead firms interviewed in this study work with MSMEs as key suppliers of base inputs (e.g., smallholder farmers and agri-food commodities), critical component producers for pharmaceuticals and healthcare equipment, third-party logistics contractors, and even as customers. During the pandemic, MSMEs suffered from reduced demand, record-high transportation and operational costs, and a significant loss of revenue, impacting its ability to respond to disruptions and recover from disruptions. As an example, around 40% of healthcare MSMEs surveyed highlighted challenges and delays when engaging with trade customs since the pandemic, causing the quality of their goods to deteriorate. Overall, many MSMEs across economies were forced to close – a separate study showed nearly two-thirds shut temporarily over 2020-22, and at least 10-15% shut permanently across APEC markets. Lead firms assisted their suppliers and customers where they could, but all cited significant challenges in providing long-term support, being forced to end relationships with many partner MSMEs that could not remain competitive.

MSMEs constitute at least a **90% share of medical device manufacturing companies** in many APEC economies including Australia, the US, and Viet Nam



## 1.3

## Healthcare firms in APEC are largely resilient, but key gaps remain

The impact of supply chain disruptions has raised significant questions over the healthcare sector's ability to withstand future disruptions. Some firms were able to evolve their supply chains to manage disruptions better. They added digital elements to their supply chains and changed where and when they source and produce key goods. However, overall progress has been uneven. This is particularly the case for MSMEs, which typically have less resources to change. Business action is by no means the only determinant in the resilience of healthcare supply chains. However, understanding gaps in the state of resilience today will prove critical to APEC policymakers in strengthening policies that support healthcare supply chains during crises.

### Box 2: Measuring supply chain resilience



To understand the current state of healthcare supply chains' ability to withstand disruptions, this study uses a comprehensive framework of supply chain resilience. The framework was presented at the Second Meeting of the APEC Business Advisory Council (ABAC-II) in Brunei in April 2023. It is based on extensive review of the existing literature on resilience and in close coordination with lead firms in the industry. It adopts a holistic view of supply chain resilience across five key dimensions – flexibility, visibility, connectivity, robustness, and redundancy. These dimensions are underpinned by 27 indicators, which allow us to measure a firm's levels of resilience quantitatively and qualitatively.



## Exhibit 1

### Resilience Scorecard: APEC healthcare supply chains

The healthcare segment's resilience scorecard shows that its supply chains are resilient across a number of indicators today, but there are also some key gaps.

#### 1. Flexibility



1.1 Products	11%	89%
1.2 Suppliers	27%	73%
1.3 Customers	42%	58%
1.4 Trade routes	58%	42%
1.5 Distribution	70%	30%

#### 2. Visibility



2.1 Digitalization in tracking	90%	10%
2.2 E-payments	88%	12%
2.3 Data analytics	91%	9%
2.4 Trade/customs knowledge	79%	21%
2.5 Information sharing & trust	86%	14%
2.6 Supplier due diligence	86%	14%

#### 3. Connectivity



3.1 Transportation modes	28%	72%
3.2 Warehousing	94%	6%
3.3 Automation & digitalization	87%	13%
3.4 Last mile	32%	68%
3.5 Specialized logistics	70%	30%

#### 4. Robustness



4.1 Business Strategy	87%	13%
4.2 Cybersecurity	84%	16%
4.3 Data protection	85%	15%
4.4 Emission targets	80%	20%
4.5 Waste management	87%	13%
4.6 Brand equity	84%	16%
4.7 Access to capital & cashflow	86%	14%
4.8 Insurance and risk transfer	87%	13%

#### 5. Redundancy



5.1 Inventory	34%	66%
5.2 Capacity	86%	15%
5.3 Financial buffer	87%	13%

X% Share of firms that are resilient in this indicator

X% Share of firms that are NOT resilient in this indicator

Note: Based on results of a survey of 311 healthcare firms in 15 APEC member economies – includes Australia, Canada, China, Indonesia, Japan, Korea, Malaysia, Mexico, the Philippines, Singapore, Thailand, US, Viet Nam, New Zealand, and Peru.

The scorecard shows that resilience appears strong on indicators under the **visibility** and **robustness** dimensions, relatively less strong under **connectivity** and **redundancy**, while largely falling short under **flexibility**. The indicators reveal a number of interesting trends:

■ **Inflexible products and suppliers.** Only 11% of healthcare firms show resilience on the **product** indicator, with their main product contributing to less than half of overall company revenue. In other words, the vast majority (89%) risk relying on potentially volatile market demand to ensure their businesses remain afloat. At the same time, only 27% of firms have more than one **supplier** for each of their critical inputs, which highlights a strong supply chain risk for almost three-quarters of surveyed firms.

Just **11% of surveyed firms** have resilience in product diversity and **27%** in supplier diversity

■ **Lack of diverse transportation options.** Only around a quarter (28%) of the surveyed firms have more than one logistics partner across each **transportation mode** (land, sea, and air) – the threshold for resilience on this indicator. In addition, 92% of the firms rely on **road transport**, but nearly half have just one road transportation partner. Any disruption among logistics partners will result in a significant risk for these firms – as the pandemic showed.

■ **Wide networks of specialized logistics partners.** Firms tend to have only few options for each mode of transport, but many have access to a range of alternatives for specialized logistics. Around nine out of ten healthcare firms require specialized logistics, including cold chain or dangerous goods transportation, and 70% of these firms are able to engage more than one provider – the threshold for resilience on the **specialized logistics** indicator. This, however, does not necessarily indicate that the full demand of specialized logistics capacity is being met, which means it could remain a bottleneck at the economy-wide level, especially during periods of excessive demand (such as mass vaccine distribution).

■ **Digitalization ranks high on the agenda.** The vast majority of surveyed firms use **digital tracking**, **e-payments**, and **data analytics**. They have **cybersecurity** and **data protection** policies in place. They also invest in **automation**, **digitalization** and connective infrastructure. This trend already began before the pandemic. Still, around a third of firms (32%) adopted digital tracking technologies only after the pandemic, 30% commenced e-payments, and 28% installed data analytics tools.

