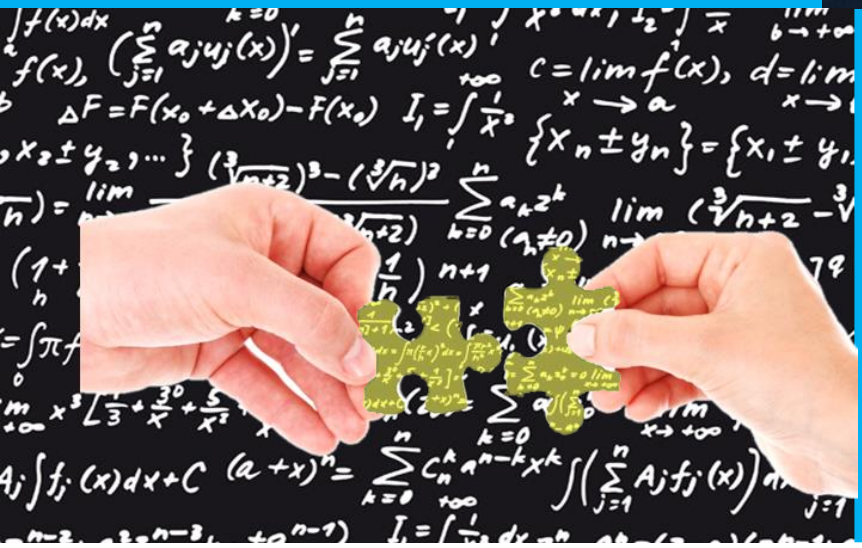
ARTNeT

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

Special Series on Trade and Health

Trade and Trade Barriers in Vaccines and Inputs to Vaccine Production in the Asia-Pacific Region





Pralok Gupta

Ayona Bhattacharjee

ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

Working Paper

No. 218 | 2022

The Asia-Pacific Research and Training Network on Trade (ARTNeT) is an open regional network of research and academic institutions specializing in international trade policy and facilitation issues. ESCAP, WTO and UNCTAD, as key core network partners, and a number of bilateral development partners, provide substantive and/or financial support to the network. The Trade, Investment and Innovation Division of ESCAP, the regional branch of the United Nations for Asia and the Pacific, provides the Secretariat of the network and a direct regional link to trade policymakers and other international organizations.

The ARTNeT Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about trade issues. An objective of the series is to publish the findings quickly, even if the presentations are less than fully polished. ARTNeT Working Papers are available online at http://artnet.unescap.org. All material in the Working Papers may be freely quoted or reprinted, but acknowledgment is requested together with a copy of the publication containing the quotation or reprint. The use of the Working Papers for any commercial purpose, including resale, is prohibited.

Disclaimer:

The designations employed and the presentation of the material in this Working Paper do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. Where the designation “country or area” appears, it covers countries, territories, cities or areas. Bibliographical and other references have, wherever possible, been verified. The United Nations bears no responsibility for the availability or functioning of URLs. The views expressed in this publication are those of the author(s) and do not necessarily reflect the views of the United Nations. The opinions, figures and estimates set forth in this publication are the responsibility of the author(s) and should not necessarily be considered as reflecting the views or carrying the endorsement of the United Nations. Any errors are the responsibility of the author(s). The mention of firm names and commercial products does not imply the endorsement of the United Nations.

© ARTNeT 2022

ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

WORKING PAPER

Trade and Trade Barriers in Vaccines and Inputs to Vaccine Production in the Asia-Pacific Region

Pralok Gupta[1], Ayona Bhattacharjee[2]

Please cite this paper as:

Pralok Gupta and Ayona Bhattacharjee (2022). "Trade and Trade Barriers in Vaccines and Inputs to Vaccine Production in the Asia-Pacific Region", **ARTNeT Working Paper Series** No. 218, November 2022, Bangkok, ESCAP.

Available at http://artnet.unescap.org

[1] Associate Professor, Centre for WTO Studies, Indian Institute of Foreign Trade, email: pralok@iift.edu.
[2] Assistant Professor, International Management Institute (IMI New Delhi), email: ayona.bhattacharjee@imi.edu. This paper was written for and funded by the ESCAP-WHO research initiative "From Lab to Jab: Improving Asia-Pacific's Readiness to Produce and Deliver Vaccines". The authors are grateful to the ARTNeT secretariat for the support in preparing this paper for dissemination.

Abstract

The COVID-19 pandemic re-emphasized the role of vaccines in prevention and control of outbreaks and infectious diseases, but not all countries are able to produce them. Limited domestic capacities combined with other bottlenecks have often resulted in vaccine stockouts in many countries. In this context, international trade could be instrumental in overcoming challenges pertaining to vaccine availability. This study is an analysis of trade and trade barriers related to vaccines and vaccine inputs in the Asia-Pacific region, the second largest regional trader of vaccine inputs. Using trade-related data of the Asia-Pacific region, we find that while there was high dependence of this region on vaccine imports from the rest of the world, there was significant intraregional trade in vaccine inputs during the last two decades. Analysis of tariff data shows that vaccines remained duty free or at low tariffs in many countries within this region while several non-tariff measures from the pre-COVID-19 period still continued. This study includes results from a primary survey of stakeholders concerned with vaccine production and trade in India. Being a significant player for vaccines in the Asia-Pacific region, experiences from India can provide substantial insights and takeaways for other trading nations. The interview results highlighted that tariffs were not particularly important for COVID-19 vaccines, but Non-Tariff Measures (NTMs) played a crucial role in vaccine trade. Our findings imply the need for diversification of import sources of vaccines and vaccine inputs; lowering of tariffs; reduction in export restrictions; promoting regulatory coherence to enhance intraregional trade of vaccines within the region; emphasizing the development of transportation and storage capabilities in poor countries in addition to ensuring the supply of vaccines through trade and the use of trade agreements to ease trade restrictions.

Keywords: COVID-19, vaccines, vaccine inputs, trade barriers, non-tariff measures, Asia-Pacific

JEL Codes: F13, F14

Table of Contents

Abstract ..... **iv**

1. Introduction **1**

2. Trade trends and patterns of vaccines and vaccine inputs globally and in Asia-Pacific countries **2**

2.1 Analysing vaccine trade data 2

2.1.1 Intraregional trade patterns 3

2.2 Analysing vaccine inputs trade data 6

2.2.1 Trends and patterns of trade flows 7

2.2.2 Import dependence of Asia-Pacific countries 9

2.2.3 Intraregional trade patterns 13

2.2.4 Composition of trade in vaccine input groups 14

3. Trade policy responses for vaccines and vaccine inputs within the Asia-Pacific region in response to COVID-19 ..... **16**

3.1 Tariff analysis of vaccine imports 16

3.2 Tariff analysis of vaccine inputs 19

3.2.1 Tariff analysis of vaccine manufacturing inputs 21

3.2.2 Tariff analysis of vaccine storage and distribution inputs 23

3.2.3 Tariff analysis of vaccine administration inputs 25

3.3 Tariff reduction/elimination on vaccines after COVID-19 26

3.4 Analysis of non-tariff measures 27

3.5 Export restrictions imposed by Asia-Pacific economies for vaccines and vaccine inputs 33

3.6 Vaccine supply to the Covax initiative 34

4. Key findings from primary survey with stakeholders in India **35**

5. Key findings and recommendations **39**

5.1 Key findings from the trade flow analysis of vaccines and vaccine inputs: 39

5.2 Key findings from tariff policy analyses of vaccines and vaccine inputs 39

5.3 Key findings from NTMs analyses of vaccines and vaccine inputs.....40

5.4 Key recommendations.....40

6. Self-assessment guide for policymakers 42

6.1 Policy area 1: Trade in vaccines and vaccine inputs and export and import dependence 42

6.2 Policy area 2: Trade policy responses for vaccines and vaccine inputs 43

6.3 Policy area 3: Vaccine trade and NTMs 44

List of references.....47

Appendix 48

List of Tables

Table 1: Vaccine trading partners of leading vaccine exporter and importer Asia-Pacific countries 3
Table 2: Herfindahl-Hirschman Index of import dependence of Asia-Pacific countries for vaccines for human medicines (HS code 300220), 2015 and 2020 5
Table 3: Classification of critical COVID-19 vaccine inputs 6
Table 4: Herfindahl-Hirschman index for import dependence of Asia-Pacific countries for vaccine inputs 11
Table 5: Top five vaccine input trading partners of leading Asia-Pacific vaccine input exporter and importer countries 13
Table 6: Most traded vaccine inputs, globally and in the Asia-Pacific region 16
Table 7: Effectively applied tariffs on vaccines (HS code 300220), 2000–2020 18
Table 8: Cross-country comparison of effectively applied tariffs on vaccine inputs, 2000–2020 20
Table 9: Tariff reduction on vaccines in Asia-Pacific after COVID-19 27
Table 10: Trade facilitating and trade restricting non-tariff measures 28
Table 11: Non-tariff measures on COVID-19 vaccines 30

List of Figures

Figure 1: Exports and imports of vaccines for human medicines (HS code 300220) globally and in the Asia-Pacific region (Millions of United States dollars) 2
Figure 2: Leading exporters and importers of vaccines for human medicines (HS code 300220) in the Asia-Pacific region, 2020 3
Figure 3: Region-wise trade shares of vaccine inputs (manufacturing, administration, storage and distribution), 2000–2020 7
Figure 4: Export and import shares of vaccine input groups, globally and in the Asia-Pacific region 8
Figure 5: Export and import trade values of vaccines and vaccine input groups, globally and in the Asia-Pacific region (Millions of United States dollars) 9
Figure 6: Import dependence of the Asia-Pacific region for vaccines and vaccine inputs sourced from the Asia-Pacific region and the rest of the world 10

Figure 7: Trends in shares of leading Asia-Pacific exporter and importer countries of manufacturing, storage and distribution, and administration inputs 12
Figure 8: Composition of export and import shares of vaccine input groups, 2000–2020 15
Figure 9: Tariffs imposed on vaccines (HS code 300220) in the Asia-Pacific region, 2015–2020 17
Figure 10: Percentage of Asia-Pacific countries with most-favoured nation applied tariffs on vaccines (HS code 300220), by tariff rate, 2015 and 2020 17
Figure 11: Comparison of effectively applied tariff rates in the Asia-Pacific region across vaccine input groups, 2015–2020 20
Figure 12: Tariffs imposed on vaccine manufacturing inputs in the Asia-Pacific region, 2015–2020 22
Figure 13: Percentage of Asia-Pacific countries with most-favoured nation applied tariffs on vaccine manufacturing inputs, by tariff rate, 2015 and 2020 22
Figure 14: Tariffs imposed on vaccine storage and distribution inputs in the Asia-Pacific region, 2015–2020 24
Figure 15: Percentage of Asia-Pacific countries with most-favoured nation applied tariffs on vaccine storage and distribution inputs, by tariff rate, 2015 and 2020 24
Figure 16: Effectively applied tariff rates imposed on vaccine administration inputs in the Asia-Pacific region, 2015–2020 25
Figure 17: Percentage of Asia-Pacific countries reporting most-favoured nation applied tariffs on vaccine administration inputs, by tariff rate, 2015 and 2020 26
Figure 18: Prevalence of trade facilitating and trade restricting non-tariff measures during the COVID-19 pandemic 29
Figure 19: Non-tariff measures on COVID-19 vaccines 29

List of abbreviations

ADB	Asian Development Bank
AHS	Effectively Applied Tariffs
BND	Bound Tariffs
CDMO	Contract Development and Manufacturing Organizations
CEPI	Coalition for Epidemic Preparedness Innovations
Covid-19	Coronavirus Disease
GAVI	The Vaccine Alliance
HHI	Herfindahl-Hirschman Index
HPV	Human Papillomavirus
HS	Harmonized System
ITC	International Trade Centre
MFN	Most Favoured Nation
mRNA	Messenger Ribonucleic Acid
NTMs	Non-Tariff Measures
OECD	Organisation for Economic Co-operation and Development
SPS	Sanitary and Phytosanitary Measures
TBT	Technical Barriers to Trade
TRAINS	Trade Analysis Information System
UNCTAD	United Nations Conference on Trade and Development
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNICEF	United Nations Children's Fund
WCO	World Customs Organization
WHO	World Health Organization
WITS	World Integrated Trade Solution
WTO	World Trade Organization

1. Introduction

The coronavirus disease (COVID-19) pandemic took the world by surprise, resulting in huge demand and supply shocks for different sectors and the health-care sector, in particular. As expected, with the sudden onslaught of the pandemic, domestic availability of medical products in most countries, fell short of matching the spike in demand. Among the medical products, the role of vaccines became most relevant as they provided hope for containing the pandemic. Though COVID-19 vaccination campaigns were not a hit among Asia-Pacific nations in the initial stages, they gained momentum in the later part of 2021.[3] The common supply-side bottlenecks in achieving successful roll-out of COVID-19 vaccine campaigns were inadequate supplies, logistical challenges and shortage of staff members, while the demand-side bottlenecks included issues of vaccine hesitancy and affordability of vaccines. These bottlenecks are not unique to COVID-19 vaccines, and traditional vaccines are affected by issues related to manufacture, procurement and distribution.

