WORLD TRADE ORGANIZATION

WORLD TRADE REPORT 2021

Economic resilience and trade

What is the World Trade Report?

The World Trade Report is an annual publication that aims to deepen understanding about trends in trade, trade policy issues and the multilateral trading system.

What is the 2021 Report about?

The 2021 World Trade Report explores current debates about economic resilience in a global economy increasingly subject to natural and man-made shocks, and explains how the WTO can contribute to improving economic resilience.

Find out more

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Disclaimer

Abbreviations and symbols

ACP	Organisation of African, Caribbean and Pacific States
AoA	Agreement on Agriculture
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
CEMAC	Economic and Monetary Community of Central Africa
COMESA	Common Market for East and Southern Africa
COVID-19	coronavirus disease
C-TAP	COVID-19 Technology Access Pool
DSU	WTO Dispute Settlement Understanding
EAC	East African Community
EGA	Environmental Goods Agreement
EIF	Enhanced Integrated Framework
EM-DAT	Emergency Events Database
FAO	Food and Agriculture Organization of the United Nations
FDI	foreign direct investment
FTA	free trade agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GHG	greenhouse gas
GPA	Agreement on Government Procurement
GVC	global value chain
HS	Harmonized System
IATA	International Air Transport Association
ICC	International Chamber of Commerce
ICT	information and communications technologies
IMF	International Monetary Fund
IP	intellectual property
IPR	intellectual property rights
LDC	least-developed country
MERCOSUR	Southern Common Market
MFN	most-favoured nation
MSME	micro, small and medium-sized enterprise
NGO	non-governmental organization
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
PPE	personal protective equipment
QR	quantitative restriction
R&D	research and development
RTA	regional trade agreement
SACU	Southern African Customs Union
SCM	subsidies and countervailing measures
SPS	sanitary and phytosanitary
STDF	Standards and Trade Development Facility
TFA	WTO Trade Facilitation Agreement
TRIMs Agreement	WTO Agreement on Trade-Related Investment Measures
TRIPS	trade-related aspects of intellectual property rights
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
WCO	World Customs Organization
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WTO Agreement	Marrakesh Agreement Establishing the World Trade Organization

Foreword by the WTO Director-General

The COVID-19 pandemic has neatly illustrated the multi-faceted ways in which globalization touches our lives. The deep interconnections of travel, trade and financial flows that characterize our era allowed the novel coronavirus and its associated economic shocks to spread around the world in a matter of weeks. Earlier pandemics took months, even years, to go global.

Yet, globalization was also at the heart of why this virus was met with vaccines in record time. Scientists were able to share ideas and technology across borders, backed by public and private funding for research and development. As the new vaccines proved to be safe and effective, supply chains cutting across hundreds of sites in a dozen or more countries came together to provide the specialized inputs and capital goods needed for vaccine production on a large scale – all within a year.

Nevertheless, access to COVID-19 vaccines remains highly inequitable. At the time of writing, vaccination rates in Africa and in low-income countries remain in the single digits, while in rich countries, and, increasingly, in upper middle-income economies, large shares of the eligible population are vaccinated, with individual hesitancy being the main obstacle to universal coverage.

Global production of COVID-19 vaccines is projected to reach 12.4 billion doses by the end of 2021 – a dramatic increase compared to the world's annual pre-pandemic production capacity of 5 billion doses for all vaccines – but this is still not enough, especially as evidence of waning immunity is leading more and more countries to pursue booster shots. Trade will continue to be central to getting the vaccine production and distribution we need, which are a prerequisite for a strong, inclusive and lasting economic recovery. Looking to the future, trade will also be at the heart of building a more decentralized and diversified production base for vaccines, therapeutics and diagnostics that would be more resilient in the face of future pandemics.

COVID-19 took us by surprise, despite many predictions that the world was overdue for a respiratory virus pandemic. Other risks are more firmly established on our radar screens, from climate change to natural disasters. Here too, trade can help us better prepare for, and respond to, the eventual shocks associated with those and other risks.

This year's *World Trade Report* reviews the role of trade, trade policy and international cooperation in building and supporting economic resilience in the face of natural and man-made disasters, including the COVID-19 pandemic. It finds that today's highly connected global economy is more exposed to risks and vulnerable to shocks, from supply chain cut-offs to infectious disease outbreaks, but that it is also more resilient to shocks when they do strike.

The report finds that trade cooperation is instrumental in improving resilience to shocks, because it promotes greater diversification of products, suppliers and markets. It points to ways in which trade can sustain economic resilience for households, firms and governments, particularly when supported by complementary domestic policies and effective global cooperation.

Anticipating, evaluating and managing risks is key to preparing for shocks. Diversifying supply sources and destination markets are two strategies for doing so, as is building inventory stocks of critical inputs. Other risk reduction and early warning strategies, such as weather forecasting, insurance, telecommunications and health services, can be enhanced by greater trade in services.

When a shock hits, trade can help to mitigate the impact by allowing households and businesses continued access to goods and services. During the COVID-19 crisis, despite some pandemic-related export restrictions, trade helped countries meet the skyrocketing demand for medical products. In 2020, even as the value of global trade declined by 7.6 per cent, trade in medical supplies grew by 16 per cent. Trade in personal protective equipment

increased by nearly 50 per cent – and by 480 per cent for the textile face masks that have become so familiar to all of us. Trade in agricultural products remained stable in 2020, preventing the health crisis from becoming a food crisis.

Once shocks begin to stabilize or dissipate, trade can accelerate economic recovery: on the import side, by facilitating access to competitively priced intermediate products and services; and on the export side, by enabling access to foreign demand. For poorer economies with limited fiscal space, trade is particularly important as a driver of economic growth.

The early stages of the pandemic were marked by concerns that global value chains (GVCs), especially those with high levels of dependency on particular nodes or countries, could break down and become a new source of cascading shocks. Although there were instances of factory closures in one part of the world forcing assembly lines elsewhere to stop operations temporarily, GVCs have thus far been generally resilient, and have helped to drive the current economic recovery. Merchandise trade has rebounded faster than gross domestic product, propelled by fiscal and monetary stimuli, along with governments' broad restraint in the use of trade protectionism.

However, coupled with investment cutbacks in early 2020 by businesses anticipating a prolonged downturn, the unexpectedly sharp rebound in demand, further ramped up by business inventory accumulation and a shift in spending from curtailed in-person services to consumer goods, has led to supply chain bottlenecks and disruptions. These have been exacerbated by extreme weather events, accidents like the ship that blocked the Suez Canal, and COVID-19-related shutdowns in important ports and production locations. In spite of all these factors, the resulting transport cost increases and delivery delays appear likely to prove transitory.

Trade, economic growth and risk management are mutually supportive at the country level as well. GDP recovery has been faster in economies with strong pre-pandemic trade ties to countries with fewer COVID-19 cases.

International trade can, however, under certain conditions, propagate shocks, such as financial crises, international transport disruptions, supply chain cut-offs and diseases. For example, trade-dependent, relatively undiversified economies have been hit particularly hard by the COVID-19 pandemic. Better access to COVID-19 vaccines is therefore essential to ensure a rapid economic recovery, highlighting that vaccine policy is trade policy, and vice versa.

Pandemic-related economic stresses have prompted calls in some countries to re-shore production, promote self-sufficiency, and unwind trade integration with the goal of building a more "resilient" economy. This report argues that such strategies are unlikely to be effective: national self-sufficiency would be expensive and inefficient, or even technically impossible in some sectors. Reduced exposure to shocks emanating from other countries would be replaced by increased vulnerability to domestic shocks – this time without the resilience mechanisms offered by international trade. Conversely, increased trade integration has been associated with decreased macroeconomic volatility.

While the WTO already contributes to economic resilience in important ways, it can and must do more, as we confront a future of increasing natural and man-made risks and disasters. As we have seen with pandemic-related trade measures, enhancing transparency and predictability is important to provide policymakers and businesses with the information they need to make informed decisions. Actions to keep key products moving freely around the world would foster resilience, as currently illustrated by the need for bottleneck-free supply chains for COVID-19 vaccines. Ongoing negotiations at the WTO on services, investment, agriculture, electronic commerce and micro, small, and medium-sized enterprises could create further opportunities for inclusive trade and diversification, making economies more resilient in the future. The WTO's upcoming 12th Ministerial Conference, from 30 November to 3 December 2021, offers an opportunity for members to advance on these fronts. Reinvigorated international cooperation, not a retreat into isolationism, is the more promising path to resilience.

Dr Ngozi Okonjo-Iweala
Director-General

Executive summary

The health and economic crisis caused by the COVID-19 pandemic has been a massive stress test of the world trading system, delivering unprecedented shocks to global supply chains and trade relations among countries. In 2020, the value of global trade in goods and services in nominal dollar terms fell by 9.6 per cent, while global GDP fell by 3.3 per cent, in the most severe recession since World War II.

However, the trading system has proved itself more resilient than many expected at the outset of the crisis. Although initially the pandemic severely disrupted international trade flows, supply chains have rapidly adapted, goods have continued to flow across borders, and many economies have gradually begun to recover.

The global trading system has been a source of flexibility, diversification and strength during the pandemic, helping countries cope by facilitating access to critical medical supplies, food and consumer goods, and by supporting their economic recovery (see Figure 1). According to the WTO's most recent forecast, global economic output (at market exchange rates) is projected to recover by 5.3 per cent in 2021. This has been, in part, thanks to the robust recovery in merchandise trade, which is set to rise by 8 per cent in 2021. However, trade in services continues to remain depressed.

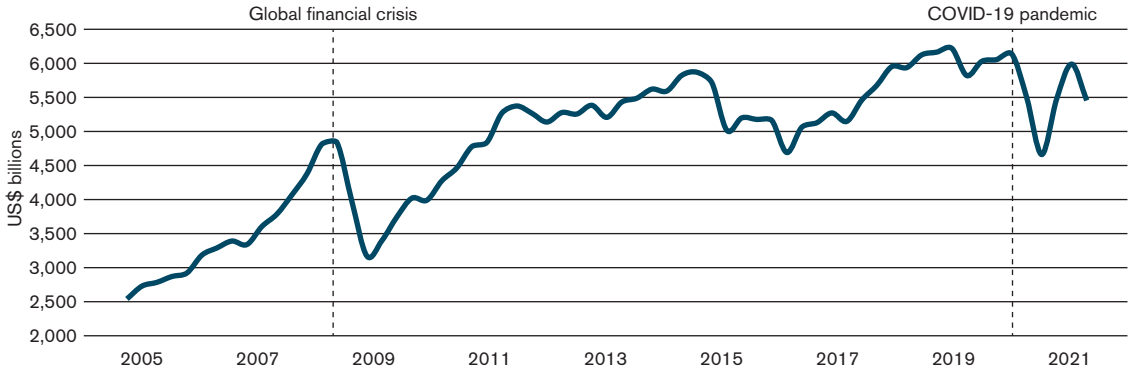
The 2021 *World Trade Report* looks at why the interconnected global trading system is both vulnerable and resilient to crises, how it can help countries to be more economically resilient to shocks, and what can be done to make the system better prepared and more resilient in the future. These are pressing questions in light of the prospect of increasingly frequent and more intense natural and man-made disasters.

For example, climate change is driving increases in extreme weather events, such as droughts, cyclones and floods, which can have devastating effects. Human encroachment on animal habitats can increase the risks of spreading zoonotic diseases, which could potentially lead to another pandemic. Although safer production processes have reduced the frequency of technological and industrial disasters, incidences of cyber-attacks and data fraud are expected to continue to increase. Rising inequality, increasing economic fragility, and growing political uncertainty and geopolitical tensions are augmenting the risk of conflicts and violence. While there is a tendency to look at these risks individually, they can interact with each other and create cascading risks and shocks to the environment, economy and society.

All of these risk trends can result in high numbers of deaths, injuries and illnesses, as well as substantial economic losses. For example, earthquakes caused over 884,000 deaths between 1980 and 2020. There were over 4,800 floods around the world during the same period, which affected over 3.5 billion people. The total economic cost caused by natural disasters between 1980 and 2020 amounted to US$ 3.6 trillion (EM-DAT, 2020).

These risk trends have significant social consequences. In times of crisis, poorer households are particularly

Figure 1: Global trade has been more resilient during the COVID-19 pandemic than during the 2008-09 global financial crisis



Source: Authors' calculations, based on WTO trade data (https://data.wto.org).

Note: The figure displays the evolution of non-seasonally adjusted quarterly world trade volume for countries that reported both merchandise and commercial services trade flows.

vulnerable to further losses in income, higher incidences of children leaving school at an early age, lost access to health care, and poor nutrition. Around 26 million people fall into poverty every year as a result of natural hazards, such as floods and droughts.

The COVID-19 pandemic has exacerbated existing gender inequalities in employment rates and hours worked due to women's greater responsibility for child and elder care, as well as their greater representation in face-to-face services disproportionately affected by the pandemic. Micro, small and medium-sized enterprises, which tend to have poorer and more vulnerable workforces, have suffered more than larger firms from the effects of the pandemic, owing to their limited access to finance, physical and digital infrastructure and to information on risk management. In global terms, economic disruptions tend to have a greater impact on developing countries, and in particular on smaller, poorer countries, than on advanced economies.

This report assesses the relationship of trade, trade policy cooperation and the multilateral trading system to economic resilience. Although "economic resilience" has become a popular term to capture the broad and diverse factors and strategies needed to reduce business interruptions and economic losses caused by shocks, it lacks a common definition. This report defines "economic resilience" as the ability of a system, including households, firms, and governments, to prevent and prepare for, cope with and recover from shocks.

Building economic resilience requires an understanding of economic challenges and opportunities, as well as the ability to anticipate, evaluate and manage risks. Although a broad range of economic resilience strategies and actions, including those related to trade policies, can be adopted by firms, households and governments, one issue that is receiving a significant amount of attention in the public and policy debate is the role of international trade in building and supporting economic resilience.

A basic binary assumption underlies much of the current debate – namely, the notion that there is an inherent trade-off between global trade interdependence, on the one hand, and domestic economic security, on the other, and that the pursuit of economic efficiency is incompatible with the pursuit of economic resilience. This report explores and re-evaluates this assumption.

The report suggests that these objectives are often interconnected and mutually reinforcing – a reality obscured by presenting them as an either-or choice – and argues that trade is a means to build and support economic resilience, particularly if it is backed by relevant domestic policies as well as effective global cooperation and rules.

The report conveys three main messages: first, today's hyper-connected global economy, characterized by deep trade links, has made the world more vulnerable to shocks, but also more resilient to them when they strike; second, policies which aim to increase economic resilience by unwinding trade integration – for example, by re-shoring production and promoting self-sufficiency – can often have the opposite effect, effectively reducing economic resilience; and third, strengthening economic resilience will require more global cooperation.

Today's hyper-connected global economy, characterized by deep trade links, has made the world more vulnerable to shocks, but also more resilient to them when they strike.

Trade can increase countries' vulnerabilities and exposure to hazards, as well as facilitating the transmission of those hazards, through economic, financial, transport and digital linkages. At the same time, trade, as a key driver of productivity and economic growth, helps countries to generate the resources they need to prevent risks and prepare for, cope with and recover from shocks.

Trade also plays a key role in diversifying access to global goods and services; for example, it enables countries to cope with shocks by switching suppliers when crises disrupt established supply relationships, whether domestic or foreign. Firms that participate in trade, especially exports, have a greater likelihood of surviving economic downturns, due to their higher productivity, on average, than firms in non-exporting sectors, as well as their tendency to have access to more diversified markets.

Trade-related mobility can be a vector for disease transmission. This includes human mobility, in the form of travel and labour migration, but also trade in livestock and in other agricultural products, particularly when trade is illicit or unregulated. For legally imported animals, these risks are reduced by disease screening, quarantine requirements and the enforcement of relevant sanitary and phytosanitary measures.

However, mobility also offers solutions as it allows for the faster diffusion of knowledge, thereby facilitating the research and development that can lead to finding cures for infectious diseases in the short term, and bolstering health systems in the long term.

Trade-driven interdependence – especially the rise of global value chains – can also increase exposure to sudden cut-offs in the supply or demand of inputs or outputs, as well as vulnerability to disruptions in international transport networks. As a result, even relatively small shocks to one "link" in the value chain can temporarily block or disrupt highly interconnected, "just-in-time" production and distribution networks. For example, the 2011 Tōhoku earthquake in Japan is estimated to have reduced the growth rate of firms with disaster-hit suppliers by 3.6 percentage points, and the growth rate of firms with disaster-hit customers by 2.9 percentage points (Carvalho et al., 2021; Tokui, Kawasaki and Miyagawa, 2017).

On the other hand, given the high costs of establishing supplier networks, the long-term relationships that underpin value chains provide firms with an incentive to keep and adjust their trading relationships with overseas suppliers, even in difficult times. This can improve the resilience of trade to crises, thus reducing the volatility of trade flows and their impact on growth. The presence of value chains also can help to accelerate recovery of production following a shock by transmitting the recovery occurring in one region to other regions along the value chain. Firms can adopt policies to enhance global value chain resilience, for example by diversifying their sources of supply, increasing inventory stocks and fostering flexible production across sites.

Trade can indirectly contribute to increased environmental risks, including deforestation, intensive farming and climate change. For example, while trade itself may not be a leading source of greenhouse gas emissions, it does cause emissions to be generated through transport and by enabling increased production. In the absence of effective climate change policy, such emissions contribute to climate change and the risk of climate-based natural disasters.

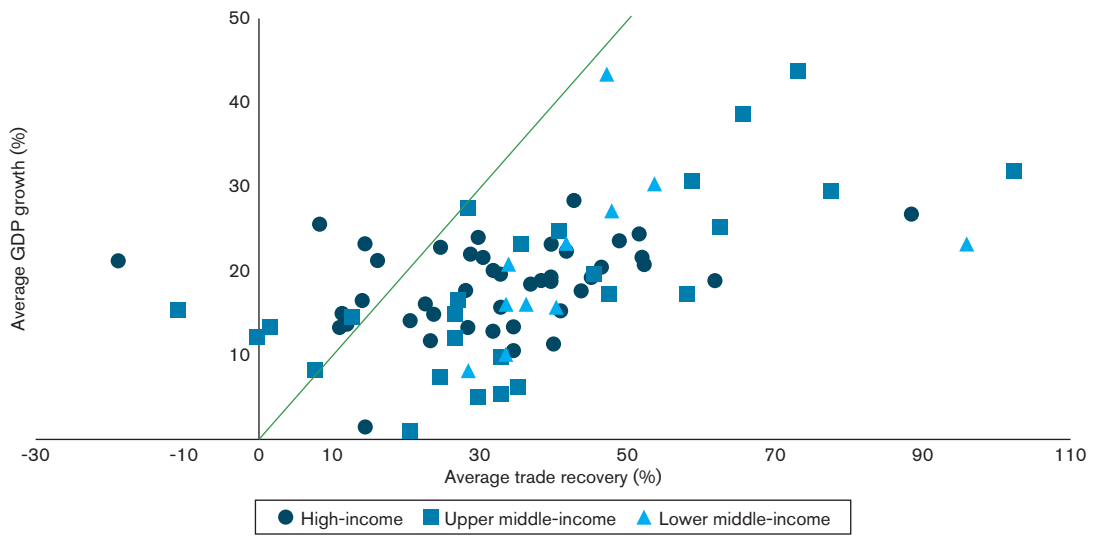
Trade can, however, also mitigate the risk of climate change by facilitating the adoption and deployment of environmental goods, services and technologies, including clean and renewable energy. Trade can also contribute to climate change adaptation by bridging the difference between supply and demand across regions; for example, as some regions experience falling yields for some crops, others will experience rising yields.

Trade in services can also be crucial in helping countries prepare for and cope with shocks. For example, weather forecasting and early warning systems can anticipate and spread information about storms, fires, floods, droughts and earthquakes. Insurance supports incomes and encourages efforts to reduce risk – although the effects of some important shocks (including earthquakes and communicable diseases) are excluded from many insurance contracts. Telecommunications, including both traditional and new technologies, can provide essential information for addressing disasters. Transportation and logistics services enable the delivery of supplies, while inadequate services can have disastrous implications during a crisis, as demonstrated at the outbreak of the COVID-19 pandemic. Finally, imported health services can ease the burden on overstretched domestic resources.

Improving the efficiency of the domestic services that affect trade also plays a key role in building and supporting economic resilience. Slow customs procedures and processes, such as refusals to release goods until payment is received in full, delays in determining which goods are exempted from tariffs, and burdensome documentation requirements, can impede the delivery of emergency supplies during disasters. Landlocked countries are particularly vulnerable to disruptions in the delivery of essential supplies due to transit issues. Several countries have undertaken trade facilitation measures since the outbreak of the COVID-19 pandemic, for example prioritizing the clearance of critical supplies (e.g., food and medical supplies), temporarily suspending certain customs duties, and expanding their trade infrastructure capacity.

Trade can also contribute to speeding up economic recovery from crises, thanks to sustained foreign demand on the export side and the availability of intermediate products and services on the import side. It can be an important recovery mechanism for many developing and least-developed countries, which have limited ability to spur economic recovery through fiscal stimulus packages. Trade has proven to be resilient and has been driving the recovery from the COVID-19 pandemic. Merchandise trade recovered more quickly than GDP after the initial shock of COVID-19 (see Figure 2). Although services trade remains depressed, trade in goods was almost at pre-crisis levels one year after the pandemic hit (WTO, 2021c). GDP recovered faster in countries with strong pre-existing trade linkages to countries with few COVID-19 cases, underscoring the mutual supportiveness of trade, economic growth and risk management. Most of the protectionist measures that were adopted at the beginning of the pandemic were soon removed; and, conversely, many trade-opening measures have been introduced to enhance the resilience role of trade. The pandemic has also shown that digital trade offers numerous solutions for a faster and more inclusive recovery.

Figure 2: Economic recovery has been associated with trade recovery during the COVID-19 pandemic (second to fourth quarter of 2020)



Sources: Authors' calculations, based on World Bank GDP data (https://data.worldbank.org) and WTO trade data (https://data.wto.org).

Note: The GDP growth rate and trade recovery rate are defined as the percentage change from Q2 to Q4 2020. Trade levels were at their lowest point in April/May 2020. The green line represents the 45-degree line.

Although trade resilience is key to supporting economic recovery, if wider economic resilience is to be sustained, the factors and conditions that cause vulnerabilities and exposures to shocks will need to be addressed. The economic recovery from the pandemic offers an opportunity to render the trading system more sustainable, resilient and equitable and to address the problems revealed by the pandemic-related crisis, such as bottlenecks and distributional inequities. It is also an opportunity to transfer idle or misallocated resources to more sustainable, productive purposes. At the same time, care must be taken that national fiscal and monetary policies to speed up recovery do not aggravate trade imbalances, as this could, in turn, provoke increased demand for protectionist trade policies.

Policies that aim to increase economic resilience by re-shoring production, promoting self-sufficiency, and unwinding trade integration can often have the opposite effect, effectively reducing economic resilience.

Restricting trade and promoting national self-sufficiency almost inevitably render national economies less efficient in the long run, as such policies ultimately drive up prices of goods and services and restrict access to products, components and technologies. While national supply chains can reduce exposure to risks emanating from other countries, they increase domestic vulnerability to supply cut-offs and demand shocks resulting from domestic disasters.

Furthermore, economic self-sufficiency is an illusory goal. In technologically advanced sectors, modern production requires a vast and complex array of global inputs that cannot be supplied by any single country. Even national self-sufficiency in food production is dependent on imports of fertilizers, farm machinery or energy to maintain sufficient agricultural output. For example, even the highly diversified European Union needed to import 40 per cent of its COVID-19 test kits and diagnostic reagents during the pandemic; and one of the US manufacturers of the COVID-19 vaccine depends on sourcing 280 components from 19 different countries to produce the final product (Pfizer, 2021).

Export restrictions adopted to secure national supplies in response to a crisis can often lead to trade retaliation from other countries, as well as dwindling imports and escalating conflicts, leaving all those concerned less well-equipped to cope with and recover from the shock that motivated the trade restrictions in the first place. Such restrictions can also impair investment in essential goods over the long term, as producers anticipate lower price increases in times of rising demand. All of this can lead to reducing free flows of trade and, crucially, essential goods being distributed less fairly when global shocks strike.

More generally, the resilience-enhancing role of trade tends to outweigh the increased exposure of countries open to trade to some risks and shocks,

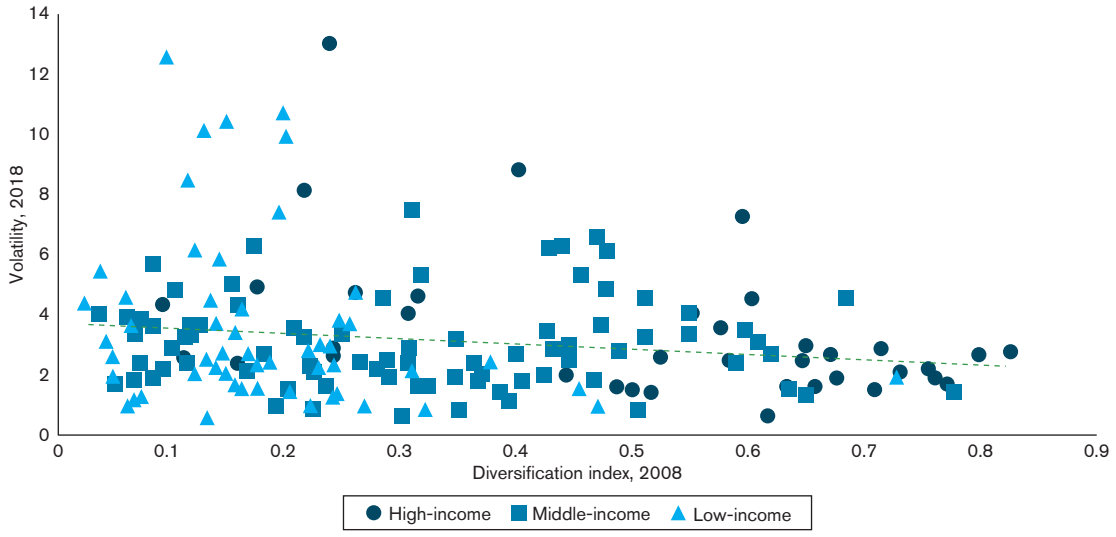
when measured by macroeconomic volatility. Empirical evidence shows that the reduction in trade costs achieved over the past 50 years has contributed to decreased volatility of GDP in most regions. Therefore, policies unwinding trade integration, such as supply chain re-shoring at the expense of international trade, are likely to contribute to increased macroeconomic volatility.

Instead, policies to promote trade diversification are more likely to build and support economic resilience and thereby reduce macroeconomic volatility (see Figure 3). Thus, just as trade can help with domestic supply shortages, diversifying trade suppliers can help when traditional foreign supply is disrupted, for example by a natural disaster affecting one supplier. Likewise, if a country's exports are concentrated in a few products, countries are more vulnerable to a drop in demand for these products, which increases aggregate volatility. The severe impact of the COVID-19 crisis on regions dependent on tourism is a case in point: for example, least-developed countries, many of which are particularly dependent on tourism/travel exports, experienced an estimated decline in services exports of 39 per cent in 2020. Similarly, if exports are concentrated in few export destinations, destination-specific demand shocks, such as recessions, can have a large impact on export revenues. Diversification across different trade routes and across different available modes of transportation also play an important role in economic resilience.

However, achieving diversification can be challenging, given the economies of scale in some traded sectors and the large fixed costs (for example, in obtaining information) involved in entering markets and establishing trade relationships with foreign firms. Moreover, in knowledge-intensive sectors, the fear of expropriation of intellectual property or imitation can prevent companies with intangible assets from engaging with a wide range of suppliers. Indeed, aggregate data show only a small increase in diversification in recent decades, while the extremely limited data at the firm level indicate high levels of trade concentration.

Trade diversification can be promoted by a wide range of policies targeting certain market, policy and institutional failures. For example, establishing clear, transparent and predictable business regulation and investment policies can reduce the costs and risks of investing in new activities. Lowering tariffs and other barriers to trade and improving the efficiency of trade facilitation can reduce trade costs and boost diversification. Limiting services trade restrictions in the home market, by increasing the quality and availability of services inputs, can increase exports of service-intensive manufactured goods. Creating policies to foster competition can spur innovation, ultimately leading to more export diversification via increases in firm productivity. Supporting labour market adjustment, for example by developing skills and reducing gender inequality, can increase trade diversification by increasing the potential pool of

Figure 3: Trade diversification reduces macroeconomic volatility



Sources: Authors' calculations, based on IMF World Economic Outlook Databases (https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases) and BACI data (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp).

Note: The diversification index is based on the Herfindahl-Hirschman index of geographical export concentration and ranges from zero (no diversification) to one (complete diversification). Volatility is computed as the standard deviation of the ten yearly GDP growth rates observed in the period 2007-17.

human capital available and improving the efficiency of the labour force.

Strengthening economic resilience will require more global cooperation.

More trade cooperation at the multilateral or regional level, backed by strong international trade rules, can support the various domestic strategies deployed to avoid and mitigate risks and to prepare for, manage and recover from shocks. Risk reduction measures and resilience policies in one country can have positive spillovers in other countries, but in the absence of global coordination, the adoption of such policies by individual countries is likely to be less than optimal from a global perspective. Cooperation also can help to limit the use of policies that can have negative spillovers for trading partners, such as export restrictions or subsidies.

Trade cooperation can help to achieve more open markets and more inclusive, stable and predictable trade that promotes the diversification of products, suppliers and markets, thus improving resilience to shocks. Cooperation can also promote greater transparency, information-sharing and predictability in the global marketplace, helping countries to better assess production capacities, avoid bottlenecks, manage inventory stocks and prevent excessive stockpiling, enhancing the ability to respond to crises. One example of resilience-enhancing information-sharing is the Agricultural Market Information System (AMIS), a platform of international agencies including the WTO, that tracks supplies of key agricultural commodities, reassuring countries when supplies are adequate and providing a forum for coordinated policy responses when needed.

International cooperation on trade takes place at the multilateral, plurilateral and regional levels. In this context, the WTO actively helps to advance trade cooperation by supporting policies that create or expand positive spillovers, by limiting WTO members' discretion to adopt policies that cause negative cross-border spillovers, and by providing a forum to address and resolve frictions. Among the WTO's contributions to trade cooperation are reduced trade barriers, streamlined customs procedures, encouragement for greater policy transparency and predictability, trade capacity-building in poorer countries, and collaboration with other international organizations to strengthen the global economy.

The existing body of multilateral, plurilateral and regional rules and disciplines is complemented by work by international organizations that directly seeks to foster economic resilience. During the COVID-19 pandemic the WTO has monitored pandemic-related measures governments have introduced to restrict or facilitate trade, thus enhancing transparency about market conditions. It has worked with vaccine manufacturers, as well as with other international organizations, to identify bottlenecks in the vaccine supply chain, which has yielded granular information about key vaccine inputs and the panoply of trade and regulatory policies that could potentially impede their cross-border movement. The WTO was able to use its role as a convener and coordinator of different actors to contribute to efforts to increase vaccine production volumes and decentralize vaccine manufacturing. Longstanding WTO work to track the evolution of goods and services trade, and to deliver policy support and technical cooperation, now reflects the pandemic's impact on the global economy, and thus helps inform members' policy responses.

WTO members themselves can work together to do more to foster economic resilience. For example, further enhancing existing WTO transparency mechanisms – particularly monitoring and notification requirements – would facilitate decision-making processes for both firms and governments by providing them with relevant information when shocks hit. To take another example, clarifying the appropriate use of export restrictions on critical materials or intermediary products during crises would reduce policy uncertainty and risks in global value chains. So would greater coordination of public procurement policies for critical goods and services during crises. Finally, advancing work on electronic commerce, micro, small and medium-sized enterprises, and women's economic empowerment would create new opportunities to make trade more inclusive and diversified, and thus more resilient.

Given the broad spectrum of risks and potential shocks, reinforcing and building on the WTO's existing cooperation with international and regional organizations will be critical. Promoting coordination, coherence, and mutual supportiveness across areas ranging from risk prevention, disaster relief and public health to climate change, environmental protection and financial stability would further support our collective ability to be resilient in the face of future crises.

A Introduction

The COVID-19 pandemic highlights a paradox: globalization has created a world that is both more vulnerable and more resilient to crises. On the one hand, economic integration makes us more dependent on far-flung trade networks and more exposed to cascading risks and shocks. On the other hand, economic integration also allows us to diversify suppliers, pool resources, and share information and expertise. The same features that make the global economy susceptible to crises – openness, interdependence, networked technologies – also make it adaptable, innovative, and better able to withstand crises when they hit. Strengthening trade, by making it more diversified, inclusive and cooperative, is also central to making the global economy more resilient to current and future crises, from pandemics to climate change.

Contents

The 2021 *World Trade Report* examines why resilience matters, how trade plays a pivotal role, and where the trade system could be improved to further support economic resilience.

1. Vulnerability and resilience: two sides of the same globalization coin

The world economy has faced various crises in recent years, but perhaps none has been as truly global in terms of reach, impact and visibility as COVID-19. More than ever before in living memory, all of humanity is focused on the same global threat, and all of humanity is dependent on the same global solutions: vaccines, social distancing and the necessity of maintaining an open world economy. The reality that "no one is safe until everyone is safe" is now true on a planetary scale (WTO, 2021a).

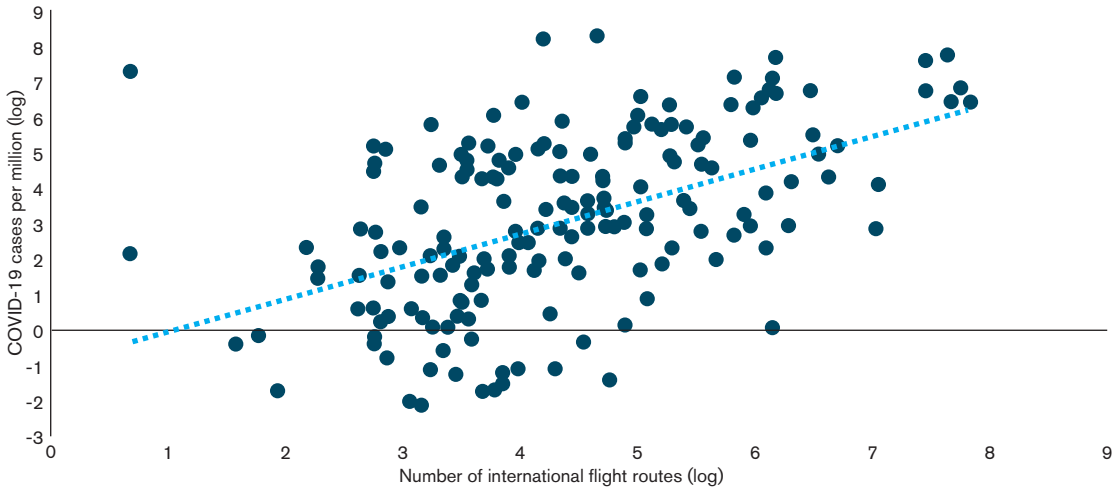
Today's highly interconnected global economy is part of the problem, by making it easier for shocks like COVID-19 to reverberate and amplify around the world; but it is also potentially part of the solution, by making it easier to mobilize the economic and technological resources the world needs in order to respond to shocks when they occur.

That globalization – the growing transborder movement of people, goods, services, capital and ideas – has made the world increasingly complex, integrated and interdependent, is self-evident. The downside of this interdependence is that crises in one part of the world, such as epidemics, financial shocks or environmental catastrophes, can quickly snowball into global crises.

This phenomenon is not entirely new. In the mid-14th century, countries were sufficiently interconnected by trade and travel to allow a bubonic plague pandemic to devastate much of Eurasia and Africa. By the early 20th century, countries' even greater interconnection allowed the great influenza pandemic of 1918 to kill millions on every continent.

What is different today is the sheer scale, scope, depth and speed of global interactions, as well as the pervasiveness of the integrating technologies that enable and drive them (Goldin and Mariathasan, 2014). The new super-highways of the global economy – air travel, supply chains, the internet – are also the new super-spreaders of shocks (see Figure A.1) (Shrestha et al., 2020). This widening and deepening of global interdependence goes a long way toward explaining how subprime defaults in the US Midwest in 2007 could have triggered a global economic crisis; how an earthquake off the coast of Tōhoku, Japan in 2011 could have sent shockwaves through global production networks; and how an outbreak of a novel coronavirus in Wuhan, China in late 2019 could rapidly have metamorphosed into today's global COVID-19 pandemic.

Figure A.1: The initial spread of COVID-19 was aided by international flights



Source: Authors' calculations, based on data from Ritchie *et al.* (2021) and OpenFlights (2019).

Note: COVID-19 cases per million by economy by March 2020; total number of international flight routes by economy.

Yet, at the same time, today's interdependent global economy has turned out to be remarkably resilient to these shocks, and possibly more resilient than many would have expected. This is not to underestimate the massive economic devastation that has been caused by COVID-19, including widespread unemployment, mass shutdowns of businesses, and the sharpest economic contraction since the Great Depression nor to overlook how the crisis has disproportionately harmed certain groups and countries, especially the poorest and most vulnerable, which were already the most exposed to economic downturns and the least protected or cushioned from shocks.

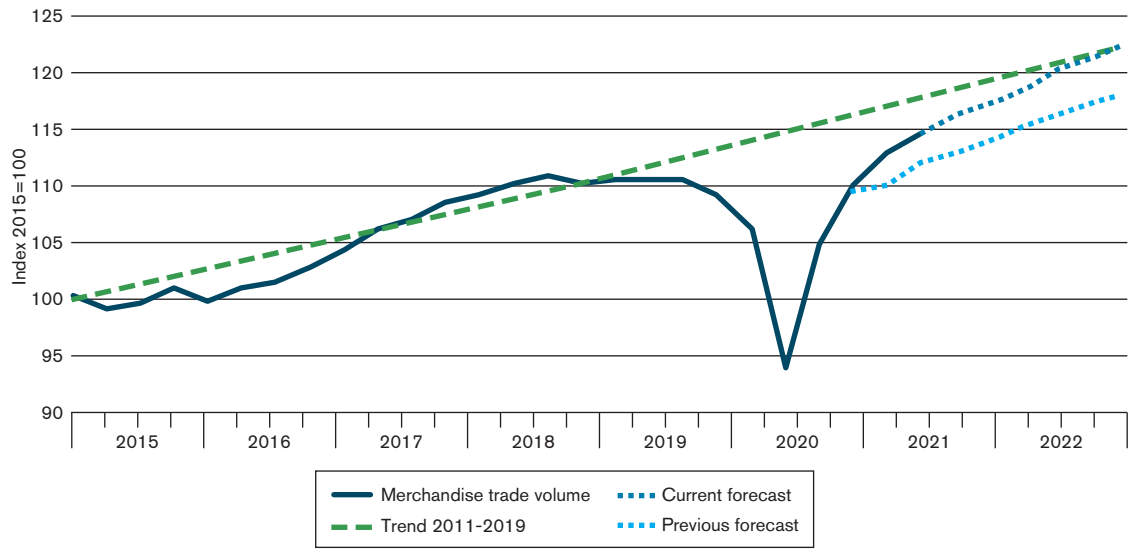
However, the fact remains that even a crisis as devastating and unprecedented as COVID-19 has not resulted in the wholesale unravelling of trade and integration, let alone the full-scale systemic collapse, that many had initially predicted and feared (Foreign Policy, 2020). In fact, after contracting sharply at the beginning of the pandemic – as countries scrambled to contain the virus's spread with lockdowns, border closures and travel bans – trade flows have bounced back, supply chains are adapting, and the world economy is beginning to recover, although this recovery is taking place at widely varying and unequal speeds (see Figure A.2).

While the unexpectedly sharp rebound in demand in many countries – propelled by pent-up consumer spending and fiscal and monetary stimuli – may have strained shipping capacity and supply chains, the trade recovery has rapidly gathered pace. Following a drop of 5.3 per cent in 2020, it is estimated that merchandise trade will rise by 10.8 per cent in 2021 – which would, in fact, result in a higher volume of world trade than before the pandemic. Even services trade, which was disproportionately devastated by COVID-19, is showing tentative signs of recovery. The fact that world trade flows exhibited a similar accordion-like "bust and boom" pattern after the 2008-09 financial crisis suggests that the system's resilience in the face of COVID-19 is not simply a one-off lucky break, unlikely to be repeated, but rather is an inherent feature of today's globally integrated economy (see Figure A.3).

One reason for the system's resilience is that networked economies are better placed than isolated ones to pool resources, share expertise and diversify their sources of supply. The early stages of the pandemic exposed how reliant many countries had become on relatively few global producers of critical medical supplies, such as face masks or ventilators, prompting widespread calls for greater supply chain diversification. But what became clear over subsequent months was not only how quickly supply chains adapted and new producers emerged, but how the key to greater diversification lay in expanding and facilitating trade with other partners, not restricting or reshoring it.

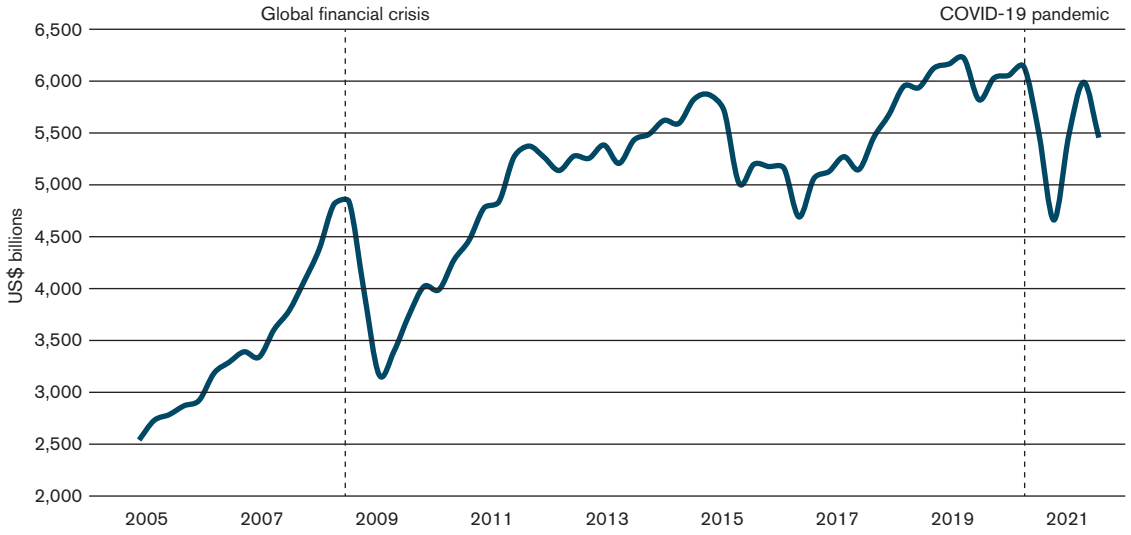
This is especially true in advanced sectors, where not even the largest economy has all the critical components, sophisticated materials and technological know-how needed to be self-sufficient.

Figure A.2: World merchandise trade volume, 2015Q1-2022Q4



Source: WTO and UNCTAD for trade volume data, WTO for forecasts, WTO (2021a).

Figure A.3: Global trade has been more resilient during the COVID-19 pandemic than during the 2008-09 global financial crisis



Source: Authors' calculations, based on WTO trade data (https://data.wto.org).

Note: The figure displays the evolution of non-seasonally adjusted quarterly world trade volume for countries that reported both merchandise and commercial services trade flows.

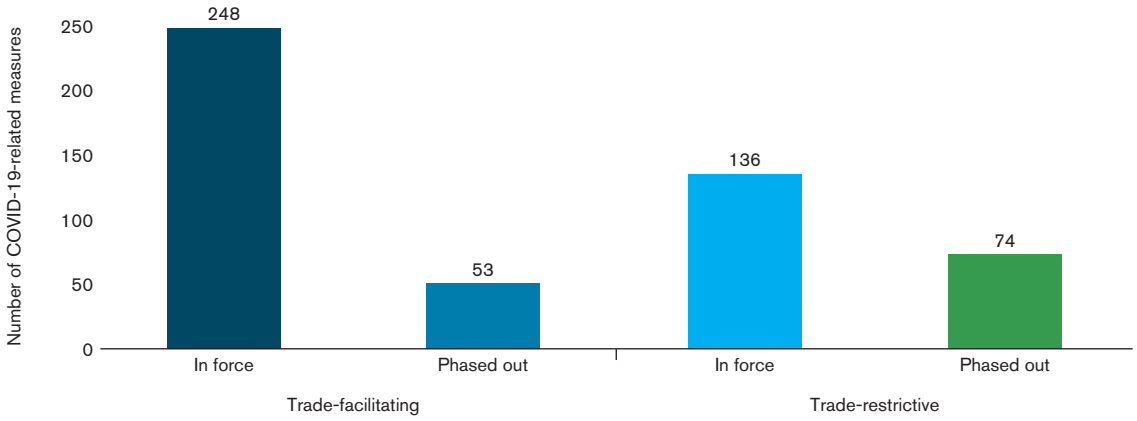
For example, even a vast and highly diversified economic union like the European Union needed to import 40 per cent of its COVID-19 test kits and diagnostic reagents during the pandemic. Likewise, one major US vaccine manufacturer depends on sourcing 280 components from 19 different countries to manufacture the final product (Pfizer, 2021).

This explains why many countries, after initially imposing export restrictions to preserve domestic supplies and promote "made-at-home" solutions, ended up reversing them: they soon realized that imposition of export restrictions by everyone would result in everyone facing import shortages, effectively paralysing everyone's integrated production networks. This also explains why most countries went on to open, not close, their markets during the pandemic, both by lowering tariffs and by amending regulations to facilitate imports (see Figure A.4). According to the WTO's monitoring reports, a majority of COVID-19-related trade measures recorded since the outbreak of the pandemic were trade-facilitating. Even in the heavily impacted services sector, most COVID-19-related measures were trade-facilitating.

Another of the main reasons for the global trading system's resilience is the adaptability and efficiency of open markets. Faced with the sudden disappearance of old business opportunities and the advent of new ones, many industries – and the supply chains supporting them – have proved remarkably nimble and innovative in adjusting to a new COVID-19-shaped economic landscape (Borino et al., 2021). For example, within weeks of the pandemic's spread, garment-makers in India, Malaysia and Sri Lanka had transformed themselves into personal protective equipment (PPE) manufacturers, taking advantage of surging global demand for face masks, rubber gloves and protective gowns (Mezzadri and Ruwanpura, 2020). Within months, major airlines had converted many of their passenger jets into air cargo planes, responding to the simultaneous collapse of tourism and business travel and the surge in online shopping and express delivery (IATA, 2020b).

Accelerating digitalization and automation have also helped to facilitate and underpin this Schumpeterian process of "creative destruction". Container shipping, rail transport and global supply-chain management were already increasingly automated and contactless before COVID-19, and have become even more since its appearance, allowing food, raw materials and consumer goods to continue moving across borders even when people could not. Technology has been just as critical to helping many services sectors to adapt, as remote work and teleconferencing took the place (at least temporarily) of locked-down offices and paralysed business travel. Nothing better exemplifies technology's role in re-inventing and "COVID-19-proofing" many aspects of global trade during the pandemic than the explosion of e-commerce (see Figure A.5). With stores closing and people staying indoors, consumers have embraced online shopping on a massive scale in almost every region, further

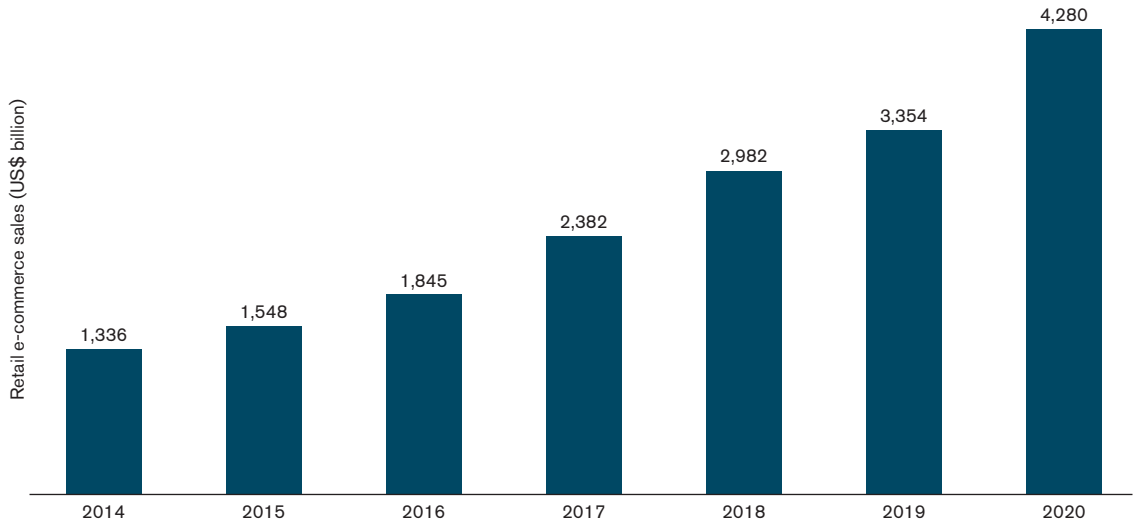
Figure A.4: An increasing number of trade-opening measures have been adopted to fight the COVID-19 pandemic



Source: WTO (2021b).

Note: The figure reports the cumulative number of COVID-19-related measures up until mid-June 2021.

Figure A.5: The growth of global e-commerce retail sales accelerated during the COVID-19 pandemic



Source: Statista Business Data Platform (https://www.statista.com) – consulted 2021.

Note: The figure reports the evolution of global retail e-commerce sales, which cover all products or services, except travel and event tickets, ordered using the internet via any device, regardless of the method of payment or fulfilment.

reinforcing and entrenching the internet's role as the indispensable infrastructure of modern economies.

Even more fundamentally, globalization – and the increasingly open, integrated world trading system that underpins it – have played a critical role in rendering economies more prosperous, more advanced and better equipped economically and socially to withstand crises when they hit. Advances in science and technology, in particular, have had a profound impact on humanity's ability to cope with the pandemic, starting with the successful development of vaccines, but including the increasing mechanization of essential food and goods production, the expanded delivery of healthcare and hospital services, the application of artificial intelligence (AI) and Big Data to pandemic mitigation policies, and the massive shift of global economic activity online. Globalization has been indispensable to these advances in productivity, technology and standards of living.

The core problem is that the benefits of globalization are not shared widely or equally enough, and this leaves the world economy less resilient than it could be. Developed economies have been able to respond to the COVID-19 crisis with massive fiscal stimuli and far-reaching income support, far more ambitious in scale and coverage than during the 2008-09 global financial crisis, and these have played a key role in sustaining domestic demand, avoiding financial contagion and collapse, and providing a critical safety net for many (though certainly not all) vulnerable workers and households.

However, these same shock absorbers and safety nets are simply unavailable to most poorer countries. While advanced economies have deployed fiscal and monetary support equivalent to about 25 per cent of their GDP since the beginning of 2020, in low-income countries the equivalent figure is under 3 per cent of a much lower GDP (IMF, 2020b). Nothing underlines the extent to which globalization's benefits are inequitably shared than the stark imbalance in access to COVID-19 vaccines. Developing countries in Africa, for example, had received just 3.2 vaccine doses per 100 people, compared to 75 doses per 100 for people in developed countries, as of June 2021. Lack of access to vaccines has prevented certain economies from getting COVID-19 under control, which has, in turn, held back their economic recovery. As a result, advanced economies are bouncing back and developing Asian economies are surging, but many other developing and least-developed economies are falling further behind (World Bank, 2021e).

In reality, the pandemic has revealed the persistence of two global economies: one that it is more technologically advanced, more economically integrated, and thus more resilient to crises when they hit; and another that is less advanced, less integrated, and thus more vulnerable. These same disparities also seem destined to emerge in response to other crises, such as climate change, which could well pose an even greater and more profound shock to the global system than COVID-19. Here again, advanced countries seem better equipped to marshal the financial resources, advanced technologies and trade networks needed to adapt to a warming world and to transition to a low-carbon economy, while too many developing and least-developed countries will struggle – in some cases literally – just to stay afloat. That poorer countries have obviously found it harder to cope with COVID-19 than richer countries, that they are recovering more slowly and tentatively from its aftershocks, and that they remain just as exposed to climate change and other crises, underscores that more, not less globalization, is needed, and that the growth, development and technological opportunities that come with globalization need to be expanded further (OECD, 2021f).

2. More resilience requires more, not less, global economic cooperation

At the beginning of the COVID-19 pandemic – as borders closed, trade fell, and shortages of critical medical and other supplies spiked – many concluded that today's open, complex and interconnected global economy was part of the problem, not the solution. They argued that globalization had gone too far, that economies had grown over-reliant on foreign suppliers, and that economic efficiency had been achieved at the expense of economic resilience – that "just in case" had been sacrificed for "just in time" (Lamy and Fabry, 2020). To protect against future shocks, and to make economies more robust and resilient, these critics suggested that global integration should be re-visited and rolled back, supply chains should be near-shored or re-shored, and domestic productive capacity should be rebuilt and made more self-sufficient (Shih, 2020).

But a year later, the conclusions that can be drawn from the crisis look different. Trade, far from being an economic liability, turned out to be an economic lifeline, as it ensured that, even when countries were paralysed by the pandemic, critical goods, services and medical supplies continued to flow. Conversely, measures to restrict trade, hoard domestic supplies, and reinforce national self-sufficiency, far from reducing economic insecurity, served to increase it, by disrupting supply chains, slowing production and sowing economic uncertainty. In fact, the biggest policy failure of the pandemic so far has been the uneven rollout and distribution of vaccines, and this is partly a result of too much economic nationalism and too little coordinated global action (El-Erian, 2021). Likewise, the biggest threat to global resilience in the future will not just be the arrival of new and unforeseen shocks, but the inability of national governments to respond in a coordinated and cooperative way, as a result of rising geopolitical tensions between key powers, growing trade protectionism and a fragmenting global economy (Financial Times, 2020; Goldin, 2020).

This year's *World Trade Report* explores why economic resilience has moved to the top of the global agenda, where trade fits in, and how the world trading system can be improved. Its core conclusion is that no country is an island in today's hyper-interconnected world, that global crises require global responses, and that strengthening resilience requires more global trade and economic cooperation, not less.

Section B looks at how past natural and man-made disasters and the prospect of increasingly frequent and more intense shocks have led firms and policymakers to consider economic resilience as a key strategy not only to avoid and mitigate risks, but also to prepare for, cope with and recover quickly from shocks. The ability to anticipate, evaluate and manage risks and understand economic challenges and opportunities, including in the context of international trade, is key to building and supporting economic resilience.

Section C examines the role of trade in economic resilience. Trade can, on the one hand, be a potential spreader of shocks, for example in pandemics, or through volatility of trade costs. On the other hand, trade can help countries to better prepare for, cope with, and recover from shocks. Trade is indispensable for the quick availability of essential goods during crises. It can help countries to recover faster after a shock, by enabling them to benefit from sustained foreign demand, and it offers benefits such as specialization, scale effects and technology spillovers.

Section D explores how greater international cooperation can leverage synergies to promote economic resilience. International cooperation is essential to prevent economies from becoming isolated and thereby being deprived of the benefits of a globalized economy when dealing with shocks. The existing WTO framework supports the conditions underpinning economic resilience by contributing to more open and predictable international markets, through more transparent and predictable trade policies. However, the WTO could still make an even greater contribution to greater economic resilience.

B Why economic resilience matters

Over the past decades, natural hazard-related and man-made disasters have increased in both frequency and severity. The effects on society and on the economy of these disasters, and the prospect of even greater risks and disasters in the future, linked to the challenges of climate change, have underlined the factors and strategies needed to avoid, mitigate, adapt to and prepare for shocks, as well as to manage risks and vulnerabilities. The term “economic resilience” has become a popular one to describe these broad, diverse strategies.

Contents

Some key facts and findings

- Natural disasters, cyber-attacks and conflicts have become more frequent and more damaging over recent decades.
- Risks are likely to rise in the future due to climate change, the increase in technology's accessibility and usage, increasing inequality and geopolitical tensions.
- The direct impact of a shock on trade depends on the type of shock, initial conditions and policy responses. Some sectors are more vulnerable to different types of shocks. Vulnerable groups, including poor households, are disproportionately affected by shocks.
- Some developing countries are disproportionally vulnerable to natural hazards, and socio-economic crises particularly affect countries with weak institutions and economic fundamentals.
- Governments, firms and households can take effective steps to prevent, prepare for, cope with and recover from the adverse impact of shocks, with a view to building economic resilience.
- Most trade measures in response to the COVID-19 crisis were trade-facilitating, and the rapid trade recovery after the shock underlines how liberalizing trade policies can support resilience.

1. Introduction

Section B looks at why economic resilience matters from a number of different angles. As resilience is often defined in relation to the state of shock, in Section B2 the concept of shock is defined and types of shocks, such as natural disasters, including pandemics and climate change-related shocks, wars, and financial and political crises, are discussed.

In Sections B3 and B4, the impact of these shocks on the economy and on trade, respectively, is discussed, with a special focus on the current COVID-19 crisis compared to the 2008-09 global financial crisis. Economic and trade disruptions are significant, but heterogeneous, highlighting the importance of initial conditions and policy responses.

In Section B5, the different policies adopted in response to shock are discussed. Section B6 concludes by identifying what defines economic resilience and what strategies and actions foster it.

2. Economies are exposed to risks and shocks

Risks and shocks are a recurring phenomenon in economies worldwide. This subsection provides a brief overview of the concepts of risks and shocks by highlighting how multifaceted risks can be, how these risks can materialize into shocks, and how risks and shocks have increased over time but remain unevenly distributed.

(a) Risk originates from a plethora of sources

Conceptually, risk[1] stems from a combination of hazard, exposure and vulnerability (UNDRR, 2019). *Hazard* refers to a potentially destructive natural or man-made phenomenon, substance, human activity or condition. *Exposure* relates to the location, attributes and value of assets (typically individuals, economic activities, infrastructure and the environment) that could be affected by a hazard. Finally, *vulnerability* refers to the likelihood that these assets could be affected, damaged or destroyed if exposed to a hazard. It is for this reason that risk is often simply defined as the probability that a shock occurs.

Risk comes from a multitude of hazard sources. Different efforts have been made to classify the broad spectrum of hazards (UNDRR, 2020). As shown in Table B.1, hazards can be grouped into three broad categories according to their origin, i.e.:

(1) **Natural risks**, which encompass all biological and environmental threats, including geophysical, meteorological, hydrological, climatological, biological and extra-terrestrial threats.

(2) **Technological and operational risks**, i.e. accidents or failures associated with economic activity, technology and infrastructure, which can be further grouped into industrial accidents, transport accidents and cyber-risks. The failure of one element within complex technological, industrial and transport systems can remain localized or can spread throughout the system.

(3) **Socio-economic risks** encompass violence, political risks and financial risks coming from the society and the institutions in which economic agents operate. Political hazards cover a range of governmental actions that increase political uncertainty and instability. Financial and macroeconomic hazards include operational and societal factors that are disruptive to business activity, such as price shocks, trade wars, financial crashes, supplier insolvencies and political barriers to trade (Barry, 2004; Martin, 2012; OECD, 2020e).

(b) Risks can materialize into shocks of varying intensity, frequency, scale and duration

While most of the time risks remain a threat, they sometimes materialize and determine shocks. In many cases, there are multiple causes for why a risk can materialize into a shock, and the complex interplay between risks and shocks can make the origin of a disaster difficult to identify.

Although risks and shocks are often considered individually, they can interact with each other and create cascading risks and shocks (UNDRR, 2020). For example, the 2011 Fukushima nuclear disaster was an industrial accident caused by a tsunami, a hydrological hazard which was in turn caused by a geophysical hazard, namely an earthquake.

Shocks can take many different forms and have complex impacts and consequences. Given their multifaceted dimensions, shocks can be analysed through different lenses, including their intensity, frequency, scale and duration.

Shock intensity refers to the physical, social, environmental or economic impact of a shock, which can be measured in different ways depending on the type of shock and impact being studied (Berz et al.,

Table B.1: Main types of hazards

Hazards		Examples
Natural risks	Geophysical hazard	Earthquakes, dry mass movements, volcanic activity
	Meteorological hazard	Extreme temperatures, storms, fog
	Hydrological hazard	Floods, landslides, wave actions (e.g. tsunamis)
	Climatological hazard	Drought, wildfire, glacial lake outburst
	Biological hazard	Bacterial/viral epidemics/pandemics (e.g. the COVID-19 pandemic), insect infestation, animal diseases
	Extra-terrestrial hazard	Asteroid impact, solar flares
Technological and operational risks	Industrial accident	Chemical or oil spills, building collapse, radiation, explosion, poisoning, fire
	Transport accident	Crashes, sinking
	Cyber disruption	Cyber-attacks, information system failures, data breaches
Socio-economic risks	Violence and conflict	War, terrorism, civil unrest, riots, pirates
	Political hazard	Adverse trade and economic policies, social tensions, institutional instability, rule of law degradation
	Macroeconomic and financial hazard	Commodity price shocks, exchange rate shocks, hyperinflation, market crash, liquidity crises, synchronized insolvencies

Note: This taxonomy is primarily based on the hazard classification of the UN Office for Disaster Risk Reduction (consulted 2020) (https://www.undrr.org) and the Integrated Research on Disaster Risk (consulted 2021) (https://www.irdrinternational.org). The list of socio-economic risks has been expanded to include shocks identified in the economic and business literature.

2001). For example, the intensity of an earthquake can be measured in physical terms (i.e. the energy released or the magnitude of vibrations in a specific location), in terms of the extent of the damage it causes, or in terms of the economic costs resulting from that damage (as discussed later in Section B2). Similarly, the intensity of the socio-economic impacts of an earthquake can be measured in several ways, for example in terms of the number of deaths caused, the number of people left homeless or the resulting loss in gross domestic product (GDP) (Kellenberg and Mobarak, 2011).

Shock frequency refers to how common (or uncommon) a shock is, historically. Frequency is the basis of most forecasts on risk (see Box B.1) and is commonly used in conjunction with intensity metrics. For example, every day there are hundreds of earthquakes, but almost all of them are too small to cause damage. The frequency of high-intensity earthquakes is, however, much lower. On average, every year there are almost 2,000 earthquakes worldwide with a magnitude of 5 (moderate) to 7 (major) on the Richter scale, around 15 of a magnitude of 7 to 8, and no more than one or two of a magnitude greater than 8 (USGS, 2021).

The impact of shocks can also be measured in terms of geographic or economic **scale**. For example, the collapse of a bridge may disrupt traffic and increase transportation costs, but its effects remain mostly localized and impact only a few firms.

However, some accidents can create severe and lasting disruption to an entire region, such as the 2020 Beirut port explosion (Andreoni and Casado, 2021; Oxford Analytica, 2020; Veiga, 2021), while others can propagate, impacting entire economic systems and other countries in unexpected ways. For example, although the collapse of the US firm Lehmann Brothers is often cited as a key point in the 2008-09 global financial crisis, the roots of this shock lay in the sub-prime mortgage crisis following the collapse of the housing bubble in the United States. The effects of this reverberated around much of the world through a series of complex interactions, coupled with second- and third-order effects channelled through financial markets, trade linkages and behavioural changes (Martin, 2011b, 2012).

Finally, shocks are characterized by their **duration**. For example, small-scale industrial accidents, such as fires in industrial plants, mechanical failures, transport accidents and cyber-attacks usually create short-lived disruptions (Ho et al., 2015; Worldland, 2015). Conversely, other types of shocks, such as pandemics, can last longer.

Box B.1: Challenges in predicting shocks

The unpredictability of shocks derives from the intrinsic complexity of reality. Even small events can interact and amplify through complex systems. Hence, even in fully deterministic systems, prediction can be dauntingly complex. This is known as the butterfly effect, whereby any uncertainty in the initial state of a system is amplified through time and linkages. This uncertainty means that, despite technological progress, it is still impossible to predict exactly when a volcano will erupt and disrupt air traffic, when the next pandemic will hit, or when stock markets will tumble and cause cycles of insolvencies. This uncertainty in prediction makes preparedness all the more important for facing shocks when they come (McKinsey Global Institute, 2020).

Notwithstanding the underlying uncertainty on the occurrence and intensity of single events, a few trends can be identified. Trend forecasts are based on stochastic modelling techniques which are developed to study means rather than single events (Bier et al., 1999; Nath, 2009; Tixier et al., 2002).

Typically, these models use past records of shocks to infer trends in risk. Hence, the quality of forecasts depends primarily on the quality of the historical record and on how representative past shocks are of future shocks (Nath, 2009; Nordhaus, 2012, 2014). In some cases, limitations in data availability and quality can lead to erroneous conclusions; for example, the rising frequency in recorded volcanic eruptions and earthquakes is purely a reflection of the improved tracking of active volcanoes and seismic activity (Smithsonian Institution, 2013).

Finally, trends may also vary regionally, and shocks can be of different intensity depending on a country's preparation. Therefore, global trends in shock frequencies can hide strong variations between countries and might not necessarily be representative of the economic impact of shocks.

(c) Shocks are on the rise and are unevenly distributed

Although the spectrums of risk are constantly evolving, the occurrence of some types of shocks has increased over the years and is expected to increase further in the future. In particular, certain types of natural disasters, cyber-attacks and socio-economic shocks are on the rise, and their risks are likely to increase in the future due to climate change, the increase in technology's accessibility and usage, increasing inequality and geopolitical tensions.

Risks remain, however, unevenly distributed across countries, leaving certain developing countries disproportionally vulnerable to natural hazards, while socio-economic crises are particularly hazardous for countries with weak institutions and vulnerable economic fundamentals.

(i) The frequency of many natural disasters is increasing

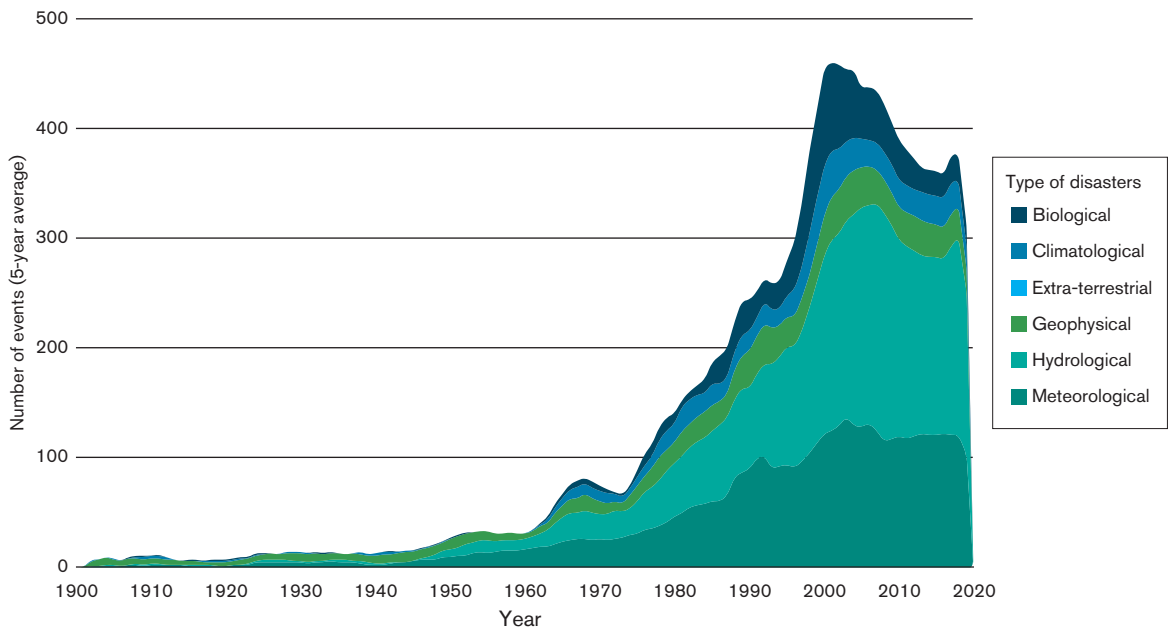
Natural risks are considered one of the most important threats humanity will face in this century. The frequency, strength and economic costs related to natural disasters are all likely to increase significantly in the coming decades, particularly as a result of climate change. Countries will be unevenly impacted by these trends. Coastal nations, island states and countries located near the equator and in arid regions are the most exposed to natural hazards.

Current scientific understanding points toward an increase in the frequency and intensity of extreme weather events due to global warming, such as droughts, cyclones or floods (IPCC, 2014). Despite limitations in data availability, available evidence suggests that there has been a significant increase in hydrological and meteorological types of natural shocks over the last century (see Figure B.1).

Climate change and encroachment upon animal habitats are also expected to increase the risk of future zoonotic diseases in the future (Estrada-Peña et al., 2014; IPCC, 2014). The consequences of climate change will be felt unevenly across the globe, amplifying the existing risks and increasing already existing vulnerabilities such as inundation risks for small-island developing states, increased water stress and food security risks for dry Northern and Eastern African countries (IPCC, 2014) (see Figure B.2).

However, not all natural risks are on the rise; trends for some types of natural shocks, such as volcanic eruptions, meteorite collisions or earthquakes, are expected to remain stable in the next century (NASA, 2021; Smithsonian Institution, 2013; USGS, 2021).

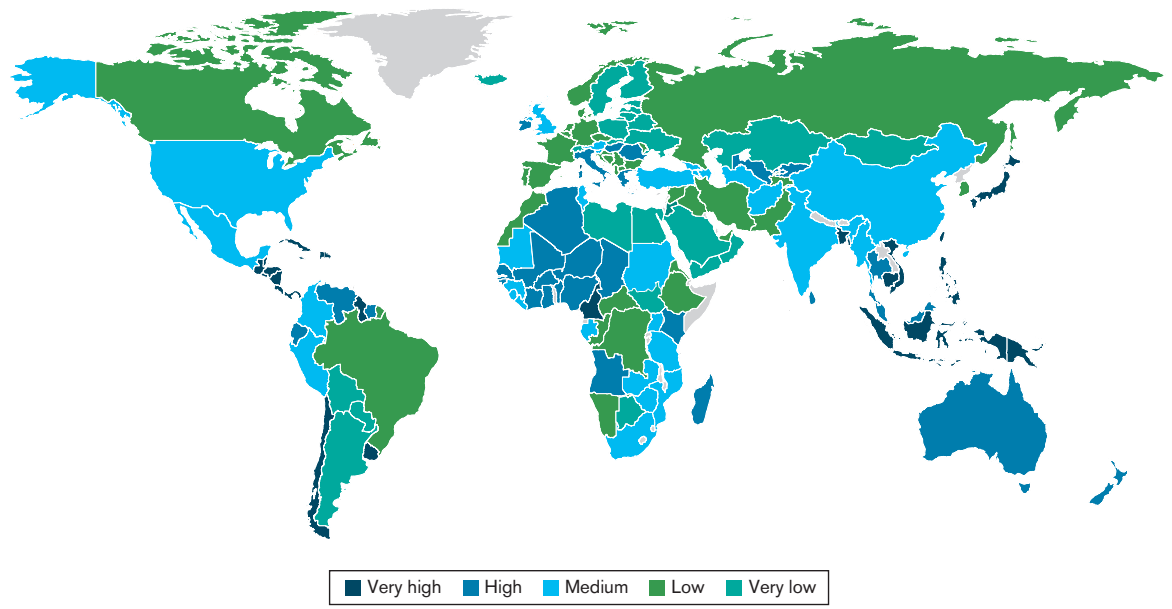
Figure B.1: There has been an increasing trend in the number of natural shocks over the past decades



Source: Authors' calculations, based on Emergency Events Database (EM-DAT) (2020).

Note: The figure displays the five-year moving average of the number of natural events to increase readability. The database includes over 20,000 disasters. However, tracking of events in earlier years of the dataset are less reliable. Events recorded in the database must meet at least one of the following requirements: involve at least 10 deaths, have affected a minimum of 100 people, or have necessitated a declaration of emergency/call for international assistance.

Figure B.2: Exposure to natural hazards differs from one region to another



Source: Authors' calculations, based on the exposition index from the World Risk Report 2020 (Behlert et al., 2020).

Note: Natural hazards taken into account are earthquakes, storms, floods, droughts and sea-level rise. Evaluation of the exposure profile is based on estimates of the population at risk of disaster.

(ii) Most technological and operational risks are decreasing

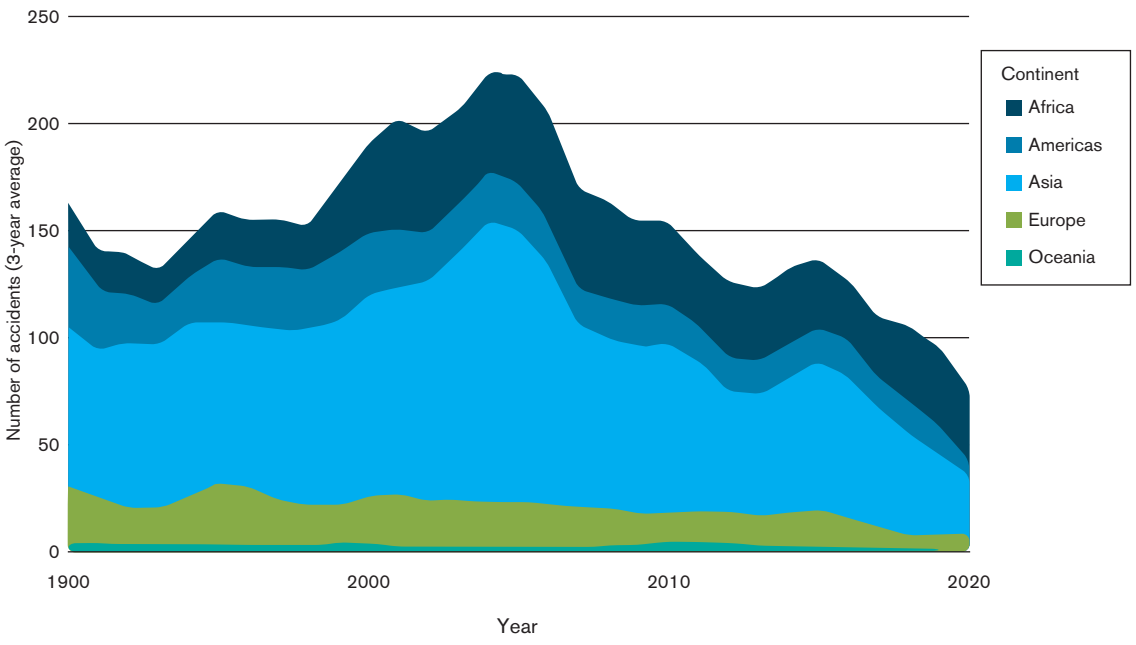
The risk of technological and industrial disasters has globally been decreasing in the past decades thanks to the diffusion of safer technologies and production processes. Nonetheless, some types of technological risks, such as cyber-risks, are expected to increase in the coming years.

Increased safety requirements, economic development and technological progress have translated into lower risks of major industrial and transportation accidents (see Figure B.3).[2] For example, for every 100 million flight departures, the average number of aeroplane accidents involving fatalities in the United States was 64 in the 1980s, 21 in the 2000s and only five between 2010 and 2018 (US Department of Transportation, 2018). Industrial accidents have also decreased. The rate of fatal and non-fatal work-related injuries per employee decreased from 26 per cent in lower middle-income countries to 43 and 53 per cent in high and upper middle-income countries between 2000 and 2015 (UNSTATS, 2021). These trends are expected to continue thanks to technological progress and its adoption and deployment in developing countries.

Although technological risks have been decreasing, the incidence of cyber-risks has intensified in recent years because digital technologies increasingly integrate every aspect of economic activities (Bailey et al., 2014). The 2019 *Global Risk Report* listed cyber-attacks and data fraud as two of the top five risks likely to be faced in the next 10 years. The growing diffusion of artificial intelligence (AI), cloud computing, the Internet of Things (IoT) and 5G is expected to increase systemic risks, including the likelihood, scale and impact of cyber-attacks (WEF, 2019, 2020).

The risk of cyber-attacks is becoming greater, especially in developed economies, which increasingly promote advanced manufacturing (Deloitte and MAPI, 2016). Characterized by the use of innovative digital technology to execute and coordinate production processes, advanced manufacturing is more exposed to the risk of business interruption caused by cyber-attacks than traditional manufacturing, which relied on manual and mechanized production techniques. More generally, advanced manufacturing in developed countries faces a greater risk of business interruption due to infrastructure disruptions such as power outages.

Figure B.3: The number of large industrial and transport accidents is on the decline across all continents



Source: Authors' calculations, based on EM-DAT (2020).

Note: The figure displays the three-year moving average of the number of accidents. The types of accidents considered include air accidents, rail accidents, water accidents, chemical spills, building collapses, explosions, fires, gas leaks, poisoning, radiation leaks, and other technological accidents. Events recorded in the database must meet at least one of the following requirements: involve at least 10 deaths, have affected a minimum of 100 people, or have necessitated a declaration of emergency / call for international assistance.

(iii) Most socio-economic hazards are increasing

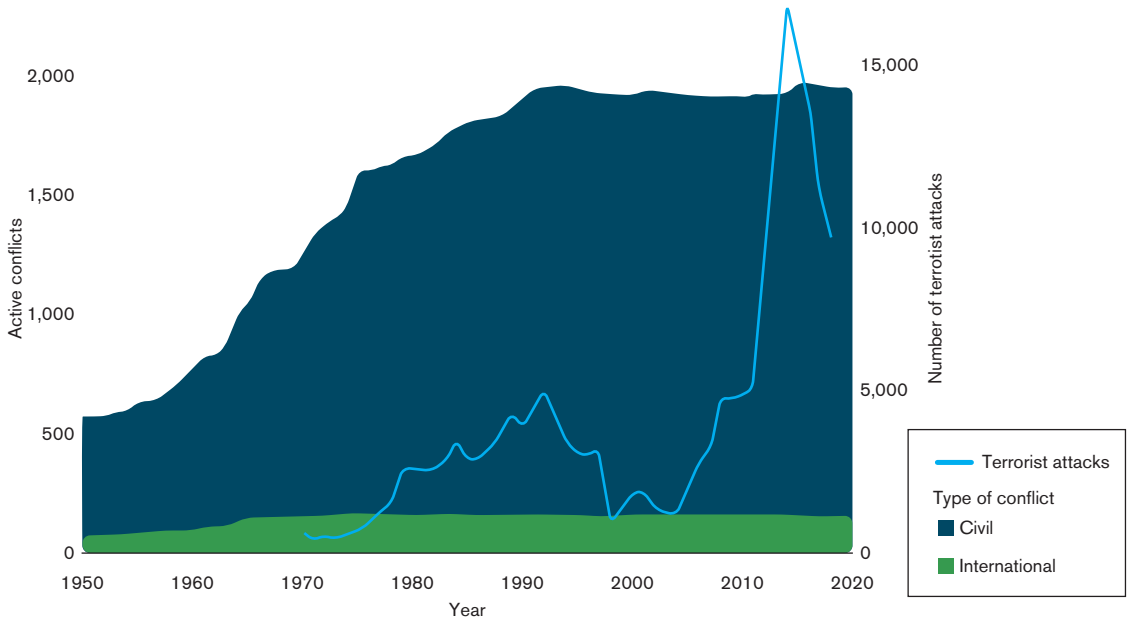
Recent years have witnessed a rise in inequalities, increased fragility of economic growth and growing political uncertainty and geopolitical tensions. These global trends foretell an increase in socio-economic risks. However, as socio-economic risks remain strongly country-specific, there is substantial heterogeneity associated with them.

Although the number of deaths due to war has been declining since the end of the Second World War, other forms of violent shocks have been increasing over time (UN, 2021). Terrorist attacks, for instance, have increased significantly in the last 30 years, rising from 651 attacks in 1970 to a peak of 16,908 attacks in 2014 (see Figure B.4). Conflicts in the last century have primarily stemmed from civil strife rather than international clashes, creating an unprecedented number of refugees and internally displaced persons. Both terrorism and armed conflict show, and are likely to continue to show, strong regional variation, with developing regions disproportionally affected (UN, 2021). Conflict risk is also poised to increase as a reflection of the rising geopolitical tensions. In addition, the use of increasingly sophisticated technologies in warfare, including weapons of mass destruction, have dramatically increased the destructive potential of wars (Knoema, 2019; WEF, 2020).

Political and macroeconomic shocks usually follow a cyclical pattern (see Figure B.5 and Figure B.6). They also tend to be highly correlated across countries due to interconnectedness of economic systems.

A few emerging global trends point towards an increase in political, financial and economic risks for the next years, in particular for countries with weak institutions and vulnerable economic fundamentals (IMF, 2020a). For example, the recovery from the COVID-19 pandemic is likely to be unequal between and within countries (IMF, 2021a), and the uncertain post-pandemic economic outlook is coupled with previous weak past global economic growth, historically low interest rates and historically high government debts (IMF, 2020a). The combination of these factors suggests governments will have limited fiscal and monetary policy space. High levels of private and public debt also raise concerns regarding future solvency (OECD, 2020e). Moreover, growing inequality between and within nations may further spur populism and policy uncertainty (see Figure B.6) (WEF, 2020).