■ **Inventory levels could manage short-term disruptions.** Just 34% of healthcare firms surveyed reveal that they keep at least three months of inventory supply (both inputs and finished products) – the threshold for resilience on the **inventory** indicator. Given the significant shortages during the pandemic, especially for PPE and generic drugs, the lack of inventory is a contributing factor to the sensitivity of healthcare supply chains during medium-to-long-term disruptions lasting more than a year. Indeed, significant public-private sector coordination was needed to ensure firms could continue to supply critical goods across markets.

Only **34% of healthcare firms** keep inventories worth at least three months of goods including gloves and chemicals



Other unique features of healthcare supply chains' resilience appear when results are broken down by firm size. Medium and large firms consistently outperform smaller firms on almost all dimensions except flexibility. In particular, micro- and small-sized firms appear to outperform their larger counterparts on key indicators such as **products** and **suppliers** (Exhibit 2). A key reason is that a majority of these smaller firms tend to be manufacturers of pharmaceuticals and chemicals, as well as less sophisticated but common medical products which require fewer inputs. These firms are therefore able to depend on larger variety of suppliers and **customers**. Meanwhile, medium-sized firms tend to produce more complex medical devices for fewer, larger customers, and thus would require more specific and scarce inputs.

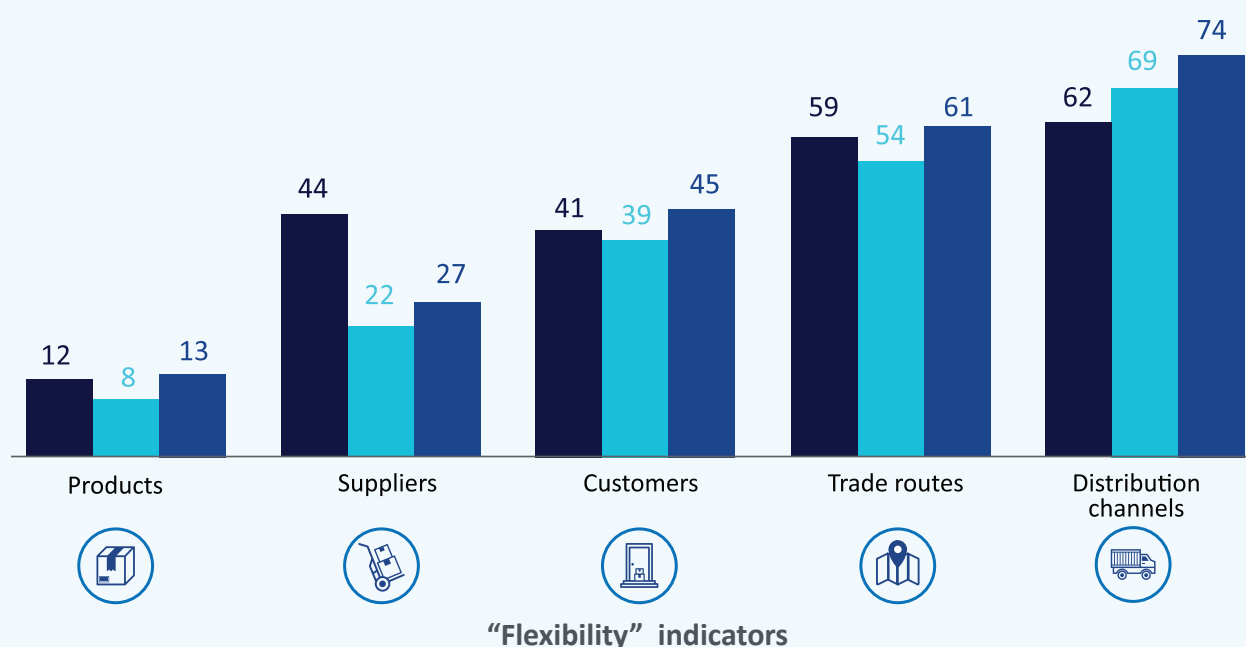
## Exhibit 2

### Smaller-sized healthcare firms slightly outperform larger firms in some areas of flexibility, highlighting unique features of the segment

#### Share of firms who are resilient in each indicator

Percentage, %

- Micro and small (Less than 50 employees)
- Medium (between 50 to 250 employees)
- Large (more than 250 employees)



SOURCE: Business survey of 311 healthcare firms in APEC.

The healthcare segment appears more resilient than other segments in APEC. Only 34% of healthcare firms have three-months' worth of **inventory**. However, this figure is still higher than the average share of inventory held in other segments such as consumer technology (26.5%) and food (28%). Pharmaceutical companies tend to have larger inventories than their peers in most other industries, typically due to relatively longer shelf lives of their products.<sup>15</sup> Healthcare firms are also more adaptable to **trade or customs challenges**, with 79% having either a dedicated team to manage trade regulations or experiencing no trade-related challenges in recent years. This share is much higher than the one in segments such as consumer goods (63%) or consumer technology (71%).