While the role of vaccines in prevention and control of outbreaks of infectious diseases and the actions of Governments to procure vaccines are well documented, it is true that not all countries have the capacity to produce vaccines (OECD, 2021). Limited domestic capacities combined with other bottlenecks have often resulted in vaccine stockouts in many countries (WHO, 2020). Trade has usually been instrumental in overcoming such challenges (Sorescu, González and Andrenelli, 2021). Despite immense potential for global expansion of vaccine markets and a reported fivefold increase in vaccine trade since 2005 (WTO, 2020), there are still regulatory hurdles impacting the trade flows. Regulatory restrictions combined with tariffs and non-tariff measures (NTMs) aimed at protecting public health affect the availability, accessibility and affordability of vaccines and thus the immunization rates across countries. The important relationship between trade and vaccination is worth exploring (Helble and Shepherd, 2017).

This study aims to analyse dimensions of trade and trade barriers related to vaccines and vaccine inputs in the Asia-Pacific region. The objectives include analysing trends and patterns in the export and import of vaccines and related inputs in Asia-Pacific countries; identifying important source and destination countries for vaccines and vaccine related inputs; assessing the import dependence of these products across the Asia-Pacific countries; and analysing and comparing cross-country trade policy responses for vaccines and vaccine inputs in response to COVID-19. These questions have been studied using data spanning the past two decades, 2000–2020. The study also includes the findings of a survey of key stakeholders on vaccination policies in India to gain insights on trade and trade barriers for vaccines and vaccine inputs. As

[3] https://indianexpress.com/article/explained/asia-pacific-covid-vaccination-japan-cambodia-china-7637163/.

a significant player for vaccines in the Asia-Pacific region, experiences from India can provide substantial insights and takeaways for other trading nations.

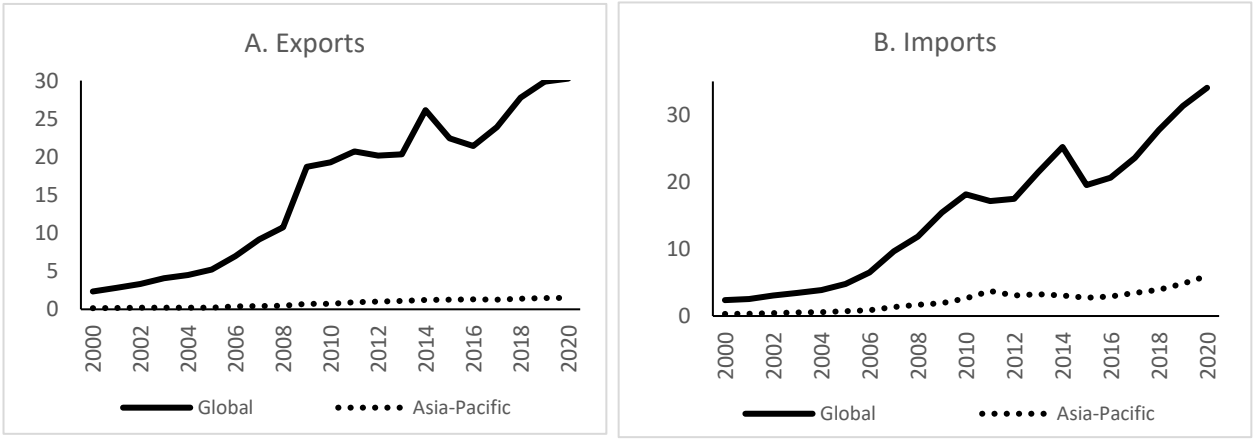
2. Trade trends and patterns of vaccines and vaccine inputs globally and in Asia-Pacific countries

In July 2021, the World Trade Organization secretariat published an indicative list of critical inputs for manufacturing, distributing and administering COVID-19 vaccines. The list was jointly produced by the Asian Development Bank (ADB), the Organisation for Economic Co-operation and Development (OECD), the World Customs Organization (WCO), some COVID-19 vaccine manufacturers, researchers the Coalition for Epidemic Preparedness Innovations (CEPI) and DHL. The analysis of trade trends and patterns of vaccines and vaccine inputs in this section is based on the list of critical inputs (see appendix table A.1). This list is based on the 2017 version of the product nomenclature developed by the WCO for the Harmonized Commodity Description and Coding System (HS), which is used by more than 177 countries and economies as the basis for their customs tariffs. The products are designated by a six-digit codes.

2.1 Analysing vaccine trade data

When analysing trade data on vaccines for human medicines (HS code 300220), we find that global exports have steadily increased over time. The leading global exporters during the past two decades were Belgium, France and Ireland while the leading importers were the United States, Belgium, United Kingdom and France. Thus, the majority of the trade shares of vaccines were held by developed countries. During this period, the Asia-Pacific region remained a net importer of vaccines, with rising import trade values over recent years (Figure 1).

Figure 1: Exports and imports of vaccines for human medicines (HS code 300220) globally and in the Asia-Pacific region (Millions of United States dollars)

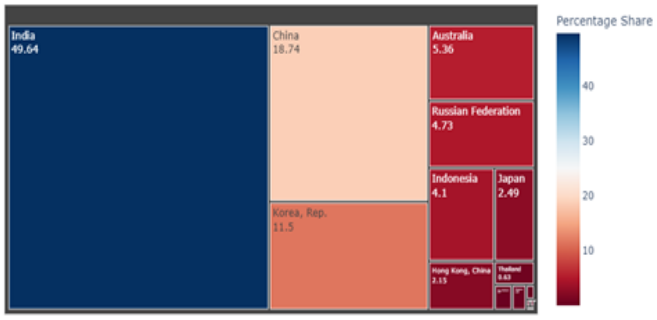


Source: Data are from the WITS database.

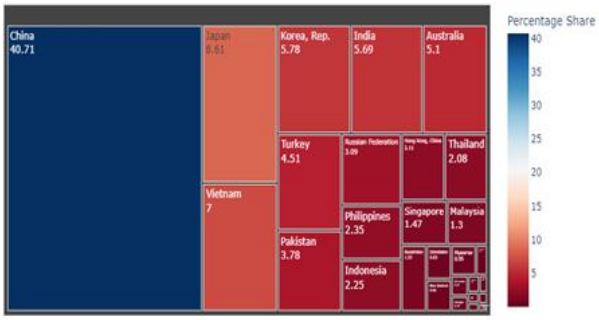
Within the Asia-Pacific region from 2000 to 2020, the leading exporter countries for vaccines were India, the Republic of Korea and Australia.[4] The leading importer countries during this period were China, Japan, and Australia. Figure 2 represents the major exporter and import Asia-Pacific countries for the year 2020. While China was not a major exporter for vaccines for the cumulative period 2000–2020, it was the second largest exporter of vaccines for the year 2020.

Figure 2: Leading exporters and importers of vaccines for human medicines (HS code 300220) in the Asia-Pacific region, 2020

A. Leading exporters



B. Leading importers



Source: Data are from the WITS database.

2.1.1 Intraregional trade patterns

The major trading partners of leading vaccine trading countries in the Asia-Pacific region from 2000 to 2020 are shown in Table 1. Most Asia-Pacific countries remained net importers of vaccines from 2000 to 2020, except India, Indonesia and Singapore.

Table 1: Vaccine trading partners of leading vaccine exporter and importer Asia-Pacific countries

	Major destination countries	Major source countries
China	India	United States
	United Arab Emirates	France
	Thailand	Ireland
	Brazil	Belgium
	Egypt	Italy
India	Nigeria	Indonesia
	Brazil	Belgium
	Bangladesh	France
	Philippines	United States
	Pakistan	China
Indonesia	Japan	Belgium
	United States	India
	Singapore	France
	China	United States
	Afghanistan	China
Japan	Republic of Korea	United States
	United States	France

[4] The Ministry of External Affairs of India reported that as of 31 December 2021, 1155 lakhs of COVID-19 vaccines had been supplied as part of grants, commercial and Covax initiatives. The major recipients of these vaccines were Bangladesh, Myanmar and Nepal (see https://mea.gov.in/vaccine-supply.htm).

	Major destination countries	Major source countries
	Thailand	Belgium
	Mexico	Ireland
	India	Germany
Republic of Korea	Pakistan	United States
	Bangladesh	Italy
	Brazil	Belgium
	Ethiopia (excludes Eritrea)	France
	Viet Nam	Germany
Russian Federation	Nigeria	France
	Kazakhstan	Ireland
	Congo, Dem. Rep.	Netherlands
	Sudan	Belgium
	Ukraine	United States
Malaysia	Brunei Darussalam	France
	Singapore	Belgium
	Thailand	United States
	Belgium	Republic of Korea
	Fiji	United Kingdom
Singapore	Belgium	Belgium
	Brunei Darussalam	United States
	Republic of Korea	France
	Viet Nam	Italy
	Brazil	Ireland
Thailand	Myanmar	France
	Sri Lanka	Belgium
	Cambodia	United States
	Malaysia	India
	Viet Nam	China
Türkiye	Cyprus	Germany
	Italy	China
	Germany	Italy
	Belgium	France
	Syrian Arab Republic	United States

Source: Author's calculations based on data from the WITS database
Note: The leading exporter and importer countries are those with the highest vaccine trade values. Their major trading partners are countries with the highest percentage of imports or exports of vaccines and they are listed in descending order.

We calculate Herfindahl-Hirschman indices (HHI) of vaccine imports to assess the concentration of import dependence of Asia-Pacific countries for vaccines. This index ranges from zero to one, with larger values signifiying lower degrees of import source diversification and thus concentrated import dependence. For vaccines for human medicines (HS code 300220), an index value of one indicates that vaccine imports come from a single country only, while a value of zero means that imports of of vaccines re homogeneously distributed among all sources. HHI values show that only a few countries have concentrated sourcing of vaccine imports (Table 2). While import concentration was higher in 2020 compared to 2015 for countries such as Brunei Darussalam, Georgia and Myanmar, many other countries in this region report lower

import concentartion in 2020. Some notable examples include Australia, Azerbaijan, Cambodia, Fiji, Kazakhstan and Sri Lanka.

Table 2: Herfindahl-Hirschman Index of import dependence of Asia-Pacific countries for vaccines for human medicines (HS code 300220), 2015 and 2020

Country	2015	2020
Armenia	0.282	0.264
Azerbaijan	0.367	0.294
Bangladesh	0.321	N/A
Brunei Darussalam	0.301	0.816
Cambodia	0.239	0.189
China	0.642	0.294
Fiji	0.477	0.269
French Polynesia	0.259	0.308
Georgia	0.273	0.434
Hong Kong, China	0.219	0.312
India	0.239	0.224
Indonesia	0.159	0.169
Iran, Islamic Republic of	0.309	N/A
Japan	0.293	0.272
Kazakhstan	0.411	0.279
Kiribati	N/A	0.989
Republic of Korea	0.354	0.274
Kyrgyzstan	0.324	0.276
Lao People's Democratic Republic	0.266	N/A
Macao, China	0.995	0.275
Malaysia	0.232	0.295
Maldives	0.274	N/A
Mongolia	0.167	0.244
Myanmar	0.162	0.225
Nepal	0.644	N/A
New Caledonia	0.328	N/A
New Zealand	0.233	0.276
Pakistan	0.153	0.210
Philippines	0.200	0.232
Russian Federation	0.220	0.252
Samoa	0.476	N/A
Singapore	0.245	0.259
Solomon Islands	0.542	N/A
Sri Lanka	0.409	0.274
Tajikistan	N/A	0.275
Thailand	0.141	0.150
Türkiye	0.266	0.181
Uzbekistan	N/A	0.221
Viet Nam	0.264	0.263

Source: Authors' construction using trade values from the WITS database
Note: N/A means data are not available.

2.2 Analysing vaccine inputs trade data

The WTO joint indicative list consists of 66 critical inputs related to COVID-19 vaccines. They have been classified into three groups or categories based on their use – manufacturing, storage and distribution and administration (see Table 3). There are 54 products listed under vaccine manufacturing, 4 under vaccine storage and distribution and 8 under vaccine administration. The 54 products listed under vaccine manufacturing comprise one active ingredient which represents vaccines for human medicines, 22 inactive ingredients such as sodium or potassium chloride, 8 other ingredients such as sorbitol or emulsifiers; 12 consumables such as liquid storage bags or vaccine vial monitors; 8 equipment products such as bioreactors or incubating shakers; and 3 packaging products such as vials or vulcanised rubber stoppers.

Variations in the product codes may have occurred since 2000, and we use the 2017-1996 correspondence tables to identify the product codes to analyse trade patterns for the years 2000–2020. The HS codes are included in appendix table A.1. We analyse trade patterns for both vaccines and vaccine inputs, but trends and patterns of trade in vaccines for human medicines (HS code 300220) are analysed separately from vaccine manufacturing products.