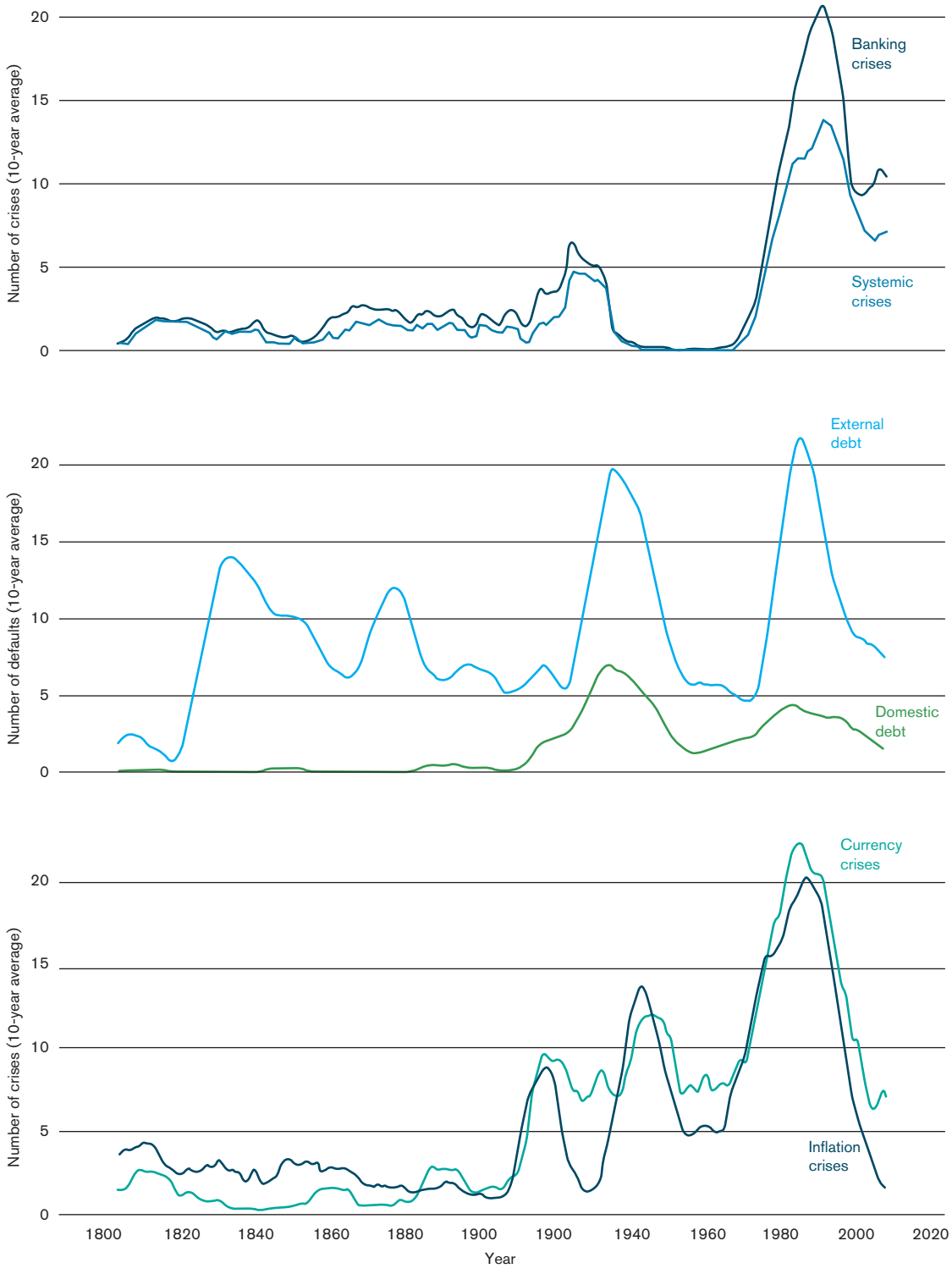
Figure B.4: The number of conflicts and terrorist attacks has increased



Source: Authors' calculations, based on the Uppsala Conflict Data Program/Peace Research Institute Oslo (UCDP/PRIO) armed conflict database (Gleditsch et al., 2002) and Global Terrorism Database (2021).

Note: Active conflicts are ongoing conflicts in a given year where a conflict is defined in the dataset as a "contested incompatibility that concerns government or territory or both where the use of armed force between two parties results in at least 25 battle-related deaths. Of these two parties, at least one is the government of a state" (Gleditsch et al., 2002).

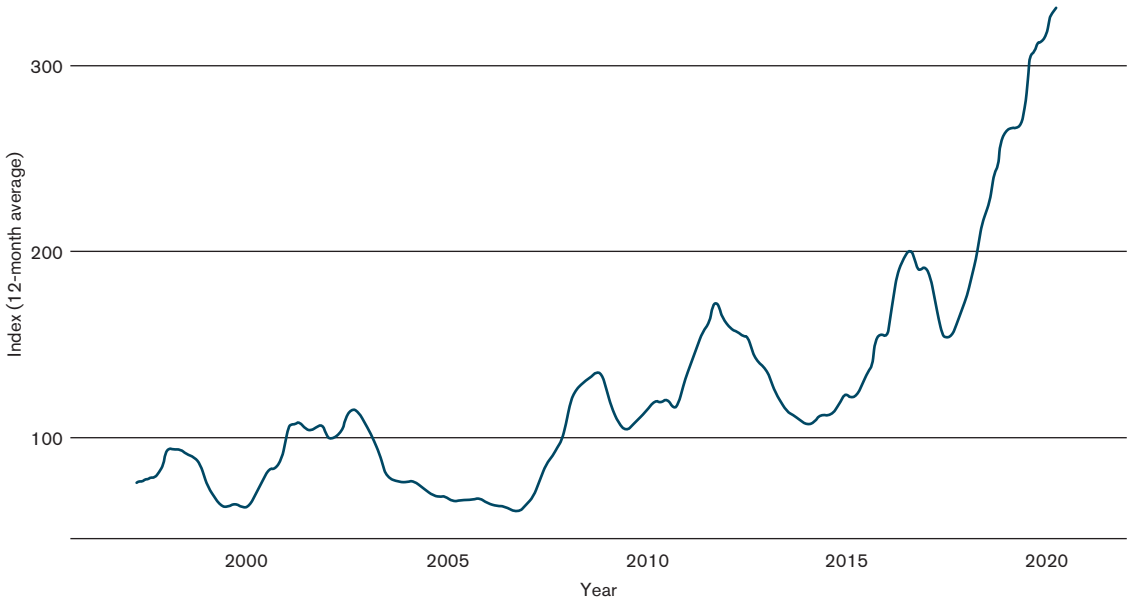
Figure B.5: Macroeconomic and financial crises show an upward trend



Source: Authors' calculations, based data from Reinhart et al. (2021).

Note: The figure displays the 10-year moving average of the number of crises. The dataset covers 70 countries. African, Middle Eastern and Central Asian countries are underrepresented in the sample.

Figure B.6: Global economic policy uncertainty is on the rise



Source: Authors' calculations, based on data from purchasing power parity weighted version of the Global Economic Policy Uncertainty Index (Baker, 2021).

Note: The figure displays the 12-month rolling average index. The index is based on the frequency of press articles discussing economic policy uncertainty in 21 large developed and developing countries.

Developing and least-developed economies are expected to remain disproportionately affected by socio-economic risks. Developing economies have been the greatest victims of violence. Virtually all of the active conflicts in the last 70 years have been located in developing countries (UN, 2021). Since 1970, 95 per cent of all terrorist attacks have taken place in Africa, the Middle East and South Asia, according to the Global Terrorism Database (GTD).[3] Many developing countries continue to face poverty – an important factor of risk. It is forecasted that in 2030, 87 per cent of the people living in extreme poverty will be living in Sub-Saharan Africa (World Bank, 2018).

Compared to advanced economies, developing economies face higher financial and macroeconomic risks and are more vulnerable during downturns because of their lower economic growth, higher average levels of debt, weaker institutions, higher borrowing costs and strong reliance on commodity prices and exchange rates (IMF, 2020a). This exposes developing countries to the risk of hyperinflation crises, exchange rate crises and sovereign debt defaults.

3. Disruptions and shocks can cause significant loss of life and severe economic impact

Shocks can have significant impacts on the individuals, communities and the economies involved. These include, but are not limited to, human casualties, loss of property, including livestock and stocks, relocation or decline of populations, economic recession and stunted economic growth. Although the impacts are unambiguously detrimental, the effects of these shocks differ depending on both the type of event and its channels of transmission. This subsection provides an overview of the impacts in terms of casualties and economic losses triggered by natural, technological and operational, as well as socio-economic, shocks.

(a) Shocks take lives and impact well-being

The destruction brought by shocks – whether natural, technological or socio-economic – can be devastating, including damage to property, ecosystems and lives.

The COVID-19 pandemic, for example, caused almost 4 million deaths between its outbreak and the end of June 2021 (see Figure B.7); compared to fatalities caused by other types of shock or past pandemics, this is an exceptionally high number of fatalities in a relatively short time. In another example, armed conflicts (i.e., socio-economic shocks) appear to have been the deadliest type of shock between 1980 and 2020, including deaths resulting indirectly from conflicts, for example as a result of lack of food, health services and infrastructure.

Wars and conflicts can also cause suffering due to displacement; by the end of 2019, the world had 79.5 million forcibly displaced people, over half having fled to a foreign country (UNHCR, 2020). And while economic shocks do not inflict physical harm on the population affected, the psychological impact can cost lives. Incidences of suicide increased in Europe and American countries following the 2008-09 global financial crisis (Chang et al., 2013).

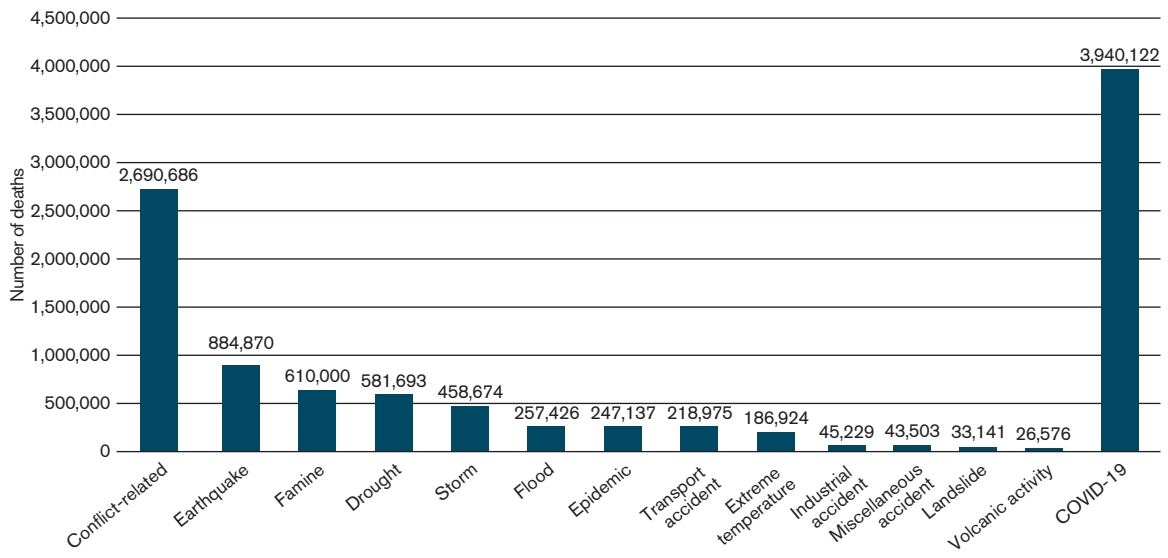
Earthquakes (i.e. a natural disaster) have been the second deadliest type of shock, amounting to over 884,000 deaths between 1980 and 2020 (EM-DAT, 2020). Hydrological events like flooding are the most frequent form of shock and affect the greatest number of people in each event. During the 1980-2020 period, there were over 4,800 floods around the world affecting over 3.5 billion people (EM-DAT, 2020). While not as deadly as earthquakes, these events can still have substantial effects on people's lives by displacing residents of affected regions. Epidemics, and in particular the COVID-19 pandemic, have also resulted in high numbers of deaths and lives affected.

Finally, technological and operation shocks and industrial and transportation accidents have caused a great deal of damage. The Beirut port explosion in August 2020, for example, claimed 178 lives, with a further 6,500 people injured, and 300,000 left homeless (Sivaraman and Varadharajan, 2021). Some of the effects of disasters on lives are immediate, and some develop over time. For example, the Chernobyl Nuclear Power Plant meltdown in Ukraine claimed 50 deaths in 1986, but cancers linked to the nuclear fallout caused a further 4,000 deaths over time. In total, over 135,000 people are estimated to have been directly and indirectly affected (EM-DAT, 2020).

(b) Economic impacts of shocks are significant

All shocks (natural disasters, technological and operational incidents and socio-economic events) cause economic losses, impacting GDP and levels of unemployment and of welfare within a population.

Figure B.7: Fatalities related to COVID-19 surpassed numbers of deaths related to other disasters over the period 1980-2020



Source: Authors' calculations, based on EM-DAT (2020), data on conflict-related deaths from the Uppsala Conflict Data Program/Peace Research Institute Oslo (UCDP/PRIO) armed conflict database, and Johns Hopkins Coronavirus Resource Center (2021).

Note: The figure reports the total number of deaths by disaster type between 1980 and 2020. For data from EM-DAT, only disasters with total deaths above 20,000 between 1980-2020 are considered. Based on the available data, conflict-related death data span 1989 to 2020, while data on casualties triggered by natural disasters and technological/operation accidents span 1980 to 2020. Epidemics between 1980 and 2020 exclude COVID-19 fatalities.

Estimates of damage caused by natural disasters only cover a subset of all natural disasters which have occurred. Yet, the overall economic cost is substantial. Based on the subset of shocks from natural disasters (representing approximately one-third of the shocks reported in the EM-DAT database), the total damage caused by natural disasters between 1980 and 2020 amounts to US$ 3.6 trillion (EM-DAT, 2020).

Natural disasters trigger economic losses not only by destroying physical assets but also by causing bottlenecks in supply chains. For example, in 2011, the Tōhoku earthquake triggered shortages along the global supply chains of multinationals relying on Japanese inputs (Boehm, Flaaen and Pandalai-Nayar, 2019; McKinsey Global Institute, 2020). The COVID-19 pandemic has also shown how epidemics caused by contagious diseases can have significant economic impacts (see Box B.2).

Technological and operational failures and industrial accidents are not only costly to firms which they directly affect, but they can also generate large negative spillover effects.

For example, in 2002, the sinking of the "Prestige" oil tanker off the coast of Galicia in Spain caused massive environmental pollution of the Atlantic Ocean and triggered an increase in expenses from EUR 33.2 to EUR 113.2 million for preventive and palliative measures by the public administration (Surís-Regueiro, Garza-Gil and Varela-Lafuente, 2007). The Chernobyl nuclear meltdown in 1986 cost Ukraine between 5 and 7 per cent of its annual GDP from 1986 until 2015 in clean-up, recovery and compensation (Danzer and Danzer, 2016).

Cyber-attacks also have had important negative impacts, even if the actual economic effects are not always easy to calculate. In 2013, the US retailer "Target" was a victim of a cyber-attack that stole the credit and debit card data of 40 million of its customers (Amir, Levi and Livne, 2018).

Critical infrastructure, such as utilities companies or networks of health services, is increasingly targeted by cyber-attacks. By compromising the systems that are responsible for controlling physical processes, cyber-attacks have the potential to paralyze or block critical infrastructure. For example, the first power outage caused by malicious software occurred in December 2015, when hundreds of thousands of households in Ukraine were left without electricity for six hours due to a cyber-attack against power companies (Allianz SE, 2021). In May 2017, the malware "WannaCry" disabled over 250,000 computers in more than 150 countries and affected the United Kingdom's National Health Service (NHS), resulting in the cancellation of 19,000 patient appointments and critical operations (Lis and Mendel, 2019). Even though the malware was thwarted within 12 hours, it is estimated that the incident resulted in costs of around £ 5.9 million (US$ 7.6 million) due to lost hospital activity (Ghafur et al., 2019).

Box B.2: Economic impacts of the COVID-19 pandemic

The COVID-19 pandemic and ensuing response measures have resulted in significant economic losses. In 2020, global GDP fell by 3.3 per cent, and global per capita GDP by 6.2 per cent, the most severe recession since World War II. In comparison, global GDP fell by about 0.6 per cent in the 2008-09 recession. Global economic growth is projected to recover to 5.3 per cent in 2021 and 4.1 per cent in 2022 – an upward revision of forecasts thanks to the vaccines and additional policy support in a few large economies (IMF, 2021a).

Macroeconomic stimulus, as well as labour market support, have helped to prevent even worse outcomes from the COVID-19 crisis. In 2020 and early 2021, accumulated fiscal and monetary stimulus reached unprecedented levels of more than 15 per cent of global GDP, and governments launched widespread job retention programmes, such as short-term work schemes or wage subsidies, amounting to an average of 1.8 per cent of GDP. Still, such policy support requires sufficient fiscal capacity, fiscal space and labour market programmes. Support varied considerably between advanced and low-income economies, and often did not reach informally employed workers (IMF, 2021a).

As also mentioned in Section A, advanced economies have deployed fiscal and monetary support equivalent to about 25 per cent of their GDP (if liquidity, loans and guarantees are taken into account beyond the 15 per cent represented by fiscal support), according to the IMF. In low-income countries, the equivalent figure is under 3 per cent, of a much lower GDP. Differences among economies with respect to pre-crisis debt levels, labour market structures and speed of access to vaccines may, therefore, lead to uneven recovery dynamics across countries. Projections of future developments are highly uncertain due to the potential for renewed waves and variants of the virus, which will continue to require further policy adjustments.

The economic impact of socio-economic shocks, such as wars, terrorist attacks and economic crises, is also substantial. In a sample of 84 countries over the period 1961-95, a civil war tended to reduce a country's growth by 31 per cent in the long run and by 85 per cent in the short run, and to impose a negative effect in neighbouring countries (Glick and Taylor, 2010; Murdoch and Sandler, 2004). Sub-Saharan countries in conflict between 1989 and 2019 faced lower annual growth averaging 2.5 percentage points, experienced falling tax revenues of around 2 per cent of GDP, and suffered from a persistent decline in the productive capacity with a cumulative impact over time (Fang et al., 2020).

Terrorist attacks also have sizable negative economic effects. Business interruption and behavioural changes of businesses and households due to the 11 September 2001 attack on the World Trade Centre led to a loss of over US$ 100 billion (almost 1 per cent of the GDP of the United States) (Rose et al., 2009). In addition, increased insurance and shipping rates, losses in tourism and travel revenues, the stock market value crash, and increased security and defence spending are estimated to have cost the United States over US$ 500 billion (Looney, 2002).

An important factor affecting the ways in which shocks affect an economy is the channels through which the shocks propagate – that is, whether the shock affects the economy through demand, supply or through its impact on the level of uncertainty within that economy.

The comparison between the 2008-09 global financial crisis and the current COVID-19 crisis offers an interesting example of the differential impact of demand-and-supply shocks (see Box B.3). An overview of the channels through which shocks affect the economy and key facts is provided in Table B.2.

(c) Economic impacts of shocks remain heterogeneous

Although disasters are increasing in frequency and severity, and can have significant economic impact, they affect economic agents heterogeneously depending on the type of hazard and the levels of exposure and vulnerability, as well as the propagation channels in the economy. A broad range of factors, including geography, macroeconomic fundamentals and policy responses, determine the exposure and vulnerability to hazards. In this context, the following subsections highlight heterogeneous effects of shocks provoked by disasters on households, gender groups, industries and regions.

(i) Welfare effects of shocks are stronger on poor households

In addition to monetary losses from shocks, households experience different welfare effects with regard to education, health and consumption, as well as general levels of poverty and inequality. These welfare effects are not only caused by the physical

Box B.3: Demand and supply shocks in the 2008-09 global financial crisis and the COVID-19 crisis

The 2008-09 global financial crisis and the COVID-19-related crisis are characterized by different shocks to supply and demand. The 2008 global financial crisis is largely considered as a negative demand shock caused by a tremendous decline in corporate investments and a significant contraction in the consumption of durable goods by around 30 per cent (Bems, Johnson and Yi, 2013; Bussière et al., 2013). As spending on domestic services largely held up during the global financial crisis, losses to global GDP were limited to 0.6 per cent (Borchert and Mattoo, 2009; IMF, 2010). Although difficulties in obtaining trade finance (Ahn, Amiti and Weinstein, 2011; Chor and Manova, 2012) and increased protectionism (Evenett, 2020) have also been identified as factors in the literature, supply-side factors accounted for much less of the global trade collapse during the 2008 global financial crisis.

In contrast to the 2008 global financial crisis, the global recession caused by the COVID-19 pandemic is described as being both a demand and a supply shock (Brinca, Duarte and Faria-e-Castro; Del Rio-Chanona et al., 2020). On the supply side, governments' responses aiming to contain the spread of the virus, such as strict lockdowns, border closures and social distancing measures, implied skyrocketing trade costs, reduced labour mobility and factory closures or severe declines in production. These, in turn, caused bottlenecks along global value chains, interrupting the domestic and international provisions of both goods and services (Baldwin and Tomiura, 2020; Bekaert, Engstrom and Ermolov, 2020; Berthou and Stumpner, 2021; Ossa and Le Moigne, 2021). On the demand side, income uncertainty, social distancing and unemployment affected aggregate demand and eventually GDP, especially through the services industry. Accounting for between 50 to 80 per cent of GDP in most countries, the collapse of supply and demand for services contributed to a substantial contraction of global GDP in 2020 by around 3.3 per cent (IMF, 2021a; World Bank, 2021d).

Table B.2: Overview of key channels for impact transmission

Category of shock	Key channels for impact transmission	Key facts and examples
Natural hazard-related disasters	Demand shocks refer to quick and unexpected surges or drops in demand. They are quite common following the occurrence of large-scale natural disasters, particularly for medical goods, food and shelter. The physical damages and the disruption of infrastructure can also lead to supply-side impacts through business interruption.	Key facts – Between 1980 and 2020, there have been 21,665 incidents of mass disasters, and natural disasters have the highest count of occurrences among different disaster categories (EM-DAT, 2020). – Natural disasters caused total damage of over US$ 3.6 trillion between 1980 and 2020, with mean yearly damage of over US$ 20,313,000 and median incident damage of US$ 78,200,000 (EM-DAT, 2020). Examples – In 2011, the Tōhoku earthquake in Japan caused supply bottlenecks for multinational firms beyond national borders (Boehm, Flaaen and Pandalai-Nayar, 2019). – The outbreak of the COVID-19 pandemic in 2020 triggered demand surges for medical goods while causing a drop in demand for services (see Box B.2).
Technological and operational shocks	The supply-side effects of technological and operational shocks can affect the production capacity of companies. Business interruption can result in regional shocks having global implications. Certain large-scale shocks in this category can have a significant environmental impact, affecting people's living condition in the region, which can then translate to the demand side, resulting in a general economic decline in the region.	Key facts – Between 1980 and 2020, there have been over 8,200 incidents of technological disasters; key types have included transport, industrial and miscellaneous accidents. – The total amount of damage caused by this category of shocks added up to an annual global average of US$ 91 billion during this period. The median of the damage is US$ 70 million, but the average is over US$ 791.5 million. – While such shocks hit a few agents directly, they can trigger tremendous negative externalities. Examples – The sinking of the "Prestige" oil tanker near Spain in 2002 caused environmental pollution and triggered costs of EUR 113.2 million, including compensations for the fishery industry (Surís-Regueiro, Garza-Gil and Varela-Lafuente, 2007). – The Chernobyl nuclear meltdown in 1986 triggered costs of 5 to 7 per cent of Ukraine's annual GDP for clean-up, recovery, and compensation between 1986 and 2015 (Danzer and Danzer, 2016). The disaster also resulted in the relocation of 335,000 people (Waddington et al., 2017). – Cyber-attacks on firms and critical infrastructure led to a power outage in Ukraine in 2015 and a partial virtual blockade of the National Health Service in the United Kingdom in 2017 (Allianz SE, 2021; Lis and Mendel, 2019).
Socio-economic shocks	Different types of conflicts, crises, and disasters in this category have different, and often complex, origins. Socio-political instability and uncertainty in this context can be a source of perceived risk by economic agents. The economic cost of uncertainty can be significant, and the effects can be persistent.	Key facts – There have been 442 significant political conflicts around the world since 1825.[4] – Between 1970 and 2017, there have been 151 banking crises, 236 currency crises, and 74 sovereign crises (Laeven and Valencia, 2018). – While economic crises generally do not result in casualties, political conflicts often do and can have a detrimental impact on social security and business confidence. Examples – Between 1989 and 2019, sub-Saharan countries in conflict suffered on average lower annual GDP growth of 2.5 percentage points, faced falling tax revenues of around 2 per cent of GDP, and suffered from a negative cumulative impact on GDP per capita which increased over time (Fang et al., 2020). – The 9/11 terrorist attack (i.e., on 11 September 2001 in the United States) triggered damages of US$ 100 billion related to business interruptions and behavioural changes and caused additional indirect costs of US$ 500 billion related to uncertainty (Looney, 2002; Rose et al., 2009).

destruction of assets or personal injuries, but are also linked to income losses of households, which trigger reduced investments, for example in education and health.

With respect to education, disasters can lead to poorer school performance and attendance, as well as to lower numbers of students completing school, particularly among poor households. There is evidence that following a shock, children start or intensify their working time at the cost of school attendance, as a coping strategy for households to mitigate income losses from disasters. For example, the tropical storm "Agatha" in 2010 triggered a 13 per cent cut in education-related expenditures in urban Guatemala (Baez et al., 2016). Similarly, between 2005 and 2009, test scores, as well as schooling, in rural India worsened in the aftermath of rainfall shocks as children shifted from school to work (Shah and Steinberg, 2017).

Disasters can have detrimental effects directly on physical and mental health as well as due to lower investments in public health. For example, after Hurricane Mitch hit Nicaragua in 1998, the probability of malnourishment of children in the affected region increased by 9 per cent, and the likelihood of being able to visit a doctor dropped by 30 per cent (Baez and Santos, 2007). In another example, more than 30 per cent of high school students reported suffering from either partial or full post-traumatic stress disorder (PTSD) after the L'Aquila earthquake in Italy in 2009 (Dell'Osso et al., 2011). Finally, surveys in 2020 have indicated that about 87 per cent of the people discharged from hospital after treatment for COVID-19 infection still had certain symptoms, even up to 60 days later (Carfi et al., 2020).

Income losses from disasters can also reduce the living standards of poor households, due to forced sales of productive assets and less consumption, as well as reduced education- and health-related investments (Hill, Skoufias and Maher, 2019). Around 26 million people fall into poverty every year as a result of natural hazards, mostly in the form of floods and droughts. Poor households are disproportionally affected by consumption losses: while people in the bottom 20 per cent experience only 11 per cent of total asset losses, they suffer from 47 per cent of losses in consumption (Hallegatte et al., 2017).

Importantly, shocks can trigger negative consequences in the long run, especially for poor households. By having a detrimental effect on education, health, savings and investments, shocks can cause persistently lower income growth rates and increased levels of poverty (Hallegatte et al., 2016). Adverse effects can be triggered by the actual occurrence of disasters, but can also arise in the presence of risks, as investments are disincentivized.

(ii) Gender effects of shocks

Disasters trigger heterogeneous effects on men and women, due to the expected roles of men and women in society, along with widespread self-selection into specific occupations on the labour market (Erman et al., 2021). Given their higher representation in risky rescue work and outdoor activities such as forestry and construction, men account for a larger share of casualties from natural hazards, particularly in developed countries (Badoux et al., 2016; Doocy et al., 2013; Erman et al., 2021). Men also tend have higher employment rates than women in sectors that are less robust to typical business cycle shocks, such as construction, natural resources and mining (Wall, 2009).

Accordingly, it is estimated that the COVID-19 pandemic will deepen short-term gender inequalities in terms of employment rates and hours worked (Alon et al., 2021; Bluedorn et al., 2021). As women tend to work in higher numbers than men in face-to-face contact-intensive jobs, for example in the tourism and hospitality sectors, that are less telecommutable than the jobs of their male peers, women are more severely affected by lockdown measures (Alon et al., 2021; WTO, 2020d), although the faster recovery of employment rates of women compared to men in the second half of 2020 likely reflects the reopening of these sectors (Bluedorn et al., 2021).

On the other hand, certain negative effects on women also depend on the fact that when women own businesses, these tend predominantly to be micro, small and medium-sized enterprises (MSMEs), which have suffered from cash flow shortages since the outbreak of the pandemic (IFC, 2014; ILO, 2020). These negative effects are further reinforced in countries where the vast majority of women is employed in the informal sector without access to unemployment benefits (Ghoshal, 2020).

Women were also more affected by the pandemic due to their often greater responsibility for housework, childcare and taking care of sick members of the household. Results from an investigation on the US Current Population Survey, for example, show that mothers with young children reduced their work hours by four to five times more than fathers in order to take on childcare and housework responsibilities, increasing the gender work-hour gap between mothers and fathers by 20–50 per cent between February and April 2020 (Collins et al., 2021).

(iii) Sectoral differences in the effect of shocks

Shocks cascade down to different sectors through various channels. Apart from the material destruction of assets, all types of disasters potentially affect different sectors by shifting demand across and within sectors, as well as by provoking price fluctuations in key inputs such as oil.

Shifts in demand are specific to shocks. For example, in the aftermath of the 2004 Indian Ocean tsunami, reconstruction work in Indonesia led to a significant surge in prices for domestic building materials and wages of construction workers, thus harming domestic industries relying on such inputs (Jayasuriya and McCawley, 2008). Since the outbreak of the COVID-19 pandemic, sectors producing goods and services such as medical equipment, health services, home entertainment and video-conferencing software have experienced a surge in demand, while services such as air travel, restaurants and tourism, have suffered from a drop in demand (see Box B.4 and Box B.5).

Shifts also occur within sectors. Since the outbreak of the COVID-19 pandemic, firms and retailers with distribution channels unaffected by lockdown measures have benefitted from growing demand. For example in Portugal, purchases in the non-specialized retail sector (i.e. shops such as supermarkets and grocery stores), which was unaffected by lockdown measures, experienced a temporary boost, while specialized retailers and services such as vehicle retailers or the travel industry faced the largest decrease (Carvalho, Peralta and dos Santos, 2020). Similarly, online platforms grew like, for example, Amazon, which expanded its net revenue in the fourth quarter of 2020 by 43.6 per cent compared to the previous year.[5]

However, lockdown measures designed to contain COVID-19 adversely impacted MSMEs. This was because MSMEs are disproportionally represented in sectors that have been most affected by the pandemic, such as wholesale and retail trade, air transport, accommodation and food services, real estate, professional services, and other personal services (OECD, 2021h).

Sectors are also affected by price fluctuations of key inputs in the aftermath of shocks. For example, socio-economic shocks in the Middle East boosted oil prices by 25 and 70 per cent in the 1980s and 1990s, respectively (Hamilton, 2009). To date, oil is intensively used in transportation, energy and plastics/chemicals production, so that oil price shocks can depress economic performance indicators such as stock market returns (Sakaki, 2019). Consequently, oil price shocks caused by socio-economic crises such as conflicts can distort the performance of industries based on their respective reliance on oil.

(iv) Regional differences in the effect of shocks

Whether shocks affect different regions around the world, and to what extent, depends on various, partially interconnected, determinants, ranging from geography to macroeconomic fundamentals, to policy responses of governments.

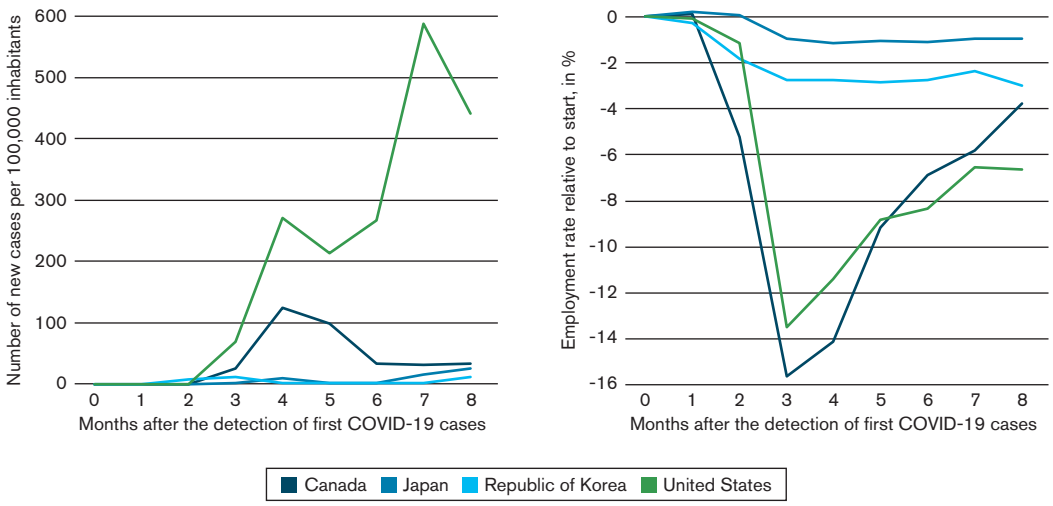
The geographic exposure of regions along coastlines or big rivers makes some areas in the world more prone to be hit by natural disasters such as storms and floods, with significant negative consequences. For example, big tropical storms hitting the Caribbean and the east coast of the United States caused an average US$ 5.9 billion worth of damage per year between 1980 and 2020 (EM-DAT, 2020).

During the 2008 global financial crisis, wealthier emerging economies and poorer high-income countries tended to experience the largest growth collapses (Didier, Hevia and Schmukler, 2012). In this context, current account deficits of economies were identified as one key macroeconomic variable making some economies more vulnerable to financial shocks than others (Lane and Milesi-Ferretti, 2011; Nier and Merrouche, 2010).

Following the outbreak of the COVID-19 pandemic, economies experienced a drop in employment rates of differing magnitudes in the first half of 2020. The United States, for example, experienced a rise in its unemployment rate from 10.3 per cent in March 2020 to 14.7 per cent in April of the same year, the highest monthly increase in unemployment in US history (Shrestha et al., 2020). Figure B.8 depicts employment rates of selected economies during the first wave of COVID-19 in 2020, along with the monthly number of new COVID-19 cases per 100,000 inhabitants.

Various factors may explain these different patterns, including labour market conditions, government support measures targeted to the labour market, and the strictness of lockdown measures adopted to control the pandemic. Figure B.8 shows a potential correlation between the growth rate of the number of confirmed COVID-19 cases and unemployment dynamics. For example, certain economies in Asia like Japan and the Republic of Korea that kept the spread of the pandemic under control during that period also

Figure B.8: Unemployment tends to rise when the COVID-19 health situation deteriorates



Source: Authors' calculations based on 2021 data from the Federal Reserve Bank of St. Louis (FRED) (available at https://fred.stlouisfed.org), World Development Indicators for 2019 populations as well as 2021 data on COVID-19 cases from Johns Hopkins Coronavirus Resource Center.

Note: The figure shows new COVID-19 cases and changes in employment rates in selected countries. Time refers to the months following the detection of the first COVID-19 cases in a given economy in 2020.

appear to have suffered fewer effects on the labour market during the same period.

4. How do shocks impact international trade?

Although it is challenging to generalize the impact of shocks on goods and services trade given the multitude of channels through which disasters can materialize, this subsection highlights how exports and imports can be impacted differently by shocks.

(a) Shocks can affect exports, imports and trade costs differently

Negative shocks triggered by natural disasters, technological and operational incidents or conflicts and violence can impact trade by increasing trade costs and by affecting demand for imports and supply of exports.

All types of disasters have the potential to trigger an increase in trade costs, as shocks can damage physical assets like merchandise goods, infrastructure, or human and physical capital, or may lead to interruptions of transport. The obstruction in March 2021 of the Suez Canal – through which 12 per cent of global trade passes – is estimated to have delayed close to US$ 10 billion in trade every day and to have caused annual trade growth to dampen by 0.2 to 0.4 per cent for each week of closure (Allianz SE, 2021). In 2005, Hurricane Katrina caused short-run disruptions in international trade by damaging and destroying major ports (Friedt, 2021). COVID-19 has had a significant impact on trade costs (see Box B.4). And increases in security measures, such as tougher border controls, following terrorist attacks (a socio-economic shock) also raise the cost of international trade by, for instance, lengthening delivery times (Nitsch and Schumacher, 2004).

Natural disasters can also affect international trade by altering the demand and supply of imports and exports. For instance, while empirical evidence on natural disasters consistently points at a reduction in exports of affected countries, there is ambiguity about the impact on imports (Da Silva and Cernat, 2012; Gassebner, Keck and Teh, 2010; Oh and Reuveny, 2010).

In terms of import demand, increased trade costs and the negative shock to demand caused by unemployment and the destruction of businesses can exert a negative pressure on imports. Conversely, the need to meet domestic demand for essential goods, such as food and medicine, and for materials for reconstruction can lead a country to import more (WTO, 2019b). Consequently, the matter of whether imports decrease or increase depends on a range of factors (see Section B4(b)).

Box B.4: Trade costs in the time of global pandemic

Travel restrictions and border closures, which were an important part of the initial policy response to the pandemic, disrupted freight transport, business travel and the supply of services that rely on the presence of individuals abroad. Depending on the sector in question, transport and travel costs are estimated to account for between 20 and 31 per cent of trade costs (Rubínová and Sebti, 2021). Travel restrictions thus result in a substantial increase in trade costs for as long as they remain in place.

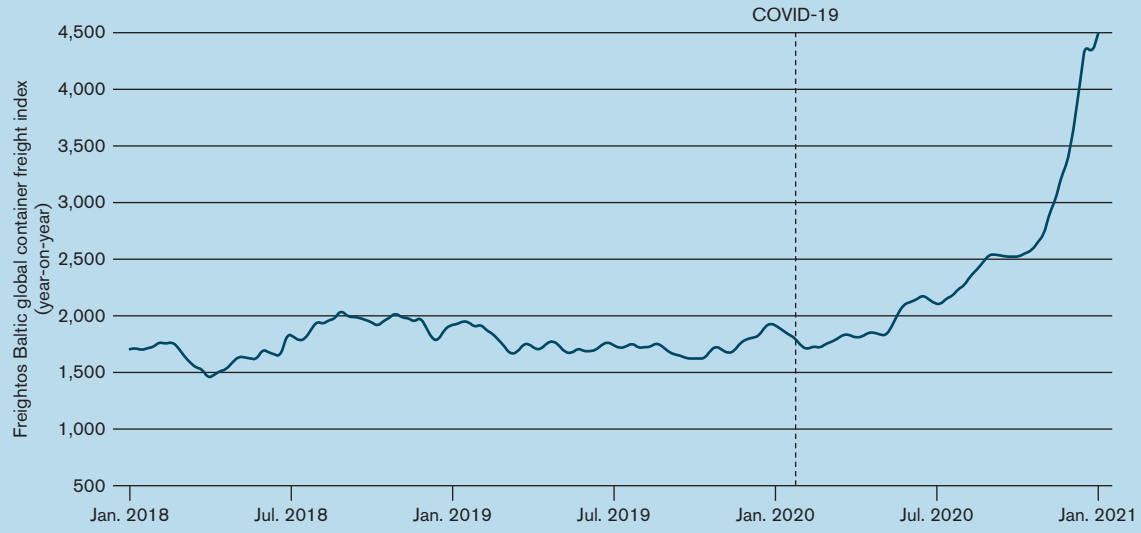
The performance of freight transport services is crucial to trade costs in manufacturing. Since the beginning of the COVID-19 crisis, maritime and land transport have remained largely functional, although they have registered considerable delays at times. Maritime transport issues have mainly related to port logistics, as many economies have changed port protocols, ranging from port closures and crew-change restrictions to additional documentation requirements and physical examinations of vessels and crew members, which disrupt shipping services (Heiland and Ulltveit-Moe, 2020).

Moreover, to prevent lower demand from depressing shipping rates, the maritime freight transport industry has decreased its supply of sailings. As a result, while the cost of container shipping in January and February 2020 was comparable to the same period in the previous year, the rebooting of the Chinese economy started pushing prices up in mid-March 2020, and the rebound of consumer demand in the United States caused a surge in May 2020 (see Figure B.9).

International land transport has been affected by border controls, sanitary measures (such as the measurement of drivers' temperatures) and special arrangements, such as the closure of certain border posts. The risks associated with travel to affected economies may also have resulted in a lack of drivers. These factors have caused delays in road cargo transport (see Figure B.10). To alleviate these issues, some exporters have tried to shift the load from road to rail, as the latter needs much fewer drivers and controls per amount of cargo (see, for instance, Knowler (2020) on the emergence of rail as the most secure option for freight transport in Italy in March 2020).

Travel restrictions have led to a drastic reduction in passenger flights, which account for around half of air cargo volume. Consequently, global air cargo capacity shrank by 24.6 per cent in March 2020, and air cargo yields (i.e. the average fare paid by customer to transport one tonne of freight and mail on one cargo revenue mile, as per www.statista.com) in April 2020 were almost twice as high as in April 2019 (see Figure B.11) (IATA, 2020a). While some airlines started flying passenger aircrafts without passengers just for the purposes of cargo, it was only the historically high prices that induced them to do so, and therefore this costs shock is likely to subside only with a rebound of passenger transport.

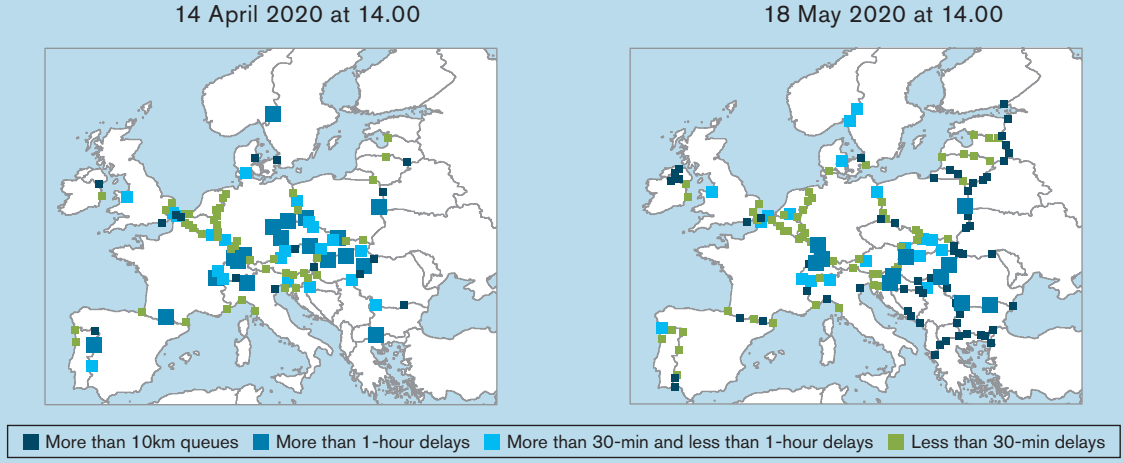
Figure B.9: Shipping rates started rising in March and surged in May 2020



Source: Freightos (2021).

Box B.4: Trade costs in the time of global pandemic *(continued)*

Figure B.10: Waiting times at European border-crossings were particularly high during the first lockdown in 2020

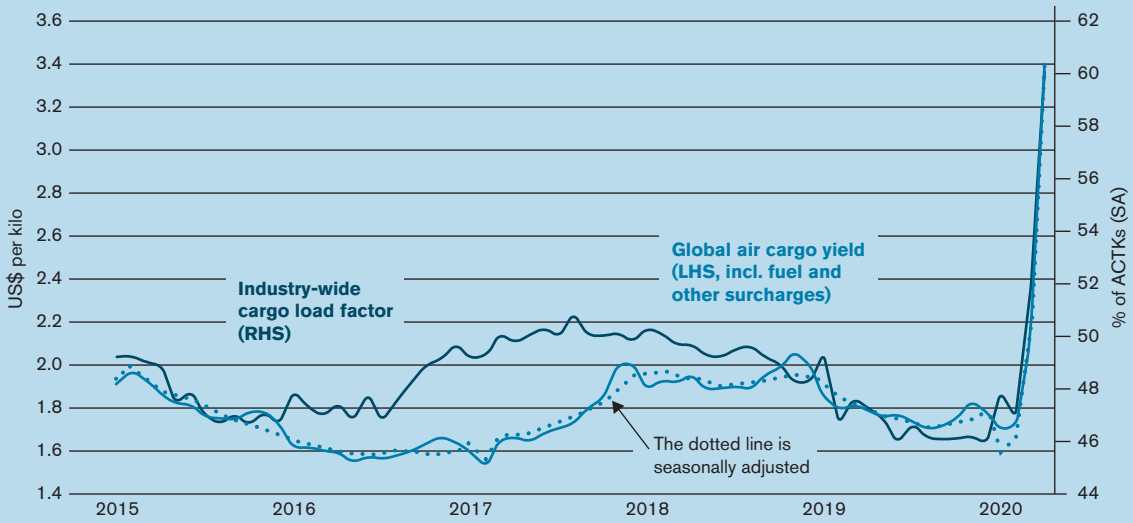


Source: Sixfold (2021) (https://live.sixfold.com).

Tradable services that rely on physical proximity between suppliers and consumers, such as tourism, passenger transport, and maintenance and repair services, have been severely impacted by travel restrictions and social distancing and have seen a prohibitive increase in trade costs. The disruption in business travel has also had an impact on trade in business and professional services, although this has depended on how possible it has been to substitute e-interactions for face-to-face communication in each particular context.

High levels of uncertainty also have increased trade costs. In the first quarter of 2020, the global level of uncertainty was 60 per cent higher than that triggered by the Iraq War and the severe acute respiratory syndrome (SARS) outbreak in 2003 (WTO, 2020e). This may result in a reduction in the supply of trade finance, imposing a particularly heavy toll on emerging and developing economies.

Figure B.11: Global air cargo capacity plummeted, causing a surge in air cargo yields



Source: IATA (2020a).

Note: Global air cargo yield (left) and load factor (right). ACTKs (SA): available cargo tonne-kilometres (seasonally adjusted). RHS: right-hand side. LHS: left-hand side.

Most shocks are local and may have limited effects in other countries. Due to increased global interconnectedness, however, some shocks can have a global scale and cause a severe global economic downturn. Both the global financial crisis of 2008-09 and the COVID-19 pandemic are remarkable examples in this regard. Box B.5 provides a comparison between these two global shocks and briefly discusses determinants of trade collapse and recovery in the wake of these crises.

(b) Shocks tend to have larger negative effects on (small) developing countries

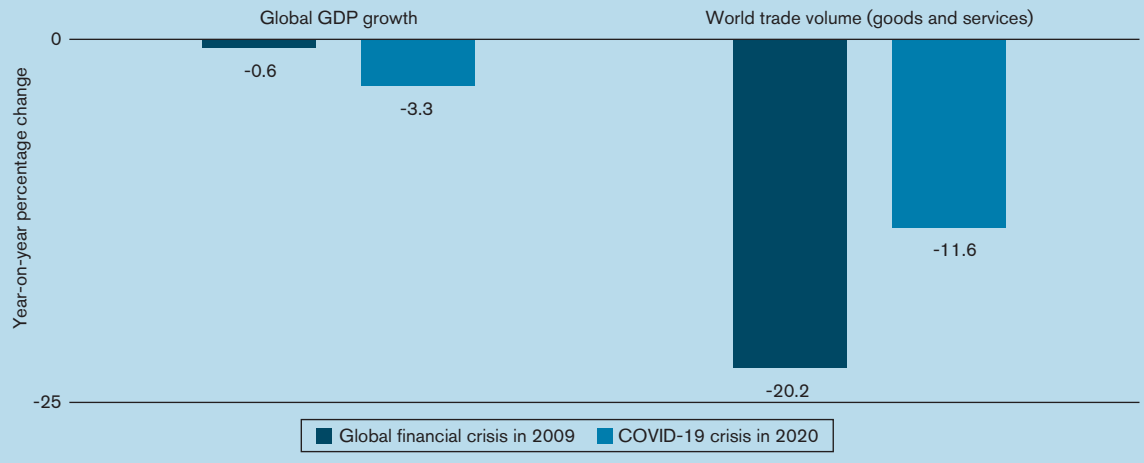
Economic disruptions tend to have a greater impact on developing countries, and in particular on small, poor countries, than on advanced countries. Imports decline by up to 20 per cent in the short run for heavily indebted poor, least-developed countries (LDCs) and landlocked developing countries affected by a natural disaster,[6] as these countries' access to financial markets is limited (Felbermayr, Gröschl and Heid, 2020). In contrast, the estimated average effect of natural disasters on imports across countries at different levels of development is either slightly positive (Felbermayr and Gröschl, 2013), or slightly negative (Gassebner, Keck and Teh, 2010). Similarly, exports from countries affected by a natural disaster are estimated to decline, on average, by merely 0.1 per cent, but exports of developing countries affected by a natural disaster fall by around 9 per cent, and exports of small developing countries drop by about 22 per cent, an effect which can last up to three years (Da Silva and Cernat, 2012; Gassebner, Keck and Teh, 2010; Jones and Olken, 2010).

Terrorist attacks, as well as industrial, transport and miscellaneous accidents, trigger heterogeneous trade effects on countries depending on their level of income. For instance, terrorist attacks have empirically been found to lead to a decline in bilateral trade of between 4 and 5 per cent on average (Blomberg and Hess, 2006; Nitsch and Schumacher, 2004). Bilateral trade between developed economies tends, however, to increase (on average by 5.6 per cent) following terrorist attacks thanks to greater imports from other developed economies and quicker recovery (Oh, 2017). Technological and operational shocks such as industrial, transport and miscellaneous accidents have also been found to increase bilateral

Box B.5: Unlike during the 2008-09 global financial crisis, trade in goods has been helping to sustain global trade during the COVID-19 crisis

A key difference between the global financial crisis and the current COVID-19 crisis has been the extent to which global merchandise trade flows have reacted to the contraction of economic activity. As depicted in Figure B.12, the global financial crisis was characterized by a "great trade collapse", with global trade in goods and services declining by 10.4 per cent in 2009 (12.6 per cent for merchandise alone), whereas global GDP contracted by 0.6 per cent. In 2020, the fall in global trade was also steep in absolute terms (9.6 per cent for trade in goods and services), although less so in terms of GDP, which dropped globally by 3.3 per cent.

Figure B.12: World trade declined less during the COVID-19 crisis in 2020 than during the global financial crisis in 2009



Sources: IMF (2010, 2021a).

Box B.5: Unlike during the 2008-09 global financial crisis, trade in goods has been helping to sustain global trade during the COVID-19 crisis *(continued)*

The reason why the COVID-19 crisis has not been accompanied by a more severe trade collapse, as experiences during the global financial crisis would suggest, is related to different demand-and-supply dynamics during the two crises, as well as a differing impact on tradable and non-tradable goods (see also Box B.3).

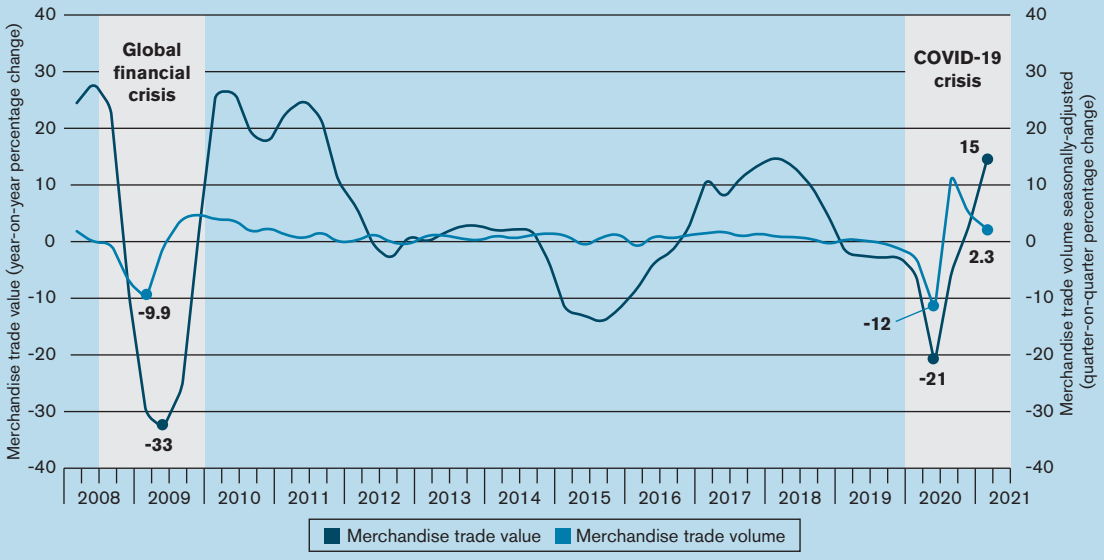
During the global financial crisis, the drop in demand for trade-intensive durable goods, in particular, had a significant impact on international trade and caused a substantial contraction of imports (Bems, Johnson and Yi, 2011; Benguria and Taylor, 2020). Besides accounting for a substantial share of merchandise trade, high-value finished goods also drive trade in intermediates (Eaton et al., 2016).

Consequently, the declining demand for durables translated into an even stronger decrease in trade. Amplified by the existence of highly integrated and synchronized production networks (Yi, 2009), the negative demand shock was propagated via global value chains and triggered a drop in international trade.

In contrast, the demand-and-supply shock caused by the COVID-19 pandemic triggered a substantial contraction in GDP, but a less severe decline in world trade compared to the collapse during the global financial crisis. Rebounding demand for tradable goods along with persistently low demand for less trade-intensive services explains the decoupling of GDP and global trade (Ossa and Le Moigne, 2021). Even though the value of global trade collapsed by 21 per cent during the second quarter of 2020 compared to 2019, it declined to a smaller extent and recovered more rapidly than it did during the global financial crisis (see Figure B.13).

While increased demand for goods related to the pandemic and to "lockdown life" – such as medical goods, masks, home office appliances and consumer electronics – have helped to mitigate the collapse in trade, empirical investigations suggest that the swift trade recovery in 2020 was related to a sharp decline of trade costs due to reduced export restrictions in the second quarter of 2020, a drop in oil prices, China's short-lived recession and firms' adaptation of production processes to the new sanitary regulations (Ossa and Le Moigne, 2021).

Figure B.13: Merchandise trade declined to a smaller extent and recovered more rapidly during the COVID-19 crisis than during the global financial crisis

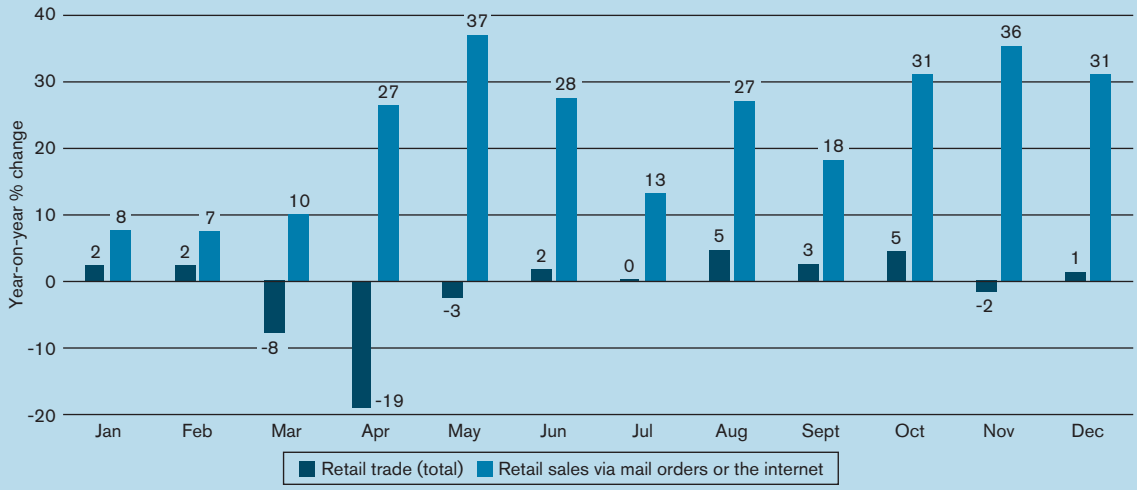


Source: Authors' calculations, based on WTO data (https://data.wto.org).

Note: The left axis shows merchandise trade captured as average of exports and imports, year-on-year.

Box B.5: Unlike during the 2008-09 global financial crisis, trade in goods has been helping to sustain global trade during the COVID-19 crisis *(continued)*

Figure B.14: Euro area retail sales via mail orders and the internet increased during the 2020 lockdowns



Source: Authors' calculations, based on Eurostat (https://ec.europa.eu/eurostat), 2021.

Note: Total retail sales excludes motor vehicles and motorcycles. The Euro area encompasses Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain.

In this context, the share of intermediate inputs in trade between late 2019 and late 2020 remained stable at around 50 per cent, indicating a limited propagation of COVID-19 related shocks via global value chains at the aggregate level (Berthou and Stumpner, 2021) based on WTO estimates. Moreover, substantial macroeconomic stimulus in 2020 and early 2021 helped trade recovery, as fiscal support to households strongly increased spending, particularly on tradable goods (Chetty et al., 2017; IMF, 2020a; 2021a).

Importantly, during the COVID-19 crisis, digital technologies mitigated the trade shock in terms of both supply and demand by helping firms to maintain activity and accelerating previous trends in consumer online shopping (OECD, 2020c). Although not all online orders involve cross-border trade, the increase in retail trade via mail orders or via the internet led to an exceptional growth in the sector throughout 2020, with companies such as UPS and PayPal reporting substantial growth on cross-border shipment volumes and values, respectively (Fitzpatrick et al., 2020).

Figure B.14 illustrates dynamics of online and total retail trade in the Euro area throughout 2020. While total Euro area retail trade dropped by 19 per cent in April 2020 compared to the previous year, retail sales via mail-order houses and the internet increased in 2020, peaking at year-on-year growth rates of 35 and 36 per cent during the two major phases of the European lockdowns in May and November 2020.

trade between developed economies by around 2.2 per cent. The increase in trade among developed countries is attributed to higher needs for imports to compensate for the loss of domestic production as well as to help with recovery efforts, coupled with little concern over ability to pay (Oh, 2017).

Financial crises also have a stronger impact on developing economies. In the aftermath of financial crises, imports of developing countries are found to decline at almost double the rate of import declines in advanced economies (Benguria and Taylor, 2020). Additionally, advanced economies' imports recover within three years, but the effects on developing economies can last more than five years.

(c) Shocks can have significant sectoral differential effects on trade

International trade in some sectors tends to be more exposed and vulnerable to certain types of shocks. Among those industries, there are the agriculture sector, services and manufacturing global value chains.

(i) Agricultural sectors are particularly vulnerable to natural disaster and technological shocks

Given its high dependence on weather and climate, the agricultural sector tends to be particularly vulnerable to adverse natural phenomena, as well as to technological shocks. For instance, tropical storms disproportionally affect primary agricultural products. Meteorological hazards spreading invasive pests, such as the locust outbreak in East Africa in 2019, can further undermine future exports of agricultural products (Mohan, 2017; WTO, 2019c).

Similarly, the increasing numbers of disease outbreaks of a transboundary nature are undermining food security and safe trade in the livestock sector (FAO, 2018). Moreover, past technological and operational shocks have demonstrated that trade in agriculture-related sectors and the fishery industry suffer when there are environmental incidents. For instance, the Exxon Valdez oil spill in Alaska in 1989 had long-lasting impacts on commercial fisheries production, much of which was destined for exports (Owen et al., 1995). The contamination of food products resulting from the Fukushima nuclear disaster in 2011 and subsequent import restrictions from trade partners reduced exports of Japanese agricultural products, which declined by 11 per cent in the last quarter of 2011. Imports in the same product category increased in the same year to compensate for the loss of local production (Bachev and Ito, 2014).

(ii) Services trade, particularly tourism, can be sharply affected by shocks

The travel and tourism industries are affected by a wide range of shocks. Individual travel decisions are influenced by various exogenous factors such as income, the exchange rate, and political and environmental conditions (Pforr, 2009; Ritchie et al., 2014). All types of disasters can thus trigger a decline in international demand for tourism by destroying relevant assets, reducing incomes, or increasing uncertainty on the political and environmental safety at destinations.

Natural disasters can destroy tourist accommodation and travel-related infrastructure, and can also adversely influence consumer perceptions. For example, tourist visits to the Caribbean fall after hurricanes in the region, due to perceptions by potential tourists that the event has destroyed the entire region (WTTC, 2018).

Industrial accidents, such as the 1989 Exxon Valdez oil spill in Alaska or the 2010 Deepwater Horizon oil spill in the Gulf of Mexico, can interrupt tourism-related business during the clean-up process and disrupt tourists' plans to visit the area (Cirer-Costa, 2015; Ritchie et al., 2014). In Alaska, the oil spill triggered a decline in tourism spending of 35 per cent and caused losses in the tourism industry of around US$ 2.4 billion (Lyon and Weiss, 2010; Robinson, 2020).

Terrorist attacks can reduce demand for tourism due to uncertainty with respect to safety as well as increasing costs linked to heightened security measures. For instance, passenger loads and hotel occupancy rates declined by more than 50 per cent in the United States immediately after the 11 September 2001 terrorist attacks (Goodrich, 2002).

Other socio-economic shocks, such as economic recessions and financial crises, can harm tourism by reducing incomes. In a study of 200 countries (Khalid, Okafor and Shafiullah, 2020), inflation crises, stock market turmoil and banking crises occurring either in the origin or in the destination country were found to reduce tourism, while currency depreciation at the destination, linked to sovereign debt crises, favours services exports and eventually triggers higher international tourist arrivals.

Nevertheless, as shown in Figure B.16 for the period from 1995 to 2020 tourism arrivals were resilient to shocks and recovered quickly from them. For example, no major drop was observed in the aftermath of the 11 September 2001 terrorist attacks, but growth slowed to 1 per cent compared to the average year-on-year growth of 4.3 per cent during the whole period (excluding 2020). During the severe acute respiratory syndrome (SARS) epidemic of 2003, global tourist arrivals fell by 9.3 per cent in Asia and the Pacific area, but this was followed by an increase of around 27.3 per cent in 2004. Similarly, global tourist arrivals declined by 3.75 per cent in 2009 after the 2008 global financial crisis, but then recovered in 2010 and went on to exceed the pre-crisis level by 7.7 per cent.

Having caused international tourist arrivals to drop by 74 per cent in 2020, the outbreak of COVID-19 represents the worst shock to international tourism in recent decades. Widespread travel bans and limited face-to-face interactions to contain the virus have restricted international cross-border movements and trade in tourism-related services (see, for example, Box B.6 on the impact of COVID-19 on the tourism industry in Mauritius).

As Figure B.17 shows, during the second quarter of 2020, trade in services such as transport and spending by international travellers ("travel") plummeted by

Box B.6: The impact of COVID-19 on the tourism sector and economy of Mauritius

The outbreak of COVID-19 has brought a halt to the tourism sector in Mauritius. The island went through a first lockdown from mid-March to mid-June 2020 with the first wave of COVID-19, and again in March 2021 with the second wave. Mauritius closed its borders when the first COVID-19 cases were discovered, and reopened them on 1 October 2020; however, a mandatory quarantine period of two weeks was introduced for all travellers entering Mauritius. This mandatory quarantine period acts as a major constraint to tourist flows in Mauritius, as the average length of a tourist stay is 10 to 12 days.

Mauritius launched a new one-year visa in October 2020, with the possibility of further extensions, to offset the damage caused to the travel and tourism sector by the pandemic. The premium visa targeted tourists, retirees seeking a safe haven from the virus and professionals (i.e. remote workers) who wish to be in Mauritius with their families. These visitors were not allowed to enter the labour market. However, following the emergence of the new strains of COVID-19, Mauritius banned entry for all travellers up to 30 June 2021.

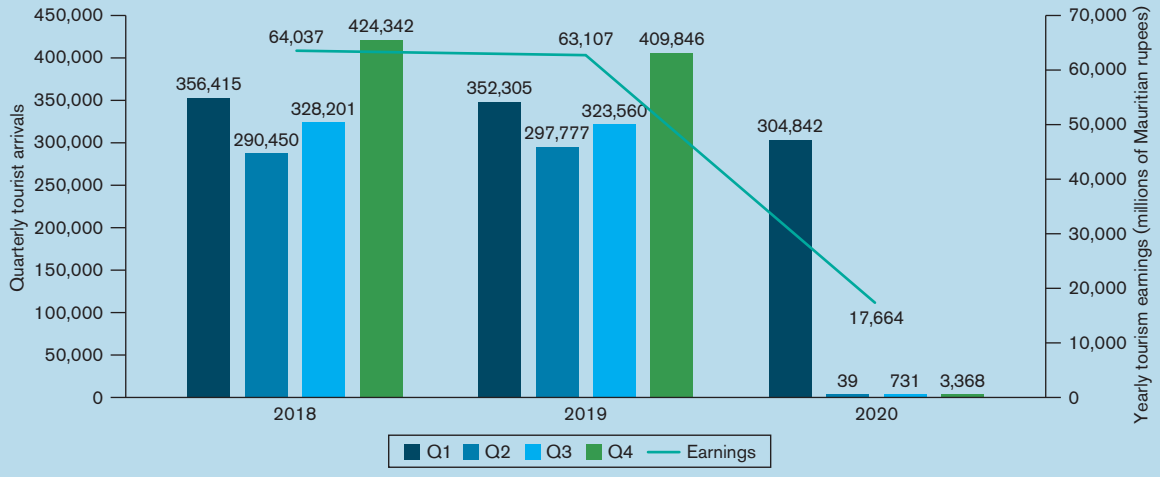
The tourism sector, which accounted for 18.8 per cent of GDP and 19.1 per cent of total employment in 2019, is facing a severe slow-down. In 2020 tourist arrivals fell by 77.7 per cent and tourism earnings by 72 per cent compared to the previous year. The first quarter of 2021 saw a further drastic drop in arrivals by 99.1 per cent relative to the same period in 2020 (Government of Mauritius, 2021) (see Figure B.15).

The authorities in Mauritius adopted the Wage Assistance Scheme (WAS) and the Self-Employment Assistance Scheme (SEAS) to mitigate the socio-economic impacts of COVID-19. The former targets businesses, allowing their employees to draw a monthly basic wage of up to US$ 1,250. The SEAS assists self-employed persons who have suffered a loss in revenue due to the lockdown. Around 24 billion Mauritian rupees were disbursed for these two financial assistance plans during the confinements of 2020 and 2021. Almost 16,700 employers requested the wage assistance schemes, while 258,079 self-employed workers benefitted from the SEAS.

In the tourism industry as of July 2020, an amount of some 2 billion Mauritian rupees had been disbursed to more than 39,000 employees under the WAS, while an estimated 26 million Mauritian rupees had been disbursed to around 1,500 self-employed workers under the SEAS. The authorities have maintained both schemes for workers in the tourism industry for as long as borders are closed. In addition, around 9 billion Mauritian rupees were provided by the National Resilience Fund to support Air Mauritius, the national airline of Mauritius.

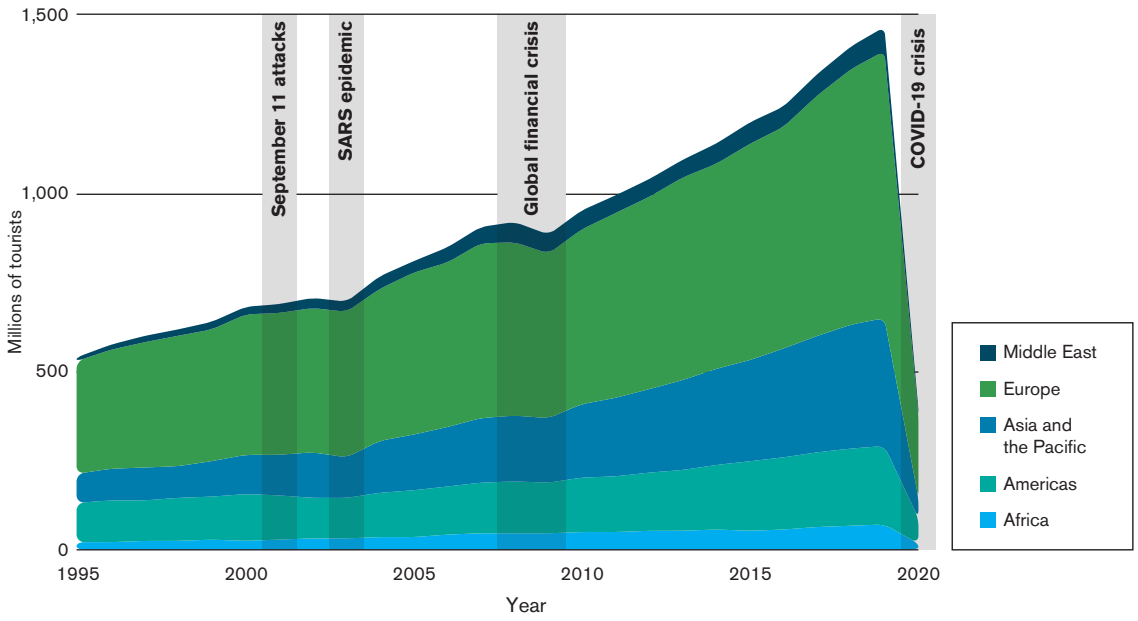
Mauritian authorities have made the vaccination of 60 per cent of the population a precondition for restarting the tourism sector. Priority for vaccination was given to frontline workers, including employees of the tourism industry.

Figure B.15: Tourist arrivals and tourism earnings of Mauritius collapsed during the COVID-19 crisis in 2020



Source: Authors' calculations, based on data from the Government of Mauritius (2021). Box prepared by Professor Boopen Seetanah (University of Mauritius and WTO Chair), Professor Verena Tandrayen-Ragoobur (University of Mauritius) and Professor Jaime De Melo (University of Geneva).

Figure B.16: International tourist arrivals collapsed during the early stages of the COVID-19 pandemic



Source: United Nations World Tourism Organization (UNWTO) World Tourism Barometer (2021).

30 per cent and 81 per cent respectively compared to the previous year, while other services dropped by only 8 per cent. The decrease in transport services trade was driven predominantly by restrictions to passenger travel. LDCs, many of which are particularly dependent on tourism/travel exports, experienced an estimated decline in services exports of 39 per cent in 2020, compared to a decline of 20 per cent for rest of the world.

Tourism showed some signs of recovery in the third quarter of 2020, in line with analyses of the International Air Transport Association (IATA) highlighting signs of substantial pent-up demand in domestic and international air travel for whenever restrictions are eased (IATA, 2020b). Future dynamics in the tourism and travel industry will, crucially, be linked to travel restrictions, the effectiveness of vaccination programmes and the successful coordination of health and safety protocols.

Other commercial services sectors were unevenly affected by the pandemic (see Figure B.18). While services requiring physical proximity, such as construction and artistic and recreational services, faced a tremendous decline in exports, others, such as financial and computer services, experienced only a marginal decline or even expanded due to rising demand – accelerated by the pandemic – for cloud computing and for virtual platforms and workplaces.

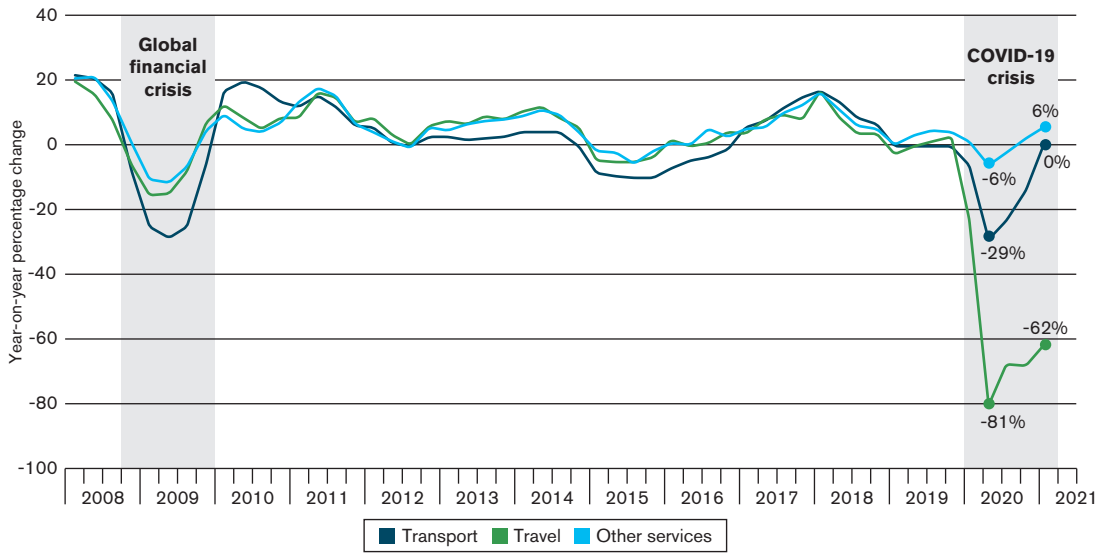
(iii) Manufacturing sectors are affected by supply and demand dynamics along global value chains

Shocks caused by disasters can impact manufacturers via different channels. The outbreak of the COVID-19 pandemic in 2020 triggered different demand-and-supply dynamics for manufacturers. Supply interruptions due to the lockdowns have devastated merchandise trade in certain categories (see Figure B.19). Sectors in exporting countries which have a lower share of occupations that can be done remotely have experienced a more severe drop in trade flows (Espitia et al., 2021). Demand-and-supply interruptions reduced trade in automotive products by 51 per cent in the second quarter of 2020 compared to the previous year (see Figure B.19).

Demand factors also contributed to the fall in trade. Confinement measures of importing countries reduced the demand for consumption goods, such as luxury goods, clothing, leather and footwear, while sectors such as food and agricultural products were relatively resilient (Berthou and Stumpner, 2021).

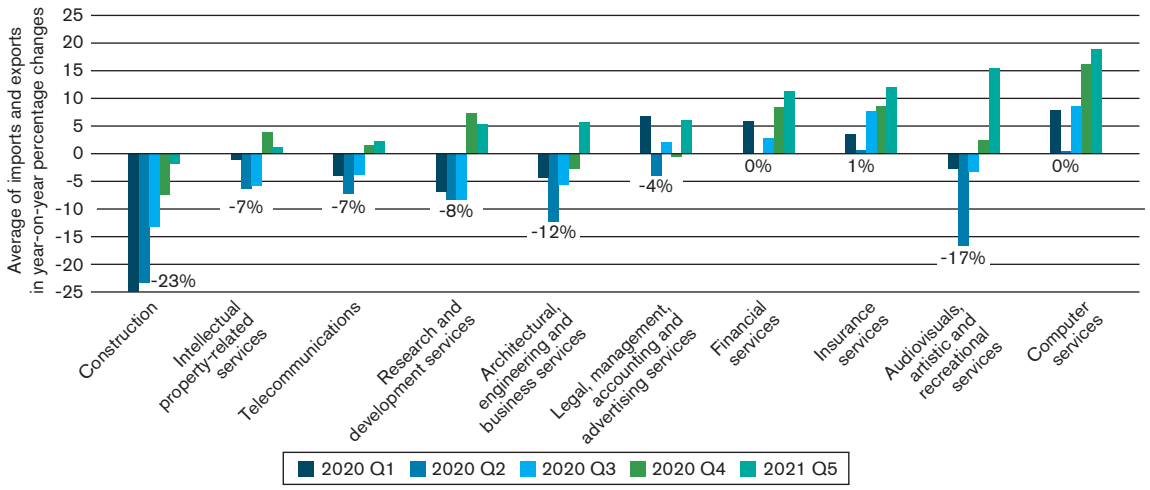
Other sectors have benefited from increased demand. For instance, trade in computers and electronic components – which are complementary with working from home – recorded growth of 4 and 12 per cent in 2020 after the first quarter, as well as growth of

Figure B.17: Trade in commercial services dropped more severely during the COVID-19 crisis than during the global financial crisis



Source: Authors' calculations, based on WTO-United Nations Conference on Trade and Development (UNCTAD)-International Trade Centre (ITC) dataset (https://data.wto.org).

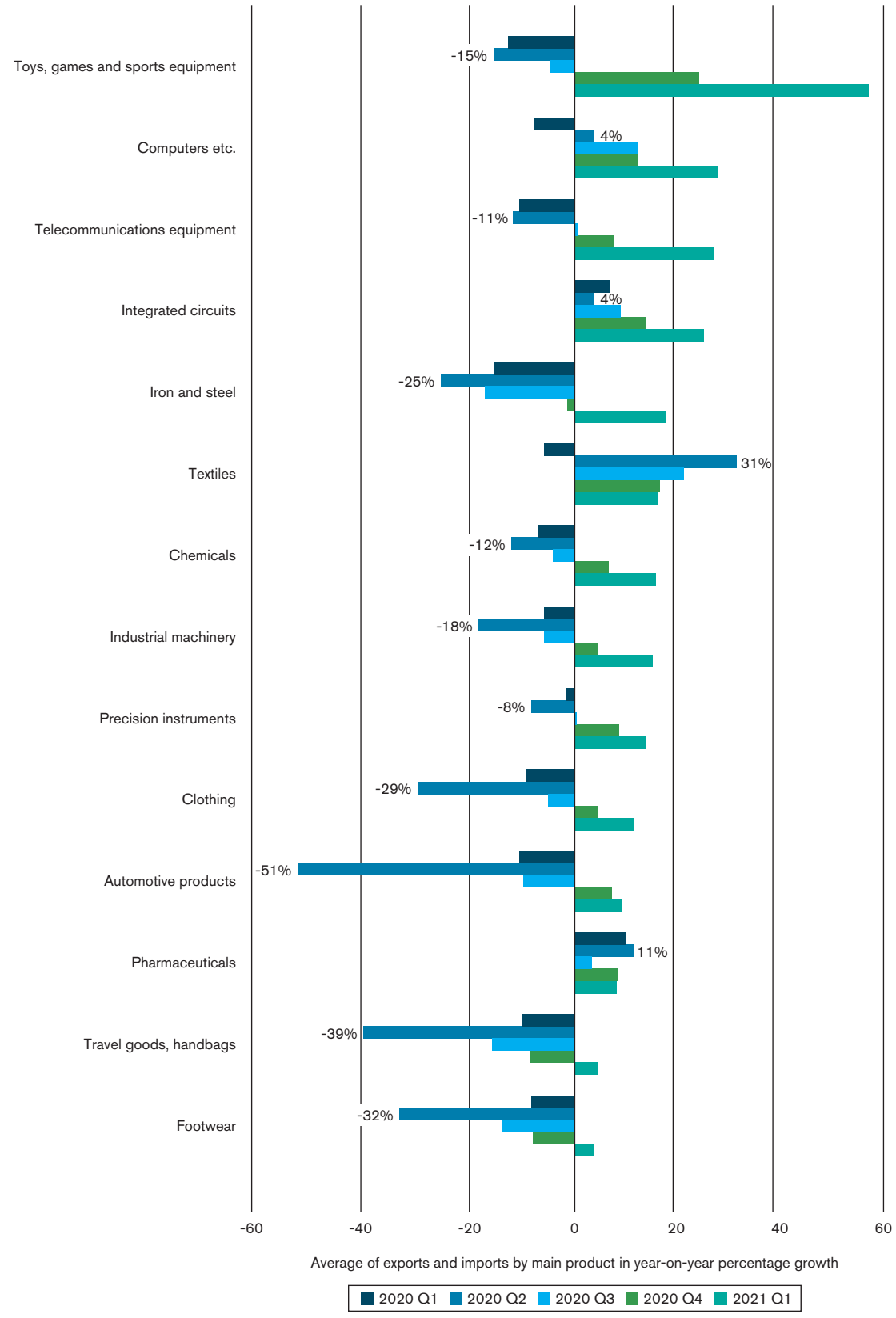
Figure B.18: Commercial services sectors were unevenly affected by the pandemic



Source: Authors' calculations, based on WTO-UNCTAD-ITC dataset (https://data.wto.org).