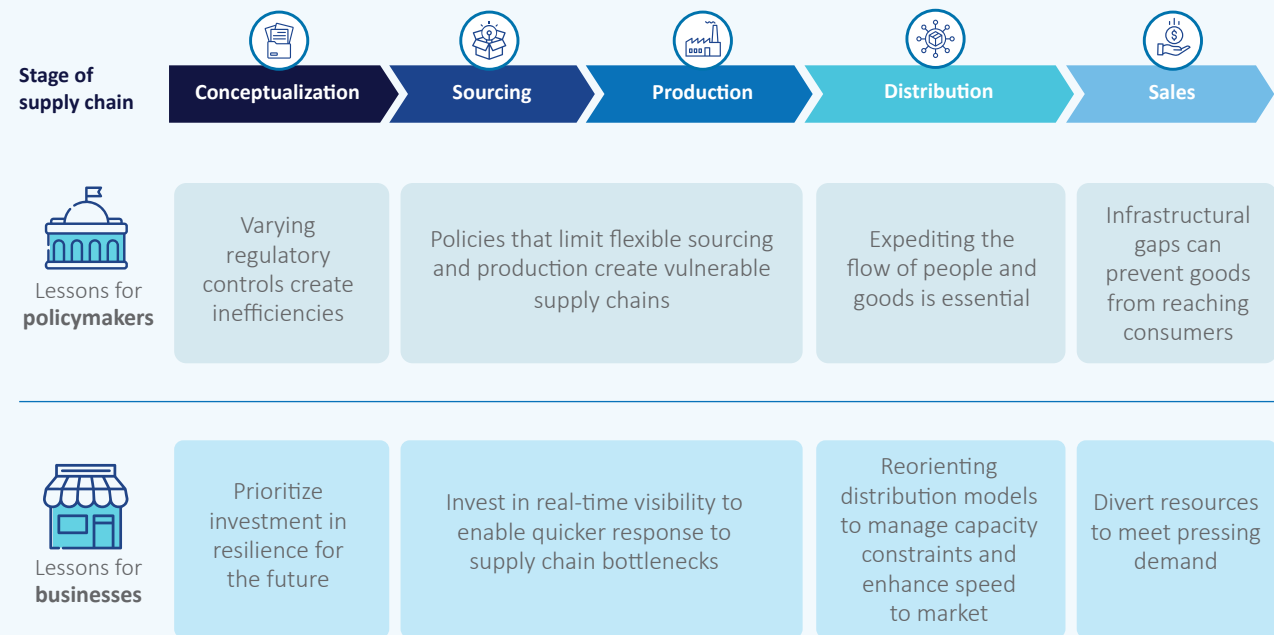


## 2 Lessons learned from the pandemic

What did APEC's most successful healthcare businesses do to keep their supply chains on track during the pandemic? Their stories, based on numerous interviews and a literature review, can teach policymakers and business leaders and policymakers important lessons. This chapter offers ideas for a future crisis response.

## Exhibit 3

### Summary: Key lessons for policymakers and business leaders



## 2.1 Lessons for policymakers

Experiences during the pandemic revealed important lessons for policymakers in building supply chain resilience. Chapter 1 showed how policy responses often exacerbated the challenges firms faced during the pandemic. Policymakers should consider the following lessons to foster an effective cooperation between the private and public sector:

### ■ Lesson 1: Varying regulatory controls create inefficiencies.

Market-specific import regulations and stringent safety requirements imply that healthcare supply chains are carefully designed around key research and development (R&D) and production centres with trusted distribution partners. However, during the pandemic, healthcare and logistics firms faced inconsistent and frequently changing safe management measures across APEC economies, greatly challenging sourcing, manufacturing, transportation, and distribution. This volatility significantly impacted all healthcare products but especially those that require complex operations such as precise cold-chain and temperature controls, Dangerous Goods (DG) certification (for example, for dry ice and biologics), as well as Good Manufacturing Practices (GMP) certification in production and distribution. A lack of harmonization of product standards between economies also prevents healthcare firms from switching between suppliers that adhere to different standards. Creating alignment in key regulatory hurdles can facilitate market access and standards compliance, reducing the need for import controls that can slow down product distribution.

Alignment of regulations, such as **good manufacturing practices (GMP)**, can facilitate market access and reduce import constraints

## ■ Lesson 2: Policies that limit flexible sourcing & production create vulnerable supply chains.

Policy responses among APEC economies toward managing supply chains during the pandemic were typically limited to an economy-wide, domestic security, or strategic sector perspective – with most policies moving toward reshoring or nearshoring.<sup>16</sup> For example, the US launched a set of executive orders that provided direct funding to domestic supply chains and curbed foreign sourcing.<sup>17</sup> Similarly, Japan introduced a sizeable emergency stimulus package of US\$1.1 trillion to enhance domestic capacity and shorten businesses' supply chains.<sup>18</sup> These decisions had clear, unintended consequences on organizational supply chain resilience for the healthcare sector, a sector that relies on a global network of partners, by creating rigidity in where firms could source critical inputs, and uncertainties in bringing products from production sites to end-consumers. These factors combined to raise prices for firms at home while also impacting suppliers from overseas.<sup>19</sup> Around 82% firms in this sector highlighted that they face geopolitical restrictions in their trade today, signaling an urgent need for policy alignment among APEC members.

## ■ Lesson 3: Expediting the flow of people & goods is essential for healthcare supply chains.

Lockdowns and severe restrictions on cross-border movements of people and goods had a range of unintended consequences, especially on procurement of critical inputs and the labor pool supporting production and transportation of medical goods. Within the healthcare goods sector, prioritizing the transportation and flows of essential goods and workers was key to the distribution of much-needed medicines and materials needed for the manufacture of lifesaving vaccines. Policy responses that included import restrictions of medical products or their inputs further exacerbated disruptions of vaccine production during the pandemic. It is worth noting that economies which remained committed to open borders and free flow of goods contributed significantly toward accelerating manufacturing and supply of vaccines worldwide. For example, the Quad Vaccine Partnership which encouraged multi-sector cooperation and prioritized availability of vaccines among Australia, India, Japan, and the US was pivotal toward vaccine development and distribution.<sup>20</sup>



#### ■ Lesson 4: Infrastructure gaps can prevent healthcare goods from reaching consumers.

Rapid import processing and reliable logistics infrastructure are also key enablers to transportation of pharmaceutical goods and vaccines. However, many economies in the Asia Pacific lack such specialized infrastructure at scale, including reliable cold chain storage, and were often observed to have delayed imports of critical vaccines during the pandemic.<sup>21</sup> APEC members also continue to have wide disparities in the ability to attract infrastructure investment. The CMS Law Infrastructure Investment Index 2021 analyzed 50 economies' investment environments and revealed that APEC economies are similarly distributed among the highest and lowest-performing entities.<sup>22</sup> Gaps in infrastructure or trade standards potentially make it more challenging or expensive for businesses to diversify into newer markets. Around 84% of firms in this study leverage last-mile transportation, highlighting the potential of addressing infrastructure gaps. Successful businesses and logistics firms generally conduct trade out of markets with better infrastructure to keep costs low, especially during disruptions. Some firms have been able to meet these challenges by using nascent technologies to reach hard-to-reach locations. For example, UPS designed custom-made drones with cold-chain capabilities to deliver vaccines in remote areas of the US and Malawi.<sup>23</sup> However, such applications are nascent and require greater research and scale to be viable for all but the largest firms.