Table 3: Classification of critical COVID-19 vaccine inputs

Category	Subcategory	Number of products
Manufacturing inputs	Active ingredients	1
	Inactive ingredients	22
	Other ingredients	8
	Consumables	12
	Equipment	8
	Packaging	3
Storage and distribution inputs		4
Administration inputs		8

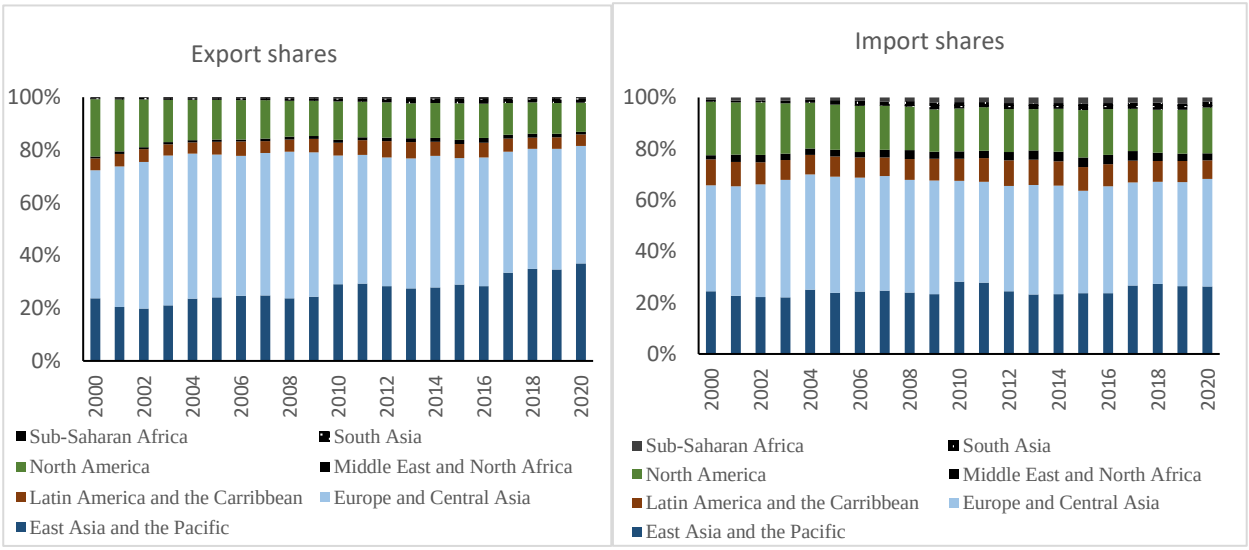
Source: The classification is based on "Joint Indicative List of Critical COVID-19 Vaccine Inputs for Consultation (Version 1.0)", dated 7 July 2021 (https://www.wto.org/english/news_e/news21_e/covid_13jul21_e.htm), accessed on 8 November 2021.
Note: HS 2017 classification is used for categorizing the products. The classification is based on a list of 83 products, 6 of which do not have their HS 2017 codes reported, some vaccine manufacturing products are repeated and there are no data for equipment (HS code 842230). Thus, trade-related data are available only for 66 products.

Next, we analyse cross-border trade data on vaccine input groups and vaccines using disaggregated data from the World Integrated Trade Solution database covering two decades, from 2000 to 2020.

First, we study the evolution of trade in different vaccine input product groups since the year 2000. Figure 3 depicts the regional evolution of international trade in these product groups (using the World Bank classification of world regions). As is evident, the largest regional traders of vaccine inputs were Europe and Central Asia followed by the East Asia and the Pacific. On further disaggregation, we find that the leading exporter and importer regions of vaccine manufacturing inputs were Europe and

Central Asia followed by rising shares of East Asia and Pacific. Leading exporter regions of vaccine administration inputs were East Asia and Pacific followed by Europe and Central Asia, while the leading importer regions were Europe and Central Asia followed by East Asia and Pacific. The leading exporter and importer regions of vaccine storage and distribution inputs were Europe and Central Asia followed by the East Asia and Pacific. Over the past two decades, countries in East Asia and Pacific have held significant shares in the trade of vaccine inputs.[5]

Figure 3: Region-wise trade shares of vaccine inputs (manufacturing, administration, storage and distribution), 2000–2020



Source: WITS database.

Note: Export or import shares are computed as region-wise exports or imports of the three vaccine input groups combined, as percentage of total exports or imports of the three vaccine input groups, globally.

2.2.1 Trends and patterns of trade flows

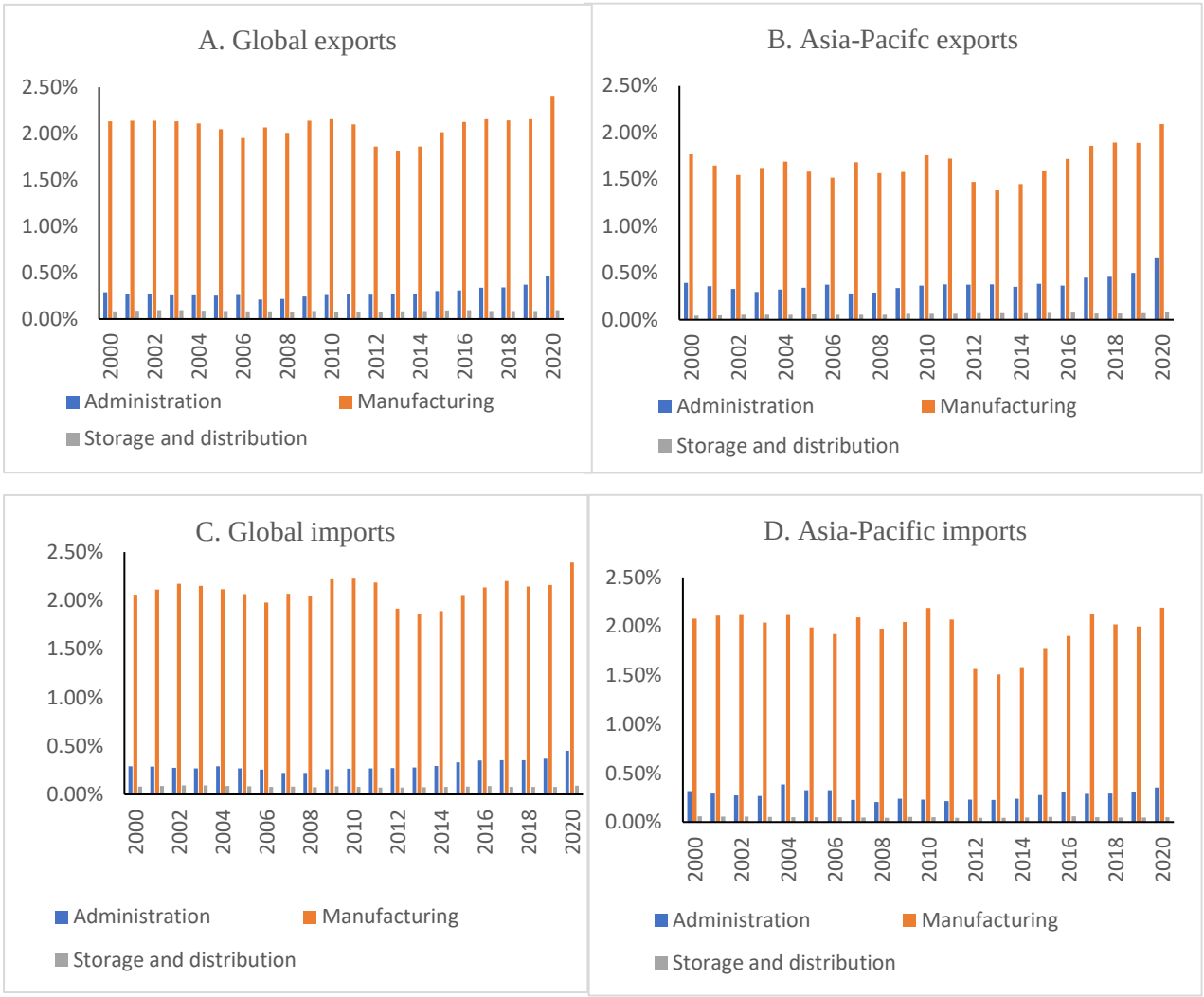
During 2000–2020, the export of these three types of vaccine inputs constituted slightly less than 3 per cent of global exports. The corresponding export share of the input groups within the Asia-Pacific region[6] was less than 2 per cent (see Figure 4). As is evident from the figure, either in the global context or in the Asia-Pacific region, the export of vaccine input groups contributed less than 3 per cent of overall exports. It is worth noting that despite the presence of populous countries in the Asia-Pacific region, trade in vaccine inputs in the region is similar to that observed globally. Part of this could be due to the restrictive trade practices commonly exercised by most of these countries. Additionally, without detailed data on the domestic production of these inputs, it is difficult to estimate the region's requirement and thus the pattern of exports and imports. Both globally and in the Asia-Pacific region, exports have been slowly rising, especially in recent years, though the rise in export shares have been relatively

[5] The data for these findings is available with the authors.

[6] The list of countries used for analysis in this paper is provided in the appendix. Due to data limitations, some countries could not be studied.

higher in the Asia-Pacific region than in general globally. Similar trends and patterns are observed in the context of import shares as well.

Figure 4: Export and import shares of vaccine input groups, globally and in the Asia-Pacific region



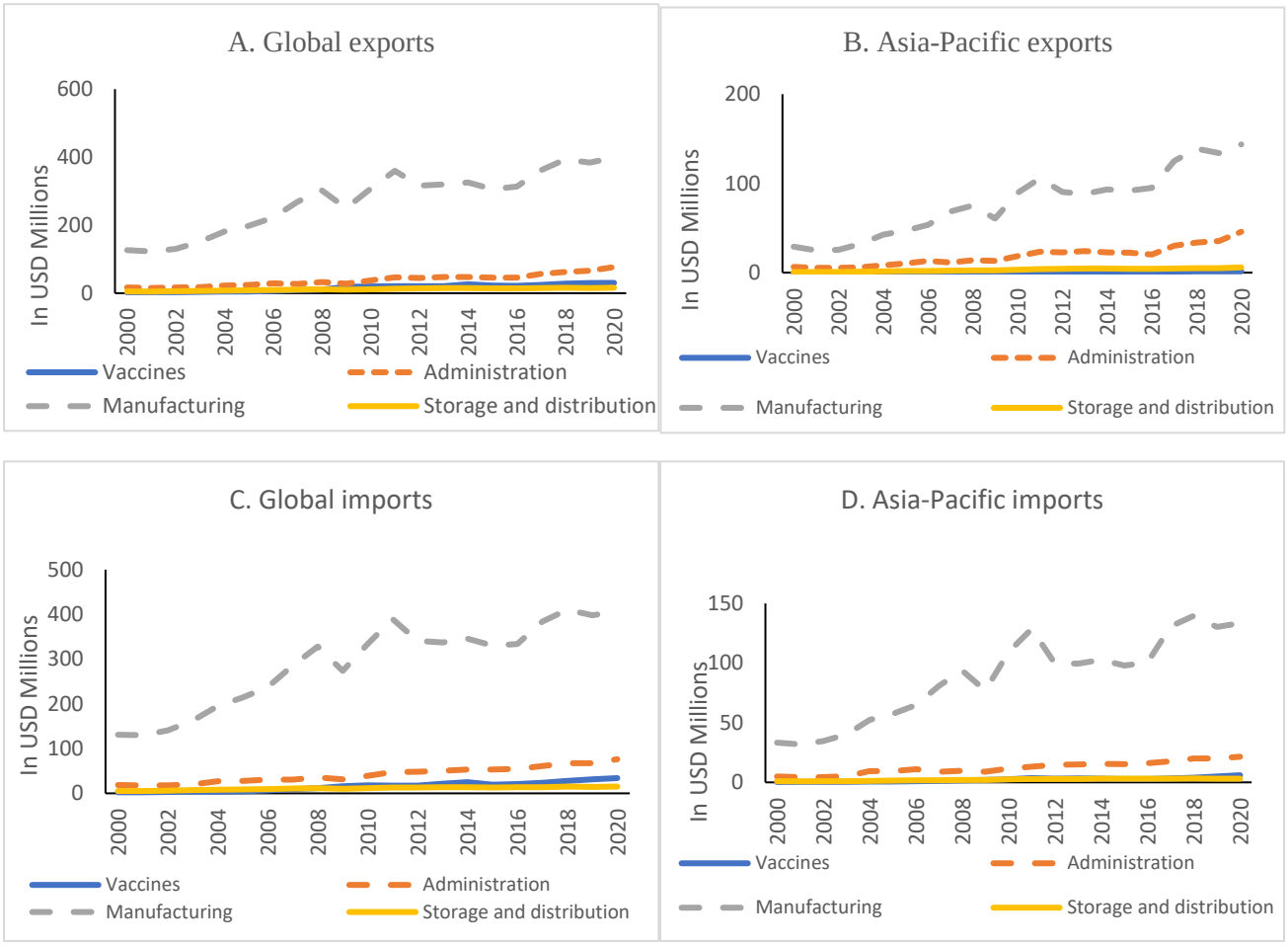
Source: Data are from the WITS database.
Note: Export (import) shares have been computed as percentages of total global exports (imports) and as percentages of total Asia-Pacific region exports (imports).