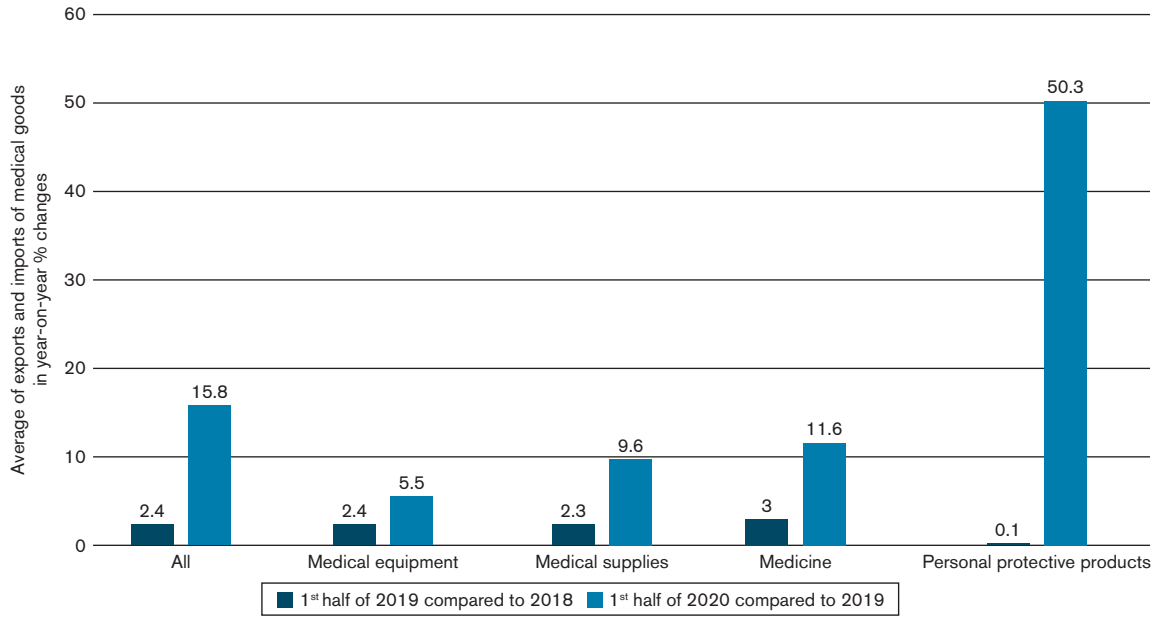
28 per cent in the first quarter of 2021. Pharmaceutical products – necessary to fight the pandemic – recorded the most rapid increase in the second quarter, up 11 per cent, but slowed in the third quarter, suggesting an end to stockpiling. Trade in medical goods necessary to fight the pandemic surged in 2020. The 15.8 per cent year-on-year growth from the first half of the year for medical goods contrasts with their modest growth of 2.4 per cent in 2019 (see Figure B.20). Trade in personal protective equipment (PPE) increased by 50.3 per cent – becoming the second-largest category of medical goods traded in 2020. Trade in medicines, which remain the largest category traded by value, grew by 11.6 per cent, followed by medical supplies (9.6 per cent) and medical equipment (5.5 per cent). Trade in breathing apparatus, such as ventilators and respirators, was up 56 per cent compared with the same period of 2019, while trade in face masks rose by 87 per cent.

Figure B.19: Trade in goods was heterogeneously affected by the COVID-19 crisis in 2020
(Percentage change in US$ values)



Source: Authors' calculations, based on WTO-UNCTAD-ITC dataset (https://data.wto.org).

Figure B.20: Trade in medical goods increased during the first half of 2020



Source: Authors' calculations, based on WTO trade data (https://data.wto.org).

As the World Health Organization (WHO) and national health authorities increasingly recommended the use of face masks in early 2020, the spike in demand for surgical masks and other PPE used by health workers caused a global shortage which could not be covered by one country alone. For example, although China had the capacity to produce about 8 per cent of the daily domestic demand to equip health, manufacturing, and transports workers by January 2020, it still had to import over two billion masks and another 400 million other items of PPE at the beginning of the pandemic, even after ramping up production (Bradsher, 2020; OECD, 2020a).

The impact of shocks on manufacturing sectors' trade dynamics is closely linked to global value chains, which are discussed in Section C.

5. Economic and trade policy response to shocks

When disasters occur, governments around the world react by implementing economic policies aimed at cushioning the economic effects of the shock. These policy responses may take different forms, depending on whether the shock affects the demand or supply. After presenting general economic policies in response to shocks, this subsection highlights how trade-restrictive measures tend to increase after some shocks, although trade-opening measures are also adopted after shocks strike.

(a) Economic policy response

In macroeconomic theory, policy response to shocks is usually defined by the type of impact they have on the economic system. As discussed in Section B3(b), the impact of economic disruptions can be decomposed into: (i) demand shocks, (ii) supply shocks and (iii) increased uncertainty.

(i) Demand shocks

The standard policy response to demand shocks is usually countercyclical. In other words, it aims to mitigate both positive and negative demand shocks in order to stabilize prices and employment levels (Friedman, 1995; Mundell, 1962; Tinbergen, 1952). To this end, a multitude of policy tools is used. Many of these measures take the form of automatic stabilizers (Égert, 2012; ECB, 2010). For example, progressive taxation automatically reduces or increases individuals' taxation depending on changes in income, and payments of unemployment benefits may automatically increase in periods of economic stress and decrease in periods of growth.

In addition, governments usually introduce exceptional measures to face large shocks (Combes, Minea and Sow, 2017; ECB, 2010). For example, in the case of a negative demand shock, expansive fiscal and monetary policies are often favoured, such as increased government spending, reduced interest rates, cuts in

taxes, or the introduction of additional consumption and unemployment subsidies. For example, the most common policy response to the global financial crisis was the adoption of expansive fiscal policies: 65 out of 77 countries examined adopted expansive fiscal policies in the aftermath of the crisis (see Table B.3). On average, countries implemented fiscal stimulus worth about 2 per cent of GDP (WTO, 2014). Other common demand-side responses explicitly targeted employment and included increased hiring in the public sector (47 countries), the reduction of certain employment-related taxes and burdens (52 countries), and actions related to employment conditions (54 countries).

Conversely, when a demand shock is positive, the usual response involves fiscal and monetary contraction to avoid "overheating" of the economic system and a surge in prices (Mundell, 1962). Moreover, trade policy plays an important role in meeting positive demand shocks (see Section B5(b)).

(ii) Supply shocks

Supply effects are common in all types of shocks but play a particularly evident role in natural and technological shocks. An example of a supply shock is the Fukushima accident in 2011, which caused shortages in the supply of over 150 car parts, which left Toyota's North American operations running at 30 per cent of capacity for several weeks (Canis, 2011). Faced with supply shocks, government intervention may be needed to limit potential economic losses. Policy responses to supply shocks take different forms, such as grants and loans, production subsidies, infrastructure investments, deregulation, tax cuts, interest rate cuts or increases in funding for training.

Table B.4 provides an overview of the policy responses adopted in the aftermath of four recent natural disasters: the 2004 Indian Ocean tsunami, the 2010 earthquake in Haiti, the 2011 earthquake and tsunami in Japan and the 2020 Australian bushfires. Many of these policies were supply-side interventions which aimed to restore economic and logistic capabilities. Some examples of adopted supply-side policies are infrastructure reconstruction, emergency grants, concession of loans, support to small businesses and to the industrial sector, subsidies to repurchase machinery and equipment, and the reopening of tourist attractions. Common policy measures following natural disasters include easier access to credit, insurance provision and subsidies to firms and farmers (WTO, 2019b).

(iii) Increased uncertainty

Finally, by increasing uncertainty in the system, shocks may have an economic effect, such as the increased spending for security and defence in the aftermath of the 9/11 terrorist attacks (Baker, Bloom and Davis, 2019; Looney, 2002). Different policy responses are used to reduce uncertainty. For instance, natural or technological shocks might be followed by campaigns to raise awareness, training schemes, mitigation planning, investments in infrastructure and warning systems, surveying and modelling, etc. On the other hand, in socio-economic shocks — such as a hyperinflation crisis or debt default — typical responses to mitigate uncertainty might include regulations to increase monetary and fiscal policy credibility, structural reforms and debt restructuring (Franco, 1990; Mishkin, 2011; Reinhart and Rogoff, 2013).

(b) Trade policy response

In the context of shocks, trade policy takes on a dual connotation. On the one hand, protectionism is seen as a way of prioritizing domestic economic activity while, on the other hand, trade-opening often plays a crucial role in solving sudden demand-supply mismatches and emergency situations. Both aspects are discussed next, including trade policy responses to shocks.

(i) Restrictive measures tend to increase after some shocks

Trade-restrictive measures have often been associated with economic shocks. The average level of trade restrictions tends to rise during economic recessions or business cycles troughs, thereby suggesting a countercyclical relationship between business cycles and trade restrictions (Bagwell and Staiger, 2002; Crowley, 2010). There is an extensive literature providing empirical evidence of this countercyclical relationship, for example Auray, Devereux and Eyquem (2020), Bohara and Kaempfer (1991), Bown and Crowley (2014), Crowley (2011), Grilli (1988), Grundke and Moser (2019), and Knetter and Prusa (2003). Restrictive trade measures typically increase following adverse productivity shocks or economic downturns. Similarly, the intensity of inspections, number of import refusals, and other trade barriers have increased during downturns (Auray, Devereux and Eyquem, 2020; Grundke and Moser, 2019). However, the countercyclical relationship between restrictive trade measures and GDP may have weakened in recent years given the diffused consensus that protectionism has negative economic effects (Rose and Wei, 2013).

Different reasons have been advanced for this countercyclical relationship. For instance, it has been argued that governments face increasing pressure

Table B.3: Policy responses following the 2008-09 global financial crisis

Policy area	Policy measure	Number of countries
Active labour market policy	Training for the employed	45
	Training for the unemployed	49
	Additional recruitment of public employment service and administration	47
	General youth training measures	34
	Measures for unemployed and disadvantaged youth	26
Macro-economic policy	Fiscal policy – expansion	65
	Fiscal policy – contraction	13
Measures to increase labour demand	Credit facilities, access to credit guarantees	49
	Employment retention measures including working time reductions, wage subsidies, incentives such as subsidies to employers to maintain existing jobs	39
	Lowering non-wage labour costs and reduction in taxes	52
	Other special measures for MSMEs and cooperatives	40
	Payment facilities	21
	Public sector job creation, incentives such as subsidies	36
	Wage reductions	5
	Supportive regulatory environment for sustainable enterprises	43
Social dialogue	Actions taken through collective agreements on working time, wages, working conditions, employment protection by social partners	48
	Actions taken by social partners through social pacts on working time, wages, working conditions, employment protection	54
	Measures to reduce gender inequality implemented through social dialogue in the field of employment	24
	Measures to reduce gender inequality implemented through social dialogue in the field of right to work	13
	Measures to reduce gender inequality implemented through social dialogue in the field of social protection	15
	Other measures implemented in the field of social dialogue	20
	Strengthen measures for labour administration and labour inspection	47
Sector-specific policy	Agriculture and fisheries	6
	Real estate	8
	Transport, storage and communication	9
	Construction	16
	Hotels and restaurants	9
	Wholesale and retail, repair of motor vehicles, motorcycles and personal and household goods	5
	Public administration and defence	7
	Various measures	4
	Manufacturing	26
	Not classifiable	18
	Financial intermediation	15
	Mining and quarrying	3
	Education	5
	Electricity, gas and water supply	7
	Health and social network	5
	Exports	38

Source: Authors' calculations, based on data from "The ILO/World Bank Inventory of policy responses to the global financial and economic crisis of 2008".

Note: Policies recorded in the database cover the period ranging from mid-2008 to end-2010 and 77 countries.

Table B.4: Examples of policy measures adopted in response to natural disasters

Objective	Policy measure
Fiscal shock	Request international assistance
	Request participation and support from international actors
	Multilateral lending, grants, concessional loans
	Debt relief
	International assistance, grants, recovery aid
Business recovery and growth	Support for small businesses and primary producers in the form of recovery grants, financial assistance and concessional loans
	Support to manufacturing sector, push for more national technological output
	Industrial support
	International partnerships within technological sectors
	Government subsidies for industries, corporate grants
	Incentives to repurchase machinery and equipment
	Job creation
Human development	Education and training, water and sanitation
	Assistance and psychological support to reduce trauma and distress
	Childcare subsidies
	Budget increase for the health sector
	Infrastructure recovery and reconstruction
	Land-use planning
	Housing reconstruction, changes in housing plans to increase resilience of infrastructures
	Post-disaster recovery of energy infrastructure, including cleaner and renewable sources of energy
Migration and displaced population	Long-term housing for the displaced
	Search and rescue
	Protection and care of separated and unaccompanied children
	Treatment and medical assistance
	Emergency aid/compensation, financial support and cash grants to the displaced population
Post-disaster preparedness lessons	Setting up of evacuation facilities
	Disaster awareness, education and mock drills
	Coastal protection plans, seawalls and breakwaters
	Tsunami warning systems
	Disaster mitigation plans
	Development of robotics to ensure help and assistance for future disasters
	Focus on developing innovative medical and environmental technologies
	Post-disaster impact survey for managing and modelling future catastrophes
Relief and recovery	Evacuation
	Setting up key infrastructure, transportation and logistics operations
	Donation of relief supplies, personnel assistance by neighbouring nations
Wildlife and environmental destruction	Wildlife rescue, care, protection and habitat protection
	Revegetation and reforestation
	Agriculture engineering, employing extensive biological testing data to help assure higher production rates and survivability rates
	Focus on agriculture and rural development

Sources: Authors' elaboration based on Margesson and Taft-Morales (2010); Suppasri et al. (2015); Koshimura and Shuto (2015); Zhang et al. (2019).

Note: Review based on the 2004 Indian Ocean tsunami, the 2010 earthquake in Haiti, the 2011 earthquake and tsunami in Japan, and the 2020 Australian bushfires.

to secure domestic markets for domestic firms, in which case trade policy during recessions depends on the relative political power of import-competing and export industries (Cassing, McKeown and Ochs, 1986). Alternatively, restrictive measures could be viewed as being less costly during a recession, as the losses from restrictive measures, such as increasing import tariffs, are greater in times of economic expansion than contraction (Bagwell and Staiger, 2002). Finally, countries have incentives to employ import restrictions in order to fight off dumping activities motivated by a decrease in demand in a contracting foreign market (Crowley, 2010).

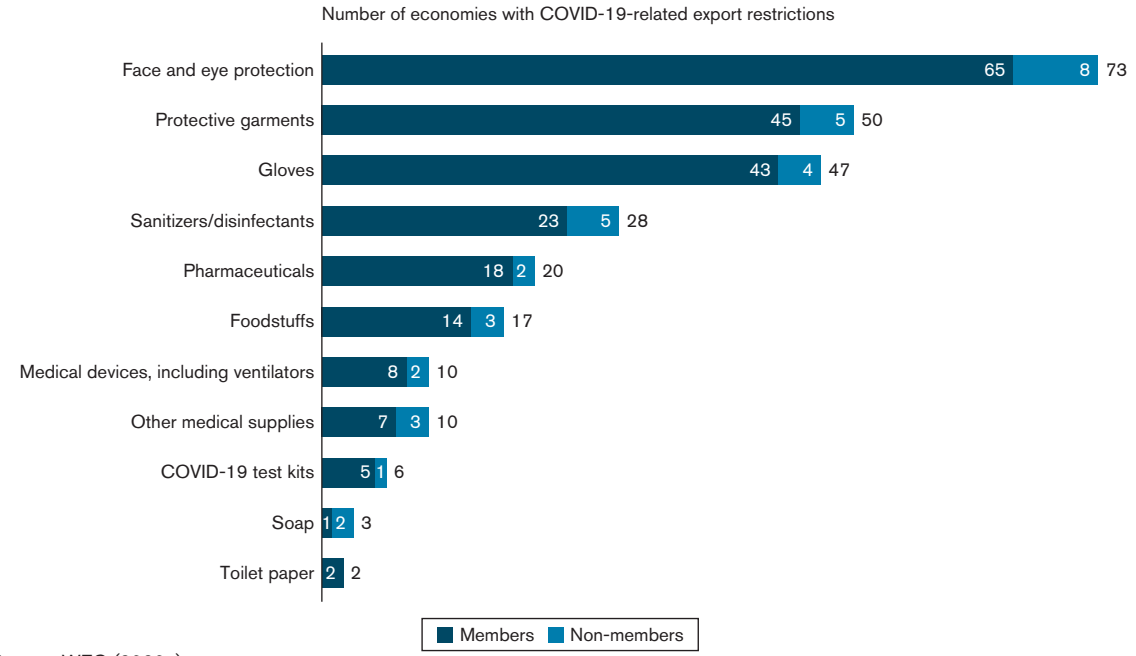
Restrictive trade measures on exports have attracted particular attention during recent crises, including both the global financial crisis and the COVID-19 crisis. In the early phases of the COVID-19 pandemic, temporary export bans on critical goods were used by some countries to address domestic supply shortages of these goods (WTO, 2020f).[7] By the end of April 2020, 80 countries and custom territories had implemented export restrictions (see Figure B.21), and by November 2020 this number had increased to 86 (Bacchetta et al., 2021). These measures primarily targeted medical supplies (e.g. facemasks and shields), pharmaceuticals and medical equipment (e.g. ventilators), but a handful of measures were also imposed on other consumption goods, such as foodstuffs and toilet paper (WTO, 2020f).

Export restrictions were also introduced on vaccines and their inputs. Based on confirmed information, 32 economies restricted exports on at least one input, while 21 economies used export bans and 11 economies used export-licensing schemes. Several measures have been withdrawn, but others still remain in place or have been renewed. A large number of inputs for the production of vaccine could potentially be affected and, since different vaccine manufacturers use different inputs, they are affected differently by the restrictions.

Export-restrictive trade measures have also been implemented in response to other types of shocks. For example, export bans were used in 2006-08 in response to spikes in commodity prices (Evenett and Fritz, 2020). In the case of natural disasters, restrictive measures are also common, and tend to be concentrated primarily in the agricultural sector (Bastos, Straume and Urrego, 2013; Klomp and Hoogezand, 2018). These policies are often unwise. A simulation of shock impacts finds that the implementation of trade-restrictive measures reduces an economy's ability to access critical goods during a shock and increases the efficiency costs associated with recovery (OECD, 2021f).

Finally, restrictive trade policies may also be a direct mitigation strategy for certain shocks (see Box B.7). For example, travel limitations, trade curtailment and

Figure B.21: The number of countries and custom territories introducing export restrictions on certain essential products increased after the outbreak of COVID-19



Source: WTO (2020a).

Box B.7: Trade policy responses to the global financial crisis of 2008-09

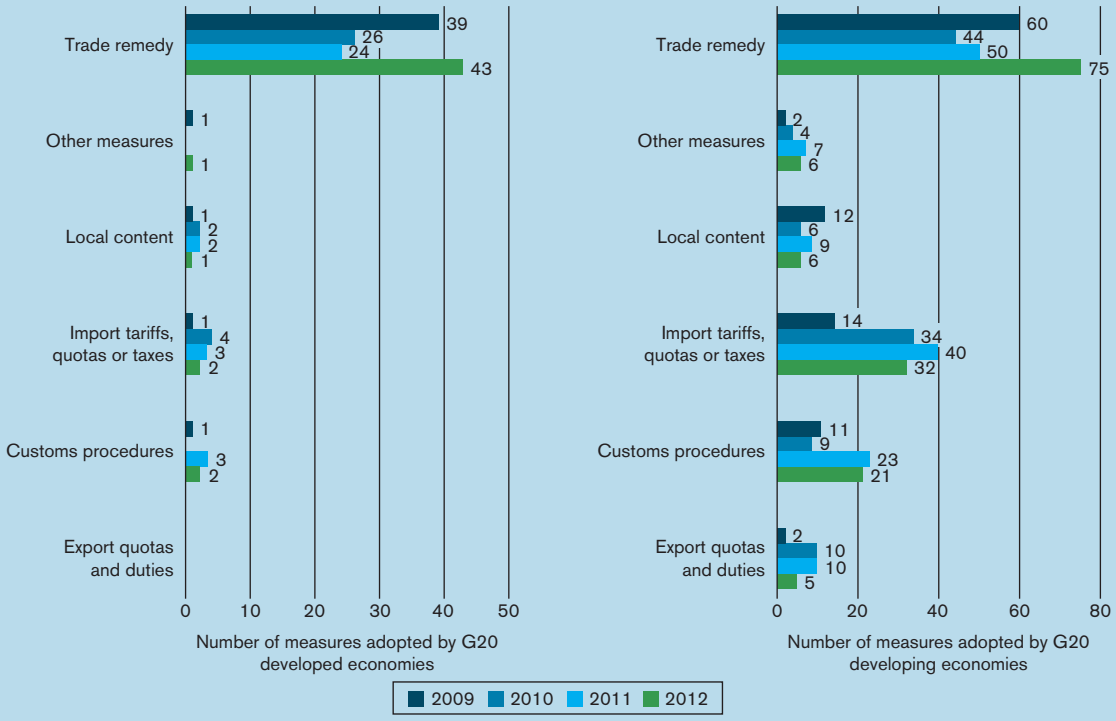
Concerns were raised at the time of the global financial crisis of 2008-09 that restrictive trade policies could return, mirroring policy responses from governments following the Great Depression of the 1930's which triggered a destructive spiral of protectionism (Baldwin and Evenett, 2009b).

Contrary to widespread concerns, many economies exhibited only a moderate use of restrictive trade policies in response to the crisis (Bown and Crowley, 2014; Gawande, Hoekman and Cui, 2015; Kee, Neagu and Nicita, 2013; Ruddy, 2010). While this development can in part be attributed to the WTO and its role as regulatory body, exporters exerted offsetting trade-opening forces against demand for protection in many countries (Gawande, Hoekman and Cui, 2015). More specifically, the economic interests of vertically integrated firms – which have an interest in keeping imported intermediate inputs cheap – helped to limit protectionism during the crisis.

The number of restricting measures on exports and imports increased. As macroeconomic conditions worsened, import restrictions imposed through temporary trade barriers – including measures such as antidumping, safeguards, and countervailing duties – became more prevalent (Bown and Crowley, 2014). Moreover, export-restricting measures, such as export quotas and duties, increased in the aftermath of the crisis (see Figure B.22). Developing economies used these measures more intensively than developed economies and were also the main targets of such restrictions (Bown, 2009; WTO, 2014) (see Figure B.22).

Despite these new measures, total restrictions covered only between 0.2 to 0.8 per cent of the pre-crisis level of imports (see Figure B.23). While trade remedies were the most common trade measure (see Figure B.22), custom procedures, tariffs, quotas and taxes had a significantly larger economic impact in developing countries (see Figure B.23).

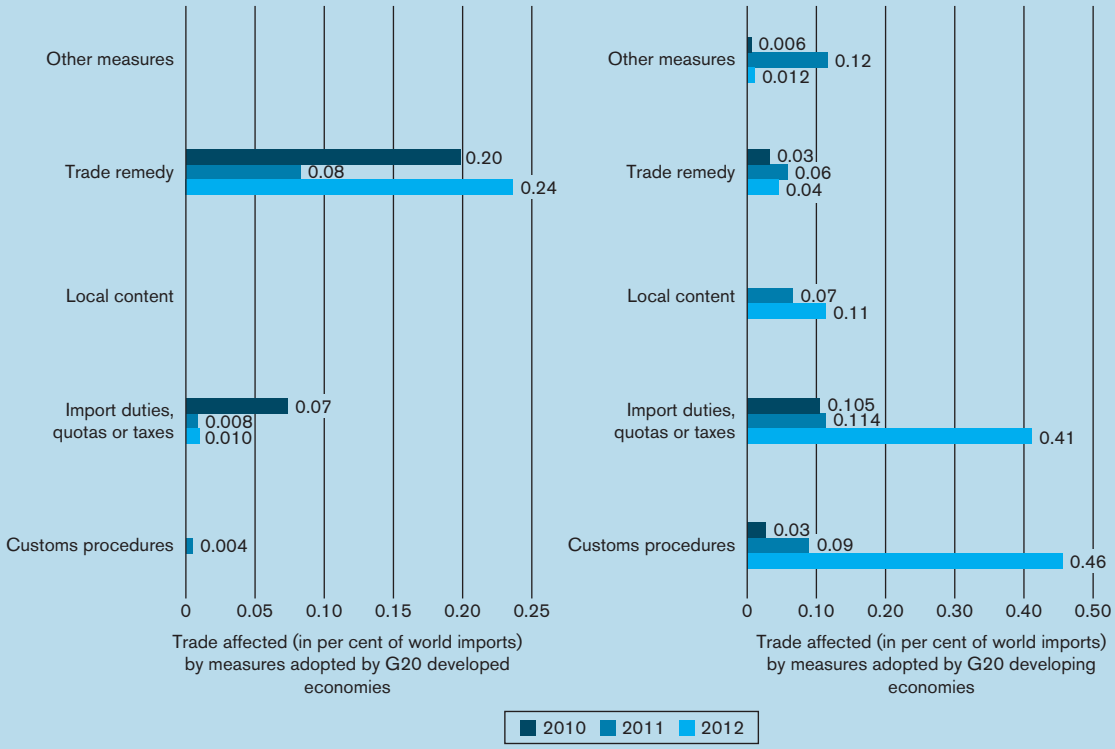
Figure B.22: Trade remedies were the most common trade measure in the aftermath of the global financial crisis



Source: WTO (2014) using data from the Trade Monitoring Database (https://tmdb.wto.org/en). Figures only include confirmed measures that are classified as restrictive. Only measures that are not withdrawn in the same year are included.

Box B.7: Trade policy responses to the global financial crisis of 2008-09 *(continued)*

Figure B.23: Trade-restrictive measures only covered a modest share of world trade between 2010 and 2012



Source: WTO (2014) using data from the Trade Monitoring Database (https://tmdb.wto.org/en) and trade figures from the UN Comtrade Database (https://comtrade.un.org/). Figures only include confirmed measures that are classified as restrictive. Only measures that are not withdrawn in the same year are included.

quarantining of goods and persons were the most effective measures to defeat epidemics before the development of modern medicine (Conti, 2008; Peaks et al., 2017; Tognotti, 2013). The first documented use of quarantine measures dates back to 1348, when the Republic of Venice introduced a 40-day isolation period for incoming ships and travellers to contain the bubonic plague epidemic, which spread through Europe and Asia in the mid-14th century (Gensini, Yacoub and Conti, 2004). Historically, complete city and port closures to foreigners have been another common policy response to contain outbreaks of epidemics; for example, when the bubonic plague reached Russia in 1644, sanitary officials in charge of the quarantining policies banned foreign travellers from entering Moscow (Conti, 2008). Border hygiene checks and licence systems were also introduced. For instance, during the 16th century, bills of health began to be issued to prove that the last port visited by a ship was clear of infection by the bubonic plague (Conti, 2020; Tognotti, 2013). The COVID-19 crisis has shown that these measures are as relevant in containing contagion today as they were in Renaissance Italy (Conti, 2020).

(ii) Shock response also involves trade-opening

Trade-opening measures also can be used in response to shocks to guarantee supplies of critical goods. Of the 335 COVID-19 measures recorded for WTO members and observers between the outbreak of the pandemic and November 2020, 58 per cent were of a trade-facilitating nature and 42 per cent were trade-restrictive (WTO, 2020g). Moreover, while shortages of PPE led to the introduction of

export bans by some PPE-producing nations in the early phases of the pandemic (WTO, 2020a; 2020f), many of these measures were subsequently lifted, and tariffs on critical goods were reduced to fight the pandemic. By the end of July 2020, 40 WTO members had suspended duties, taxes or charges on critical medical goods (WTO, 2020b), and around 39 per cent of COVID-19 restrictive measures on goods had been repealed by mid-October (WTO, 2020g). In most countries, custom procedures and border clearance for medical goods were simplified to speed up imports of critical goods; special channels were set up to simplify imports of medical goods and facilitate the movement of health workers; and exceptional government procurement, as well as intellectual property (IP), measures were put in place to hasten the delivery of medical services, facilitate innovation and ease access to new technologies (WTO, 2020b, 2020c).

As discussed in chapter D, WTO members also engaged in international initiatives to keep markets open for essential goods. For instance, New Zealand and Singapore, subsequently joined by Australia, Brunei Darussalam, Canada, Chile and Myanmar pledged to keep their markets open. Canada also led an initiative (joined by 47 other countries) pledging openness and good practices with respect to world agricultural trade.

COVID-19-related goods such as pharmaceutical products or medical/surgical equipment were the categories of goods subject to the highest number of both liberalizing and restrictive trade interventions in 2020.[8] Despite the attention drawn by trade restrictions during the pandemic, the importance of trade-opening measures has been demonstrated by the fact that, on balance, medical, pharmaceutical and testing equipment were the object of more liberalizing than restrictive trade measures. These measures were fundamental in meeting the sudden surge in demand caused by the pandemic. Rather than increasing domestic production of these goods – which would have been neither cost- nor time-effective – many countries increased imports (OECD, 2021f). International trade in these critical goods increased dramatically during the pandemic; for instance, trade in textile face masks was multiplied by six, trade in face protection products grew by 90 per cent and Chinese exports of medical products tripled (WTO, 2020f). This was essential for low-income countries, which rely entirely on foreign production for COVID-19 related products and to access a broader variety of medical goods options (OECD, 2021f).

Services sectors have been heavily affected by the pandemic, although the extent of the impact varies by sector and mode of supply (WTO, 2020g). Until mid-October 2020, members had adopted 124 measures affecting trade in services in response to the pandemic. Most of these measures appeared to be trade-facilitating, including measures to ease the supply of, and access to, telecommunication services and measures to facilitate the supply of online health services. In a few cases, governments responded by removing existing trade restrictions, such as by relaxing limitations on the supply of Voice over Internet Protocol (VoIP) services (i.e. technology that allows users to make voice calls via the internet rather than via regular phone lines). However, some of the measures adopted also appear to be trade-restrictive, including measures tightening foreign investment regimes.

While trade-restrictive policies have been found to hinder the response to natural disasters (WTO, 2019c), trade policy liberalization is used to cope with and recover from natural disasters. Notable trade-opening and facilitating measures adopted following a natural disaster include the exemption of pre-shipment inspection, the institution of urgent clearance mechanisms for certain goods imported in case of disaster, value-added tax (VAT) exemption, tariff rebates and tariff suspensions on goods deemed to be of public interest in exceptional circumstances (WTO, 2019b). These trade measures focus primarily on facilitating the availability of domestic and foreign relief goods, equipment, services and personnel, as well as on simplifying the import of products used in the reconstruction of physical infrastructures (e.g. building materials), and essential services (e.g. engineering services).

To sum up, trade policy always plays an important role in government response to shocks. Trade policy responses are rarely fully trade-restrictive or trade-opening: a mixed profile is the norm. On the one hand, trade-facilitating and trade-opening policies play a crucial role in harnessing the resilience potential of trade — such as in guaranteeing the supply of critical goods, smoothing emergency operations and easing the recovery phase. On the other hand, trade-restrictive policies may also play an important role in mitigating certain types of shocks (e.g. quarantining of goods and persons during an epidemic) and are sometimes used as a political message to display priority for the domestic situation (e.g. an export ban on medical goods or import tariffs to favour local producers during recessions). The existence of negative spillover effects of trade policy interventions makes the international coordination of trade measures indispensable. Possibilities for effective policy coordination and cooperation will be discussed in Section D.

6. Building and supporting economic resilience has become a key strategy to reduce business interruptions and economic losses caused by shocks

The term "economic resilience" has become a popular one to capture the broad and diverse factors and strategies needed to avoid and mitigate risks, and prepare, manage and recover from shocks. Although the concept of economic resilience has regained significant attention during the COVID-19 pandemic, it sparked particular interest during the global financial crisis of 2008-09 (see Figure B.24).

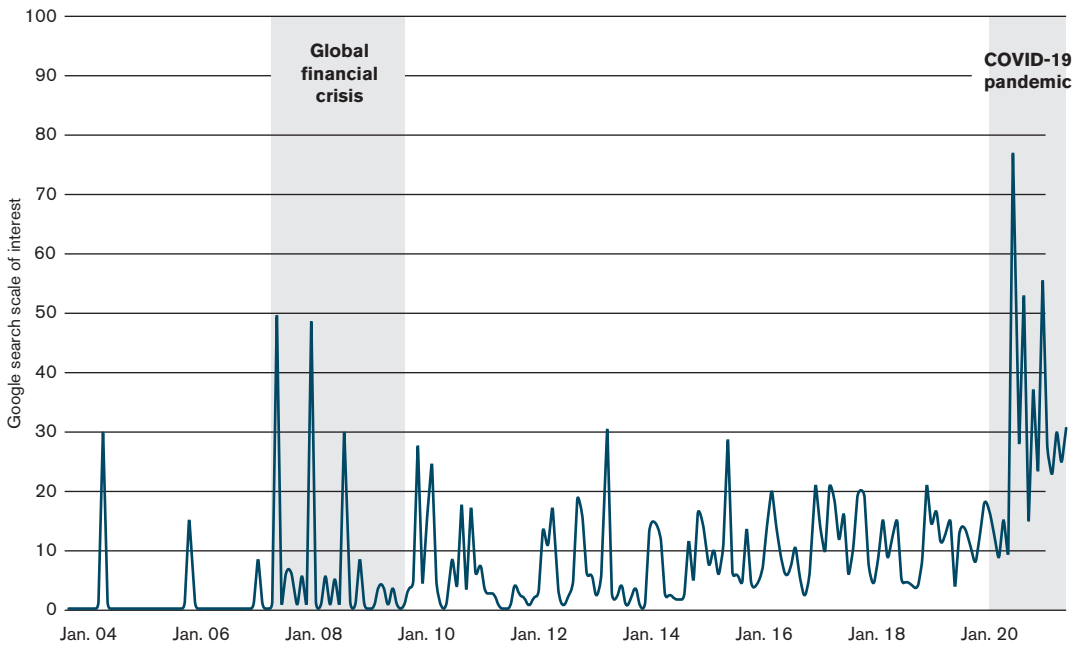
Yet, there is no consensus on the definition and concept of "economic resilience", nor on how to measure it. This is, in part, due to the use of the term in different disciplines, but even in the economics literature, the term "economic resilience" is sometimes undefined, ill-defined or broadly defined. To limit confusion, this subsection provides a definition and conceptual framework of "economic resilience" that will be used throughout the report. It also discusses the broad range of actions and strategies available to build and sustain economic resilience. Building resilience is, however, not costless, and it involves a cost-benefit assessment. Given the complex and multidimensional nature of economic resilience, its measurement remains particularly challenging.

(a) Economic resilience is a complex and multidimensional concept

In this report, "economic resilience" is defined as the ability of a system, including households, firms, and governments, to prevent and prepare for, cope with and recover from shocks.[9] Accordingly, economic resilience can be viewed as a process by which different actions and strategies can be deployed to prevent, reduce and manage as much as possible the risk of shocks, minimize the economic cost of such shocks, and accelerate recovery and adaptation to prevent future risks and shocks. Although economic resilience focuses on the economic cost, sustainable economic resilience cannot be achieved without environmental and social resilience.

Building economic resilience capacity requires an understanding of economic challenges and

Figure B.24: "Economic resilience" has become a popular term in recent times



Source: Authors' calculations, based on Google trends data (search term "economic resilience").

Note: Numbers represent the average relative search interest of "economic resilience" as a search term and topic in Google. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there were not enough data for this term.

opportunities, as well as the ability to anticipate, evaluate and manage risks (Anbumozhi, Kimura and Thangavelu, 2020). While economic resilience is determined by the level of predictive risk reduction and prevention implemented, preparedness for risks that can never be fully eliminated is also critical.

When a shock strikes, economic resilience operates on two interrelated temporal dimensions (Miroudot, 2020; Rose, 2004; 2017). *Static* economic resilience, sometimes called robustness, refers to the ability of the system to use available, possibly scarce, resources to continue functioning when shocked.[10] *Dynamic* economic resilience refers to the ability of the system, once the shock is over or under control, to hasten the speed of recovery by efficiently allocating and using possibly scarce resources to enhance productive capacity and investment for the repair, reconstruction and support of parts of the economy affected by the shock, including by adapting to changes.

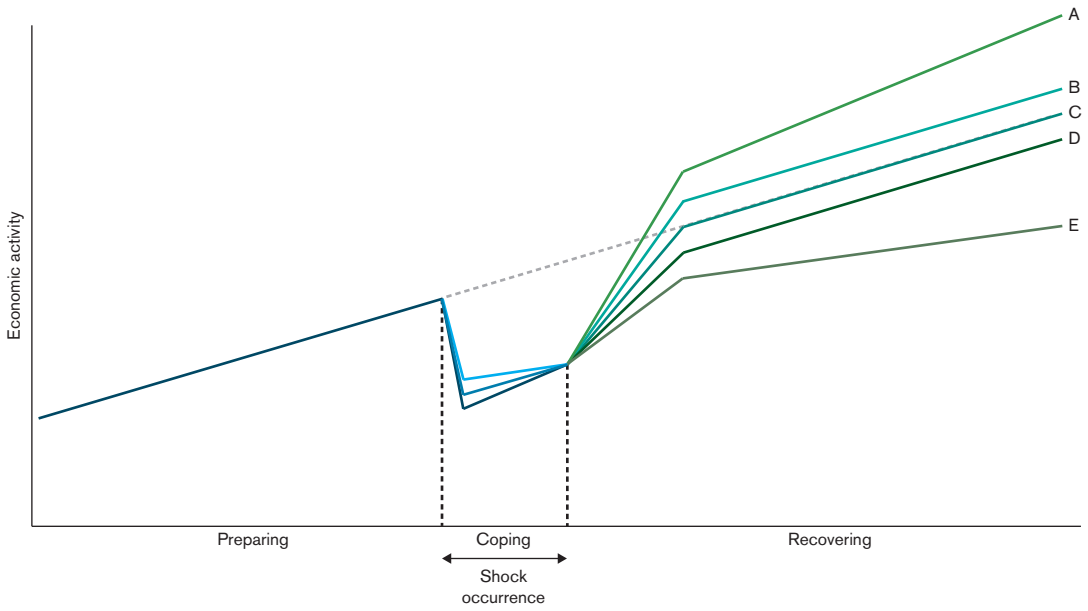
As highlighted in Figure B.25, depending on initial conditions and strategies and actions in place, households, firms and governments, and more generally economies, can experience different coping and recovery trajectories once a shock has hit. Some shocks might cause the trend to deviate in the short term but be absorbed in the long run (line C). Other shocks might permanently shift the economy towards a new lower path (line D or E). Persistence of shock effects, also known as hysteresis or shock memory, can have important and challenging competitiveness, efficiency, and welfare implications. Conversely, economic agents can, thanks to appropriate strategies and actions, withstand shocks and accelerate their recovery, and ultimately deliver a superior performance in the long run (line A or B).

(b) Different strategies can be adopted to build and support economic resilience

Economic resilience is a complex and multidimensional process involving different economic, social and institutional actors and spanning both pre- and post-shock strategies and actions. These strategies and tactics can apply to inputs (including capital, labour, infrastructure services, and materials) and final goods and services.

Given the sharp increase in the frequency of disasters and the economic damage caused by many disasters, risk prevention, reduction and preparedness are increasingly considered as key strategies to reduce response and recovery costs from shocks (UNDRR, 2019). Risk prevention and reduction can be achieved through relevant and well-designed infrastructure, monetary, trade, social, health, energy and environmental policies. The scope of these policies can be broad, depending on the types of hazards, exposure and vulnerability. Explicitly integrating risk management into business decision-making, including

Figure B.25: Economic resilience is a multidimensional process



Source: WTO Secretariat.

the financial appraisal of risks, and enhancing the ability to leverage risk information to adjust business strategy can also contribute to reducing and preventing risks (UNDRR, 2014, 2021a).

Preparedness encompasses strategies and actions designed effectively to anticipate, respond to and enable recovery from the impacts of likely, imminent or current shocks. Business preparedness includes developing disaster responses and contingency planning, identifying priorities, training employees on emergency preparedness, and reviewing insurance coverage.

Business operations can also continue once a shock strikes by using emergency stockpiles of critical inputs, modifying production processes to reduce the use of inputs or to substitute for scarce inputs, replacing damaged equipment, working overtime, or improving the efficiency of business operations (e.g. working from home – see Box B.8).

Some strategies focus on delivery logistics, such as expanding and diversifying wholesale and retail trade networks, negotiating contingency contracts with transport firms, and implementing disaster response planning exercises. As discussed in greater detail in Section C, some actions to build and sustain economic resilience, for example diversification of supply chains, finding new export markets or relocating plants, have a direct international trade dimension. Diversifying supply chains can be achieved by importing needed inputs that are in short supply or are not available from the usual local or regional suppliers. Similarly, economic resilience can be strengthened through export substitution by serving new foreign markets. Relocating some or all economic activities to new or additional locations not affected by or less prone to shocks is another strategy with potential trade implications.

The availability of many of the strategies discussed above to firms can be limited by various barriers, including a lack of access to finance or to

Box B.8: The role of information and communication technologies in economic resilience

The COVID-19 pandemic revealed how a public health crisis can quickly turn into a serious economic crisis, destroying jobs and pushing many firms, in particular MSMEs, out of business (see also Box B.2). Yet, at the same time, the COVID-19-induced economic crisis created opportunities for alternative and innovative solutions based on digital technologies to cope and recover from the pandemic (Aghion, Antonin and Bunel, 2021).

Digital technologies have been instrumental in coping with the pandemic, partly thanks to their flexibility and the reduction in trade costs. Monitoring and tracing the pandemic have been greatly facilitated by digital technologies (Yang et al., 2020). Information and communication technologies (ICT) have also helped to provide COVID-19-related information and financial assistance to marginalized groups and communities in the informal sector, who typically face greater difficulties in accessing public assistance (Nurse and Cabral, 2020).

Lockdown, quarantine and social distancing measures have also led both firms and consumers to start organizing digitally a substantial part of their operations and transactions not requiring physical face-to-face interaction. The increased adoption of teleworking and wider use of e-commerce, including in digital healthcare services, have allowed firms to sustain production and consumption (OECD, 2020d; Strusani and Houngbonon, 2020). As a result, online business-to-consumer and business-to-business activities have been growing, including in low-income countries, since the beginning of the pandemic (Banga and te Velde, 2020; Tuthill, Carzaniga and Roy, 2020). The share of e-commerce activities, for example, rose from 14 per cent to 17 per cent between 2019 and 2020 (UNCTAD, 2021d).

Digital technologies offer a large number of opportunities to recover faster and in a more inclusive way from the pandemic. They can also facilitate risk prevention and preparedness for future shocks. Yet, there remain shortcomings in the current paradigm of digital infrastructures that prevent an inclusive recovery and enhanced preparedness from fully materializing. The digital divide is still significant, with only slightly over 51 per cent of the world population having access to the internet in 2019 (ITU, 2021 statistics).[11] Many MSMEs, particularly those in developing economies, continue to face important obstacles to adopt, access and use ICT tools (Callo-Müller, 2020). Similarly, although women's digital inclusion has increased, it remains limited in many developing economies (WTO and World Bank, 2020). Reducing the digital divide and improving the quality and access of ICT infrastructure, equipment and services are therefore key to building and supporting economic resilience (WTO, 2018).

OPINION PIECE

By Stephane Hallegatte,
Lead Economist, Climate Change Group, the World Bank

Beyond the aggregate: defining and measuring households' resilience

The severity of natural disasters is usually measured based on the "direct damages" they provoke. These "direct damages" include physical damages to assets (e.g. after a hurricane or an earthquake) and losses in agricultural production (particularly in the case of droughts). In most cases, direct damages are estimated as the expenditure needed to repair or replace damaged assets, from repairing roads and roofs to replacing lost appliances and cars. Sometimes the loss due to the interruption in economic activity during the event is also considered.

According to Munich Re, a global provider of reinsurance, primary insurance and insurance-related risk solutions, economic losses due to natural disasters averaged US$ 187 billion per year between 2009 and 2018, a 30 per cent increase over the 30-year average of US$ 41 billion (Munich Re, 2019). However, this increase in direct damages does not fully inform as to the real impact of these disasters. Other dimensions – such as the impact of disasters on health, education or quality of life – are not usually incorporated into disaster loss estimates, even though they are often the main drivers of the full impact of these shocks.

This is not only a measurement issue. One implication of using aggregate economic losses as the unique measure of disaster impacts is that disaster risk management strategies tend to favour the wealthy. Interventions targeting poor people, who have few assets and small incomes to start with, cannot generate large gains in terms of avoided economic losses and are therefore discouraged. Similarly, avoided losses cannot measure the benefit from "soft solutions", such as financial inclusion or social protection, and tend to favour hard solutions such as investments in infrastructure.

This metric is therefore unlikely to prioritize attractive solutions aimed at helping poor people to become more resilient, i.e. better able to cope with and recover from disasters and other shocks (Hallegatte et al., 2017). In addition, risk management does not give sufficient attention to small interventions that could reduce the stunting of children, disease transmission, absenteeism from work and school, lost wages, and other impacts on well-being that reduce resilience.

Interventions that leverage trade to make populations more resilient are also undervalued when benefits are measured solely in terms of avoided asset or economic losses. They do not capture the benefits that accrue from using imports to replace critical goods, such as food or medicine, that cannot be produced domestically. The fact that firms trading with clients and suppliers outside an affected area tend to recover more quickly than firms trading solely within the affected area is often not considered (Todo et al., 2015). The vulnerability that results from being dependent on imports for essential goods and services, and therefore dependent on major ports or airports (Hallegatte et al. 2019), is also not quantified.

A better assessment of risk management solutions would result from metrics which could (1) better capture the impact of disasters on well-being and (2) account for the ability to cope with disaster impacts, including by means of supply chains, trade and financial instruments. The concepts of socioeconomic resilience and well-being losses (i.e., a measure of the impact of disasters that captures the specific vulnerability of poor people) aim to capture these effects. The application of these metrics to the assessment of trade policies would make it possible to balance the benefits that trade brings in terms of resilience against the risks it can also create.

infrastructure, including ICT networks, as well as a lack of information and guidance on risk management. This is particularly challenging for MSMEs that disproportionately face such barriers, while remaining disproportionately vulnerable to risks and shocks (UNDRR, 2021b).

At the industrial level, economic resilience strategies are often designed to pool different resources and develop and implement sharing mechanisms. Pricing and bargaining mechanisms can be used to renegotiate supply contracts. Similarly, short-term agreements can be negotiated between firms to share production and distribution facilities in exchange for the provision of specific inputs or services in the event of a shock. Information- and expertise-sharing between firms can also contribute to economic resilience at the industry level. The industry-level of analysis of economic resilience is sometimes referred to as meso-economic resilience (Rose, 2017).

Although economic resilience is often implicitly focused on firms, many of the same economic resilience strategies can, under some conditions, be adopted by households (indeed, many micro and small enterprises are often family businesses). For instance, households can, in some cases, engage in input conservation activities by changing their consumption habits or adopting new technologies.

The economic resilience strategies available to individual households are determined by their available pre-shock income, as well as their ability to smooth disruptions over time thanks to personal savings, loans, insurance and the social safety net. While, as discussed above, the negative welfare effects of shocks affect poor households more strongly, their strategies to increase resilience are often very costly in relative terms due to their limited resources and alternatives.

At the country level, economic resilience not only depends on the behaviour of individual economic decision-makers, including households, firms, industries and governments, but also on their direct and indirect interactions. The country-level of analysis of economic resilience is sometimes referred to as macro-economic resilience (Rose, 2017). Many of the economic resilience strategies associated with firms, households and industries are also applicable to local and national governments.

As discussed in Section B4, after a shock hits, governments tend to adopt various measures to cushion the initial impact of the shock, and later on to support the recovery. Some of these policies may have conflicting effects on economic resilience. For instance, strict employment protection legislation may reduce the extent to which firms can lay off workers in the short run in response to a negative shock, thereby supporting employment and private consumption. At the same time, such legislation may slow down the wage adjustment process as well as workers' reallocation towards other productive jobs, thereby delaying the labour and output adjustment to new economic conditions (Duval and Vogel, 2008). The relationship between trade policy and resilience is discussed in Section C, while the importance of building public trust in institutions to sustain individual, national and international efforts in economic resilience is discussed in Section D.

(c) Measuring economic resilience can be challenging given its multidimensionality

A cost-benefit assessment of strategies and activities to build resilience can determine how much firms, households, and governments need to invest in developing economic resilience. However, this is a challenging task given the complex and multidimensional aspects of these strategies and activities. Different approaches have been proposed to estimate economic resilience.

The unit of measurement of economic resilience is often expressed in monetary terms,[12] such as GDP, or in (un)employment terms (Martin, 2012). Using an aggregate unit measure, such as GDP, can, however, mask the large heterogeneous impacts of shocks (see the opinion piece by Stephane Hallegatte).

Economic resilience can be measured as the difference between the level of attainment of any economic activity achieved with and without economic resilience actions adopted before and/or aftershocks. This assessment approach is used to estimate the ratio of averted losses as a percentage of the potential losses in computable general equilibrium studies (Rose, 2009; Rose and Liao, 2005). While this approach can be used both before and after the event, it remains complex and data-intensive. An alternative approach to implicitly measure economic resilience is to compare the actual output level impacted by shocks with the counterfactual output level that would have prevailed if the shock had not occurred (see opinion piece by Ralph Ossa).

An alternative approach, adopted in the context of the United Nations Office for Disaster Risk Reduction (UNDRR), is to identify various indicators to measure global trends in the reduction of risk and losses, such as the direct economic loss attributed to disasters

OPINION PIECE

By Ralph Ossa,
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A simple measure of economic resilience

How should we measure economic resilience? This question is of considerable importance, given that strengthening economic resilience is now a policy priority of many governments. We can only strengthen economic resilience if we understand the determinants of economic resilience; and we can only understand the determinants of economic resilience if we know how to measure it.

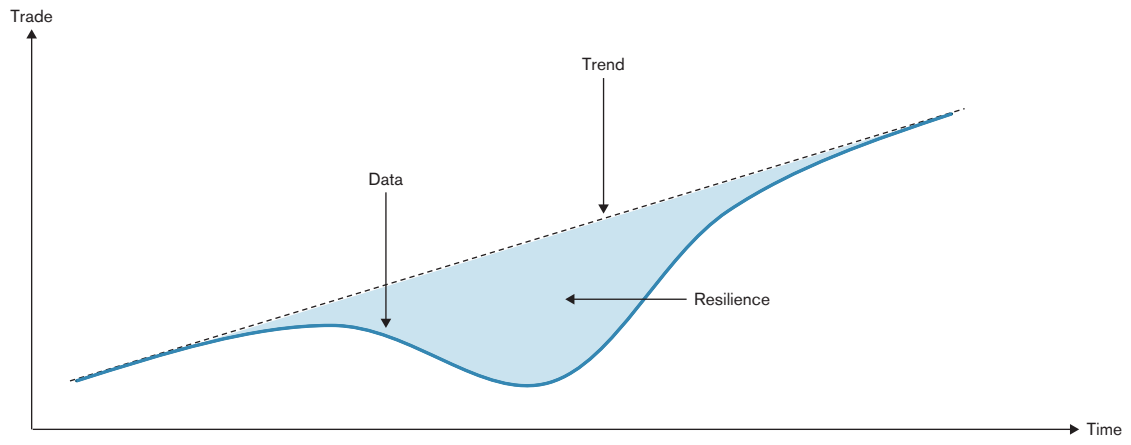
Hereafter I will discuss one simple measure of economic resilience, based on the ongoing research in Le Moigne, Ossa and Ritel (2021). It builds on the idea of capturing resilience as the cumulative deviation from a trend, which is already present in the literature (e.g. Ringwood, Watson and Lewin, 2018). I illustrate this with reference to international trade flows, but it can really be applied to any variable of interest.

Any proper measurement of resilience has to start with a clear definition of resilience, and I will adopt a relatively narrow one: the ability to cope with and recover from shocks (but not the ability to prepare for them).

My starting point is the idea of measuring resilience as the cumulative deviation from a trend, as illustrated by the green area in Figure B.26. The smaller the green area, the higher is the resilience, because it implies a smaller cumulative deviation.
The main advantage of this idea is that it intuitively combines information on the depth and duration of the disruption, essentially trying to calculate the cumulative loss in international trade due to the shock.

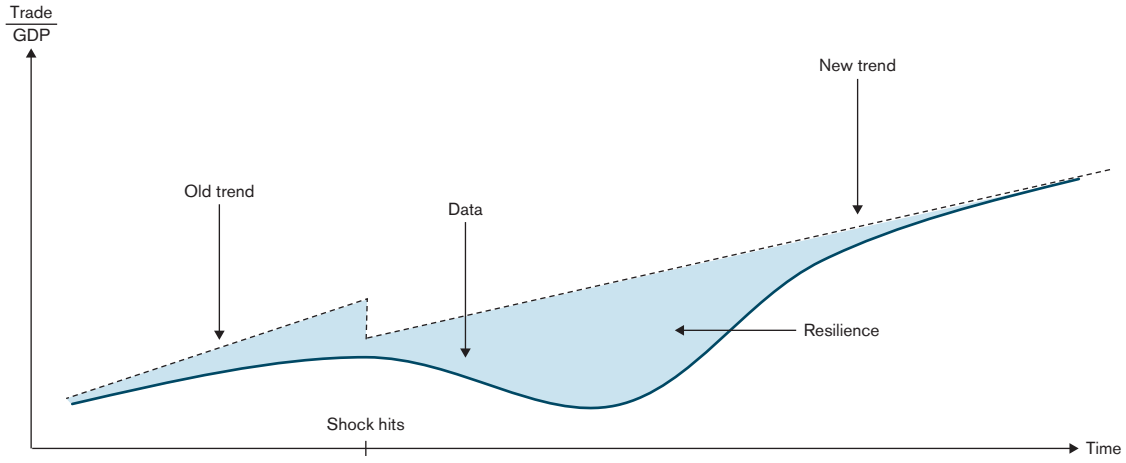
In Le Moigne, Ossa and Ritel (2021), we highlight three problems with this idea. First, it conflates the magnitude of the shock with the resilience to the shock. Second, it does not take into account that shocks often have permanent components; for example, the COVID-19 pandemic is likely to bring about permanent changes in the way we work.

Figure B.26: The original resilience measure only considers the pre-shock trend



Source: Le Moigne, Ossa and Ritel (2021).

Figure B.27: The resilience measure can be adjusted to account for the post-shock trend



Source: Le Moigne, Ossa and Ritel (2021).

And third, it relies on strong assumptions that trade would have behaved as predicted by the trend had it not been for the shock, and that the deviation from the trend is solely due to the shock.

The first two problems can be addressed straightforwardly, as illustrated in Figure B.27. To isolate resilience, one simple option is to express the series relative to the shock. For example, when investigating the resilience of international trade to a major recession, it would make sense to look at the trade-to-GDP ratio instead of just at trade. To accommodate persistence, one simple option is to allow for the convergence to a new trend.

The third problem, however, cannot be addressed without a model, which allows us to estimate the shocks driving the disruption and simulate more reliable versions of the "trend" and "data" lines in Figure B.27. In Le Moigne, Ossa and Ritel (2021), we therefore use a fully specified dynamic general equilibrium model, which allows us to link the behaviour of international trade to a number of underlying shocks, including shocks to the supply of traded goods, the demand for traded goods, and trade costs. The natural alternative is to apply a reduced form statistical model from the toolbox of time-series econometrics.

in relation to global gross domestic product, and the damage to critical infrastructure attributed to disasters.

Another approach involves identifying and monitoring the factors that have been found or expected to contribute to or hinder economic resilience (Briguglio et al., 2009; Cutter et al., 2008). These factors cover a broad spectrum of issues, from socio-economic and financial determinants to infrastructure and institutional capacity, many of which determine the initial conditions before the shock occurs.

Some of the socio-economic and financial factors include high economic diversification, income per capita, labour force size and insurance coverage, and low poverty rates, fiscal deficits, inflation, external debt, and export and import concentration. High quality infrastructures, such as transportation network, broadband services and housing, are associated with higher economic resilience.

Efficient institutional capacity can also play a key role in economic resilience through good governance, including impartial and independent courts. As discussed in Section C, trade policy plays an important role in the resilience of transport and logistics services and of digitally-enabling and digitally enabled services (WTO, 2020a). A high level of social capital and strong community capacity, including a high quality of life and low share of vulnerable people, can strengthen the economic resilience of households. Similarly, natural resources

endowment, including the environment, can be an important determinant of economic resilience.

Given the high number of variables needed to capture the different dimensions of economic resilience, composite indexes are sometimes used to facilitate the analysis, such as the Swiss Re Institute Macroeconomic Resilience Index, Prasad and Foda's Tracking Indexes for the Global Economic Recovery, and Briguglio et al.'s *Economic Resilience Index*.[13]

7. Conclusion

This section has highlighted how past shocks, such as natural disasters, pandemics, industrial accidents, financial crises, cyber- and terrorist attacks, as well as increasing risks of future disruptions, have led firms and policymakers to consider economic resilience as a strategy to reduce business interruption and economic loss. The review of the large disruptions produced by shocks underlines the need for effective strategies to prepare for, cope with and recover from disasters.

There are four key takeaways from this section. First, the analysis of the frequency of shocks and the magnitude of their damages shows that shocks have not only become more frequent over past decades, but also more substantial with respect to economic implications, including international trade disruptions. This increasingly justifies a focus on economic resilience.

Second, the heterogeneous effects of shocks across countries, regions, industries, households and gender groups shows the relevance of prevailing initial conditions and the channel through which a shock affects the economy (demand, supply or increased uncertainty and trade costs) as factors affecting resilience.

Third, economic responses to shocks have a lot to do with resilience. For instance, countercyclical fiscal and monetary policies, payments of unemployment benefits and subsidies to firms and farmers in response to demand-and-supply shocks, and the implementation of warning systems and regulations to mitigate uncertainty can be effective tools to enhance economic resilience and to stabilise an economy in the aftermath of shocks. Economic resilience strategies to prevent and mitigate adverse effects of shocks can be adopted by individual economic agents, for example by households through savings as a means to smooth income fluctuations, by firms through the enhancement of digitalization and diversification, or by governments through well-designed infrastructure, fiscal, monetary, social and trade policies.

Finally, trade policy also matters. Trade policy responses to disasters are neither fully trade-restrictive nor fully liberalizing, and mixed policy stances are the norm. Although restrictive measures gained more attention during the onset of the COVID-19 crisis, most of the related measures were trade-facilitating – in contrast to the 2008 global financial crisis, when trade restrictions became more prevalent. The fact that trade recovered swiftly after an initial drop during the first half of 2020 stresses the potential of liberalizing trade policies to harness the resilience potential of trade.

While this section has focused on whether economies and trade have been resilient to shocks or have been seriously disrupted, and on the policies that can make an economy or trade more resilient, Section C will discuss the role of trade in economic resilience.

Endnotes

1 The origin of the word "risk" has been traced to the classical Greek nautical term rhizikon, rhiza — referring to the difficulty to avoid sea rock (Abdel-Basset et al., 2019). In its current meaning, the word risk has lost its nautical application, but it has conserved all the original connotation of danger present in its etymology.

2 The global number of road accidents is recorded to be increasing, but in relative terms (i.e. relative to the population), transportation has become safer and mortality rates from road accidents have been falling.

3 The Global Terrorism Database, an open-source database, is managed by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) and includes information on more than 200,000 terrorist attacks dating back to 1970. Available at https://www.start.umd.edu/gtd.

4 According to 2021 data from the Heidelberg Institute for International Conflict Research (https://hiik.de/hiik/organization/?lang=en).

5 Figures from Statista (https://www.statista.com).

6 This study covers natural disasters such as earthquakes, volcanic eruptions, storms, droughts, excessive precipitation and temperature anomalies (Felbermayr, Gröschl and Heid, 2020).

7 Although a government may introduce export restrictions with the intention of avoiding critical shortages of essential goods and keeping domestic prices low, export restrictions can backfire rather than help in situations of shortage. Export restrictions can lower domestic production of essential goods and lead to retaliation. Lack of predictability in the administration of export restrictions makes it difficult for firms to plan the sourcing of critical inputs and to execute those plans, resulting in suboptimal supply chain decisions. From a political perspective, there is also the risk that, in the aftermath of the pandemic, economies may move away from open and transparent trade policies toward policies driven by strategic political considerations. This would further increase operation costs for supply chains, thus making production sub-optimal.

8 WTO estimates based on the Global Trade Alert Database (https://www.globaltradealert.org).

9 This broad definition is in line with current national and international policymaker discussions. However, it departs from the other major approach to economic resilience found in the economics literature, which focuses only on the post-shock dynamics, in particular the ability to cope with and recover from shocks (Hallegatte et al., 2017; Rose, 2017).

10 The literature on social-ecological resilience defines robustness as the probability that a system maintains its identity and does not cross an undesirable (possibly irreversible) threshold following one or more adverse events (Brand and Jax, 2007).

11 https://www.itu.int/itu-d/sites/statistics.

12 Property damage is an imperfect unit of measure because the capital stock does not contribute directly to economic well-being. It is the flows of goods and services stemming from capital stock that make actual contributions to economic well-being.

13 Other resilience indexes have been developed, including the Pandemic Resilience Index, FM Global Resilience Index, and the Global Labour Resilience Index.

C The role of trade in economic resilience

Building economic resilience requires an understanding of economic challenges and opportunities, as well as the ability to anticipate, evaluate and manage risks. Although trade can spread and magnify shocks, it can help countries prepare for, cope with and recover from shocks. Initial conditions, the nature of the shock and policy choices, including the level of diversification, are important in determining what role trade will play.

Contents

Some key facts and findings

- Trade and related mobility can increase the impact of shocks by spreading disease, magnifying economic disruptions through value chains, and increasing emissions that contribute to climate change.
- However, trade can also strengthen resilience by boosting productivity and growth and by increasing access to goods and services to prepare for, cope with and recover from the impact of shocks.
- Trade can speed up economic recovery, for example when sustained foreign demand helps to compensate for reduced domestic demand.
- Trade policies are crucial to support the beneficial role of trade, for example by easing trade controls to support the flow of emergency goods, and by limiting the use of export restrictions to promote the availability of essential goods globally.
- A diversified trade and production structure makes it more likely that trade can play a positive role in coping with shocks.

1. Introduction

This chapter explores the relationship between trade and resilience in three different ways.

Section C2 focuses on the role of trade as a potential spreader of shocks, both directly (e.g., in the case of pandemics) and indirectly (e.g., in the case of climate change), as well as the relationship between trade and technological shocks (e.g., cyber-attacks) and socioeconomic shocks (e.g., violent conflict and political instability). The potential for changes in trade costs to be a source of shocks is also considered, as well as how global value chains (GVCs) may spread shocks.

Section C3, conversely, discusses the beneficial role of trade in dealing with shocks. Trade can raise economic growth and productivity, thus helping countries build resilience and facilitate access to essential goods and services. Trade facilitates the resolution of shortages during supply-side disruptions and the channelling of sales abroad during recessions. Trade can also speed up recovery if trade recovery is faster than general economic recovery, as for example with the COVID-19 pandemic. Also, during recovery, reforms can help countries to build a more resilient trading system.

Section C4 shows that both in terms of mitigating shocks, particularly in GVCs, and coping with shocks, trade can play a more beneficial role if trade patterns are more diversified. Diversification reduces the likelihood that price volatility will translate into large fluctuations in export revenues, thus reducing aggregate volatility. Section C4 also considers how trade diversification has changed over time and the policies that could be followed to foster diversification. Section C5 concludes.

2. Trade can be a spreader of shocks

This section analyses the potential role of trade as a spreader of shocks, with reference to the three categories in the taxonomy of shocks in Section B2, i.e., natural shocks, technological and industrial shocks, and socioeconomic shocks.

Section C2(a) considers the direct and indirect links between trade and natural shocks, including the effects of trade on the spread of disease and the indirect effects of trade on climate change. Section C2(b) examines the role of trade in technological shocks (e.g. cyber-attacks). Section C2(c) explores the role of trade in socioeconomic shocks. Section C1(d) analyses the impact of different types of shocks on trade costs, which potentially make trade itself a spreader of shocks and affect trade resilience. Finally, Section C1(e) discusses the extent to which trade propagates shocks through GVCs, and the factors that determine that propagation.

(a) The role of trade in natural shocks

(i) Trade-related human and animal mobility may affect the spread of epidemics

Trade-related mobility can contribute to the spread of an epidemic; the reasons why humans move are irrelevant to the fact that this movement can spread disease. For instance, international migration (i.e., the movement of people who change residence from their country of origin to a destination country) can contribute to spreading infectious diseases across borders, as shown by Lee et al. (2021) for COVID-19. The same applies to the movement of workers in the logistics sector, such as truckers, as shown by Oster (2012).

There are several examples in human history of trade-related human mobility enabling the spread of communicable diseases. For example, bubonic plague arrived in Europe in October 1347 after 12 commercial ships from the Black Sea docked at the port of Messina, Italy (Antràs, Redding and Rossi-Hansberg, 2020), resulting in the 1347-51 "Black Death" pandemic; the last major outbreak of plague in Europe occurred in 1720, when crew members of a cargo ship from Lebanon carrying textiles spread plague to the city of Marseille in France (Voth, 2020). It is believed that the first human-to-human infections of COVID-19 in Europe may have taken place in January 2020 in Starnberg, Germany, when a local car parts supplier organized a training session with a Chinese colleague from its operation in Wuhan, China (Antràs, Redding and Rossi-Hansberg, 2020). In the COVID-19 pandemic, more internationally connected countries registered their first cases of COVID-19 infections significantly earlier than less connected countries (Keita, 2020).

Nevertheless, the relationship between trade-related human mobility and the spread of communicable diseases is ambiguous. Less exposure to international mobility may be associated with greater harm during pandemics, through various mechanisms (Clemens and Ginn, 2020). First, more isolated countries with less frequent exposure to a variety of pathogens may develop less cross-immunity to reduce the harm from new communicable diseases. Second, a country's isolation may complicate globally coordinated

surveillance. Third, exposure to international mobility is likely to allow countries to develop higher incomes, stronger health systems and a greater capacity for innovation (see, for instance, Dollar, 2001; Owen and Wu, 2007). These, in turn, can reduce pandemic-related harm.[1]

In the aftermath of the COVID-19 pandemic, virtually all countries implemented emergency restrictions on international, as well as internal, mobility.[2] While most studies on epidemics of the influenza and Ebola viruses and the human immunodeficiency virus (HIV) conclude that such emergency restrictions have a minimal impact on arrival time of these epidemics, and negligible impact on the overall harm caused by them,[3] the currently available evidence relative to the COVID-19 pandemic (Eckardt, Kappner and Wolf, 2020; Linka et al., 2020; Wells et al., 2020) suggests that emergency border measures contributed to limiting the spread of the virus.[4] According to Chinazzi et al. (2020), however, travel restrictions alone do not mitigate the effects of the pandemic and are effective only in combination with behind-the-border measures, such as reductions in face-to-face interactions, self-isolation and quarantine requirements.[5]

Restrictions on international travel implemented in the wake of the outbreak of the COVID-19 pandemic have contributed to disrupting freight transport, business travel and the supply of services that rely on the presence of individuals abroad, such as tourism. Since transport and travel costs account for 15 to 31 per cent of trade costs (depending on the sector), travel restrictions are likely to account for a substantial increase in trade costs (WTO, 2020a). Benz, Gonzales and Mourougane (2020) estimate that closing borders to passengers could increase services trade costs by an average of 12 per cent across sectors and countries in a scenario in which all countries close their borders to passengers but leave freight trade open, while OECD (2021b) estimates that lifting restrictions to international travel unilaterally in G7 countries would increase services export levels by around 5 per cent, and import levels by around 3 per cent, on average in 2021, and that lifting restrictions to international travel through international coordination would increase the effect by a factor close to two.

The trade-related mobility of live animals is another potential channel of exposure and vulnerability to biosecurity risks, such as the spread of communicable diseases from animals.[6] According to FAO data,[7] in 2017 nearly 2 billion live pigs, chickens, cattle, sheep and goats were trucked and shipped around the world, compared to 1 billion in 2007. In the early 2000s, global movements of animals for the pet trade were estimated at some 350 million live animals (Karesh et al., 2005).[8]

Given the risks connected to animal mobility, livestock trade is highly regulated. As further discussed in Section D, WTO members are bound by the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), which concerns food safety and animal and plant health regulations. Countries are encouraged to base their sanitary and phytosanitary measures on existing international standards. The international standards relating to animal health and zoonoses are developed by the World Organisation for Animal Health (OIE) and are contained in the Aquatic Animal Health Code and the Terrestrial Animal Health Code,[9] which detail the health measures that should be used by veterinary authorities to ensure the sanitary safety of traded animals and their products (Chomel, Belotto and Meslin 2007; Fèvre et al., 2006).

In the presence of a good veterinary infrastructure, it is reasonable to expect that licit (i.e. legal, formal, and therefore regulated) livestock trade should largely not be associated with disease spread.[10] Conversely, illicit (i.e. illegal/informal, and therefore unregulated) livestock trade, which normally circumvents screening and quarantine protocols, has been shown to be related to diseases (Fèvre et al., 2006), and to affect humans (Beverelli and Ticku, 2020).[11]

Much of the discussion about the impact of animal trade on diseases focuses on wildlife trade. Although significantly smaller in size (at least for its recorded part) than livestock trade, cross-border wildlife trade can lead to disease transmission that can not only cause human disease outbreaks, but can also threaten livestock, rural livelihoods, native wildlife populations and ecosystem health (Chomel, Belotto and Meslin 2007). Exotic species, even after being legally imported, can potentially establish themselves in the wild and become pests, including by introducing viruses and bacteria into native populations which are not adequately resistant (Schloenhardt, 2020).[12]

As with livestock trade, trade in wildlife is highly regulated. As further discussed in Section D, trade in wildlife is regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). At present, CITES bans international trade in approximately 900 species of plants and animals listed in its Appendix I (including tigers, marine turtles, rhinoceroses and pangolins), and controls trade in a further 33,000 species listed in Appendix II (e.g. many parrot and reptile species). Despite the severe resource constraints to which CITES is subject, making trade requirements more

stringent (via the inclusion of a species in Appendix I of CITES by the exporting country) leads to a decrease in the number of animals traded, as well as a decrease in the risk of a spread of zoonotic disease (Borsky et al., 2020).

Given the difficulty of control and enforcement,[13] even in the absence of trade restrictions or outright bans, a lot of wildlife is smuggled or imported informally (Beltran-Alcrudo et al., 2019) and thus not inspected or tested. This is a lucrative business, due to the value of trafficked wildlife for medicinal use and healthcare, food consumption, collections, clothing and accessories, cosmetics and fragrance, and as exotic pets (Schloenhardt, 2020; Van Uhm, 2016). Illicit trade in wildlife has been shown to be responsible for spreading pathogens such as avian influenza, Newcastle disease and retroviral infections (Gomez and Aguirre, 2008), due to the circumvention of screening and quarantine protocols. Furthermore, there is abundant evidence that the prevalence of zoonotic diseases among emerging infectious diseases is linked to increasing volumes of animal trafficking and smuggling (Aguirre et al., 2020; Fisman and Laupland, 2010).

(ii) Trade may be related to deforestation, urbanization and intensive farming, and to their associated risks

Deforestation – which is largely caused by human activities such as agricultural expansion, cattle breeding, timber extraction, mining, oil extraction, dam construction, and infrastructure development – is responsible for several sources of risks:

- soil erosion, which can lead to clogged waterways and other problems;
- water cycle disruption, which can lead to desertification and habitat loss;
- greenhouse gas emissions and reduced capacity to remove carbon dioxide from the atmosphere, both of which contribute to global climate change;
- biodiversity losses, which can lead to extinctions and loss of natural beauty;
- disease outbreaks and spread.

Diseases are more likely to spill over from animals to humans in "hotspots" such as rainforest edges (Hook, 2020), and deforestation, by changing the length of the edge between forest and non-forest, affects the likelihood of disease emergence (Dobson et al., 2020). For instance, zoonotic Ebola virus disease outbreaks located along the limits of the rainforest in Central and West Africa between 2001 and 2014 have been found to be significantly associated with forest losses which had occurred within the two years preceding the outbreak (Olivero et al., 2017).

Does trade lead to deforestation, and therefore indirectly contribute to the sources of risk listed above, including disease outbreak and spread? From a theoretical perspective, trade-opening can either increase or decrease deforestation.[14] Some recent empirical studies (Abman and Lundberg, 2019; Faria and Almeida, 2016) find that trade-opening is associated with increased deforestation. The empirical association between trade and deforestation, however, is likely to be moderated by a country's institutional framework (Ferreira, 2004). According to Bellora et al. (2020), trade-opening-induced changes in relative prices can lead to further investment and exports without leading to overexploitation of an open access resource, provided that there exist efficient collective resource management policies, such as land registers in the case of forestry.

Furthermore, restricting trade in the presence of weak institutions can have counterproductive effects, due to the creation of a parallel illegal market. For example, Chimeli and Soares (2017), having studied the effects of trade restrictions on, and eventual prohibition of, mahogany in the Brazilian Amazon, found that such policies created an illegal market, and documented relative increases in violence in areas with natural occurrence of mahogany.

Population density is another potential risk factor for the spread of transmissible diseases. In theory, densely populated areas lead to more face-to-face interaction among residents, which makes them potential hotspots for human-to-human disease transmission (Tarwater and Martin, 2001), as well as increasing the risks of animal-to-human disease transmission. In a study of 6,801 ecological assemblages and 376 host species worldwide, Gibb et al. (2020) find that populations of species known to host diseases transmissible to humans, including 143 mammals such as bats, rodents and various primates, increase in sites under substantial human use (including urban ecosystems) compared with nearby undisturbed habitats.

On the other hand, there can be a higher incidence of implementation of social distancing policies and practices in densely populated areas. It is therefore an empirical question whether higher population density leads to more disease transmission. Some preliminary evidence regarding the spread of COVID-

19 shows that population density has precipitated infections in various countries, including Algeria (Kadi and Khelfaoui, 2020), Bangladesh (Alam, 2021), Brazil (Pequeno et al., 2020), India (Bhadra, Mukherjee and Sarkar, 2020), and the United States (Hamidi, Sabouri and Ewing, 2020; Sy, White and Nichols, 2021). However, population density – at least in the United States – might negatively correlate with COVID-19-related mortality rates due to better health systems (Hamidi, Sabouri and Ewing, 2020).

Urbanization, as discussed in WTO (2013), is one of the most important global demographic trends. According to the United Nations Population Division's World Urbanization Prospects 2018, the percentage of the world population residing in urban areas increased from 29.6 per cent in 1950 to 55.3 per cent in 2018, and is projected to further increase to 68.4 per cent in 2050. The same data source shows that the percentage of the world's urban population residing in cities with at least 500,000 inhabitants rose from 33 per cent in 1950 to 51 per cent in 2015, while the percentage of the world's urban population residing in cities with at least one million inhabitants rose from 24 per cent in 1950 to 43 per cent in 2015.

Urbanization is affected by several economic and non-economic factors, including international trade. A central question is whether trade-opening fosters the concentration or dispersion of economic activity within a country. In theory, the effect is ambiguous, as it depends on the relative importance of agglomeration and dispersion forces.[15] Recent direct empirical evidence points to a positive impact of trade on urbanization (Chhabra, Giri and Kumar, 2021; Nagy, forthcoming; Thia, 2016). In the light of the links between urbanization and disease transmission discussed above, it can be concluded that trade might indirectly affect disease transmission through trade-induced increases in urbanization worldwide.

Intensive farming (i.e., large-scale industrial operations in farming of animals for human consumption) has been associated with the emergence of infectious diseases by various commentators (see for instance Wiebers and Feigin, 2020). Outbreaks of avian influenza viruses, including H5N1, which were almost non-existent 25 years ago, in countries with large-scale industrial poultry operations have been cited as an example of the consequences of intensive farming (Gregor, 2006). The large-scale confinement of animals implied by intensive farming can, in principle, decrease or increase the spread of diseases (Espinosa, Tago and Treich, 2020).

The main reason for the structural change from small-scale to large-scale farming methods is technological economies of scale, both in the industry itself, and in the complementary processing industry (MacDonald and McBride, 2009).[16] Trade-opening, which allows firms to exploit economies of scale (Krugman, 1979), might therefore create incentives to further increase intensive farming in countries that specialize in the production and exports of live animals and animal products.

While trade contributes to increases in the scale of production, and therefore to intensive farming at the expense of small-scale farming, its impact on intensive farming-induced health hazards is likely to depend on where specialization occurs. Intensive farming is capital-intensive. All other things being equal, relatively capital-abundant countries should therefore have a comparative advantage when it comes to intensive farming.[17] At the same time, the costs of intensive farming are likely to depend on the stringency of standards and regulations, such as those concerning the use of subtherapeutic doses of antibiotics. All other things being equal, countries with less stringent standards and regulations should produce farmed animals at lower costs. Borrowing from the theoretical framework in McLaren (2012, Chapter 13), one of the following two opposite outcomes can emerge.

On the one hand, intensive farming may be cheaper in countries with less stringent standards and regulations, even if capital is relatively scarce in such countries. Thus, a reduction in trade costs can lead to expansion of intensive farming in countries with less stringent standards and regulations, and contraction in countries with more stringent standards and regulations, exacerbating the health issues connected to intensive farming.

On the other hand, intensive farming may be cheaper in relatively capital-abundant countries, even if standards and regulations are more stringent in such countries. In this case, a reduction in trade costs can lead to expansion of intensive farming in countries with more stringent standards and regulations, and contraction in countries with less stringent standards and regulations, alleviating the health issues connected to intensive farming.

(iii) Trade can affect the occurrence of natural disasters by affecting climate change

Climate change increases the frequency and intensity of natural shocks such as extreme weather events, floods, storms, rising sea levels and the spread of infectious diseases in the medium to long term (Hoegh-Guldberg et al., 2018). Trade can also affect climate change, and thus a broad range of natural

shocks caused by climate change, by changing the amount of carbon dioxide (CO_2) and of other greenhouse gas (GHG) emissions in the atmosphere.

The expansion of economic activity induced by trade-opening, including the expansion of transportation activities, often results in an increase in GHG emissions. It is estimated that international maritime and international aviation transportation are responsible for 3.5 per cent of total emissions annually (Cristea et al., 2013). However, this does not mean that international trade will necessarily lead to higher GHG emissions. Trade can sometimes reduce emissions if the differences of output emissions between the imported product and the domestic product are large enough to offset transportation emissions. Cristea et al. (2013) estimate that about 34 per cent of international trade measured in value terms results in a net reduction of total emissions. Considering the total amount of trade-related GHG emissions compared with a counterfactual scenario without trade, Shapiro (2016) estimates that international trade increases global emissions by 5 per cent, or 1.7 gigatons of CO_2 annually, and that this effect is almost equally driven by production and transportation.

Trade openness can also alter countries' production mix, impacting GHG emissions either negatively or positively, depending on whether a country has a comparative advantage in emission-intensive sectors. Overall, research finds that trade benefits the environment in Organisation for Economic Co-operation and Development (OECD) countries, but has detrimental effects on CO_2 emissions in non-OECD countries (Managi, Hibiki and Tsurumi, 2009). In addition, international differences in climate change policies can increase the likelihood of "carbon leakage", a situation in which the measures taken by some countries to limit their GHG emissions lead to the relocation of carbon-intensive industries to countries with lower carbon emission standards, resulting in an overall increase in global GHG emissions.

On the other hand, trade can enable the incorporation of green technologies into production processes. Research shows that a large part of the cost decline in solar photovoltaic (PV) technologies in the past decade has been attributed to GVCs, which allowed developing countries to acquire solar PV production technology and know-how (Carvalho, Dechezleprêtre and Glachant, 2017). Conversely, restrictions on international trade and foreign direct investment reduce the diffusion of climate-friendly technologies (Dechezleprêtre, Glachant and Ménière, 2013). In addition, trade can promote GHG emission reductions by allocating resources towards more productive, greener firms (Cherniwchan, Copeland and Taylor, 2017; Kreickemeier and Richter, 2014). A diverse array of recent studies shows that large-scale production allows exporting firms to reduce the per unit cost of pollution abatement in both developed and developing countries (Forslid, Okubo and Ulltveit-Moe, 2018; Martin, 2011a).

Considering the different effects, the overall impact of trade on GHG emissions is likely to be minimal, and the key to tackling climate change is to enable trade in environmentally friendly goods and services, while limiting the negative impact of trade and trade barriers. In this regard, Shapiro (2021) shows that in most countries the import tariffs and non-tariff barriers are substantially lower for "dirty" industries that emit larger amounts of CO_2 per output than cleaner industries do. This difference in trade policy creates an implicit subsidy to carbon emissions and contributes to climate change. Governments and international organizations are working to mitigate the carbon emissions in transport to ensure a transition to sustainable mobility (ITF, 2021). It is estimated that further trade-opening in environmental goods and services would contribute to the reduction of GHG emissions (De Melo and Solleder, 2020; European Commission, 2016).

The mitigation of climate change will require government policies, such as carbon-pricing schemes, to shift the social costs of climate change to the private agents responsible for GHG emissions (High-Level Commission on Carbon Prices, 2017). Carbon-pricing schemes can take different forms, such as cap-and-trade emissions trading systems (ETS), which allow industries to trade their carbon emission allowances, or carbon taxes consisting of a notional tax rate on GHG emissions (World Bank, 2020b). Other complementary policies, such as land and forest management, emission regulations and standards, investment in research and development (R&D) for green technology and financial devices to incentivize the adoption of low-carbon technologies, are needed to help countries mitigate climate change at a more rapid pace (Acemoglu, Aghion, et al., 2012; Cohn et al., 2014; Dechezleprêtre, Martin and Bassi, 2019). Given the global nature of GHG emissions, international cooperation is sorely needed to mitigate climate change in the long term and to create a harmonized global carbon price to avoid carbon leakage (see Section D).

(b) Technological shocks: The role of trade in cyber-attacks

While trade offers access to new and better-quality technologies at more competitive prices, trade can

play a role in spreading technological shocks such as oil spills, transport accidents (e.g. the Suez Canal obstruction of 2021) and cyber-attacks. Among these, cyber-attacks merit special attention, as they have been on the rise both in frequency and in scale, as mentioned in Section B2. Trade in the information and communications technology (ICT) sector, in particular, can expose the economy to cyber risks if, for example, imported telecommunication devices and software contain malicious parts, hidden viruses or spyware.