## 2.2 Lessons for business leaders

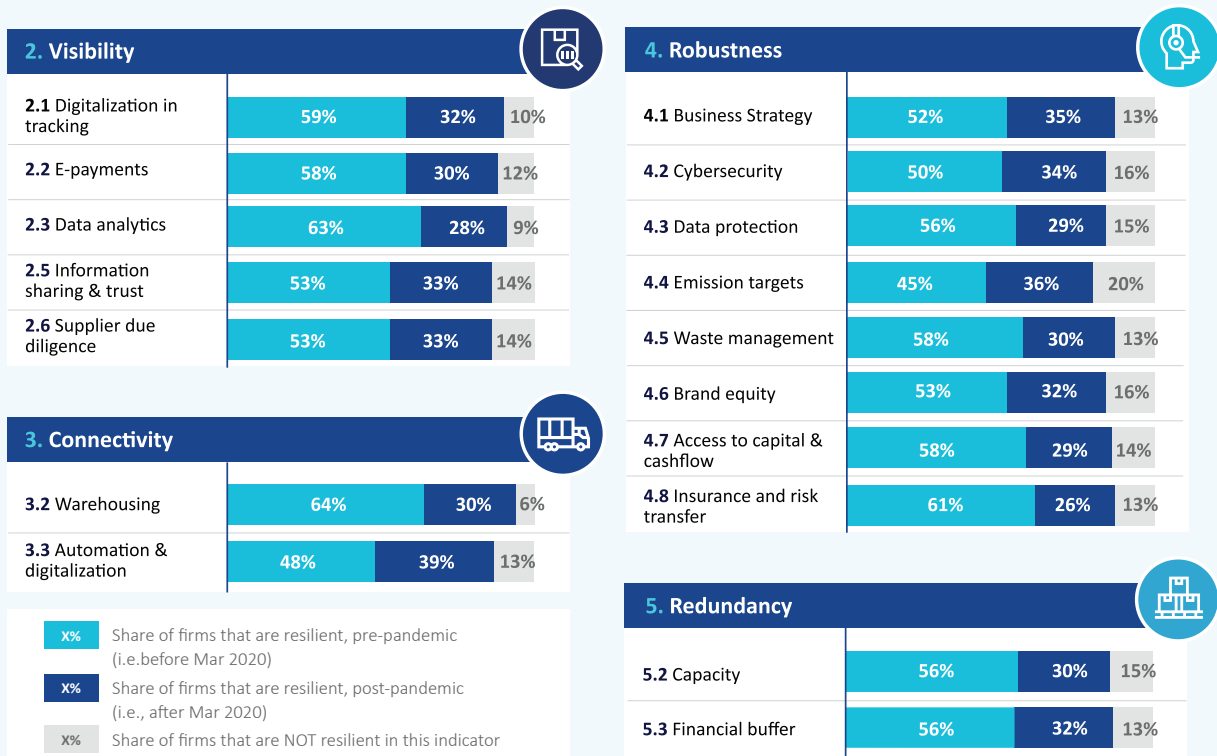
Despite the disruptions posed by the pandemic, companies in the healthcare sector largely updated and innovated their supply chains. Firms worked closely with customers, suppliers, and governments to redesign their supply chains to manage uncertainties, reduce recovery time and increase responsiveness to emerging bottlenecks and changing demand.<sup>24</sup> This provides an opportunity for businesses to learn from each other. Major strategies included:

- Strategy 1: Investing in resilience for future pandemics and disruptions.** Many firms have recognized that efficiency is no longer the “end-goal”. They look toward investing to create capacity buffers – be it in people, production or pipelines. At the same time, cross-border production is now considered a means of reducing geographical risk. Johnson & Johnson pointed out how geographical diversity should be viewed as a strength during a crisis, especially if governments can facilitate expedited flow of essential goods. Pfizer, meanwhile, invested in new manufacturing facilities and parallel supply chains to ensure redundancy for critical goods, a practice it intends to learn from for future disruptions. In addition, maintaining a wider portfolio of products, partners, and processes necessitates a regular review of product and segmentations by business leaders.

Exhibit 4 shows that, on average, 30% of firms in the healthcare segment improved resilience as a result of the pandemic on a number of indicators – particularly those related to digitalization and better business management. Another clear result of the pandemic was that businesses began to focus more on restructuring their supply chains to manage costs of disruptions. Indeed, there is a strong imperative for effective supply chain management – it is estimated that supply chain shocks could cost medical device companies around 38% of annual earnings if not managed well.<sup>25</sup>

### Exhibit 4

#### More and more firms are investing in resilience across their supply chains post-COVID-19



NOTE: Indicators listed here reflect ones that companies can implement or improve with relative ease post-COVID-19, and predominantly are applicable to any type of company regardless of product type or industry.  
 SOURCES: Business survey of 311 healthcare firms in APEC.

■ **Strategy 2: Investing in visibility for quicker response to bottlenecks.**

Almost all lead firms used digital technologies to make informed decisions by responding to changes or disruptions in real-time and quickly identify critical vulnerabilities within their supply chains. During the crisis, J&J established clear communication points with both direct and indirect suppliers, introduced advanced product tracking systems leveraging digital technology, invested in monitoring capacity, and created an early warning system to identify supply chain risks in real-time. This visibility enabled greater responsiveness to emerging challenges and drove down costs and delivery times. This approach resonates with many business leaders

– according to a separate global survey of 71 supply chain executives across industries and regions, more than half indicate visibility as their top priority for digitalization initiatives.<sup>26</sup> This corroborates with on-ground observations – 32% of firms surveyed for this study adopted digital tracking technologies during or after the pandemic.