When comparing exports of individual vaccine input groups or vaccines from 2000 to 2020, it is worth mentioning that the vaccine manufacturing inputs experienced a steady upward trend, followed by an increasing trend in vaccine administration inputs (see Figure 5).[7] Trade in vaccine manufacturing inputs has been rising steadily both globally and in the Asia-Pacific region. Global exports of vaccine manufacturing and vaccine administration inputs have increased relatively faster than in the Asia-Pacific

[7] WTO (2021) lists product code 300220 (human vaccines) as a manufacturing input. This study analyses trends and patterns for this product code separately as this is the only code which represents human vaccines.

region. Trade in vaccine storage and distribution inputs or vaccines has mostly remained at the same level from 2000 to 2020.

Figure 5: Export and import trade values of vaccines and vaccine input groups, globally and in the Asia-Pacific region (Millions of United States dollars)

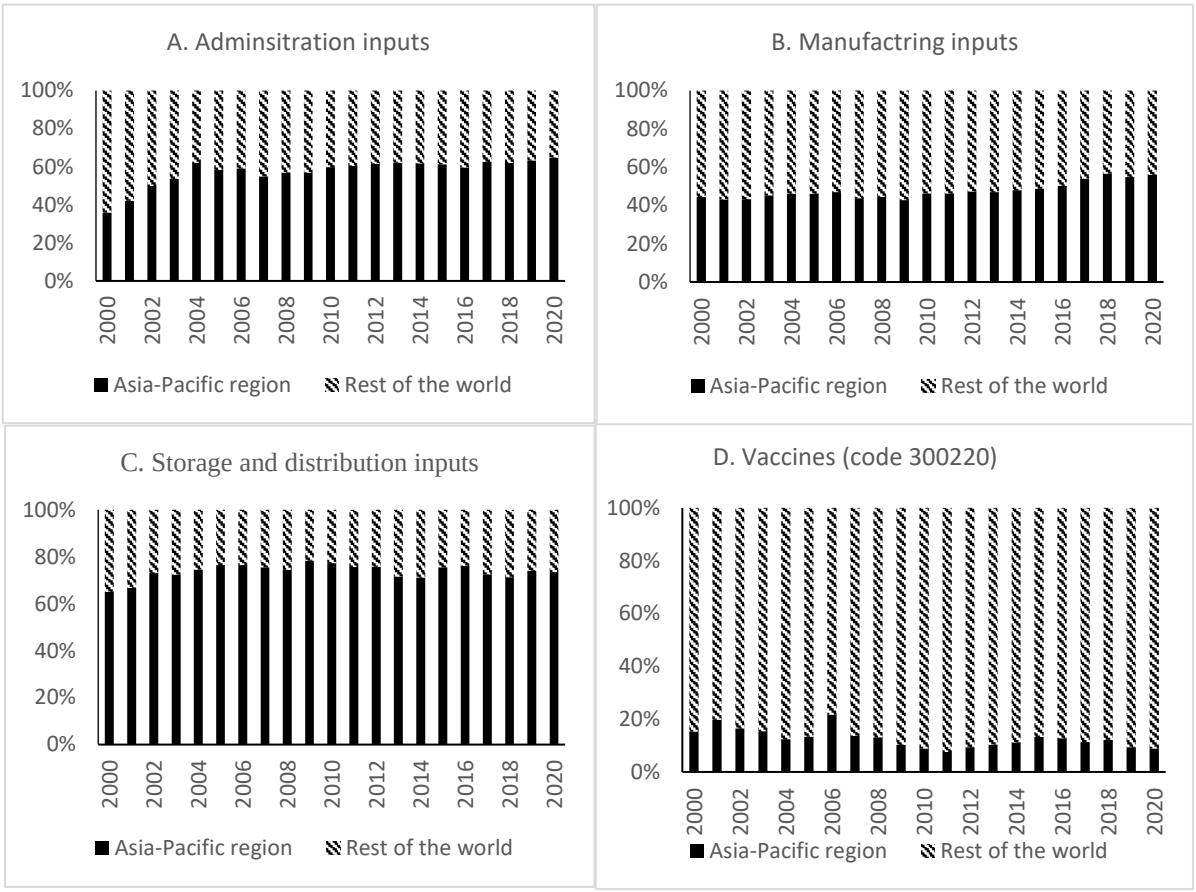


Source: Data are from the WITS database.

2.2.2 Import dependence of Asia-Pacific countries

Next, we analyse the import dependence of the Asia-Pacific countries for the vaccine input groups and vaccines. The source countries of the imported products are divided into Asia-Pacific countries and the rest of the world. As Figure 6 represents, the Asia-Pacific countries have exhibited high import dependence on intraregional sources for all vaccine input groups. Almost three fourth of imports of vaccine storage and distribution inputs, followed by high proportions of vaccine manufacturing and vaccine administration inputs are from within the region, signifying significant intraregional trade in vaccine inputs. Asia-Pacific countries have higher dependence on the rest of the world for imports of vaccines than for imports of vaccine inputs. High import dependence on the rest of the world for vaccines could be due to intraregional import blockages limiting the prospects for final assembly production trade. It implies possibilities for greater intraregional trade ties.

Figure 6: Import dependence of the Asia-Pacific region for vaccines and vaccine inputs sourced from the Asia-Pacific region and the rest of the world



Source: Data are from the WITS database.
Note: Trade with the rest of the world has been computed as the difference in total imports (trade values) between the world and Asia-Pacific countries. The import shares have been computed as percentage of total imports of each product from either the Asia-Pacific region or from the rest of the world. The graphs depict the import dependence of the Asia-Pacific region on the rest of the world.

We use the Herfindahl–Hirschman index (HHI) to identify the import dependence of developing Asia-Pacific countries for the three groups of vaccine inputs (see Table 4). Different countries exhibit different levels of diversification in their import dependence, depending on the type of vaccine inputs. While Mongolia has concentrated import dependence, China and Türkiye have more diversified import dependence. Most countries had more concentrated import dependencies in 2020 than in 2015. Kiribati is the only country exhibiting less import concentration in 2020 than in 2015 for all vaccine inputs. Another interesting observation from table 4 is that HHI values for many of the selected countries indicate that the import concentration of vaccine inputs has increased since 2015.

Table 4: Herfindahl-Hirschman index for import dependence of Asia-Pacific countries for vaccine inputs

Countries	Manufacturing inputs		Storage and distribution inputs		Administration inputs	
	2015	2020	2015	2020	2015	2020
Afghanistan	0.406	N/A	N/A	N/A	0.483	0.261
Armenia	0.092	0.169	0.124	0.248	0.162	0.214
Azerbaijan	0.089	0.112	0.524	0.313	0.172	N/A
Bangladesh	0.111	N/A	0.253	N/A	0.091	0.638
Cambodia	0.174	0.261	0.232	0.287	0.102	0.099
China	0.095	0.124	0.213	0.176	0.205	0.188
Fiji	0.145	0.191	0.215	0.377	0.110	0.139
Georgia	0.094	0.087	0.564	0.475	0.142	0.167
India	0.104	0.115	0.287	0.427	0.262	0.440
Indonesia	0.082	0.106	0.231	0.349	0.244	N/A
Iran, Islamic Republic of	0.148	N/A	0.455	N/A	0.153	0.321
Kazakhstan	0.126	0.166	0.358	0.442	0.329	0.202
Kiribati	0.183	0.124	0.292	0.281	0.401	0.318
Kyrgyzstan	0.148	0.189	0.208	0.281	0.272	N/A
Lao People's Democratic Republic	0.485	N/A	0.772	N/A	0.088	0.110
Malaysia	0.092	0.118	0.266	0.364	0.099	N/A
Maldives	0.095	N/A	0.122	N/A	0.165	0.151
Mongolia	0.268	0.177	0.809	0.608	0.243	0.496
Myanmar	0.295	0.245	0.288	0.427	0.293	N/A
Nepal	0.583	N/A	0.477	N/A	0.340	0.399
Pakistan	0.200	0.210	0.247	0.181	0.387	0.244
Philippines	0.080	0.106	0.533	0.322	0.129	0.236
Russian Federation	0.075	0.081	0.207	0.228	0.568	N/A
Samoa	0.235	N/A	0.315	N/A	0.390	N/A
Solomon Islands	0.138	N/A	0.265	0.143	0.250	0.332
Sri Lanka	0.119	0.221	0.244	N/A	N/A	0.484
Tajikistan	N/A	0.241	N/A	0.293	0.225	0.159
Thailand	0.135	0.146	0.270	0.204	0.124	0.142
Türkiye	0.076	0.075	0.158	0.241	N/A	0.400
Uzbekistan	N/A	0.143	N/A	0.144	0.124	0.199
Viet Nam	0.148	0.196	0.286	0.377	0.483	0.261

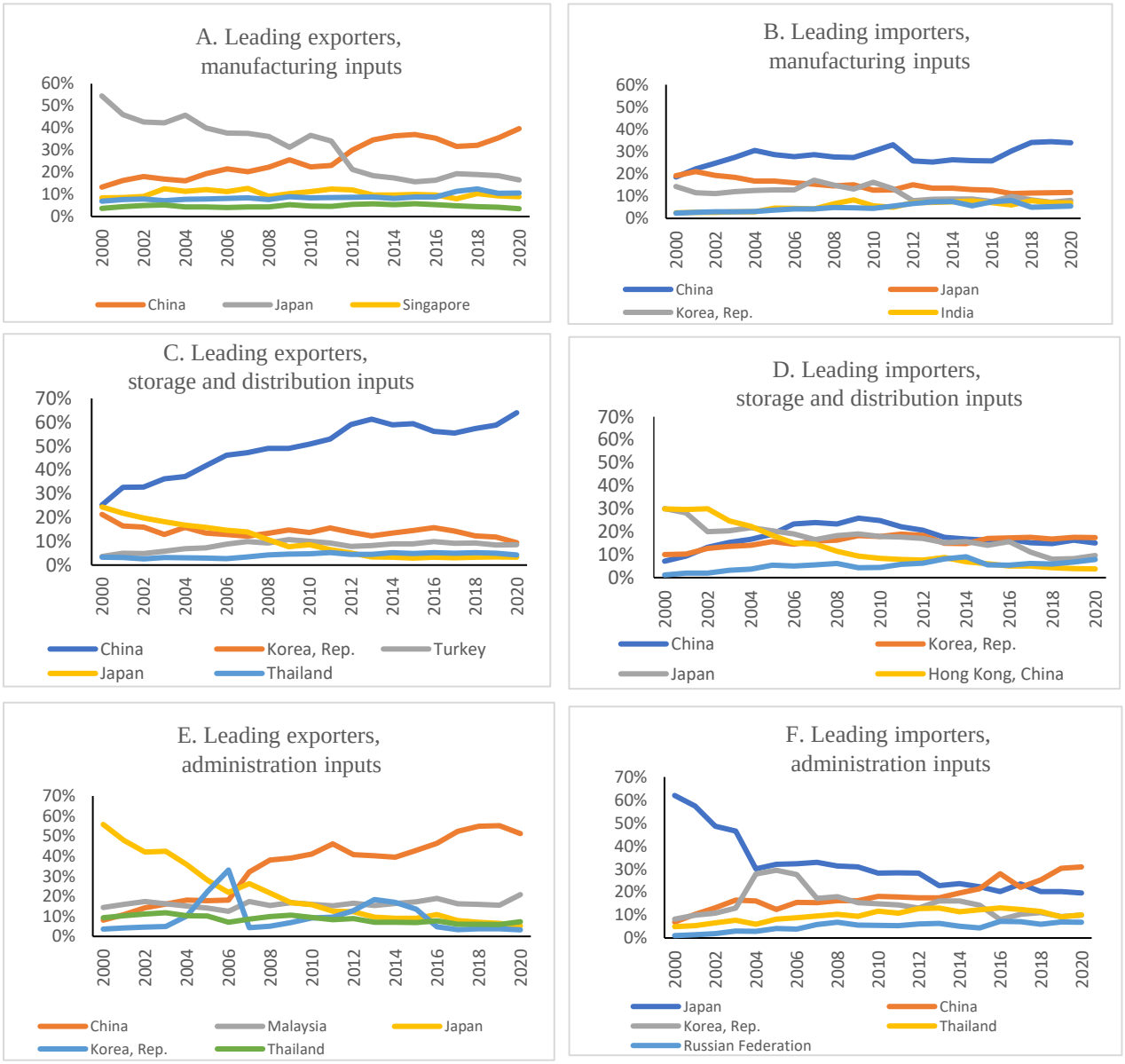
Source: Authors' construction using trade values from the WITS database.
Note: N/A means data are not available.