Cyber-attacks possibly arising from trade and with the objectives of information theft and espionage can weaken a country's military capability and undermine political and economic stability in a country, thereby harming "national security" (Huang, Madnick and Johnson, 2018; Meltzer, 2020). To anticipate this potential threat, many countries have adopted preventive measures with regard to ICT imports, that, for instance, require that providers request prior approval and undergo thorough inspection, or that debar network providers which could potentially have ties with a foreign government (CCDCOE, 2019). However, some view these precautionary measures as disguised trade-restrictive measures (Huang, Madnick and Johnson, 2018; Moran, 2013).

Trade also plays a role in propagating the adverse effects of cyber-attacks through global supply chains in the same way as other types of shocks, which is discussed further in Section C2(e). For instance, the cyber-attack "NotPetya", which directly targeted firms in Ukraine in June 2017, also indirectly affected their international trade partners, causing a decrease in profitability, revenue and trade credit for the Ukrainian firms (Crosignani, Macchiavelli and Silva, 2020). Although the cyber-attack only hit firms located in Ukraine, the indirect adverse effect of the shock extended further down along the global supply chain through international trade and spread internationally.

The risk of cyber-attacks induced by trade can, however, be partly mitigated through different policy measures such as intellectual property (IP) protection, instead of focusing solely on fortifying defence mechanisms against perpetrators and increasing cybersecurity. IP protection is relevant because firms in possession of trade secrets are more likely to be targets of cyber-attacks involving a data breach (Ettredge, Guo and Li, 2018). According to Andrijcic and Horowitz (2006), IP thefts that occur during cyber-attacks in the United States indirectly cause significant long-term harm to the economy equivalent to multiples of the direct and short-term damage of the attack itself.

(c) Socioeconomic shocks: The role of trade in conflicts, peace and political instability

Trade can act also as a potential amplifier of socioeconomic shocks. Terms-of-trade variations can have a substantial impact on the business cycle and the variability of output, especially in developing economies, as well as on real exchange rate fluctuations (Mendoza, 1995). Trade can also influence social shocks such as conflicts and political instability by adjusting the opportunity costs of social decisions. In this subsection, special attention will be drawn to the role of trade in conflicts and political instability, as public interest in the subject has risen during the past five years (Google trends, 2021).

While conventional economic theory points to the positive role of trade in promoting international peace, it can also increase the likelihood of conflicts depending on various factors. First, in contrast to bilateral openness to trade which can decrease the probability of conflicts by raising the opportunity cost of engaging in a conflict, multilateral openness, i.e., openness with all trading partners, can lead to an increase in conflicts (Martin, Mayer and Thoenig, 2008b). Moreover, although trade helps to deter domestic conflicts due to the possibility of losing gains from trade, the availability of international trade can offer a promising alternative when domestic production is disrupted by the breakout of a civil war, thus raising the risks of a domestic conflict. Because of these two opposing mechanisms at play, trade openness decreases the likelihood of devastating civil wars, but increases the possibility of smaller-scale conflicts (Martin, Mayer and Thoenig, 2008a).

Trade can also affect political instability. Through the additional wealth it generates, trade can, in the long run, stabilize the political and economic environment of a country. However, unequal redistribution of trade gains may exacerbate social and economic inequality, precipitate unbalanced growth, debilitate governance and institutions, and damage social integrity, all of which increase political instability and thus political risk (Krause and Suzuki, 2005). For instance, the United States has recently witnessed an increase of nationalistic populism and social volatility, which can be partly attributed to economic globalization, including trade and the economic inequality associated with it, among other factors (Rodrik, 2021). Furthermore, more extensive cronyism and the further deterioration of institutions can emerge as an indirect consequence of trade, because trade induces more infrastructure investment and heavy taxation on firms to finance it (Hochman, Tabakis and Zilberman, 2013).

One policy strategy that can contribute to reducing the risk of conflicts and instability is trade diversification, especially with regard to sources of income. Economies whose earnings are dependent on natural resources or on a small number of export commodities can be particularly more susceptible to terms-of-trade shocks and fluctuations (Humphreys, 2005). This susceptibility creates instability and dissatisfaction within the country, potentially leading to political and social unrest, which can eventually further develop into conflict. By diversifying the sources of income and reducing dependency on a single commodity or natural resource, economies can grow to be less susceptible to socioeconomic shocks like conflicts.

(d) Trade costs volatility can impact trade resilience

Changes in the conditions under which goods and services are traded, or trade costs, broadly speaking, can impact trade, as discussed in Section B4, and this, in turn, affects the rest of the economy. Although trade can serve as a shock absorber, as discussed below, it can also, therefore, be a source of shocks, contributing to macroeconomic volatility which can hinder economic resilience (further discussed in Section C3), if trade costs are volatile.

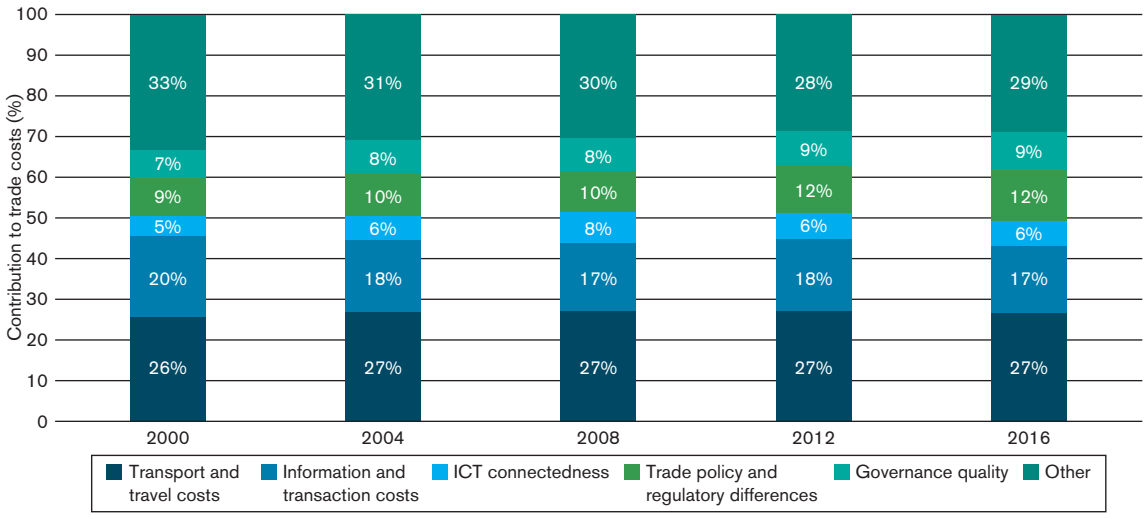
The WTO Trade Cost Index (http://tradecosts.wto.org) tracks the evolution of trade costs decomposed into five main components: transport and travel costs; information and transaction costs; ICT connectedness; trade policy and regulatory differences; and governance quality (WTO, 2021). According to data from 2016, transport and travel costs account for the largest variation in trade costs (about 27 per cent), followed by information costs (17 per cent), trade policy and regulatory differences (12 per cent), governance quality (9 per cent) and ICT connectedness (6 per cent); other factors account for 29 per cent of the trade cost variation, but their share has been decreasing steadily, highlighting the rising importance of the five main components. Between 2000 and 2016, transport and travel costs remained relatively constant, while governance quality and trade policy and regulatory differences have been steadily increasing. Figure C.1 displays trade costs according to the five components and their variation over time.

Based on these five principal components of trade costs, this subsection discusses how different types of shocks can affect the economy through their effect on trade costs. The objective of this discussion is to provide a comprehensive overview of how shocks can affect trade cost volatility and (if applicable) what policies governments could implement to prevent shocks to trade costs, particularly relevant for trade policies.

(i) Shocks to transport and travel costs

Transport costs in trade have been on a steady decline since the mid-1980s due to improvements in transport technology and infrastructure (Combes and Lafourcade, 2005; Glaeser and Kohlhase, 2004;

Figure C.1: Policy-related factors account for a significant part of trade costs



Source: Rubínová and Sebti (2021).

Note: The underlying regressions do not include Services Trade Restrictiveness Index (STRI) variables, which were not available for the entire period at time of writing. Furthermore, they are based on a balanced panel of observations. Consequently, the results for 2016 are not directly comparable to the results presented for earlier years.

Lundgren, 1996). Despite this downward trend, transport costs are also significantly affected by shocks. Economic research has mainly focused on identifying how natural and socioeconomic shocks can impact trade and transport costs, although technological or industrial shocks such as the 2021 Suez Canal obstruction or road accidents can have an effect as well.

The growing availability of alternative sources of supply and routes has dampened the impact of external shocks on trade and transport costs (Lundgren, 1996), which is in line with the role of diversification in strengthening resilience (as discussed in Section C3). However, considering that rerouting also comes with additional costs, natural disasters still can increase transport costs despite available alternatives. Moreover, some countries, such as small-island states, are unable to avail of alternative trade routes due to their limited endowment of transport infrastructure and higher dependency on a small number of shipment service providers. These countries tend to be more exposed to higher transport cost volatility, and thus more subject to shocks (Briguglio, 1995; Wilmsmeier and Hoffmann, 2008).

Natural disasters can cause significant destruction or temporary disruptions in transport infrastructure, such as ports, road or railway connections, which can increase transport costs (see Colon, Hallegatte and Rozenberg (2019), Oh (2017), Osberghaus (2019), Rozenberg et al. (2019) and Volpe Martincus and Blyde (2013) for a discussion of this). For example, a substantial rise in transport costs has been observed in Tanzania due to frequent floods, which generate disruptions in the road system (Colon, Hallegatte and Rozenberg, 2019). Future extreme weather events resulting from climate change, such as heatwaves, heavy downpours, high winds and extreme sea levels and waves, are likely to increase disruptions to transport infrastructure (UNECE, 2020). For example, more frequent floods and unpredictable winter weather are forecast to raise rail transport costs in Europe by 80 per cent in the next 40 years (Doll, Klug and Enei, 2014).

Epidemics affect transport costs by temporarily reducing transport efficiency. For instance, during the COVID-19 pandemic, international land transport was subject to increased delays due to border controls and sanitary measures, aviation transport costs rose because of the lack of belly capacity in passenger airplanes as a result of fewer passenger flights, and maritime transport costs increased due to travel restrictions affecting maritime personnel and the asymmetric recovery between different regions. In March 2020, global air cargo capacity diminished by 24.6 per cent compared to the previous year, and air cargo yields in April 2020 doubled relative to April 2019. According to the FBX Global Container freight index, shipping rates started to surge in May 2020, resulting in a 30 per cent higher shipping rate by July 2020 compared to the previous year (WTO, 2020a).

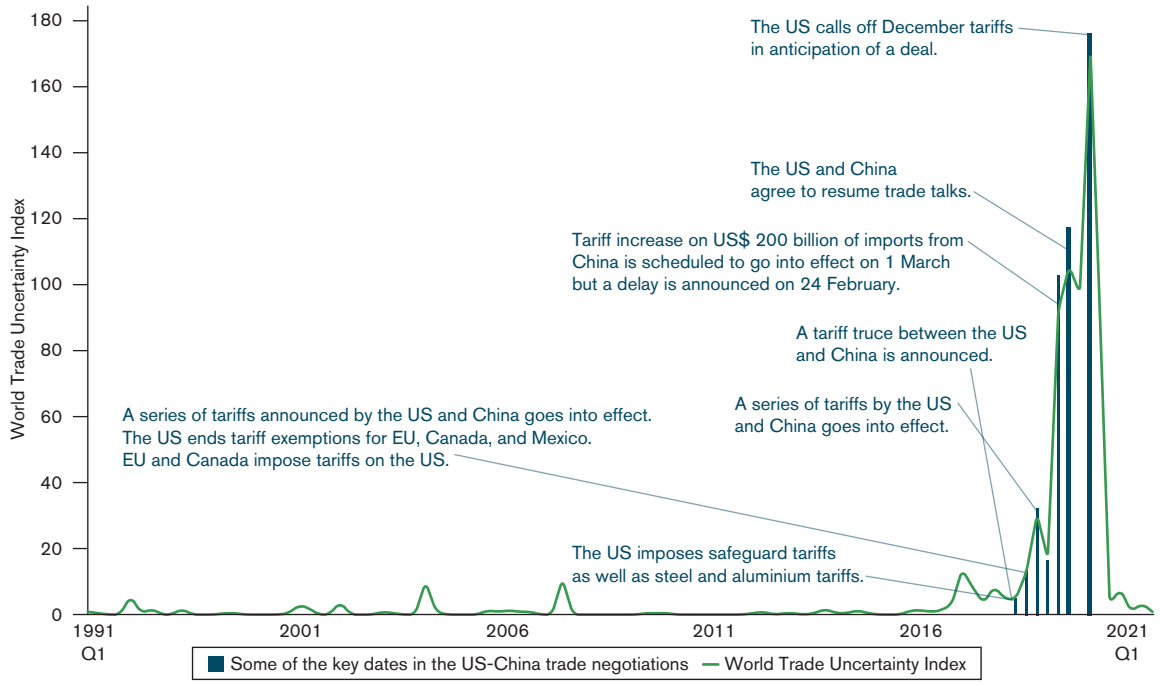
Violence and conflict can increase transport costs through destruction of infrastructure. For example, transport costs for international trade doubled in Malawi with the redirection of Malawi's trade to distant ports when nearby ports were disrupted during the 20-year civil war in Mozambique (Milner and Zgovu, 2006). Moreover, the mere expectation of a violent incident can increase transport costs because firms may have to purchase insurance to protect themselves from risks of property loss (Long, 2008).

(ii) Shocks to trade policies

More and more trade restrictions have been imposed in recent years, as shown by the yearly WTO trade monitoring reports. For example, the 2019 trade monitoring report observes that countries imposed 102 new trade-restrictive measures, such as tariff increases, quantitative restrictions, stricter customs procedures, and import taxes and export duties (WTO, 2019e).[18] Uncertainty about trade policy has also increased drastically since 2018, after having remained relatively low and stable during the preceding two decades (see Figure C.2).[19] The spikes in Figure C.2 roughly coincide with the introduction of new protectionist measures during the "trade conflict" between the United States and China. Although the World Trade Uncertainty Index seems to have returned to a lower level since the second quarter of 2020, the potential sudden variability highlights the importance of considering uncertainty in trade policy discussions.

Higher trade policy uncertainty can make entry into export markets more difficult for companies because they must wait to pay the sunk entry costs (i.e. one-time costs to enter a market). For example, one-third of the increase in exports from China to the United States after China's accession to the WTO is attributed to falling uncertainty on the level of US import tariffs on Chinese goods (Handley and Limao, 2018). A larger difference between bound and applied tariffs, which increases uncertainty over the scope of future tariff increases, depresses trade in a global sample of countries (Osnago et al., 2018). Similarly, larger differences between applied market access and market access commitments in the General Agreement on Trade in Services (GATS) and in free trade agreements (FTAs) reduce services trade, because they increase uncertainty about trade policy (Ciuriak, Dadkhah and Lysenko, 2020).

Figure C.2: Trade tensions led to large world trade uncertainty



Source: Ahir, Bloom and Furceri (2018).

Note: The figure displays the World Trade Uncertainty index between 1991 (first quarter) and 2021 (first quarter). The font in blue indicates the tariff measure taken.

Trade policy uncertainty also negatively affects investment, as decisions on investing in export- versus import-competing sectors are delayed pending changes in tariffs (Krugman, 2019). For example, trade policy uncertainty has been estimated to reduce investment in the United States by 1 to 2 per cent in 2018 during the US-China "trade conflict" (Caldara et al., 2020).[20]

This analysis underlines the potential for trade policy changes to hamper economic resilience. To prevent trade from becoming a source of shocks as a result of trade policy volatility, it is essential that trade policy is stable and predictable, as will be further discussed in Section D.

An interesting policy question in this respect is whether temporary trade barriers (TTBs) play a stabilizing role or not. On the one hand, the frequent use of TTBs during the global financial crisis of 2008-09 may have prevented the resort to more severe protectionist policies (Bown, 2011). In emerging economies, TTBs were more actively used in response to shocks as the number of imported products subject to WTO agreements limiting the use of import tariffs increased between 1988 and 2010 (Bown and Crowley, 2014). On the other hand, according to Barattieri, Cacciatore and Ghironi (2021) in data from Canada for years 1994 to 2015, an increase in the use of TTBs has a negative macroeconomic impact through a decrease in investment, labour productivity and the number of active employer businesses, in part due to higher trade policy uncertainty. Therefore, it is important to consider that, while TTBs have the potential to raise uncertainty and serve as a source of instability, they also serve as a safety valve for protectionist demands.

(iii) Shocks to governance quality

Low-quality institutions that do not guarantee efficient transaction and contract enforcement discourage trade (Anderson and Marcouiller, 2002; Beverelli et al., 2018; Yu, 2010). Therefore, shocks that precipitate alterations in governance and institutions, especially socioeconomic shocks, increase the uncertainty associated with contract enforcement, thus increasing volatility in trade costs.

In particular, violence and conflict can destroy social and political institutions, or at least paralyse them temporarily (Blattman and Miguel, 2010; Van Raemdonck and Diehl, 1989), and can alter the societal preferences and norms that constitute the underlying principles of formal institutions (O'Reilly, 2021). Civil wars can also bring about deterioration in the quality of institutions. A significant degradation of institutional quality has been observed in some, but not all, countries that experienced a civil war in an empirical study of a large sample of countries between

1960 and 2010 (O'Reilly, 2021). In light of these findings, institutional instability caused by violence and conflict, as well as the heterogeneous outcomes of these events, can be expected to increase volatility in trade costs and uncertainty in trade.[21]

(iv) Shocks to ICT connectedness

Trade costs associated with ICT connectedness have been decreasing throughout history. Constant progress in telecommunications technologies has allowed for greater connectivity around the world and lowered communications costs, promoting rapid growth in international trade towards the last few decades of the 20th century (Fink, Mattoo and Neagu, 2005). Nevertheless, such costs are still subject to shocks, and the fluctuation of these costs can increase economic volatility and be an obstacle to trade resilience.

The availability and quality of telecommunications infrastructure are closely linked to information and communications technology (ICT) costs (Abeliansky and Hilbert, 2017; Fernandes et al., 2019; Malgouyres, Mayer and Mazet-Sonilhac, 2021), and natural and socioeconomic shocks can affect physical telecommunications infrastructures, especially ground-based facilities such as transoceanic fibre cables, data centres and cell towers (Chang, 2016). Moreover, the interdependency of critical infrastructure systems can exacerbate the impact of shocks that interrupt ICT infrastructure. Because most telecommunications devices rely heavily on electricity, ICT-related costs are also greatly affected by disturbances in the power network (Chang, 2016; Laugé, Hernantes and Sarriegi, 2013).

In addition to natural and socioeconomic shocks, technological shocks can also trigger changes in ICT costs. As trade rapidly adopts new digital technologies, it is also more exposed to the risk of cyber-attacks (Huang, Madnick and Johnson, 2018). In order to deal with the aftermath of cyber-attacks, damaged hardware and software needs to be repaired and time and personnel are necessary, all of which incur substantial additional costs (Lis and Mendel, 2019). Furthermore, in preparation for the uncertainty that cyber-attacks pose, firms are compelled to invest more resources into fortifying their cybersecurity systems and maintaining them, incurring further ICT costs (Bojanc and Jerman-Blažič, 2008).

(e) Trade as a shock propagator in value chains

International production is increasingly organized within GVCs, with the different stages of the production process spread across different countries. This type of production organization often enables greater efficiency in production but may also create vulnerabilities, as relatively small shocks can result in significant supply chain disruptions (Acemoglu and Tahbaz-Salehi, 2020). This subsection will first discuss the role of value chains in propagating shocks and then present factors that determine the propagation of shocks in GVCs.

(i) The role of value chains in propagating shocks

International trade can act as a channel through which a shock to one sector or one region can affect the global economy. Trade can thus transmit uncertainties across countries through the cross-border flow of goods and services, along with financial flows (Röhn et al., 2015). For instance, a negative demand shock abroad can reduce demand for a country's exports, while a negative external supply shock tends to increase import prices.

Multi-stage processing and complementarity between intermediate inputs specific to supply chains can lead to the amplification of shocks, as demonstrated by a well-established literature. Kremer (1993) refers to this phenomenon as the O-ring theory, deriving the name from a 1986 incident in which the Challenger space shuttle was completely destroyed as a result of the failure of a simple gasket, or O-ring, to work properly.[22] Just as a chain is only as strong as its weakest link, problems at any point in a production chain can reduce output substantially if inputs enter production in a complementary fashion (Jones, 2011).

Value chain disruptions can exacerbate the direct impacts of a disruption and indirectly impact overall volatility through several channels (OECD, 2020d):

(1) an indirect supply impact when production in one location requires inputs from another location that is directly impacted by a shock;

(2) an indirect demand impact where GVCs play a role in the transmission of economic shocks through demand channels; and

(3) a disruption in international transport networks, where the disaster does not affect the production of inputs but rather the intermediary means of transportation.

Therefore, a shock can not only exert a direct impact on a firm, an industry or a region, but can also indirectly affect the overall economy through input-output linkages to sectors both upstream and downstream from the point of shock. While this propagation effect is present in both domestic and global supply chains, the fragmentation of production process across

countries has led to an international transmission of shocks. Notably, supply-side shocks (e.g., productivity shocks) can propagate downstream more powerfully, and demand shocks (e.g., through imports or government spending) are more likely to propagate upstream (Acemoglu, Akcigit and Kerr, 2016).

Apart from the type of the shock (i.e. supply or demand), the position within value chains also matters. For instance, micro, small and medium-sized enterprises (MSMEs) are less likely to withstand adverse shocks given their position within value chains – as trading MSMEs in developing economies are often suppliers of specialized intermediate inputs – and are thus more likely to contribute to the transmission of shocks. The products supplied by MSMEs can be especially hard to replace in a crisis-induced disruption, creating potential supply chain weaknesses (Baghdadi and Medini, 2021; OECD, 2008; WTO, 2016) (see Box C.1).

The 2011 Tōhoku earthquake is a good example of the impact of exogenous shocks on production through supply chain disruptions. The production losses caused by the supply chain disruptions that resulted from the earthquake are estimated to have amounted to at least 0.35 per cent of Japan's gross domestic product (GDP) (Tokui, Kawasaki and Miyagawa, 2017). Based on micro firm-level data, the earthquake is estimated to have reduced the growth rate of firms with disaster-hit suppliers by 3.6 percentage points, and the growth rate of firms with disaster-hit customers by 2.9 percentage points (Carvalho et al., 2021). This suggests that the earthquake resulted in both a supply-side disruption affecting downstream firms and a demand effect that impacted upstream firms. Based on a general equilibrium model, Carvalho et al. (2021) also estimate the impact on GDP in the year following the disaster at 0.47 percentage points.

The outbreak of the COVID-19 crisis fuelled the debate on global value chain risks, as empirical studies attributed about one-quarter of the total GDP contraction to the shock transmission through GVCs especially linked to disruptions caused by lockdown measures (Bonadio et al., 2020; Espitia et al., 2021). The lockdown measures in the wake of the COVID-19 pandemic reduced GDP through input-output linkages. Constraints on transportation and labour supply during a two-month lockdown in China, the European Union and the United States could have reduced world GDP by 13 per cent (Guan et al., 2020). A strict lockdown in Tokyo lasting one month could reduce Japan's total GDP indirectly by propagation through supply chains (based on a simulation framework applied to the supply chains of 1.6 million Japanese firms), leading to a total loss of 27 trillion yen, or 5.2 per cent of GDP (Inoue and Todo, 2019, 2020).

On the other hand, the GVC integration of sectors has also been a factor of resilience to past shocks. For example, after the 2011 earthquake in Japan, affected firms with a more diversified set of suppliers recovered more quickly, so subsequently firms increased off-shoring in manufacturing activities and expanded their network of foreign suppliers (Matous and Todo, 2017; Todo, Nakajima and Matous, 2015; Zhu, Ito and Tomiura, 2016). During the COVID-19-related crisis, after an initial phase of shortages in intermediate inputs in key industries, firms were able to reallocate their sales to other countries and source their inputs from other markets whenever key partners went into lockdowns (Berthou and Stumpner, 2021). Hence, manufacturers integrated into GVCs were able to better insulate themselves from domestic pandemic shocks by sourcing their inputs from foreign markets with less stringent lockdowns, so that trade in these sectors fell by smaller margins than in less integrated sectors (Bellora, Bois and Jean, 2020; Hyun, Kim and Shin, 2020). The extent to which the current COVID-19-related crisis will lead to changes in the organization of manufacturers' spatial production in the long run is yet to be determined.

(ii) Determinants of shock propagation through GVCs

Several factors explain the extent to which trade and supply chains act as a shock propagator.

First, this depends on the degree to which inputs from different sectors are substitutable or complementary. For example, US suppliers affected by a natural disaster impose substantial output losses on their customers, especially when they produce specific inputs, have a high level of R&D, or hold their own patents, which makes their products plausibly more difficult to replace (Barrot and Sauvagnat, 2016).

While it is usually difficult or costly to find alternative suppliers immediately following a disruption, substitution becomes more readily available over time. One unit drop in intermediate inputs imported by US affiliates of Japanese firms in a few months following the 2011 earthquake in Japan resulted in one unit drop in exports (Boehm, Flaaen and Pandalai-Nayar, 2019), corresponding to a small elasticity of substitution across material inputs in the short term. Trade elasticities, which measure the amount of trade affected by a change in trade cost, are estimated at about one after one quarter, about five after one year, and about seven after five years following a trade cost shock (Yilmazkuday, 2019). The higher long-run than short-run trade elasticity suggests that firms take time

Box C.1 Impact of COVID-19 on Tunisian imports

The COVID-19 pandemic initially hit international trade in goods hard, raising concerns of serious disruption to supply chains. Its consequences have been particularly larger for low- and middle-income countries participating in GVCs, such as Tunisia. Tunisian imports in some sectors declined by between 20 per cent and 60 per cent (see Figure C.3).

In this context, identifying which products are most exposed to external shocks can help when economic resilience strategies are being built. Imported products can be classified into risky (those most exposed to supply chain shocks) and less risky based on how challenging it would be to obtain substitutes in the event of a shock. Different vulnerability criteria can be used to classify the exposure of imported products to supply chain shocks:

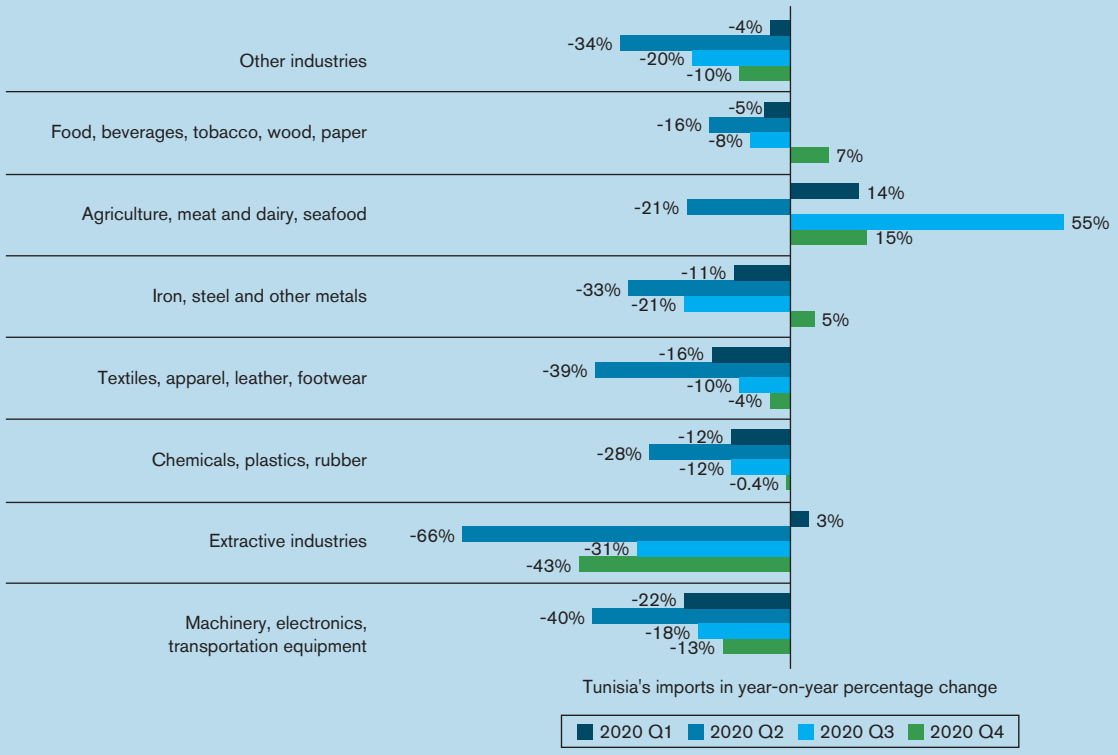
(1) market concentration of the importing country's partners (i.e., how easy would it be for the importing country to find another supplier);

(2) intensity of imports, measured using the revealed comparative advantage for imports (i.e., how easy would it be for the importing country to substitute an imported product with another import); and

(3) the feasibility of producing the imported good in the importing country, given the factors of production available in the country (Medini and Baghdadi, 2021).

The analysis for Tunisia reveals that less than 20 per cent of the total number of products imported by Tunisia (among 4,778 Harmonized System six-digit (HS-6) products) can be considered as moderately or highly risky. However, 71 per cent of these risky products are intermediate products (see Figure C.4), which suggests that the large drop in imports could have a significant impact on the country's production of final products and ultimately exports.

Figure C.3: Most merchandise imports from Tunisia experienced a drastic drop during the first year of the COVID-19 pandemic in 2020



Source: Baghdadi and Medini (2021), based on Tunisian Customs data.

Box C.1 Impact of COVID-19 on Tunisian imports *(continued)*

Figure C.4: Most intermediate products in Tunisia are potentially exposed to external shocks

Source: Baghdadi and Medini (2021), based on Tunisian Customs data.

Note: The left panel of the figure reports the change in Tunisia's imports between 2019 and 2020, while the right panel of the figure displays Tunisia's distribution of risky products by end-use (final goods and intermediate goods).

Risky products imported to Tunisia are mostly related to the extractives sector (representing 51 per cent of the total value of risky products) and the machinery sector (21 per cent). Many COVID-19-related essential products have also been found to be highly exposed to supply chain disruptions in Tunisia.

An econometric analysis further confirms that the decline of Tunisia's imports between 2019 and 2020 are in part due by changes in Tunisia's imports of risk products (Baghdadi and Medini, 2021). Identifying and addressing supply chain vulnerabilities are therefore important strategies for building and supporting trade resilience.

Prepared by Professor Leila Baghdadi (University of Tunis and WTO Chair).

to adjust to changes in trade costs; it generally takes seven to 10 years to converge to the long-run value of trade elasticity (Boehm, Levchenko and Pandalai-Nayar, 2020).

Moreover, there might be greater long-term consequences as firms re-shore or near-shore certain production steps (Altomonte et al., 2013). The expansion of GVCs halted after the 2008-09 global financial crisis, so that supply chains have become more domestic, with fewer production stages located abroad (Miroudot and Nordström, 2019; OECD, 2020d). By contrast, in the aftermath of the 2011 earthquake in Japan, firms increased off-shoring in manufacturing activities, and expanded their network of foreign suppliers (Matous and Todo, 2017; Zhu, Ito and Tomiura, 2016); however, the earthquake did not lead to reshoring, nearshoring or diversification for firms in the automobile and electronic sectors that relied on Japanese imports, likely due to the cost of switching suppliers, especially for relationship-specific intermediate products (Freund et al, 2021).

Second, the structure of a supply network also determines the extent to which an idiosyncratic shock can propagate through input-output linkages, thus leading to aggregate fluctuations. If the economy consists of many non-interacting sectors, microeconomic idiosyncratic shocks average out. But in the presence of input-output linkages, a sectoral shock propagates to the rest of the economy and affects aggregate outcomes (Acemoglu, Carvalho, et al., 2012). And the structure of the production network is key in determining whether and how microeconomic shocks can propagate throughout the economy (Carvalho, 2014). When the linkage structure in the economy is dominated by a small number of hubs supplying inputs to many different firms or sectors, aggregate fluctuations may arise. This is because fluctuations in these hub-like production units can propagate throughout the economy and shorten distances between otherwise disparate parts of the economy. In other words, hub-like production units can function as "choke points" through which a shock occurring to one sector is likely to propagate throughout the economy.

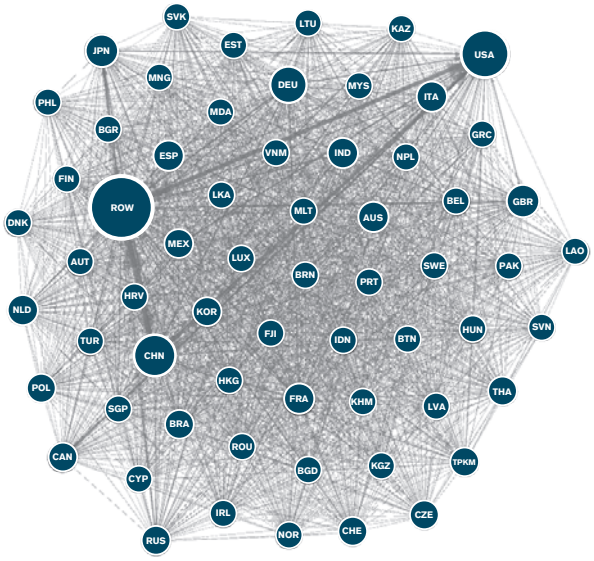
The cross-border transmission of shocks also depends on the granularity of an economy and can thus occur, for instance, through large multinational

firms. Fluctuations at the firm level can be linked with aggregate economic fluctuations (Gabaix, 2011; Herskovic et al., 2020). Trade linkages at the firm level are significantly associated with increased international business-cycle co-movement between an individual firm and the country with which it trades (Di Giovanni, Levchenko and Méjean, 2018). The downstream indirect linkages, where a firm buys intermediate inputs from firms that import from a particular country, have also been found to matter significantly for firm-level co-movement with foreign markets. As a relatively small number of firms dominate international trade, small differences in firm characteristics can have amplified effects (Bernard et al., 2018). The degree of shock transmission also depends on the type of transaction between firms, i.e. through arm's length (i.e. trade between independent parties) or intra-group trade (i.e. trade between vertically linked firms). In the trade collapse during the 2008-09 global financial crisis, intra-group trade in intermediates was characterized by a faster drop followed by a faster recovery than arm's length trade (Altomonte et al., 2013).

Given the importance of value chains in transmitting shocks, it is critical to identify the choke points in global supply chains that may propagate throughout the economy. Figure C.5 provides a network representation of the world input-output linkages, reflecting the amount of value-added trade between economies. At the aggregate level, the global production network appears to be relatively spread out; the United States, China and Germany appear to be larger hubs connecting with other economies. However, Figure C.5 does not capture the degree of interconnectedness for specific sectors.

Finally, the magnitude and nature of a shock can also determine the extent to which trade may impact economic resilience. If a shock is specific to a region or a country (for instance, a natural disaster), openness to international trade can reduce exposure to domestic shocks and allow countries to diversify the sources of demand and supply across countries (Caselli et al., 2020). On the other hand, trade openness can make the economy more susceptible to sector-specific shocks, as trade often leads to increased specialization (Di Giovanni and Levchenko, 2009). If regions specialize in certain industries, import competition affecting local labour markets can lead to significant economic shocks in a region, particularly in the absence of cross-regional labour mobility (Autor, Dorn and Hanson, 2016). As argued in Section C5, a certain degree of diversification may be desirable to cushion the impact of shocks (Hausmann and Rodrik, 2003).

Figure C.5: The global production network is characterized by a few larger hubs connecting with other economies



Source: Authors' calculations, based on the multiregional input-output table 2018 by the Asian Development Bank.

Note: The figure displays the world input-output linkages between economies in 2018. It reflects the direct value-added and the indirect ripple effect of an economy, captured by the Leontief inverse of the matrix.[23] The Leontief inverse matrix shows the coefficients (economic multipliers) that measure the successive effects on the economy as a result of the initial change of an economic activity. It incorporates both direct and indirect inputs in production. Each node in the network corresponds to an economy. Each line links the origin and final destination of value-added. Bolder lines represent larger amount of trade in value added. The size of circles for each node corresponds to the intensity of connections and trade in value-added. The abbreviation "ROW" refers to "Rest of the world".

OPINION PIECE

By Susan Lund,
Partner, McKinsey Global Institute

How more resilient supply chains could reshape global trade

In May 2021, a cyberattack shut down the operations of Colonial Pipeline, a major gas pipeline along the East Coast of the United States. Almost two months earlier, a combination of weather and underappreciated fluid dynamic forces had left a giant super cargo ship wedged sideways in the Suez Canal, bottling up a critical global trade route (Greeley, 2021). In February 2021, unusually low temperatures and a power outage in Texas disrupted a number of petrochemical plants, creating shortages of key plastics and resins for a range of industries. And a global shortage of semiconductors in the wake of demand volatility from COVID-19 has caused automotive companies around the world to curtail production.

These incidents are not just a string of bad luck, but rather the latest reminders of the potential fragility of global supply chains, an issue that the COVID-19 pandemic has catapulted to the top of CEO agendas. Industry value chains often span thousands of companies, and their configurations reflect specialization, access to consumer markets around the world, long-standing relationships and economies of scale. But a shock to any node in the network can be amplified in unpredictable ways.

Disruptions to global supply chains, once seen as rare occurrences, now must be considered probable. Research from the McKinsey Global Institute (MGI) (McKinsey Global Institute, 2020) finds that the average manufacturing company can expect to see production disrupted for up to two weeks every two years, and for periods of one to two months every 3.7 years. These disruptions are costly: over the course of a decade, the average company can expect to lose nearly half of one year's profits from supply chain disruptions.

Companies are actively considering ways to reduce vulnerabilities and enable prompt reactions. While no one can predict the next "black swan" event,[24] there are many ways to make value chains more resilient, including by holding more inventory of critical components or adding redundancy among suppliers, simplifying product designs and sharing components across products, digitizing the supply chain to improve transparency regarding potential risks and enabling more nimble responses, and regionalizing production closer to where goods are sold. The pandemic has also prompted policymaker action around the world focused on goods and technologies deemed critical for national economic security.

As a result of both economic calculations of companies and changes in the policy landscape, global trade flows may shift. MGI research estimates that 15 to 25 per cent of global goods trade could shift to different countries over the next five years in a scenario where value chains become more regionally oriented. This scenario does not mean that globalization is dead, or even that global trade flows would diminish. It is possible that a broader set of countries will participate in GVCs in the years ahead. Moreover, more international cooperation will be needed – not less – to monitor and mitigate the shocks that are global in nature, such as pandemics and climate change. The global economy and trading system held up better than many expected in the face of a devastating pandemic. Now we have a chance to build on that system, not abandon it.

3. Trade can enable countries to better prepare for, cope with and recover from shocks

This section discusses the role of trade in helping countries to prepare for, cope with and recover from shocks.

(a) Trade can enable better preparation for disruptions

As seen in Section B, a broad range of tactics and strategies can be adopted to build and support economic resilience. Rather than waiting for a shock to hit before taking action, advance planning can help in preparing for disruptions.

When a shock hits, the availability of critical goods and services is of the utmost importance, and trade can play a key role in ensuring their timely availability. Services like weather forecasting, insurance, telecommunications, transportation, logistics and health services are fundamental to mitigate the impact of shocks and begin recovery, as is the efficiency of customs clearance and transit procedures and of public procurement processes. Trade can also be useful in preparing for shocks by helping to minimize and manage risk before a shock hits. For example, making risk-informed decisions, i.e. incorporating and valuing risk, requires data and services, which can be traded across borders.

(i) Trade in services

Trade in services, including weather forecasting, insurance, telecommunications, transportation, logistics and health services, can play a key role in the preparation of firms, citizens and governments for shocks. Some services might be relevant to managing specific risks (e.g. weather forecast services matter for weather-related disasters), while others are pertinent for a broader spectrum of risks (e.g. telecommunications and logistics).

Actions can be taken in advance to ensure that relevant services are provided for the domestic market, or that a foreign supply can be made readily available if required to meet demand. Although such actions are often taken independently of an economic resilience strategy, they can support resilience. Such actions can include putting in place comprehensive regimes to recognise foreign qualifications (such as medical qualifications), so that if foreign personnel supplying the required services are required, their entry can be facilitated (WTO, 2019a). Opening the services market to foreign services and service suppliers, where the domestic market is not developed enough in these sectors, can have a positive impact on inward investments in these sectors, encouraging the growth of the private sector and, overall, enhancing the domestic capacity to supply services crucial for improving economic resilience capacity and reducing vulnerability to shocks (Thangavelu, Ing and Urata, 2015; WTO, 2019a; 2019b).

Weather forecast services

Various studies confirm the critical role that effective weather forecasting services and early warning systems can play in disaster resilience and reduction (Rogers and Tsirkunov, 2013; WTO, 2019c). The provision of early warning services enables communities to prepare for, and minimize the impacts of, tornadoes, storms, hurricanes, heatwaves, wildfires, floods and droughts (WMO, World Bank, GFDRR and USAID, 2015). However, large regional and development-related disparities exist in terms of access to commercial weather forecast services (Georgeson, Maslin and Poessinouw, 2017).

Such services depend on imports of technical equipment and services needed to build and maintain the weather observation infrastructure (WTO, 2019a), in particular in developing countries where the World Bank's experience suggests a lack of equipment and expertise (Rogers and Tsirkunov, 2013). The World Meteorological Organization (WMO) estimates that national meteorological and hydrological services maintain and operate global hydrological and meteorological infrastructures worth more than US$ 10 billion (WMO, World Bank, GFDRR and USAID, 2015), and the private sector is also now increasingly investing in its own observation networks.

Import policy can play an important role in determining the cost of purchasing such equipment, particularly where the private sector may not enjoy the same exemptions as public sectors from tariff and taxes (e.g. sales tax) or charges.

As many developing countries lack the skills to develop and run models and provide risk information for their citizens, training is critical. Rogers and Tsirkunov (2013) note that a key problem in developing countries is the focus on the infrastructure of the weather stations rather than on training to ensure quality outputs.

Insurance services

Insurance services play a key role in mitigating the impact of disruptions, in particular natural disasters,

OPINION PIECE

By Alison Gillwald,
Executive Director, Research ICT Africa and University of Cape Town

Multiple economic resilience challenges for Africa in a rapidly digitalizing global economy

For the African Continental Free Trade Agreement (AfCFTA) to fly, the currently missing digital underpinnings need to be in place. Digital infrastructure, both to undergird the financial and logistical trade of analogue goods, and to support tradable digital services, urgently needs to be prioritized.

Yet, there are multiple digital readiness challenges that Africa needs to overcome before it can benefit from digital processes to increase the continent's visibility on global markets and in global value chains. These are part of the broad objectives of the AfCFTA, and although previously e-commerce and digital services were not specifically part of the agreement, they are now on the agenda for the third round of AfCFTA negotiations. Already the importance of digital trade has been recognised in African policies such as the African Union Digital Transformation Strategy, from which several practical guiding frameworks are being developed, including a data policy framework.

The importance of creating a safe and secure cyber-realm for digital markets and e-trade to flourish is already recognised on the African continent through the African Union Convention (Malabo Convention) on Cyber Security and Personal Data Protection, which was finalized by the African Union in 2014. The problem, however, is that most African countries are not signatories to such enabling agreements, which not only prevents them from capitalizing on a single digital market, but also prevents the trusted cross-border data flows that are required if a single digital market is to be operationalized.

While African countries are understandably sceptical of entering into global free trade agreements while their digital markets remain undeveloped or as long as the data future remains unpredictable, adopting protectionist measures through narrow notions of data sovereignty or localization will not enable them to be competitive, as the digital and data economy is inherently a global economy.

With relatively low levels of internet penetration and limited digital services, even countries with larger populations or economies in Africa do not generate enough data to have an internal data economy. Further, data has little value in of itself and few can beneficiate the data that they have to create value on scale.

With data becoming a critical asset underpinning the global economy, ensuring cross-border flows is a prerequisite to the creation of a single African digital market and to enabling that digital market to be globally competitive. If countries are concerned about the welfare of their citizens' privacy and the protection of their data, they can control the use of the data at a higher level in the data economy architecture, while enabling the physical flow of data on which the efficiency and effectiveness of the data economy is dependent.

There is a vast amount of data in the global flows of data that is not personal data, has no inherent value and is not sensitive in any way. Any physical interruption at the infrastructural level, as witnessed in its most extreme form through internet shutdowns, not only curtails political freedoms, but instantly stalls trade and therefore economic growth, as well as associated consumer welfare outcomes. Data protection laws in African countries should, and in some cases already do, recognise that there are various kinds of data with different degrees of sensitivity, and allow any data that requires protection to flow among jurisdictions in which the legal protections are equivalent.

Unless African countries harmonize their regulatory frameworks and fully commit to an integrated market, the continent will continue to be marginalized with regard to dynamic global markets and will continue to encounter difficulties in enabling a more even distribution of the benefits within them.

by providing necessary financial support to affected parties. The development of insurance systems can therefore significantly support preparedness (IMF, 2019; WTO, 2019a). However, some shocks may be excluded from private insurance contracts, especially when massive losses are possible, such as in the case of earthquakes. Following the severe acute respiratory syndrome (SARS) outbreak of 2003, many insurers added clauses to exclude damage payment caused by communicable diseases. In practice, business interruption policies pay out only if there is physical damage; thus, business interruption due to the COVID-19 pandemic, for example, may not be covered by insurance (Hay, 2020).

Nevertheless, insurance services can also play a useful role in preventing risk. In November 2019, the International Cooperative and Mutual Insurance Federation (ICMIF) and the United Nations Office for Disaster Risk Reduction (UNDRR) began a multi-year collaboration to help address the urgent challenge of reducing disaster risks by enabling a shift within the insurance industry, from focusing on providing risk transfer products and services as a means to protect the insured from disaster risks, to focusing on prevention through disaster risk reduction incentives, awareness, capacity and financing (ICMIF and UNDRR, 2021). Using analytics to gain a better insight into risk plays an important role in this respect (IDF, 2020).

However, insurance protection gaps, i.e. the difference between insured losses and economic losses, are all too common, especially in developing economies.[25] The natural disaster protection gap, in particular, remains massive, with only about 30 per cent of catastrophe losses insured globally. While some progress in terms of reducing this gap has been made in high-income and upper middle-income countries, there has been hardly any progress in lower middle-income and lower-income countries, with protection gaps persisting in excess of 95 per cent (Schanz, 2018). Estimates of the value of uninsured losses from natural disasters totalled US$ 280 billion for the years 2017 and 2018 (Bevere, 2019). In Nepal, for instance, a limited range of insurance products is offered, and the ratio of total assets/liabilities to GDP is only 7 per cent for insurance companies and 0.3 per cent for re-insurance companies. This means that liabilities end up having the government or family members, through remittances, as the final guarantor (WTO, 2019c). Empirical studies reveal that uninsured disaster-related losses lead to high macroeconomic costs, and that countries whose households and businesses are financially prepared to cope with a disaster recover faster (Von Peter, Von Dahlen and Saxena, 2012).

Another significant insurance gap concerns cyber protection. Attempts to quantify the cyber risk protection gap estimates it at about 90 per cent of damages caused by cyber incidents (Schanz, 2018).

As experience has shown (Swiss Re Group, 2019), preparedness for shocks through insurance could be improved by a variety of measures, ranging from diversification of insurance products (see Section C4) and the introduction of tailored insurance products specifically addressing the risk run by the potential buyers, to proper communication on available insurance products covering specific risks, to the introduction of public incentives to the purchase of risk insurance (such as the tax breaks on premiums approved by the Italian government in the aftermath of the 2010 earthquakes in Central Italy).

For countries with immature financial markets, opening the domestic market to foreign suppliers, in particular suppliers of insurance and reinsurance services on a cross-border basis or through commercial presence, can help to overcome some of the shortcomings of the domestic market, increase the overall supply of insurance services to it, and strengthen disaster preparedness.

Trade-opening can improve the efficiency of financial services, including insurance, with potentially large payoffs for the economy. Eschenbach and Francois (2002) find that financial sector openness leads to greater growth and financial sector competition. Mattoo and Subramanian (2006) estimate that, with full financial services liberalization, developed countries could grow 1.2 per cent faster and developing countries 2.3 per cent faster. Less restrictive economies have also been found to have deeper life and non-life insurance markets, as measured by the size of total gross premiums relative to GDP, indicating that households and firms in these economies are better equipped to deal with common risks and to engage in long-term planning (Kyvik-Nordås and Rouzet, 2016).

Telecommunications

Telecommunications play a key role in times of disruptions, and so promoting the development of efficient telecommunications services is an essential element of any preparedness strategy.

Traditional telecommunications services (i.e. mobile telecommunications services, internet telecommunications services and data transmission services), as well as new services technologies (i.e. artificial intelligence (AI), Big Data, cloud capabilities, Internet of Things) could play a critical role in disaster

management, as they allow communication with disaster-hit areas and collection of information on the actual damages and the needs of the affected population (ITU, 2019). After the floods in Chennai, India, in 2015, for example, several groups used Twitter to share information that helped relief operations to plan assistance, and to provide updates to those living in the area hit by the floods (ITU, 2019).

Some telecommunications services may also support the remote cross-border supply of other services that are equally critical in times of disruptions, such as telemedicine or engineering services.

As in the case of insurance services, trade liberalization in telecommunications can enhance their efficiency and enable the provision of more affordable, higher-quality and more diverse telecommunications services, which can support preparedness. Various studies find that economies with stronger actual and prospective competition in the telecommunications sector tend to have lower prices and better-quality services (Boylaud and Nicoletti, 2000; Eschenbach and Hoekman, 2006; Lestage et al., 2013; Mattoo, Nielsen and Kyvik-Nordås, 2006).

Transportation and logistics

Transportation and logistics are essential for business or leisure travel, also enabling other services, as well as goods, to be traded internationally. In 2017 one-third of global trade in transport services, or US$ 529 billion, related directly to the cost of shipping goods across economies, mainly by sea or by air. Supporting transport services, such as cargo handling, storage and warehousing, made up an additional 16 per cent of global trade in transport services (WTO, 2019b).

Deficiencies in transportation and logistics systems can have dire consequences when a shock hits, highlighting the importance of investment in logistics and transport preparedness. In the wake of the 2015 earthquakes in Nepal, shortcomings revealed in trade connectivity, most notably in airport and road capacity, posed serious challenges to the government's disaster response capabilities. (Logistics Cluster, 2015; WTO, 2019c). Efficient transportation and logistics systems are therefore essential to allow emergency personnel to be brought into a country and goods to be imported and distributed rapidly and smoothly. They can also be instrumental to reduce risk and build resilience. The move to low-carbon and climate-resilient transportation and logistics system is a key part of risk mitigation (Mehndiratta, 2020).

As in other services sectors, there is empirical evidence that trade-opening in the transport sector produces benefits in terms of efficiency and price. According to Fink, Mattoo and Neagu (2002), for example, trade-opening in maritime transport would reduce transport prices by 9 per cent and generate US$ 850 million worth of savings. Given that transport and travel costs make up a large portion of trade costs in goods – 28 per cent on average in 2016 (WTO, 2019b) – and can act as a non-tariff barrier to trade (Nordås and Piermartini, 2004), opening trade in these sectors can boost the efficiency of transport services and help prepare for shocks.

Health services

Trade plays a critical role in emergency situations by providing access to medical services and medical assistance to affected populations, including through the entry of foreign medical personnel (WTO, 2019c, 2020d), allowing the shortage of services caused by shocks in one location to be covered by imports from other unaffected places. The conclusion of agreements on the mutual recognition of professional qualifications can be a useful anticipatory measure (WTO, 2019a), as the lack of such recognition can hinder the efficiency of international emergency medical teams (IFRC, 2014; WHO, 2017). For example, the absence of special mutual recognition provisions for doctors or medical professionals wishing to enter Nepal on short notice to provide medical services was highlighted as a key issue of concern following the 2015 earthquakes (WTO, 2019a).

Likewise, mapping and prioritizing the interdependencies between public health and other sectors and developing preventive long-term approaches to health through partnerships can help mitigate risks.

Easing access to e-health and cross-border services can also facilitate the sharing of knowledge and experiences when detecting, monitoring and responding to crises (WTO, 2020d). However, the implementation of e-health requires proper planning and management and good telecommunication services (Li et al., 2012).

Other services

Other services sectors can also play an important role in resilience and preparedness to disruptions. For example, expanding renewable sources of electricity generation, such as hydro-electrical and geothermal energy, can lessen dependence on imports of liquid fuels, which can be a major drain on the balance of payments of disaster-prone countries (WTO, 2019c). Likewise, expanding the provision of

the "general services" listed under Annex 2 of the WTO Agreement on Agriculture (i.e. "expenditures (or revenue foregone) in relation to programmes which provide services or benefits to agriculture or the rural community", which constitute non-trade-distorting "green box" subsidies), such as research, rural infrastructure, pest and disease control, and extension and advisory services for farmers, could contribute to risk prevention and help economic actors to prepare for shocks (including by improving productivity and raising rural incomes).

(ii) Trade facilitation

Trade facilitation measures play a fundamental role in building resilience to shocks. Trade facilitation reforms, including implementation of the WTO Trade Facilitation Agreement (see Section D), can play an important role in ensuring the smooth importation of critical goods such as food, medical supplies and emergency equipment that may be in short supply in countries hit by a shock.

A recent WTO study on countries hit by natural disasters (WTO, 2019c) highlights the critical importance of preparedness and of the anticipatory incorporation of specific measures in customs procedures and processes. A key problem observed in the surveyed countries was that customs would not release goods until payment of customs duties or other fees had been made in full, which resulted in containers piling up at customs when humanitarian relief goods started to arrive. Procedures that would have allowed goods to be released without waiting for duties to be paid would have relieved pressure in the immediate aftermath of the crisis. Another critical issue was the delay in clearing goods that occurred while decisions were taken on what goods should be exempted from customs duties. Such decisions typically only came after a few days. Prior agreement on an approved list of critical goods to be exempted from taxes and duties would have allowed such a situation to be avoided.

A further difficulty was the customs clearance process, in particular the fact that forms had to be filled in by hand. Anticipatory measures to streamline the documentary requirements for imports and establish simplified procedures for customs inspections and for the clearance and release of goods, for example through authorized economic operator and pre-arrival processing tools, digitalization and the establishment of single windows (i.e., a single unified point through which documents can be submitted digitally), could go a long way toward facilitating the importation of critical goods. Another issue that emerged was the accumulation at customs of small parcels, which are frequently the medium through which support is provided, due to the expansion of e-commerce. Such accumulation delayed the timely clearance of relief items and placed additional pressure on the response system. Some stakeholders have noted that the use of *de minimis* provisions (i.e., a valuation ceiling for goods below which no customs duty or tax is charged and clearance procedures are minimal) combined with the introduction of simplified customs procedures would alleviate administrative burdens at customs and reduce the congestion of customs facilities.

A further critical element in resilience highlighted in these studies is security of transit (WTO, 2019c). The customs laws and procedures of transit countries can reduce the pace and availability of relief assistance for disaster-prone countries, in particular landlocked economies. For example, transit issues disrupted the delivery of essential supplies and delayed recovery in Nepal following the 2015 earthquakes (WTO, 2019a).

Ensuring that critical goods can transit without unnecessary cost and delays is an essential condition in times of a shock. One way to prepare for shocks is to develop stable relationships with neighbouring countries, for instance by signing agreements related to trade and/or transit procedures. Finally, the importance of improved information-sharing and coordination among border agencies has often been stressed. All these issues are best addressed through anticipatory actions to build resilience, including through implementation of the WTO Trade Facilitation Agreement (WTO, 2019a). Studies on the COVID-19 pandemic flag the same issues as being of critical importance to prepare better for possible future pandemics (UNCTAD, 2020c, 2020d).

(iii) Government procurement

Government procurement preparedness is another way to pursue resilience and prepare for future disruptions (IMF, 2019; OECD, 2020c; World Bank, 2015; WTO, 2019c). The effectiveness of the response to emergencies in meeting the immediate needs of the affected populations and embarking on the path to recovery and reconstruction depends directly on the effectiveness of government procurement processes. When a shock hits, governments must urgently purchase critical products and services, including from abroad, meanwhile ensuring the smooth and accountable management of ongoing contracts needed to ensure the delivery of critical public services. The electronic conduct of government procurement can be particularly useful in times of extreme urgency, both by providing transparency in emergencies and thus helping to

prevent corruption, and by allowing governments to accelerate procurement procedures, thereby reducing costs for suppliers.

A recent survey conducted by the Inter-American Network on Government Procurement on the level of preparedness of 18 Latin American governments to manage COVID-19-related procurement (INGP, 2020) highlighted the importance of having strong frameworks in place well before a crisis hits (see also Section C3(b)(iv)). The survey found that countries that had updated their regulatory frameworks and established clear government procurement emergency procedures and long-term agreements were better positioned to deal with urgent supply requests. These countries included Costa Rica, Ecuador, Paraguay, Peru and Uruguay.

(b) Trade can enable countries to cope with shocks more effectively

Section C2 describes the mechanism by which trade can contribute to the spread of shocks. However, trade often plays a more prominent role in helping countries to cope with shocks more effectively by allowing them to import essential goods and services from other regions. Trade can also help firms to cope with shocks by channelling foreign demand and identifying alternative foreign suppliers. To allow trade to play a beneficial role in withstanding shocks, adequate and coordinated policies are of crucial importance. In particular, certain strategies are important to enhance the resilience of supply chains.

(i) The role of trade in addressing supply shortages

Openness to international trade allows countries or regions to confront shortages of goods and services after a shock strikes, enabling them to attenuate the impact of the shock. In this subsection, the role of trade in coping with different types of shocks, including natural disaster shocks and socioeconomic shocks such as regional conflicts, is discussed.

International trade brings goods and services from regions of surplus to regions lacking in those goods and services, thus smoothing the differences between output and consumption. As discussed in Section B, a higher degree of trade openness is often associated with lower economic damages from natural disasters, although other factors such as education, the quality of institutions and financial conditions also matter (Felbermayr and Gröschl, 2014; Noy, 2009; Toya and Skidmore, 2007).

When natural disasters trigger disruptions in domestic production, trade can offer an alternative source of supply through imports and stabilize the market. Following a supply-side disruption, a surge in the price of affected goods is to be expected; however, trade enables the market to meet the excessive demand with imported foreign substitutes and prevents sudden spikes in prices. For example, when Bangladesh was hit by a flood in 1998, massive rice imports from India, which were facilitated by trade-opening prior to the catastrophic event, contributed to stabilizing the market. Rice prices in Bangladesh would otherwise have experienced price increase of up to 19 per cent (Del Ninno, Dorosh and Smith, 2003).

Trade also plays an essential role in adapting to long-term changes in climate patterns. For example, increased variability of regional temperature and precipitation as a result of climate change can reduce agricultural productivity, which can impair food security, especially for populations living in rural areas where agriculture is the predominant form of economic activity (Hertel and Rosch, 2010). It is estimated that northern countries which have traditionally had cold temperatures and short growing seasons may benefit from higher yields in some crops, while tropical countries may see reduced yields because of extreme temperatures. As the impact of climate change and weather variations is heterogeneous across regions, trade can often bridge the difference between supply and demand across regions. For instance, the expansion of railroads across regions in India between 1861 to 1930 is found to have mitigated the effects of agricultural productivity shocks due to rainfall volatilities on famine, as lower trade costs brought about by rail transport allowed surplus regions to sell food to deficit regions (Burgess and Donaldson, 2010).

Adjustments through production and trade patterns can significantly dampen the adverse consequences of climate change. Since climate change has a differential effect on crop yields both within and between countries, some of the negative impacts could be mitigated by changing production patterns (to crops more resistant to warmer temperatures) and allowing international trade (Costinot, Donaldson and Smith, 2016).[26]

While Costinot, Donaldson and Smith (2016) find a relatively small effect of trade in mitigating the negative impact of climate change, Gouel and Laborde (2018) find that international trade plays a major role in alleviating the consequences of climate change by allowing countries that experience a negative impact on food production to import agricultural products; the different results in these two studies can be

explained by the use by Gouel and Laborde (2018) of low elasticity of substitution and opportunity costs of converting land between its various agricultural uses. In a similar vein, rising temperatures are predicted to lower real GDP per capita by 6 per cent and welfare by 15 per cent by the year 2200.

However, reducing trade costs would lead to more geographic concentration in agriculture in northern regions such as Canada, Russia, and Central Asia and less climate-induced migration. Thus, trade can be a powerful mechanism to adapt to rising temperatures (Conte et al., 2020).

In the case of a global shock, essential goods often become scarce, and countries often compete for them, while trade helps to ensure their availability. Essential goods can be defined as goods whose consumption cannot be substituted with other goods and cannot be deferred (Bacchetta et al., 2021; Leibovici and Santacreu, 2020). The COVID-19 pandemic brought considerable attention to trade in medical products, and specifically trade in products for prevention, testing and treatment of the disease. Imports and exports of medical goods were valued at US$ 2,343 billion in 2020, representing a growth of 16 per cent compared to the previous year (WTO, 2020c).

As manufacturers seek to meet the demand for COVID-19 vaccines, shortages have arisen in the wide range of ingredients and goods needed to produce, distribute and administer the vaccines. There are strong international interdependencies in the supply chains of vaccines, and trade plays an essential role in ensuring that vaccines can reach populations (OECD, 2021e). In Box C.2, the role of trade and trade policies in COVID-19 vaccine production is discussed in further detail.

Several governments have called for the domestic production of essential goods to avoid shortages during a global crisis like the COVID-19 pandemic. This, however, would come with three important disadvantages, which would lead to an undesirable outcome.

First, government policies to guarantee domestic production of essential goods would require a mix of subsidies and import protection, which could be costly in terms of government expenditures and higher consumer prices.

Box C.2: The role of trade in vaccine production and distribution

The influenza A (H1N1) and COVID-19 pandemics have highlighted the key role that an open trade regime plays in enabling quick vaccine production and distribution.

Vaccine production relies on complex upstream raw material and component value chains. A typical vaccine manufacturing plant uses about 9,000 different materials sourced from some 300 suppliers across approximately 30 different countries, according to estimates from the International Federation of Pharmaceutical Manufacturers and Associations. Pharmaceutical companies increasingly rely on third parties for the timely supply of goods, such as components of medical equipment (e.g. vials, syringes, stoppers) and raw materials (e.g. active pharmaceutical ingredients), machinery and equipment, formulated drugs, packaging materials, critical product components and services. In view of the complexity of upstream raw material and component value chains, ensuring smooth customs clearance and transit procedures of imported raw materials is critical.

Trade also plays a critical role in the distribution of vaccines (WTO, 2020c). Vaccines are biological products that can be damaged by conditions such as high or freezing temperatures or by excessive light, and are often effective only for a limited time period at room temperature. Thus, inappropriate transportation or improper storage reduces their effectiveness, and functional end-to-end supply chain and logistics systems are essential.

The role of the supply chain is to ensure effective vaccine development, manufacturing, storage, handling and stock management, rigorous temperature control in the supply chain, and the maintenance of adequate logistics management information systems.

As time is of the essence for global vaccine distribution, the speed and reach of air transport is a critical factor in prompt vaccine distribution. Another consideration is transit. Cargo may be transferred between several different flights before it reaches its final destination, and consignments may be subjected to a variety of procedures and documentary requirements.[27]

Second, self-sufficiency and relying on domestic production capacity are not always a guarantee of greater security, as eliminating reliance on foreign production and inputs means increased reliance on domestic production, which is also subject to adverse shocks. In the context of the pandemic, ordering multiple vaccines in advance can be an efficient risk diversification strategy if it is not known which vaccines will prove effective. However, such a policy can only work under open trade policies, so that foreign vaccines can be ordered (Ahuja et al., 2021).

Third, for smaller and low-income countries it is difficult to build up the manufacturing capacity and obtain specialized machinery to build domestic production capacity and seek self-sufficiency. For countries with less advanced production capacity or limited access to intermediate inputs it is difficult to rely solely on domestic production.

Hence, domestic production is not the best decision, from both an efficiency and an equity perspective. Policy cooperation to prevent this suboptimal outcome is discussed in Section D.

Aside from domestic production, there are at least three other policy options governments can consider to guarantee the provision of essential goods during crises (Bacchetta et al., 2021). First, increases in inventory stocks of raw materials, intermediate inputs and finished goods, as well as redundancy in production to be able to quickly ramp up the production of essential goods, can help to address bottlenecks in production. Second, diversification of suppliers at the various steps of production in a value chain can increase robustness and resilience, as a negative shock hitting supplies from one location can be offset by substitute supplies from other locations. Third, innovative solutions can be explored to quickly switch production from non-essential to essential goods when needs arise. Since the outbreak of the COVID-19 pandemic, many companies have repurposed production plants and idle manufacturing capacity to supply personal protection equipment and medical supplies, and have begun to use 3D printing technology to increase manufacturing of face shields and ventilators (Fiorini, Hoekman and Yildirim, 2020; Statt, 2020).

(ii) The role of trade in channelling foreign demand

Trade can also cushion the potentially detrimental effect of socioeconomic shocks, such as violence and conflicts, political shocks and economic crises. Firms that participate in trade have a greater likelihood of surviving through times of economic downturn, especially through exports, although the underlying mechanisms may differ (Amendola et al., 2012; Costa, Pappalardo and Vicarelli, 2014; Eppinger et al., 2018; Görg and Spaliara, 2014; Narjoko and Hill, 2007).

One of the reasons why exporting firms can better withstand macroeconomic shocks is that they tend to demonstrate higher productivity and better resilience to adverse external events, as trade drives out the less productive firms and engenders resource reallocations in favour of the surviving firms (Melitz, 2003). Exporting firms are more efficient than non-exporters and are less likely to fail in the face of shocks, such as foreign exchange rate movements and tariff reductions (Baldwin and Yan, 2011) and the 2008-09 global financial crisis (Amendola et al., 2012). Similarly, internationalized firms seem to have coped with the COVID-19 pandemic better than firms that operate only in the domestic market (Giovannetti et al., 2020).

While the volume of trade in firms already participating in the export market dropped during the 2008-09 global financial crisis, the number of exporting firms did not, as exporting firms tended to survive through the crisis. For example, in the United Kingdom, exporters outperformed non-exporters during the global financial crisis in terms of employment and sales growth, while facing lesser risks of failing (Görg and Spaliara, 2014). In Spain, even though all firms suffered from economic contraction, firms that consistently exported before and during the crisis were more successful in maintaining the number of employees and productivity compared to non-exporters (Eppinger et al., 2018). Another study using a dataset comprising 4,433 enterprises across 133 countries shows that firms engaged in international trade have taken more resilient actions during the COVID-19 crisis than firms that only operate domestically (Borino et al., 2021). These results underscore the importance of global inter-connectedness and international trade for promoting resilience to economic shocks.

Trade can also enhance the economy's capacity to endure disruptions by diversifying supplier and customer networks. As discussed in Section C2, natural disaster shocks can propagate through input-output linkages within an economy (Barrot and Sauvagnat, 2016; Carvalho et al., 2021), but there is little evidence in support of cross-border transmission of natural disaster shocks beyond firms that have direct and tight trade linkages with a disaster-stricken country. For example, Chinese processing manufacturers with tight trade linkages to US suppliers reduced their intermediate imports from the US following the 2005 hurricane season,

but there has been no evidence of an international propagation of supply shocks along GVCs, and findings also suggest that firms with more diversified suppliers are less affected by the hurricane season (Längle, Xu and Tian, 2020). Similarly, a mapping of firm-to-firm transactions following Hurricane Sandy in 2012 shows little international propagation of the shock. The authors attribute this to the fact that firms embedded in international production networks can more easily substitute partners whose operations have been hampered by a disaster (Kashiwagi, Todo and Matous, 2018).

Trade also offers the possibility of risk diversification when firms are confronted with economic recessions, as falling domestic sales during an economic downturn can be substituted with foreign sales through trade (Amendola et al., 2012; Costa, Pappalardo and Vicarelli, 2014; Eppinger et al., 2018). For instance, Spanish exporting manufacturing firms compensated for their losses in the domestic market during the 2008-09 global financial crisis by expanding into foreign markets (Eppinger et al., 2018). Exporting allows firms to take advantage of better economic conditions in the foreign market, and a higher degree of diversification in markets and products fosters firm survival (Costa, Pappalardo and Vicarelli, 2014).

In the case of regional shocks, the benefits of exporting to foreign markets can be large, as declining demand in the affected region can be compensated by increasing demand in other regions. During the Asian financial crisis of the late 1990s, the export propensity of Indonesian manufacturing firms was associated with a higher chance of survival because of a boost in relative price competitiveness caused by real exchange rate depreciation in the region (Narjoko and Hill, 2007). On the other hand, if negative economic shocks strike globally or relatively harder in foreign economies, the opposite effect can occur. In Germany during the global financial crisis, exporting firms were relatively more at risk because of a worldwide decrease in demand for exports, while importing firms gained from this and were thus more likely to survive through the crisis (Wagner and Gelübcke, 2014).

(iii) Trade policies in coping with shocks

Supportive policies are often necessary for trade to play a positive role in coping with adverse shocks. In particular, trade facilitation measures can speed up the imports and exports of goods and services and thus bridge the gap between supply and demand in the immediate aftermath of a shock. Some governments also resort to the temporary suspension of customs duties or other taxes to facilitate the imports of goods and to help disaster-stricken regions to withstand the shock. Some governments also impose export restrictions when faced with a shock, although such measures often yield detrimental impacts on other countries. Government procurement is often used to supply essential goods in emergency situations.

Trade facilitation

Trade facilitation measures can significantly enhance efficiency in trade and lower trade costs, thereby boosting trade volume and flows. The beneficial role of trade facilitation is particularly pronounced in coping with shocks. Ensuring that customs and other border clearance procedures operate efficiently and promptly is critical in emergency situations to make goods such as food, medical supplies, and emergency equipment available that may be in short supply in countries hit by a shock.

Since the outbreak of the COVID-19 pandemic, several countries have taken trade facilitation measures with the objective of better coping with the crisis. According to the World Bank (2020), some countries have focused on prioritizing the clearance of critical supplies, to facilitate imports and promote inter-agency cooperation, with a view to smoothing trade procedures for these goods. Canada, for instance, has established a special communication channel between the government and firms to minimize confusion over changed regulations. Furthermore, in an attempt to counterbalance the efficiency loss induced by additional sanitary regulations, such as social distancing of personnel, some countries have expanded their trade infrastructure capacity by temporarily expanding facilities or prolonging their operating hours (Sela, Yang and Zawacki, 2020; Vassilevskaya, 2020).

The digitalization of customs procedures and documentation requirements is also conducive to containing the adverse effect of shocks, as it is known to boost efficiency in trade procedures and subsequently to reduce trade costs (WTO, 2021). On top of this efficiency gain, keeping electronic trade records during the pandemic helped to reduce in-person contact, thereby reducing the risk of disruptions caused by contagion, as well as facilitating business (Vassilevskaya, 2020). Since the COVID-19 outbreak, trade operators have been using interim/alternative solutions relying on digitization. During the lockdowns, flows of original documents were severely disturbed, as they were subject to delays or no transmission at all; however, many national laws still require original documents for verification. Thus, without documents, transactions could not be processed, and deliveries could not be made.

The International Chamber of Commerce (ICC) issued a guidance note in April 2020 allowing for some relaxation of procedural requirements for letters of credit, i.e., a commitment by the importer's bank to pay the exporter's bank upon execution of the contract. The guidance note includes recommendations such as a five-day deadline for the presentation of compliant documentation, and a request for governments and central banks to avoid prohibitions on the use of electronic documentation (ICC, 2020). Where it was possible, interim solutions have been found by parties tied to specific transactions, despite the legislation still requiring physical documents and signatures.

Suspension of custom duties and other taxes

The temporary suspension of import restrictions, such as custom duties, is usually taken in response to a shock to ensure that essential goods such as food or medical equipment can continue to be imported and supplied. In response to the elevated demand for imported medical supplies occasioned by the COVID-19 pandemic, 106 governments have implemented 240 reforms that eased imports of these goods since the start of the pandemic (Global Trade Alert, 2021). A number of countries also implemented similar measures on food items and exempted imported goods from value-added tax (VAT) or sales taxes as a means to smoothen importation.

The suspension of import tariffs can also be initiated by trading partners to help a disaster-struck country. For example, the European Union's temporary tariff waiver on goods from Pakistan's main export industries after the floods in 2010 had a significant, positive effect on Pakistani exports to the European Union, and helped to foster employment in Pakistani industries (Cheong, Won Kwak and Yuan, 2017). Further findings suggest that the measures did not negatively impact the European Union's trade with competing countries in the industry.

Despite its beneficial role in coping with shocks, a temporary lift of import tariffs can have adverse side effects on other countries in specific situations. For example, analysis by Bouët and Laborde (2012) using a global computable general equilibrium model indicates that, if export restrictions had been implemented by large net food-exporting countries and import tariffs been relaxed by net food-importing countries following the food crisis of 2007-08, this could have driven up world food prices even further, leading to calamitous impacts for small net importers of food.

Export restrictions

Export restrictions may be implemented to guarantee sufficient domestic supply of essential goods in times of crises and to alleviate inflationary pressures (Abbott, 2012). This tendency has been especially notable in the agricultural sector. During the food crisis of 2007-08, numerous countries tightened their export restrictions in fear of skyrocketing food prices. This included several major grain and rice exporters, which banned or taxed agricultural exports (Abbott, 2012), hoping to achieve domestic market stabilization through these export restrictions, as well as a potential redistributive welfare effect benefitting the consumers. However, export restrictions can have negative effects on trading partners. By reducing the world supply of a product, export restrictions push up world prices, limiting importers' ability to access essential goods, in particular poor countries with limited production capacity.

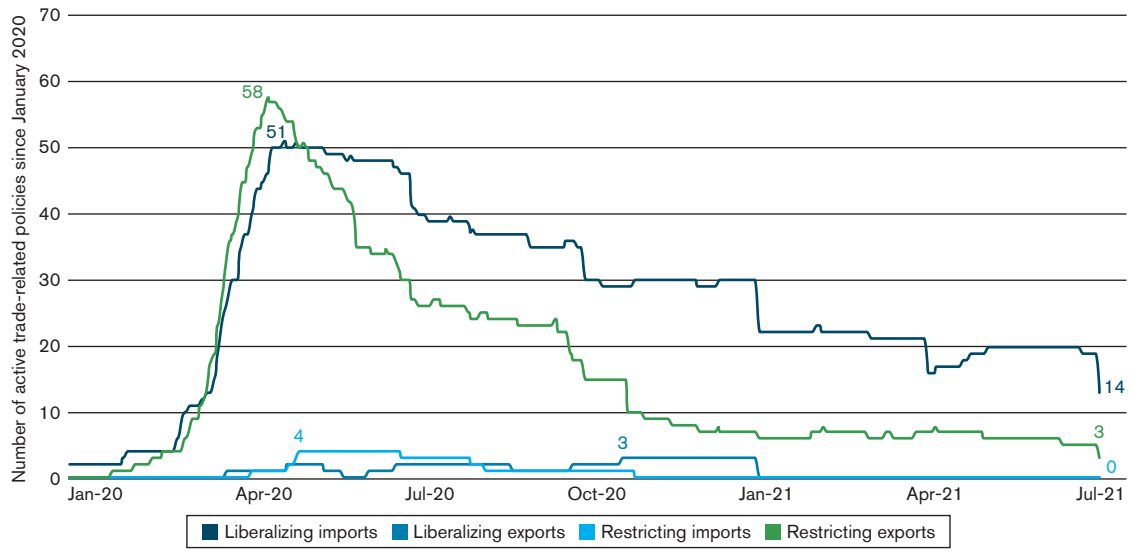
In a global crisis, the negative effects of export restrictions on importing countries are magnified. Since the exporting capacity of some essential medicines and medical equipment is concentrated in a small number of countries, export restrictions by large suppliers effectively denies access to these essential goods to populations in countries that do not produce them (Piermartini, 2004). The increased use of export restrictions on medical goods during the COVID-19 crisis has exposed the fragility of supply chain production, and has been one of the leading factors inflaming the debate over the need to re-shore production of essential goods. The WTO database tracking COVID-19 measures found 58 active restrictive export measures affecting trade in goods in the second quarter of 2020, although some of these export restrictions have since been lifted (see Figure C.6). Similarly, the adoption of restrictions on food exports was found, on average, to exacerbate the initial impact of the COVID-19 pandemic to a reduction of 40 per cent in food export supply and a consequent rise in world food prices of 18 per cent (Espitia, Rocha and Ruta, 2020).

There are at least three reasons why export restrictions during crises can backfire.

First, the production process of essential goods can be complex, requiring many intermediate inputs that have to be partially imported from abroad. If imposing export restrictions generates tit-for-tat retaliation from trading partners, the value chain production process can be jeopardized, with the country imposing the restriction running the risk of ending up with a smaller supply of the essential goods.

Second, by reducing domestic prices, export restrictions reduce the incentives for domestic firms to increase production and invest in new capacity. Such restrictions can also foster smuggling (Fisman

Figure C.6: A majority of COVID-19 trade and trade-related measures are of a trade-facilitating nature



Source: Authors' calculations, based on WTO data on COVID-19 trade and trade-related measures (https://www.wto.org/english/tratop_e/covid19_e/covid19_e.htm).

Note: The figure is based on measures affecting trade in goods confirmed by WTO members.

and Wei, 2004; McDonald, 1985). Similarly, if firms anticipate that they might face export restrictions and thus lower prices during crises (when their goods are in high demand), they will invest less in the production of such goods. Thus, in India, export restrictions in response to the dramatic increase in world grain prices in 2007 and 2008 were followed by a reduction in domestic market efficiency and an increase in domestic price volatility (Baylis, Jolejole-Foreman and Mallory, 2014).

Third, net importers of essential goods will respond to the export restrictions by attempting to build up a domestic production capacity of essential goods in future crises.

Government procurement

As highlighted in Section C3(a), government procurement of goods and services is also important to enable countries to cope with negative shocks. Measures related to government procurement of personal protective equipment (PPE) were introduced during the COVID-19 crisis. Shortly after the outbreak of the COVID-19 crisis in China in January 2020, most of the facemask supplies in China had been ordered by the Chinese government, resulting in a shortage of exports. Exports of facemasks from China resumed in March 2020, and many countries that faced shortages in medical goods engaged in "bidding wars" to divert shipments of PPE to their own country (Hoekman, Fiorini and Yildirim, 2020; OECD, 2020; Ye et al., 2021).

Besides the need to ensure efficient supplies of PPE, access to vaccines to fight COVID-19 is an essential step in the global fight against the virus. The role of government procurement in this regard, from the start of research for the development of a vaccine up to the point of administering the manufactured product to the population, cannot be underestimated. As discussed in Section D, ensuring equitable access to essential goods, including vaccines, is also important, highlighting the important role of international cooperation and coordination of public procurement programmes during global crises.

(iv) Supply chain reorganization to enhance resilience

As described in Section C2, domestic and global value chains can play a role in propagating shocks. Building supply chain resilience can be of crucial importance for many firms. There may also be a role for governments to provide incentives to firms to invest in supply chain reorganization. This subsection discusses firm strategies and government policies to enhance supply chain resilience.

Firm strategies to enhance resilience

A firm's vulnerability can reside in five critical areas: demand planning and inventory management; supplier network structure; transportation and logistics networks; financial fragility; and product portfolio complexity (McKinsey, 2020). The magnitude of losses from supply chain disruptions can be large. A single, prolonged, production-only shock can wipe out between 30 and 50 per cent of a company's earnings, and an event that also disrupts distribution channels would push the losses much higher for some firms (McKinsey, 2020). Building economic resilience can thus be of critical importance for firms' survival. A firm's resilience strategy can include maintaining redundancy (high safety or buffer stocks, additional production capacity) and flexibility (alternative suppliers for sourcing, alternative transportation options), as well as cash flow and balance sheet buffers (Chowdhury and Quaddus, 2017; Dolgui, Ivanov and Sokolov, 2018; Katsaliaki, Galetsi and Kumar, 2021). Easy-to-replace standardized inputs, resilience monitoring (i.e. assessing the time to recover from a shock for each type of supplier) and design of the value chain (i.e. identifying locations and suppliers less subject to risk) can also help when it is necessary to switch production swiftly in response to shocks (Miroudot, 2020). Table C.1 summarizes the various firm strategies to enhance resilience, their advantages and disadvantages.

Diversification in supplier networks is often cited as a critical strategy to help minimize exposure to risk (McKinsey, 2020; Matous and Todo, 2017; Miroudot, 2020; Zavala-Alcívar, Verdecho and Alfaro-Saíz, 2020). As emphasized in Section C4, relying on a single source for critical inputs or suppliers located in the same location can be a source of vulnerability. Having diversified suppliers and a production network spanning various countries enables firms to adjust their production when disruption occurs. For instance, the 2011 Japanese earthquake had a positive effect on firms' total offshoring in manufacturing activities, possibly because the damaged transport network in the Tōhoku area forced some manufacturing firms to replace domestic contractors with foreign contractors (Zhu, Ito and Tomiura, 2016).