Among all healthcare firms surveyed,

**59% were already using digital tracking technologies** before the pandemic, while **32% began to use it after**

■ **Strategy 3: Reorienting distribution models to manage capacity constraints and enhance speed to market.**

To meet urgent demands for COVID-19 vaccines, healthcare companies worked closely with logistics providers to maximize efficiency and product integrity in transportation and distribution. This involved developing solutions to ensure vaccines remained at required temperatures and integrated real time tracking to prevent spoilage. As such, vaccine manufacturers such as Pfizer / BioNTech adopted just-in-time models due to short life-cycles of mRNA vaccines, reorienting

distribution from manufacturing plants to freezer farms in key air express hubs for on-demand dispatch to dosing sites throughout the world. This enabled them to meet strict cold chain requirements and ship with minimal delay.<sup>27</sup> To ensure viability of the vaccines, specialized temperature controlled packaging outfitted with sensors and GPS trackers were developed, pre- and re-conditioned for oversight and tracking in specially created distribution networks for vaccine roll-outs.

U.S.-based manufacturers Pfizer and BioNTech opted for **just-in-time** supply chains for vaccines to meet cold chain requirements and ship with minimal delay



- **Strategy 4: Diverting resources to meet pressing demand.** Businesses recognize that the ability to pivot toward new markets and “flexing up and down” capacity is a key trait of resilient business models. During the pandemic, J&J monitored data on order patterns and vaccine demand to flexibly scale available production capacity, redirecting resources away from low-demand products towards categories of goods that were in high demand. Firms also exercised market and product diversification to mitigate losses of revenue. Many healthcare brands have also pivoted toward direct-to-consumer channels instead of relying on traditional middlemen retailers, with e-commerce and direct-to-consumer revenue growing by a significant 36.5% between 2019 and 2021 in the vitamins and nutrition market.<sup>28</sup> This also included identifying new avenues to generate leads and creating new ways to engage with consumers – for example, multiple healthcare providers were able to quickly adopt telehealth technologies to provide services at a distance during the pandemic.



## 3 Building resilient healthcare supply chains

What should happen next? This chapter presents fresh recommendations for policymakers and healthcare firms. They are the result of extensive stakeholder engagement, as well as a review of best-practice policies and business strategies across APEC.

## Summary: Strategies to build resilient healthcare supply chains



Strategies for **APEC**  
and **policymakers**

- 01** Establish trade flows and movement of essential services personnel as key priorities during disruptions
- 02** Create APEC-level guidelines for supply chain crisis response
- 03** Speed up trade connectivity, digitalization, and harmonization efforts
- 04** Encourage the establishment of economy-wide task forces dedicated to supply chain flexibility
- 05** Develop a framework for capacity building for MSMEs



Actions for  
**healthcare businesses**

- 01** Measure your supply chain's resilience and identify gaps
- 02** Focus on being more flexible and diversified
- 03** Create more visibility over your supply chains
- 04** Align with leading or large businesses to emulate industry best practice
- 05** Join discussions with chambers of commerce, associations, and international fora

### 3.1 Five strategies for APEC to foster resilient supply chains

Supply chain disruptions could remain a prominent challenge to healthcare supply chains, but concerted effort by APEC and member economies can overcome them and build resilience. The continuing impact of the pandemic, new pandemic threats, geopolitical developments, rising manufacturing costs, and intensifying natural disasters will continue to disrupt supply chains in the near future. Building supply chain resilience, therefore, is essential to absorb shocks from potential disruptions by limiting the impact of and recovering from those disruptions that do occur.<sup>29</sup>





APEC and associated organizations can focus on five key initiatives to promote greater supply chain resilience within and among member economies, drawing on lessons learned and gaps in the current state of resilience:

- **Strategy 1: Establish trade flows and movement of essential services personnel as key priorities among APEC economies during disruptions.** Ensuring that the movement of goods and services can continue unimpeded is critical to the development and delivery of medicines and vaccines that are critical in public health emergencies. APEC should focus on prioritizing these trade flows and personnel – that is, policymakers in APEC must commit to having the first instance of policy coordination to be on keeping goods moving, even if lockdowns, and closures of ports and manufacturing facilities are necessary containment measures elsewhere. Almost half of surveyed healthcare goods firms in APEC agreed that governments should commit to prioritizing trade flows during such periods. As such, APEC as a forum could facilitate the development of pre-determined whitelists or “green lanes” for key product supply chains that take effect only during periods of disruptions. This enables firms to maintain stable flows of inputs and distribute finished medical goods toward populations across borders without compromising on safety. Such features could also be integrated into ongoing workstreams such as the current iteration of the Supply-Chain Framework Action Plan (SCFAP III), which aims to support businesses in building secure and resilient supply chains.<sup>30</sup> Aligning on such lists early is the main feature of this action as it can minimize regulatory uncertainty and manage business and public concern on the availability of medical goods.
- **Strategy 2: Create APEC-level guidelines for supply chain crisis response, especially in prioritizing medical goods.** Coordinating responses between economies and within subnational jurisdictions when disruptions occur is key to minimizing unnecessary restrictions and to facilitate the smooth flow of essential goods and services. For example, closures of ports and grounding of air transportation that were simultaneously enforced by many economies during the pandemic created bottlenecks in logistics networks and volatility in levels of shipped inventory, impacts of which continue to last even till today. Thus, establishing an APEC-level guidelines that highlight common rules and protocols, which could take the form of “playbooks” or standard operating procedures (SOPs), to address future disruptions can mitigate the “domino effects” of unforeseen events or competing policy responses.

An important component of such plans are early warning systems, powered by data analytics, to track stocks and predict shortages of essential items (including PPE, drugs, vaccines, and medical supplies) which require lockstep coordination with private sector stakeholders who are involved in sourcing, manufacturing, and distribution of these relevant goods. Integrating response protocols with warning systems and industry input could address regulatory uncertainty by enabling governments across APEC by pegging responses to appropriate threshold levels, which could be related to disease outbreak levels or product inventory. In addition, these protocols must prioritize business continuity for cross-border movement of essential products and should be developed in consultation with businesses.