Leading exporters and importers of vaccine inputs

Globally, the leading exporter countries for manufacturing inputs were Germany, the United States and China, the leading importer countries were the United States, China, and Germany. While the leading exporter countries for storage and distribution inputs were China, the United States and Germany, the leading importer countries were the United States, Mexico and Germany. The leading exporter countries for administration inputs were China, the United States and Germany while the leading importer countries were the United States, Germany and Japan.

Within the Asia-Pacific region, country-wise export shares of vaccine input groups have varied over time. The leading exporter and importer countries of vaccine manufacturing, storage and distribution, and administration inputs in the Asia-Pacific countries are represented in Figure 7. Overall, China and Japan have remained major exporters of vaccine manufacturing inputs; China and the Republic of Korea have remained the major exporters of vaccine storage and distribution inputs; and China and Malaysia have remained major exporters of vaccine administration inputs. While the share of China in the exports of all vaccine input groups has increased significantly, the shares of Japan and Malaysia have declined significantly. Major importers of vaccine manufacturing and administration inputs have been China and Japan, while Japan and Hong Kong, China, have held major shares of storage and distribution inputs.

Figure 7: Trends in shares of leading Asia-Pacific exporter and importer countries of manufacturing, storage and distribution, and administration inputs



Source: Data are from the WITS database.

2.2.3 Intraregional trade patterns

Within the Asia-Pacific region from 2000 to 2020, the leading vaccine input export and import countries were China, India, Indonesia, Japan, the Republic of Korea, Malaysia, the Russian Federation, Singapore, Thailand and Türkiye. The corresponding major trading partners of vaccine inputs for these ten countries from 2000 to 2020 are shown in Table 5.

Table 5: Top five vaccine input trading partners of leading Asia-Pacific vaccine input exporter and importer countries

	Major destination countries	Major source countries
China	United States	Japan
	Hong Kong, China	Germany
	Japan	United States
	India	Republic of Korea
	Republic of Korea	Singapore
India	United States	China
	United Arab Emirates	United States
	United Kingdom	Germany
	China	Japan
	Germany	Canada
Indonesia	Japan	China
	United States	Canada
	Singapore	Japan
	China	Thailand
	Australia	Singapore
Japan	China	China
	United States	United States
	Republic of Korea	Germany
	Germany	Thailand
	Thailand	Republic of Korea
Republic of Korea	China	Japan
	United States	United States
	Japan	China
	Viet Nam	Germany
Russian Federation	China	Germany
	India	China
	Brazil	Italy
	United States	United States
	Kazakhstan	Ukraine
Malaysia	Hong Kong, China	Netherlands
	United States	China
	Singapore	Japan
	Japan	United States
	United Kingdom	Singapore
	Thailand	Germany
Singapore	Belgium	United States
	China	Japan
	United States	Malaysia
	United Kingdom	China
	Malaysia	Germany
Thailand	United States	Japan
	Japan	China
	China	United States
	Indonesia	Malaysia
	Malaysia	Germany
Türkiye	Germany	Germany

	Major destination countries	Major source countries
	Iraq	China
	United Kingdom	Italy
	France	France
	Russian Federation	United States

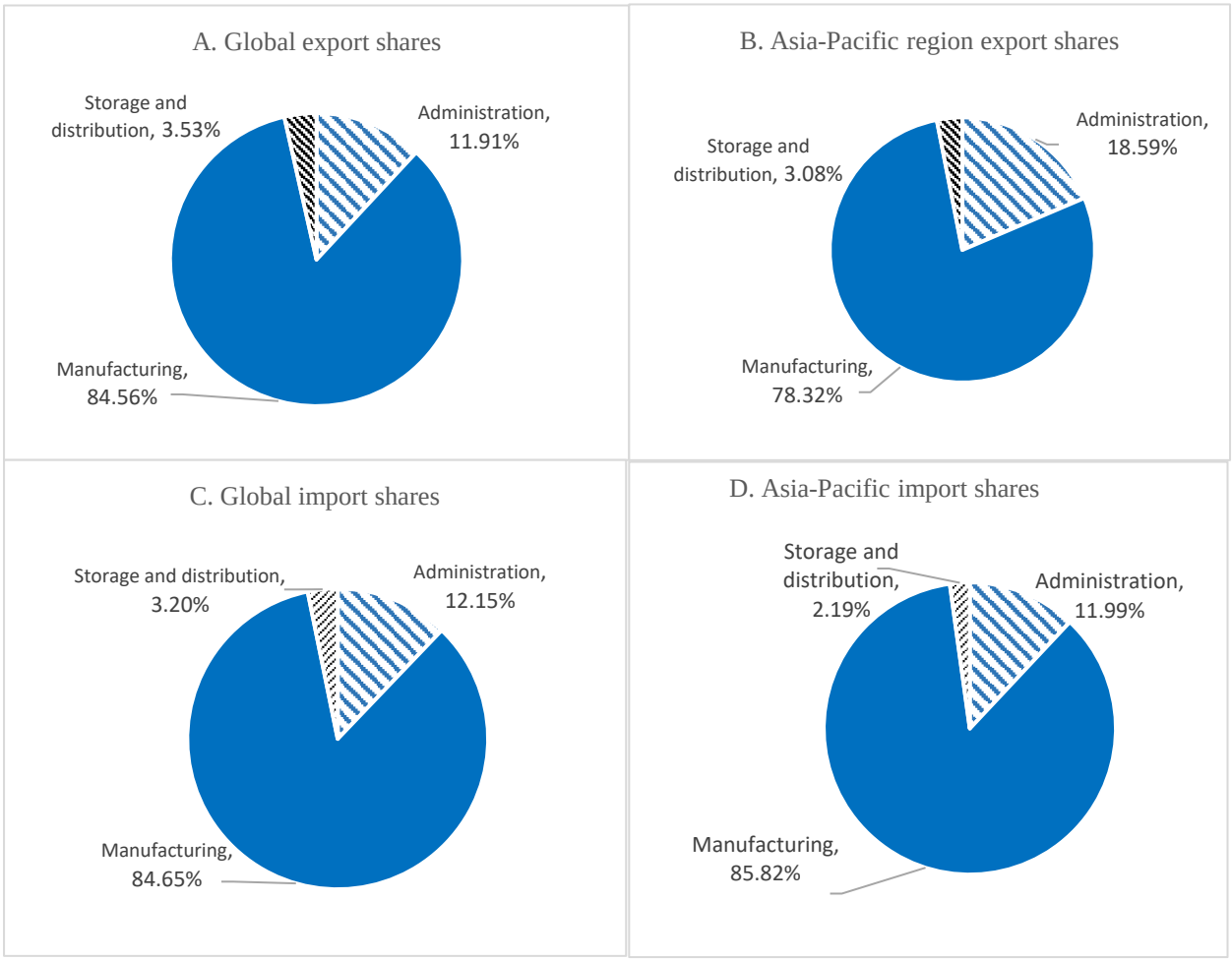
Source: Author's calculations based on data from the WITS database
Note: The leading exporter and importer countries were identified on the basis of highest trade values of all the input categories combined. Their top five trading partners are identified in descending order by percentage of imports or exports of all vaccine input categories combined.

The countries with the lowest trade values for vaccine inputs were Armenia, Bangladesh, Bhutan, Cambodia, the Lao People's Democratic Republic, Maldives, Nepal, Turkmenistan and Uzbekistan. Data show that during 2000–2020, most Asia-Pacific countries remained net importers of vaccine inputs. However, Japan and Singapore were net exporters of manufacturing inputs; China, Indonesia, the Republic of Korea, the Lao People's Democratic Republic, Malaysia, Pakistan, Singapore, Sri Lanka and Thailand were net exporters of administration inputs; and China, the Republic of Korea, Malaysia, Thailand and Türkiye were net exporters of storage and distribution inputs.

2.2.4 Composition of trade in vaccine input groups

During 2000–2020, the highest global export share of vaccine inputs was constituted by manufacturing inputs (85 per cent), followed by the share of administration inputs (around 12 per cent) and relatively low shares of around 3 per cent by the storage and distribution inputs. Corresponding export shares in the Asia-Pacific region were of the order of 78 per cent for manufacturing inputs, 19 per cent for administration inputs, and 3 per cent for storage and distribution inputs (see Figure 8). High shares of the manufacturing category is also because of the larger number of products listed in this category, compared to those listed under administration inputs or storage and distribution inputs.

Figure 8: Composition of export and import shares of vaccine input groups, 2000–2020



Source: Data are from the WITS database.

Further disaggregation at the global level shows that not all products witnessed similar trends in trade shares. Certain products within each input group exhibited considerably higher export or import shares (see Table 6). For instance, bioreactors, as represented by HS codes 847989 and 392690 have been the most traded manufacturing inputs globally, contributing around 30 per cent of manufacturing inputs exports during 2000–2020. Among the storage and distribution inputs, products such as cold boxes, represented by HS codes 392310 and 841830 have been the most exported products, constituting around 86 per cent of storage and distribution exports globally. These products are also the most exported and imported products even in the Asia-Pacific region. Among the administration inputs, HS codes 854389 and 401519 have been the most exported products, constituting around 67 per cent of overall administration exports.

Table 6: Most traded vaccine inputs, globally and in the Asia-Pacific region

Manufacturing inputs		Administration inputs		Storage and distribution inputs	
Code	**Description**	**Code**	**Description**	**Code**	**Description**
847989	Bioreactor for biopharmaceutical cell culture and disposable bioreactor bag for cultivation, used for e.g. cell culture and fermentation	854389	Ultra-violet irradiation equipment for disinfection purpose	392310	Cold boxes of plastics
392690	Single-use bioreactor bags	401519	Nitrile gloves	841830	Freezers of the chest type, not exceeding 800 l capacity

Note: The only difference between the most imported storage and distribution input globally and in the Asia-Pacific region is HS code 392310 followed by HS code 841840. The rest are all the same.

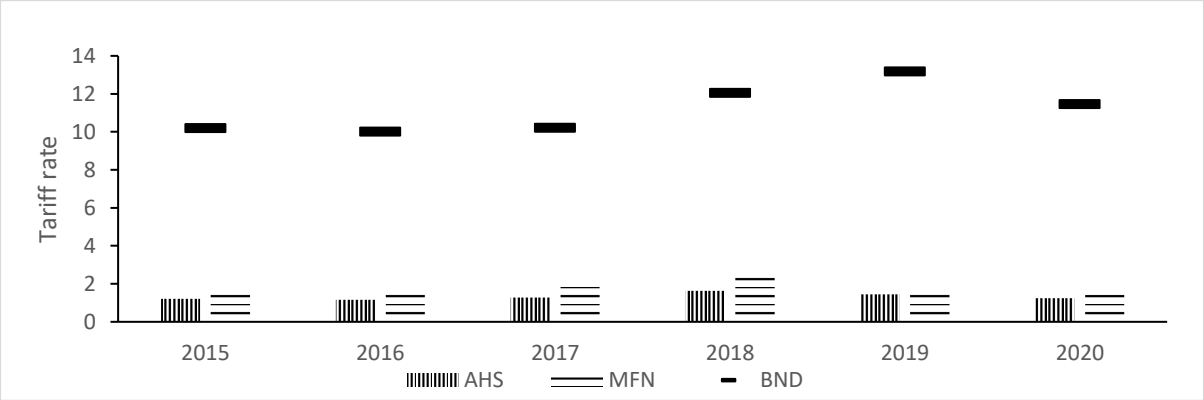
3. Trade policy responses for vaccines and vaccine inputs within the Asia-Pacific region in response to COVID-19

This section addresses possible bottlenecks for trade in vaccines and vaccine inputs. Analysis of bottlenecks for trade in vaccine inputs is important as the delay of a single input can significantly disrupt the process of vaccine production and hamper supply chains. For instance, tariffs can be a bottleneck that may add to the manufacturing cost, thereby raising questions on the accessibility, availability and affordability of vaccines.

3.1 Tariff analysis of vaccine imports

The three types of tariffs for vaccines are depicted in Figure 9. The figure depicts year-wise simple average measures of effectively applied tariffs (AHS), most-favoured nation (MFN) and bound tariffs (BND) for vaccines (HS code 300220). The highest effectively applied tariff rate imposed by any country in the Asia-Pacific region on vaccines from 2015 to 2020 was 10 per cent in India in 2015, and it was reduced to around 8 per cent the following year. The effectively applied tariff rates have remained relatively high in only a few countries in the region, such as China, French Polynesia, India, the Lao People's Democratic Republic, Mongolia, Pakistan, Solomon Islands and a few other developing countries. Other countries, such as Australia, Maldives, Singapore, Türkiye and Viet Nam have remained duty free for vaccines during this period. Maximum fluctuations in the average effectively applied tariff rates from 2015 to 2020 were recorded in Palau, China, Pakistan, Armenia and India.