Table C.1: Comparison of firm resilience strategy options

Sourcing option	Pros	Cons
Diversification	▪ Allows for easier switching between suppliers in response to supply disruptions. ▪ Diversification of downstream customers can also reduce firms' exposure to demand shocks. ▪ Trade route diversification minimizes disruption to transportation. ▪ Competition between suppliers can encourage suppliers to make investments that facilitate recovery.	▪ On average, sourcing from multiple suppliers reduces the size of purchases from each one, weakening buyer leverage. ▪ Costlier for buyers to identify counterparties that are better managed, less likely to suffer shocks and able to recover faster from disruption. ▪ More time needed to restore full operations after disruption.
Long-term relationships	▪ Facilitate relationship-specific investments, information-sharing and cooperative behaviour that speeds-up recovery from disruption. ▪ Support investments in alternative supplier capacity.	▪ Can result in complacency and diminished incentives to invest in solutions that could otherwise foster recovery from disruption.
Increased inventory stocks	▪ Provides buffer in case of supply shortages.	▪ Increased cost of inventory maintenance and monitoring. ▪ Not feasible to maintain inventory of perishable goods, such as medicines and food.
Enhance supply chain transparency	▪ Allows identification of potential supply chain vulnerabilities. ▪ Allows swift reallocation of resources and inventories in case of disruption. ▪ Digitalization can facilitate supply chain mapping.	▪ Individual firms often do not have information on second- and third-tier suppliers and customers. ▪ Supply chain mapping and real-time monitoring systems require time, resources and planning.
Flexible production across sites	▪ Possibility to switch production swiftly in case of supply shortages.	▪ Requires initial investment in flexible production facilities; production cost likely to be higher per unit of output.
Sourcing from locations with efficient and low-cost logistics	▪ High-quality logistics infrastructure and fewer bureaucratic hurdles can facilitate faster recovery after disruption.	▪ Lean, low-cost logistics tend not to be associated with the redundancy in capacity needed to cope with disruptions (in particular, surges in demand).

Source: Author's summary partially based on Jain, Girotra and Netessine (2021).

OPINION PIECE

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Semiconductors and pandemic resilience

One unsung pandemic-era hero was the mighty semiconductor. Millions of us were lucky to suddenly be able to work, school, or get healthcare from home. All of those new laptops, smartphones, medical devices and data servers needed chips. People could not travel, but open trade meant semiconductors could. As a result, parents continued to work, kids continued to receive education, and many were able to stay safe. Semiconductors helped make many of us more resilient to the crisis.

Things could have gone very differently for the tiny chip. About 10 per cent of all semiconductors are sold to car-makers, with some cars needing upwards of 3,000 different chips. Orders from car companies dried up when commuters disappeared. But for that new stay-at-home generated demand, the semiconductor industry could have suffered the same bankruptcies, layoffs and need for government assistance that impacted so many others.

Semiconductors are made all over the world. Their "inputs", too, are often from far-flung places – the final chip that emerges is from a highly fragmented and global production process. Some companies just design semiconductors. Others only produce them. Some make the equipment for the manufacturers. Others develop software for the designers. Some firms package them up. But each step is essential. If its supply chain weren't diversified and resilient, semiconductor flows could easily seize up.

The industry was hardly in peak form heading into the pandemic. Governments had suddenly discovered how to weaponize chips for other uses. Starting in 2019, the sector found itself caught in a row between Japan and the Republic of Korea, hit with United States-China trade war tariffs, and subject to export controls over cyber-security worries for the telecom sector.

Finally – and more than one year into the pandemic – the world ran short of semiconductors. But even that had less to do with a vulnerable supply chain. Demand just grew too big, too fast. The once-departed car companies returned to the chip market with big orders in hand… only to find an industry running at full tilt.

Overcapacity is the opposite of a shortage. It takes time – and tens of billions of dollars of investment – but the semiconductor companies are building new plants, often with generous financial "help" from policymakers (Busvine and Rosemain, 2021).

Unfortunately, governments have also been known to show chips too much love.

Historically, the semiconductor industry has known booms, busts, and trade not being open. Chips were a major battleground in the 1980s United States-Japan trade war. Through the early 2000s, governments often imposed trade remedies, segmenting markets. The relative policy calm of the last 15 years may come to be known as the industry's period of peak resilience.

Today's semiconductor supply chains also wind through a *Who's Who* of trade protagonists. This interdependence may, in fact, have helped keep the peace during a period of escalating geopolitical tensions. But changing supply chain geography to reduce that interdependence could provoke new vulnerabilities. Freak winter storms, droughts, floods and fires happen. Pandemics happen. Don't forget the pace of technological change. (There are few other industries where a government bet on one firm poses a bigger risk.)

The resilience of the semiconductor industry and supply chain made millions of us better able to manage the crises brought on by COVID-19. Next time might be different.

However, maintaining alternative suppliers imposes additional costs on firms, as they need to invest in multiple suppliers to tailor inputs and to make sure that parts and components from different manufacturers fit together. Certain industries, such as semiconductor manufacturing, are highly concentrated in a few countries and suppliers, because significant upfront investment in production limits the number of suppliers (Leering, Spakman and Konings, 2020). The shortage of semiconductors since the outbreak of the COVID-19 pandemic has caused some downstream industries, such as car and smartphone manufacturers, to halt production (King, Wu and Pogkas, 2021).

In addition to supplier diversification, the diversification of downstream customers can also reduce firms' exposure to demand shocks (Esposito, 2016). The volatility of firms is directly correlated to the lack of diversification in their portfolio of clients, and such risk contributes to aggregate fluctuations (Kramarz, Martin and Méjean, 2020). Research finds that large firms are less volatile than small firms because they are connected to more customers, which improves diversification. A supplier's customer network is more diversified if there is less dispersion in the size of its customers, i.e. if the customers have more or less similar sizes, because shocks to the biggest customers would not then exert an outsized influence on the supplier and raise the supplier's volatility (Herskovic et al., 2020).

Despite the potential benefit of supply chain diversification, most of trade originates or is destined for top trade partners, and thus the level of diversification is still rather low. On average, the top three import suppliers account for 51 per cent of total imports, the top five suppliers for 63 per cent and the top ten suppliers for 79 per cent (see Figure C.7). The level of import diversification differs across countries, with Canada, Mexico and Nepal displaying a higher level of import concentration. Similarly, the top three export destinations on average account for 64 per cent of total exports, the top five suppliers 74 per cent and the top ten suppliers 86 per cent.

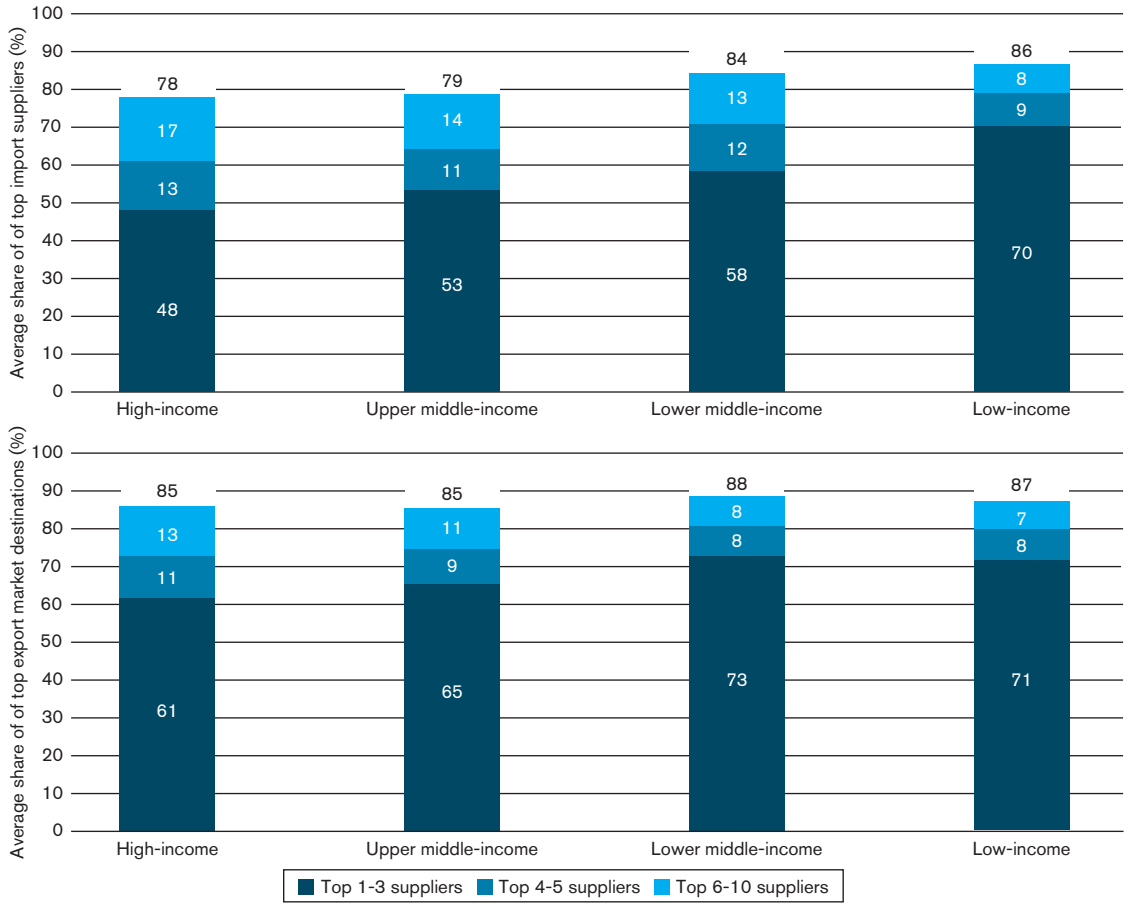
As diversification is not always feasible in certain industries, the organization of GVCs relies on long-term relationships between buyers and sellers (Liker and Choi, 2004; Martin, Méjean and Parenti, 2020). Creating relations with suppliers in GVCs entails a fixed cost, especially for specific inputs, and in case of a shock switching suppliers can be costly and inefficient. Supplier diversification is likely associated with slower recovery from disruptions, while the use of long-term relationships is associated with faster recovery (Jain, Girotra and Netessine, 2016). However, trade policy uncertainty causes a decline in long-term supplier relationships within GVCs even though such relationships increase supply chain resilience (Schott et al., 2017).

Alternatives in transportation and logistics also help to minimize exposure to shocks in trade routes (Katsaliaki, Galetsi and Kumar, 2021; McKinsey, 2020; Rose, 2017). The blockage in the Suez Canal in March 2021, caused by a massive container ship stuck in the waterway, highlights that a lack of diversification in global trade routes can lead to significant supply chain bottlenecks. Some international shipments had to detour around the Cape of Good Hope in South Africa (Veiga, 2021), and an increasing amount of freight was transported between Asia and Europe by rail to avoid shipping delays. Firms with more diversified trade routes are less likely to experience disruptions following a shock (Huang, 2019) and trade often diverts to alternative ports and trade routes after the original trade routes are hit by natural disasters (Friedt, 2021; Hamano and Vermeulen, 2020). Contracting with multiple transport and logistics services and identifying backup providers in advance can help companies reroute critical shipments when a shock hits.

Increased inventory stocks also can help address short-term supply chain disruptions. Inventories enable firms to continue production in the short run, but also to deal with possible changes in prices if a trade partner imposes export restrictions (Glauber et al., 2020). As shocks propagate, the level of inventories kept by each firm also affects partners that belong to the same supply chain, especially in the case of big firms that serve as hubs to spread shocks in the production network. Inventories are a way to smooth the shock for firms that are dealing with delays in supply chains (OECD, 2020d).

Defining the optimal level of inventories at the firm level is a trickier question. Stockpiling of perishable goods such as medicines and foods can results in waste, while limited inventory stocks can make supply chains susceptible to long-lasting shocks. In this regard, economic losses from transport disruptions increase in a non-linear manner with the duration of disruptions, as some firms start to run out of inventory stocks in the face of long disruptions and are forced to delay their deliveries (Colon, Hallegatte and Rozenberg, 2021). In just-in-time supply chains, production is predicated on a downstream demand signal, which is shared between the supplier and the customer in real time (Pisch, 2020). Diligent information-sharing and coordination along the value chain makes managing those additional inventories cheaper and more efficient.

Figure C.7: Supplier and downstream customer diversification remains limited



Source: Authors' calculations, based on the Multiregional Input-Output Table in 2018 by the Asian Development Bank.

Note: The figure shows the average share of top suppliers and destination market for both manufacturing and services sectors in 2018. The bar chart successively shows the percentage share of foreign value added from the top three, the next top two and the next top five import suppliers and/or export destination markets.

To cope better with shocks, it is important to enhance supply chain transparency. Comprehensively mapping the supply chain allows for the identification of potential vulnerabilities. Unfortunately, the visibility companies have within their supply chain usually extends only to one tier above them and one tier below (McKinsey, 2020; Scheibe and Blackhurst, 2018). Digital technologies can play a crucial role in enhancing supply chain transparency and enabling new capabilities of real-time reconfigurations (Rose, 2017). Technologies like big data analytics and artificial intelligence (AI), the Internet of Things, advanced robotics, distributed ledger technology, and digital platforms enable companies to run scenarios, assess trade-offs, improve transparency and responsiveness, and ensure trade compliance (George , Ramaswamy and Rassey, 2014; Goering, Kelly and Mellors, 2018; Katsaliaki, Galetsi and Kumar, 2021; Viswanadham, 2018).

While most companies are still in the early stages of developing such systems, some large multinationals have developed "control towers" across geographies and products that provide real-time information on production networks, from inventory levels to road delays, to support the efficient management of risks (McKinsey, 2020; Miroudot, 2020). When a problem occurs, the system runs scenarios to identify the optimal solution (Cosgrove, 2019). However, the development of such systems requires time and resources, and therefore planning.

Digitalization also plays an important role in strengthening the resilience of firms to shocks. Evidence shows that companies with online capabilities can better withstand disruptions, for instance through sales via e-commerce (McKinsey, 2019). The surge of the COVID-19 crisis has accelerated the use of AI and other forms of

automation. Indeed, investing in automation can help ensure the continuity of production in a crisis and can prevent disruptions in supply chains.

This is particularly important for small firms that have limited resources to sustain disruptions. A survey conducted in the early days of the COVID-19 pandemic showed that 20 per cent of small firms risked shutting down permanently within three months (ITC, 2020). However, small firms that had prepared alternative contingency plans and had online capabilities either gained market shares or suffered less by moving to online marketing and sales either through their own or other established platforms, such as Amazon, Alibaba, Shopify and other similar platforms (Etemad, 2020). In the same vein, a survey by the Canadian Federation of Independent Business (CIBC, 2020) found that of the 26 per cent of business owners that do have online operations, 30 per cent have seen an increase in sales and 25 per cent say they have remained the same compared to pre-COVID-19 levels.

Government policies to enhance resilience

Market failures can prevent individuals or firms from fully anticipating or internalizing the risks of disruptions in supply chains (Bacchetta, Bekkers, Piermartini, Rubínová, et al., 2021). Thus, governments and policymakers may have a role to play in identifying vulnerabilities to supply chain disruptions.

The COVID-19 pandemic has highlighted several potential market failures related to the organization of value chains. A first potential failure is a biased assessment of risks. As an extreme event like COVID-19 hardly occurs in a generation, individuals and firms tend to underestimate the probability of such an event and thus underinvest in mitigation strategies. The behavioural literature suggests that the perception of risks related to rare but impactful events can be biased. For instance, Hong, Wang and Yang (2020) argue that when such events hit, economic agents "overreact" in updating their beliefs and become pessimistic, overestimating the risk, thus reflecting bounded rationality. However, as time passes without the anticipated event happening, their beliefs become increasingly optimistic and they begin to underestimate the risk.

It would also follow that firms tend to under-invest in mitigation in normal times when they underestimate risks. Investment in mitigation strategies benefits everyone in an economy by curtailing aggregate risk, and it therefore constitutes a public good that would be underprovided by private actors.

According to this view, there is a potential role for governments to stimulate investment in strategies that mitigate risks of value chain interruption (Mehran, Morrison and Shapiro, 2011). In this regard, policy tools to incentivize firms to invest in risk mitigation strategies, such as regulatory requirements or tax credits for minimum stockholding of inventories, may help enhance preparedness for shocks.

A second potential market failure is imperfect information about the value chain. Firms have difficulty understanding the implications of the complexity of their value chains and the costs of shocks to the economy. A prerequisite for an efficient mitigation strategy is acquiring full information about the structure of the value chain. While a company knows its exposure to disaster risks via its first-tier suppliers or customers, it may not be aware that it is indirectly exposed to disaster risk via its second- or third-tier suppliers or customers. Moreover, companies may be able to mitigate disaster impact by switching to alternative suppliers (in the case of non-customized inputs), but for that they need to be aware of their options. As searching for suppliers is costly, few firms will have invested in the full mapping of potential suppliers (Bernard, Moxnes and Saito, 2019).

Market failures associated with information frictions can be addressed by promoting transparency, possibly helping companies with information about the organization of value chains and alternative suppliers. For example, since the outbreak of the COVID-19 crisis, the government of Canada has developed indices to identify which industries in an economy are more vulnerable to supply chain disruptions on both the supply and the demand sides. This vulnerability index includes components such as reliance on direct and indirect intermediate inputs or exports, and geographic concentration of imports and exports (Boileau and Sydor, 2020). The US administration also recommends improving ability to track supply-and-demand disruptions and improving information-sharing between federal agencies and the private sector to identify near-term risks and vulnerabilities more effectively.

Governments can also help to identify components critical for the economy, such as critical minerals and semiconductors, and to recommend policies to enhance resilience in the supply of these components (White House, 2021). In particular, identifying supply-chain bottlenecks is crucial to ensure the provision of essential goods. The Asian Development Bank, for instance, has developed supply chain maps for products essential to tackling the pandemic, and allows investors, governments and healthcare professionals to access this information in order to

reach out to the companies involved in these supply chains of goods.

A third potential market failure in the organization of value chains is the presence of spillovers along the value chain: when deciding on the level of diversification and the inventory holding, firms may not fully take into account the impact of their decisions on upstream and downstream firms. While firms may have an incentive to invest in risk mitigation, private incentives may not fully align with what is socially optimal (Grossman, Helpman and Lhuillier, 2021). In the case of large firms that act as hubs in production networks, idiosyncratic shocks at the firm-level can result in volatility in aggregate economic performance (Gabaix, 2011), thus creating a negative spillover for the entire economy. Although such vulnerabilities apply to any supply chain, irrespective of whether it is international or not, the risk of disruptions does become magnified in sequential supply chains that are spread across production locations.

In light of the potential market failures, many governments have introduced measures to enhance supply chain resilience by encouraging diversification, reshoring or nearshoring. Several studies have estimated the efficiency and risks associated with different policy scenarios of supply chain reorganization. In Bonadio et al. (2020), one-quarter of the fall in real GDP is due to the transmission of the COVID-19-induced labour supply shock through global supply chains. However, the "renationalization" of global supply chains does not in general make countries more resilient to pandemic-induced contractions in labour supply. This is because eliminating reliance on foreign inputs increases reliance on domestic inputs, which can also be disrupted by nationwide lockdowns. Overall, the average GDP drop would have been slightly larger in a world without trade in inputs and final goods.

A localized regime, in which economies are less interconnected via GVCs, has significantly lower levels of economic activity and lower incomes (Arriola et al., 2020; OECD, 2021a). It trades less and has less geographic diversification of production stages in supply chains. As a result, a localized regime is found to be more – not less – volatile to shocks, because while shocks that originate abroad have fewer and narrower trade channels to propagate within the localized regime, that regime also provides fewer opportunities for adjustment to the shocks. This lack of adjustment channels leads to increased instability in trade, incomes, prices, and ultimately household incomes and expenditures. Similar conclusions are drawn in a study by the Bank of England (D'Aguanno et al., 2021) and in research by Eppinger et al. (2021). These results indicate that re-shoring might be counterproductive in terms of reducing aggregate volatility at significant cost of welfare losses, while diversifying can lower volatility by making increased use of inputs from the rest of the world.

The studies do not take into account the long-term dynamic effects of international trade in encouraging innovation and diffusing technology across countries (Buera and Oberfield, 2020; Cai, Li and Santacreu, forthcoming). In particular, GVCs can be a powerful channel of knowledge spillovers by intensifying contacts between lead firms and suppliers and facilitating the transfer of know-how and technology required for an efficient production (Piermartini and Rubínová, 2021). Therefore, policies to renationalize GVCs may significantly undermine the benefits of trade in boosting innovation and diffusing knowledge.

(c) Trade can enable countries to accelerate economic recovery

Trade can accelerate economic recovery after shocks and disruptions. In particular, trade allows for the international diversification of demand and supply in such a way that trade flows can recover at a different speed from domestic flows in the aftermath of downturns. Put differently, fast trade recovery can boost economic recovery. Importantly, economic recovery from shocks can also be used to rebuild the trading system in a more equitable and sustainable way.

Whether trade recovers faster than the domestic part of an economy depends on various factors, including the speed of recovery in important trading partners, the nature of the shock, policy responses, and relational aspects of trade, especially within GVCs. These factors are discussed in this subsection. In addition, this subsection discusses the role of trade for the recovery of disadvantaged groups, and examines how economic recovery can be used to build a more resilient trading system.

In addition to these links between trade and economic recovery, trade can also support economic recovery through its impact on the level and growth of GDP. An increase in trade tends to raise productivity and innovation which benefits economic growth. This effect can be particularly strong in the aftermath of crises, when fewer workers and less capital are bound within low-productivity firms. In addition, trade in services such as insurance, transportation and logistics can determine the speed of recovery of both international trade and domestic trade. For instance, it is likely that the surge in transportation costs following the high demand volatility during the COVID-19 pandemic has

slowed down trade and economic recovery. The trade-growth nexus and trade in services have already been discussed in Section C3.

(i) How trade recovery supports economic recovery

Exports form a part of GDP and, hence, a faster recovery of exports leads automatically to a faster recovery of GDP. In addition, a rebound of imports can provide necessary inputs to the domestic economy while it is still coping with a shock. In a large sample of countries, almost all experienced more rapid trade growth than GDP growth after the trough in the second quarter of 2020, as can be seen in Figure C.8, given that most of the points are below the 45-degree line, with trade growth on the horizontal axis. While this is partially attributable to the sharp drop of trade in the second quarter of 2020, it still indicates that trade has accelerated economic recovery during the COVID-19 pandemic.

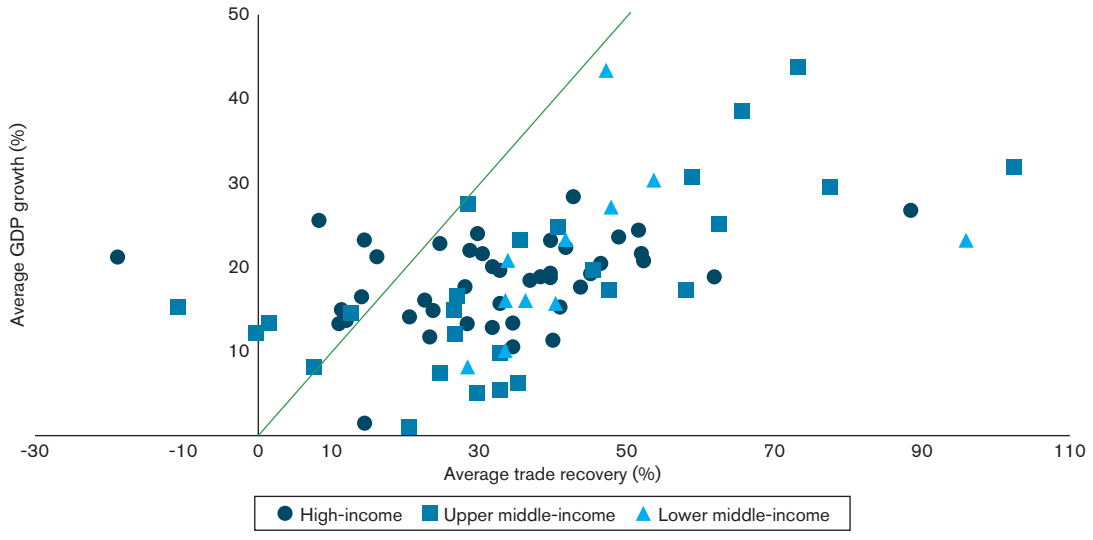
It is important to understand the determinants of trade recovery in order to understand how trade can contribute to economic recovery more broadly. There are various reasons why international trade may recover at a different speed from domestic economic activity. Firstly, trade can benefit from beneficial supply or demand conditions abroad. Secondly, shocks can have differential impacts on the traded sectors of an economy *vis-à-vis* the non-traded sectors, which, in turn, affects the speed of recovery. Thirdly, trade and trade-related policies can lead to differences in the speed of recovery between trade and domestic sales. Finally, the nature of relationships between firms in GVCs can differ from relationships among domestic firms, and can determine how fast trade recovers.

International demand and supply as a driver of trade recovery

The importance of foreign demand-and-supply conditions to trade can lead to a divergence between how fast the traded sector recovers from a disruption compared to the non-traded sector. In the case of a purely domestic shock, or if the crisis persists longer in the domestic market than elsewhere, trade linkages to other countries can be an important source of supply and demand. These linkages can start the recovery process even before the end of the coping period. In contrast, when the shock is less severe domestically than abroad, the traded sector can slow down economic recovery.

In the context of the COVID-19 pandemic, the beneficial impact of foreign demand and supply can be seen from the relatively strong rebound of trade starting in the third quarter of 2020. This rebound was driven in particular by trade with countries in which the virus was more contained at that time (see Section B5) (Ossa and Le Moigne, 2021; WTO, 2021). Ossa

Figure C.8: Economic recovery has been associated with trade recovery during the COVID-19 pandemic (second to fourth quarter of 2020)



Sources: Authors' calculations, based on World Bank GDP data (https://data.worldbank.org) (quarterly GDP) and WTO trade data (https://data.wto.org).

Note: The GDP growth rate and trade recovery rate are defined as the percentage change from Q2 to Q4 2020. Trade levels were at their lowest point in April/May 2020. The green line represents the 45-degree line.

and Le Moigne (2021) argue, for instance, that the rapid recovery of production by the Chinese economy in the second and third quarter of 2020 stabilized the supply of goods globally. GDP recovered faster in the second half of 2020 in countries with strong pre-existing trade linkages to countries with few COVID-19 cases at that time (see Figure C.9). The list of countries in the note to Figure C.9 highlights that this effect is partially due to the presence of China, as it was by far the biggest trader among the countries with low rates of COVID-19 infections. Using data from January to June 2020, Espitia et al. (2021) show that the sustained imports of inputs from abroad led to a faster recovery of exports in supply-chain-integrated countries compared to countries relying primarily on the domestic supply of inputs.

More generally, in the aftermath of shocks, imports and offshoring tend to increase under certain conditions which can facilitate recovery of domestic production and exports and relieve the pressure on domestic supply chains (Gassebner, Keck and Teh, 2010; Osberghaus, 2019; Zhu, Ito and Tomiura, 2016). Trade recovery might benefit from changes in preferences that shift demand towards exports from the affected country in the form of a solidarity effect: when foreign importing countries are culturally close to a country affected by shocks or host a relevant diaspora, their imports from the affected country increase up to the point that the negative effects of the shock are balanced out (El Hadri, Mirza and Rabaud, 2018).

The positive impact of foreign demand and supply on trade recovery can be shaped by the diversification of the trading network. As noted above, the question of whether foreign demand and supply can accelerate recovery depends on the impact of shocks on the domestic economy relative to foreign economies. A diversified network, both with respect to the number and the spatial distribution of suppliers and customers, reduces dependence on any particular location or firm and thereby increases the likelihood of having access to stable demand and supply from abroad. The fact that diversification through trade can help countries recover from shocks is supported by the literature on trade and volatility, which finds mainly volatility-reducing effects of trade, especially if trade is diversified (see, for example, Burgess and Donaldson, 2012; Caselli et al., 2020; Haddad et al., 2013). The role of diversification for resilience is discussed in more detail in Section C4.

The nature of the shock and its impact on trade recovery

Different shocks have different sectoral and geographical implications, and this has consequences for trade recovery. Due to the COVID-19 pandemic, international trade declined sharply in the second quarter of 2020 but recovered quickly over the following months (see Section B5). While services trade remains depressed, trade in goods is almost at pre-crisis levels one year after the pandemic hit

Figure C.9: Trade linkages help to accelerate GDP growth during the first year of the COVID-19 pandemic

Sources: Authors' calculations, based on Oxford Group Database "COVID-19 Data Explorer" (https://ourworldindata.org/explorers/coronavirus-data-explorer) (number of cases), IMF World Economic Outlook Databases (https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases) (GDP growth in 2020) and IMF trade data (https://data.imf.org).

Note: Countries with a lower number of COVID-19 infections are those which had an average number of below five daily new confirmed COVID-19 cases (rolling seven-day average) in the second half of 2020 according to the Oxford Group Database, namely: Afghanistan, Angola, Australia, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, China, Egypt, Eritrea, Guinea-Bissau, Liberia, Madagascar, Malawi, Mali, Mongolia, Mozambique, New Zealand, Nicaragua, Niger, Nigeria, Rwanda, Senegal, Sudan, Tanzania, Thailand, Timor-Leste, Togo, Uganda, Viet Nam and Zimbabwe. Trade shares were calculated based on 2019 trade flows (average of exports and imports).

(WTO, 2021). In contrast, the recovery of trade after the 2008-09 global financial crisis took substantially longer and remained incomplete for a protracted period of time (Ossa and Le Moigne, 2021).

A comparison of the COVID-19 pandemic with the 2008-09 global financial crisis illustrates how the nature of shocks affects the speed of trade recovery. To begin with, demand and supply were affected differently in 2020 compared to 2009. In 2009, the demand for domestic services in part cushioned the sharp fall in demand for manufactured goods, particularly in developed countries. The subprime crisis resulted in financial defaults among many highly indebted private economic agents, leading to a sudden contraction of the consumption of durable goods in developed countries (Eaton et al., 2016). Durable goods, such as cars or machinery, account for a significant share of merchandise trade, but high-value finished goods also drive trade trends for the intermediate parts and components needed to produce them. The 2008-09 global financial crisis also paralysed corporate investment, as the element of aggregate demand had the highest import share (Auboin and Borino, 2017). The collapse in the demand for investment and durable manufactured products was a major driver of the trade collapse (Bussière et al., 2013).

In contrast, the sanitary crisis and related lockdowns of 2020 affected aggregate supply and demand mainly through the services sector. Services output accounts for 80 per cent of GDP in the most advanced countries, and 50 to 60 per cent in developing countries, an even greater share than in 2009 relative to manufacturing, whose share of GDP has continued to erode (WTO, 2019b). The collapse in global economic activity in the second quarter of 2020 was mainly driven by sharp declines in the demand and supply of services, domestically and internationally (World Bank, 2021c). Domestic retail and wholesale trade, tourism and travel, hospitality, entertainment and cultural activities, and, in general, many activities requiring face-to-face interactions have been severely affected by the lockdowns.

The effects of the pandemic on trade in durable goods differed from those of previous recessions (Espitia et al., 2021; Ossa and Le Moigne, 2021), because the increase in remote work, home schooling, and reliance on home entertainment increased demand for electronic devices. The lockdown did not greatly limit purchases of these goods, as customers can observe and compare their characteristics online; the share of e-commerce in global retail trade rose from 14 per cent in 2019 to 17 per cent in 2020 – a trend which is expected to continue throughout the recovery from COVID-19 (UNCTAD, 2021). Additionally, the high demand for medical goods since the outbreak of the pandemic supported trade flows (Ossa and Le Moigne, 2021). All these changes contribute to explaining the fast recovery of goods trade.

The comparison between the 2008-09 global financial crisis and the ongoing COVID-19 pandemic highlights that the sectoral dimension of shocks is central to the question of whether trade recovery slows down or accelerates broader economic recovery. The global financial crisis hit the real estate and financial sectors first; its impact then hit the heavily traded durable and investment goods sectors. In combination with other factors, such as the contraction of trade finance availability, this caused a slow recovery of trade, hampering economic recovery. In contrast, the COVID-19 pandemic limits economic activity most strongly in sectors that are less trade-intensive, with the exception of tourism, while it raises demand for trade-intensive goods. This allows trade to recover faster and to support economic recovery. Interestingly, in the past, trade in services was more resilient to shocks than goods trade, for instance after the global financial crisis (Loungani et al., 2017), perhaps because demand for services tends to be less cyclical and their production is less reliant on external financing (Borchert and Mattoo, 2009). While these considerations remain valid, the limits on face-to-face interaction during the COVID-19 pandemic have affected services trade more than trade in goods.

Local shocks allow trade to recover faster than global shocks. If a shock is limited to a single country, the likelihood that the country's international trade recovers faster than its domestic trade is high, as demand and supply from abroad remain stable. In contrast, if the domestic economy is less affected by a shock than its trading partners, trade recovery might be slower. However, if foreign demand is sustained by policy measures such as fiscal stimuli, the fact that domestic supply is unaffected by a shock can even lead to an increase in exports and, as a result, to a faster recovery of trade even in such a scenario. This is evidenced by China's substantial export growth in the second half of 2020.

The nature of the shock also matters. In contrast to health or financial shocks, large natural disasters and conflicts can cause severe damages to seaports or airports, as well as to other transportation infrastructure (see Section B3). This can slow down trade recovery significantly. Thus, the ability to substitute between ports accelerated the recovery of exports from the 2011 earthquake in Japan considerably, especially with respect to perishable goods and goods subject to just-in-time supply chain demand (Hamano and

Vermeulen, 2020). This is consistent with findings that small countries, which tend to have fewer domestic alternatives, tend to be more affected by natural disasters than large countries (European Commission, 2012; Gassebner, Keck and Teh, 2010). Cole et al. (2017) also show that having alternative transportation arrangements increases the speed of recovery, and Hosoya (2016) and Taghizadeh-Hesary et al. (2019) provide further evidence that the quality of infrastructure can substantially accelerate recovery.

Finally, the nature of a shock can induce actions that allow trade to be more resilient and recover faster in future crises. The COVID-19 pandemic has increased the flexibility of firms by boosting both private and public investments in digital infrastructure. The Inter-American Development Bank (2020) reports, for example, that businesses in Latin America and the Caribbean achieved more digital progress over the first months of the COVID-19 crisis than they did in years. These investments were made in conjunction with regulations that made working from home more widespread and efficient. The ensuing increase in firm flexibility has not only increased the coping abilities of economies but has also accelerated recovery, as digital investments lower trade costs, which enables firms to draw more benefit from their participation in international supply chains.

Policy as a driver of trade recovery

Fiscal and monetary policies are a major determinant of trade recovery; indeed, they can have a larger impact on trade than trade policy itself (see Section B6(b) on the role of trade policy in trade recovery). Importantly, policy responses to shocks can have significant medium- to long-term impacts on trade recovery beyond their immediate impact, for instance by affecting trade balances and the political economy surrounding them.

The fiscal stimulus enacted in response to the COVID-19 crisis by several countries is considered to be one of the main reasons why trade has been recovering so quickly from its trough (WTO, 2021). Generous fiscal stimuli in advanced countries have eased the contraction of the domestic economy and have also boosted demand in other advanced, emerging and developing markets. UNCTAD (2021c) presents quantitative evidence confirming positive spill-over effects emerging from the 2020 fiscal stimulus package of the United States, in particular to its neighbouring countries through trade linkages. The OECD (2021c) estimates that the large US fiscal package increased GDP in 2020 by 0.5-1 per cent in Canada and Mexico and by 0.25-0.5 per cent in China and the Euro area by accelerating trade recovery in these regions. Chudik, Mohaddes and Raissi (2021) argue that accommodative macro policies in advanced countries lead to a reduction of volatility in global financial markets and mitigate capital outflow pressures in emerging countries. In line with these estimates, Figure C.10 shows that fiscal stimuli in advanced economies during the COVID-19 pandemic led to sizeable increases in imports, to the benefit of exporting nations.

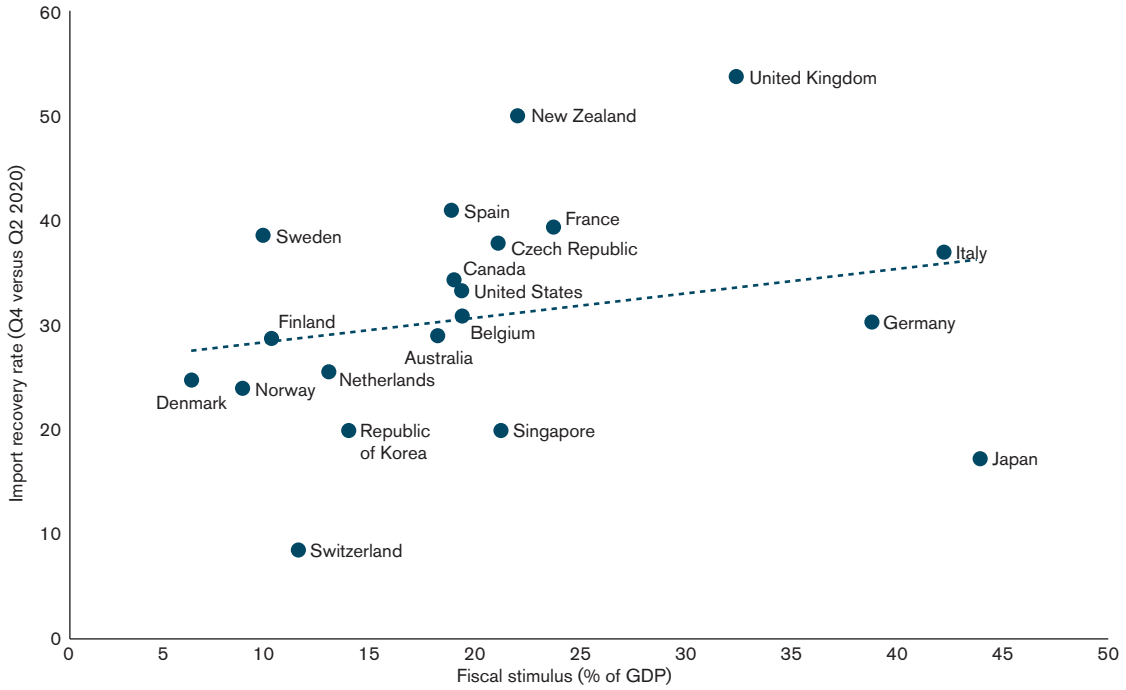
However, the downside of fiscal stimuli is widening current account deficits, which can have medium- and long-term impacts on trade recovery. The US fiscal stimulus is estimated to have widened the current account deficit by 0.75 per cent of GDP during the first year of the stimulus (OECD, 2021c), and both bilateral and multilateral trade imbalances are robust predictors of future tariff increases from 2009 onward (Delpeuch, Fize and Martin, 2021). As fiscal stance is one driver of such imbalances (IMF, 2020), differences in the fiscal response to COVID-19 between economies could aggravate trade tensions and lead to trade-restrictive measures. Moreover, as argued by Röhn et al. (2015), growing current account deficits in the aftermath of economic crises make countries susceptible to shifts in foreign investor sentiment, leading to a sudden deterioration of a country's financial situation. This can slow down trade recovery considerably.

Like fiscal stimuli, expansionary monetary policy can accelerate trade recovery by ensuring stable financing conditions and by contributing to currency depreciation, which in turn increases a country's competitiveness, at least temporarily (Dornbusch, 1979; Inoue and Rossi, 2019). However, currency depreciation can become a zero-sum game when other countries apply similar strategies, thus hindering a global recovery. Interestingly, Beattie (2021) argues that, in the context of the COVID-19 pandemic, the scenario of a weak dollar and a subsequent currency war is rather unlikely. Instead, the extensive US fiscal stimulus package could lead the US Federal Reserve System to tighten monetary policy, which could result in an appreciation of the US dollar. This suggests that an appropriate balance between monetary policy and fiscal stimuli is critical in the aftermath of a crisis to prevent exchange rate distortions. Mishra and Rajan (2016) advocate the international collaboration of countries in the implementation of macroeconomic policies to avoid adverse spill-over effects such as exchange rate distortions.

The relational nature of GVCs

Trade within value chains can be more resilient than other aspects of trade due to the relational nature

Figure C.10: Fiscal stimuli led to quickly recovering imports during the first year of the COVID-19 pandemic



Sources: Authors' calculations, based on the IMF Database of Fiscal Policy Responses to Covid-19 (https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19) and IMF trade data (World Exports and Imports) (https://data.imf.org).

Note: Import recovery is defined as the percentage change of total imports in Q4 2020 as compared to Q2 2020.

of value chains (see also Section C4(b)). Recent estimates suggest that more than two-thirds of global trade occurs within value chains (WTO, 2019). Some relationships between firms in GVCs are characterized by long-term, just-in-time practices that require closer links between firms than more shallow one-off transactions. These firms can also trade highly differentiated inputs that lead to significant interdependencies between them. Based on survey evidence from France, a study finds that about 60 per cent of French international trade flows depend on firms relying on just-in-time supply chains employing about two thirds of all French manufacturing workers (Pisch, 2020).

The advantage of long-term supply chain relationships for recovery can be manyfold, as they create incentives for cross-firm support in terms of technology or capital both during and outside of crises. Long-term relationships in supply chains can raise profitability by decreasing the need for inventory stock and costly quality inspections, as repeated interactions increase the incentives for suppliers to ensure quality (Schott et al., 2017). Bombardini et al. (2020) find that firms with a higher share of long-term supply chain relationships benefit from size and productivity effects; for example, Cajal-Grossi, Macchiavello et al. (2019) report that international buyers pay larger mark-ups to the suppliers in the Bangladeshi garment sector with whom they have more long-term relationships. Similarly, Minetti, Murro et al. (2019) show that small and medium-sized Italian firms exposed to bank credit rationing and which have weaker relationships with banks benefit from long-term trading relationships with large and international trading partners as an alternative means of addressing liquidity shortages. In addition, Pisch (2020) argues that information flows and transparency are higher within just-in-time supply chains due to the high coordination requirements.

Long-term relationships can increase the likelihood that a firm's trading links will survive crises, which, in turn, allows for a faster recovery. If long-term supply chain relationships offer an additional margin of adjustment during shocks, they can make firms more resilient and allow them to recover faster. For example, publicly traded US firms recover faster from supply shocks when relying on long-term relationships compared to firms with a more diversified supply network and more *ad hoc* transactions (Jain, Girotra and Netessine, 2021).

However, long-term relationships in supply chains can also slow down recovery, because they are costly to establish and involve significant sunk costs (Antràs, 2020; Beverelli et al., 2019). This implies that when a disruption severs such a relationship, it can take time to replace it. In a period of heightened uncertainty, such as during or following a shock, fewer new supply chain relationships are formed, and this affects products that more commonly feature long-term relationships (Martin, Méjean and Parenti, 2020). Reliance on long-term relationships also implies that the supplier network is less likely to be diversified, which can lead to bottlenecks when shocks are concentrated. Thus, firms with more diversified supply networks recovered faster from the 2011 Tōhoku earthquake and tsunami (Cole et al., 2017; Todo, Nakajima and Matous, 2015), and Toyota and other automobile manufacturers, one of the earliest adopters of long-term relationships in supply chains, moved to a more diversified supply network in response to the earthquake (Matous and Todo, 2017).

This at first sight contradictory evidence suggests that the questions of whether firm-to-firm relationships survive shocks and whether supply-chain support can mitigate the impact of shocks are central to determining whether the relational nature of supply chains supports or slows down economic recovery. Natural disasters or conflicts are geographically concentrated, and can lead to severe production disruptions even if lead firms can ease the liquidity constraints of suppliers during the shock. In contrast, the impact of macroeconomic and financial shocks or of technological and operational shocks can be significantly mitigated by intra-supply-chain support. This notion is empirically buttressed by evidence from Chile showing that firm-to-firm supply chain links are resilient in small shocks but can be severed by relatively large shocks (Huneeus, 2018).

As a result, the evidence can be interpreted in two ways. First, it can suggest that the relational aspect of GVCs can indeed facilitate trade recovery. However, such a positive link requires the survival of firm-to-firm links even during large shocks. Firms can increase the resilience of supply-chain links by monitoring their suppliers, including suppliers beyond the first tier and other strategies (see Section C4(b) and Miroudot, 2020), but policies to that effect are necessary too. During the 2008-09 global financial crisis and the COVID-19 pandemic, several countries enacted short-time work schemes that allowed firms to retain workers even during periods of subdued demand or lockdowns (OECD, 2020a), rather than letting them go. This can accelerate recovery by sustaining the accumulated job-specific experience of employees and reducing the need for costly and time-consuming employee searches once demand picks up again or post-lockdown. A similar approach may be needed for firm-to-firm links in supply chains. While many of the existing policies targeted at firm survival contribute to the survival of links, more targeted policies, that take into account key bottlenecks in global supply, might be possible.

Second, the evidence suggests that diversified supply networks might be more conducive to the fast recovery of supply chain trade in more conflict-prone regions, or in regions that are more frequently affected by natural disasters, while long-term relationships are preferable for most other regions. Optimal supply chain organization needs to take into account regional characteristics and risk profiles in order to improve the ability of supply chains to recover from shocks rapidly.

(ii) Trade and the economic recovery of disadvantaged groups

In the discussion on economic resilience and the role of international trade, it is critical to pay attention to the resilience of disadvantaged groups in society. As already noted in Section B, the effects of a crisis on certain demographic groups or types of firms, such as MSMEs, are generally more severe than on other segments of the population, but their recovery is of vital importance for the resilience of the entire society (ITC, 2020). Similarly, least-developed countries (LDCs) have fewer resources to dampen the effects of crises and depend on foreign markets for recovery.

Unfortunately, disadvantaged groups are typically less prepared for a crisis event, often due to resource constraints and unequal access to information. This means that the impact of a crisis can be relatively more severe for these groups and they will struggle more to be resilient and will need more time, on average, to return to pre-crisis levels. International trade, which is critical for imported supplies and creating demand for exported goods and services, plays both a direct and indirect role in the recovery of these groups.

Trade disruptions generally have an indirect negative impact on women and MSMEs. Women are often employed in services sectors that engage in low levels of cross-border trade, like education, health and social services, and are disproportionately engaged in informal trade at border crossings in certain developing countries (Bouët, Odjo and Zaki, 2020; WTO, 2018). Similarly, many MSMEs participate relatively less in trade directly, being more reliant on domestic demand (The Economist, 2014; WTO, 2016). As a result, research shows relatively

smaller trade losses attributable to these populations (Hallegatte, 2014; The Economist, 2014; Wheatley, 2021; World Bank, 2021b; WTO, 2016). However, a significant amount of trade in some developing economies occurs at border crossings and is carried out by MSMEs and informal businesses, meaning that border closures can severely disrupt these small-scale traders (UNCTAD, 2021a; World Bank and WTO, 2020a).

Even if they are not direct traders, these groups can still be important links in global supply chains and indirectly dependent on international trade (The Economist, 2020). According to a recent Asia-Pacific Economic Cooperation (APEC) survey, the majority of the MSMEs surveyed were connected to at least one large business (McAuley, 2020), and manufacturing enterprises such as apparel, footwear and electronics, especially in developing economies, which are tightly linked to GVCs, often principally employ women (World Bank and WTO, 2020).

Many of the issues considered elsewhere in this report are particularly important for LDCs. For example, LDCs do not have the resources to sustain a large domestic stimulus policy, and inevitably these economies need to turn abroad to find demand for their products and services and to stimulate economic growth (Razzaque and Ehsan, 2019). In terms of infrastructure, following a disaster, especially a natural event like a storm or hurricane, external assistance – whether in the form of physical aid or emergency workers – must arrive via the same channels as regular trade, and LDCs may find it challenging when a large influx of assistance arrives following a catastrophe unless they already have a strong trading system in place to compensate for the necessity of sharing infrastructure channels (Jackson and Roberts, 2015). In order to support trade by LDCs, it is recommended that institutional capacity development improve trade facilitation (including the digitalization of trade processes), transportation infrastructure and customs changes, so that the cross-border trade of small shipments may be encouraged (UNCTAD, 2021a).

For many vulnerable groups, gaining access to any kind of credit can be a struggle. These groups have fewer resources and more trouble sourcing funding, especially trade finance, either because they lack the required documentation and know-how, or because the amounts they need are too small to interest a commercial lender. This means that these groups are often obliged to rely on internal funds or finance from friends and family, all of which are less reliable than commercial lenders (ADB, 2013; World Bank, 2021b).

Those MSMEs that do access financing are highly dependent on bank loans, whereas banks are not dependent on MSMEs for their business revenue, and this creates an unequal power relationship (Gourinchas et al., 2020; The Economist, 2009). Economic crises, such as in 2008-09, when finance became scarce across the board, can create significant problems for businesses without other financing options, as banks turn away from more risky subjects like MSMEs (The Economist, 2009). Although there are significant differences in access to finance by businesses based on macroeconomic levels of development, smaller firms are more constrained across the board (Apedo-Amah et al., 2020). Indeed, Dursun-de Neef and Schandlbauer (2020) found that, while access to finance declined for all firms at the start of the COVID-19 pandemic, the decline in trade credit was larger for smaller firms. The difficulties in guaranteeing trade finance mean that exporting MSMEs have a harder time both coping with and recovering from shocks.

Women in certain economies and demographic groups can also experience significant difficulties in accessing finance, whether because of collateral requirements or gender discriminatory banking requirements, and this can constrain recovery and trade for firms owned by women in such circumstances (UNCTAD, 2021b; World Bank, 2021a).

Trade facilitation policies, especially those that support global supply chains, could be one of the most efficient ways to speed recovery by helping MSMEs to participate as exporters and/or importers and increasing the trade volumes of those that already participate in trade. Measures such as the automation of border processes, the simplification of fees and non-tariff barriers, the streamlining of procedures and the inclusion of MSMEs in regulatory consultations, would be the most efficient ways to help these firms recover from the current shock and become more resilient in the future (OECD, WTO and UNCTAD, 2021). Trade facilitation measures that make full use of digital solutions can also be especially beneficial to small, cross-border traders, many of whom, in certain economies, are women (Sun and Larouche-Maltais, 2020).

(iii) Economic recovery as a means to build a more sustainable trading system

This report particularly examines how trade affects economic resilience, and economic recovery can also provide an opportunity to rebuild the trading system in a more sustainable, resilient and equitable way. This subsection looks at how economic resilience,

and in particular, recovery can lead to a better trading system.

Job losses and broken relationships between suppliers and customers caused by crises lead to substantial welfare losses, but they can also lead to the improved reconstruction of supply chains, and of trade more generally. Substantially fewer resources are tied down during crises and, hence, resources can more easily be shifted to sustainable purposes. Crises can also reveal important information about existing problems in the trading system, from bottlenecks in supply chains to distributional inequities, pointing to where improvements are needed. Related to the previous subsection on disadvantaged groups, recent research has highlighted that the gains from trade are not shared equally among workers or regions (WTO, 2017; WTO et al., 2019) and that barriers in the trading system can prevent, for instance, women or MSMEs from fully participating in trade (WTO, 2020; WTO, 2016). In addition, the trading system can do more to address global challenges, from climate change to decent work in supply chains (UN Global Compact, 2018; WTO and UNEP, 2018). Building a more sustainable trading system also can raise productivity, increase transparency, incentivize innovation and unlock demand for sustainable goods.

Policy incentives can make an important contribution when building a more sustainable trading system. In this regard, the substantial fiscal and monetary responses to the COVID-19 pandemic could be important tools to incentivize firms to address societal and environmental concerns. According to a survey conducted by the OECD (2020b), many OECD member countries have either already evaluated the ecological and social impact of implemented rescue measures and packages or are planning on doing so for forthcoming programmes. Similarly, many developing countries are including green production and inclusiveness targets in their fiscal responses to the pandemic.

The European Union's new trade policy strategy, for instance, is built around a sustainability pillar which includes aspirations to integrate the Paris Agreement on climate change into all future trade agreements, to frequently evaluate the effectiveness of implemented measures, and to use the information gained in future negotiations (European Commission, 2021a). The fiscal stimulus package is intended to help build a greener, more digital and more resilient Europe.

In another example, United States Trade Representative Katherine Tai focused in her first speech in this position, in April 2021, on trade policy as a tool to protect the environment and tackle climate change. She emphasized that trade agreements should include environmental provisions going forward (Office of the United States Trade Representative, 2021).

In another example, the Government of Colombia has organized its recovery package around five pillars, including clean and sustainable growth and support for vulnerable and rural communities (Gobierno de Colombia, 2020).

Finally, the Republic of Korea's stimulus package aims to transform its economy from a carbon-dependent economy to a green one (IMF, 2021).

Policy can also help firms to establish supply chain links that ensure that trade is environmentally and socially sustainable. The United Kingdom and France have already passed laws requiring firms to conduct due diligence checks on their supply chains, while Germany and the European Union are in the process of passing or formulating laws. An important side benefit of due diligence laws is that they can increase transparency along supply chains and, thereby, increase resilience. This allows firms to also ensure that other policy goals are achieved, such as the better representation of women-led firms in the supply chain, or the reduction of CO_2 emissions and the strengthening of labour and ecological standards (Granskog et al., 2020; McKinsey Global Institute, 2020).

Some of these policies are based on the United Nations Guiding Principles on Business and Human Rights, which can serve as a building block for countries working on due diligence laws. When drafting a supply chain due diligence law, authorities must consider potential difficulties that come with it, such as the related increase in transparency requirements, as well as compliance and trade costs for firms. A suitably formulated law, complemented by capacity-building, can guarantee solid export possibilities, in particular for developing countries and their MSMEs. The recovery process after a crisis is likely an optimal point in time for such laws, given that supply chains are naturally restructuring in this period.

Gender inequality has also received increased, albeit more limited, attention, in particular as COVID-19 has led to a widening of already existing gender gaps (see Section B3(c)). After evaluating the impact of its first COVID-19 rescue investment programme on gender equality, Iceland pledged to adjust the subsequent fiscal package in order to give stronger support to women (OECD, 2020b). The Government of Canada has allocated CAD 100 million to its Feminist Response and Recovery Fund (Government

of Canada, 2021). The European Commission has also included gender equality as a consideration in its fiscal stimulus package (European Commission, 2021b). The American Rescue Plan Act of 2021 includes components that help schools and day-care institutions to remain open and financially supports families with children – measures which help women engaged in trade in particular (American Rescue Plan Act of 2021, 2021).

Policies that attempt to capitalize on digitalization can also help to address the trade-gender inequality nexus, as well as the trade-regional inequality nexus. They also help MSMEs to connect to foreign markets by lowering information frictions and market access costs, which tend to be particularly restrictive for smaller firms (WTO, 2016).

The Government of Malaysia has, for example, introduced measures that aim to increase job security in the gig economy (i.e., in which firms tend to hire independent contractors and freelancers rather than full-time employees) and accelerate digital technology transformation and the reskilling and upskilling of Malaysians to serve international clients while working from home (Said, 2020). The Government of Peru has implemented measures to connect more than 3.2 million Peruvians from the country's rural areas to the internet (Gobierno de Peru, 2021). The European Commission has announced that one-fifth of its fiscal stimulus package will be spent on the digital transformation (European Commission, 2021b). The Government of Ireland plans to address regional inequality by creating a network of 400 remote working hubs and using tax breaks to support employees working from home (Government of Ireland, 2021), as a means to helping workers who are less mobile or more time-constrained due to domestic responsibilities. This is often particularly the case for women, and can lead to inequities in the trading system (Bøler, Javorcik and Ulltveit-Moe, 2018; Orkoh and Stolzenburg, 2020; World Bank and WTO, 2020).

These examples highlight that the aim to build a stronger and fairer trading system influences the fiscal response of a range of countries with the governments of the world's 50 largest countries having invested US$ 341 billion in green recovery between the onset of the COVID-19 crisis and early 2021. However, while this is a large figure, it accounts for only 18 per cent of what these countries spent in total on long-term recovery from the pandemic up until then (O'Callaghan and Murdock, 2021), and a significant part of COVID-19-related funding has been earmarked for carbon-intensive sectors.

Respective measures include airline bailouts and expanding coal mining, as well as investments in oil and gas generation. G20 governments have announced support for fossil fuel industries which considerably exceed the sum budgeted for clean energy (SEI et al., 2020). Moreover, UNCTAD (2020b) states that it is not only environmental aspects which have fallen short in recent stimulus packages, but also issues of gender equality, food security and agriculture, which have been addressed to an insufficient extent given the targets set by the United Nations Sustainable Development Goals (SDGs) and the setback to the SDGs caused by the pandemic. As a result, the fiscal response will likely fall short to address the inequities and vulnerabilities of the trading system.

In addition, elements of fiscal responses that support re-nationalizing supply chains are unlikely to increase resilience and may be justifiable only for very finely specified products. The present report highlights the fact that international trade and cooperation are the most efficient tools to achieve an optimal trade-off between efficiency and resilience. It also highlights the importance of diversification for trade and economic resilience. Policies that support the geographical diversification of suppliers rather than re-shoring therefore appear better adapted to address concerns about bottlenecks in supply chains. Some countries have put in place financial incentives to support supply chain reorganization. Japan has, for example, allocated around US$ 5 billion to enhance domestic manufacturing or diversify supply chains in Asia. However, the majority of the funds have been used so far for domestic re-shoring (Nohara, 2021).

Nevertheless, researchers agree that a more sustainable recovery is still attainable. As argued by O'Callaghan and Murdock (2021), committing to sustainable investments has become easier for governments in 2021 than it was in 2020, when measures were largely focused on taking urgent control of the pandemic. With a widening scope for funding going to long-term recovery policies, governments now have the opportunity to invest more sustainably relative to what has been observed since the outbreak of the health crisis. UNCTAD (2020b) proposes that the SDGs can serve as a blueprint for action in this regard.

Concrete measures that can be taken include promoting green energy and transport, supporting energy efficiency, increasing the transparency of countries' climate balances, retraining workers, and committing to global cooperation (Geddes et al., 2020; O'Callaghan and Murdock, 2021; OECD, 2021d; SEI, 2020). Researchers emphasize that a commitment to a

green global recovery is not only crucial for the future of the planet, but is also beneficial economically, as it can support stronger growth, counteract structural inequality, and yield the potential to create millions of future-oriented jobs (Harvey, 2020; O'Callaghan and Murdock, 2021; Goodall, 2020).

4. The role of trade diversification in resilience

One of the most important insights to be gathered from the discussion in previous sections is that diversification of the production and export structure is an important determinant of the ability of countries to prepare for, cope with and recover from shocks. If the production and export structure is concentrated in a few products, price volatility is likely to translate into large fluctuations in export revenues, increasing aggregate (i.e. macroeconomic) volatility. If exporting is concentrated on few export destinations, destination-specific demand shocks will also have a large impact on export revenues and volatility, and the capacity to take advantage of positive spillover effects of foreign import demand during recoveries will be limited. In the absence of geographical import diversification, destination-specific supply shocks are likely to propagate in the economy, again increasing aggregate volatility.

This section digs deeper into the impact of trade diversification on preparing for, coping with, and recovering from shocks. The first part of this section shows evidence that export and import diversification dampen volatility, which is considered an indicator of lack of resilience to shocks, i.e., trade diversification increases resilience to shocks.

At the same time, there is evidence that diversification in the aggregate (at country-level) has increased only modestly in recent decades. This is likely due to two factors. First, micro-level differences in diversification due, for instance, to the entry and exit of firms that may differ in their degree of diversification, may not be captured by aggregate measures. Second, it may be difficult for international firms to highly diversify their import and/or export structure in the presence of the fixed costs of entering foreign markets, or to build a large pool of suppliers of intermediate goods or services in the presence of various transaction costs. This will limit aggregate trade diversification.

In the light of the beneficial impact of export and import diversification in enabling to prepare for, cope with and recover from shocks, the section also discusses which government policies foster diversification of the trade structure of the economy.

At the outset, it is worth emphasizing that several of the aspects of international firms' diversification that contribute to aggregate trade diversification depend on the organization of supply chains, which is discussed in Section C3. This section complements the discussion in Section C3 by focusing on the channels through which aggregate trade diversification increases the ability of countries to prepare for, cope with and recover from shocks, and by discussing which policies can foster diversification.

(a) Trade diversification reduces volatility, thereby increasing resilience

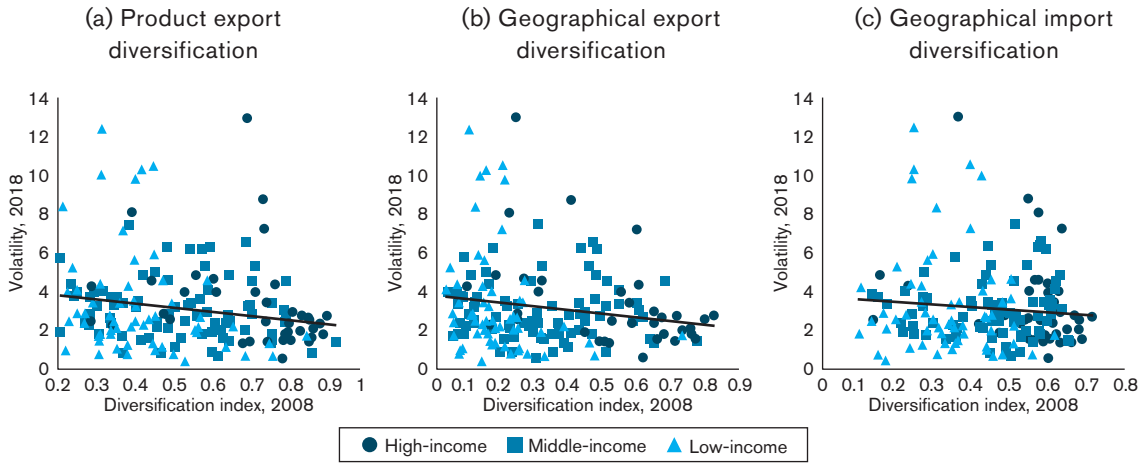
Aggregate (i.e., country-level) volatility negatively affects economic growth. As reported by WTO (2014), the principal channel through which volatility reduces growth is through its damaging effect on capital accumulation, as it makes the returns on investment in human and physical capital more uncertain. Welfare losses may also arise because of the difficulty in smoothing consumption. Furthermore, volatility tends to worsen income inequality.

Figure C.11 presents descriptive evidence of a negative correlation, at the country level, between macroeconomic volatility – defined as volatility in the cyclical component of GDP, i.e. volatility around the trend growth of GDP – and various measures of export and import diversification that are used throughout this subsection: product export diversification, geographical export diversification, and geographical import diversification.[28]

The negative empirical correlation between trade diversification and aggregate volatility displayed in Figure C.11 confirms that trade diversification enhances resilience.[29] This is likely to occur because of the "diversification through trade" mechanism highlighted by Caselli et al. (2020). Trade allows a country to diversify its sources of demand and supply, thereby reducing the country's exposure to country-specific demand and supply shocks. For example, when a country has multiple trading partners, a domestic recession or a recession in any one of its trading partners translates into a smaller demand shock for its producers than when trade is more limited (WTO, 2014). Openness reduces volatility through this diversification mechanism as long as it does not expose a country to disproportionately large and volatile trading partners or partners whose shocks are highly correlated with a country's own.[30]

Caselli et al. (2020) estimate that for all of the 24 countries in their analysis, except China, macroeconomic volatility would have been larger had trade costs not decreased since the early 1970,

Figure C.11: Trade diversification reduces macroeconomic volatility



Sources: Authors' calculations, based on IMF World Economic Outlook Databases (https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases) and the BACI database (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp).

Note: Volatility is computed as the standard deviation of the ten yearly GDP growth rates observed in the period 2007-17. In each panel, the diversification index is computed as 1 - HH, where HH is the respective Herfindahl-Hirschman (HH) index. In panel (a), the HH index of product export concentration is used. This is calculated, for each exporting country *i*, as a simple average across all importing countries *j* of bilateral (*ij*-specific) HH indexes $HH_{ij}=\sum_{k=1}^{K}(\frac{M_{ijk}}{M_{ij}})^2$, where *k* indexes Harmonized System six-digit (HS6) products (HS 2002 classification, BACI data) and $\frac{M_{ijk}}{M_{ij}}$ is the share of each *k* in total exports of *i* to *j*. In panel (b), the HH index of geographical export concentration is used. This is calculated, for each exporting country *i*, as a simple average across all HS6 products *k* of exporter-product (ik)-specific HH indexes $HH_{ik}=\sum_{j=1}^{I}(\frac{M_{ijk}}{M_{ij}})^2$, where $\frac{M_{ijk}}{M_{ij}}$ is the share of each *j* in total exports of *k* by *i*. In panel (c), the HH index of geographical import concentration is used. This is calculated, for each importing country *j*, as a simple average across all HS6 products *k* of importer-product (*jk*)-specific HH indexes $HH_{jk}=\sum_{i=1}^{I}(\frac{M_{ijk}}{M_{ij}})^2$, where $\frac{M_{ijk}}{M_{ij}}$ is the share of each *i* in total imports of *k* by *j*. Since HH concentration indexes constructed as described above range from zero to one, diversification indexes (1 – HH) also range from zero (no diversification) to one (complete diversification).

i.e. they show that volatility decreased because of declining trade costs. The diversification mechanism decreases volatility in most countries (17 out of 24) considered by Caselli et al. (2020), and it has an average impact on volatility of -41 per cent.

The relevance of the diversification mechanism discussed above should naturally be larger, the more diversified a country's import and export structure is, both in terms of product scope and in terms of geographical scope. This is, at least partly, confirmed in a sample of 77 economies at various stages of economic development (during the period 1976-2005), where product diversification moderates the relationship between trade openness and macroeconomic volatility: for about half of the countries in the sample that are sufficiently diversified, trade openness reduces output volatility (Haddad et al., 2013).

(b) How has trade diversification evolved over time?

Trade diversification evolves slowly over time, and countries that have reached a certain level of development tend to reconcentrate their production and exports structure (see Cadot, Carrère and Strauss-Kahn, 2011; Imbs and Wacziarg, 2003). However, as shown by Koren and Tenreyro (2007), they tend to do so in intrinsically less volatile sectors, with little impact on macroeconomic volatility (i.e. without becoming less resilient).

With these caveats in mind, this subsection presents descriptive evidence that trade diversification has increased, in the aggregate, in recent years. Figure C.12 displays indexes of product export diversification (left panel) and of geographical export diversification (right panel) in 2003 (horizontal axis) and in 2018 (vertical axis). Most observations lie above the 45-degree line, indicating an increase in export diversification, in particular in terms of geographical scope, between 2003 and 2018.

The aggregate measures of export diversification displayed in Figure C.12 do not necessarily reflect similar trends in the evolution of export diversification at the level of individual firms, which is important because the extent of diversification by individual firms matters for aggregate fluctuations. The sparse

available firm-level evidence on export diversification does not allow analysis over time. However, it suggests that most exporting firms have generally low levels of diversification.

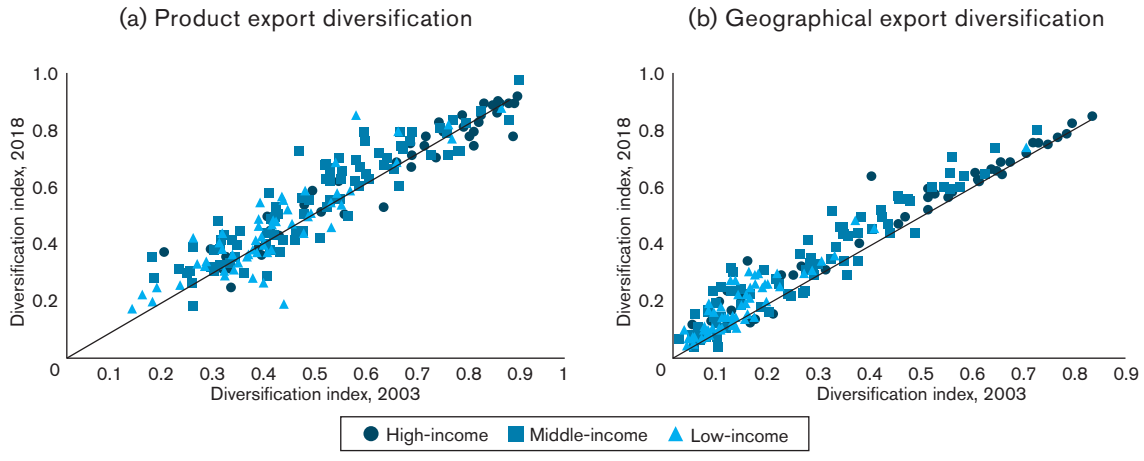
In 2007, large French exporters tended to serve more destinations and more buyers within a destination than small exporters: the 20 per cent of firms that served more than six EU destinations accounted for almost 70 per cent of the value of French exports, and the 12 per cent of exporters with more than ten partners in a destination represented 40 per cent of the aggregate flow (Kramarz, Martin and Méjean, 2020). Even large exporters, however, were poorly diversified: 60 per cent of French exporters had at least 90 per cent of their sales in a single destination country, while 90 per cent of French exporters had at least half of their sales in a single destination country. And among the 12 per cent of exporters that served more than ten buyers, many served tiny importers with a cumulative share of less than 10 per cent of the firm's exports.

Overall, for the vast majority of French exporters, at least half of export sales were accounted for by a single partner in a single destination (Kramarz, Martin and Méjean, 2020). These exporters were largely exposed to buyer- and match-specific demand shocks, which could, in principle, be diversified along the firm's portfolio of sales. Since large exporters were also the largest firms in the economy, and in light of the fact that idiosyncratic shocks to large firms contribute to aggregate volatility (Gabaix, 2011), the limited diversification of large exporters exposed the overall economy to more macroeconomic volatility.

Export volatility and export diversification in China were negatively correlated for large exporters over 2000-06, but positively correlated for small exporters (Vannoorenberghe, Wang and Yu, 2016). They explain the latter result by noting that among small exporters, a more diversified pool of destinations makes firms more likely to export occasionally to some markets, thereby raising export volatility. Consistent with Kramarz, Martin and Méjean (2020), export diversification was found to be limited: on average, a Chinese firm exported to seven markets in 2000-06, but 70 per cent of the export value went to the top destination.[31]

Import diversification has attracted comparatively less attention by policymakers than export diversification (Cadot, Carrère and Strauss-Kahn, 2014). Diversification by source country might impact productive efficiency and welfare in two ways (Jaimovich, 2012). First, products from different countries within the same category may be imperfect substitutes. For both intermediate and final goods, a larger set of import sources will raise welfare because of "love for variety" effects. Second, diversifying the sources of imports reduces exposure to country-specific demand and supply shocks, since importers can mitigate those shocks by shifting part of their spending to suppliers from other countries. Furthermore, in the absence of diversification on the import side, countries are exposed to the risk of policy

Figure C.12: Product and geographical export diversification has increased in recent years



Source: Authors' calculations, based on the BACI database (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp).

Note: The figure compares the product and geographical export diversification indexes between 2003 and 2018. See note to Figure C.11 for the definitions of the diversification indexes. The straight line is the 45-degree line. Product export diversification (panel (a)) increased for 136 countries, while it decreased for 85 countries. Geographical export diversification (panel (b)) increased for 174 countries, while it decreased for 47 countries.

changes, such as export restrictions, in exporting countries (Bacchetta et al., 2021).[32]

In line with studies such as Parteka and Tamberi (2013), Figure C.13 provides descriptive evidence that import diversification has increased, in the aggregate, in recent years. The figure displays indexes of geographical import diversification in 2003 (horizontal axis) and in 2018 (vertical axis).[33] Most observations lie above the 45-degree line, indicating an increase in geographical import diversification between 2003 and 2018.[34]

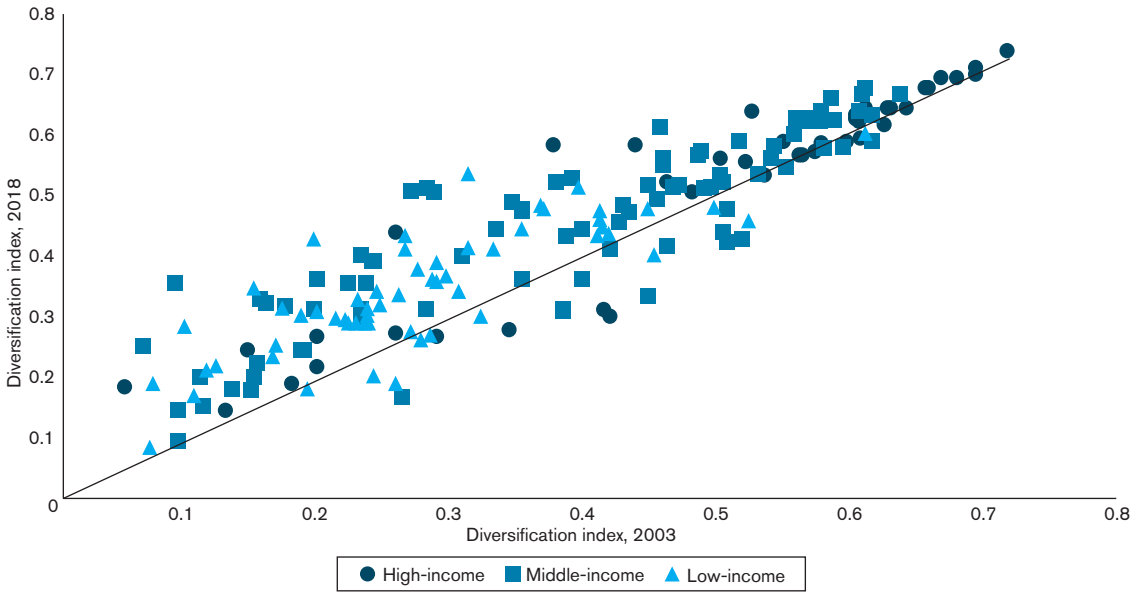
As mentioned in Section C3, the outbreak of the COVID-19 pandemic has revived interest in import diversification to avoid supply bottlenecks, especially in essential goods. The available evidence only concerns levels, rather than changes over time, and does not provide detailed firm-level information. Nonetheless, the extreme concentration of imports in terms of number of suppliers appears to be rare (Guinea and Forsthuber, 2020; Jaravel and Méjean, 2021).[35]

(c) Despite the presence of sector-specific obstacles to diversification, government policy can help

Many of the costs incurred by international firms in organizing their trade network are fixed, i.e. independent of the amount produced, and sunk, i.e. they can hardly be recouped (Antràs, 2020). Fixed costs constitute a "technological" obstacle to trade diversification that should be taken into account when designing policy to foster diversification (discussed below). The fixed costs of entering foreign markets limit the degree of export diversification by reducing the degree of variation in the extensive margins of trade, i.e. number of products exported or of destinations served (Helpman, Melitz and Rubinstein, 2008).[36] Fixed costs also limit the ability of firms to build a pool of suppliers from a large number of countries (Antràs, Fort and Tintelnot, 2017) and, therefore, the extent to which import diversification is possible. As discussed by Bacchetta et al. (2021) in the context of supplier diversification in value chains, fixed costs that limit or prevent such diversification are sector-specific, and hinge on three economic characteristics.

First, some manufacturing sectors are capital-intensive, featuring significant economies of scale (McKinsey Global Institute, 2020), including significant upfront investment in production and cost savings due to large orders, which are logical obstacles to the diversification of suppliers. Descriptive aggregate evidence consistent with the insight that capital intensity can constitute an obstacle to diversification is provided in Figure C.14, which shows a negative correlation between capital intensity and import geographical diversification at the country-level.

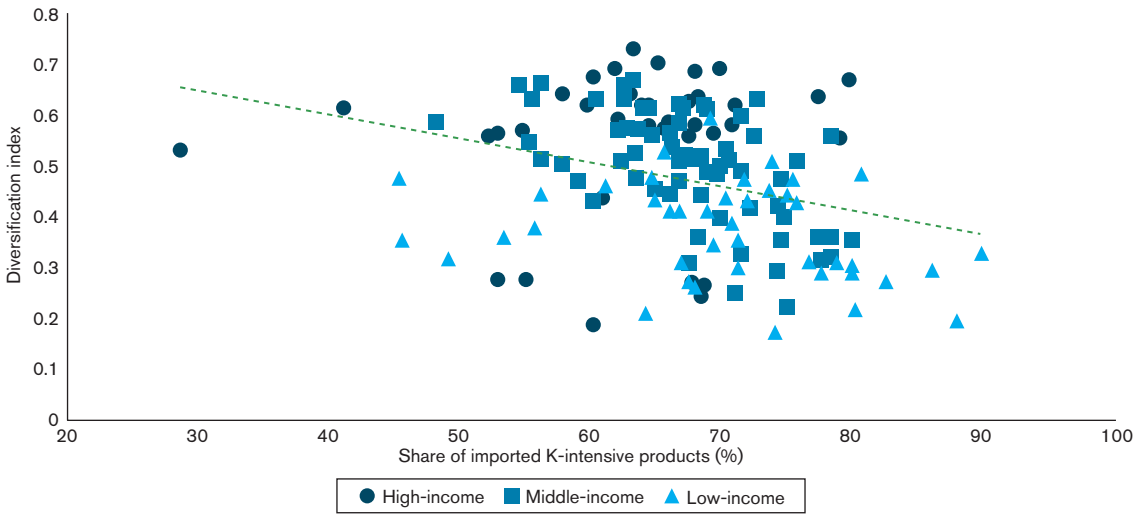
Figure C.13: Geographical import diversification index has increased in recent years



Source: Authors' calculations, based on the BACI database (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp).

Note: The figure compares the geographical import diversification index between 2003 and 2018. See note to Figure C.11 for the definition of the diversification index. The straight line is the 45-degree line.

Figure C.14: Capital intensity can hinder geographical import diversification



Sources: Authors' calculations, based on the BACI database (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp), Comtrade (https://comtrade.un.org), and NBER-CES Manufacturing Industry Database (https://www.nber.org/research/data/nber-ces-manufacturing-industry-database).

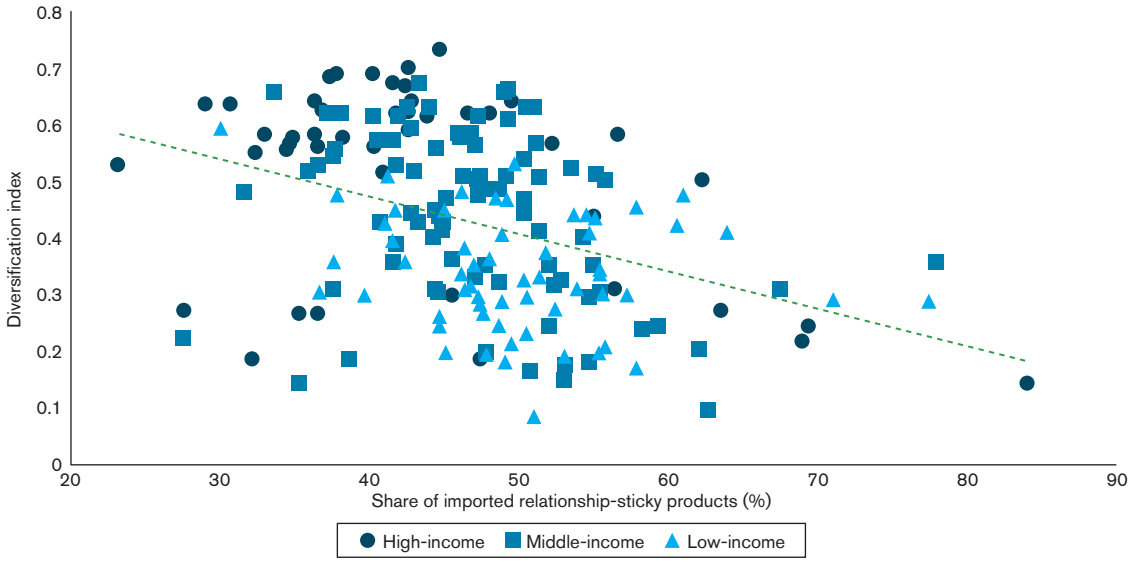
Note: The figure compares capital intensity with geographical import diversification in 2018. The diversification index is the same as used in panel (c) of Figure C.11. See note to Figure C.11 for its definition and construction from BACI data. The capital intensity is measured by the share of imported capital-intensive products computed, from COMTRADE data, as the ratio of overall imports by importing country j in Standard Industrial Classification (SIC) industries k that are classified as capital-intensive to overall j's imports. Capital-intensive industries are defined as those industries with capital intensity above the median value of capital intensity across all SIC industries. Following Romalis, (2004, p.79), capital intensity for each SIC industry is computed, from NBER-CES data, as $1 - \frac{wL_k}{VA_k}$, where wL_k is total industry payroll and VA_k is industry value-added.