- **Strategy 3: Speed up APEC-level agendas on trade connectivity, digitalization and regulatory harmonization for medical products.** APEC must double down on its Supply Chain Connectivity agenda focusing on bread-and-butter issues of infrastructure, transportation, and logistics services to strengthen linkages and maximize options for distribution and delivery. More developed and more digitalized transport and logistics networks promise more flexibility and stronger linkages between economies (e.g., wider road networks, more efficient seaports and customs etc.). They support resilience by smoothing the flow of goods and people across borders. Thus, the decades-old focus on digitizing customs and border processes must be kept. While the pandemic accelerated the shift to a more digitalized bureaucracy, the progress remains uneven within the region. To facilitate scale and improve access to medicines, APEC can play an important role in bridging regulatory systems, working to harmonize product approvals, border clearances, or certification for medical-grade goods. Such efforts will eliminate barriers in sourcing or distribution allowing healthcare companies to establish greater proximity to markets.

To create additional flexibility, APEC could also standardize Good Manufacturing Practices (GMP) and similar Good Distribution Practices (GDP) for warehousing and distribution standards. To improve access for land-locked and rural communities, APEC should consider common regulatory frameworks for emerging transportation technology such as unmanned aerial vehicles (UAVs). The Committee on Trade and Investment (CTI) is one key platform to sponsor such agendas with the Sub-Committee on Standards and Conformance (SCSC) and Digital Economy Steering Group (DESG).



- **Strategy 4: Encourage the establishment of economy-wide task forces dedicated to supply chain flexibility.** Economies must respond to future disruptions by evaluating them systematically and crafting policies that balance multiple outcomes. For instance, a future pandemic must prioritize health outcomes for citizens but also must ensure businesses stay afloat and supply chains remain operationally viable. Accordingly, cross-functional task forces that deal with pandemics must evaluate the knock-on impact of health protocols on trade and supply chains by coordinating policies with domestic agencies responsible for trade and foreign relations. Importantly, these coordinative bodies must proactively solicit and welcome industry feedback.

Rather than adding another regulatory layer, such arrangements are designed to function as a centralized coordination center that can facilitate rapid communications to support development of urgent responses. For instance, Canada established a public-private COVID-19 working group with local industry associations to share information and gather business feedback on regulations up to three times per week at the height of the pandemic.<sup>31</sup> Similarly, Australia established the National COVID-19 Coordination Commission in March 2020 to provide “whole-of-society” and “whole-of-economy” policy responses, with leaders from the private sector and civil society working together with the government to mitigate the socioeconomic impact of the pandemic.<sup>32</sup> APEC could consider encouraging economies to establish economy-wide task forces that can function as key points of contact for businesses and governments to mitigate such bottlenecks.

- **Strategy 5: Develop a framework for capacity building for MSMEs.** Supporting MSMEs in times of wide-spread economic disruption is critical to maintaining business continuity and socioeconomic stability. Greater MSME participation in global value chains can also diversify supplier and customer bases. To advance this, there is a need for APEC to develop a comprehensive framework to support MSMEs in mitigating supply chain risks and tools to assist them improve their resilience ahead of future disruptions, particularly toward improving aspects of flexibility, visibility, connectivity, robustness, and redundancy. Flexibility in terms of product variety, customers, suppliers, and trade routes may indeed be the most pressing challenge. Policymakers and MSME-specific workstreams in APEC must therefore focus on increasing these MSME access to markets and trade distribution networks, as well as providing support in product innovation and connecting suppliers. There is also a clear need to support MSMEs that lack the scale or financial stability to digitalize their supply chains and introduce greater buffers to build resilience.



## Five ways for healthcare firms to bolster supply chains



There are a number of actions that healthcare firms can take to build supply chain resilience. Data from the survey show the pandemic has already caused some significant changes in practices related to visibility and robustness. This indicates that firms are aware of the need to build resilience and are committed to doing so. Deficiencies remain in areas such as flexibility and connectivity. This is particularly relevant to MSMEs. Drawing on this momentum and learning from the best practices of lead firms to manage recent disruptions, there are five strategies that healthcare firms, especially MSMEs, can consider to improve their supply chain resilience:

**1. Measure your supply chain’s resilience and identify gaps.** In a similar vein to our assessment of the segment’s current levels of resilience, firms should conduct this exercise at an individual level to understand gaps and priorities for them to build resilience. This ensures that investment and improvement is targeted in areas where this is most needed. It also ensures that firms can plan for the knock-on effects of interventions in any one area to others and avoid new bottlenecks; for instance, product diversification is only possible if connectivity and transportation options are developed in tandem.

Firms should also conduct scenario analyses to plan for future disruptions. For example, firms in the healthcare industry should set aside contingencies for different health-related crises to ensure they have adequate supply of materials for different disease outbreaks. At the same time, these exercises must reveal the biggest sensitivities that impacts the bottom line – from exchange rate fluctuations to network dependencies in specific markets. To support this, NCAPEC has developed a Supply Chain Resilience Toolkit, which guides users through an assessment of their resilience across each of the five dimensions and constituent 27 indicators, providing clear rationale behind scores, and appropriate recommendations on how to improve resilience where gaps are identified.

**2. Focus on flexibility, particularly by having more diverse products and suppliers.** At an organizational level, a firm can improve flexibility by encouraging diversification in its products sold, suppliers, customers, trade routes, and distribution channels through which it reaches customers. For example, lead firms responded by redesigning their supply chains with these principles in mind, increasingly valuing the benefits of diversification more than the additional costs that expanding into new markets or bargaining with multiple suppliers may bring, including risks from “single points of failure” that jeopardize the success of their entire supply chain. Some firms also reoriented their production lines to produce new goods, targeting newer sources of demand, or considered commercializing other aspects of their business model. For example, providing advisory services to peers or smaller firms based on industry knowledge built through experience may hedge short-term revenue fluctuations.