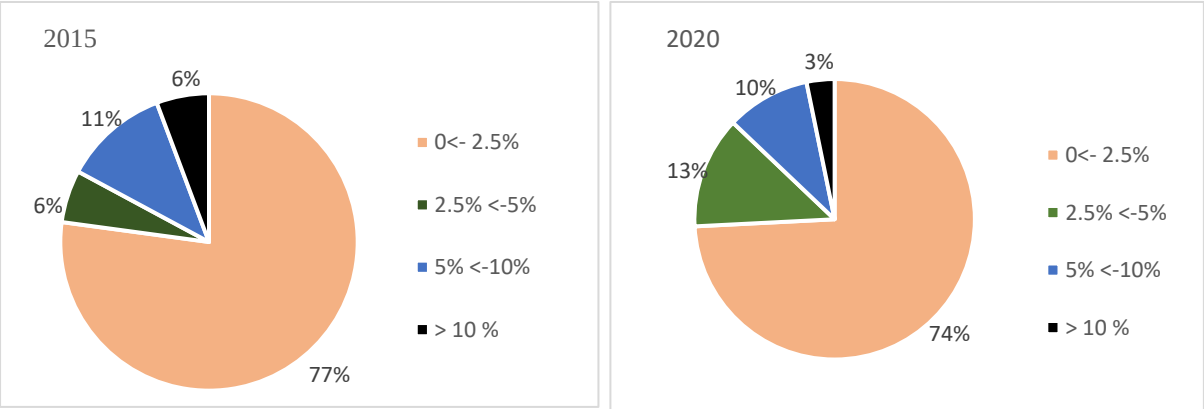
Figure 9: Tariffs imposed on vaccines (HS code 300220) in the Asia-Pacific region, 2015–2020



Source: Data are from the WITS database.
Note: The three tariff rates have been computed as simple averages of the tariffs of Asia-Pacific countries.
Abbreviations: AHS, effectively applied tariffs; MFN, most-favoured nation; BND, bound tariffs.

Figure 10 shows the variations of MFN applied tariffs imposed on vaccines by Asia-Pacific countries in 2015 and 2020. Very low tariffs were imposed on vaccines in the majority of countries. Compared to 2015, in 2020 fewer countries had MFN applied tariffs greater than 10 per cent and more countries had MFN applied tariff rates between 2.5 and 5 per cent. Some countries reduced MFN applied tariff rates on vaccines during this period, including Pakistan (from 6.7 to 3.7 per cent), Kazakhstan (from 2.9 to 0 per cent) and the Russian Federation (from 2.9 to 2 per cent), but other countries increased MFN applied tariff rates on vaccines during this period, including China (from 0 to 3 per cent), Palau (from 0 to 3 per cent), Armenia (from 0 to 2 per cent) and Kyrgyzstan (from 0.7 to 2 per cent).

Figure 10: Percentage of Asia-Pacific countries with most-favoured nation applied tariffs on vaccines (HS code 300220), by tariff rate, 2015 and 2020



Source: Data are from the WITS database.

No domestic peaks were reported for vaccines across the sample of Asia-Pacific countries in 2015 and 2020. While zero international peaks were reported for most countries, at least one international tariff peak for vaccines was reported for Brunei Darussalam, Myanmar, Fiji, French Polynesia, India, Indonesia, Maldives, Pakistan, the Philippines and Tonga.

Among countries in the Asia-Pacific region, effectively applied tariffs on vaccine imports from 2000 to 2020 (see Table 7) have been most restrictive in India, Pakistan, French Polynesia, Mongolia and the Islamic Republic of Iran while most other Asia-Pacific countries have been duty free. It is also worth mentioning that the tariffs imposed on imports of vaccines have been much lower than those imposed on vaccine inputs.

Table 7: Effectively applied tariffs on vaccines (HS code 300220), 2000–2020

Country	Rate
India	8.152
Pakistan	5.224
French Polynesia	5.000
Mongolia	5.000
Iran, Islamic Republic of	5.000
Lao People's Democratic Republic	3.478
Solomon Islands	3.435
China	2.500
Russian Federation	2.072
Indonesia	1.920
Kazakhstan	1.550
Palau	1.200
Armenia	0.872
Kyrgyzstan	0.798
Philippines	0.696
Singapore	0.000
New Zealand	0.000
Fiji	0.000
Australia	0.000
Japan	0.000
Republic of Korea	0.000
Sri Lanka	0.000
Bangladesh	0.000
Nepal	0.000
Viet Nam	0.000
Brunei Darussalam	0.000
Georgia	0.000
Hong Kong, China	0.000
Thailand	0.000
Samoa	0.000

Country	Rate
Tonga	0.000
Azerbaijan	0.000
Uzbekistan	0.000
Taiwan, China	0.000
Bhutan	0.000
Myanmar	0.000
Türkiye	0.000
Malaysia	0.000
Cambodia	0.000
Maldives	0.000
Macao, China	0.000

Source: Compiled from the WITS Database
Note: The values shown are simple averages of the tariffs in each country.

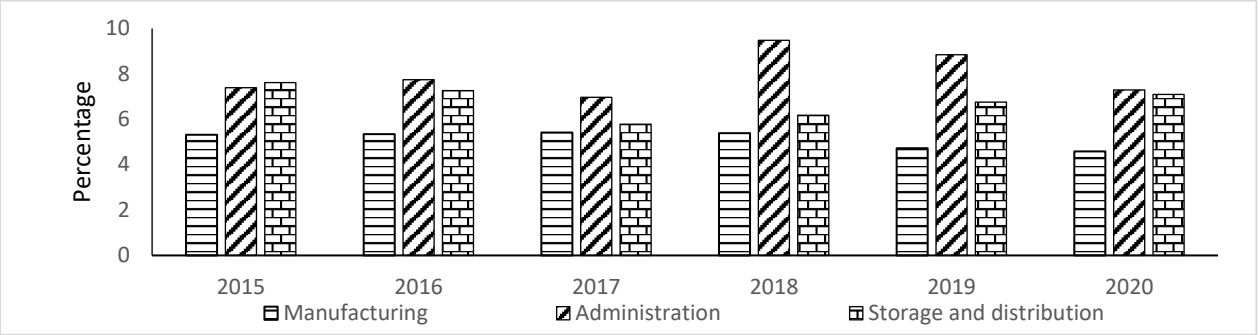
3.2 Tariff analysis of vaccine inputs

To identify and analyse trade barriers arising from tariffs, first we extract country level data on effectively applied tariffs[8] for the three vaccine input groups with the world as the trading partner. For further comparison, we also extract data on bound tariffs and MFN applied tariffs.[9] Simple averages of effectively applied tariffs of each vaccine input group are presented in Figure 11.

As is evident, from 2015 to 2020, manufacturing inputs have reported the lowest range of applied tariffs, around 5 per cent, with slight reductions since 2018. Rates of applied tariffs on vaccine administration inputs or storage and distribution inputs were relatively higher during this period. While the average applied tariff on vaccine administration inputs have slightly declined since 2018, the applied rates on vaccine storage and distribution inputs have increased, especially since 2017. However, these simple average measures at the level of the input groups do not reveal cross-country or cross-product differences, so trends and patterns for each vaccine input group are analysed separately in the sections that follow.

[8] WITS uses the concept of effectively applied tariff which is defined as the lowest available tariff. If a preferential tariff exists, it will be used as the effectively applied tariff. Otherwise, the MFN applied tariff will be used. Thus, the effectively applied tariff is equal to the MFN applied tariff unless a preferential tariff exists. See WITS User Manual, pp. 95 and 137, available at http://wits.worldbank.org/data/public/WITS_User_Manual.pdf.
[9] The analysis is based on countries reporting a min number of observations on tariff data.

Figure 11: Comparison of effectively applied tariff rates in the Asia-Pacific region across vaccine input groups, 2015–2020



Source: Data are from the WITS database.
Note: Tariff rates reported by all countries in the region are averaged. The graph shows that vaccine manufacturing inputs had the lowest effectively applied tariffs during the study.

A country-level comparison (see Table 8) of the effectively applied tariff rates during 2000–2020 reveals that the Islamic Republic of Iran, Pakistan, Maldives, India and Bangladesh have reported the maximum tariff rates for vaccine inputs while Hong Kong, China; Macao, China; and Singapore have remained duty free for these input imports.

Table 8: Cross-country comparison of effectively applied tariffs on vaccine inputs, 2000–2020

Country	Effectively applied tariffs on vaccine inputs		
	Manufacturing inputs	*Administration inputs*	*Storage and distribution inputs*
Afghanistan	13.06	2.5	5.28
Armenia	3.126	4.741	7.047
Australia	1.732	2.083	2.326
Azerbaijan	5	3.757	9.513
Bangladesh	9.49	14.534	20.9
Bhutan	7.458	11.106	15.418
Brunei Darussalam	0.086	0	0.244
Cambodia	7.177	7.391	10.276
China	6.13	9.012	9.055
Fiji	9.506	6.214	17.343
French Polynesia	6.825	7.511	8.794
Georgia	0.794	0	1.239
Hong Kong, China	0	0	0
India	12.331	29.59	7.787
Indonesia	7.558	27.97	7.36
Iran, Islamic Republic of	12.177	23.425	33.75
Japan	1.748	4.485	0.752
Kazakhstan	3.503	5.106	6.368

Country	Effectively applied tariffs on vaccine inputs		
	Manufacturing inputs	*Administration inputs*	*Storage and distribution inputs*
Kyrgyzstan	3.045	7.488	5.548
Lao People's Democratic Republic	2.709	1.851	2.572
Macao, China	0	0	0
Malaysia	4.646	0	19.584
Maldives	20.317	13.316	17.005
Mongolia	4.916	7.342	4.941
Myanmar	2.265	4.688	3.731
Nepal	9.733	9.744	16.533
New Zealand	0.955	0	2.246
Pakistan	11.643	32.391	15.661
Palau	2.821	2.6	3
Philippines	3.065	3.529	5.277
Republic of Korea	9.045	4.549	3.1
Russian Federation	4.11	8.422	7.323
Samoa	7.947	11.44	8
Singapore	0	0	0
Solomon Islands	7.484	7.321	8.14
Sri Lanka	4.055	14	14.036
Taiwan, China	3.827	6.625	3.071
Thailand	4.271	9.631	12.363
Tonga	8.063	6.667	5.25
Türkiye	4.368	2.496	1.125
Uzbekistan	3.267	6.145	11.338
	5.13	11.522	9.191

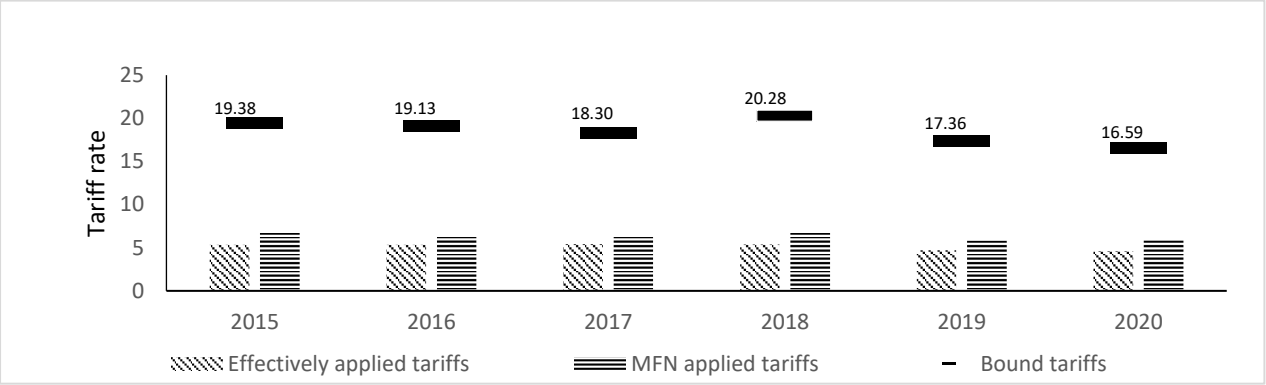
Source: Compiled from the WITS database.
Note: Simple averages were computed of the tariffs for each country on their vaccine input combination.

3.2.1 Tariff analysis of vaccine manufacturing inputs

Figure 12 depicts year-wise simple average measures of bound, effectively applied and MFN applied tariff rates for vaccine manufacturing inputs. The highest simple average of the effectively applied tariffs imposed by any Asia-Pacific country from 2015 to 2020 was 750 per cent, imposed by Indonesia in 2017 for chemically pure sucrose (HS code 170199), an inactive ingredient categorized as "others" under sugar and sugar confectionery. Indonesia had a 10 per cent effectively applied tariff on this product for all the other years. During this period, the effectively applied tariffs on average remained high in Maldives (20 per cent), Afghanistan (13 per cent) and India 12 per cent). Meanwhile, the average effectively applied tariff remained relatively low in Brunei Darussalam (0.08 per cent), Georgia (0.79 per cent) and New Zealand (0.95 per cent). Some countries and economies remained duty free during this period, including Hong Kong, China; Macao, China; and Singapore. Maximum fluctuations in

the average tariffs imposed by any country during 2015–2020 were reported by Indonesia, Maldives and the Republic of Korea.