Second, relationships between buyers and sellers along supply chains are complex and require relationship-specific investments, such as purchasing specialized equipment or customizing products. This means that suppliers and buyers need to develop specific relationships to configure production through repeated interactions, especially in the presence of weak contract enforcement (Antràs, 2020). Identifying new suppliers and managing the production process can be costly and time-consuming, resulting in a certain "stickiness" in supply chain relationships (Huneeus, 2018; Monarch, 2021). Based on the duration of individual buyer-seller relationships in French trade statistics, Martin, Méjean and Parenti (2020) construct a sector-level index of relationship stickiness, showing that it is correlated with measures of relationship-specificity and contract complexity. Descriptive evidence that such relationship stickiness is an obstacle to diversification on the import side is provided in Figure C.15, which shows a negative correlation between the share of imports of relationship-sticky products in total imports and geographical import diversification at the country-level.[37]

The third sector-specific characteristic affecting the costs of diversification is the intangible component of production. Sectors differ widely in their intellectual property rights (IPR) intensity (EPO and EUIPO, 2019), as well as in the amount of tacit, non-codifiable knowledge in the production process (WTO, 2020b). In IPR-intensive sectors, as well as in sectors where knowledge is largely tacit, the fear of expropriation of intellectual property or imitation may prevent companies with intangible assets from engaging with a wide range of suppliers, and rather opt for vertical integration where the company owns or controls its suppliers (Antràs and Yeaple, 2014; Bolatto et al., 2017). Descriptive evidence in Figure C.16 suggests, however, that countries that import relatively large amounts of patent-intensive and copyright-intensive products tend to do so from a well-diversified set of importers. This positive correlation might be explained by the fact that rich countries, which are more diversified, are also on average the largest importers of sophisticated products, which are more IPR-intensive.[38]

Against this background of a series of sector-specific obstacles to diversification, governments

Figure C.15: Relationship stickiness can constitute an obstacle to geographical import diversification



Sources: Authors' calculations, based on the BACI database (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp) and Martin, Méjean and Parenti, (2020).

Note: The figure compares relationship stickiness and geographical import diversification in 2018. The diversification index is the same as used in panel (c) of Figure C.11. See note to Figure C.11. for its definition and construction from BACI data. The share of imported relationship-sticky products is computed as the ratio of overall imports by importing country *j* in HS6 products *k* that are classified as relationship-sticky to overall *j*'s imports. Relationship-sticky products are defined as products with relationship stickiness above the median in the classification of Martin, Méjean and Parenti, (2020).

have employed a toolkit of policies to promote trade diversification. Such a toolkit is vast, because there are many factors that affect the incentives of firms to export or import new products, and to export or import existing products to (from) new markets.

Four considerations are worth making at the outset.

First, the type of trade diversification that has mostly been at the forefront of the academic debate and of economic policy is export diversification.[39]

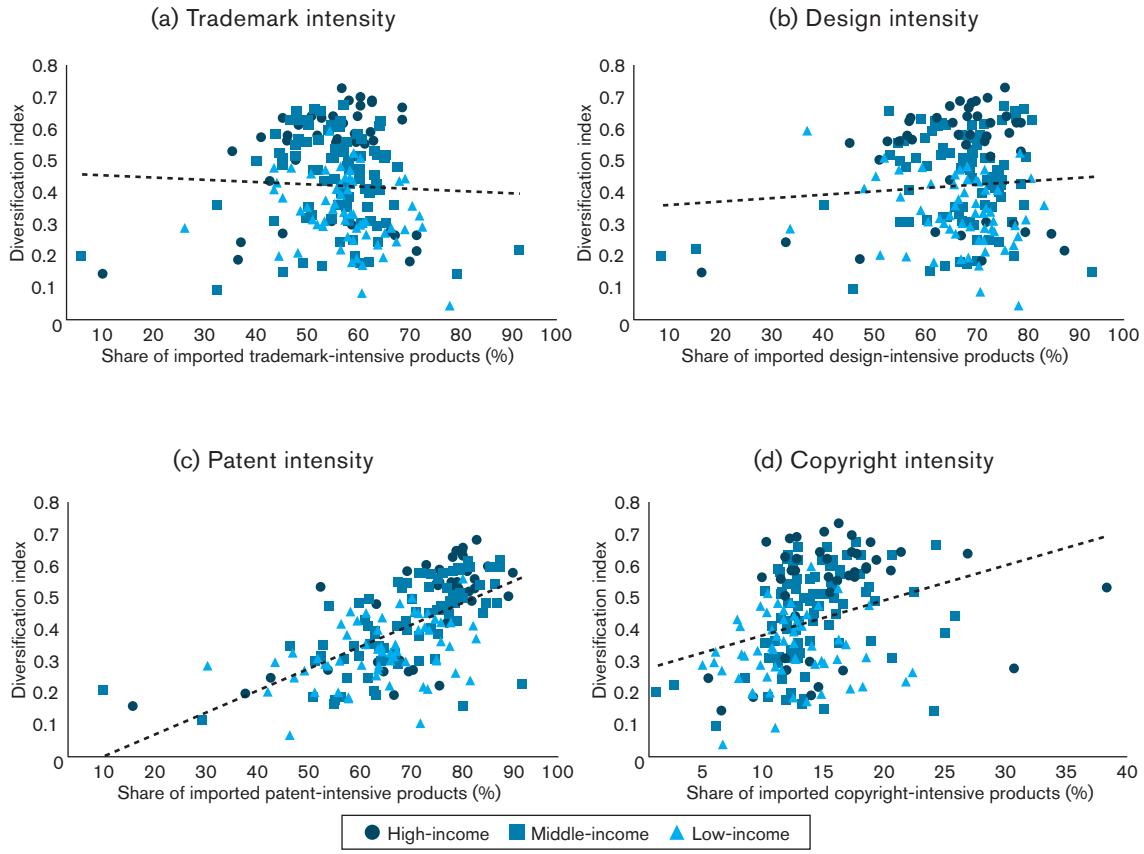
Second, since firms' export and import diversification increases with firms' productivity, any policy that increases firms' productivity (including policies to promote innovation, discussed in Section C of WTO, 2020b) is also likely to increase diversification.

Third, government intervention to support trade diversification is justified by various market failures. These include lack of information about the destination countries; positive spillovers on other firms resulting from a firm's investment in acquiring information on whether a new product can be exported profitably; the threat of entry by imitators, which reduces the number of "discoveries" of export destinations;[40] and inter-industry spillovers, whereby export discoveries in one industry lead to discoveries in another industry (Hausmann and Hidalgo, 2011).

Fourth, there is no one-size-fits-all approach when it comes to policies to foster diversification, neither across countries nor within countries. At the initial stages of economic development, industrial policy, such as subsidies, may have limited impacts if institutions are weak and there is limited capacity to implement complex policies (OECD and WTO, 2019).[41] Box C.3 discusses the need for diversification in Africa and the role of the African Continental Free Trade Agreement (AfCFTA) in promoting diversification.

Four types of policies tend to foster trade diversification (OECD and WTO, 2019).[42] First, an appropriate incentive framework needs to be in place. A clear, transparent and predictable business regulation and investment policy can create incentives for firms to diversify by reducing the costs and risks of investing in new activities. Tax regulation, credit and labour market regulation, entry and exit business regulation, intellectual property rights regulation, and investor protection laws determine the incentives of firms to engage in new activities.

Figure C.16: Well-diversified importers tend to import more patent-intensive and copyright-intensive products



Sources: Authors' calculations, based on the BACI database (http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp) and European Patent Office (EPO) and European Union Intellectual Property Office (EUIPO) (2019, Table 47).

Note: The figure compares different measures of IPR intensity with geographical import diversification in 2018. The diversification index is the same as used in panel (c) of Figure C.11. See note to Figure C.11 for its definition and construction from BACI data. EPO and EUIPO (2019) define various dimensions of IPR intensity (including the trademark, design, patent, and copyright intensity used in the figure) for 353 NACE[43] rev.2 industries. To create the share of imports that are IPR-intensive, HS6 products in BACI are aggregated into ISIC[44] rev.3 sectors and then matched with the NACE rev.2 classification, following several crosswalks (ISIC rev.3 – ISIC rev 3.1 – ISIC rev.4 – NACE rev.2). A dummy equal to one is defined for all NACE rev.2 products that fall within an ISIC rev.3 and are IPR-intensive. IPR intensity for each ISIC rev.3 sector is computed as a simple mean of the IPR-intensity of NACE rev.2 products. An ISIC rev. 3 sector is classified as IPR-intensive if its corresponding value is higher than the average value of IPR-intensity across all ISIC rev. 3 sectors. The share of imported IPR-intensive products is computed as the ratio of overall imports by importing country *j* in ISIC rev. 3 sector *k* that are classified as IPR-intensive to overall *j*'s imports.

The appropriate design of trade policy, both at home and abroad, can foster diversification. Export diversification and upgrading the value-added content of exports are hindered by import protection at home, which acts like a tax on exports because it raises the relative price of imports relative to exports (Lerner symmetry). Tariff escalation (i.e., a situation in which relatively higher imports duties are applied on processed products compared to those on the corresponding raw products) in destination markets is also likely to hamper export diversification, while there is evidence that some trade preference programmes affording developing countries and LDCs high preferential margins from tariffs and favourable rules of origin, such as the Generalized Scheme of Preferences (GSP), lead to increasing ranges of export products (Persson and Wilhelmsson, 2016).[45]

Standards and other non-tariff measures in destination markets can increase exports by addressing information asymmetries on product quality and safety (WTO, 2012), but they can also raise fixed market entry costs, limiting export diversification.[46] Dennis and Shepherd (2011) find

Box C.3: The role of regional trade cooperation in coping with and recovering from the COVID-19 pandemic in Africa

The COVID-19 pandemic resulted in a fall in Africa's GDP growth from 3.3 per cent in 2019 to 2.1 per cent in 2020 (ADB, 2021), as Africa experienced its worst recession in 50 years. In East Africa, for example, sectoral cash flows plummeted, particularly in services requiring face-to-face contact, like tourism and hospitality (see Figure C.17).

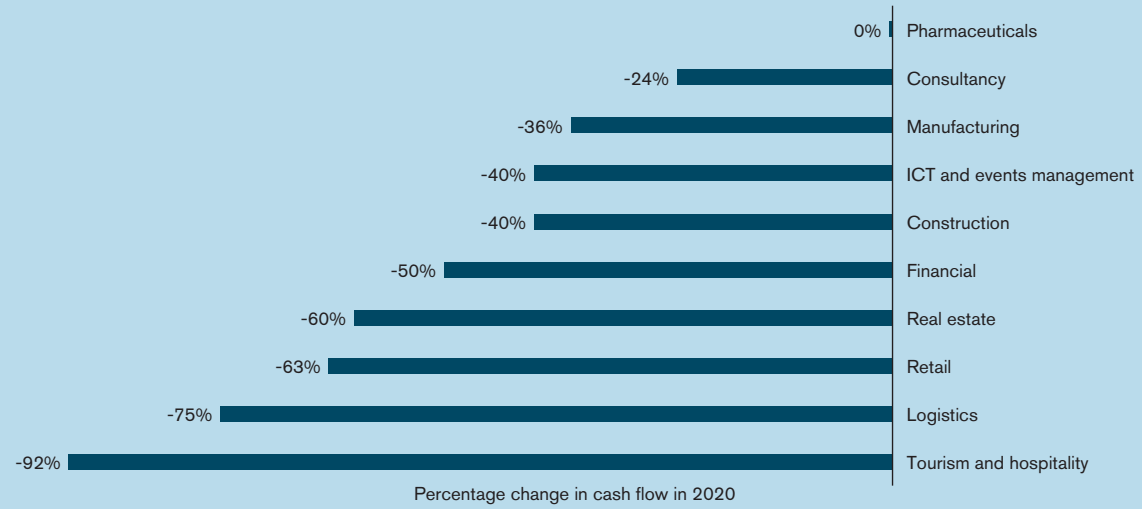
These sectors in 2018 contributed 8.5 per cent to Africa's GDP, 6.7 per cent to employment, and 30 per cent to service exports, a major foreign exchange earner (Jumia, 2019).

Diversification is low in African economies, with most of them producing and exporting only a few agricultural or mineral products, concentrating on the lowest level of the value chains, producing and exporting unprocessed products, and importing and exporting to only a few countries. This increases their vulnerability to external shocks. Moreover, most African economies rely on imports for some of the critical goods that were required during the pandemic. Thus, the closure of borders and disruption of production value chains, in combination with export restrictions in some producing countries, led to shortages of supplies such as disease-testing reagents, masks, ventilators and pharmaceutical drugs, as well as vaccines. Hence, diversification and developing manufacturing are important for Africa to reduce vulnerability to shocks and ensure access to essential goods.

One avenue to increased diversification is to encourage greater trade within the continent. Intra-African trade fell from a high of 20 per cent of total trade in 2015 to 16 per cent in 2019. Data on the share of intra-African trade in 2020 are not yet available. One indicator of the trend is that during the first six months of 2020, Kenya's trade to other East African Community (EAC) countries appears to have been more resilient than its trade with countries outside the EAC (UNECA, TradeMark East Africa and African Economic Research Consortium, 2021) (see Figure C.18).

Trading under the African Continental Free Trade Area (AfCFTA) started in January 2021 based on the principle that increasing levels of industrial production are necessary for African countries to move up the ladder in GVCs (Attiah, 2019). Through AfCFTA, regional value chains could be created, and integration into GVCs could be fostered. AfCFTA increases the continent's bargaining power in the global market. Its consolidated market, a combined population of one billion people and a GDP of over US$ 3.4 trillion, provide opportunities for product diversification, industrial growth, home-grown solutions and the development of regional value chains.

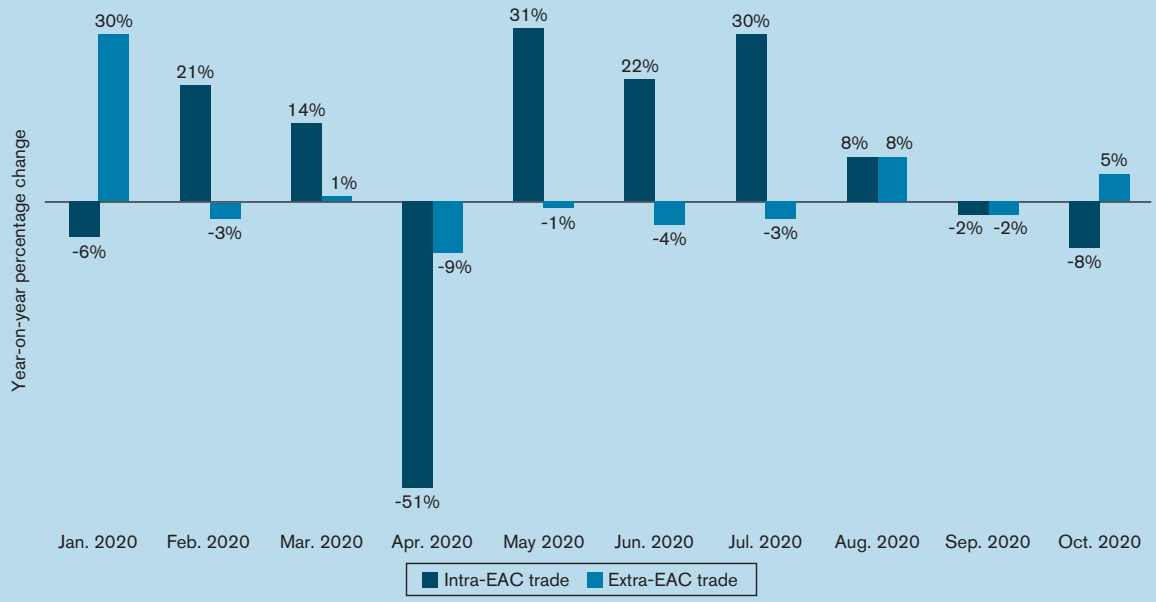
Figure C.17: Most sectors in East Africa experienced a significant reduction in cash flow in 2020



Source: East African Business Council (2020).

Box C.3: The role of regional trade cooperation in coping with and recovering from the COVID-19 pandemic *(continued)*

Figure C.18: Trade between Kenya and other EAC countries was particularly resilient during the first few months of the COVID-19 pandemic



Source: Kenya National Bureau of Statistics 2020.

Note: The figure displays Kenya's intra- and extra-EAC trade between January and October 2020.

The response to the shortages due to the COVID-19 pandemic show that there is potential for African industries to respond to local demand. The inadequacy of equipment and other medical supplies led to local innovations to fight the spread of the disease. For example, in Kenya, students from Kenyatta University created ventilators, while researchers from the University of Nairobi designed a local oxygen concentrator. At the same time, textile factories, such as Rivatex in Eldoret and another in Kitui, which had been closed for decades, opened again in order to start manufacturing personal protective equipment (PPEs), including masks, for use in the East African Community. On 18 April 2018, the EAC partner states resolved to develop their own pharmaceutical industry, including vaccine manufacturing, as part of the region's social, economic and political integration. This would ensure a stable access and supply of vaccines. The AfDB is also supporting development of pharmaceutical products and creation of value chains for the Common Market for East and Southern Africa (COMESA) member states.

Strong regulation is required to ensure that AfCFTA exports meet international required standards. There is a need to strengthen technical regulations, ensure laboratories are accredited, and provide for conformity assessments and metrology.

International cooperation would help African countries reduce their risks and vulnerabilities to economic shocks. Measures could include entering into public-private partnerships in research and development, deepening regional integration in order to pool financial resources to reduce the risk of shortages, and collaborating with international development partners who can provide technical assistance. African countries can also take advantage of the WTO Trade Facilitation Agreement (TFA), the World Bank Trade Facilitation Support Program (WB-TFSP), UNCTAD, and development partners such as AfDB, the European Union and the OECD, among others, to align their trade practices with the TFA, thus supporting diversification, access to technology and resilience.

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that lower market entry costs are associated with greater product export diversification in a sample of 118 developing countries. Services trade policy can also increase diversification, in particular on the export side. Lower services trade restrictiveness in the home market, by increasing the quality and availability of services inputs, can boost exports of service-intensive manufactured goods (see Section C2 in WTO, 2019b).

Policies that foster competition are important in creating an appropriate incentive framework for diversification. In contestable markets, both current market leaders (including a dominant incumbent) and disruptive rivals have an incentive to innovate and capture future sales (Federico, Morton and Shapiro, 2020). Therefore, policies that increase market contestability spur innovation, ultimately leading to more export diversification via increases in firm productivity. Moreover, reforms that boost competition in input markets, including backbone services (transportation, finance, energy and communications), can have positive productivity spillovers on downstream firms, again increasing the prospects for export diversification.

Second, reducing trade costs can improve trade diversification (OECD and WTO, 2019). Both investments in transport-related infrastructure and investments in telecommunications infrastructure are relevant in this regard. Equally important are reforms to improve the quality of transport logistics, because export concentration is often associated with poor logistics.[47] In the above-mentioned study by Dennis and Shepherd (2011), the largest impact on product export diversification is due to improved trade facilitation. Similarly, Shepherd (2010) shows that lower export costs at home have stronger potential for increasing geographical export diversification than do comparable changes in market access abroad or international transport costs. Finally, as argued in Section C4(b), policy measures aimed at reducing reliance on a small number of transport service providers, or at improving trade connectivity, are likely to enable diversification across different trade routes and across different available modes of transportation.

Third, targeting market, policy and institutional failures can support trade diversification (OECD and WTO, 2019). Diversification is likely to be dampened by information failures. For instance, a firm would be able to export to a market because its products would meet the necessary standards, but it does not export because it has inadequate information on the standards in place. Provided that they operate in environments that are not biased against exports, that they function autonomously, and that they are financed through general revenues rather than through taxation of exports, export promotion agencies can help overcome such issues, especially asymmetric information problems associated with exports of heterogeneous goods (Lederman, Olarreaga and Payton, 2010). Similarly, investment promotion agencies can foster economic diversification by attracting foreign direct investment (FDI), in particular efficiency-seeking FDI that is focused on export-oriented production.[48] Finally, special economic zones (SEZs) have also been used to support diversification, but there is scarce empirical evidence of such impact (Aggarwal, Hoppe and Walkenhorst, 2009).

Finally, policies that support adjustment can have a positive impact on trade diversification (OECD and WTO, 2019). For diversification to take place, skills development policies are needed to align with labour market demand.[49] Policies aimed at reducing gender inequality (see also discussion in Section C3(c)) are also likely to increase trade diversification, through two channels (Kazandjian et al., 2016). First, gender gaps in opportunity, such as lower educational enrolment rates for girls than for boys, harm diversification by constraining the potential pool of human capital available in an economy. Second, gender gaps in the labour market impede the development of new ideas by decreasing the efficiency of the labour force. In a sample of (up to) 100 countries at various stages of economic development during the period 1990-2010, Kazandjian et al. (2016) find evidence supportive of both channels in low-income and developing countries, concluding that gender-friendly policies could help these countries diversify their economies.[50]

5. Conclusion

International trade plays an important role in economic resilience to shocks. Although trade can be a spreader and magnifier of shocks, it can also enable countries to better prepare for shocks, better cope with shocks and recover quicker aftershocks occur. Diversification of production and trade helps trade to play a beneficial role.

On the one hand trade can be a spreader of shocks if the conditions under which goods and services are traded are subject to shocks. Volatility in transport costs and variability of trade policies can make trade a source of instability. This implies that a multilateral trading system guaranteeing stable trade policies is of paramount importance for trade to be conducive to economic resilience, as will be discussed in

Section D. Trade can also be a spreader of shocks in other situations: for example, pandemics may spread through trade in live animals, and through travel and tourism. However, permanent restrictions are costly and seem to be largely ineffective to reduce the harm of pandemics. Furthermore, trade in livestock regulated by international standards tends to be safe for animals and humans alike, in contrast to illicit trade in livestock and wildlife trafficking. Indirectly, trade has an impact on natural disaster shocks through its role in climate change. Although trade contributes to emissions through increased production and transportation, it also fosters the spread of green technologies. This could be further complemented by domestic climate change policies such as carbon-pricing schemes and incentives for low-carbon technologies and projects.

On the other hand, trade can enable countries to better prepare for, cope with and recover from shocks through various channels.

First, trade can help countries to better prepare for shocks. Services trade can be a source of economic growth and thus increase the available technical, institutional and financial means to prepare for disruptions. Furthermore, services trade plays a vital role in the availability of crucial services during disasters, such as weather forecast services, insurance, telecommunications, logistics and health services. Trade is also important for efficient government procurement during crises. Finally, trade facilitation policies are crucial to ensure smooth imports of essential goods and services during a crisis.

Second, trade enables countries to better cope with the different types of shocks discussed in Section B: natural disaster shocks, technological and operational shocks, and socioeconomic shocks. For example, trade enables countries to better adjust to natural disaster shocks that are the result of climate change. A general principle is that trade makes it easier for countries to adjust to shocks, by being able to switch the sources of supply in case of domestic shortages or the market where goods are sold in case of a fallout of domestic demand. Trade policy measures such as suspension of import-related taxes and government procurement can also facilitate the coping process during shocks.

Furthermore, trade plays a critical role in the provision of essential goods to cope with crises such as the COVID-19 pandemic. Trade promotes specialization and knowledge spillovers, thus fostering technologies needed to confront shocks. Trade also makes it possible to import essential goods quickly in case of local shocks. With global shocks, it is crucial that trade can flow freely, and that essential goods are distributed in a fair way. While countries have an incentive to impose export restrictions and resort to domestic production, in the long run this makes the production process less efficient.

Third, trade can play a beneficial role in speeding up economic recovery, by benefiting from sustained foreign demand on the export side and the availability of intermediate inputs on the import side. Trade seems to have played a beneficial role in hedging countries against the adverse effects of the COVID-19 pandemic. The recovery in trade has been stronger than the recovery in GDP in 2020, and regions with stronger trade links with low-case regions have displayed higher GDP growth. At the same time there is a risk that national fiscal and monetary policies to speed up recovery could aggravate trade imbalances, which could in turn provoke increased demand for protectionist trade policies. Finally, during recovery, countries can implement trade reforms to improve economic outcomes. Various reform policies, such as supply chain due diligence laws, trade facilitation and digitalization, can help countries to build a more resilient trading system as they recover from COVID-19.

Trade diversification makes it more likely that trade will play a beneficial role in promoting economic resilience, as measured by reduced macroeconomic volatility. With a high degree of specialization, trade can magnify the impact of sector-specific shocks, as has been happening in regions dependent on tourism as a result of measures to contain COVID-19. With a diversified economic structure, however, the benefits of trade in coping with shocks will dominate, because trade enables countries to import goods in case of domestic shortages or export goods in case of a fallout in domestic demand. Various policies can be implemented to promote economic diversification, such as an appropriate incentive framework (predictable business regulation, appropriate trade policies, and policies fostering competition); reduction in trade costs; policies targeting market, policy, and institutional failures; and policies supporting adjustment, such as skills-development policies and policies reducing gender inequality.

LDCs do not have the resources to sustain a large domestic stimulus policy, and inevitably these economies will need to turn abroad to find demand for their products and services and to stimulate economic growth. Trade can be a means of diversifying input sources or sales markets, thereby increasing resilience. Having a strong trading system in place before a storm or hurricane is necessary to

absorb external assistance, such as physical aid or emergency workers, that will be sent via the same channels as regular trade. This will be particular challenging for many developing economies. To cope better with shocks, policies to facilitate digital trade and trade in services are particularly important.

Trade through international value chains can both be a shock absorber and a shock propagator, depending critically on the structure of the value chain. Trade can be a shock propagator in complementary GVCs, but can act as a shock absorber with diversified sources of supply. The presence of choke points – sectors crucial for the functioning of value chains – can make production more vulnerable to sudden increases in trade costs. Policies fostering supplier, customer, and trade route diversification can help to make value chains more resilient. Other policies to enhance GVC resilience are diversification of sources of supply, raising inventory stocks, and fostering flexible production across sites.

A lack of diversification and a predictable trade policy can impact more vulnerable groups, particularly women and MSMEs, especially hard. However, the lack of the required detail in trade statistics and substantial levels of informality make these impacts challenging to assess. Nevertheless, these groups may depend heavily on international trade, due to their reliance on large firms for inputs or demand. These groups are also often involved in informal, cross-border trade, so they are particularly affected by the closure of land borders.

Section D discusses how trade policy coordination can limit the potential shock-propagating effects of trade and promote the shock-absorbing role of trade, by helping countries to better prepare for, cope with and recover from shocks.

Endnotes

1 Further theoretical insights are provided by Antràs, Redding and Rossi-Hansberg (2020). In a model where, in order to exchange goods, economic agents travel both within and across borders, they show that international trade or mobility frictions may increase or decrease the likelihood of global pandemics depending on the disease environment prevailing in each country.

2 See Figure 2 in WTO (2020a), based on data from Oxford COVID-19 Government Response Tracker, OxCGRT (Hale et al., 2021).

3 See the studies cited in Clemens and Ginn (2020) (page 47). The authors claim that once a pandemic has arrived, acquiring it from an infected traveller is significantly less likely than acquiring it from an infected local.

4 Eckardt, Kappner and Wolf (2020) find that border control had a significant effect in limiting the pandemic in 18 western European countries. Linka et al. (2020) show that unconstrained mobility would have significantly accelerated the spread of COVID-19, especially in Central Europe, Spain, and France. Wells et al. (2020) find a significant correlation between the timing of the global exportation of COVID-19 events and airline connectivity with mainland China. They find that travel restrictions decreased the daily rate of exportation by 81.3 per cent on average.

5 Chinazzi et al. (2020) show that by the start of the travel ban from Wuhan, China, on 23 January 2020, most Chinese cities had already received many infected travellers. Modelling results suggest that sustained 90 per cent travel restrictions to and from mainland China only modestly affected the trajectory of the epidemic, unless they were combined with a 50 per cent or higher reduction of transmission in the community.

6 Only cross-border trade, as opposed to domestic trade (including trade of live animals in traditional food markets) is considered here. Traditional food markets have received considerable attention as sources of zoonoses and places in which there is an elevated risk of outbreak and/or spread of those zoonoses. On policies that could reduce public health risks associated with the sale of live wild animals in traditional food markets, see WHO, OIE and UNEP (2021). The focus here is on zoonotic diseases, i.e. infectious diseases caused by a pathogen (bacterium, virus, parasite or prion) that has jumped from an animal to a human. In a list of 1,415 pathogens that can affect humans, about 60 per cent are zoonotic (Karesh et al., 2005). The International Livestock Research Institute (ILRI, 2012) estimated that some 56 zoonoses were together responsible for around 2.5 billion cases of human illness and 2.7 million human deaths a year.

7 http://www.fao.org/faostat/en/#data

8 In the United States only, between 2000 and 2006, approximately 1.5 billion live wild animals (around 120 million per year) were legally imported. Nearly 90 per cent of these were destined for the pet industry (Smith et al., 2012).

9 Available at https://www.oie.int/en/what-we-do/standards/codes-and-manuals/.

10 Empirical evidence of a negative correlation between licit trade and disease spread is provided by Beverelli and Ticku (2020). This is, however, an area where more research is needed.

11 Fèvre et al. (2006) report that in Saudi Arabia, most cases of Brucellosis – a zoonotic disease which infects animals like sheep and cattle – are due to unscreened imports from East Africa. Beverelli and Ticku (2020) provide evidence that illicit trade in livestock (measured through discrepancies in mirror trade statistics that are reported by trading partner countries), in addition to threatening animal health, could pose a risk to human health through the spread of zoonotic diseases.

12 It should be emphasized that a large part of the licit (i.e., regulated) cross-border movement of live wild animals occurs through non-commercial transactions, for instance in the framework of cross-border translocation programmes with the goal of species survival/recovery or restoration. Several examples of adverse side effects of (both domestic and cross-border) relocation of wild animals can be found in Fèvre et al. (2006) and Chomel, Belotto and Meslin (2007).

13 Even in a country with advanced customs administration like the United States, only 25 per cent of wildlife shipments that are declared at the border are inspected (Williams and Grante, 2009).

14 According to Robalino and Herrera (2010), trade-opening can either increase or decrease timber prices or local agricultural prices, thereby increasing or decreasing deforestation. For instance, in countries with a comparative advantage in extensive agriculture, trade liberalization might increase the relative prices of agricultural products produced using extensive agriculture, and, if all other things are equal, this can lead to more deforestation. Moreover, trade-opening can affect the prices of agricultural inputs, such as fertilizers, which can also affect deforestation. Robalino and Herrera (2010) further argue that the location of transport investments, the type of roads, the amount of forest originally present, and the prior development of the area affect the incentives to engage in deforestation in the wake of trade-opening.

15 See footnote 82 in Section C of WTO (2013) for a detailed discussion.

16 As packing plants have become larger in order to exploit scale economies, they have demanded a larger volume from individual producers. This requires either an increase in the size of production or some form of joint marketing (Duffy, 2009).

17 For a discussion of the determinants of comparative advantages in different types of livestock (e.g. poultry and pigs versus ruminants), see Section 2 in Upton and Otte (2004).

18 Using different methodology and definitions, Global Trade Alert (https://www.globaltradealert.org) reports that in the first 10 months of 2020, 2,031 such policy measures were taken by governments. These measures allegedly distorted 13.6 per cent of global goods trade, whereas trade reforms covered 8.2 per cent of global trade (Evenett and Fritz, 2020).

19 In cooperation with the International Monetary Fund (IMF), Ahir, Bloom and Furceri (2018) construct a monthly index of uncertainty about trade policy or trade in general, the

so-called World Trade Uncertainty (WTU) Index. The Index is based on counting how often the word «uncertainty» appears together with «trade» (or words related to trade such as «protectionism», «tariff», or «WTO») in reports of the Economist Intelligence Unit.

20 Caldara et al. (2020) measured trade policy uncertainty in three ways using: (i) earnings calls of publicly listed companies mentioning trade policy uncertainty; (ii) newspaper reports about trade policy uncertainty; and (iii) historical volatility in tariffs. They arrive at an estimated reduction of 1 per cent of investment because of trade policy uncertainty based on variation across sectors in the earnings calls of firms and investment.

21 Governance quality is not the only channel through which violence and conflicts affect trade costs. As discussed previously in the subsection on transport costs, violence and conflicts also cause disruptions in the transport network and increase the risk and uncertainty related to shipment and delivery of traded goods. For example, during World War II, trade in the United Kingdom was challenged as trade routes were disrupted by the conflict, although governance and regulations remained relatively stable (Jackson, 2011).

22 Kremer (1993) posits that even the smallest components of a complex production process must perform properly if the end-product is to have any value for users.

23 The Leontief inverse matrix shows the coefficients (economic multipliers) that measure the successive effects on the economy as a result of the initial change of an economic activity. It incorporates both direct and indirect inputs in production.

24 A "black swan" is an extremely unpredictable, rare event, the occurrence of which may, nevertheless, seem obvious in hindsight, and which often triggers severe negative consequences.

25 Several factors explain the insurance protection gap observed in many developing countries. On the demand side, common reasons include potential buyers at low-income levels, expectations of external assistance in case of future disasters (disincentivizing the conclusion of insurance contracts and the payment of the premiums), the limited awareness and understanding on risk exposure by households, businesses and governments, and previous practice attesting delays (Benson and Clay, 2004; Cummis and Mahul, 2009; WTO, 2019a). On the supply side, some weaknesses may be due to unfavourable financial environments at the domestic level and to the lack of insurance products specifically designed to cover losses incurred from shocks, based upon accurate data and tailored risk models and risk profiles (ILO, 2012; Benson and Clay, 2004; Cummis and Mahul, 2009).

26 Costinot, Donaldson and Smith (2016) estimate that the impact of climate change on the agricultural markets would amount to a 0.26 per cent reduction in global GDP when trade and production patterns are allowed to adjust, while the GDP reduction would be 0.78 per cent if production does not adjust.

27 http://www.wcoomd.org/~/media/4B167884A3064E78BCF5D29E29F4E57E.ashx

28 See the note to Figure C.11 for details on the constructions of these three measures of trade diversification.

29 The narrow focus here is on trade diversification and macroeconomic volatility (an inverse proxy of resilience). A relatively large literature has studied the more general relationship between trade openness and volatility. A major contention in this literature is that increased specialization induced by trade mechanically increases volatility (see for instance Di Giovanni and Levchenko, 2009). Caselli et al. (2020) question this view, arguing that trade-induced specialization increases volatility only if specialization occurs in intrinsically volatile sectors, or in sectors that are subject to shocks that correlate with country's aggregate shocks or other sectoral shocks. Consistently, Koren and Tenreyro (2007) find that countries at the initial stage of development (i.e. poor countries) tend to produce in sectors with higher intrinsic volatility, and also tend to experience higher levels of country-specific volatility. As countries develop, they tend to move towards sectors with lower intrinsic volatility. Even if they tend to re-concentrate production, concentration occurs in low-volatility sectors, and is associated with lower macroeconomic volatility.

30 For the diversification-through-trade channel highlighted by Caselli et al. (2020) to be relevant, country-specific shocks must matter. The authors refer to studies showing that country-specific shocks are more important than sector-specific shocks in shaping volatility patterns in a number of industrialized countries, and to Koren and Tenreyro (2007), who show that the relative weight of country-specific shocks is even more relevant in less developed economies.

31 The fact that even large exporting firms are not very diversified points to important costs in building a dense web of relationships with customers.

32 The symmetrical argument is that lack of diversification on the export side exposes countries to the risk of trade restrictions in importing countries (tariffs and non-tariff measures).

33 Only the geographical, and not the product, scope of import diversification is analysed because most countries tend to import most products, with relatively little variation across countries or over time within countries.

34 Geographical import diversification increased for 165 countries, while it decreased for 56 countries.

35 Guinea and Forsthuber (2020) estimate that only 1 per cent of EU imports are imported from a single supplier. Jaravel and Méjean (2021) identify only 644 products, out of a total of 9,334 products imported by France, for which the supply is mainly outside the Union European and is particularly concentrated in a low number of supplying countries. These 644 products account for only 4 per cent of the value of total French imports.

36 Indirect evidence for this can be gathered from several studies – such as Bricongne et al. (2012), Behrens, Corcos and Mion (2013), and other studies cited in footnote 7 of Antràs (2020) – documenting that the bulk of the great trade collapse in the aftermath of the 2008-09 crisis occurred at the intensive margin (value or volume of existing trade flows) rather than at the extensive margin.

37 This result is also consistent with the micro-level evidence in Monarch and Schmidt-Eisenlohr (2020), who document a remarkable degree of persistence in buyer-seller links in US trade, with 80 per cent of US imports occurring in pre-existing firm-to-firm relationships.

38 Qualitatively similar positive correlations are also obtained between IPR-intensity and geographical export diversification. Such diversification may be reduced in IPR-intensive sectors due, for instance, to the fear of

imitation in the importing country. However, as in the case of geographical import diversification discussed in the main text, the positive correlation between patent and copyright intensity and geographical export diversification might be explained by the fact that rich countries, which are on average more diversified, are also the largest exporters of sophisticated products, which are more IPR-intensive.

39 Export diversification has, in particular, long been advocated in the case of resource-rich countries, not only as a tool to reduce volatility and increase resilience, but also for two other sets of reasons: first, based on the premise that these sectors are characterized by positive spillovers on the rest of the economy, such as learning-by-doing or knowledge spillovers; and second, because of the depletable nature of non-renewable resources, the significant impact of resource extraction on the environment, and the threat that technological shocks could suddenly eliminate or sharply reduce demand by resource-importing countries (WTO, 2014).

40 This is an application of Hausmann and Rodrik (2003), who consider the problem of a domestic pioneer entrepreneur. See Box C.1 in WTO (2020b).

41 This is because industrial policies can be undermined by imperfect knowledge of the externalities justifying sector-specific interventions, and by the vulnerability of such interventions to rent-seeking (Lane, 2020).

42 Only domestic policies are considered here. Policies that are implemented in the framework of international cooperation or trade agreements, such as, respectively, Aid for Trade and the WTO Trade Facilitation Agreement, are discussed in Section D.

43 NACE stands for "Nomenclature statistique des activités économiques dans la Communauté européenne", or "statistical classification of economic activities in the European Community".

44 ISIC is International Standard Industrial Classification of All Economic Activities (https://unstats.un.org/unsd/classifications/Family/Detail/2).

45 Indeed, one of the main objectives of preference schemes is to assist developing countries and LDCs with economic diversification, as can be read in the original EU Generalized Scheme of Preferences (GSP) regulation (Regulation (EU) No 978/2012).

46 By symmetric reasoning, standards and other non-tariff measures in the home country can both increase or decrease import diversification, depending on their relative impact on information asymmetries and market entry costs.

47 Product export diversification, geographical export diversification, and geographical import diversification indexes (see note to Figure C.11 for their definitions) positively correlate with the World Bank's overall Logistics Performance Index (LPI) in a sample of around 160 countries and six years (2007, 2010, 2012, 2014, 2016, and 2018). In particular, both in ordinary least squares (OLS) and in Pseudo-Poisson maximum likelihood (PPML) regressions of each diversification index on the LPI, controlling for country and year fixed effects (N = 912), the coefficients on the geographical export diversification index and on the geographical import diversification index are positive and statistically significant. The coefficient on product export diversification index is also positive, although not statistically significant.

48 Bauerle Danzman and Gertz (2020) show that investment promotion agencies (IPAs) which are integrated (i.e. with a governance structure integrated into the government bureaucracy) score better than autonomous IPAs (i.e. IPAs with a governance structure autonomous from the rest of the government bureaucracy) in terms of the number of programmes designed to link domestic suppliers to foreign firms.

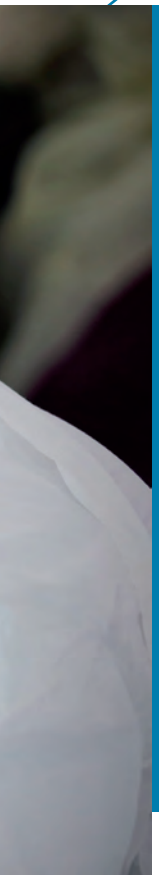
49 See WTO (2018b) for a discussion of skills development policies in the digital age.

50 In particular, Kazandjian et al. (2016) interpret the negative impact on diversification of gender inequalities in opportunities, such as education, as supportive of the first channel (inequality constrains the level of human capital, which limits diversification). They also interpret the negative impact of gender inequalities on diversification in outcomes, such as labour force participation, as supportive of the second channel (inefficient allocation of resources leads to suboptimal creation of ideas).

D The role of international cooperation in building economic resilience

As responses to the 2008-09 global financial crisis and the COVID-19 pandemic have shown, lack of cooperation among governments can create significant tensions and lead to suboptimal outcomes. In contrast, governments benefit from acting cooperatively to enhance their resilience, whether they are preparing for future disruptions, coping with shocks or stimulating the recovery. International cooperation in the trade area can play an important role in building economic resilience to shocks by leveraging synergies and supporting a more open, diversified, inclusive and predictable trade environment.

Contents



Some key facts and findings

- Trade-restrictive domestic measures adopted in response to shocks are often characterized by negative spillovers, such as cross-retaliation risks and income and welfare losses.
- International cooperation can minimize negative spillovers and help governments to prepare for, cope with, or recover from shocks. International cooperation can mitigate the risks from trade policy uncertainty and help prevent trade policies from becoming a source of shocks.
- The WTO actively helps to advance trade cooperation and to make economies more resilient by supporting the smooth, predictable and open or freer international movement of goods and services and the diversification of supply sources and exports.
- International cooperation can play an important role in increasing the resilience of global value chains and securing essential goods and services, including COVID-19 vaccines, at a reasonable cost.
- WTO members could make an even greater contribution to building economic resilience by strengthening their cooperation on various issues, including transparency, export restriction and electronic commerce.

1. Introduction

As discussed in sections B and C, governments adopt different strategies, some of which involve trade policies, to prepare for future disruptions and enhance their economic resilience capacity. They also respond to shocks and stimulate recovery with various trade and non-trade policy measures.

Before disruptions and shocks strike, governments can benefit from cooperating on risk prevention and reduction and preparedness. Shocks that originate in one country may propagate to others through trade or other vectors of transmission. Risk reduction measures and resilience policies in one country will have positive spillovers in other countries, independently of whether the shocks are local, regional or global. In the presence of such spillovers, countries acting non-cooperatively may adopt less risk prevention, reduction and preparedness policies than would be optimal from a global perspective. International cooperation can help them move closer to the optimum level of risk reduction.[1]

As part of their efforts to cope with shocks and to reinforce the recovery process, governments may also adopt policies with negative spillovers for their trading partners, such as restrictions in their exports of essential products, or subsidies which can have adverse effects on other countries. This chapter explains how international cooperation can help to limit the use of such measures.

First, this chapter will suggest why international cooperation matters for economic resilience, and the various forms that international cooperation takes, for example in terms of cooperation between international organizations or of trade agreements, including regional and plurilateral trade agreements. The chapter will then outline how international cooperation on non-trade policies interacts with international cooperation on trade policies to reduce risk and vulnerabilities and enhance resilience, before proceeding to discuss in more detail how international cooperation on trade-related policies can contribute to economic resilience, for example by helping to reduce risks and vulnerabilities for economies and prepare them for shocks. The chapter will examine how international cooperation on trade policies can assist governments in coping with shocks. The "recovery" aspect of economic resilience, and how trade policies may contribute to helping countries rebound more strongly and quickly after shocks, will then be addressed via an examination of the most salient or recurrent crisis-related policy issues. This examination will analyse how such issues are currently dealt with through policy cooperation, both from an economic and a legal perspective. Finally, a number of areas in which further cooperation could strengthen the contribution of international trade to economic resilience will be highlighted.

2. Why does international cooperation matter for economic resilience and what forms does it take?

In all three stages of resilience – preparation, coping and recovery – the benefits from international cooperation can arise independently of whether the countries affected are rich or poor. In addition, international cooperation can involve an element of solidarity if it results in a transfer from richer to poorer countries, such as when a rich country provides aid to a poorer country hit by a natural catastrophe, or when donor countries and international organizations supply vaccines to low-income countries.

These considerations underline the importance of strengthening economic and financial resilience through increased global cooperation, to ensure the resilience of trade and assist trade in playing its role positively. International cooperation in the field of economic and financial resilience has, primarily since the 2008-09 global financial crisis, translated into various forms of "soft law" issued by groups of governments such as the G20 in the form of non-binding declarations or recommendations, or in "best practices" resulting from the consultation of expert groups convened by the United Nations or prepared by international organizations such as the Organisation for Economic Co-operation and Development (OECD). In both instances, the importance of trade in enabling resilience is reiterated.

Disaster risk reduction is another domain in which cooperation is essential. A number of international organizations work on aspects of resilience not directly related to trade, but for which trade can provide essential support. This is the case for weather forecasting (World Meteorological Organization – WMO), disaster prevention and reduction (United Nations Office for Disaster Risk Reduction – UNDRR), disaster relief (United Nations Office for the Coordination of Humanitarian Affairs – OCHA), climate change adaptation and mitigation (United Nations Framework Convention on Climate Change – UNFCCC), access to medication (World Health Organization – WHO and Gavi, the Vaccine Alliance) and financial resilience (International Monetary Fund – IMF, World Bank). The missions of all of these organizations can be facilitated by WTO norms on trade in goods, services and trade-related aspects of intellectual property.

More generally, while each of these organizations has separate domains of competence, improved capacities to prevent, mitigate, cope and recover from shocks may be achieved through enhanced coordination and inclusiveness in the international cooperative and normative process.

In comparison to financial resilience, multilateral cooperation in trade-related matters follows a somewhat different path. The 1994 Marrakesh Agreement Establishing the World Trade Organization (WTO Agreement), like the General Agreement on Tariffs and Trade (GATT) 1947 before it, provides for essentially binding rules and disciplines legally enforceable through a dispute settlement mechanism. The WTO Agreement also contains built-in flexibilities which allow members to respond to higher interests, such as health or national security.

The multilateral trading system originated in a major crisis: the Great Depression of the 1930s and the "beggar-thy-neighbour" trade policies applied at the time. The GATT 1947 achievements on tariff reduction alone are evidence of how the multilateral trading system can reinforce economic resilience by reducing trade costs and, more generally, maintaining trade flows, even in times of crisis.

While the term "resilience" appears neither in the GATT 1947 nor in the WTO Agreement, and only recently made its way into RTAs (see Box D.1), it can be argued that the GATT 1947 was already intended to contribute to a more resilient world economy by building a more stable and predictable multilateral trading system in response to the errors of the 1930s. The WTO Agreement can be seen, in this regard, as a continuation of the GATT 1947.

International cooperation also takes place at various levels. In addition to the multilateral trade norms of the WTO Agreement, countries also conclude trade agreements at the regional level (regional trade agreements or RTAs).

Another category of international trade norms is that of plurilateral agreements, which are negotiated and concluded in a WTO context, but outside a multilaterally agreed process, by a part of the WTO membership. In addition to the plurilateral agreements contained in Annex 4 to the WTO Agreement, during the Uruguay Round (1986-94) and since the early days of the WTO, groups of members have negotiated specific additional commitments which they have incorporated into their schedules and applied on a most-favoured-nation (MFN – i.e., the principle of not discriminating between one's trading partners) basis. This category of agreements includes the 1994 Pharmaceutical Products Agreement ("Pharma Agreement") and the 1996 Information Technology Agreement, both subsequently updated or extended.

Joint statement initiatives are also plurilateral discussions or negotiations. They are not part of a multilaterally agreed WTO process. They are proposed and discussed in the WTO context by groups of members which intend to negotiate agreements elaborating on WTO rules in specific domains. Joint statement initiatives currently exist in electronic commerce,[2,3] investment facilitation for development,[4] services domestic regulations,[5] micro, small and medium-sized enterprises (MSMEs),[6] and trade and environmental sustainability.[7] Whereas agreements incorporated into individual members' schedules, such as the Pharma Agreement, have already shown their relevance in terms of preparation and response to crises, joint statement initiative-based negotiations may also offer opportunities to enhance economic resilience if they can lead to new forms of cooperation and new disciplines in the WTO framework.

The existing body of rules and disciplines is complemented by an increasing number of joint actions decided at the level of heads of international organizations aimed at enhancing and structuring cooperation in certain domains, essentially by pooling information, technical assistance and other forms of capacity-building (WTO, 2021e). Some of these actions take the form of agreements between organizations defining common work programmes.

Plurilateral agreements and negotiations may be relevant in terms of resilience in that they build on the existing WTO disciplines, essentially in technical subject matters which, as will be explained further below, are often important for trade and economic resilience. Plurilateral norms discussed or negotiated in the WTO will be hereafter addressed together with the existing multilateral rules.

RTAs have – with some exceptions – evolved over the past decades from simpler forms of free trade agreements (FTAs) or customs unions primarily focused on eliminating "duties and other restrictive regulations of commerce"[8] (i.e., "shallow" preferential trade agreements) into comprehensive economic cooperation agreements extending their coverage beyond traditional border measures to policy areas such as competition, foreign direct investment protection, environment or labour (i.e., "deep" preferential trade agreements) (Mattoo, Rocha and Ruta, 2020).[9]

Box D.1: Resilience in RTAs

While provisions in RTAs do not have to refer explicitly to resilience to be relevant to strategies aimed at supporting economic resilience, a limited number of RTAs incorporates provisions explicitly addressing resilience. These provisions cover a broad range of issues, from resilience in the face of climate change and natural disasters to cyber-attacks, as shown in Figure D.1.

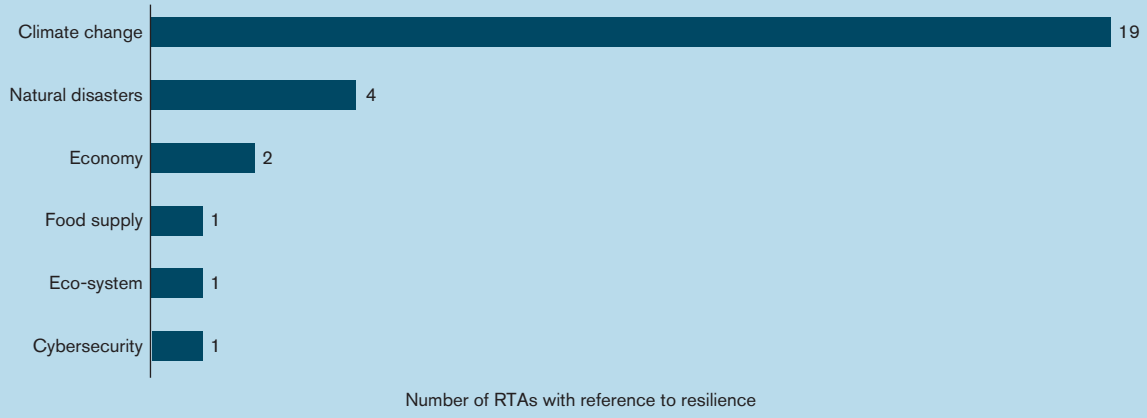
Although limited, the inclusion of provisions on resilience in trade agreements is not a recent phenomenon. The fourth Lomé Convention between the then European Community and the Organisation of African, Caribbean and Pacific States (ACP), signed in 1989, referred to structural adjustment support to assist ACP states achieve greater economic diversification as part of their effort to develop a larger measure of resilience in their economies. Similarly, the 1992 Agreement on the Common Effective Preferential Tariff (CEPT) Scheme for the Association of Southeast Asian Nations (ASEAN) Free Trade Area refers in its preamble to the parties' conviction that preferential trading arrangements among them act as a stimulus to the strengthening of national and intra-ASEAN economic resilience.

A couple of recent RTAs refer specifically to resilience in the face of natural disasters. For instance, the RTA between Argentina and Chile requires the parties to endeavour to manage the planning of fault-resilient telecommunication networks jointly in order to mitigate the impact of natural disasters (Monteiro, 2021a).

A limited but increasing number of RTAs refers more generally to resilience to climate change (Monteiro, 2016b). Several RTAs, including the RTA between the Eurasian Economic Union (EAEU) and Singapore, list climate-resilient development as an area of cooperation. Similarly, a few RTAs, including the RTA between China and Mauritius, identify as a cooperation area the promotion of environmentally-friendly production techniques and efficient management of natural resources to increase the resilience to climate change of sustainable agriculture and organic farming. Other agreements, including the RTA between Brazil and Chile, refer to cooperation on resilient water management. Similarly, some RTAs negotiated by the European Union, including with Georgia, promote cooperation on integrated coastal zone management to enhance the resilience of coastal regions to coastal risks, including the impacts of climate change.

Other specific resilience issues are only found in a limited number of agreements. For instance, the RTA between the European Union and Singapore mentions that Singapore's competent authority in charge of holding technical consultations on sanitary and phytosanitary (SPS) measures is the Agri-Food and Veterinary Authority that is responsible for ensuring a resilient supply of safe and wholesome food, among other things. Although a few RTAs include explicit provisions on cybersecurity (Monteiro and Teh, 2017), the RTA between the European Union and the United Kingdom is the only agreement to date explicitly to require the parties to endeavour to cooperate in relevant international bodies and forums, and to strengthen global cyber-resilience and enhance the ability of third-party countries to fight cybercrime effectively.

Figure D.1: Most provisions referring to resilience in RTAs relate to climate change



Source: Monteiro (2021b).

Note: Analysis based on 611 RTAs, including 563 RTAs notified to the WTO.

In terms of their normative content, RTAs often expand or deepen WTO disciplines (such provisions are called "WTO+" provisions). RTAs may also contain provisions on subjects which are not yet covered by the WTO agreements, such as competition, investment and e-commerce, but also climate change and natural disaster management (see Box D.2). These provisions do not merely enhance RTA parties' preparation for shocks. As normative models they pave the way for more international cooperation on economic resilience.

Box D.2: Natural hazards and related disasters in RTAs

RTAs are sometimes considered to be a laboratory in which new types of provisions are designed to address different challenges. This is the case with the management of natural disasters, in particular climatological, geophysical, hydrological and meteorological risks. These provisions complement other explicit provisions addressing other types of risks and disasters, including pests, epidemics, industrial and transport accidents, and civil strife and terrorism.

Although the inclusion of provisions explicitly addressing natural disasters in RTAs is not a recent phenomenon, the number of these provisions in any given agreement has increased over the years. This trend largely explains the high heterogeneity characterizing most provisions on natural disasters.

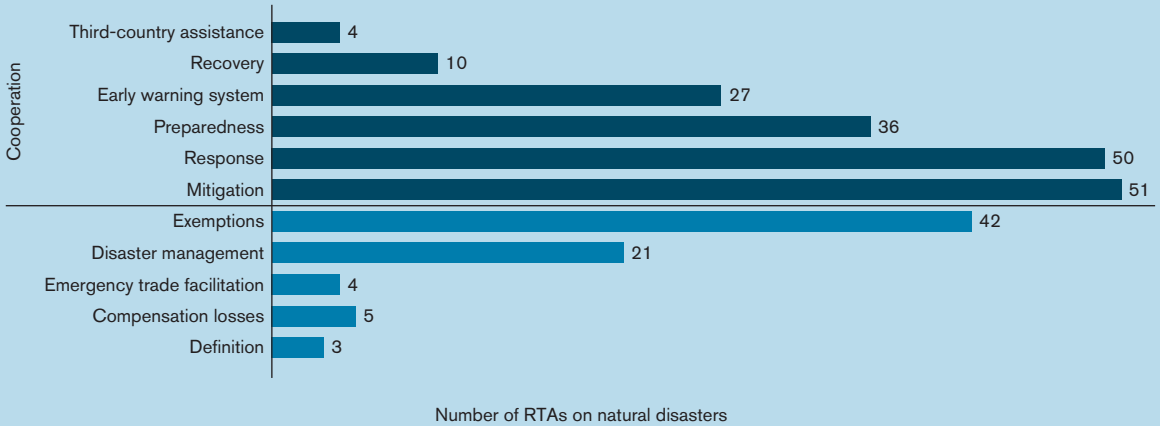
These provisions differ not only in terms of structure and location in RTAs, but also in terms of language and scope. While most provisions refer to natural disasters in general, a few provisions address specific types of disasters, such as drought, earthquake, flood, landslide, tsunami, volcano eruptions, and wildfire. Most provisions on natural disasters are only specific to a single or a few RTAs, and most of them are couched in best-endeavour language, indicating that parties do not have an obligation to cooperate, or to cooperate in a certain way, in case of disaster, but only to "try their best" under the circumstances.

Cooperation provisions are the most common type of provisions on natural disasters, as highlighted in Figure D.2. Disaster prevention, mitigation and response are the most common cooperation areas explicitly listed in RTAs (Monteiro, 2016b). Fewer RTAs explicitly address other aspects of natural disaster management, such as preparedness, early warning systems, and recovery and rehabilitation.

The most detailed cooperation provisions are found in stand-alone chapters on civil protection negotiated by the European Union, including with Georgia and the Republic of Moldova. While most cooperation provisions in RTAs relate to cooperation between the parties, a few provisions refer to third-country assistance.

Another relatively common type of provision lays down exemptions in case of natural disasters. Several agreements, such as the RTA between New Zealand and Singapore, exclude the urgent procurement of goods and related services in the event of natural disasters from the application of the chapter on government procurement.

Figure D.2: Explicit provisions on natural disasters in RTAs remain heterogenous



Source: Monteiro (2021b).

Note: Analysis based on 611 RTAs, including 563 RTAs notified to the WTO.

Box D.2: Natural hazards and related disasters in RTAs *(continued)*

A few RTAs, including the Lisbon Treaty of the European Union, also stipulate that subsidies aimed at making good the damage caused by natural disasters will be deemed compatible with the agreement concerned. Other exemptions specified in some RTAs include the full rebate of customs duties and sales taxes on goods imported for rescue and relief assistance in case of natural disasters.

The remaining types of provisions on natural disasters, found in a relatively limited number of RTAs, cover various issues. Some RTAs compel the parties to adopt measures on natural disaster management.

For instance, the convention establishing the Economic and Monetary Community of Central Africa (CEMAC) requires its Conference of Heads of State to ensure that the fight against drought, among other natural calamities, be taken into account. Similarly, the environmental cooperation agreement negotiated along with the RTA between Canada and Chile requires the parties to develop and review environmental emergency preparedness measures. More recently, the RTA between Chinese Taipei and New Zealand requires the parties to eliminate all tariffs on a list of environmental goods, including instruments and appliances necessary to monitor, measure and assist planning for natural risks such as earthquakes, cyclones and tsunamis.

Besides tariff exemption, a few provisions on natural disasters relate specifically to trade facilitation. For instance, the amended RTA between Canada and Israel requires the parties to ensure that their customs procedures allow for the expeditious release of goods in emergency situations, such as natural disasters.

While many chapters on investment in RTAs include provisions on compensation for investment losses owing to a state of national emergency or civil strife, only a couple of agreements, including the RTA between Canada and the European Union, explicitly require the non-discriminatory treatment of restitution, compensation or other settlement of covered investments losses caused by natural disasters.

3. International cooperation on non-trade policies can help reduce risk and vulnerabilities and enhance resilience

International cooperation on resilience-enhancing policies can yield both individual and collective benefits, and coordinated actions by members can leverage synergies. Multilateral initiatives adopted by governments in relation to previous shocks provide substantial arguments in favour of countries cooperating to assist those under stress in containing crises (OHCHR, 2016; United Nations, 2015). Cooperation can help internalize some cross-border spillovers, thereby improving resilience. This subsection discusses how cooperation on a broad set of economic and financial policies can complement trade cooperation, and describes the synergies between trade cooperation and cooperation on disaster risk reduction.

(a) Enhancing economic and financial resilience

Over the last two decades, the world has witnessed five global recessions with adverse impacts on economic growth, employment and development across borders (Kose, Sugawara and Terrones, 2020; World Bank, 2021d). In particular, the 2008-09 global financial crisis and the economic crisis caused by the COVID-19 pandemic which began in 2020 have had negative socioeconomic impacts of an unprecedented magnitude, clearly demonstrating the need for increased international cooperation. Containing global financial crises requires cooperation among countries because national interventions generate positive and negative cross-border spillovers. For example, after the 2008-09 global financial crisis, negative spillovers arising from national policies on bailing out big financial institutions through implicit subsidies justified the need for countries to cooperate to ensure bank resilience and global financial stability (Agénor and Pereira da Silva, 2018; Napolitano, 2011).

Various studies highlight that global financial crises create frictions in the international financial system and expose countries to excessive volatility. The rapid pace of financial globalization has led to an increase in external assets and liabilities of nations and raised new policy challenges due to the transmission and amplification of cross-border shocks. Factors such as high cross-border balance sheet exposure, fluctuations in interest rates and asset prices, agents' expectations and information effects, and trade linkages act as key propagators of financial spillovers and trigger shocks across equity, foreign exchange

and sovereign bond markets (Agénor and Pereira da Silva, 2018; IMF, 2014; IMF, 2016; Pesce, 2014). For example, fluctuations in interest rates in major advanced economies can affect other countries by altering the cost of external borrowing and amplifying domestic leverage. This can generate large negative effects when the borrowing country is under severe distress, and lead to a crisis (Agénor and Pereira da Silva, 2018).

Promoting financial stability and reducing global financial crises and cross-border shocks is fundamentally a global public good that requires special governance mechanisms and international cooperation (Agénor and Pereira da Silva, 2018; Currie, 1993; Napolitano, 2011; Pilbeam, 1998; Taylor, 2013). In this regard, Kaul (2020) points out three distinguishing features of global public goods that justify the case for international cooperation: transnational reach, the inability and insufficiency of actors to address them individually, and disparities in national priorities and preferences for dealing with them. Hence, when financial crises span countries and areas beyond national jurisdictions, reducing the crisis and mitigating its effects becomes a global public good, demanding a coordinated approach led by all or the majority of countries affected or concerned.

As discussed in Section C3, trade can be a powerful tool for increasing economic growth and productivity, giving countries more fiscal space to build resilience and preparation for shocks. The relevance of trade recovery and resilience was stressed in international cooperation initiatives on economic and financial resilience in the aftermath of the 2008-09 global financial crisis. In November 2008, G20 countries, in their Declaration of the Summit on Financial Markets and the World Economy, set out principles and decisions to sustain an open, resilient global economy in which trade would play a role in fostering economic growth and prosperity by reducing poverty and raising global standards of living (G20, 2008). Beyond assisting countries hit hard as a result of their lack of resources, the G20 also played an important role in increasing the number of countries coordinating global economic recovery beyond the narrow circle of the G7 or G8 countries (G20, 2009).

With similar objectives, the Commission of Experts of the President of the United Nations (UN) General Assembly on Reforms of the International Monetary and Financial System addressed how important it is for countries to cooperate in order to maintain coherence in financial, economic and trade policies, to ensure that trade contributes to recovery processes after crises (Stiglitz, 2010; United Nations, 2008). Both the G20 and the UN have stressed the WTO's role in maintaining a global open economy by ensuring the consistency of national trade measures to multilateral trade agreements and providing a multilateral forum for countries to negotiate outstanding and new agreements and cooperation initiatives.

A decade after the global financial crisis, the G20 adopted a set of economic resilience principles that emphasized the benefits of international cooperation in designing efficient resilience policies maximizing positive cross-border spillovers resulting from fostering financial stability, confidence and growth (G20, 2017). The promotion of international trade and investment became one of the G20 economic resilience principles because of its role in reaping benefits for people, economies, societies and global systems (Atteslander and Ramò, 2020; G20, 2017; OECD, 2021d).

In response to the COVID-19 pandemic, the G7 and G20 have also recognized that the objective of building economic and financial resilience should support the various roles of trade in underpinning prosperity and development (G7, 2020; OECD, 2021d; OECD, 2021f).

International cooperation also plays a role in assisting countries that are hit harder and/or lack resources and abilities to cope. The G20 Declaration of the Summit on Financial Markets and the World Economy stressed that multilateral cooperation should help poorer and vulnerable countries to manage crisis responses and potential risks stemming from global financial crises (G20, 2008). In the aftermath of the 2008-09 global financial crisis, G20 initiatives led to the creation of the Financial Stability Board (FSB), which monitors assistance programmes provided to developing countries by multilateral institutions (Carney, 2017; FSB, 2011; FSB, 2014). The World Bank and the IMF provided substantial financial assistance to developing countries, which contributed to promoting economic activity, increasing reserves and liquidity, and fostering market confidence (IEG, 2012; IMF, 2008; IMF, 2015). The WTO mobilized various actors to cooperate on increasing trade finance availability and market conditions for both developed and developing countries (Auboin, 2009; OECD and WTO, 2009). In response to the COVID-19 crisis, G20 members implemented the Debt Service Suspension Initiative (DSSI) and the Common Framework for Debt Treatments beyond the DSSI, which aimed to provide temporary suspension of debt-service payments for vulnerable and emerging economies (World Bank, 2021b). The WTO, meanwhile, has continued its coordination of public-private initiatives on trade finance cooperation (Auboin, 2021).

The WTO contributes to coherence in international cooperation efforts aimed at building economic and financial resilience and enhancing the impact of trade in facilitating recovery, growth and development, in three concrete ways. The first is by strengthening the coherence of international trade and financial policies under working groups and initiatives such as the Debt, Trade and Finance Working Group and the Aid for Trade Initiative (WTO, 2005). The second consists of enhancing the transparency of trade and economic support measures adopted by countries in response to crises. An example of this is the series of trade monitoring reports developed by the WTO in response to the 2008-09 global financial crisis and the COVID-19 pandemic (WTO, 2021f). The third is by providing multilateral frameworks and fora for countries to review the consistency of their economic and financial policies with the multilateral trade agreements they have signed.

(b) Reducing disaster risk

There is a growing awareness of the need for governments to increase their resilience to natural disasters by reducing vulnerability and exposure to hazards. Preventing losses, alleviating the impact of a crisis and speeding up the rebound from that crisis require a planned approach to disaster prevention, reduction and preparedness, and the implementation of contingency plans. An important focus of international cooperation is to mitigate climate change, perhaps the most critical challenge to sustainable development facing the international community. A key step in these efforts is to exploit synergies between these policies and international trade (see Box D.3).

International cooperation also has an important role to play in enhancing the efficiency of national resilience policies. National policies can have strong cross-border effects. For instance, reducing the risk that an epidemic will arise in a particular country reduces the risk that this epidemic will spread to other countries. In the absence of cooperation, governments may not sufficiently take into account the positive effects that their measures can have on their neighbours or on their trading partners. Inversely, certain measures aimed at reducing the risks of importing a human or animal disease could negatively affect trading partners; cooperation can ensure that the negative spillovers of such measures are taken into account and mitigated.

Countries have adopted regional and international cooperation frameworks on disaster risk reduction to coordinate efforts and strengthen resilience to natural disasters (Buchholz, 2020; Thomas and López, 2015; UNDRR and CRED, 2020; Vision of Humanity, 2019). Such frameworks help countries to adopt an integrated approach and channel efforts towards disaster prevention and management, as well as recovery. They help to set country-specific priorities for action and targets, thus offering a mechanism for reviewing and reporting their progress and creating a virtuous cycle of knowledge and evidence for improved international policy and practice (UNDRR, 2017). Such national efforts then support and contribute to wider international policy objectives.

UNDRR, which is the UN focal point for disaster reduction, was created in 1999. UNDRR works with and supports governments, the international community and other UN agencies and international organizations in the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030, including through implementation, monitoring and sharing of effective strategies to reduce existing risks and to prevent the emergence of new risks.

The Sendai Framework, adopted by all UN member states in 2015, is a voluntary non-binding global blueprint for risk reduction and resilience-building, reflecting the change of focus from responding to disasters after they happen to strengthening resilience to hazards before a disaster strikes. The Sendai Framework encapsulates the global recognition that disaster risk is economic and financial risk and can only be addressed by better incorporating disaster risk reduction, prevention and resilience considerations into policy, law and regulatory frameworks that support risk-informed economic and financial decision-making. The Sendai Framework outlines four priorities[10] to prevent new and reduce existing disaster risks:

(1) understanding disaster risk;

(2) strengthening disaster risk governance to manage disaster risk;

(3) investing in disaster reduction for resilience; and

(4) enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.[11]

It is important to note that the Sendai Framework enshrines the central role of international cooperation in ensuring effective implementation of risk reduction measures globally by committing governments to "substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national

Box D.3: Climate change mitigation and adaptation

The transboundary and transgenerational nature of the climate crisis makes it impossible for any country to manage it alone. Unilateral actions to mitigate its effects could be suboptimal and cause negative spillovers to other countries. One such example is the risk of carbon leakage, either directly, through emission outsourcing to countries with less stringent carbon policies (Nielsen et al., 2021), or indirectly through lower energy prices (REF). The lack of incentives to take substantive climate action on the part of some countries could undermine the efforts of others. For example, fossil fuel subsidies by some countries undermine efforts to reduce emissions by depressing the prices of fossil fuels and increasing their use (Global Subsidies Initiative, 2019).

Various global dialogues and negotiations, such as the United Nations Framework Convention on Climate Change (UNFCCC) (established in 1992), the Kyoto Protocol (1997) and the Paris Agreement (2015) have taken crucial steps to monitor and reduce greenhouse gas emissions and have attained significant positive impacts (Böhringer and Vogt, 2003; Kim, Tanaka and Matsuoka, 2020; Tulpulé et al., 1998). However, due to principles of differentiated responsibility, the major onus for emission reductions was initially placed on industrialized economies. As a result, reductions in countries with rigorous emission restrictions were being offset by increased emissions in countries with less stringent policies as production locations and international trade were shifted from one to another (Aichele and Felbermayr, 2015; Jiborn et al., 2018; Nielsen et al., 2021). Such differences in climate policy stringency have also raised concerns about rising emissions from the developing world, which now accounts for more than half of all greenhouse gases (Mattoo and Subramanian, 2013).

To be effective, resilient and sufficient, climate change adaptation and mitigation require a coordinated approach which strikes a balance between the right to growth of developing countries and their responsibilities towards environmental protection. Multilateral commitments like the Paris Agreement mark an important step forward in global efforts to combat climate change by binding and tracking the progress of all countries in their efforts to limit emissions and curb global warming (UNFCCC, 2020). Such broad engagements could potentially reduce the risk of carbon leakage compared to previous agreements, in which only developed countries committed to carbon reductions (Nielsen et al., 2021).

However, such engagements can only be effective if domestic climate policies address potential interactions between climate and trade regimes and harness international trade approaches that encourage and support the transition to low-carbon sustainable economies (Brandi, 2017). As discussed in sections B2 and C2, climate change increases risks for trade by negatively impacting production, trade patterns and supply chains. At the same time, however, emissions embodied in international trade amount to roughly 25 per cent of global greenhouse gas emissions (Peters et al., 2011; Wood et al., 2018).

This bilateral relationship highlights the need for synergies between international trade and climate change mitigation initiatives (World Bank, 2007). Exploiting such synergies is only possible through international cooperation. For instance, a Carbon Border Adjustment Mechanism (CBAM) is a climate policy aimed at ensuring that the price of imports is representative of their carbon content, thereby addressing carbon leakages and displacement of environmental impacts to less stringent regions. Although no country has yet adopted a CBAM, its potential environmental, social, and financial impacts, as well as the economic efficiency and feasibility the mechanism offers, including with respect to the rules of the WTO multilateral trading system (WTO, 2020i), would ultimately depend on its design.

actions for implementation of this framework by 2030" (see also the opinion piece by Ms Mami Mizutori). This is particularly important for the poorest countries, given that they are often not only more exposed to hazards but also hit the hardest, as discussed in Section B. Yet progress remains limited. Between 2010 and 2018, only 47 cents of every US$ 100 in official development assistance was allocated to disaster risk reduction (Alcayna, 2020). Official development assistance for disaster risk reduction is often de-prioritized in light of other urgent humanitarian or domestic financing needs. In addition, international financial support remains mostly focused on preparedness, even though the focus seems to be changing rapidly to risk prevention, in part due to rising economic losses and the impact of COVID-19 and climate change.

The Sendai Framework is closely interlinked with and mutually supportive of other international efforts, notably the 2030 Agenda for Sustainable Development, the Paris Climate Agreement and the Addis Ababa Action Agenda. Together, these agreements have set the agenda for reducing risks associated with all hazards and unsafe conditions. The strong linkages across these agreements can help to identify and reduce systemic risks, and promote sustainable development (Handmer et al., 2019).

In parallel, over time, regional organizations like ASEAN and the African Union, as well as non-governmental organizations (NGOs), have also been proactive in fulfilling the commitments under the Sendai Framework and have developed their own frameworks for encouraging disaster risk reduction.[12] All of this falls under the umbrella of "disaster governance", a term which encompasses interaction between the public sector, the private sector and civil society in a way that relies on both formal institutions as well as informal norms. This governance includes a broad range of horizontal and vertical linkages spanning local, sub-national, national, regional and international jurisdictions (Enia, 2020). These actions create incentives for governments to better assess, prevent, respond to and recover from the effects of extreme weather events, as well as to take measures to build resilience to rebound from unanticipated events (OECD, 2014).

At the same time, there is an increasing number of new kinds of public-private partnerships to support resilience-building in order to prevent and manage disasters. In 2017, the G7 launched the InsuResilience Global Partnership for Climate and Disaster Risk Finance and Insurance to bring together governments, civil society, international organizations, the private sector and academia. The central objective of the InsuResilience Global Partnership is to use climate and disaster risk finance and insurance solutions to promote the expansion of financial protection in developing countries as part of comprehensive disaster risk management (GIZ, 2016; InsuResilience Global Partnership, 2017). Such initiatives complement the increasing recognition of the need to incorporate financing solutions into the bigger disaster and climate risk management frameworks in light of the rapidly rising economic damages and the related consequences on the insurability of countries and regions (InsuResilience Global Partnership, 2020).

Neither the role of trade as a vector of shocks, nor its possible contribution to strengthening resilience to disasters features very prominently in disaster risk-reduction initiatives (with the exception of some work on resilience related to the tourism sector, especially in the Caribbean region). This is, however, not specific to trade. "Disaster resilience" and "economic resilience" are often still treated as separate issues. With regard to the contribution of trade to strengthening resilience, this may in part reflect the fact that the interventions that leverage trade to make populations more resilient are undervalued when benefits are measured using avoided asset losses alone (see also the opinion piece by Stephane Hallegatte in Section B).

Similarly, disaster risk reduction and resilience-strengthening strategies may need to be given more importance in the trade policy debate. As already mentioned, the WTO framework has the potential to serve as a catalyst for disaster-affected members to prevent and reduce disaster risks and, where it is impossible to eliminate all risks, to prepare for, cope with and recover from natural disasters when they occur.

Yet, there is a broad consensus that disaster risk reduction policies should be more widely incorporated. UNDRR stresses the importance of moving from a response-based to a prevention-based approach that considers climate and disaster risk comprehensively. Many of the ongoing discussions among and between WTO members on trade, environment, climate change and sustainability can contribute to the shift from response to prevention.

These discussions could be leveraged to bring lessons learned and practical examples for the incorporation of disaster risk, including the effects of its cascading, interrelated and systemic nature on trade, into trade policy and decision-making for a resilient and sustainable trade system. In that context, several trade-related preparedness measures that could be taken by disaster-prone members and their trading partners to strengthen resilience have been identified in the literature (WTO, 2019b). Among them, strong emphasis is given to the elaboration of emergency legislation, agreements on the mutual recognition of professional qualifications (i.e. to facilitate the entry of qualified personnel), and the development of special features within trade preference schemes that can automatically be triggered in the event of a disaster.

4. International cooperation on trade policies can reduce risk and vulnerabilities

Section C3 discussed how governments can use trade policies to prepare for shocks by increasing

OPINION PIECE

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The business case for trade, risk reduction and resilience

In 2015, United Nations member states adopted the Sendai Framework for Disaster Risk Reduction, the global blueprint to reduce disaster losses, and they made reducing economic losses one of its seven global targets to be achieved by 2030.

Another Sendai global target is to enhance international cooperation to developing countries to help them reduce their disaster losses.

In this age of global crisis and systemic risk, the resumption of trade after a disaster event is often key to a sustainable and long-term recovery. The WTO has been called upon to consider the trade dimensions of several crises. The trade preferences granted to Nepal in the aftermath of the 2015 earthquake, and the tariff preferences granted to Pakistan to help its recovery after the 2010 floods, are cases in point.

In the wake of the devastation wrought by the Atlantic hurricane season in 2017, Dominica and other Caribbean states made a declaration at the WTO's 11th Ministerial Conference affirming the need for special consideration and targeted assistance to be given to small, vulnerable economies. These countries cited Aid for Trade, trade and transfer of technology, trade facilitation, trade finance and development assistance as priorities for special consideration by the WTO.

The WTO has done much in recent times to highlight the links between economic resilience in disaster-prone countries, trade and international cooperation, and its members have shown good will in addressing the issues that disasters can create for members' trade and development.

This is all in keeping with the spirit of the UN Sustainable Development Goal 17, which stresses the importance of continued work for a fair, equitable, inclusive, transparent, non-discriminatory and rules-based multilateral trading system.

Whether they are triggered by natural, man-made, biological, environmental or technological hazards, financial and trade policy choices made in the coming years will shape our resilience to disasters for decades to come. The right policies can boost supply and demand, and can restore trade after a disaster, while the wrong measures can undermine recovery and have a disastrous impact on achieving sustainable development.

Encouragingly, a dialogue is opening. Faced with an increasingly tight fiscal space, political leaders discussing development finance in the era of COVID-19 have recognized the value of investing in anticipatory disaster risk reduction. There is a need to bridge short-term immediate demands with long-term resilience-building, whilst addressing climate change and ensuring environmental sustainability.

This is being accompanied by a rapidly changing regulatory landscape, as seen by the entry into force of the European Union taxonomy, the EU Sustainable Finance Disclosure Regulation (SFDR) and related work by the International Financial Reporting Standard (IFRS) Foundation and the Sustainability Standards Accounting Board (SASB) on climate and sustainability standards. Global standard-setters are working on climate and sustainability standards, and policy and business leaders are breaking new ground on the development of global risk data and analysis.

Aligned with this rapid progress, WTO members have shown their commitment to act on the Marrakesh Agreement and ensure that trade and economic endeavours are conducted "with a view to raising standards of living, ensuring full employment and a large and steadily growing volume of real income and effective demand, and expanding the production of and trade

in goods and services, while allowing for the optimal use of the world's resources in accordance with the objective of sustainable development, seeking both to protect and preserve the environment and to enhance the means for doing so in a manner consistent with their respective needs and concerns at different levels of economic development" (Preamble to the Marrakesh Agreement Establishing the World Trade Organization).

There has been a welcome trend away from a reactive to a prevention-first approach as WTO members' understanding of the systemic nature of risk expands. However, despite these advances, we have some way to go to ensure a future-fit trade system that builds and enables resilience and sustainable development.

We must make sustainability and resilience a baseline requirement for every trade and investment decision. To do so, we must improve how we monitor and manage systemic risk.

Only what is measured can be managed. We need greater understanding of the complex and changing risk landscape and its socioeconomic effects, and more coherent definitions, standards, and tools to assess and manage risk.

This requires international cooperation and political support for building resilience to disasters into trade policy and linking it explicitly with disaster risk reduction, climate change adaptation, environmental protection and long-term sustainability.

Bold leadership is necessary. There is no time to lose in this era of climate emergency and pandemics.

economic resilience, and how international cooperation can play an important role. However, even without active policy coordination geared towards resilience, existing WTO rules and regional trade agreements already reduce the trade policy volatility that can result from shocks and/or that can be itself a source of shocks or a propagator of existing shocks.

(a) Reducing trade policy volatility

Trade policy volatility can be limited through trade policy cooperation, which can ensure that individual countries' trade policy changes, which would otherwise be discretionary, are bound by a multilateral framework. Ensuring that trade flows as smoothly, predictably and freely as possible is the WTO's main function, and this function, as recalled in the introduction to this section, is achieved through disciplines limiting members' discretion to adopt policies causing trade costs volatility and negative cross-border spillovers.

As shown in Section C2(d), trade can be a source of shocks if trade costs are volatile. While relatively little research has focused on the role of the WTO as a trade stabilizer, studies show that WTO membership reduces terms-of-trade volatility by influencing government behaviour (Cao and Flach, 2015; Mansfield and Reinhardt, 2008) and encourages authorities to resist pressure to resort to protectionist measures (Ruddy, 2010). Binding tariffs reduces the scope for their discretionary use (Bacchetta and Piermartini, 2011). In a counterfactual scenario in which WTO members can arbitrarily increase tariffs, states are 4.5 times more likely to do so than under current bindings (Jakubik and Piermartini, 2019). Compared to the GATT, the WTO also provides for a deeper level of multilateral cooperation on trade, establishing many different mutually reinforcing channels that can reduce vulnerabilities. This is particularly true for new members, which, in order to accede to the WTO, need to undertake commitments to ensure that their trade regime fully complies with the extensive WTO framework. Those commitments usually cover a wide range of topics and are enforceable through the WTO dispute settlement mechanism. The WTO legal system nevertheless leaves room for limited exceptions and derogations.

Thus, this system of rules and flexibilities reinforced by individual commitments helps to deliver a more stable and predictable trading environment by shaping WTO members' trade policy responses to import shocks. In addition, considering that private traders and investors prefer stability in relative prices, lower export volatility itself has also been found to increase the level of exports (Mansfield and Reinhardt, 2008).

For integrated global markets to contribute to stronger resilience, governments need to have confidence in them (OECD, 2021f). In some countries, citizens believe that the benefits from globalization are not shared widely enough, that competition in the global economy is unfair and that everyone is not playing

by the same rules (OECD, 2017). Reinforcing trust in the multilateral system requires a demonstration of its benefits for people in their everyday lives, as well as of re-energized international cooperation. This necessitates multiple actions in several areas, including trade and investment.

There is by now a relatively broad agreement that reforms could improve the efficiency of the WTO's main functions. Proposals focus on three aspects: rule-making, transparency and monitoring, and dispute settlement. There is also an expectation that the WTO should finalize its work in a number of traditional areas and address new issues that have become increasingly important in recent years, such as the digital economy and climate change. While negotiations continue in some of the traditional domains, discussions have started in several new areas. The COVID-19 pandemic is also raising a number of new issues, given that, since its outbreak, some countries have implemented restrictive policies concerning essential supplies (Evenett et al., 2020).