**3. Create more visibility over your supply chains and transportation modalities.** Having stable and smooth linkages across all stages of production is vital to its overall resilience. Lack of coordination between sea/air freight and inland logistics was one of the key logistical bottlenecks created by the pandemic, especially during global port congestions in late 2021. To build efficiency and resilience across these linkages, which may include elements of sea, air, and road transport, specialized logistics, and last-mile delivery, lead firms have ensured that they leverage diverse options and platforms.<sup>33</sup> One initiative a lead firm undertook involved creating a strategic logistics network to manage distribution, enabling the company to readily meet local demand in both periods of upswing and downswing. Technology can also be leveraged to manage warehousing or the transfer of goods, thereby reducing downtime, increasing efficiency, and improving the ability of firms to adapt to shifting demand.<sup>34</sup>

**4. Align with leading or larger businesses to emulate industry best practice to build segment-wide resilience.** Closer collaboration between major healthcare players and MSMEs can help develop better standards and crisis response problems. For example, good manufacturing practices (GMP), which outline best practices that maintain standards of quality among manufacturers in the healthcare goods industry, are typically co-developed by industry players and authorities. Industry associations also facilitate collaboration between firms large and small to highlight common issues or share experiences in tackling them. For example, the International Society for Pharmaceutical Engineering (ISPE), a global association of pharmaceutical manufacturing firms, holds regular seminars to discuss challenges faced by players across the entire supply chain such as shortages of raw materials, lack of talent, and regulatory uncertainty.<sup>35</sup> MSMEs, whether as competitors, customers, or suppliers, could also consider leveraging such platforms or engaging with larger businesses to identify common areas of vulnerabilities, co-create targeted solutions, or promote interoperability of supply chain systems.

**5. Join discussions with local business chambers, MSME associations, and in international fora for policy advocacy.** Firms can rally together through chambers of commerce or local associations to facilitate dialogue with governments and multilateral organizations on topics of supply chain issues, talent development, and industry policy. Chambers of commerce and trade associations are examples of platforms where the industry can discuss the latest trends and business bottlenecks with policymakers. As an example, the US Chamber of Commerce provides guidance on and events for businesses large and small to tackle industry-wide issues, and even runs sharing sessions between industry players to discuss the latest best practices. Enterprise Singapore, a government agency dedicated toward promoting the development of local enterprises, also provides funding and advisory services for firms who plan to expand internationally, while also acting as a representative within international platforms to share industry concerns. Alongside business objectives, such platforms also serve to facilitate input from industry for trade deal negotiations and inter-governmental efforts.

# Appendix A:

## Supply chain resilience framework

The resilience of a supply chain is typically defined by its capacity to resist potential disruptions by limiting the impact of and recovering from those the disruptions that do occur.<sup>36</sup> In general, there are four “phases” of resilience – planning, absorbing impact, recovering, and adapting.<sup>37</sup> This baseline definition has been used to define supply chain resilience in relation to trade by many organizations such as APEC, the Organisation for Economic Cooperation and Development, the International Monetary Fund (IMF), the Organisation for Petroleum-Exporting Countries (OPEC), and others, as well as a broad range of academic literature and professional services companies. A summary of insights from the prevailing literature is available in the main report of this study, while elaborations of each key dimension are provided below.



**Flexibility:** This dimension refers to the ability of firms to adjust their business operations to adapt to and minimize supply chain disruptions.<sup>38</sup> Supply chain flexibility can be supported through greater diversification of products, suppliers, customers, trade routes, and distribution channels through which it reaches customers.



**Visibility:** This concept refers to the ability of an organization to track the flow of goods from the point of sourcing from delivery right to the customer (and even disposal or recovery).<sup>39</sup> To this end, achieving visibility involves the use of technology and data analytics, internal industry expertise, information sharing, and conducting supplier due diligence (i.e., identifying supplier-related challenges).<sup>40</sup>



**Connectivity:** Having stable and smooth linkages across all stages of production is vital to a supply chain’s overall resilience. Lack of coordination between sea/air freight and inland logistics was a logistical bottleneck revealed in the pandemic.



**Robustness:** This dimension involves pre-emptively minimizing the impact of disruptions by institutionalizing key internal processes that focus on longer-term survivability. Firms can enhance robustness by developing long-term business strategies, focusing on sustainability, building a trustworthy brand reputation, and adopting cybersecurity capabilities to support digital transformation efforts.



**Redundancy:** This refers to the availability of excess capacity or resources to sustain or enhance the other four dimensions of supply chain resilience during disruptions. Many firms are increasing investment in buffers across different nodes of their supply chains by maintaining buffers in inventories, utilizing the lower capacity to mitigate system failures and capture demand cycles, or having financial buffers.<sup>41</sup>

# Appendix B:

## State of resilience survey

To better understand the state of resilience in healthcare supply chains within APEC members, a survey was conducted for this study in June 2023. The survey respondents included 311 healthcare firms located in 15 APEC member economies, which include: Australia, Canada, China, Indonesia, Japan, Korea, Malaysia, Mexico, the Philippines, Singapore, Thailand, US, Viet Nam, New Zealand, and Peru. The total sample closely resembles the GDP proportion of each economy and to be representative of APEC's overall supply chain. A breakdown of these respondents by economy and business size is given in Tables A2 and A3.

**TABLE A2**

	AU	CA	CN	ID	JP	KR	MY	MX	PH	SG	TH	US	VN	NZ	PE
<b>No. of respondents</b>	12	10	53	40	27	25	10	7	10	17	13	51	16	7	3

**TABLE A3**

	Micro- and small-sized firms	Medium-sized firms	Large-sized firms
<b>No. of respondents</b>	34	125	152