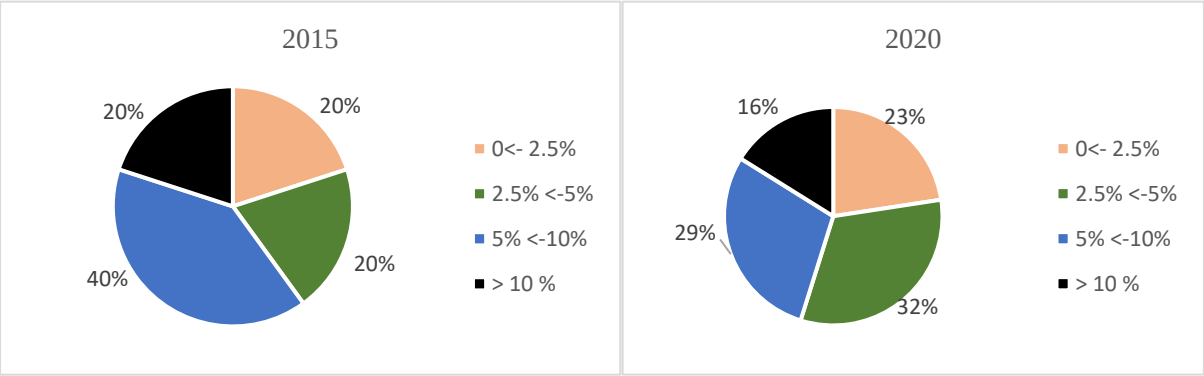
Figure 12: Tariffs imposed on vaccine manufacturing inputs in the Asia-Pacific region, 2015–2020



Source: Data are from the WITS database.
Note: The three tariff rates have been computed as simple averages.
Abbreviation: MFN, most-favoured nation.

Figure 13 shows the change in the MFN applied tariffs imposed on vaccine manufacturing inputs across Asia-Pacific countries from 2015 to 2020 to represent the situation before and during the COVID-19 pandemic. Compared to 2015, in 2020 fewer countries reported MFN applied tariffs greater than 10 per cent and more countries reported MFN tariff rates between 2.5 and 5 per cent thereby signifying a reduction in MFN applied tariffs. The MFN applied tariff on vaccine manufacturing inputs increased in India (from 12.6 to 13.9 per cent), the Republic of Korea (from 13.9 to 14.2 per cent), Sri Lanka (from 3.4 to 4.5 per cent) and Viet Nam (from 6.1 to 7.8 per cent) while it decreased in Kazakhstan (from 5.3 to 3.9 per cent), Lao People's Democratic Republic (from 8.6 to 7.4 per cent), Pakistan (from 12.6 to 11 per cent) and the Russian Federation (from 5.3 to 4.3 per cent).

Figure 13: Percentage of Asia-Pacific countries with most-favoured nation applied tariffs on vaccine manufacturing inputs, by tariff rate, 2015 and 2020



Source: Data are from the WITS database.

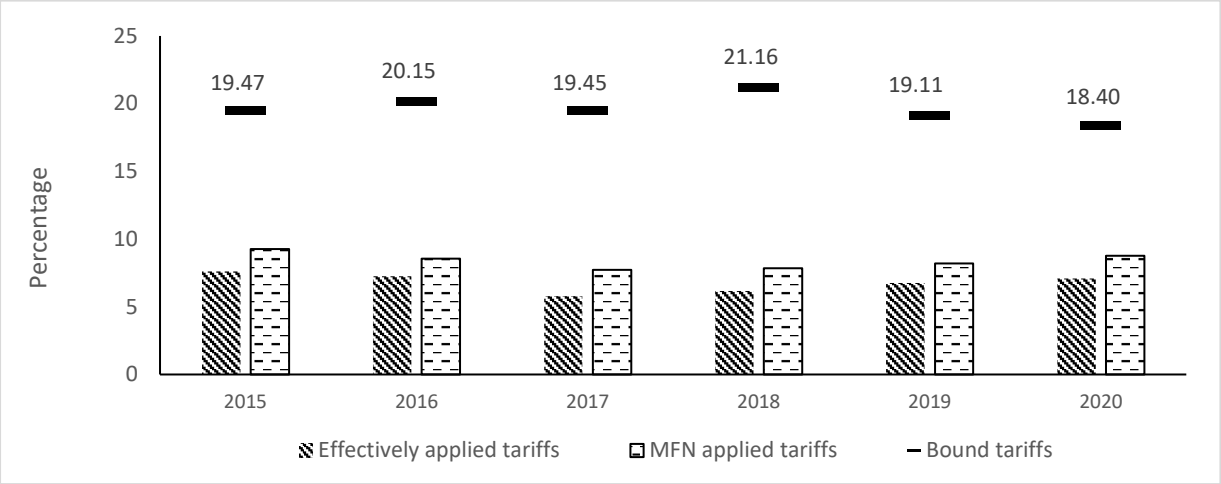
Other possible indicators of trade restrictiveness include the number of domestic or international peaks which we analyse in the context of the effectively applied tariffs. The majority of the countries in the region, including Australia; Bangladesh; Bhutan; Honk Kong, China; Nepal; and Singapore, have reported zero domestic peaks for vaccine manufacturing inputs from 2015 to 2020. During this period the highest number of domestic peaks for any vaccine manufacturing input was reported for Malaysia in 2020 for HS code 401699, categorized as “others” under articles of vulcanized rubber, used for packaging. With regard to international peaks, most countries have reported at least one international peak but zero international peaks were reported for Georgia; Hong Kong, China; Macao, China; and Singapore. The maximum number of international peaks was reported for Maldives, Indonesia and Malaysia. Such high numbers of international peaks are attributed to bioreactor products such as bioreactor bags as consumables (HS code 392690) and bioreactor for biopharmaceutical cell culture (HS code 847989).

Across Asia-Pacific countries from 2015 to 2020, the highest effectively applied tariffs have been imposed on a range of products, including inactive ingredients such as ethanol (HS code 220710), chemically pure sucrose (HS code 170199), 2-hydroxypropyl-β-cyclodextrin (HS code 350510) and consumables such as liquid storage bags, of polymers of ethylene (HS code 392321), liquid storage bags, of other plastics (HS code 392329). The lowest effectively applied tariffs have been imposed on products that include equipment such as chromatography system (HS code 902720) and ingredients such as potassium chloride in bulk (HS code 310420), (4-hydroxybutyl)azanediyl)bis(hexane-6,1-diyl)bis(2-hexyldecanoate) (HS code 292250), neomycin (HS code 294190) and cholesterol (HS code 290613).

3.2.2 Tariff analysis of vaccine storage and distribution inputs

Figure 14 depicts year-wise simple average measures of bound, effectively applied and MFN applied tariff rates for vaccine storage and distribution inputs from 2015 to 2020. During this period the highest simple average reported by any Asia-Pacific country on vaccine storage and distribution inputs was 55 per cent in the Islamic Republic of Iran in 2019 and 2020, for freezers of the chest type (HS code 841830) and freezers of the upright type (HS code 841840). From 2015 to 2020, the average effectively applied tariff rates in the Asia-Pacific region have remained relatively high in the Islamic Republic of Iran (34 per cent), Bangladesh (21 per cent) and Malaysia (19.5 per cent). The average level of effectively applied tariffs was relatively low in Brunei Darussalam (0.24 per cent), Japan (0.75 per cent) and Türkiye (1.12 per cent). By comparison, Hong Kong, China; Macao, China; and Singapore remained duty free for vaccine storage and distribution inputs. Maximum fluctuations in the average effectively applied tariff rates during 2015–2020 have been reported in the Islamic Republic of Iran, Malaysia and Thailand.

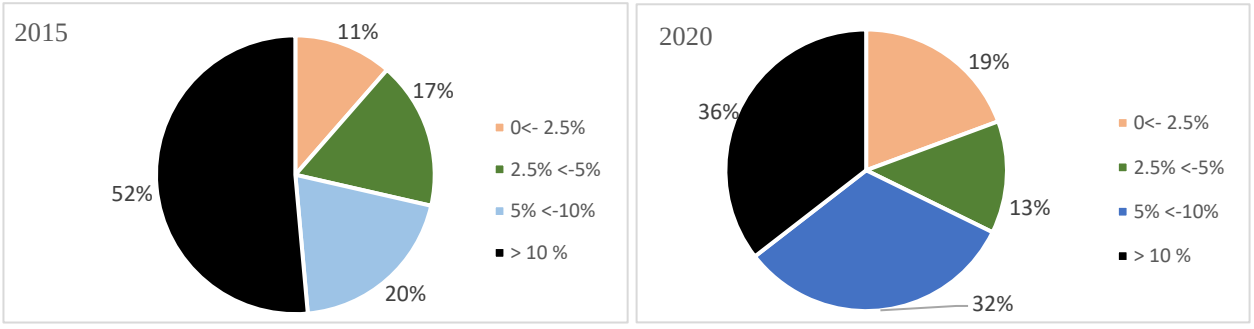
Figure 14: Tariffs imposed on vaccine storage and distribution inputs in the Asia-Pacific region, 2015–2020



Source: Data are from the WITS database.
Note: The three tariff rates were computed as simple averages of the rates reported by the countries in the region.
Abbreviation: MFN, most-favoured nation.

Figure 15 shows the variations of the MFN applied tariffs imposed on vaccine storage and distribution inputs across Asia-Pacific countries in 2015 and 2020. Compared with 2015, in 2020 far fewer countries had MFN applied tariffs greater than 10 per cent while more countries had MFN applied tariff rates less than 2.5 per cent or between 5 to 10 per cent compared to those reporting in 2015. Sri Lanka (tariff rate from 13.6 to 15.6) and India (from 8.4 to 9.7) increased MFN applied tariff rates but many countries like China (from 13.5 to 6.8), Lao People's Democratic Republic (11.2 to 8.7), Kazakhstan (from 10.3 to 6.5) or Japan (1.8 to 0.8) reduced the MFN rates on vaccine storage and distribution inputs during this period.

Figure 15: Percentage of Asia-Pacific countries with most-favoured nation applied tariffs on vaccine storage and distribution inputs, by tariff rate, 2015 and 2020



Source: Data are from the WITS database.

To identify trade restrictive measures, we identify both domestic and international tariff peaks. Zero domestic peaks for vaccine storage and distribution inputs have been commonly reported across majority of our sample of countries. The highest number of

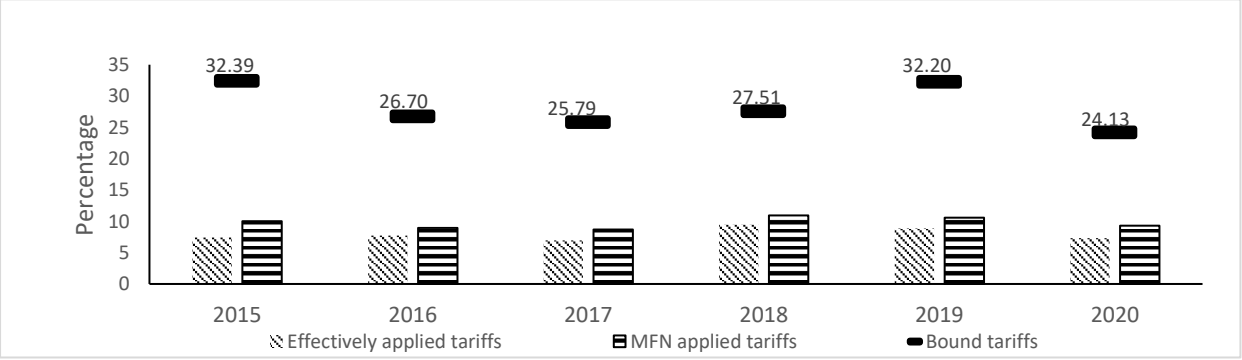
domestic peaks for any vaccine storage and distribution input ever during 2015–2020 has been reported by Sri Lanka in 2017 for product code 392310 (boxes, cases, crates and similar articles). While most countries reported zero international peaks, Sri Lanka and Indonesia had the maximum number of international tariff peaks. A high number of international tariff peaks have affected boxes, cases, crates and similar articles (HS code 392310).

On an average, freezers (HS code 841840) within the category of vaccine storage and distribution inputs, were subject to the highest tariff rates in Asia-Pacific region from 2015 to 2020. The highest effectively applied tariffs were imposed on freezers of the upright type (HS code 841840) and freezers of the chest type (HS code 841830), especially in 2019 and 2020.