Progress in all of these areas would contribute to reinforcing trust in the multilateral system. When the world is confronted with a crisis such as the COVID-19 pandemic, a functioning global trading system with the WTO at its centre can play a crucial role in ensuring the efficient supply of critical products, coordination of global action in the trade area, and support for the global trading system.

(b) Enabling import and export diversification

Trade can become a source of shocks when intermediate inputs are highly specific or if economies are too dependent on certain sectors, firms or products. As explained in Section C4, diversification reduces countries' exposure to country-specific demand-and-supply shocks, and governments can take various measures to diversify their economy. In most cases, cooperation can help governments to ensure that diversification policies are as effective as possible and that they do not have negative cross-border effects. Building on evidence suggesting that open and predictable markets enable import and export diversification (Giri, Quayyum and Yin, 2019), this subsection discusses how multilateral and regional cooperation, in the form of various disciplines and initiatives, can contribute to diversification by ensuring that markets are open and predictable, and how international cooperation can help to ensure that industrial policies are not used to diversify at the expense of trading partners and of an efficient allocation of resources.

(i) Transparent, predictable and open markets support diversification

Transparency and predictability of trade policies

Recent shocks have demonstrated that promoting and enforcing the transparency of trade-related policies, which is already important for the predictability of the global trading system in normal circumstances, becomes essential in times of crisis to maintain trust and adapt trade flows. For instance, during the 2008-09 global financial crisis, opacity and misunderstandings about the content of stimulus packages adopted by certain WTO members led to inefficient and trade-disruptive responses from others (Baldwin and Evenett, 2009a). The early stages of the COVID-19 pandemic saw frequent policy changes as the situation unfolded and countries sought to slow down the spread of the virus, mostly by limiting the cross-border movements of persons, but also that of certain goods, often leaving traders to guess what rules applied at any given time. Requiring countries to share accurate regulatory information, and to do it as much as possible on a "real time" basis, facilitates diversification of supply sources and export, avoids unnecessary disruptions in trade flows, and enhances resilience.

The WTO agreements, as well as many RTAs, include provisions to improve transparency in domestic trade policies. These provisions cover a wide range of issues, such as:

- the prompt publication of finalized laws and regulations, their availability to other governments and traders, and in some cases explanations of the purpose and rationale of decisions, or opportunities for comments;
- the establishment of contact points or "single windows" to treat requests for information from exporters/importers; and
- the obligation to notify trade policies or measures to the relevant WTO councils and committees or, in RTAs, to oversight bodies.

Moreover, the Trade Policy Review Mechanism (Annex 3 to the WTO Agreement), while not intended to convey real-time information to traders, provides a complete picture of the whole range of trade and trade-related policies of individual WTO members, as well as their impact on the multilateral trading system. Reports regularly issued on the trade policies of individual members by the WTO allow policymakers and traders to reach informed views on the prospect

of developing – and thus diversifying – their trade with those members.

Market-opening in goods and services

WTO rules facilitate the diversification of imports and exports through the MFN clause, which, broadly speaking, provides that any concession granted to one member must be extended to all WTO members. This places all foreign suppliers on an equal footing in terms of the customs duties or other measures at the border applicable to them and allows domestic importers to select their partners primarily on commercial grounds. The General Agreement on Trade in Services (GATS) requires treatment of services or services suppliers of all other members that is "no less favourable than that accorded to like services and services suppliers of any other country".

It is possible to derogate to these rules to grant more favourable market access conditions to selected trade partners, particularly developing countries and, more specifically, least-developed countries (LDCs); this can also be accomplished through RTAs. While this can lead to trade diversion, such derogations can nevertheless promote trade diversification, in particular when they benefit infant industries in developing countries. Similarly, derogations are provided for under the GATS, for example by listing exemptions to the MFN obligation, under economic and labour market integration agreements, or through the recognition of other members' standards or criteria for the authorization, licensing or certification of service suppliers.[13]

Another contribution to trade diversification is the reduction of tariffs[14] in the context of multilateral tariff negotiations, which has substantially brought down the cost of trade since the inception of GATT 1947. In the context of such negotiations, WTO members bind tariffs on identified goods at a maximum level or rate (for *ad valorem* duties). Members are free to modify their applied rates, including by raising them to the level of their bound rates, as long as they do it on an MFN basis.[15] Some members made use of such possibilities both during the 2008-09 global financial crisis (tariff increases) and since the outbreak of the COVID-19 pandemic (reduction or suspension of tariffs). The setting of maximum tariff rates, in conjunction with MFN obligations, protects existing trade and provides the security and predictability needed to conduct future trade (e.g., the conditions of competition), thus also facilitating its diversification.

Some members have agreed to permit MFN duty-free imports of goods in certain sectors. Of relevance in the context of a shock where access to medical products is a condition for economic resilience, the 1994 Pharma Agreement eliminates tariffs and other duties and charges on a large number of pharmaceutical products and the substances used to produce them.[16] WTO members participating in the Pharma Agreement have agreed to review this agreement periodically, with a view to updating and expanding the list of items covered.[17]

A similar role is played by the GATS, where concessions take the form of negotiated commitments on market access or national treatment in specified sectors. Market access commitments can be made subject to various types of limitations.[18] National treatment is likewise subject to individual members' commitments and to conditions set in their schedules. Members are free to tailor the sector coverage and substantive content of such commitments as they see fit. Granting national treatment implies that the member concerned does not apply measures that modify the conditions of competition in favour of domestic services or service suppliers.

RTAs still play an important role in market access in goods through tariff reductions (Mattoo, Rocha and Ruta, 2020), and participation by a country in several RTAs can be a way to diversify imports and exports. Moreover, as the scope of RTAs has expanded with the conclusion of "deep" trade agreements, issues covered in RTAs have extended to include trade in services, intellectual property (IP) or foreign direct investment. Transparency and predictability in domestic policies on foreign direct investment, as well as intellectual property rights (IPR) protection, are increasingly becoming a market access concern for investors and host states alike, as is the role of state-owned enterprises.

Some RTAs also cover trade-related matters not covered by the WTO, such as competition policy. Indeed, tariff preferences can be significantly eroded by monopolies' discriminatory practices or other distortions of competition. Market access is also used in RTAs for non-trade related matters. Tariff reductions or exemptions or other preferences can be granted in return for the compliance of the other party with, for instance, international labour or environmental standards.

Electronic commerce as a trade diversification tool

As discussed in Section C3, electronic commerce (e-commerce) can assist in diversifying trade, particularly when, as has been the case since the outbreak of the COVID-19 pandemic, more

traditional forms of business are severely disrupted by lockdowns and restrictions in the cross-border movement of persons and goods. Digital trade can be particularly relevant to MSMEs, which may not otherwise have the resources to prospect new markets and business partnerships. It can also foster women's empowerment through their increased participation in international trade, thus creating a denser network of potential trading partners and favouring diversification.

The GATS applies to services produced, distributed, marketed, sold or delivered electronically, as well as to services involved in the marketing, sale and delivery of goods through e-commerce. Specific commitments found in members' schedules regarding financial, telecommunications and computer-related services, as well as logistics and ground, air and maritime transport, are therefore highly relevant to e-commerce.

A Work Programme on Electronic Commerce was adopted after the second WTO Ministerial Conference (1998), in which members committed to continuing their practice of not imposing customs duties on cross-border electronic transmissions (known as the "Moratorium"). The Work Programme and Moratorium were extended in 2019 until the 12th Ministerial Conference (planned for November/December 2021). At the 11th Ministerial Conference in December 2017, in an initiative distinct from the Work Programme, ministers representing 44 members (counting the European Union as one member) issued a joint statement on electronic commerce. By April 2021, negotiations in the context of this joint statement had finalized "clean" negotiating texts in preparation for the 12th Ministerial Conference on the specific issue of unsolicited emails and on e-signatures and authentication. The latter can be particularly relevant in situations of crisis such as the COVID-19 pandemic, where restrictions on travels and other services can make the signing in person of contractual documents or, more generally, the communication of original certificates or other documents in paper format, more complex.

The international regulation of e-commerce is more advanced at the RTA level. A growing number of RTAs notified to the WTO already contain a specific chapter on electronic commerce or individual e-commerce provisions (Monteiro and Teh, 2017; WTO, 2018a). RTAs' provisions on e-commerce generally aim to encourage the development of a coherent framework of rules for e-commerce and its expansion among parties to those RTAs. Some RTAs extend their disciplines on cooperation, transparency and non-discrimination in other sectors to e-commerce. Others address more e-commerce-specific topics, such as cross-border information flows. Provisions related to customs duties and cooperation are among the most commonly found provisions on e-commerce in RTAs. Consumer/personal data protection, the applicability of WTO rules to e-commerce, paperless trading, non-discriminatory treatment for digital products and electronic authentication also feature fairly frequently. Regarding domestic regulations, some RTAs prevent their parties from discriminating between paper and electronic documents or between different forms of technology. Some also encourage their parties to consult with industry when developing e-commerce regulatory frameworks. Finally, some agreements call for cooperation and the sharing of experiences on laws, regulations and programmes.

Trust is essential to trade, but even more so in e-commerce. The need to protect consumers from fraudulent and deceptive commercial activities is acknowledged in RTAs' and, in some of them, parties are encouraged to adopt or maintain, or commit to adopting or maintaining, consumer protection laws. An increasing number of agreements request parties to adopt a legal framework that protects the personal data of e-commerce users having regard to applicable standards, criteria, guidelines and recommendations issued by relevant international organizations. Provisions on paperless trading are now often included in RTAs' e-commerce chapters. A few RTAs prohibit their participants from imposing restrictions on cross-border data flows as well as measures that require the localization of computer facilities in a country as a condition for conducting business in that country. However, this is often subject to general and security exceptions provisions. Finally, given the impact that electronic commerce has in the field of IP, recent RTAs contain e-commerce-related provisions in their IP chapters (WTO, 2018a).

Trade facilitation

As has been experienced since the beginning of the COVID-19 pandemic, tariffs are not the only impediment to trade diversification. Several factors, such as the customs classification of medical ingredients to produce vaccines, or the requirement of original paper certificates of compliance or origin, can delay the importation of essential goods and dissuade traders from diversifying sources of supply. The WTO Trade Facilitation Agreement (TFA), which entered into force in 2017, contains measures to expedite the movement, release and clearance of goods, including goods in transit; to improve cooperation between customs and other authorities on trade facilitation and customs compliance; and for technical assistance and capacity-building in this area.

Various provisions of the TFA have been found to facilitate both product and geographical export diversification, suggesting that implementing the TFA should create significant export diversification gains for developing countries, and particularly for LDCs (WTO, 2015).

Trade facilitation provisions in RTAs have evolved over time and their type, binding nature and degree of enforceability vary according to factors ranging from the level of integration of the RTA, to the practical issues where facilitation is most needed. As trade facilitation is also dependent on resources and access to technology, the level of development of the parties to the RTA affects the extent to which they can engage in trade facilitation (Mattoo, Rocha and Ruta, 2020; Neufeld, 2014; WTO, 2014).

The most common category of trade facilitation provisions in RTAs relates to exchange of information, primarily for enforcement purposes. Procedures for appeal or review of customs and other administrative decisions are also common. Whereas most RTA's trade facilitation chapters do not go beyond the requirements of Article VIII ("Fees and Formalities connected with Importation and Exportation") of the GATT 1994 in terms of customs fees and charges, several RTAs promote the use of international (mostly World Customs Organization (WCO)) standards for import, export and transit formalities. Others engage in legal harmonization by adopting directly enforceable customs codes[19] or rules to be implemented by parties to such RTAs in their domestic legislations.[20] E-customs has a significant potential for trade facilitation and paperless trading features in RTAs between countries having access to the relevant technology.

One trade facilitation issue which is specific to RTAs is the implementation of "preferential" rules of origin, which ensure that only goods "originating" in parties to the RTA are eligible to preferential treatment. Preferential rules of origin can be very complex, and can vary from one FTA to the next. Their administration usually requires certificates of origin. This can increase trade costs and is an area of trade facilitation on which many RTAs focus (Mattoo, Rocha and Ruta, 2020).[21] Ultimately, it is often easier to apply RTA trade facilitation provisions in a non-discriminatory manner to parties to the RTA and third parties alike, mainly because of the impracticality of maintaining two (or more) separate trade facilitation regimes. In this regard, RTA trade facilitation measures add to the TFA in contributing to easing trade flows and diversification.

(ii) Other related initiatives contributing to trade diversification

Aid for Trade

The WTO Aid for Trade initiative was launched at the Hong Kong Ministerial Conference in 2005 and is intended to assist developing countries, in particular LDCs, in building up their trade capacity and infrastructure. Aid for Trade operates through grants and concessional loans from donor countries targeted at trade-related programmes and projects. These include technical assistance (e.g. helping countries to develop trade strategies, negotiate more effectively and implement outcomes), improving infrastructure (e.g. building the roads, ports, and telecommunications that link domestic and global markets), enhancing productive capacity (e.g. investing in industries and sectors that allow diversification of exports), building on comparative advantages, and adjustment assistance (e.g. helping with the costs associated with tariff reductions, preference erosion, or declining terms of trade).

Aid for Trade has been found to enhance export product diversification (Gnangnon, 2019; Kim, 2019) and import diversification by increasing both the number of import commodities and the number of import partner countries (Ly-My, Lee and Park, 2020). All three components of Aid for Trade (aid for trade-related infrastructure, aid for building productive capacity, and aid for trade policy regulations and trade-related adjustment) have been found to contribute significantly to the import diversification of recipient countries.

Trade finance

MSMEs amount to 95 per cent of business globally and 60 per cent of global employment. Their participation in international trade could significantly contribute to the diversification of supply sources, yet they remain underrepresented (WTO, 2016). One reason is that the international legal environment insufficiently takes their needs and constraints into account, particularly in terms of trade financing, cross-border payments and trade facilitation.

Trade finance is essential to allow firms, and particularly MSMEs, to diversify import and export markets, but trade finance tends to be increasingly difficult to obtain in middle- and low-income countries. During the 2008-09 global financial crisis, which significantly impacted the availability of trade finance, the WTO, among other contributions, engaged with regulators to ensure that improved access to trade finance be reflected in the new financial stability rules.

A limited but increasing number of RTAs includes explicit provisions on MSMEs (Monteiro, 2016a). At the WTO level, efforts to facilitate MSMEs' participation in international trade are currently conducted by an informal working group on MSMEs created in December 2017 at the WTO's 11th Ministerial Conference. This informal working group comprises WTO members of all regions and levels of development. It has put forward a package aimed at enhancing MSME access to market and regulatory information, promoting the inclusion of MSME-related dimensions in trade rule-making, encouraging the effective application of trade facilitation measures and full implementation of the Trade Facilitation Agreement, and increasing MSME access to finance.

The Declaration on "Access to finance and cross-border payments" forms part of the package of six recommendations and declarations aimed at addressing challenges smaller businesses face when they trade internationally, which was adopted by the Informal Working Group on Micro, Small and Medium-sized Enterprises at its meeting of 11 December 2020. The Declaration calls on WTO members to consider the trade-related aspects of MSMEs' access to finance and cross-border payments. This should be done more particularly through the exchange of best practices and information-sharing on relevant technical assistance and capacity-building.[22] The Declaration also welcomes international initiatives aimed at facilitating a global legal identification ("Legal Entity Identifiers")[23] system for companies, and invites WTO members to cooperate in such initiatives.

Investment facilitation and investment protection

Trade and investment are intimately linked. However, while trade in goods and investment in goods production remain subject to two different legal regimes, despite increasing synergies between the two, the GATS already covers investment in services in the third of the four modes of supply defined in Article I.2(c) of the GATS, through the establishment of a commercial presence in a partner country.

International rules on investment and investment facilitation promote diversification and global value chains by allowing, for instance, the establishment of production facilities closer to suppliers or consumers. A first initiative to pursue "structured discussions" on investment facilitation in the WTO context was agreed upon by a number of members at the 11th Ministerial Conference in 2017 with the aim of developing a multilateral framework for facilitating foreign direct investment (FDI) for development purposes. Further to a second Joint Ministerial Statement on Investment Facilitation for Development, issued on 22 November 2019, participating members decided to move into negotiation mode in December 2019. Negotiations are ongoing, based on the informal consolidated text circulated by the Coordinator on 2 March 2021. Participation in this joint initiative is open to all WTO members (WTO, 2019d).

An agreement on investment facilitation could allow a better flow of investment into supply chains located in developing countries thanks to increased certainty and predictability. If so, it could generally raise these countries' levels of economic resilience by contributing – in the context of a preparation for future shocks such as a new pandemic – to expanding their production capacities in domains in which they are currently limited, such as medical products, including personal protective equipment (PPE), tests, medicines, and even vaccines.

Over the past decades, an extensive network of generally bilateral investment treaties has been built with the objective of liberalizing and protecting FDI. With the entry into force of the GATS and the subsequent development of "deep preferential agreements", these standalone bilateral investment treaties are now being complemented or replaced by investment chapters in regional trade agreements (Mattoo, Rocha and Ruta, 2020). Many RTAs opening up trade in services now extend coverage of investment beyond the GATS mode 3 service provision, and regulate a broader investment framework, including areas such as investment in goods, IP and portfolio investment. A lot of recent RTAs also highlight and incorporate sustainability as part of their investment objectives, adding to the potential of investment as an instrument of resilience.

Recent years have witnessed changes in the nature and scope of investment protection, allowing governments to engage in social, health or environmental policies without being challenged by investors for alleged indirect expropriation or lack of "fair and equitable treatment". One important change has been the tightening of the definition of "investment" (Mattoo, Rocha and Ruta, 2020). Many investment chapters of RTAs are now limiting the types of assets that fall within their scope by adopting a closed-list definition of investment instead of the previous open-ended ones, excluding various types of assets such as certain commercial contracts, certain loans and debt securities, and assets used for non-business purposes, or using a more selective approach to IPR as protected assets. Similarly, RTAs have also introduced changes in the definition of "investor" and, hence, of those who can enjoy the

protections accorded by their investment provisions. This evolution is considered to have generally brought greater certainty to the interpretation and implementation of international rules on FDI.

Another significant evolution has been the introduction into RTAs' investment chapters of market access provisions, whereby parties agree to liberalize their regulatory regimes with respect to foreign investment. These provisions have helped developing and emerging economies to channel resources to important sectors and to make domestic industries more efficient, globally competitive and integrated within global production networks. More generally, balanced FDI rules can promote efficient labour allocation, higher salaries and local industry expansion in the host country, allowing it to withstand disruptions better and to attract international support in case of adversities (Adams, 2009).

E-commerce and cybersecurity

As discussed above, e-commerce can play a significant role in diversification, particularly when other forms of doing business are disrupted. The COVID-19 pandemic has accelerated the digital transformation of the global economy, and recovery from the pandemic is unlikely to reverse this trend. However, this transformation may widen the digital gap between rich and poor countries, raising new trade policy challenges. Equal access to the benefits of e-commerce may justify that the current discussions taking place at the WTO consider means to avoid or limit the widening of the divide, as new technologies such as 5G telecommunication are being rolled in.

Trade spurs innovation which, in return, expands trade into new domains, such as trade in data (WTO, 2020g). Because data can be particularly sensitive, trade in data needs to be protected against fraudulent actions. Whereas e-commerce represents an opportunity for MSMEs to engage in international trade, MSMEs often lack the resources to invest in cybersecurity. Cybersecurity is not only essential for innovative forms of trade. Both trade in goods and trade in services, and not only through e-commerce, heavily depend on the reliability of firms' IT resources and telecommunication networks. Enhanced international cooperation on cybersecurity, as it relates to the specific constraints of international trade, needs to be considered.

Competition

As discussed in Section C4, diversification can be impeded not only by government measures but also by anti-competitive practices in countries in which firms seek to diversify their sources of supply or to export because of cartels or abuses of dominant position. After the 1st WTO Ministerial Conference (1996), a Working Group on the Interaction between Trade and Competition Policy (WGTCP) was established to study various aspects of this issue, with the participation of all WTO members. The Doha Ministerial Declaration (2001) focused the mandate of the WGTCP on matters such as hardcore cartels and on support for progressive reinforcement of competition institutions in developing countries through capacity-building. A reactivation of the WGTCP could help to address some of the obstacles to the diversification of supply sources and export markets originating in anti-competitive practices.

(iii) Industrial policies

As explained in Section C4, while industrial policy can be part of the toolkit to foster trade diversification, other forms of government intervention – such as reforms to the business and investment climate, trade and investment policies that are not biased against exporting, and policies that increase competition in markets of factors of production, products and services – might be more appropriate to foster diversification than industrial policy. This is because targeted industrial policy interventions are more distortive than most of those other policies, and raise various difficulties, such as vulnerability to rent-seeking (i.e., seeking to gain added wealth without making any reciprocal contribution of productivity), or difficulties related to identifying spillovers that warrant sector-specific interventions (WTO, 2020g).

As explained in the *World Trade Report 2020*, many countries use active and targeted industrial policies – often involving the use of instruments such as financial support or investment incentives – to steer capital and labour into activities that the markets might not choose. Market-distorting government support in the context of industrial policies can lead to significant trade frictions and may best be addressed through international cooperation. It is important to distinguish the sort of longer-term support that can distort markets from the emergency support that governments provide in the context of a pandemic or of other crises, and which are necessary measures in the face of significant, possibly historic, economic crises. However, the limit between the two categories can sometimes be blurred. As discussed below, forms of emergency support can also be used for industrial policy purposes, and it may distort competition in the long run, in which case it should also be addressed through international cooperation.

In recent years, concerns have been voiced by some WTO members regarding possible gaps in existing disciplines on subsidies which could be discussed at the multilateral level (OECD, 2021f; WTO, 2020g). A first important gap concerns transparency. In order to facilitate a discussion on government support and to develop effective disciplines to cover existing and potential new support, information on the nature and scale of government support would be very useful, if not indispensable. Yet such information remains limited. A second important gap that may need to be addressed concerns the proper identification of the ultimate beneficiary of government support in global value chains. Identifying the ultimate beneficiary of government support when the effects of such support propagate through entire value chains that span multiple industries and countries can be difficult. The third gap involves concerns that have been raised regarding state-owned or state-controlled enterprises, which can be both significant recipients and providers of support.

(c) Strengthening the resilience of global value chains, in particular for essential goods

In a number of countries, shortages of PPE and other essential goods in the early stages of the COVID-19 pandemic raised concerns about dependency or over-reliance on imports of essential products, as well as about the vulnerability of GVCs. In response to these concerns, some politicians called for the adoption of industrial policies to reduce dependence on global supply chains. As discussed in Section C3, governments can use various trade-related strategies, for example subsidies, tax incentives, tariffs, local content requirements, investment restrictions or the easing of investment-related regulations, to encourage reshoring of production and the diversification of input supplies in value chains. Such policies have high costs in terms of efficiency, entail negative cross-border spillovers, and could ultimately trigger protectionist reactions from other countries, inducing cross-retaliation and further income and welfare losses (OECD, 2020d). Governments could then be tempted to increase fiscal incentives or to relax labour or environmental standards to compensate for additional costs, with the risk of a race to the bottom.

A number of other options are available to governments to enhance resilience by reducing vulnerability to disruptions in the supply of essential goods. These include promoting transparency in value chains producing essential goods; building inventory stocks, or encouraging firms to build inventory stocks; facilitating trade; ensuring mutual recognition of standards for essential products and essential inputs for these products; and encouraging the adoption of flexible production methods that allow for quickly switching production. Consumer behaviour with regard to essential goods tends to change drastically during certain types of crises, as demonstrated by the COVID-19 pandemic.[24] Without sufficient inventory stocks, shortages can arise as consumers stock up in preparation for potential quarantines. Inventory stocks are costly, but having too little stock is risky. Thus, firms face the challenge of meeting demand during normal times in a cost-effective manner, while maintaining the ability to meet exceptional demand peaks in response to public health emergencies. They may decide to bolster inventory stocks through backup capacity that comes into production (or is diverted from other goods) when demand is expected to exceed inventory (Craighead, Ketchen Jr and Darby, 2020).

International cooperation can play an important role in helping governments to increase the resilience of GVCs and secure essential goods at a reasonable cost by discouraging reshoring policies and promoting transparency on essential goods (in particular with regard to production capacity and bottlenecks in value chains), facilitating trade and mutual recognition of standards, (in particular for emergency goods), and holding inventories to prevent excessive stockpiling. All of these forms of cooperation, short of substituting for national policy options, can usefully complement national diversification or stockpiling policies.

International cooperation could take place at different levels. Multilateral cooperation may be possible in some cases, but cooperation at the regional or plurilateral levels may be easier to achieve; for example, after a short non-cooperative episode in the initial stages of the COVID-19 crisis, EU member states quickly reverted to cooperation. Since 2017, groups of WTO members have begun talks that may lead to open plurilateral agreements on specific trade and investment-related policies. Open plurilateral cooperation could offer interesting prospects for groups of countries to explore and develop their potential common interests on regulatory matters, while safeguarding core aspects of their national regulatory sovereignty (Hoekman and Sabel, 2019).

(i) Disciplining reshoring policies

Given the negative cross-border spillovers that reshoring policies generate, governments may collaborate to impose further disciplines on the use of such policies. First, more transparency on reshoring policies is needed. The WTO and other international

organizations have gone to considerable lengths to document the use of measures to promote reshoring by governments since the outbreak of the pandemic.[25] More evidence on the cross-border spillovers of such policies would also be useful. Second, while most of these instruments are, in principle, covered by multilateral disciplines, the legality of the measures typically depends on their design and implementation. Moreover, these disciplines still leave considerable space for governments to implement reshoring policies. There may, therefore, be room for discussing further tightening of the disciplines on some of the reshoring policies to limit their negative impact.

In light of the above, it should not come as a surprise that government financial support for reshoring is not encouraged by WTO rules. Financial contributions conferring benefits on specific recipients are divided into two categories of subsidies: prohibited subsidies and actionable subsidies. The former are presumed to have negative effects on trade and are, therefore, banned. The latter are subject to WTO disciplines only insofar as they cause adverse effects to another member. Subsidies "contingent […] upon the use of domestic over imported goods"[26] ("local content subsidies"), which can be used by a government as an incentive for companies to re-locate their production on its territory, fall within the category of prohibited subsidies.

Another "local content" threat to an efficient and resilient functioning of GVCs is the requirement that products sold on a given market incorporate a certain percentage of locally sourced inputs or, in the case of a foreign firm having production facilities in the country concerned, matching the quantity of imported goods with a ratio of locally produced goods. Local content requirements were prohibited by the GATT long before the concept of GVCs was introduced in trade literature. Although imposing a minimum threshold of local content may promote interactions between firms in the host markets and may, in some circumstances, reduce international firms' exposure to external risks and shocks, such requirements conflict with the GVC rationale to produce certain goods or intermediary goods in the countries offering the best conditions in terms of comparative advantage. The WTO Agreement on Trade-Related Investment Measures (TRIMs Agreement) provides that no WTO member shall apply any trade-related investment measures inconsistent with Articles III ("National Treatment on Internal Taxation and Regulation") and XI ("General Elimination of Quantitative Restrictions") of the GATT 1994. To this end, an illustrative list of TRIMs deemed to breach those provisions is appended to the TRIMs Agreement.

Regarding regional disciplines on local content, some RTAs simply refer to the TRIMs Agreement. Others, such as the RTAs concluded by the United States, Canada and Japan, explicitly prohibit local content requirements, trade-balancing requirements, export controls, and foreign exchange restrictions related to foreign exchange inflows attributable to an enterprise. Others go beyond the TRIMs Agreement by applying disciplines on performance requirements for both goods and services, or by adding additional limitations on, for example, forced technology transfer, the hiring of a certain number or percentage of nationals, or the exclusive supply of the goods or services produced (Mattoo, Rocha and Ruta, 2020). Moreover, an increasing number of RTAs include a chapter on FDI. The conditions imposed on FDI in RTAs are discussed in Section D4(b)(i).

(ii) Collecting and sharing information on value chains

Given that GVCs are necessarily international, cooperation between governments to strengthen the resilience of value chains is a sensible approach. As no single government is likely to have access to information on production over the full length of a value chain, they may cooperate with other governments to collect and share information on potential concentration and bottlenecks upstream and/or to develop stress tests for essential supply chains (Hoekman et al., 2021; OECD, 2020e). More communication can certainly lead to more transparency and more confidence in GVCs. Firms need systems to monitor market conditions and identify slack and chokepoints in their global network so that they can adjust production and respond to changes in demand. Governments need information systems that allow them to determine where supply capacity exists (Hoekman et al., 2021). To anticipate and mitigate disruptions, it is important to know exactly the level of inventory stocks, as well as output all along the value chain. Firms can generally assess demand and their supply options, but governments often do not have direct access to such information. Identifying bottlenecks in supply chains and measures to address them therefore requires cooperation between industry and government, as well as among governments.

While individual lead firms know their supply chains, they may not wish to share this information, as they may consider it to be business sensitive. Conversely, governments may require firms to share more information on the value chains of essential products, and such information may be shared with other governments. As noted by Hoekman et al. (2021), some regulators – notably the New Zealand Medicines

and Medical Devices Safety Authority – already require approved product marketers to disclose their supply chain, including where active ingredients for medicines are made and where they are packaged (Ross, 2020). It would be interesting to assess if and how such requirements have contributed to enhancing the robustness of value chains and whether they helped to ensure the supply of essential products during the COVID-19-related crisis.

Traceability has also become an important part of the production process for food products. In the case of agri-food production, a system to facilitate collecting and sharing information on global agricultural markets – the Agricultural Market Information System (AMIS), established at the request of the G20– already exists (FAO, et al., 2011). This system has helped countries generate valuable information and an international expertise network to inform coordinated policy responses with regard to shocks (Hoekman et al., 2021; OECD, 2021f).

(iii) Facilitating trade and cooperating on standards

Lowering trade costs is essential to ensure the resilience of GVCs, and tariff reductions and the opening of certain services markets can reduce trade costs. Reducing administrative burdens and delays related to border controls can improve the efficiency and, thus, the resilience of GVCs. Border crossings must guarantee supply chain continuity and not unduly delay the transport of critical goods. Trade preparedness and the anticipatory incorporation of specific measures into customs procedures and processes can significantly facilitate the importation of critical goods in times of crisis, thereby enhancing GVC resilience. Trade facilitation reforms, including implementation of the WTO Trade Facilitation Agreement (see Section D4(b)(i)), can play an important role in this respect. Other measures, discussed in Section C, that can simplify customs procedures and processes in preparation for crises, are easier to develop and adopt cooperatively, and can therefore be discussed in the context of the implementation of the WTO Trade Facilitation Agreement.

International cooperation among governments, international organizations and also, possibly, firms can help in the development of common approaches, such as agreements on simplified export and import procedures and international standards, to facilitate the flow of essential goods. Cooperation on technical standards and regulatory regimes can take various forms. Using relevant international standards as a basis for domestic measures on some essential goods can prove particularly useful to ensure that these measures are aligned with those of other countries. Formal recognition and equivalence arrangements for the certification and acceptance of foreign standards can help to prevent the rigid enforcement of national standards and any accompanying detrimental trade-restrictive effects (Hoekman et al., 2021). Recognising conformity assessment procedures – such as testing conducted by partner economies – can help to expedite administrative procedures.

International regulatory cooperation has an important role to play in the development of emergency measures to increase predictability and in ensuring the consistency of policy approaches and mitigating unnecessary impacts on trade. The publication or notification to the WTO of draft regulations designed to respond to emergencies which can have a significant impact on trade should ensure more transparency, as this gives foreign stakeholders an opportunity to comment on such regulations at the development stage. International organizations can promote a common understanding of the specific products that are relevant to fight crises such as the COVID-19 pandemic, and thus can help focus regulatory cooperation across countries and, in time, improve access to essential goods (OECD, 2021f).

Technical barriers to trade in goods (TBT) and sanitary and phytosanitary (SPS) measures include technical regulations and standards, as well as conformity and equivalence assessment procedures. TBT measures are subject to the WTO Agreement on Technical Barriers to Trade (TBT Agreement),[27] while SPS measures fall under the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement).[28] TBT and SPS measures ensure, among others, the quality of imports and exports, the protection of human, animal, and plant life or health, and the prevention of deceptive practices, thereby contributing to economic resilience by preventing or limiting certain risks. In this regard, in the first stages of the COVID-19 pandemic, a number of import restrictions were applied for sanitary reasons, based, for instance, on the initial assumption that certain animals (particularly wildlife) could transmit COVID-19 to other animals and to humans.[29]

TBT and SPS measures can nonetheless generate significant costs for exporters and importers and impair economic resilience to shocks when products must comply with different regulations and standards in each country or region. Therefore, both the TBT and SPS agreements primarily aim to ensure that technical regulations, standards and conformity assessment procedures[30] are non-discriminatory and do not create unnecessary obstacles to trade. Both agreements also urge members to harmonize their

SPS/TBT measures on the basis of internationally agreed standards and to give positive consideration to accepting equivalent technical standards or SPS regulations of other members, provided that such regulations adequately fulfil the objectives of their own standards and regulations. The TBT Agreement promotes the recognition of conformity assessment procedures undertaken by designated conformity assessment bodies in the territory of another member. The SPS Agreement specifies that each member should accept SPS measures performed by other members as long as they provide protection equivalent to that provided by the member's own procedures.

Several WTO members provisionally applied the mutual recognition provisions of the TBT Agreement during the early stage of the COVID-19 pandemic,[31] thus facilitating the importation of essential goods that were in high demand at the time.

The inclusion of provisions on SPS and TBT is common in RTAs. A number of SPS chapters in RTAs make references to international standards such as those developed by the Codex Alimentarius, the World Organisation for Animal Health (OIE), the International Plant Protection Convention (IPPC),[32] regional standards, or other parties' standards in the SPS domain. Most TBT chapters in RTAs recommend the adoption of international or regional standards and/or the harmonization of standards at international and regional levels for rules and conformity assessments. In fact, many RTAs reaffirm the commitments of their parties to the adoption of international or regional standards.[33]

RTAs containing deeper integration clauses, such as the harmonization and mutual recognition of technical standards or conformity assessments, can contribute to bolstering the capacity for economic resilience of the parties in case of a shock (Espitia et al., 2020). Ideally, mutual recognition of standards and conformity assessments should be pursued simultaneously (Veggeland and Elvestad, 2004). RTAs promoting mutual recognition of both standards and conformity assessments are mainly concluded by countries with similar levels of development, such as Australia, the European Union, Japan and Singapore.[34]

Mutual recognition of standards regulations, including control, inspection and approval procedures, is not systematically mentioned in RTAs SPS chapters. This may be because "the nature of mutual recognition (of standards and conformity assessments) relates more to the objective of TBT than SPS" (Trivedi et al., 2019). For the purposes of recognition of another party's SPS-related regulations, RTAs use equivalence provisions. Equivalence provisions under SPS chapters of RTAs vary from binding commitments[35] to "best endeavour" clauses (Mattoo, Rocha and Ruta, 2020; Prabhakar et al., 2020). As in the TBT context, the latter option is less conducive to creating a resilient environment in times of crisis.

Countries can also explore the coordination of emergency programmes to speed up the clearance and release of medicines, medical supplies and food in times of crises. Such items have to be clearly defined, and simplifications in customs procedures could reduce the resulting administrative burden on businesses. In 2020, the WCO Secretariat published a list of Harmonized System (HS)-coded medical supplies and essential products used in the prevention and treatment of COVID-19 (e.g. COVID-19 diagnostic test kits, PPE, medical devices such as ventilators and extracorporeal membrane oxygenation, consumables and disinfectant products) and highlighted certain essential provisions of WCO instruments and tools aimed at trade facilitation and supply chain continuity (WCO and WHO, 2020).

Governments also need to ensure that people with key competences can cross borders safely when needed. Collective global measures are still needed to make the unilateral, temporary measures to liberalize trade in medicines and medical supplies permanent (Stellinger, Berglund and Isakson, 2020).

(iv) Assessing and managing risks of bottlenecks or chokepoints

GVCs are highly dependent on continual and smooth supply flows. National policies affecting trade in goods and services are only one of the potentials sources of disruptions to such flows in times of crisis. The current global situation is such that the next crisis could come from any corner: climate, other environmental issues, health, etc. These multiple sources of risk require governments to integrate risk assessment and management into all aspects of their policies and plans on development, climate, economy and trade, among others. It is also essential to ensure a coherent approach, domestically and internationally, to multi-hazard risk. By identifying all the risks, understanding where gaps exist in policies, and finding solutions in cooperation with others, countries can contribute to ensuring the resilience of value chains.

As discussed in Section D4(c)(ii), governments do not usually have real-time access to the information on supply chains that is available to firms and that would allow governments to respond promptly to

the occurrence of bottlenecks, e.g., by adopting temporary measures to speed up imports or facilitate the diversification of sources of supply. Having this information available at the international level and putting cooperation arrangements in place would allow countries with excess production to facilitate exports, while those experiencing shortages in supply could temporarily ease import rules.

Countries can also individually adopt rules to prevent bottlenecks or chokepoints in value chains which can paralyse a whole production and delivery process, e.g., by mandating factories to keep sufficient stocks and backup sources of supply, or to ensure that other business continuation plans are in place, and by monitoring them to ensure that these mandates are being fulfilled. This could, however, increase the cost of doing business in countries applying such rules, leading firms to move their production to less demanding countries. This can only be avoided through international cooperation if a large number of countries commits to adopt such policies.

International cooperation, in the form of pooled resources and policy coordination through international institutions, is already used in disaster relief, but such cooperation could also assist governments in preparing for global disruptions such as pandemics. Developed countries can manage their own stockpiling programmes, but developing countries can run into difficulties, given that stockpiling is costly both in terms of the expenses for building up and maintaining those stocks (for instance if the goods concerned are perishable or have a determined shelf-life) and in terms of opportunity costs, as building stockpiles may come at the expense of pursuing other essential policies, such as water sanitation or other infrastructure. Handing over part of the stockpiling efforts in essential goods and their delivery to international organizations or regional associations[36] can ensure that all governments, and not only those with the means to build up stockpiles, have access to stockpiled essential goods in times of crisis. However, this system should be incentive-compatible to make sure that countries do not forget their commitments in times of crisis, and that stocks are not confiscated for their own use by the countries where they are held. Not only is it preferable to assign the management of stockpiles to neutral entities, such as international organizations, but, ideally, those stocks should be held in countries with small populations, where production of the essential goods stockpiled on their territories is sufficient to make these countries net exporters of the product in question. This way, incentives for these countries to requisition those emergency stocks would be limited.

Establishing regional or international stockpiles of medical equipment and other essential products could help address future supply chain disruptions for critical goods, primarily in case of pandemics. Strategic stockpiling could also reduce incentives for countries to put in place restrictions on exports of medical products, and could mitigate some other risks that are more often associated with emergency contracting, such as insufficient research for and verification of suppliers, bias in favour of domestic producers or even corruption. As demonstrated by the European Union's COVID-19 experience and discussed below, regional and international cooperation is very important with regard to stockpiling.

However, if not managed carefully, stockpiling practices in anticipation of possible shortages can actually contribute to the occurrence of such shortages. While a certain level of stockpiling of essential medicines for emergency use can be useful, the more localized the stockpiling, the greater the risk that an unsustainable increase in aggregate anticipatory demand will lead to shortages in places where needs have materialized. This led the European Commission to recommend that stockpiling of medical supplies be coordinated at the EU level, and that any stockpiling by member states should be at the national level and for moderate quantities based on epidemiological indications (European Commission, 2020).

Global value chains are also vulnerable to shocks resulting from natural disasters, as discussed in Section B. Extreme weather conditions can disrupt air and maritime transport, damage infrastructure and increase insurance costs. The issue of climate change, *per se*, is not part of the WTO's ongoing work programme. However, some measures adopted by governments to mitigate and adapt to climate change or other disasters, such as under the Sendai Framework, can have an impact on international trade and fall under the existing provisions, allowing members to depart from their obligations under the WTO Agreement to pursue environmental policies, essentially Articles XX(b) and (g) of the GATT 1994[37] and Article XIV ("General Exceptions") of the GATS. Agreement on policy responses with regard to economic resilience to the effects of climate change and the implementation of environmental, social and governance mechanisms that strengthen and support sustainable development and trade will, however, require much greater international cooperation.

(v) Other related initiatives

The effective operation of GVCs does not depend only on policies and infrastructure resilience.

Identifying potential bottlenecks and stockpiling are only part of the solution. As highlighted during the COVID-19 pandemic, GVCs also depend on the people who operate the trucks, trains, aircraft and ships that transport parts, components and finished goods, and measures taken to limit contamination have thus affected these service providers. For instance, the application of stringent public health rules to both ship and air crews, including quarantining, in response to the COVID-19 pandemic have complexified operations and significantly added to transport costs. Because of this, the International Civil Aviation Organization (ICAO), the International Labour Organization (ILO), the International Maritime Organization (IMO), the International Organization for Migration (IOM) and the World Health Organization (WHO)) issued, on 25 March 2021, a "joint statement on prioritization of COVID-19 vaccination for seafarers and aircrew" in which they encouraged authorities to designate ship and air crews as essential workers and to facilitate their access to COVID-19 vaccines, given that they are regularly required to travel across borders.

(d) Enhancing emergency preparedness and limiting the propagation of shocks

(i) Enhancing government procurement practices

Developing good government procurement practices is an invaluable component of emergency preparedness and management (see Section C3). Government procurement has a role to play in strategic stockpiling, but also in the emergency procurement of critical goods. International cooperation, such as in the WTO context, can help with the development of good procurement practices. However, when many countries are affected simultaneously by a crisis such as the COVID-19 pandemic, clear incentives exist to increase collaborative approaches to procurement strategies at the national, regional and supranational levels (OECD, 2020e).

Collaborating and coordinating at various levels has several advantages. It can help to avoid sending counterproductive messages to the market. Joint government procurement also allows participating procuring entities to have more bargaining power and better access to suppliers, thanks to the increased procurement capacity, in addition to economies of scale and avoidance of competition among entities at national, regional and local levels.

Cross-border collaboration in procurement can take various forms. Sharing information about prices and suppliers between different countries, for example, can improve understanding of the constantly changing purchasing environment. Tools that allow public buyers to search for vendors can help them to find critical suppliers more quickly during crises.

At the multilateral level, government procurement is explicitly exempted from the main disciplines of both the GATT and the GATS.[38] It is nevertheless subject to a plurilateral agreement: the WTO Agreement on Government Procurement (GPA). The GPA was renegotiated in 2012.[39] Forty-eight WTO members are currently parties to the GPA 2012, and a majority of acceding WTO members that have obtained their membership since 1995 have, over time, either joined or committed to join the GPA. This suggests that governments are increasingly mindful of the importance of more open markets, better value for money, sound government procurement systems and international cooperation in a context in which they are essential when preparing for and recovering from shocks.

The GPA 2012 extends a number of WTO disciplines to cover the public procurement of goods as well as of services and construction works (Anderson and Müller, 2017). Public procurement covered by the GPA 2012 must comply with the principle of non-discrimination.[40] The GPA 2012 also provides for rules to ensure that laws, regulations, procedures and practices regarding government procurement are transparent,[41] thus promoting efficient procurement mechanisms (Moïsé and Geloso Grosso, 2002). In addition, the GPA 2012 requires that government procurement procedures be conducted in a fair manner, free from corrupt and collusive practices, making it an international tool for good governance.

GPA obligations can be enforced under the WTO Dispute Settlement Understanding (DSU) or at the level of national review bodies vested with the power to hear procurement complaints. The rules of the GPA 2012 apply to the procurement of goods, services and construction works that are necessary to respond to public health crises, subject to their coverage in the schedules of parties to the GPA. The flexibilities offered by the GPA 2012, particularly in terms of procurement methods, deadlines and e-procurement, can be used by GPA parties to obtain high-quality medical goods and services (including vaccines) with the necessary efficiency and speed. Well-administered procurement procedures, together with well-organized contract management and product delivery, can be considered essential for viable mass vaccination programmes.

At the regional level, the economic significance of government procurement is further illustrated by the inclusion of government procurement provisions

in RTAs over the past 20 years (Mattoo, Rocha and Ruta, 2020).

Most RTAs incorporating government procurement transparency clauses broadly adopt the corresponding obligations in the GPA 2012. Non-discrimination provisions have also become a common feature in RTAs. Some RTAs explicitly forbid "buy national" policies, price discrimination, and local content requirements favouring domestic firms. A number of RTAs nonetheless include additional provisions, such as the requirement to create or strengthen national institutions dealing with procurement policies and to promote associated reforms, as well as provisions calling for cooperation with respect to the formulation of national procurement policies (Hoekman, 2018). Such provisions contribute to better government procurement management overall, as well as to planning ahead and having the capacity to respond to shortages during both domestic and cross-border disasters. A number of RTAs also contain dispute settlement clauses and enhanced market access schedules.

Some RTAs contain provisions which go beyond the GPA 2012 in terms of facilitating the access of firms from parties to those RTAs to government procurement carried out by other parties to those RTAs. These include provisions on technical specifications, e-procurement and the facilitation of MSME participation in calls for tender.

Extending the coverage of bilateral or regional procurement rules to more public entities, and opening public procurement to firms from other RTA parties, can help government services to be better prepared for disruptions caused by shocks.

Despite the growing trend toward inclusion of substantive government procurement chapters in RTAs, the GPA 2012 remains the most efficient and transparent forum for undertaking further liberalization in government procurement (Dawar, 2017).

Moreover, potential future shocks may lead to increased government intervention to build resilient infrastructure (e.g., earthquake-resistant hospitals, power stations and transport infrastructure) or to upgrade existing infrastructure in conformity with new constraints (such as increasing the height of dikes against rising sea levels). The GPA 2012 itself has a built-in mandate for parties to undertake further negotiations with the aim of improving the Agreement, such as by progressively reducing and eliminating discriminatory measures and achieving the greatest possible extension of its coverage on the basis of reciprocity, while taking into consideration the needs of developing countries.[42]

(ii) Preparing for disruptions by improving the availability of critical services

International cooperation at the multilateral or regional level can also help governments to open their markets to foreign services and services providers in services sectors of critical importance (WTO, 2020g). As discussed in Section C3, opening the domestic market to foreign weather forecasting, insurance, telecommunications, transportation, logistics and health services and providers can play a key role in enabling firms, citizens and governments to cope better and to recover more quickly after crises. Putting in place comprehensive regimes for the recognition of foreign qualifications in advance of crises helps to ensure that the entry of foreign personnel supplying the required services will be facilitated when this is necessary. In addition, where a domestic market is not yet developed enough, opening it to foreign services and service suppliers can have a positive impact on inward investments in the sectors concerned, encouraging the growth of the private sector and enhancing the domestic capacity to supply services crucial for improving economic resilience capacity and reducing vulnerability to shocks.

Arguably, Articles II ("Most-Favoured-Nation Treatment") and III ("Transparency") of the GATS, as well as Article VI.1 ("Increasing Participation of Developing Countries") and VI:3 ("Domestic Regulation") already impose disciplines on WTO members' implementation of domestic regulation in services. However, the successful negotiation of additional disciplines in such a sensitive domain may enhance the contribution of WTO trade norms to economic resilience through better preparation to potential shortages of specialized skills.

Domestic regulatory requirements in services such as licensing, qualifications or technical standards are essential to fulfil legitimate policy objectives and prevent undesirable trade practices, particularly in essential services such as health, transport or telecommunication. However, even in the absence of market access limitations or outright discrimination against foreign service providers, domestic regulatory requirements can still raise unnecessary obstacles to foreign services and service suppliers. For instance, they may be implemented through insufficiently transparent or unnecessary burdensome procedures. Opening foreign access to critical services for which licensing and qualifications requirements or technical standards apply would, however, not require a lowering of standards or consumer protection. It could be facilitated through the recognition of the equivalence of foreign standards, qualifications or authorizations to practice, or the recognition of the qualifications

of foreign service providers. In this regard, more and more governments are modernizing their services to the public, including the publication of regulations, application forms, and relevant guidance on electronic portals, as well as the possibility to submit applications and receive feedback electronically. This facilitates the participation of foreign service providers, particularly of MSMEs, in trade in services subject to domestic regulation.

Article VI:4 of the GATS ("Domestic Regulation") provides that the Council for Trade in Services shall develop any necessary disciplines with a view to ensuring that domestic regulation in services does not create unnecessary barriers to trade. A Working Party on Domestic Regulation was established in 1999. The mandate of this working party is to develop generally applicable disciplines and, as appropriate, rules for individual sectors. At the 11th Ministerial Conference in 2017, a group of members decided, through a joint ministerial statement initiative, to advance discussions on domestic regulation in parallel with the work of the Working Party on Domestic Regulation. In May 2019, participants in the joint initiative committed to continue their work on outstanding issues with a view to incorporating the outcome in their respective schedules of commitments at the forthcoming 12th Ministerial Conference. Participation in the joint initiative is open to all members.

Many recent RTAs contain disciplines on domestic regulation of services, such as national or MFN treatment (Mattoo, Rocha and Ruta, 2020). A large majority of RTAs also includes provisions relating to qualifications, licensing and technical standards. After 2005, a new generation of trade agreements started to address the trade barriers that result from a lack of transparency and procedural red tape, with a view to promoting the good governance of services markets. Among the domestic regulation measures that feature most prominently in RTAs are obligations on the advance publication of new measures before their adoption, on enquiry points for service suppliers, and on the involvement of interested stakeholders through public consultation procedures. In addition, building on Article VI:3 of the GATS ("Domestic Regulation"), many RTAs provide for certain procedural benchmarks to be followed by competent authorities when dealing with applications for authorizing the supply of a service. In this context, most of those RTAs require competent authorities to establish indicative timeframes for processing applications, to allow applicants to submit additional documentation needed to complete applications, and inform applicants in case of rejection, including on the reasons thereof.

RTAs often contain provisions on regulatory coherence and regulatory cooperation. RTA provisions on regulatory coherence prescribe minimum standards and principles that must be observed when developing, applying, administering and reviewing domestic regulation. Their aim is to tackle regulatory divergence by fostering minimum common quality standards across jurisdictions, and to deter unreasonable and inconsistent administrative practices. These provisions may require the parties to a RTA to base their technical requirements on international standards when the latter are available and provided they do not undermine the fulfilment of legitimate objectives.[43]

Some RTAs encourage competent standard development bodies and authorities respectively to develop and to adopt technical standards through open and transparent processes.[44] Introducing some minimum due process may help in sectors in which firms must apply for a licence in order to supply their services, and in which lack of information, differences in licensing requirements across jurisdictions, delays or arbitrary handling of the application process can negatively impact trade in services.[45]

In addition to substantive disciplines for the development of specific types of regulations on services and procedural disciplines for their application and review, some RTAs provide for the application of good regulatory practices. These provisions are intended to enhance the quality of regulatory outputs by avoiding unnecessary, duplicative or inefficient regulations, thus contributing to preparedness by enabling a framework that can facilitate responses to shocks.

(iii) Limiting the propagation of diseases through trade and trade-related mobility

International cooperation at the multilateral or regional level can help governments to adopt and enforce SPS policies that limit the propagation of animal diseases. As discussed in Section C2, SPS measures are useful and effective in preventing the spread of animal diseases in licit animal trade. The SPS Agreement promotes science-based SPS measures necessary to protect human, animal or plant life or health. It ensures health protection by making it possible for governments to adopt or enforce SPS measures while avoiding arbitrary or unjustifiable discrimination between members where the same conditions prevail and facilitating international trade.

In addition, Section B4 has shown that the costs of restrictions to travel imposed in the context of the COVID-19 pandemic, and of restrictions to mode 4

of the GATS (i.e. supply of services via the temporary movement abroad of individuals), in particular, were relatively large. International cooperation can help governments lower the costs of such restrictions. Establishing common approaches and recommendations while providing clear and timely information to the public is important in this regard. International cooperation can aim to ensure that travel-restrictive measures to control the spread of a pandemic are based on careful risk assessments which take into account reasoned scientific evaluations of the available evidence on their potential effectiveness on a regular basis (Petersen et al., 2020). By the same token, it can also help to ensure that testing capacities are made available to countries as and when they need them, thus ensuring the rapid isolation of suspected, confirmed and contact cases.

Ultimately, international cooperation must guide policymakers and other stakeholders to optimally balance the expected positive effect from mobility restrictions on public health with the negative impact of those same restrictions on freedom of movement, the economy and society at large. OECD (2021e) estimates that lifting restrictions to international travel unilaterally in G7 countries would increase services export levels by around 5 per cent, and services import levels by around 3 per cent on average in 2021, while lifting those restrictions through international coordination could boost the effect by a factor close to two.

Improved information-sharing and coordination among border agencies regarding the transit and importation of critical goods could significantly speed up the exportation, transit and importation of urgently needed supplies. Further cooperation on these measures could be discussed in the context of the implementation of the TFA.

Successful recourse to e-processing of customs measures since the outbreak of the COVID-19 pandemic should encourage customs authorities to continue to move into this direction. The TFA and trade facilitation discussions at the WTO would offer an ideal forum for further cooperation in this domain.

The COVID-19 pandemic has also highlighted the need for greater cooperation and efforts to reduce barriers to trade, including through additional mutual recognition agreements on essential goods, as part of future trade negotiations.

Strengthening the capacity of SPS agencies is critical to increasing resilience to future SPS risks, but a more holistic approach to health in general is also necessary in a world where human, animal and environmental health increasingly condition each other. Regarding SPS capacity-building, the WTO is one of the partners of the Standards and Trade Development Facility (STDF), which was established to help build capacity in developing countries in this area (see also Section D6). Strengthening SPS capacity, as a global public good, is critical to help developing countries to recover from shocks, such as COVID-19, and to become more resilient against future outbreaks of pests and diseases. As far as a more global approach to health is concerned, the Global Health Summit, held on 21 May 2021 in Rome, recognized that working across the human, animal and environmental health silos by adopting a "One Health" approach could help to address future risks and enhance resilience (G20, 2021). 'One Health' is an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes. A One Health approach is, among others, particularly relevant in food safety and the control of zoonoses.[46]

5. International cooperation on trade policies can help cope with shocks

This subsection examines the role international cooperation can play in enhancing the positive impact on resilience of trade policy responses to shocks. Policies adopted unilaterally in response to shocks can generate positive or negative cross-border spillovers including by affecting efforts to build and support economic resilience. International cooperation can help reduce negative spillovers and increase positive spillovers. Negative cross-border spillovers can be addressed by imposing disciplines, or otherwise by promoting cooperative approaches that can substitute for the unilateral measures that induce negative spillovers. As for measures that generate positive cross-border spillovers, they can be encouraged through the adoption of disciplines or by being diffused as "best practices".

(a) Ensuring access to essential goods during a crisis

(i) Dissuading governments from adopting export restrictions on essential goods

As discussed in sections B5 and C3, some countries producing essential medicines and medical equipment, faced with a sharp increase in the domestic demand for medical supplies and

concerned with protecting their populations from COVID-19, decided to impose quantitative export restrictions. Such restrictions reduce the world supply of essential medicines, which in a global crisis can seriously limit the access of importing countries which do not have sufficient manufacturing capacity for these products themselves. In case of essential medical products, such as life-saving pharmaceuticals and equipment, allocation across countries could fail, leading to the accumulation of stocks in one country while patients are unnecessarily suffering or dying in others (Berden and Guinea, 2020).

In view of the negative consequences of these export restrictions, international organizations, G20 trade ministers and some WTO members appealed to governments, in the spring of 2020, to keep the trade of essential goods flowing, including by removing export restrictions on such goods as soon as possible. In the G20 statement of 14 May 2020, trade ministers indicated a number of actions to support world trade and investment in response to the COVID-19 crisis, several of which particularly targeted export restrictions. In a joint statement, the heads of the IMF and WTO called on governments to lift trade restrictions on medical supplies and food and expressed concerns at the decline in the supply of trade finance. The FAO, WCO and WHO pledged to work together to minimize the impact of policy measures on the flow of medical supplies and food. The WTO and WCO decided to establish a coordinated approach to facilitate cross-border trade and ensure that essential goods reach those who need them the most, including least-developed and land-locked countries. At the WTO, Singapore and New Zealand issued a joint declaration of principles to keep their markets open. They were joined in by five other WTO members. Canada led an initiative of 47 countries (counting the EU member states separately), pledging openness and good practices with respect to world agricultural trade. Finally, a Swiss-led initiative, supported by 42 countries (mostly middle-income economies), committed to lift export restrictions that had been imposed in response to the crisis as soon as possible. This encouraged the WTO to work on concrete actions to foster the cross-border flows of medical supplies, services and equipment, and to preserve agriculture supply chains and enhance food security. The signatories also pledged not to impose export restrictions on food, as such restrictions had been witnessed in a number of countries at the early stage of the pandemic.

In the context of a crisis such as the COVID-19 pandemic, it is crucial to maintain an open and predictable international trading system. While seeking to preserve domestic supply in times of crisis is instinctive, it can artificially cause or worsen shortages, and it is important to coordinate international efforts to ensure a sufficient supply of essential goods for all. Given the issues raised since the outbreak of the pandemic by export restrictions, it may be necessary to further discipline or discourage their use. However, because of the challenges that this may raise, finding alternative approaches to increase the supply of essential goods has become the priority.

A key economic rationale for WTO rules is to enhance cooperation among trading partners in areas where unilateral actions can trigger detrimental consequences. Anticipatory negotiations of trade rules on essential goods are complicated by the diverging interests of net exporters and net importers of essential goods over time. While net exporters of essential goods benefit from low trade barriers before a crisis hits, there is an incentive to impose export restrictions in times of crisis in order to guarantee the domestic supply of essential goods. Inversely, net importers of essential goods seek to protect their markets before a crisis hits, in order to become less dependent on imports, and to develop domestic industries. In times of crisis, however, net importers of essential goods have an interest in keeping trade barriers low to ensure that there is a sufficient supply of essential goods available in their domestic markets. In view of these diverging interests, anticipatory negotiations on commitments to refrain from imposing export restrictions in times of crisis are difficult to conclude.[47] Still, to avoid any deterioration of global supply or shortages of essential goods, especially in times of crisis, international cooperation is in the common interest to ensure free and predictable trade flows. As a compromise, net importers might agree to lower import restrictions on essential goods in normal times in exchange for a credible commitment by exporters to abstain from export restrictions in times of crisis.

As discussed in Section B5, although governments adopted a larger number of trade-facilitating measures in response to the COVID-19 pandemic, many economies applied export restrictions to trade in critical goods such as food or medical products, primarily through export bans, quotas or licences, at the early stage of the COVID-19 pandemic. The resumption of international trade after the first wave of the pandemic rapidly contributed to alleviating the original shortages in PPE and other critical medical goods. However, the small number of countries producing COVID-19 vaccines, the agreements concluded between certain governments and pharmaceutical companies, and the decisions of

some countries to reserve their production or stocks of vaccines for their own residents may remain a cause of frictions for as long as the production of vaccines fails to meet global demand.

Quantitative import and export restrictions on goods, other than duties, taxes or other charges, are banned under Article XI:1 ("General Elimination of Quantitative Restrictions") of the GATT 1994.[48] However, Article XI:2(a) of GATT 1994 permits the temporary imposition of quantitative export restrictions, on a non-discriminatory basis, to prevent or relieve critical shortages of foodstuffs or other products essential to the exporting member.

WTO members may also unilaterally invoke Articles XX ("General Exceptions") and XXI ("Security Exceptions") of GATT 1994 and their equivalents in the GATS Agreement and in the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), subject to certain conditions, to justify a measure that is otherwise inconsistent with one or more of the GATT 1994 obligations. For instance, Article XX(b) of the GATT 1994 concerns measures "necessary to protect human, animal or plant life or health", thus potentially covering trade restrictions taken in response to such crises as natural disasters, zoonoses or pandemics. Article XIV ("General Exceptions") of the GATS contains similar language and allows members, under certain conditions, to restrict the supply of services.[49] Export restrictions that may be applied pursuant to Paragraph (j) of Article XX of the GATT 1994 to meet emergency situations including "natural catastrophes"[50] must respect the principle that all WTO members are entitled to "an equitable share of the international supply". These terms may support claims by some WTO members for access to a more equitable share of the worldwide production of, for example, COVID-19 vaccines.

Complex treaties such as the WTO Agreement usually contain built-in derogations that governments can invoke unilaterally with respect to specific obligations while they continue to fulfil their other commitments. Actually, the mere availability of such "escape clauses" can sometimes be sufficient to reassure governments and make them stick to their obligations. This is evidenced by the fact that the multilateral trading system has survived two of the most severe economic crises of the post-World War II period (i.e., the 2008-09 global financial crisis and the COVID-19 crisis) and that, particularly during the latter, many derogations adopted in the early stage of the pandemic were lifted by the end of 2020. In other words, the flexibility of the WTO legal system contributes to its resilience.

As far as RTAs are concerned, it seems that, even though the negative economic effects of quantitative restrictions (QRs) are largely acknowledged, on the grounds that they are generally prohibited in RTAs, the trend at the regional level is not to eliminate all QRs but to elaborate on the exceptions of Articles XI ("General Elimination of Quantitative Restrictions") and XX ("General Exceptions") of the GATT 1994 by expressly providing for situations in which QRs may be legally maintained or introduced.

A number of RTAs also contain provisions that operate in a similar manner to Articles XX ("General Exceptions") and XXI ("Security Exceptions") of GATT 1994 and their equivalents in the GATS and the TRIPS Agreements. As a result, a government engaging in policies departing from its international obligations – whether multilateral or regional – will be required to comply with two cumulative sets of conditions: those in the RTA in the context in which the government in question plans to depart from its obligations, and those in the WTO Agreement if this departure affects not only its obligations towards its RTA partners, but also its obligations *vis-à-vis* other WTO members. RTAs with exceptions do not always add any conditions of substance to those of the GATT 1994, the GATS or the TRIPs Agreement, but this two-tier control nevertheless adds to the obligations of transparency and to the international legal supervision over this derogation to accepted international rules on QRs.

The COVID-19 pandemic has shown the importance of QRs as policy instruments at a time when governments have wished to take, or to be seen to take, firm actions to protect their constituents' lives and health, despite long-standing evidence that QRs are sub-optimal trade policy instruments. It therefore seems that QRs will continue to be used in a world increasingly prone to shocks. The challenge, therefore, is to ensure that there is a balance between allowing governments subject to heavy political pressure to use derogations, and making sure that those derogations are not abused and do not lead to the unravelling of the multilateral trading system. Criteria such as those defined by the G20 in the context of the COVID-19 pandemic, whereby "emergency measures […], if deemed necessary, must be targeted, proportionate, transparent, and temporary, and that they do not create unnecessary barriers to trade or disruption to global supply chains, and are consistent with WTO rules", act as useful reminders that countries have more to gain than to lose by exercising due restraint when invoking derogations to WTO norms, even in times of crisis (G20, 2020b).

(ii) Other initiatives

The COVID-19 pandemic has brought about new forms of international cooperation. For instance, the Trade and Health Initiative, proposed by a group of WTO members[51] in November 2020, is an example of a new inter-governmental joint action (WTO, 2020j). According to this initiative, first, a special investment fund is to be created. Second, the initiative suggests an enforceable commitment on the part of participating countries not to place export restrictions on essential goods destined for other participating countries. Participating governments could therefore expect that the imposition of export restrictions on output would swiftly be met with joint restrictions, by their trading partners, of their exports of inputs. Third, the agreement suggests an informative monitoring system to improve transparency and coordinate policy actions. This system may be established on the model of the Agricultural Market Information System (AMIS), but would be broader in terms of its product coverage and would include information on any barriers to trade irrespective of their type (tariff and/or non-tariff).

(b) Boosting vaccine production and making vaccines available to poorer countries

(i) Global demand and concentrated production

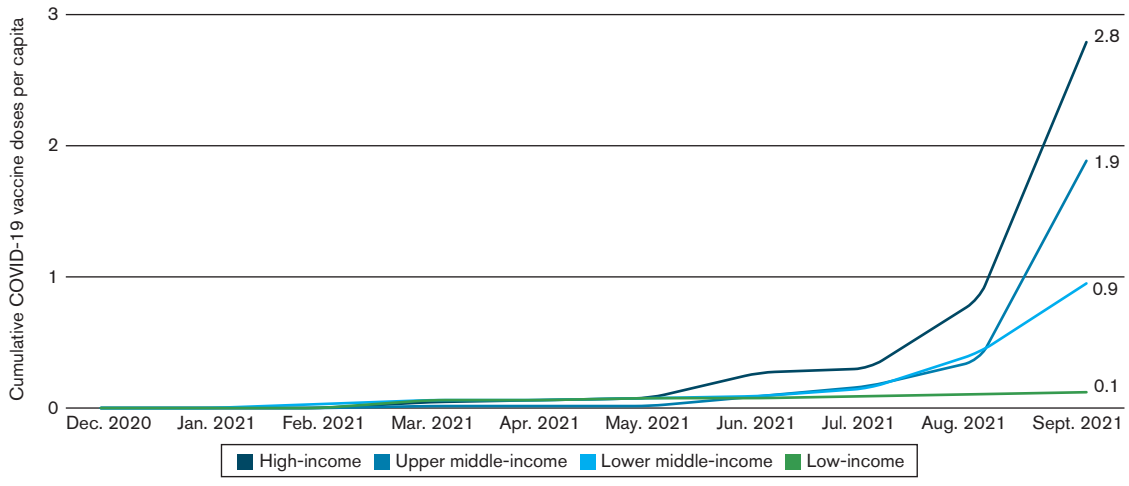
One key element in the fight against the COVID-19 pandemic has been the development and deployment of safe and effective vaccines as quickly as possible (WHO, 2021). There is no doubt that vaccines are an essential product, and governments have been involved in different ways and at different phases of their development and deployment.

The speed of the COVID-19 vaccine development has been unprecedented, thanks to the involvement of both the private and public sectors and to international cooperation. Several vaccines have been developed or are still being developed by private pharmaceutical companies. These companies have benefited from IP protection and, in some cases, from governmental financial support.

Production and deployment of vaccines have been more challenging. The main problem has been unequal access to vaccines caused by both supply and demand factors (see Figure D.3).

On the supply side, not only are vaccines patented, but their production process is complex, requiring inputs and know-how from several countries. Production is geographically concentrated and, partly for the reasons just mentioned, cannot easily be extended to other countries, particularly those with limited means to sustain such a complex production process. For reasons related to regulatory requirements, economies of scale or simply politics, as with other vaccines in the past, it is probable that almost 75 per cent of the COVID-19 shots expected to be manufactured in 2021 will come from only five countries (Airfinity, 2020; Evenett et al., 2021; Wang et al., 2020).[52] The study by Evenett et al. (2021), using the European Union as an example, indicates that the situation with vaccine ingredients is analogous. Vaccine-producing countries are both the main sources and the destinations of exports

Figure D.3: COVID-19 vaccine access remains highly unequal



Source: Author's calculation based on data from Airfinity.

Notes: Figure D.3 displays the cumulative COVID-19 vaccine purchases by income level and as a proportion of purchaser population. The country income level is divided according to World Bank classifications. The data contain government purchases of vaccine doses per capita. Vaccine purchase deals that do not have specific purchase dates are not included.

OPINION PIECE

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The economic case for global vaccinations

Rolling out a vaccine to stop the spread of a global pandemic does not come cheap. Billions of dollars have been spent on developing drugs and putting in place a programme to get those drugs into people's arms. But amid the uneven distribution of vaccines – with poorer countries lagging far behind richer nations – another concern presents itself: the economic cost of not vaccinating everyone.

My colleagues and I sought to find out and measure the impact of uneven vaccination distribution on the global economy. To do this, we analysed 35 industries – such as services and manufacturing – in 65 countries, and examined how they were economically linked through trade and production networks in 2019, before the pandemic hit. For example, the construction sector in the United States relies on steel imported from Brazil; American auto manufacturers need glass and tyres that come from countries in Asia; and so forth. We then used data on COVID-19 infections for each country to demonstrate how all countries will lose out if the coronavirus crisis were to disrupt global trade, curbing shipments of steel, glass and other exports. The more a sector relies on people working in close proximity to produce goods, the more disruption there will be to that sector due to higher infections.

Our results showed that even if wealthier nations had been fully vaccinated by the middle of 2021 and developing countries had managed to vaccinate only half of their populations, the global economic loss would have amounted to around US $4 trillion, and the United States, Canada, Europe and Japan would have shouldered almost half this burden, a whopping 48 per cent.

Our research underscores that no economy is an island, and it is in rich countries' direct economic interests to ensure that poorer nations are also fully vaccinated. Widespread vaccinations in wealthier nations will certainly help domestic businesses such as restaurants, gyms and other services, but industries such as the automobile industry, construction and retail, that depend on imports of materials, parts and supplies from developing economies, will continue to suffer from the lack or delay, caused by the pandemic, of supplies produced in developing economies.

Our estimates have been made weekly throughout 2021, on the assumption that prices will not adjust enough. When prices rise and these bottlenecks in global supply chains are smoothed out by the end of 2021, then losses will stop, but they will already have been incurred in 2021.
In addition, as long as people are not vaccinated in the poorer countries of the world, exporting industries in rich countries will not fully recover because the continuing pandemic in developing economies reduces the demand for products from advanced economies. A full global economic recovery will only come when vaccines are made available worldwide and every economy recovers from the pandemic.
We have already had a glimpse of the scenario modelled by our work, with uneven worldwide recoveries for the first six months of 2021.

It is primarily a humanitarian responsibility to produce and distribute vaccines to the whole world. Our results also highlight that this is not simply an act of charity, but an act of economic rationality from the perspective of advanced economies, by returning high returns to their investments in initiatives such as COVAX that aims to produce and distribute more vaccines to the rest of the world. This implies that global policy coordination of the supply of vaccines across the world is in the economic interest of all regions.

of key vaccine inputs, which results in a lack of bargaining power for economies in which there are no firms producing either the final vaccine or vaccine ingredients. Moreover, some countries with production capacity have restricted their exports.

On the demand side, the main issue is the vast global demand and the limited resources in low- and middle-income countries. With production concentrated in only a few countries and demand coming from all countries, trade is playing a key role in ensuring global access to vaccines. Without global coordination, however, countries may bid against one another, driving up the prices of vaccines and related materials (Bollyky and Bown, 2020).

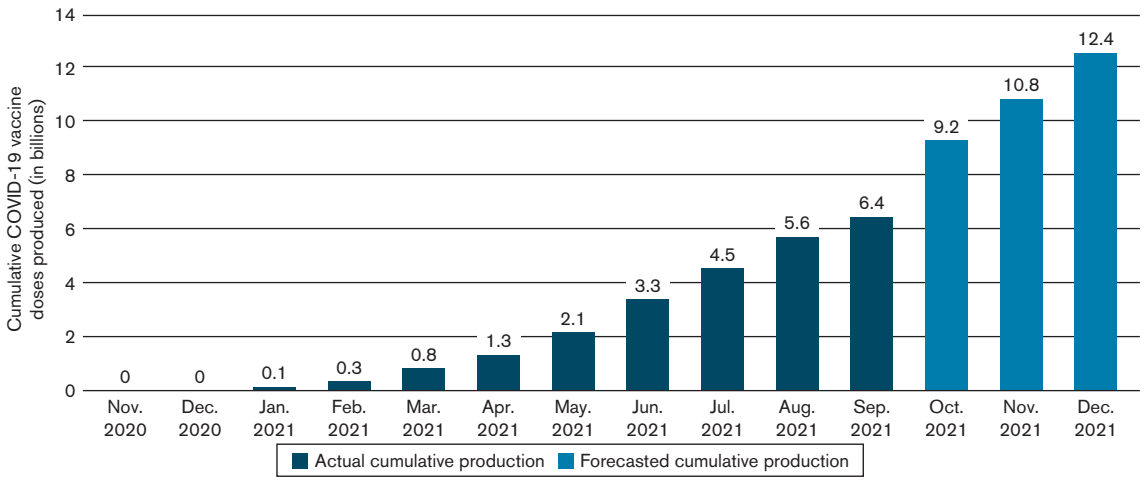
International cooperation can help boost production and ensure universal access to vaccines. To meet the vast global demand for COVID-19 vaccines, it is necessary to ramp up production in the short run by using the capacities of existing facilities. As shown by Figure D.4, the production capacity of COVID-19 vaccines from developers that have licensure experience[53] will increase more than 20 times up until the end of 2022 compared to the level of the last quarter of 2020. Assuming that, under a two-dose regime, 16 billion doses will be necessary to immunize the world population, this is encouraging news, provided that it is coupled with equitable distribution arrangements.

However, vaccines continue to be unevenly accessible, and other challenges persist in efforts to inoculate people in many developing economies. Hence, it is important to exploit all available production capacities by providing third-party countries with access to the technologies that are necessary for the production of COVID-19 vaccines while, at the same time, ensuring that future innovation and investments in new technologies are not put at risk. As outlined in Section D4, international cooperation can play an important role in the identification and avoidance of potential concentrations and bottlenecks within the global production network by collecting and sharing information.

International cooperation also has an important role to play in ensuring that IPR does not impede the production and deployment of vaccines, while continuing to facilitate the necessary technology partnerships. This can give public and philanthropic research funders leverage over health technologies, while encouraging private investment into medical research.

Knowledge transfers through cross-border partnerships can facilitate manufacturing scale-ups in multiple contexts. Most straightforwardly, firms can manufacture a vaccine that was successfully developed by an originator firm under some form of licence or production contract that encompasses the transfer of know-how along with formal IP and access to regulatory dossiers. Alternatively, the transfer of knowledge can help competitors to develop vaccines with new properties (such a wider spectrum, a longer shelf-life, or that are easier to distribute and store in vaccination centres) (Price, Rai and Minssen, 2020). Finally, a transfer of knowledge which can be used irrespective of the type of vaccine to be produced could also facilitate the manufacturing of vaccines for other contagious diseases.

Figure D.4: COVID-19 vaccine production capacity expanded significantly in a few months



Source: Author's calculation based on data from Airfinity.

By early 2020, several WTO members had implemented specific IP measures aimed at facilitating the development and dissemination of COVID-19-related health technologies, as well as at relaxing procedural requirements and adapting deadlines for administrative IP matters. These government measures were complemented by voluntary actions by IP rights-holders, such as the sharing of IPR to support research and development (R&D) and to facilitate access to relevant health technologies (WTO, 2020e). Some developers of COVID-19 vaccines declared they would abstain from enforcing patents during the pandemic to allow other developers of COVID-19 vaccines to build on their technology (Moderna, 2020). Moreover, international vaccine alliances, public research centres and private companies are collaborating to coordinate the transfer of production licences in order to provide the vaccine on a non-profit basis, especially to low- and middle-income countries (AstraZeneca, 2020).

To ensure the global distribution of vaccines, it is also important to maintain a transparent and well-functioning multilateral trading system. Getting vaccines and their ingredients to where they are needed depends on borders being open. One obstacle to the free movement of vaccines is export restrictions, which, as discussed previously, have many disadvantages. Export restrictions, however, are not the only impediment to trade in vaccines.

As announced by various governments, exports of vaccine-related products have to undergo specific approval procedures, and subtle curbs on exports have been identified in this respect. Concerning these curbs on exports, a closer look at contracts between governments and vaccine producers reveals that certain arrangements lead to a *de facto* (although probably temporary) ban on exports of vaccines or of key vaccine inputs, even though no export restriction has been publicly announced. More precisely, such arrangements provide for a lock-up of output in favour of governments which have previously invested in the development and production of COVID-19 vaccines (The Economist, 2021). Some suppliers of important vaccine inputs receive subsidies in exchange for the guarantee that they will supply domestic vaccine producers first. Contractual arrangements between governments and private firms can limit exports of vaccines on the world market and trigger shortages along the global value chain of vaccines. Unanticipated delays along global value chains could induce retaliation from trade partners (Evenett et al., 2021). International cooperation may help shed light on such arrangements and find ways to reduce their negative spillovers on trading partners.

The COVID-19 pandemic has also revealed the degree of geographical concentration of vaccines production in general, and of the technology and know-how needed to develop and produce COVID-19 vaccines in particular.

In a context in which current producers are already running at full capacity, the granting of licences to produce vaccines or related ingredients, and the sharing of know-how with other manufacturers could address the problem of export restrictions if those IP rights are shared with producers located abroad. In addition, The TRIPS Agreement gives WTO members the right, where necessary, to issue compulsory licences to produce vaccines or related ingredients.

Securing licences on relevant IP rights and sources of supply of necessary ingredients may, however, prove insufficient to enable countries to engage rapidly in their own production of COVID-19 vaccines if they do not have the resources and expertise to upgrade existing facilities or build new ones, or if they lack the relevant human capital and know-how. In the short term, domestic regulations on the marketing of medical substances or materials may prevent or delay the importation of relevant vaccine ingredients or production equipment. Customs regulations may also make the importation of the relevant ingredients more difficult because of complex TBT or SPS requirements or slow or cumbersome clearance procedures. In this regard, cross-border regulatory cooperation, in the form of regulatory convergence and mutual recognition of regulatory outcomes, would allow significant progress towards the development of distribution and production capacities.

Beside the facilitation of trade in vaccines, ingredients, equipment and related services, the question of funding the exportation and distribution of billions of doses, particularly for LDCs, remains particularly acute. At the request of the G20, a high-level independent panel – the G20 High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response – has proposed a number of solutions to ensure the perennial funding of vaccines production and supply having regard to the risk of the multiplication of pandemics.[54]

An array of initiatives has also been proposed to create technology hubs in the developing world (such as South Africa's mRNA[55] centre) and to establish more evenly distributed production capacities with a view to longer-term resilience beyond COVID19. In this regard, the WTO is already involved in a number of programmes[56] which aim to diversify development and production sites, most notably the

COVAX Manufacturing Task Force, which has been established to identify and resolve issues impeding equitable access to vaccines through COVAX. The task force intends to leverage the capabilities of the global vaccine community to address short-term, medium-term, and long-term COVID-19 vaccine manufacturing challenges and bottlenecks. Of particular relevance for the WTO, one of the task force's most urgent objectives is to address shortages of raw materials and single-use materials (potentially by ramping up supply capacity) and to expedite the cross-border transit of these materials, vaccine components and finished products. The longer-term aim is to help strengthen regional health security for the future,[57] as the risk of future pandemics and the related costs for trade and the world economy underline the necessity of establishing reserve production capacities, while putting in place the financial means to ensure their continued funding.[58]

(ii) TRIPS and the expansion of vaccines production

The WTO TRIPS Agreement establishes for all WTO members[59] a set of minimum standards for the protection and enforcement of an array of IP rights, including substantive obligations contained in World Intellectual Property Organization (WIPO) conventions incorporated by reference.[60] Equally, in line with the objective of promoting social and economic welfare from the IP system, the TRIPS Agreement is designed to assure governments a wide range of options for overriding the exclusive character of IP rights in the public interest. Such options can, for instance, be deployed to extend the production and distribution of pharmaceutical products even if these are covered by patents.[61]

Compulsory licensing of patents embraces a range of mechanisms to permit the use of a patented technology without the authorization of the patent-holder. For example, a government can directly authorize the local production of a vaccine in the public interest regardless of patent coverage, or it may permit the importation of generic medicines or critical ingredients without the patent-holder's consent. For non-commercial public use, such as government orders for the production of medicines, and during emergencies, such licences or government-use authorizations can be streamlined, for instance without prior negotiations with the patent-holder. The Doha Declaration on the TRIPS Agreement and Public Health of November 2001 affirms the right of members to grant compulsory licences and to determine their grounds, and clarifies that members have the right to determine what constitutes a national emergency or other circumstances of extreme urgency. This expressly applies to public health crises.

Several countries have considered instituting compulsory licensing as part of their COVID-19 response. On 24 March 2020, Israel issued a compulsory licence to import generic versions of the lopinavir/ritonavir (AbbVie's Kaletra) treatment (Kass, 2020). The WTO monitors this and other compulsory licensing.[62] South Africa and India,[63] are, however, pushing for a stronger measure in the form of a proposed waiver of certain provisions of the TRIPS Agreement in relation to the "prevention, containment or treatment" of COVID-19 (WTO, 2021b). Since it was tabled in October 2020, the proposal has been subject to extensive discussions among WTO members (WTO, 2020n), including intensive text-based discussions on a revised proposal.[64] While supporters of the request argue that vaccine manufacturing capacities in developing countries are not used due to IP barriers, and stress the shortcomings of the existing TRIPS flexibilities as a means of overcoming those barriers, other delegations[65] submit that existing TRIPS flexibilities are sufficient tools to address any IP hurdles encountered when ramping up and diversifying vaccine manufacturing (WTO, 2021b). The European Union has, for instance, tabled a proposal that aims to clarify the application of these options in a pandemic.[66] To date, no consensus on the TRIPS waiver proposal has been reached (see also the opinion pieces by Ellen 't Hoen and Patrick Gaulé). However, the TRIPS Council has agreed to continue discussions on the IP response to COVID-19.[67] In the meantime, calls for further voluntary collaborative efforts continue (WTO, 2020e).

RTA provisions that set standards for national IP systems may also have an impact on how the production of COVID-19 vaccines can be expanded. However, the nature of IP commitments differs from one RTA to the other. Most simply reaffirm parties' existing commitments to IP protection and the TRIPS Agreement, and promote cooperation (Valdés and McCann, 2014), in some cases also recognising the possibility of public health waivers under the TRIPS Agreement. However, a considerable number of RTAs aim at stronger protection of IP rights, above the standards of TRIPS (called "TRIPS+" provisions), for instance by limiting grounds for compulsory licensing of patents. Some RTA provisions explicitly promote technical assistance, coordination, cooperation and capacity-building between developing and developed economies, building on provisions which are well-established elements of the TRIPS Agreement itself. Such provisions could contribute to the facilitation of technology transfers to developing countries,

OPINION PIECE

By Ellen 't Hoen,
Lawyer and public health advocate

Vaccine knowledge needs to be a global public good

The global health crisis caused by the COVID-19 outbreak has laid bare the lack of an effective mechanism for the sharing of IP and technology required to produce the diagnostics, therapeutics and vaccines to respond to the pandemic.