# Appendix C:

## Lead firm case study - Johnson & Johnson

Johnson & Johnson

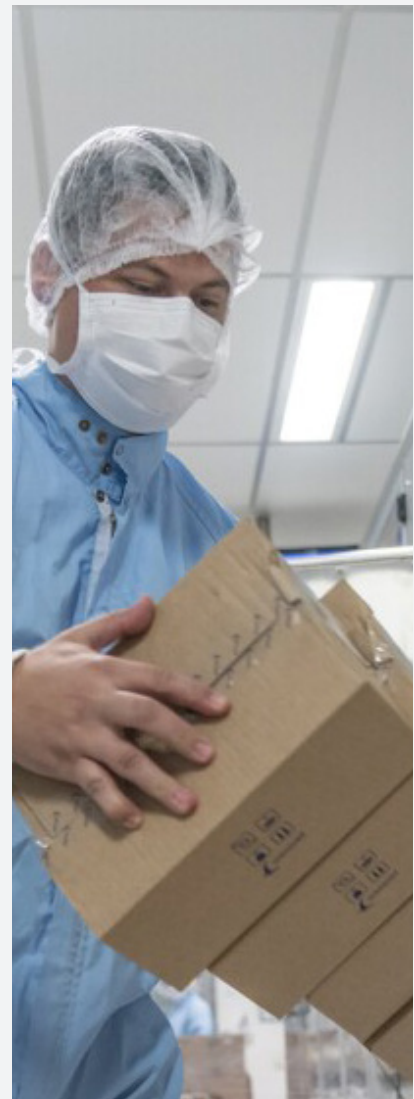
Johnson & Johnson has been actively engaged in addressing times of health crisis for over a century. As the world's largest, most diversified healthcare products company, they have a global reach and unique ability to leverage deep scientific expertise and extensive partnership. Most recently, Johnson & Johnson mobilized and tapped into their network of more than 130,000 employees around the world towards mitigating the impact of the COVID-19 pandemic.

### Role during pandemic

At the onset of the COVID-19 pandemic, Johnson & Johnson worked to develop and deliver a COVID-19 vaccine for global populations that was easily transported, stored using standard refrigeration, and combined with its efficacy, was uniquely positioned for ease of deployment in any setting. 80 percent of their vaccines have been delivered to low and low-middle income economies at non-profit pricing or via donations.

Since the early days of the outbreak, Johnson & Johnson worked in several ways with industry partners, governments and health authorities to help end and mitigate the impact of the fast-moving COVID-19 pandemic and to ensure continuity of supply for critical products for patients. This includes:

- Committing \$300 million dollars to support frontline health workers;
- Encouraging employees with medical skills/background to volunteer their time to serve their communities and health systems under strain;
- Invested at risk to scale up its global manufacturing capabilities to meet the unprecedented global demand for vaccines;
- Ramping up production of critical medicines and healthcare products by running manufacturing sites 24/7; and
- Assisting critical suppliers in need of key components, support and even loaned assistance from members of its own workforce to help avoid disruptions for critical materials.





## Approach to supply chain resilience

Johnson & Johnson was able to successfully support the needs of the patients, customers, and communities despite the unprecedented challenges of COVID-19. They attribute this success to the robust Business Continuity Planning (BCP) processes they had in place prior to the pandemic.

This includes maintaining critical inventory at distribution centers, working with external suppliers to support preparedness plans and maintaining a geographically dispersed supply chain that has the ability to adapt as economies implemented restrictions to contain the spread of the virus. They proactively monitor trends and develop actions to manage emerging or current risks, including pandemics, natural disasters, cyber threats, terrorism, social unrest, geopolitical risks, import/export restrictions, regulations, or disruption of sourcing. Additionally, throughout the year, risk assessments, scans and surveys are performed by the business and/or risk management functions to identify internal and external events that might affect Johnson & Johnson's supply chains. They also provide BCP training for employees, using unique scenarios and table-top exercises – ensuring crisis management teams are ready to be activated across every region of the globe.

Johnson & Johnson actively monitors its end-to-end supply chain during a major event like COVID-19 so they can ensure they are maximizing product availability, producing and delivering the right volumes of the medicines and devices that people need. Examples of what they did include:

- **Flexible planning:** Johnson & Johnson teams incorporated a high degree of flexibility in supply chain planning, including pre-positioning supplies, pre-staging and pre-clearing alternate shipping methods and routes, and harnessing digital capabilities to monitor sales patterns and order flows to avoid unnecessary stockpiling that may lead to patient shortages.
- **Working closely with governments and suppliers:** Johnson & Johnson teams ensured sufficient coordination and intelligence gathering with appropriate Government partners, and negotiated where necessary to ensure free flow of goods and services across borders. It also worked cooperatively with their suppliers to expedite shipments, and maintained BCP commitments for key primary and secondary suppliers.



- **Maintaining sufficient buffers:** Including dual sourcing for key manufacturing steps and dual source locations for key raw materials (or inventory), maintaining inventory levels by enabling alternate sites to cover demand, where available; ensuring backup line(s) within existing sites (with available capacity) for key manufacturing steps; maintaining sufficient inventory levels; and having spare parts for critical equipment.
- **Investing in visibility:** In response to Hurricane Maria in late 2017, Johnson & Johnson's supply chain teams used digital tools to track the exact location of emergency supplies and products heading to or from the Puerto Rico to help automate business continuity efforts and ensure Johnson & Johnson continued to supply products on time to customers. This same approach, together with significant investments in digital and data science capabilities, informed their response to the pandemic and enabled end-to-end visibility for the entire portfolio. It allowed Johnson & Johnson to make better and faster trade-off decisions to deliver the best health outcomes for patients and communities.

## Building for the future

Johnson & Johnson teams are also using highly automated scenario risk simulation technology to help minimize delivery disruptions. For example, they are using automated statistical scanning of sales order patterns to proactively handle abnormal demand patterns to help identify and subsequently prevent unnecessary stockpiling, hoarding or panic buying – ensuring they can continue to respond to and meet patient demands. Johnson & Johnson is also building a digitally-enabled resilience dashboard so that it can see across its value streams in real-time and actively predict the impact of risks like geopolitical changes or even regional disease outbreaks – helping to ensure an even more proactive response for the future.

Over a century ago, Johnson & Johnson played a leading role in helping to limit the impact of the 1918 Flu pandemic. As new challenges arise, Johnson & Johnson has been very public that they will continue to partner with governments and stakeholders across the globe to address immediate and long-term health care needs, supplying critical products for those who rely upon them. Their size, expertise, and the investments made in one of the largest supply chains globally, allow Johnson & Johnson to continue to be there in times of need.



# Endnotes

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