The WHO established, in May 2020, well before the first vaccines came to market, the COVID-19 Technology Access Pool (C-TAP): a mechanism to allow the sharing of the IP, know-how, data and technology that are needed to meet the global need for 11 billion doses of COVID-19 vaccines, as well as diagnostics and treatments.

Companies have so far refused to collaborate with C-TAP, citing the age-old talking point that sharing IP is detrimental to future investments in pharmaceutical innovations – even though the development of COVID-19 vaccines has been de-risked with unprecedented amounts of public financing. Governments have spent 93 billion Euro on the development of vaccines, therapeutics, and diagnostics. It is therefore a reasonable expectation that both the products and the IP associated with them would be shared globally as public goods.

Instead of joining COVAX – a multilateral vaccine-sharing scheme to ensure the equitable distribution of vaccines – wealthy nations placed pre-purchase orders and hoarded vaccines, leaving developing nations behind in the queue.

The failure to deliver those goods has prompted various proposals for compulsory measures to close the know-how gap. On 2 October 2020, India and South Africa proposed a temporary waiver from certain obligations under the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) for the duration of the pandemic – a rather modest proposition that was nevertheless initially met with opposition from most high-income countries, except for the United States, which supports a TRIPS waiver but only for COVID-19 vaccines. The European Union is promoting the use of compulsory licensing of patents instead.

Such measures, however, have limitations when it comes to the COVID-19 vaccines, because their production and rapid scale up require the transfer of know-how and technology and therefore the collaboration of rights-holders. It is important that the discussions at the WTO on the TRIPS waiver address how the know-how gap can be closed.

Since the WHO declared COVID-19 a public health emergency of international concern on 30 January 2020, gross inequities have emerged. While rich countries are beginning to regain a level of pre-pandemic normalcy, the disease is surging in areas where vaccines are not sufficiently available, creating a breeding ground for new variants of the virus which puts everyone at risk. In July 2021, only 15 million people in Africa – just 1.2 per cent of the African population – were fully vaccinated, and death rates were increasing rapidly on the continent, mostly affecting young people. This calls for an immediate action to donate vaccines and get them into people's arms.

To be better prepared for future outbreaks, the world needs new rules to ensure automatic access to technologies and IP in the case of a pandemic. The pandemic treaty negotiations scheduled to start in the fall of 2021 offer an opportunity to regulate this. Such regulations should have the following features:

(1) Access to technologies to prevent and treat a pandemic-potential disease should not be burdened with monopolies. Sharing of know-how and technology should be assured and not subject to controversy in the middle of a pandemic.

(2) Public financing for research and the development of vaccines and treatments should be abundant, predictable, and provided upon the conditions that (a) the know-how is open-sourced for others to use either in further research or to produce at-scale and (b) that resulting products are priced fairly.

(3) Vaccine production capacity should be created in the regions in the world that currently have no or insufficient production capacity.

Preparedness for the next pandemic should start now, not when the next crisis is in full swing.

including in pharmaceutical domains such as vaccines, by reinforcing predictability and trust.

The degree of protection – and enforcement – of IP rights offered by RTAs can also play an important role in the dissemination of technology and know-how in the field of vaccination. Since around 2000, many RTAs have included TRIPS+ provisions, such as provisions which prevent national drug regulatory authorities from registering and allowing the sale of generics as long as the original medicine is still patented (also called "patent linkage").[68] Other RTAs have obliged certain developing countries to provide various forms of exclusive protection of the clinical test data submitted to regulatory agencies to demonstrate the quality, safety and efficacy of new medicines,[69] which can prevent manufacturers of generics from using such data while applying for their own marketing authorizations. Along with limited convergence on regulatory procedures and standards, such data exclusivity may impact the availability of COVID-19 vaccines and impede the availability of COVID-19 treatments (Adetunji, 2021).

Other initiatives

The COVID-19 pandemic has highlighted the essential role of innovation and technologies to respond to shocks and, at the same time, the importance of making sure that the intellectual property system plays its part in meeting the demands of such a crisis (Santavicca, 2020). Beyond the existing multilateral, plurilateral and regional legal frameworks, a number of countries, as well as multilateral and regional organizations, have advocated for greater cooperation to ensure equitable and affordable access to medical care, which has led to enhanced cooperation[70] and several initiatives in domains such as information and transparency, policy support, technical cooperation and capacity-building, as well as support for innovation and technology transfer.[71]

For instance, in order to tackle barriers to mass manufacturing and distribution of products to prevent or cure COVID-19, Costa Rica and the WHO launched in 2020 the Solidarity Call to Action[72] and the WHO COVID-19 Technology Access Pool (C-TAP)[73] (WHO, 2020) to improve equitable global access to COVID-19 health technologies through a voluntarily pooling of knowledge, IP and data to support technology transfer and rapidly expand manufacturing throughout the world in relation to the detection, prevention and treatment of COVID-19. It further called on funders, researchers, governments and holders of IP and know-how to support C-TAP, in particular by sharing IP in a transparent and non-exclusive manner and facilitating technology transfer to multiple manufacturers (Garrison, 2020). This call was subsequently reiterated in an open letter from the President of Costa Rica and the Director-General of the WHO.[74]

In May 2021, the Medicines Patent Pool (MPP) also expanded its mandate into the licensing of technology with an initial focus on COVID-19 vaccines and pandemic preparedness.[75] The MPP also developed a new patents database devoted to COVID-19 vaccines: VaxPaL, building on MPP's experience in mapping patents on key health technologies through MedsPaL, the MPP Medicines Patents and Licences database. The patent information on COVID-19 vaccines was compiled for the purpose of providing greater transparency on patents relating to key COVID-19 vaccines and focuses primarily (though not exclusively) on patents filed by the entities that have developed each vaccine.[76]

WIPO has also established a COVID-19 search facility within its global PATENTSCOPE database.[77] The tool offers predefined search strings that support the searching of COVID-19-related patent information. Regional patent organizations such as the European Patent Office (EPO), regional technical cooperation initiatives like PROSUR/PROSUL (which brings together Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Paraguay, Peru and Uruguay), and national IP authorities have developed similar tools.[78]

In June 2021, the heads of the World Bank Group, IMF, WHO and WTO held the first meeting of the new Task Force on COVID-19 Vaccines, Therapeutics and Diagnostics for Developing Countries. In their joint statement, the heads of those organizations described the task force as a "war room" to help track, coordinate and advance delivery of COVID-19 health tools to developing countries and to mobilize relevant stakeholders and national leaders to remove critical roadblocks in support of the priorities set out by the task force members,[79] as well as in an IMF staff proposal, which explains how a US$ 50 billion investment to defeat the pandemic would generate US$ 9 trillion in global economic returns by 2025 and boost manufacturing capacity, supply, trade flows and the equitable distribution of diagnostics, oxygen, treatments, medical supplies and vaccines.[80]

The Task Force on COVID-19 Vaccines, Therapeutics and Diagnostics for Developing Countries subsequently set up a website which provides an array of data on rates of vaccination and the purchase and deliveries of vaccines, diagnostics and therapeutics broken down by country, region and level of income.[81]

OPINION PIECE

By Patrick Gaulé,
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Patents and the availability of essential goods in crises: the case of COVID-19 vaccines

The development of safe and effective COVID-19 vaccines at an unprecedented speed has been a remarkable achievement for modern science and technology. However, scaling up the supply of COVID-19 vaccines remains a key challenge to quickly vaccinating the world's population (Agarwal and Gopinath, 2021).

In order to facilitate timely access to COVID-19 vaccines and other essential products, India and South Africa have proposed to WTO members that a waiver be applied to the relevant provisions of the WTO TRIPS Agreement until widespread vaccination is in place globally. The proposal has attracted both support and opposition from a number of quarters.

Because a pandemic-specific TRIPS waiver would target essential goods during the pandemic, it is unlikely to change incentives for the creation of future non-pandemic goods. A more pressing concern is the effect on incentives for innovation for essential goods in future pandemics. The COVID-19 experience suggests that, during a crisis, R&D efforts quickly scale up (Agarwal and Gaulé, 2021). However, before a crisis occurs, there tends to be far too little R&D investment in pandemic preparedness (Abi Younes et al., 2020), and an IP waiver during the current crisis might accentuate such underinvestment. Increased public support for R&D into pandemic preparedness might alleviate that problem.

How effective would pandemic-specific IP waivers be in expanding access to COVID-19 vaccines?

In the case of therapeutics based on small molecules, intellectual property rights matter considerably for such access. In the early 2000s, for instance, the threat (or actual implementation) of compulsory patent licensing was used by a number of countries to obtain significant discounts for HIV antiretrovirals (WHO, 2014).

Vaccines, however, are different from small molecule therapeutics in ways that may be highly relevant for the effect of IP waivers on access. Whereas simple tests can be used to show that a generic small molecule drug has the same effects as the original, clinical safety and efficacy testing of copycat vaccines would be required for vaccines (Friede 2010). Moreover, a considerable amount of know-how is involved in the production of vaccines (even for those based on older technological platforms), and most of the producers with the relevant experience and expertise are already engaged in the production of COVID-19 vaccines.

The existence of additional barriers to entry in the production of COVID-19 vaccines – above and beyond IP – implies that the effect of IP waivers on vaccine availability might be rather limited in the short run. Subsidizing the development of new production capacity is likely to be a more effective way to accelerate the COVID-19 vaccine supply.

IP policy is fundamentally a choice between the speed of creation of new products and the speed of their diffusion. In a crisis, the speed of diffusion of essential products naturally assumes greater importance. However, IP waivers may not be effective in quickly expanding access for essential goods when other barriers to entry are present. Non-IP policies, such as subsidizing R&D and manufacturing capacity, have a key role to play in accelerating the creation and diffusion of essential goods in crises.

(iii) Other trade-related aspects of boosting vaccine production

If countries which, until now, did not have the capacities to produce COVID-19 vaccines (or other related medical products for that matter) deem it necessary to develop their production, a number of actions are open to them under the WTO Agreement.

Governments may decide to lower tariffs on equipment and ingredients necessary to produce vaccines in order to obtain the materials they do not produce and/or lower their production costs, thanks to cheaper inputs. Countries may also adopt international standards or engage in mutual recognition of product specifications in order to facilitate the importation of equipment or ingredients needed for the production of vaccines.

Countries that do not have the necessary skills or know-how to produce vaccines or other medical products may, under the GATS, open their markets for engineers, technicians or other specialized professionals. Facilitating compliance with their domestic regulation in services may help in this regard, without lowering existing standards. These countries may also attract investment from services providers in those domains, such as pharmaceutical companies, by allowing their establishment through the constitution, acquisition or maintenance of a company for the provision of related services.[82]

The COVID-19 pandemic has also exposed the risks attached to the dependency of certain countries on a limited number of foreign suppliers and their exposure to potential export restrictions by producing countries, given the geographical concentration of the production not only of vaccines, but sometimes also of other medical products. Diversifying sources of production could limit the consequences of such conduct by one or more producing countries, through access to alternative sources of supply. It could also dissuade countries from engaging in export restriction if global production is sufficient. The possibility of scaling up production in different regions of the world could also facilitate responses to another potential future pandemic if it developed through waves of contamination, in the same way that, during the first wave of the COVID-19 pandemic, some countries were able to resume or continue production of essential goods while others were in lockdown.

It is anticipated that many countries and groups of countries will expand their investments in research on emerging infectious diseases and in establishing clinical trial networks, developing vaccine manufacturing capacity, and expanding regional collaborations, in preparation for potential future pandemics.[83] Some authors have also advocated the negotiation of a new and enforceable sectoral COVID-19 Vaccine Investment and Trade Agreement (Bown and Bollyky, 2021) Finally, during the Annual Ministerial Assembly of the WHO on 31 May 2021, the WHO Director-General, Dr Tedros Adhanom Ghebreyesus, called for the launch of negotiations on an international treaty to boost pandemic preparedness, as part of the reform of the WHO envisioned by its member states. The ministers from the WHO's 194 member states are to meet by the end of November 2021 to decide whether to launch negotiations on this treaty.[84]

(c) Mitigating protectionist responses to shocks and disciplining emergency support

(i) Mitigating protectionist responses

International cooperation can help countries limit their use of protectionist trade policies in response to a crisis. Experience with the 2008-09 global financial crisis suggests that the multilateral trading system can help fend off protectionist impulses (Agah, 2015), for while its outbreak triggered concerns of a relapse into protectionist behaviours similar to the those observed during the Great Depression of the 1930s, barriers to trade did not increase as much as was initially feared (Bown and Crowley, 2012).

One key element contributing to this positive development has been the codification and institutionalization of rules within the multilateral trading system. International cooperation within the legal boundaries of the WTO and various RTAs have established a trade environment with transparent enforceable rules and the knowledge that improper trade measures could trigger legal and economic consequences (Agah, 2015). Based on the lessons drawn from the 2008-09 global financial crisis on the importance of transparent monitoring of trade measures, the WTO's Trade Policy Review Mechanism has been supplemented by the regular publication of trade policy monitoring reports and the introduction of reporting provisions to oblige WTO members to provide information to the Trade Policy Review Body on a regular basis (Laird and Valdés, 2012).

Alongside trade-related cooperation, empirical evidence also points to the relevance of collaborations in the field of monetary policies. Given that exchange rates (through their effect on competitiveness) and GDP shocks are among the main drivers of trade protectionism, the IMF provides

a platform for consultation and collaboration on international monetary problems that is essential to mitigate macroeconomic volatility and, ultimately, to discourage short-sighted protectionist actions (Bown and Crowley, 2012; IMF, 2000).

(ii) Contingent trade remedies and economic resilience

Although it has been demonstrated that letting trade flow as freely as possible is essential in times of crisis, governments may nevertheless feel pressed by domestic firms to reserve domestic markets or to protect essential ("strategic") or fledging industries by having recourse to the contingent trade remedies allowed under the WTO, i.e., anti-dumping, countervailing or anti-subsidy or safeguard procedures. This can be particularly the case if demand shrinks due to economic difficulties, or if local producers suddenly find themselves confronted with more competitive foreign products or did not adapt to situations of overcapacity.

The 2008-09 global financial crisis saw an increased recourse to contingent trade remedies, primarily in developing countries (Bown, 2009). However, there is no indication yet that WTO members resorted to trade policy instruments such as safeguards or to anti-dumping or anti-subsidy measures in the context of the economic crisis that has resulted from the COVID-19 pandemic.[85]

Pursuant to Article II:2(b) ("Schedules of Concessions") of the GATT 1994, WTO members are allowed to impose additional duties on top of applied customs duties against imports found to be dumped or subsidized and which cause or threaten to cause material injury to a domestic industry. The WTO Agreement on Implementation of Article VI of the GATT 1994 (the Anti-dumping Agreement) nonetheless imposes limits on the use of anti-dumping by providing for disciplines on the determination of the existence of dumping, the injury that may be caused by such practices to domestic producers of like products, the measures that may be imposed and the duration of such measures. It also provides for detailed procedures to be followed by domestic authorities when investigating complaints of dumping practices.

The Agreement on Subsidies and Countervailing Measures (SCM Agreement) also imposes disciplines on the determination of the existence of a subsidy, of the injury to the domestic industry producing like products, and of the causal link between the two, on the measures that may be imposed on subsidized imports, and on the duration of such measures. It also provides for detailed procedures to be followed by members when investigating complaints of subsidization. More generally, countervailing and anti-dumping procedures are subject to detailed but largely similar requirements. Safeguard measures are the third type of trade remedy that a WTO member may take to cope with a situation of economic downturn caused by a shock and resulting in a surge of imports threatening a domestic industry.

The WTO Agreement on Safeguards disciplines the use of safeguard measures. Safeguard measures have a different role from anti-dumping and countervailing duty instruments. They are intended to protect an industry or branch of industry temporarily against an increase in imports of competing products while the industry or branch of industry restructures itself. This is why they are applied on an MFN basis and are strictly limited in time. Unlike anti-dumping or countervailing measures, safeguard measures do not require any allegation of "wrongdoing". Instead, safeguards may be adopted against any import surge causing serious injury to a domestic industry. In this regard, they are more an instrument to respond to the structural consequences of a domestic, regional or worldwide crisis than a response to unfair trade practices. Safeguards can play an important role by allowing an industry time not simply to recover from the economic consequences of a shock, but also to adapt to the new economic environment resulting from it.

Whereas RTAs cannot make it easier than the WTO agreements to impose anti-dumping duties, countervailing duties or safeguard measures, particularly on imports from third-party countries, they can impose more constraints on the use of these trade remedies between RTA parties or *vis-à-vis* third parties, and generally tend to do so. They can even decide to ban the use of trade remedies between RTA parties altogether.

A majority of RTAs have rules that go beyond the WTO Anti-Dumping and SCM Agreements in terms of disciplines imposed on investigating authorities (Mattoo, Rocha and Ruta, 2020). However, only a very small number of RTAs prohibit the use of anti-dumping procedures between RTA parties.[86] Likewise, few RTAs contain rules that curb subsidies or state aid[87] to the extent that they can dispense with intra-RTA countervailing duties.

RTA anti-dumping or SCM provisions that go beyond the WTO agreements impose, for instance, a higher *de minimis* volume of dumped/subsidized imports,[88] higher *de minimis* dumping or subsidy margins,[89] or mandate a shorter period of application of anti-

dumping and countervailing duty measures than do the WTO Anti-Dumping and SCM Agreements (generally three years instead of five).[90] Many RTAs also include joint oversight bodies, which tend to reduce the amount of anti-dumping and countervailing duty activity between parties and, thus, the risk that they have a protectionist, resilience-reducing effect.[91]

(iii) Import licensing and other customs procedures

Shocks and the urgent need for increased quantities of critical goods can lead governments to open up their import licensing regimes. This was, for instance, the case with Argentina's decision, in April 2020, to remove medical equipment and PPE from its list of imports subject to non-automatic import licences, in the context of the COVID-19 pandemic (WTO, 2021g).

Import licensing requirements can address legitimate public interests in certain circumstances, such as controlling the entry of hazardous goods. However, import licensing can also represent an unnecessary barrier to trade, and an impediment to resilience in times of crisis.[92] The WTO's basic rules on import licensing are contained in Article XI:1 ("General Elimination of Quantitative Restrictions") of GATT 1994, which prohibits the use of trade policies based on non-automatic, as well as automatic, import licensing regimes "if such a regime restricts trade". For agricultural products, Article 4.2 ("Market Access") of the Agreement on Agriculture (AoA) prohibits quantitative import restrictions, including discretionary import licensing, in an effort to keep border measures on such products transparent.

More elaborate rules are set out in the WTO Agreement on Import Licensing Procedures. Import licensing procedures may be used to monitor the volume and value of trade in certain goods without limiting their importation. They may also be used to administer quotas and tariff quotas.

Under the Agreement on Import Licensing Procedures, an import licensing system must guarantee transparency and impartiality, and must not be operated in such a way as to restrict trade.[93] Exceptions may apply, for example, in order to relieve critical shortages of foodstuffs and/or safeguard balance of payments.[94]

Other forms of customs processing-related requirements were resorted to during the 2008-09 global financial crisis and have been used since the outbreak of the COVID-19 pandemic. These could breach Article XI:1 ("General Elimination of Quantitative Restrictions") of the GATT 1994, for example, when countries limit the number of ports of entry where the customs clearance of specific goods can take place. Other restrictions relate to services, and their legality depends on the commitments undertaken by the members concerned.

Most RTAs contain provisions that seek to ensure that all automatic and non-automatic import licensing procedures are implemented in a transparent and predictable manner and applied in accordance with the WTO Agreement on Import Licensing Procedures. Most of them incorporate by reference the obligations contained in Article XI:1 of the GATT 1994[95] or in the WTO Agreement on Import Licensing Procedures.[96]

(iv) Disciplining emergency support

In the context of both the 2008-09 global financial crisis and the economic crisis triggered by the COVID-19 pandemic, governments have been and are still providing emergency support to sectors, firms and workers in the form of subsidies or grants (OECD, 2021f) to help them to cope with the effects of these crises, thus seeking to enhance their resilience to these shocks. As explained above, emergency support can be used for industrial policy purposes, and it can distort competition in the long run. If it generates negative cross-border spillovers, it should be addressed through international cooperation.

This cooperation can take several forms. On the one hand, there exists a number of key principles for government interventions in times of crisis which can help minimize negative cross-border effects, as listed in Box D.4 (OECD, 2020d). On the other hand, support measures which distort competition in the manufacturing and agricultural sectors are subject to WTO disciplines. As discussed below, however, certain forms of distortive support are not or are insufficiently covered by existing WTO disciplines, which may be a source of international tensions and may require discussion among members and, if deemed necessary, new negotiations.

With regard to multilateral rules, OECD (2021f) identifies four areas where possible gaps in disciplines could be discussed at the multilateral level.

Improving transparency comes first. Information on the nature and scale of current government support is essential to developing both baselines for reductions and effective rules to address existing and potential new support. Yet such information remains limited.

A second important finding concerns the importance of adopting a value chain approach. This is because

Box D.4: Key principles for state intervention in times of crisis

Seven key principles to design support

1. Distinguish viable from non-viable firms.
2. Match tools to problems.
3. Consider equity assistance when suitable.
4. Safeguard integrity.
5. Ensure transparency.
6. Make financial support conditional on advancing public policy goals.
7. Strengthen government capacity to handle support to the private sector.

Governments need to manage their role in the economy carefully, especially if the state becomes an "unintended owner":

1. Plan for an exit.
2. Where governments need to stay, invest in effective state ownership.
3. Lead by example on responsible business conduct.
4. Governments must ensure that market competition is not distorted, including internationally, to uphold rules-based global trade.
5. Transparency will be key in global efforts to discipline government support.
6. Ensure coherence-of-government interventions and monitor the impact of the support measures.

identifying the ultimate beneficiary of government support is not always evident, as the effects of support in industrial sectors propagate through entire value chains that span multiple industries and countries.

A third finding concerns state-owned enterprises, which can be both significant recipients and providers of support. According to OECD (2021f), it is unclear whether existing trade rules cover all of the support provided by government-invested firms.

The fourth finding is with regard to support provided through the financial system (below-market loans and government equity injections), which, according to the OECD, is significant in a number of sectors, and is complex and hard to measure.

International cooperation to support industries heavily affected by shocks can also take other forms, as can be seen from the example of the tourism sector (see Section B4). With the aims of guiding countries towards recovery after COVID-19, mitigating the adverse impacts from future crises, and building resilience, in April 2020 the United Nations World Tourism Organization (UNWTO) proposed a package of 23 recommendations that countries could adopt. These recommendations stress the roles that trade openness in the travel and tourism sectors will have in facilitating recovery and resilience, by creating new businesses and jobs that contribute to economic growth and sustainable development (UNWTO, 2020). On the one hand, these recommendations advise governments to cooperate by lifting travel restrictions, facilitating work visas and liberalizing air transport to reactivate employment and business activity across sectors and boost air capacity and connectivity for recovery. On the other hand, the recommendations also provide action points for local and central governments, businesses and banks to collaborate in creating tourism recovery committees with specialists in trade, transport, education, foreign affairs and governance (UNWTO, 2020).

The support programmes that have been relied upon by developed countries during the COVID-19 pandemic, the 2008-09 global financial crisis and earlier crises like the 1970s oil shocks, have often taken the form of extensive stimulus packages involving financial contributions or income or price support schemes for consumers or sectors of the economy. Multilateral trade rules do not specifically or formally distinguish between less trade-distortive domestic emergency support measures, the objective of which is essentially to help an economy cope with the immediate effects of a shock, and more trade-distortive longer-term support, granted, for example, in the context of an industrial policy plan.

When governments decide to grant financial assistance to individuals or households particularly affected by a shock, this may not amount to a subsidy as set out by the SCM Agreement. Indeed, financial support is not normally subject to WTO disciplines on subsidies, unless it is granted specifically to an enterprise or industry, or a group of enterprises or industries, within the jurisdiction of the granting authority. Therefore, stimulus packages in the form of tax breaks or other forms of changes in the rates of generally applicable taxes, whether locally, regionally or nationally, are not specific subsidies within the meaning of the SCM Agreement if applied automatically, non-discriminatorily and on the basis of objective criteria. Provided that the above requirements are complied with, governments can, for instance, suspend, delay or waive the payment of generally applicable taxes by individuals or enterprises affected by economic difficulties while they try to cope with the immediate effects of a shock, without breaching the SCM Agreement.

The issue of stimulus packages in the form of financial contributions or income or price support schemes granted to industries or branches of industry particularly affected by a shock is more delicate. Governments with sufficient fiscal space may decide to put in place resilience policies in the form of financial support intended to help certain sectors of the economy to withstand the consequences of a shock or even recover. This support will be subject to the disciplines of the SCM Agreement if granted in such a way as to become "specific" to a group of enterprises or industries. Therefore, conferring a financial benefit exclusively to a sector of industry affected by a shock may be considered to be a subsidy. The reasons for which a subsidy (except a prohibited subsidy)[97] is granted (e.g. to develop new technologies) are in themselves irrelevant, since Article 8 ("Identification of Non-Actionable Subsidies") of the SCM Agreement ceased to be applicable, consistent with the provisions of Article 31 of the SCM Agreement, five years after the entry into force of the SCM Agreement (Coffin and Horowitz, 2018).

Domestic support and export subsidies to agricultural products are subject to specific disciplines under the AoA,[98] derogating from the SCM Agreement (Article 21.1 ("Final Provisions") of the AoA). As long as it conforms with certain conditions, domestic support to agricultural products is not subject to a maximum ceiling or to reduction commitments when it is provided as part of certain government service programmes, including public stockpiling programmes for food security purposes or for domestic food aid programmes to support poorer parts of the population.[99] These can make them useful tools to cope with shocks,[100] and a number of countries have therefore set up such stockpiling programmes for disaster relief purposes.[101] However, coupled with import duties, domestic support to agriculture can have a strong protectionist effect, as this combination may reduce or prevent price-based competition from imported products.[102]

Finally, as experienced during the recent crises, governments may decide to financially support services sectors hit by a shock, as they did for the banking and insurance sectors during the 2008-09 global financial crisis or, during the COVID-19 pandemic, airlines and the tourism industry affected by travel restrictions and lockdown. As far as trade in services is concerned, it should be recalled that, apart from any commitments members may have undertaken on national treatment in their schedules, subsidies are not regulated under the GATS. This means that, to this day, WTO members have a large margin of discretion for subsidizing services and services providers. This may lead to trade distortions in the services sector. For instance, during the 2008-09 global financial crisis, individual bailouts were offered to banks on condition that they lend or provide guarantees to domestic industries which might not otherwise have been eligible for such loans (Baldwin and Evenett, 2009a). Financial packages granted to airlines during the COVID-19 pandemic most probably cannot give rise as such to a challenge under the WTO, even if they have an impact on international competition, also because the essence of the air transport sector has been carved out from the scope of the GATS.[103]

The relationships of RTAs with subsidies are quite diverse. Some RTAs to which the European Economic Area or the European Union are parties exempt aid related to natural disasters from their disciplines on subsidies. RTAs also tend to "revive" the WTO category of non-actionable subsidies.[104] Some RTAs

allow subsidies that pursue horizontal or general objectives (such as environmental protection), public services or regional development,[105] as well as subsidies to categories of industries (for example, to steel or coal). Some RTAs permit particular forms of horizontal or sectoral aid, by providing that the prohibition of aid to ailing companies "does not apply to subsidies granted as compensation for carrying out public service obligations and to the coal industry",[106] thereby allowing governments to maintain industries afloat which would otherwise probably become insolvent. Horizontal aid was common during the COVID-19 pandemic (Van Hove, 2020).

A problem related to subsidies has often been the lack of transparency of the stimulus packages used to kickstart domestic economies after a shock. Whereas members have no obligation under the WTO Agreement to consult each other or coordinate before taking such measures, consultations and coordination between countries planning to implement stimulus packages could significantly increase the efficiency of those domestic packages, while avoiding the adoption of countermeasures by countries which consider themselves negatively affected by such policies.

(v) Strengthening compliance with multilateral and regional trade norms

As demonstrated in Section C, during a crisis, governments should comply with the international norms that they have set for themselves, since acting otherwise can have negative spillovers and lead to domino effects. Members who believe themselves harmed by other members' violations of WTO disciplines, for example due to measures taken during crises, are not allowed to reach a determination of violation of the WTO Agreement, of nullification or impairment of benefits, or of impediments to attaining any objective of the WTO Agreement, without first resorting to the WTO Dispute Settlement Mechanism.[107]

The WTO Agreement and many RTAs provide for dispute settlement mechanisms but generally these are not suited to dealing with measures adopted in response to shocks which remain in place for a few weeks or months only, even though these measures may, temporarily or for longer periods, suppress or divert pre-existing trade flows, and can thereby seriously disrupt existing trade patterns.

For instance, in the case of the WTO Dispute Settlement System, there is no "public prosecutor", which means that at least one WTO member must have an interest in challenging the legality of a protectionist measure taken by another member. In this respect, governments may not be too keen to make such a challenge when they are all engaged in similar practices.

But, even if those concerns are put aside, the ultimate limitations are the dispute settlement mechanisms themselves, even in the case of the WTO Dispute Settlement System. A member alleging that another member has breached its obligations before the WTO Dispute Settlement Body – the body supervising the functioning of the Dispute Settlement Understanding – has to go through consultations, an elaborate two-tier review and an implementation stage, a process which, even if timelines are strictly adhered to, remains relatively long.[108]

Dispute settlement is not, however, the only channel open to countries whose trade is affected by emergency policies adopted by some other country. The increasingly global nature and impact of shocks exposes WTO members to similar effects which, as already highlighted, are better addressed through closer international or regional cooperation and by maintaining trade flows. This means that, as more crises occur, more global experience is acquired and more exhaustive information on supply and demand becomes available in real time, governments may increasingly adopt similar responses to benefit from the multiplying effect of positive spillovers that results from international cooperation on crisis preparation and management.

6. International cooperation on trade policies can help recovery after shocks

(a) Trade policies and recovery

Once a shock dissipates or becomes manageable, the phase of recovery can typically start. As discussed in Section B, recovery strategies cover a broad range of actions and policies with a view to repairing, rebuilding, restoring and, in some cases, adapting to new structural, infrastructural, agricultural and environmental conditions. Depending on the country's financial resources, recovery policies can include monetary, fiscal, industrial, labour market and infrastructure policies. Although many recovery strategies are similar to the coping strategies adopted by firms, households and governments, they tend to be framed in a longer-term perspective. In addition, aspects of recovery strategies that focus on adapting to new conditions and building a more sustainable system, can contribute to risk prevention, reduction and preparedness strategies, underscoring the dynamic and ongoing nature of economic resilience.

Trade policy can contribute to accelerating economic recovery through improved market access and greater diversification. The types of recovery policies that have an impact on trade are more likely to be those involving support for sectors of domestic economies in the form of industrial policy measures (e.g., local content requirements and reshoring of GVCs or of industries deemed "strategic" to face future shocks) or financial support to assist all or certain branches of industry in transitioning to a greener and more digital economy. International cooperation can mitigate the risk that trade-related recovery measures in one country delay or impede recovery in other countries. It can also build synergies between recovery plans.

Most WTO rules and WTO-compatible RTA provisions not only facilitate the response of governments to shocks, but they can also contribute to economic recovery, to the extent that they create the legal framework for a return to regular trade flows and dissuade members from resorting to trade policies or measures which, by disrupting or diverting such trade flows, can delay recovery, including recovery through adaptation and innovation. In this respect, the discussions of the multilateral, plurilateral and regional normative set-up in the previous sections apply equally to the topic of recovery. Indeed, the relevance of those rules and disciplines does not depend on the shorter or the longer-term dimension of the policies involved, respectively, in coping and recovery. Therefore, they will be addressed in this subsection only where the longer-term and more structural nature of recovery measures will make it necessary.

(b) International cooperation and recovery

(i) International disciplines and initiatives

As already mentioned above in Section D3(a), a number of the financial measures which governments may implement, including as part of recovery plans, are not disciplined by WTO agreements. Moreover, actionable subsidies, i.e. those that fall within the scope of the definition contained in Article 1 ("Definition of a Subsidy") of the SCM Agreement, but which are not prohibited pursuant to its Article 3 ("Prohibition"), may have to be removed only if they cause adverse effect to the interests of another member, and only to the extent that they cause this adverse effect. In other words, they may not always have to be eliminated, only adapted so that they cease to have an adverse effect on the interests of another member, within the meaning of the SCM Agreement.

Besides trade policy, some recovery policies may have a trade dimension by affecting exports and imports directly or indirectly. For instance, policies to enhance digital infrastructure can allow some socioeconomic categories to engage in trade in goods and services, including through e-commerce, which is already addressed in a number of RTAs (see Section D4). Enhancing trade capacity also can be key to ensuring that trade opportunities materialize, in particular in developing countries and LDCs, which are more exposed to risks, hit hardest by shocks and have limited financial resources, including fiscal space, to recover faster from shocks.

As emphasized in Section B4, one area that has received increasing attention is the digital divide between advanced economies, developing countries and LDCs (WTO, 2020g), as well as between men and women, the young and the old, the poor and the rich, and large and small firms within a country (Antonio and Tuffley, 2014; Morrow-Howell, Galucia and Swinford, 2020; WTO, 2020g). Poor digital infrastructure, particularly in rural areas, excludes millions from productive activities or access to essential services. Limited access to digital technologies and lower IT skills rates further reduce teleworking and e-commerce opportunities in LDCs, for MSMEs and for women, thus slowing down recovery from the crisis.

Aid for Trade programmes have already proved particularly valuable in mitigating the impacts of COVID-19 on women entrepreneurs, helping women take advantage of e-commerce opportunities and bridging the gender digital divide. In this context, the Informal Working Group on Trade and Gender, created in 2020 further to the Joint Declaration on Trade and Women's Economic Empowerment adopted at the 11th WTO Ministerial Conference, has proposed, among other things, to include issues concerning women's economic empowerment in the regular work of WTO bodies and to improve the impact of Aid for Trade on women by mainstreaming gender considerations into programmes and strategies.

Through international cooperation, developing countries and LDCs can be provided with trade-related financial and technical assistance to support and accelerate their recovery, which in turn can sustain the recovery of other countries. Several WTO initiatives adopted for development purposes can also assist developing countries to build and support their recovery, with the objective of increasing the economic resilience of these countries to future risks and shocks by integrating them more into international trade.

Such initiatives are essential because, while high-income countries have the means to adopt large

recovery packages, developing countries have limited financial and other resources. International cooperation can help address this gap. More particularly, the Aid for Trade initiative (discussed above in Section D4(b)(ii) can assist in building economic resilience through recovery, including from the economic impact of the COVID-19 pandemic. LDCs can also seek the support of the Enhanced Integrated Framework (EIF), a multilateral partnership which helps LDCs to use trade for growth, sustainable development and poverty reduction, and which is the main mechanism by which LDCs access Aid for Trade. The EIF helps to bridge the gap between demand for, and supply of, Aid for Trade, and to include trade in national development plans. It provides a procedure for clearly mapping out and prioritizing key LDC needs in terms of trade-related assistance and capacity-building, including trade infrastructure, supply and productive capacity, and for submitting these demands to the donor community of each country, to access funding beyond the resources available in the EIF's own trust fund.

The Standards and Trade Development Facility (STDF), a global partnership to facilitate safe trade and contribute to sustainable economic growth, poverty reduction and food security, also maintains close contacts with the Aid for Trade initiative. It complements Aid for Trade with projects and monitoring of aid flows at an operational, issue-specific level in the field of SPS measures. The STDF provides funding both to develop and to deliver innovative, cross-cutting projects. STDF projects help public and private sector stakeholders in developing countries to improve food safety and animal and plant health to facilitate safe trade, thus reducing the risks of zoonoses.

Finally, the capacity-building part of the WTO Trade Facilitation Agreement (TFA), through which donors can help developing countries to streamline their import and export procedures, can also contribute to recovery. When a new crisis hits, TFA-assisted countries will be able to import essential goods more rapidly and safely. This could be achieved, for instance, by promoting the development of e-customs.

Given that trade-opening can lead to some disruptions in the labour market, because some sectors tend to expand while others tend to contract, adjustment policies, including labour market adjustment policies, can be important complementary policies to lower the adjustment costs for displaced workers who have to change jobs or occupations. Since the use of adjustment measures can have an impact on other countries through trade, and some parties do not necessarily have the relevant knowledge and experience, some RTAs include explicit cooperation provisions on labour adjustment measures, including human resources development, vocational training, skills development, life-long learning programmes, unemployment assistance and social protection programmes (WTO, 2017). Reducing the costs of adjustment for workers can contribute to preventing the rise of trade protectionism, which in turn undermines economic recovery, and ultimately economic resilience.

(ii) "Green recovery" and economic resilience

Some governments have adopted, or are in the process of adopting, post-COVID-19 economic recovery plans with sustainable development objectives, including on climate change and inclusiveness.[109] The scope of such plans is broader than traditional recovery plans and covers environmental, social, energy, information and communications technology, health and education policies, among others, with a view to triggering investment and behavioural changes from firms and households, so that vulnerabilities and exposures are reduced and future risks avoided or mitigated.

Plurilateral initiatives, such as the negotiation of an environmental goods agreement (EGA), which originally failed to reach consensus, received renewed attention in 2021. The intention to resume EGA negotiations was expressed on 5 March 2021 as part of the new "structured discussions on trade and environmental sustainability". A joint submission from Australia, the Republic of Korea and Singapore, as well as separate individual submissions, has called for a resumption of negotiations on environmental goods and for discussions on environmental services, to support international commitments to combat climate change and contribute towards a more sustainable world economy.

As part of a broad and overarching sustainability objective, efforts are being made to promote dialogue and information-sharing at the WTO on issues where trade and environment policies intersect, including on the circular economy, natural disasters, climate change, fossil fuel subsidies reform, plastic pollution, combatting illegal, unreported and unregulated fishing, ensuring legal and sustainable trade in wildlife, the conservation and sustainable use of biodiversity, the Blue Economy (i.e., the sustainable use of ocean resources), and sustainable agriculture, as well as trade in environmental goods and services.

Two main initiatives related to risk prevention and reduction are currently being pursued by a number of

WTO members at the plurilateral level: the Trade and Environmental Sustainability Structured Discussions (TESSD) and the informal dialogue on plastics pollution. The TESSD initiative ranks resilience of the multilateral trading system to climate risks (climate adaptation) as one of its top priorities. This initiative was launched in November 2020 during the WTO's Trade and Environment Week, at which 53 WTO members declared that they planned "to collaborate, prioritize and advance discussions on trade and environmental sustainability," naming, among other priorities, the pressing challenge of climate change and the lessons learned from the COVID-19 pandemic.

7. Conclusion

International cooperation can leverage synergies to promote economic resilience. International cooperation on economic resilience can play an important role in preparing for, coping with and recovering from shocks. It can amplify the positive cross-border spillovers effects of individual policy actions taken to promote economic resilience. It can also mitigate possible negative cross-border spillovers from individual policy actions.

Trade-restrictive domestic measures adopted in anticipation or response to shocks are often characterized by negative cross-border spillovers, such as those associated with export restrictions, which can undermine economic resilience. Global policy coordination can, therefore, be an important means to prevent trade policies from becoming a source of shocks and to mitigate the risks from trade policy uncertainty.

Open and predictable international markets are key to supporting economic resilience by enabling import and export diversification. Although governments can open up to trade unilaterally, international trade cooperation can help to achieve a higher level of openness and predictability, and can limit the use of protectionist trade policies in response to crises. International cooperation at the multilateral or regional level can help governments to open their markets to services that play a key role in handling shocks, such as weather forecasting, insurance, telecommunications, transportation, logistics and health services.

International cooperation can also play an important role in increasing the resilience of global value chains and securing the supply of essential goods and services, including COVID-19 vaccines, at reasonable cost. Besides discouraging reshoring policies, it can help to promote transparency, in particular on production capacities; to identify and avoid bottlenecks; to facilitate cross-border trade; to enhance mutual recognition of standards; and to manage inventories to prevent excessive stockpiling. Short of substituting for national policy options, international cooperation can usefully complement national diversification or stockpiling policies.

International cooperation at the WTO participates in supporting economic resilience. Although the term "resilience" does not appear in the WTO agreements, the existing WTO framework supports the conditions underpinning economic resilience by contributing to more open and predictable international markets, through more transparent and predictable trade policies.

The WTO obligation to publish relevant laws and regulations, the Trade Policy Review Mechanism or the trade policy monitoring reports significantly enhance multilateral transparency. The WTO Trade Facilitation Agreement helps to smooth customs procedures for the importation of critical goods in times of crisis. Cooperation through mutual recognition agreements on TBT and the SPS standards on essential products enhances predictability and contributes to ensuring supplies of essential goods in times of crisis. Initiatives such as Aid for Trade, the EIF and the STDF support more diversified import and export structures in developing countries. Collaboration between the WTO and other international and regional organizations contributes to greater policy coherence regarding economic resilience.

In a number of areas, the WTO could help members further enhance economic resilience through improved access to, and coordination of, relevant trade policy information. All WTO agreements provide, one way or the other, for the transparency of trade policy measures (mainly through publication and notification) and, during the COVID-19 crisis, the rate of notification and the speed at which governments notified to the WTO policies with potentially significant trade impact – such as import facilitation measures or export restrictions – were quite high. However, the degree of compliance with WTO notification requirements continues to vary between members and agreements, with some categories of measures likely to be used in times of crisis (e.g., subsidies) facing "chronic" underreporting. Stronger international commitments to improve trade policy transparency are therefore essential.

Given the negative spillovers that can be generated by export restrictions during crises such as the COVID-19 pandemic, international cooperation is needed to discipline or discourage the use of such export restrictions and to find alternative approaches,

in order to increase the supply of essential goods. Tariff reductions or elimination can reduce the cost of essential goods. Trade facilitation reforms can help smooth customs procedures for the importation of critical goods in times of crisis. Negotiations on services domestic regulation could assist in overcoming the scarcity of essential services in some countries, particularly in the health or telecommunications sectors.

Greater cooperation to improve the predictability and transparency of measures affecting cross-border mobility is also essential to limit barriers to the provision of cross-border services and the delivery of essential goods. Global rules on electronic commerce could further facilitate the delivery of services and goods. Promoting access to government procurement and the international coordination of domestic procurement policies could allow more effective use of public resources, particularly in the procurement of medical products, including vaccines. New initiatives in relation to IP and investment could also promote access to relevant technologies in middle and low-income countries.

Although trade and trade policy can play an important role in building and supporting economic resilience, they cannot overcome other obstacles that may prevent economic resilience from fully materializing. Given the broad spectrum of risks and shocks and the cross-cutting nature of economic resilience, strengthening the cooperation between the WTO and international and regional organizations specializing in aspects that are key for economic resilience, such as risk prevention, disaster relief, public health, climate change, environmental protection and financial stability, is key to promoting coordination and coherence in the various efforts to build and support economic resilience.

Endnotes

1 A good example is the case of carbon emission reduction policies to reduce the risks associated with climate change.

2 WTO official document number WT/MIN(17)/60 of 13 December 2017.

3 All WTO official documents mentioned in this report can be accessed via https://docs.wto.org/.

4 WTO official document number WT/MIN(17)/59 of 13 December 2017.

5 WTO official document number WT/MIN(17)/61 of 13 December 2017

6 WTO official document number WT/MIN(17)/58 of 13 December 2017.

7 In contrast with the other initiatives made at the 11th Ministerial Conference, this initiative is the result of a communication. See WTO official document number WT/CTE/W/249 of 17 November 2020.

8 See Article XXIV:8 ("Territorial Application — Frontier Traffic — Customs Unions and Free-trade Areas") of the GATT 1994.

9 "Deep preferential trade agreements" range from bilateral agreements (e.g., the China-Australia Free Trade Agreement (ChAFTA)) to "mega-regional agreements" such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

10 In addition to these priorities, the Sendai Framework outlines seven global targets. Targets C, D and F especially relate to economic losses. Among other things, they aim to enhance international cooperation with developing countries through adequate and sustainable support, as well as by increasing public and private investment in disaster prevention and reduction.

11 See https://www.undrr.org/implementing-sendai-framework/what-sendai-framework.

12 Some examples of disaster reduction framework initiatives include the Recommendation of the Council on the Governance of Critical Risks, adopted in 2014 by the OECD (https://www.oecd.org/gov/risk/Critical-Risks-Recommendation.pdf).

13 See also WTO official documents numbers WT/L/847 and WT/L/918 (on preferential treatment to LDCs' services and service suppliers by developed and developing countries).

14 Duties can be imposed on imports and exports. Although the latter have generally received less attention during negotiations, they can have an effect on trade equivalent to a quantitative export restriction if there are no or only limited supply alternatives to the country imposing such export duties. Quantitative export restrictions are discussed later in this section.

15 Members can also raise import duties above their bound rate by negotiating a new bound rate or by means of contingent trade remedies such as safeguard, anti-dumping or countervailing measures.

16 The concessions agreed to in the negotiations were incorporated into the WTO's schedules of concessions of the participating members via the Procedures for Modification and Rectification of Schedules of Tariff Concessions (1980 Procedures) (Decision of 26 March 1980, GATT document L/4962). The goods covered include finished pharmaceutical products, pharmaceutical active ingredients and chemical compounds used by the pharmaceutical industry, enumerated in four annexes. As a result of the Pharma Agreement and its subsequent reviews, participating members committed to eliminating customs duties and all other duties and charges, not only on all finished pharmaceutical products, whether sold in bulk or in dosified packages for retail sale (paracetamol, antibiotics, vaccines, etc.), but also on over 7,000 pharmaceutical active ingredients and chemical components used in pharmaceutical supply chains. (see GATT documents L/7430 and L/7430/Add.3).

17 Four reviews have taken place since the establishment of the WTO: in 1996 (WTO official document G/MA/W/10), 1998 (WTO official document G/MA/W/18), 2007 (WTO official document G/MA/W/85) and 2010 (WTO official document G/MA/W/102).

18 For example, limitations may be imposed on the number of services suppliers, service operations or employees in the sector, on the value of transactions, on the legal form of the service supplier, or on the participation of foreign capital.

19 See, for instance, the European Union, the Gulf Cooperation Council and the East African Community.

20 See, for instance, the Southern African Customs Union (SACU).

21 The WCO published, in 2014, Guidelines on Certification of Origin, aimed at providing guidance for WCO members to design and develop origin-related procedures. Section II of the Guidelines deals with the certification of origin with regard to preferential rules of origin, which is used to determine whether a preferential tariff rate is applicable under preferential schemes such as FTAs (WCO, 2018).

22 See the Declarations by the Informal Working Group on Micro, Small and Medium-sized Enterprises (WTO, 2020b; 2021a).

23 The "Legal Entity Identifier" (LEI) is a unique system of 20 digits that identifies companies, governments or entities that are involved in financial transactions. The primary use of LEIs is to help financial institutions find due diligence information about their customers, including small businesses, transparently and quickly (WTO, 2020c).

24 For example, during the first eight months of the pandemic, the US demand for protective masks was roughly 100 times larger than the amount in their national stockpile (Cohen, 2020).

25 See the WTO trade monitoring reports (WTO, 2021f).

26 Agreement on Subsidies and Countervailing Measures Article 3 (b) ("Prohibition").

27 See, e.g., Appellate Body Report, EC – Asbestos (2001); Appellate Body Report, US – Clove Cigarettes (2012); Appellate Body Report, US – Tuna II (Mexico) (2012); Appellate Body Report, EC – Seal Products (2014); Appellate Body Report, Russia – Railway Equipment (2020); and Panel Reports, Australia – Tobacco Plain Packaging (2020).

28 See, e.g., EC – Hormones (1998); Australia – Salmon (1998); Japan – Agricultural Products II (1999); Australia – Salmon (Article 21.5 – Canada) (2000); Japan – Apples (2003); Japan – Apples (Article 21.5 – US) (2005); EC – Approval and Marketing of Biotech Products (2006); US – Poultry (China) (2010); Australia – Apples (2010); India – Agricultural Products (2015); US – Animals (2015); Russia – Pigs (2017); and Korea – Radionuclides (2019).

29 China, for instance, issued an immediate and comprehensive ban on all wildlife trade and consumption in February 2020. Indonesia introduced a certification requirement for the importation of live animals from countries not free from COVID-19 in April 2020. The Republic of Korea imposed a temporary import restriction on wild animals considered to be possible intermediate hosts for COVID-19 transmission in February 2020 (ITC, 2021).

30 In the SPS area, the term "conformity assessment" is not commonly used. While mutual recognition is less common, "equivalence agreements" exist where the authority of an importing country may, for example, recognize the results of tests or inspections carried out in the exporting country.

31 For instance China, confronted with diverging technical regulations and conformity assessment procedures for PPE produced in different countries in the early stages of the COVID-19 pandemic, issued guidelines on emergency imports of PPE. These allowed the importation of products from the European Union, Japan, the Republic of Korea and the United States, which were not yet registered with China's Medical Products Administration, provided that manufacturers could present the results of tests performed under their domestic technical regulations and a declaration of conformity as a written assurance of conformity with those technical regulations. Likewise, the United States allowed, for a certain period, the use of respirators which were not certified by the National Institute for Occupational Safety and Health (NIOSH) by explicitly listing the countries concerned, their technical standards and the acceptable product classifications. See also Fu and McMahon (2021).

32 See Article 6.5 of the India-Malaysia RTA.

33 See, e.g., Article 6.5 of the China-Republic of Korea RTA.

34 See, e.g., the EU-Singapore or EU-Japan RTAs. The New Zealand-Singapore RTA is illustrative of how the parties to the RTA struck a balance between the sovereign right to regulate and the abstention from creating unnecessary obstacles to trade between the parties "where appropriate and consistent with good regulatory practice". However, this "soft" requirement may not facilitate trade between the parties in times of shock, as it leaves open the possibility of restrictive measures. Only a few RTAs negotiated between developed and developing countries include provisions on mutual recognition. For instance, the Japan-Thailand RTA contains a horizontal chapter on mutual recognition with detailed commitments where parties accept the results of conformity assessment procedures conducted by registered/accredited conformity assessment bodies.

35 This includes the following RTAs: EU-Japan; Hong Kong, China-Georgia; EU-Canada; EU-SADC; Australia-China; EU-Georgia; EU-Moldova; EU-Ukraine; New Zealand-Chinese Taipei; New Zealand-Malaysia.

36 See, for instance, the Food and Agriculture Organization (FAO) and other UN specialized agencies and funds and programmes for foodstuffs, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) for medical products; the EU Joint Procurement Agreement for the joint procurement of medicines, medical devices and "other services and goods" that mitigate or respond to cross-border threats to health (De Ruijter, 2019); and the ASEAN Plus Three Emergency Rice Reserve Agreement (APTERR) to address potential food shortages in the region in the light of climate and market uncertainties.

37 Articles XX(b) and XX(g) of the GATT 1994 refer, respectively, to the "General Exceptions" "(b) necessary to protect human, animal or plant life or health" and "(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption".

38 Pursuant to Article III:8(a) ("National Treatment on Internal Taxation and Regulation") of GATT 1994, national treatment obligations do not apply "to laws, regulations or requirements governing the procurement by governmental agencies of products purchased for governmental purposes and not with a view to commercial resale or with a view to use in the production of goods for commercial sale" (see also Article XIII ("Government Procurement") of the GATS on procurement in services).

39 The GPA 2012 applies to procurement for governmental purposes of goods, services, and construction services by central, sub-central and other entities, above threshold values as specified in the Parties' schedules to the Agreement.

40 GPA 2012, Article IV:1(a) and (b) ("General Principles").

41 GPA 2012, Articles VII to XVI ("Notices", "Conditions for Participation", "Qualification of Suppliers", "Technical Specifications and Tender Documentation", "Time-Periods", "Negotiation", "Limited Tendering", "Electronic Auctions", "Treatment of Tenders and Awarding of Contracts" and "Transparency of Procurement Information").

42 See Article XXII:7 ("Final Provisions") of the GPA 2012.

43 See Article III, Annex IV of the Japan-Switzerland FTA.

44 See Article 8.32 of the EU-Japan Economic Partnership Agreement.

45 The Comprehensive and Economic Trade Agreement (CETA), for instance, calls for, among other things, the simplification of procedures, and the observance of standards of impartiality and independence in the decision-making process. See Article 12.3 of the CETA.

46 https://www.who.int/news-room/q-a-detail/one-health

47 This phenomenon is discussed as a time-inconsistency problem by Leibovici and Santacreu (2020b).

48 Panel Report, Japan – Semi-Conductors (1988), paragraph 104. See also: Panel Report, India – Quantitative Restrictions (1999), para. 5.129. The panel in this case further noted that: 'the scope of the term "restriction" is also broad, as seen in its ordinary meaning, which is "a limitation on actions, a limiting condition or regulation"'.

49 Article XX of the GATT 1994 and Article XIV of the GATS add that such measures must not be applied in a manner that would constitute a means of arbitrary or

unjustifiable discrimination between countries where the same conditions prevail, or as a disguised restriction on international trade.

50 GATT Analytical Index, Article XX, pages 593-594.

51 Australia, Brazil, Canada, Chile, the European Union, Japan, Kenya, Republic of Korea, Mexico, New Zealand, Norway, Singapore and Switzerland.

52 China, France, India, the United Kingdom and the United States.

53 "Licensure experience" encompasses reported production capacities from developers which have at least one other vaccine in their current portfolio that has been licensed for use by a national regulatory authority.

54 See https://www.g20.org/high-level-independent-panel-urges-the-g20-to-launch-a-global-deal-to-prevent-catastrophic-costs-of-future-pandemics.html

55 mRNA stands for messenger ribonucleic acid.

56 One of those initiatives has involved the establishment, by the heads of the World Bank Group, IMF, WHO and WTO of the Task Force on COVID-19 Vaccines, Therapeutics and Diagnostics for Developing Countries (https://www.wto.org/english/news_e/news21_e/covid_30jun21_e.htm).

57 See https://www.gavi.org/vaccineswork/covax-manufacturing-task-force-tackle-vaccine-supply-challenges.

58 On this matter, see the Report of the G20 High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response, 9 July 2021 (https://www.g20.org/high-level-independent-panel-urges-the-g20-to-launch-a-global-deal-to-prevent-catastrophic-costs-of-future-pandemics.html).

59 The TRIPS Agreement acknowledges the difficulties that LDC members may face in implementing their obligations under this Agreement and their need for flexibility to create a viable technological base. It thus provided a transition period of 10 years for implementation of TRIPS obligations, aside from those of national treatment and MFN treatment, for these members (see Article 66.1). This transitional period has been extended by the TRIPS Council until 1 January 2033.

60 Specific provisions of the Paris Convention for the Protection of Industrial Property of 1967 (Paris Convention); the International Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations of 1961 (Rome Convention); the Treaty on Intellectual Property in Respect of Integrated Circuits of 1989 (Washington Treaty); and the Berne Convention for the Protection of Literary and Artistic Works of 1971 (Paris Act) are integral parts of the TRIPS Agreement.

61 See the amendment to the TRIPS Agreement which entered into force on 23 January 2017, and which aims to improve the access of poor countries to affordable medicines. The amendment integrates in the TRIPS Agreement a decision on patents and public health originally adopted in 2003.

62 See https://www.wto.org/english/tratop_e/covid19_e/covid19_e.htm.

63 See WTO official document number IP/C/W/669. This proposal has since been co-sponsored by the Plurinational State of Bolivia, Egypt, Eswatini, Kenya, Mongolia, Mozambique, Pakistan, Venezuela, Zimbabwe, the African Group and the Least Developed Countries Group. Fiji, Indonesia, Jordan, Maldives, Mauritius, Namibia, Vanuatu have voiced their support.

64 See WTO official document IP/C/W/669/Rev.1.

65 See, e.g., "Statement by President von der Leyen at the joint press conference with President Michel and Prime Minister Costa following the informal meeting of EU Leaders and the EU-India leaders' meeting," 8 May 2021, https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_21_2361.

66 See WTO official document IP/C/W/681.

67 See https://www.wto.org/english/news_e/news21_e/trip_20jul21_e.htm.

68 See Chapter 18 of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

69 For instance, El Salvador, Guatemala, Honduras, Jordan, Morocco and Nicaragua in their RTAs concluded with the United States.

70 On 24 June 2021, the heads of the WHO, WIPO and the WTO agreed to build further on their existing commitment to WHO-WIPO-WTO trilateral cooperation on IP and public health (see https://www.wto.org/english/tratop_e/trips_e/who_wipo_wto_e.htm), which aims to support and assist all countries as they seek to assess and implement sustainable and integrated solutions to public health challenges. On this occasion, they agreed to collaborate on the organization of practical, capacity-building workshops to enhance the flow of updated information on current developments in the pandemic and responses to achieve equitable access to COVID-19 health technologies, and to implement a joint platform for tripartite technical assistance for countries relating to their needs for COVID-19 medical technologies (https://www.wto.org/english/news_e/news21_e/igo_23jun21_e.htm).

71 The WTO makes available to its members and observers a list of measures regarding TRIPS in relation to the COVID-19 pandemic. This non-exhaustive list, compiled by the WTO Secretariat from official sources, represents an informal situation report and an attempt to provide transparency with respect to measures related to IPR taken in the context of the COVID-19 crisis (https://www.wto.org/english/tratop_e/covid19_e/trade_related_ip_measure_e.htm).

The WIPO COVID-19 IP Policy Tracker (https://www.wipo.int/covid19-policy-tracker/#/covid19-policy-tracker/ipo-operations), meanwhile, provides information on measures adopted by IP offices in response to the COVID-19 pandemic, such as the extension of deadlines. In addition, the policy tracker provides information on legislative and regulatory measures for access and voluntary actions.

72 See https://www.who.int/initiatives/covid-19-technology-access-pool/solidarity-call-to-action.

73 See https://www.who.int/initiatives/covid-19-technology-access-pool.

74 See https://www.who.int/news/item/27-05-2021-the-president-of-the-republic-of-costa-rica-and-the-director-general-of-the-world-health-organization-call-once-again-on-all-who-member-states-to-actively-support-the-covid-19-technology-access-pool-(c-tap)

75 See https://medicinespatentpool.org/news-publications-post/covid-19-vaccine-technologies-mandate-expansion/.

76 See https://medicinespatentpool.org/what-we-do/disease-areas/vaxpal/.

77 See https://www.wipo.int/patentscope/en/.

78 See https://www.wto.org/english/res_e/booksp_e/extract_who-wipo-wto_2020_e.pdf.

79 See https://www.who.int/news-room/commentaries/detail/a-new-commitment-for-vaccine-equity-and-defeating-the-pandemic and https://www.worldbank.org/en/news/statement/2021/06/03/world-bank-group-and-international-monetary-fund-call-to-action-on-covid-vaccine-access-for-developing-countries.

80 See https://www.who.int/news/item/01-06-2021-new-50-billion-health-trade-and-finance-roadmap-to-end-the-pandemic-and-secure-a-global-recovery. The IMF proposal is available at https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2021/05/19/A-Proposal-to-End-the-COVID-19-Pandemic-460263.

81 See https://www.covid19taskforce.com/en/programs/task-force-on-covid-19-vaccines and https://www.wto.org/english/news_e/news21_e/igo_28jul21_e.htm.

82 Articles I:2(c) ("Scope and Definition") and XXVIII(d)(i) ("Definitions") of the GATS.

83 See, for example, A Global Deal for Our Pandemic Age (https://www.bruegel.org/2021/07/a-global-deal-for-our-pandemic-age/), report presented by the G20 High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response (HLIP) at the third G20 Finance Ministers and Central Bank Governors meeting in Venice on 9 July 2021. For countries seeking to expand their investments in health security, the Coalition for Epidemic Preparedness Innovations (CEPI) can also offer multisectoral partnerships and expertise (CEPI, 2021).

84 See https://www.reuters.com/world/china/who-agrees-study-major-reforms-meet-again-pandemic-treaty-2021-05-31/.

85 In fact, the opposite occurred when Argentina suspended its anti-dumping duties on imports of certain medical products from China and when Brazil introduced a temporary suspension of the anti-dumping duties on vacuum plastic tubes for blood collection imported from Germany, the United Kingdom and the United States (WTO, 2021g).

86 See, for example, Australia-New Zealand (ANZCERTA); Canada-Chile; China-Hong Kong, China; China-Macao, China; the Common Economic Zone (CEZ); the original EC and its various expansions; the European Economic Area (EEA); the European Free Trade Association (EFTA); EFTA-Bosnia and Herzegovina; EFTA-Chile; EFTA-Hong Kong, China; EFTA-Montenegro; EFTA-Serbia; and EFTA-Ukraine.

87 See, for example, Canada-Chile, Australia-New Zealand, Canada-Costa Rica, Chile-Colombia, Chile-Nicaragua, Dominican Republic-Central America, which prohibit certain subsidies on agriculture.

88 A *de minimis* volume is a volume of imports below which such imports are deemed insufficient to justify proceeding with the anti-dumping case (see Article 5.8 ("Initiation and Subsequent Investigation") of the Anti-Dumping Agreement).

89 A *de minimis* dumping margin is a margin of dumping deemed insufficient to justify proceeding with the anti-dumping case (See Article 5.8 ("Initiation and Subsequent Investigation") of the Anti-Dumping Agreement).

90 The Andean Community has a higher *de minimis* volume requirement and a shorter period of application of anti-dumping measures. The New Zealand-Singapore FTA has a higher *de minimis* dumping margin (5 per cent) and a higher *de minimis* volume requirement (5 per cent) than the WTO benchmark. The Southern Common Market (Mercosur) limits the duration of anti-dumping duties to three years, compared to five years under the WTO Agreement.

91 See, e.g., Canada-Costa Rica, Canada-Chile, Caribbean Community and Common Market (CARICOM), Common Market for Eastern and Southern Africa (COMESA), the North American Free Trade Agreement (NAFTA).

92 This ambivalence is at the origin of disputes regarding import licensing regimes, from the GATT 1947 panel on EEC – Minimum Import Prices (1978) to, more recently, the panel report on Indonesia – Import Licensing Regimes (2017).

93 Article 1 ("General Provisions") of the Agreement on Import Licensing Procedures.

94 Articles XI:2(a) ("General Elimination of Quantitative Restrictions") and XVIII:B ("Governmental Assistance to Economic Development") of the GATT 1994, respectively.

95 See, for example, the USA-Chile FTA, Article 3.11.

96 See, for example, the Regional Comprehensive Economic Partnership (RCEP), Article 2.19.

97 See Article 3 ("Prohibition") of the SCM and Section D.3.

98 See Articles 6 to 10 ("Domestic Support Commitments", "General Disciplines on Domestic Support", "Export Competition Commitments", "Export Subsidy Commitments" and "Prevention of Circumvention of Export Subsidy Commitments") of the AoA.

99 See paragraphs 3 and 4 of Annex 2 to the AoA, as well as footnotes 5 and 6 thereto.

100 See Hepburn et al. (2021) for a comprehensive discussion of how policies affecting trade and markets in agricultural products taken during recent crises have had an impact on both producers and consumers in the countries applying the measures and elsewhere, as well as what governments can do to ensure that policies and rules on trade help improve resilience to future food system shocks.

101 For instance, rice and grains have been stockpiled in India, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam to mitigate food supply instability during disasters. See Chen et al. (2020).

102 Countries' public stockholding programmes can be challenged at the WTO under the AoA, as well as the SCM Agreement. Getting the right metrics on the amount of support to provide through public stockholding programmes is, therefore, important for countries' compliance with the WTO agreements.

103 Air transport services are covered by a specific annex of the GATS. The annex excludes from the agreement the largest part of air transport services: traffic rights and services directly related to traffic. These services are nevertheless subject to a regular review by the Council of Trade in Services, with a view to considering the possible further application of the GATS to the sector.

104 The SCM Agreement originally provided, in its Article 8 ("Identification of Non-Actionable Subsidies"), for a category of non-actionable subsidies. Subsidies meeting the conditions of Article 8 could neither be subject to countervailing duties, nor contested under the WTO Dispute Settlement Understanding. This category included, subject to a number of conditions, subsidies granted for research activities, assistance to disadvantaged regions, and subsidies intended to assist firms adapting to new environmental requirements. The provisions of the SCM Agreement relating to this category of subsidies were intended to apply for a period of five years from the date of entry into force of the WTO Agreement. Upon the expiry of this period, no decision was taken to extend their application.

105 Some RTAs recognise that certain subsidies, while favouring certain firms or the production of certain goods and distorting or threatening to distort competition, may be adopted to pursue public policy objectives. See, for example, Article 41 of the EU-South Africa Free Trade Agreement.

106 See the EU-Republic of Korea FTA, Article 11.11.

107 See the Dispute Settlement Understanding, Article 23 ("Strengthening of the Multilateral System").

108 See, for example, Articles 20 ("Time-frame for DSB Decisions") and 21.4 ("Surveillance of Implementation of Recommendations and Rulings") of the Dispute Settlement Understanding.

109 G20 financial minister have already manifested that they will "commit to support an environmentally sustainable and inclusive recovery" (G20, 2020a).

E. Conclusion

The health and economic crisis caused by the COVID-19 pandemic has highlighted both the vulnerabilities and the strengths of the interconnected global economy, which has at its core the multilateral trading system. This report has examined the resilience of the global economy to crises, how trade plays a pivotal role in developing resilience, and in what ways the global trade system can be improved to allow countries to prepare for, cope with and recover from crises.

The frequency, intensity, scale and duration of natural disasters, including pandemics, and incidences of technological and operational risks, in particular cyber-attacks, have been increasing and are likely to continue to do so. Social inequalities, the fragility of economic growth, political uncertainties and geopolitical tensions are all growing, foretelling a rise in socio-economic risks.

All types of shocks can have significant economic and welfare losses, ranging from the monetary cost of damages to injuries, diseases and deaths. Although the economic effects of shocks may differ according to the country, sector or household affected, certain vulnerable groups continue to be disproportionately affected.

Building and supporting economic resilience have become key strategies to reduce business interruptions and economic losses caused by shocks. Although there is no consensus on its definition, "economic resilience" is defined in this report as the ability of firms, households and governments to prepare for, cope with and recover from shocks.

Individual firms and households can adopt a broad range of tactics and strategies in order to build and support economic resilience, such as input substitution, production equipment redundancy, and expanding and diversifying wholesale and retail trade networks. Pooling resources can contribute to economic resilience at the industry level. And governments can support economic resilience through relevant and well-designed infrastructure, fiscal, monetary, social, environmental and health policies, with the policy choice depending on the channel through which a shock hits the economy. Trade policy is another key policy area that can help countries to prevent risks and to confront and recover from shocks. Although governments may have incentives to adopt temporary protectionist trade measures in response to shocks, trade policy responses are rarely either fully trade-restrictive or fully trade-liberalizing when a shock hits.

It is true that trade can increase countries' vulnerabilities and be a spreader of shocks, because it can expose countries to risks and hazards, and can facilitate the transmission of these risks and hazards through economic, financial, travel, transport and digital linkages. For example, the trade-related mobility of both people and livestock can be a vector for disease transmissions. Trade can also indirectly contribute to deforestation and climate change, spurring natural risks. And trade-driven interdependence, such as global value chains, can also increase countries' vulnerability to crises, because the impact of a shock to one "link" in the chain can affect numerous other "links" by temporarily blocking or disrupting production and distribution networks. Shocks can impact trade through different channels by increasing trade costs and/or impacting the demand and/or supply of exports and imports. Some sectors and types of trade, such as trade in agricultural products, services and time-sensitive products, tend to be more vulnerable to different types of shocks.

On the other hand, trade can also better equip countries to deal with shocks. As a source of economic growth and productivity, it gives countries the technical, institutional and financial means to prepare for shocks. It also can help to ensure that critical services, such as weather forecasting, insurance, telecommunications, transportation, logistics and health services, as well as critical goods, are available in a timely manner before and after a shock hits. It can also enable countries to switch from domestic to external suppliers in case of domestic shortages, thereby making it possible to import essential goods quickly and more easily cope with shocks. In addition, trade contributes to economic recovery from shocks by improving allocative efficiency and unlocking scale effects, enabling the creation of export-related jobs and the importation of affordable necessary inputs, ultimately leading to better incomes and increased productivity and innovation. Although significant barriers to physical infrastructure and human capital development still exist, digital trade can be an important vector for the economic recovery of all segments of the economy, including MSMEs, disadvantaged groups and LDCs, by providing new market opportunities.

Empirical evidence shows that the historical reduction in trade costs has decreased the volatility of GDP in most regions. In addition, more diversified economies can better cope with specific shocks, because if exports are concentrated in a few products, price volatility is likely to translate into large fluctuations in export revenues, increasing aggregate volatility. Similarly, if exports are concentrated in a few export destinations, destination-specific shocks can have a large impact on export revenues. Although it can be challenging to diversify suppliers, customers and trade routes, such diversification can mitigate the impact of supply chain disruptions, thereby increasing resilience to shocks. Conversely, policies aimed at increasing economic resilience by re-shoring productions, promoting self-sufficiency and unwinding trade integration can often have the opposite effect, actually reducing economic resilience.

International cooperation to increase economic resilience can play a dual role in helping countries to prepare for, cope with and recover from shocks. It can amplify the positive cross-border spillover effects of individual policy actions taken to promote economic resilience, and it can mitigate possible negative cross-border spillovers from individual policy actions that can hinder the economic resilience strategies of other countries.

Although the term "resilience" does not appear in the WTO agreements, the WTO framework supports the conditions underpinning economic resilience by reducing trade barriers, streamlining customs procedures, encouraging transparency, building trade capacity in poorer countries, and collaborating with other international organizations to strengthen the global economy and make it more secure. International trade cooperation can further help to achieve more open markets and more inclusive, stable and predictable trade, promoting the diversification of economies and trade relations, so that countries are less reliant on single exports and suppliers when crises hit.

The WTO could make an even greater contribution to increasing economic resilience. WTO members' trade policies can be made more transparent by ensuring existing transparency mechanisms – particularly monitoring and notification requirements – provide timely access to relevant information. Encouraging information-sharing by WTO members with reference to the production, trade and consumption of vaccines and other essential products can also contribute to enhancing economic resilience by helping countries to better assess production capacities, avoid bottlenecks, manage inventories and prevent excessive stockpiling. Other important trade-related areas that could benefit from greater cooperation and coordination among WTO members include export restrictions, national procurement policies for critical goods and services, and trade measures concerning the temporary movement of people, subsidies, and e-commerce.

This report has underlined how broad the spectrum of risks and shocks to the economy is, as well as the cross-cutting nature of economic resilience. By strengthening cooperation between the WTO and the international and regional organizations specialized in key aspects of economic resilience, such as risk prevention, disaster relief, public health, climate change, environmental protection and financial stability, efforts to improve economic resilience can be made more coherent and coordinated.

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Technical notes

WTO members are frequently referred to as "countries", although some members are not countries in the usual sense of the word but are officially "customs territories". The definition of geographical and other groupings in this report does not imply an expression of opinion by the WTO Secretariat concerning the status of any country or territory, the delimitation of its frontiers, nor the rights and obligations of any WTO member in respect of WTO agreements. The colours, boundaries, denominations and classifications in the maps of the publication do not imply, on the part of the WTO, any judgement on the legal or other status of any territory, or any endorsement or acceptance of any boundary.

Throughout this report, South and Central America and the Caribbean is referred to as South and Central America.

The Netherlands with respect to Aruba; the Bolivarian Republic of Venezuela; Hong Kong Special Administrative Region of China; the Republic of Korea; and the Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu are referenced as: Aruba, the Netherlands with respect to; Bolivarian Rep. of Venezuela; Hong Kong, China; Korea, Republic of; and Chinese Taipei respectively.

There are no WTO definitions of "developed" and "developing" economies. Members announce for themselves whether they are "developed" or "developing" economies. The references to developing and developed economies, as well as any other sub-categories of members used in this report, are for statistical purposes only, and do not imply an expression of opinion by the Secretariat concerning the status of any country or territory, the delimitation of its frontiers, nor the rights and obligations of any WTO member in respect of WTO agreements.

The data supplied in the *World Trade Report 2021* are valid as of 17 September 2021.

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WTO members

(As of 17 September 2021)

Afghanistan
Albania
Angola
Antigua and Barbuda
Argentina
Armenia
Australia
Austria
Bahrain, Kingdom of
Bangladesh
Barbados
Belgium
Belize
Benin
Bolivia, Plurinational State of
Botswana
Brazil
Brunei Darussalam
Bulgaria
Burkina Faso
Burundi
Cabo Verde
Cambodia
Cameroon
Canada
Central African Republic
Chad
Chile
China
Colombia
Congo
Costa Rica
Côte d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic
Democratic Republic of the Congo
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Estonia
Eswatini
European Union
Fiji
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hong Kong, China
Hungary
Iceland
India
Indonesia
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Korea, Republic of
Kuwait, the State of
Kyrgyz Republic
Lao People's Democratic Republic
Latvia
Lesotho
Liberia
Liechtenstein
Lithuania
Luxembourg
Macao, China
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Mauritania
Mauritius
Mexico
Moldova, Republic of
Mongolia
Montenegro
Morocco
Mozambique
Myanmar
Namibia
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
North Macedonia, Republic of
Norway
Oman
Pakistan
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russian Federation
Rwanda
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Samoa
Saudi Arabia, Kingdom of
Senegal
Seychelles
Sierra Leone
Singapore
Slovak Republic
Slovenia
Solomon Islands
South Africa
Spain
Sri Lanka
Suriname
Sweden
Switzerland
Chinese Taipei
Tajikistan
Tanzania
Thailand
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Uganda
Ukraine
United Arab Emirates
United Kingdom
United States of America
Uruguay
Vanuatu
Venezuela, Bolivarian Republic of
Viet Nam
Yemen
Zambia
Zimbabwe

Previous World Trade Reports

Government policies to promote innovation in the digital age

2020

In recent years, a growing number of governments have adopted policies aimed at supporting the transition towards a digital economy. The *World Trade Report 2020* looks at these policy trends and at how trade and the WTO fit with them.

The future of services trade

2019

Services have become the most dynamic component of global trade, yet the extent of services' contribution to global trade is not always understood. *The World Trade Report 2019* attempts to remedy this by examining how trade in services is evolving and why services trade matters.

The future of world trade: How digital technologies are transforming global commerce

2018

The *World Trade Report 2018* examines how digital technologies – in particular the Internet of Things, artificial intelligence, 3D printing and Blockchain – affect trade costs, the nature of what is traded and the composition of trade. It estimates how global trade may be affected by these technologies over the next 15 years.

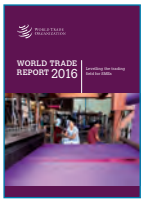
Trade, technology and jobs

2017

The *World Trade Report 2017* examines how technology and trade affect employment and wages. It analyses the challenges for workers and firms in adjusting to changes in labour markets and how governments can facilitate such adjustment to ensure that trade and technology are inclusive.

Levelling the trading field for SMEs

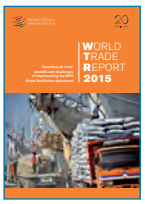
2016



The *World Trade Report 2016* examines the participation of small and medium-sized enterprises (SMEs) in international trade. It looks at how the international trade landscape is changing for SMEs and what the multilateral trading system does and can do to encourage SME participation in global markets.

Speeding up trade: benefits and challenges of the WTO Trade Facilitation Agreement

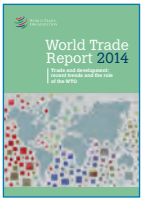
2015



The WTO Trade Facilitation Agreement (TFA), agreed by WTO members at the Ministerial Conference in December 2013, is the first multilateral trade agreement concluded since the establishment of the WTO in 1995. This Report is the first detailed study of the potential impacts of the TFA, based on analysis of the final agreement text.

Trade and development: recent trends and the role of the WTO

2014



This Report looks at four major trends that have changed the relationship between trade and development since the start of the millennium: the economic rise of developing economies, the growing integration of global production through supply chains, the higher prices for agricultural goods and natural resources, and the increasing interdependence of the world economy.

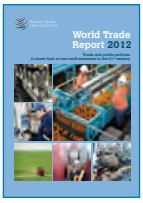
Factors shaping the future of world trade

2013

This Report looks at what has shaped global trade in the past and reviews how demographic change, investment, technological progress, developments in the transport and energy/natural resource sectors, as well as trade-related policies and institutions, will affect international trade.

Trade and public policies: A closer look at non-tariff measures in the 21st century

2012



Regulatory measures for trade in goods and services raise challenges for international cooperation in the 21st century. This Report examines why governments use non-tariff measures and services measures and the extent to which these measures may distort international trade.

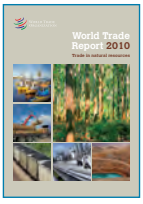
The WTO and preferential trade agreements: From co-existence to coherence

2011

The ever-growing number of preferential trade agreements (PTAs) is a prominent feature of international trade. This Report describes the historical development of PTAs and the current landscape of agreements. It examines why PTAs are established, their economic effects, the contents of the PTAs, and the interaction between PTAs and the multilateral trading system.

Trade in natural resources

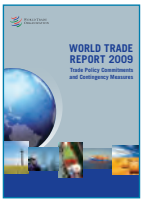
2010



This Report focuses on trade in natural resources, such as fuels, forestry, mining and fisheries. It examines the characteristics of trade in natural resources, the policy choices available to governments and the role of international cooperation, particularly of the WTO, in the proper management of trade in this sector.

Trade policy commitments and contingency measures

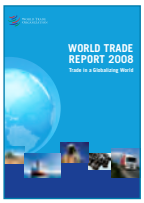
2009



This Report examines the range and role of contingency measures available in trade agreements. It aims to analyse whether WTO provisions provide a balance between supplying governments with the necessary flexibility to face difficult economic situations and adequately defining these in a way that limits their use for protectionist purposes.

Trade in a globalizing world

2008



This Report provides a reminder of the gains from international trade and highlights the challenges arising from higher levels of integration. It addresses the question of what constitutes and drives globalization, the benefits and challenges it brings, and the role trade plays in this world of ever-growing inter-dependency.

Sixty years of the multilateral trading system: achievements and challenges

2007

On 1 January 2008 the multilateral trading system celebrated its 60th anniversary. The *World Trade Report 2007* celebrates this landmark anniversary with an in-depth look at the General Agreement on Tariffs and Trade (GATT) and its successor, the WTO – their origins and achievements, the challenges they have faced, and what the future holds.

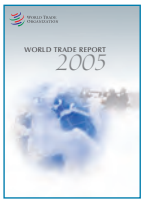
Exploring the links between subsidies, trade and the WTO

2006

This Report focuses on how subsidies are defined, what economic theory can tell us about subsidies, why governments use subsidies, the most prominent sectors in which they are applied and the role of the WTO Agreement in regulating subsidies in international trade.

Trade, standards and the WTO

2005



This Report seeks to shed light on the various functions and consequences of standards, focusing on the economics of standards in international trade, the institutional setting for standard-setting and conformity assessment, and the role of WTO agreements in reconciling the legitimate policy uses of standards with an open, non-discriminatory trading system.

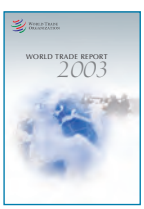
Coherence

2004

This Report focuses on the notion of coherence in analysing interdependent policies: the interaction between trade and macroeconomic policy, the role of infrastructure in trade and economic development, domestic market structures, governance and institutions, and the role of international cooperation in promoting policy coherence.

Trade and development

2003



This Report focuses on development. It explains the origin of this issue and offers a framework within which to address the question of the relationship between trade and development, thereby contributing to more informed discussion.

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World Trade Report 2021

The COVID-19 pandemic and the prospect of increasingly frequent and more intense natural and man-made disasters raise important questions about the resilience of the global economy to such shocks. The *World Trade Report 2021* explores the basic, binary assumption driving much of the current debate about economic resilience, namely the inherent trade-off between global trade interdependence and national economic security, and suggests that this can be a false dilemma.

Due to its interconnected nature, international trade can increase an economy's exposure to risks and contribute to the transmission of shockwaves. At the same time, it can bolster economic resilience, particularly when backed by domestic policies and effective global cooperation. As a driver of economic growth, trade can generate the resources and knowledge needed to prepare for crises. It can also help countries recover by facilitating the provision of goods and services needed to cope with a crisis.

Policies aimed at increasing economic resilience by re-shoring production and unwinding trade integration ultimately reduce economic resilience. Conversely, trade diversification can contribute to economic resilience by allowing countries to be less dependent on a limited number of importers, exporters and sectors.

The World Trade Report 2021 shows that a more open, inclusive and predictable trade environment is needed to promote diversification and contribute to economic resilience. The WTO already plays a key role in making economies more resilient by promoting lower trade barriers and greater transparency in trade policies. Further international cooperation at the WTO can strengthen the mutual supportiveness of trade openness and economic resilience so that the world is better prepared to deal with future crises.

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A shipment of COVID-19 vaccines being unloaded in Abidjan, Côte d'Ivoire.