3.2.3 Tariff analysis of vaccine administration inputs

Figure 16 depicts year-wise simple average measures of bound, effectively applied and MFN applied tariff rates for vaccine administration inputs. The highest simple average of the effectively applied tariffs by any Asia-Pacific country was 150, reported for India and Indonesia for alcohol solution (HS code 220890) almost every year from 2015 to 2020. During this period, the average effectively applied tariffs have remained relatively high in India, Indonesia and Pakistan. Meanwhile, in Australia, the Lao People's Democratic Republic and Türkiye low average levels of effectively applied tariffs were maintained. Brunei Darussalam; Georgia; Hong Kong, China; Macao, China; Malaysia; New Zealand and Singapore remained duty free for vaccine administration inputs during this period. Maximum fluctuations in the tariffs imposed across Asia-Pacific countries have been reported for India, Indonesia and Pakistan.

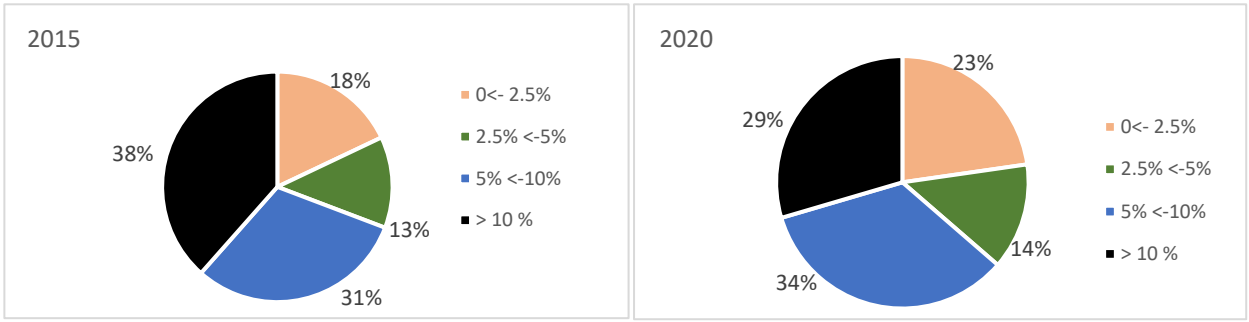
Figure 16: Effectively applied tariff rates imposed on vaccine administration inputs in the Asia-Pacific region, 2015–2020



Source: Data are from the WITS database.
Note: The three tariff rates for the Asia-Pacific region have been computed as simple average of the respective tariffs reported by countries in the region. The effectively applied rates were approximately 6–9 per cent during this period. Tariff data are not available for HS17 product code 854370 (corresponding to HS96 product code 854389).
Abbreviation: MFN, most-favoured nation.

Next, we check for the variations of the MFN applied tariffs imposed on vaccine administration inputs across Asia-Pacific countries for two time points: 2015 and 2020, to represent the situation before and after the COVID-19 pandemic (see Figure 17). The graphs show that the percentage of countries imposing very high tariffs has fallen while the percentage of countries reporting low tariffs i.e. in the range of 0–2.5 per cent has increased. Compared to 2015, in 2020 fewer countries have MFN applied tariffs greater than 10 per cent, and more countries have lower MFN applied tariff rates. A reduction in the tariff rates was reported for some countries, including Fiji (from 12.8 to 2 per cent), the Lao People's Democratic Republic (from 15.7 to 4.28 per cent), Maldives (from 20 to 12.85 per cent), while an increase in tariff rates was reported for other countries, such as China (from 8.5 to 11 per cent), India (from 28.6 to 32 per cent), Kyrgyzstan (from 2.7 to 7.1 per cent), Mongolia (from 4.3 to 8.6 per cent) and Sri Lanka (from 10 to 15 per cent). The shift in overall percentage of countries with low tariffs signifies a reduction in trade restrictiveness across the region.

Figure 17: Percentage of Asia-Pacific countries reporting most-favoured nation applied tariffs on vaccine administration inputs, by tariff rate, 2015 and 2020



Source: Data are from the WITS database.
Note: The graphs are based on available most-favoured nation data from 34 countries (2015) and 31 countries (2020).

Zero domestic peaks were reported for most Asia-Pacific countries for vaccine administration inputs. The highest number of domestic peaks for any vaccine administration input ever reported from 2015 to 2020 was in Taiwan, China, in 2016 and 2018 for alcohol solution (HS code 220890). Most Asia-Pacific countries had zero international peaks. The maximum number of international tariff peaks were reported for Indonesia and Taiwan, China. The high number of international peaks was mostly attributed to alcohol solution (HS code 220890).

The highest effectively applied tariffs were imposed on alcohol solutions (HS codes 220720 and 220890). The least restrictive tariffs were for needles of metals (HS code 901832).

3.3 Tariff reduction/elimination on vaccines after COVID-19

Tariffs on vaccines were reduced/eliminated in some countries in response to the COVID-19 pandemic to reduce the cost of vaccines and enhance the supply. Information on countries reducing tariffs on vaccines is scanty and differs across

various databases. Table 9 provides a list of countries in the Asia-Pacific region where tariffs on vaccines were reduced, in some cases temporarily, in response to COVID-19.

Table 9: Tariff reduction on vaccines in Asia-Pacific after COVID-19

Country	Measure	Countries affected	Start date	End date
Fiji	Temporary elimination of value-added tax on imports of certain products, e.g. vaccines and pharmaceutical products due to the COVID-19 pandemic.	All countries	26 March 2020	Unknown
India	Import duty waived on COVID-19 drug Remdesivir, vaccines, oxygen and related gear.	All countries	20 April 2021	31 October 2021
India	Certain domestic requirements regarding exports of vaccines were announced.	All countries	25 March 2021	Unknown
Indonesia	Imports of COVID-19 vaccines are exempted from import tariffs and value-added tax.	All countries	26 November 2020	Unknown
Philippines	Tax-free and duty-free importation of COVID-19 vaccines	All countries	26 December 2020	Unknown

Source: Based on ITC Market Access Map, UNCTAD and WTO databases.

3.4 Analysis of non-tariff measures

Non-tariff measures (NTMs) play an important role in the global trade of medical goods, including vaccines. These have been used frequently during the COVID-19 pandemic for various trade and non-trade objectives. For instance, NTMs such as export restrictions have been used to prevent shortages of supplies of medical products in exporting countries as a reaction to increased domestic demand, whereas other NTMs have been adapted to facilitate imports of important goods (UNCTAD, 2021). Therefore, it is relevant to analyse the prevalence of NTMs related to the trade of vaccines and vaccine inputs in the Asia-Pacific region.

This study uses NTMs nomenclature based on UNCTAD revised classification of NTMs (2019) that include sanitary and phytosanitary measures, technical barriers to trade, import licensing, prohibitions, quantity-control measures, price-control measures and export-related measures (Table 10).

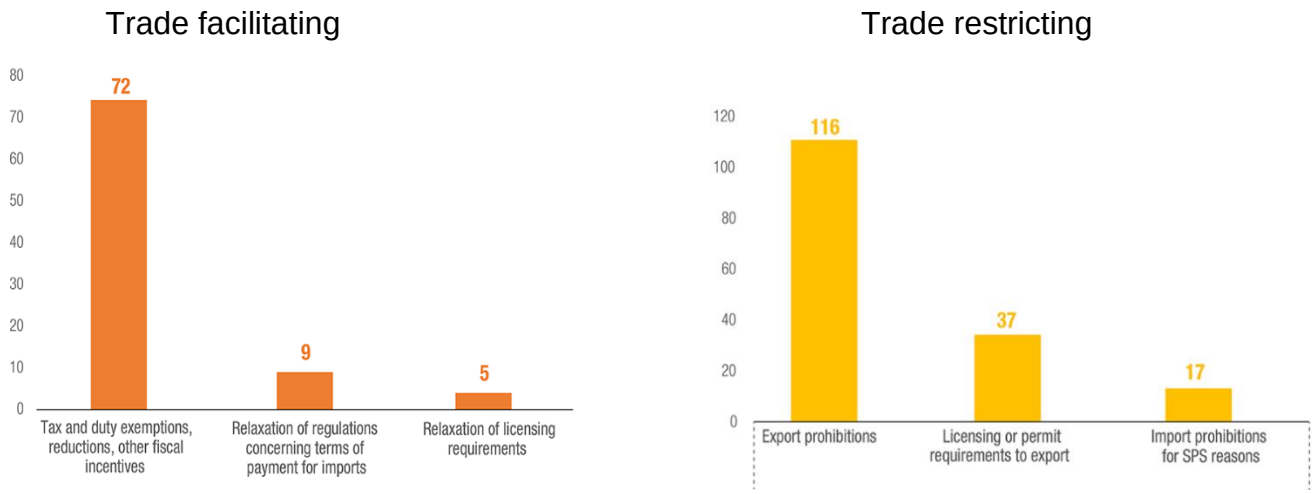
Table 10: Trade facilitating and trade restricting non-tariff measures

Trade facilitating measures	Trade restricting measures
L41 Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due	P31 Export prohibition
G4 Regulations concerning terms of payment for imports	P33 Licensing, permit or registration requirements to export
E125 Licensing for the protection of public health	A11 Prohibitions for SPS reasons
A83 Certification requirements for SPS reasons	E313 Temporary prohibition, including suspension of issuance of licenses
L11 Transfers of funds (monetary transfers) by the Government (to an enterprise) – Grants	P32 Export quotas
D12 Anti-dumping duties	P22 Export monitoring and surveillance requirements
B83 Certification requirements for TBT reasons	E325 Prohibition for the protection of public health
L9 Support for consumers or producers not elsewhere specified	C9 Other pre-shipment inspection formalities not elsewhere specified
E325 Prohibition for the protection of public health	B14 Authorization requirements for importing certain products TBT reasons
B7 Product quality, safety, or performance requirements for TBT reasons	
B14 Authorization requirements for importing certain products TBT reasons	

Source: UNCTAD International Classification of Non-tariff Measures – 2019 version.
Abbreviations: TBT, technical barriers to trade; SPS, sanitary and phytosanitary.

As reported by UNCTAD, frequently used trade restricting NTMs across the globe during the COVID-19 pandemic include export prohibitions, license or permit requirements to export and import prohibitions for sanitary and phytosanitary reasons. The frequently used trade facilitating NTMs include tax and duty exemptions, reductions, other fiscal incentives, relaxed regulation of payment for imports and relaxed licensing requirements. Figure 18 shows the prevalence of trade restricting and trade facilitating NTMs during the COVID-19 pandemic across 140 developing and 32 developed countries.

Figure 18: Prevalence of trade facilitating and trade restricting non-tariff measures during the COVID-19 pandemic



Source: https://unctad.org/topic/trade-analysis/non-tariff-measures/covid-19-and-ntms.
Note: Y-axis represents the number of countries.

However, little information is available on NTMs for vaccines and vaccine inputs. UNCTAD provides very broad information on such NTMs based on the developing and developed income group classification of countries (Figure 19).

Figure 19: Non-tariff measures on COVID-19 vaccines



Source: https://unctad.org/topic/trade-analysis/non-tariff-measures/covid-19-and-ntms.

Table 11 provides information on NTMs on vaccines and vaccine inputs in selected countries and economies from the UNCTAD NTM database, WITS TRAINS database, WTO database and ITC Market Access Map.

Table 11: Non-tariff measures on COVID-19 vaccines

Enacting country/ region	Measure description	Measure type	Affected products	Effect on trade	Status
China	The Ministry of Commerce, the Ministry of Industry and Information Technology, the National Health Commission and the National Medical Products Administration published the List of COVID-19 Vaccines for Exportation to ensure the smooth exportation of COVID-19 vaccines and support international cooperation on fighting the pandemic. COVID-19 vaccines approved or conditionally approved by the National Medical Products Administration (developed and manufactured by enterprises in China) were included in the list. The list will be dynamically adjusted according to National Medical Products Administration marketing authorizations.	Export authorization of vaccines.	COVID-19 vaccines.	Facilitating	Active
European Union	Reduced value-added tax rate to the supply of COVID-19 vaccines and in vitro diagnostic medical devices.	Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due.	COVID-19 vaccines and in vitro diagnostic medical devices.	Facilitating	Active
European Union	Export authorization requirement for vaccines against SARS-related coronaviruses (SARS-CoV species) irrespective of their packaging. Authorizations are granted to the extent that the volume of exports is such that it does not pose a threat to the execution of advanced purchase agreements that the Union has concluded with vaccine manufacturers. Exemptions apply to exports to the Republic of Albania, Andorra, Bosnia and Herzegovina, the Faeroe Islands, Iceland, Kosovo, Liechtenstein, Montenegro, Norway, the Republic of North Macedonia, the Republic of San Marino, Serbia, Switzerland, Vatican City, the overseas countries, territories listed in Annex II of the Treaty of the Functioning of the European Union, and exports to Büsingen, Helgoland, Livigno, Ceuta and Melilla, Algeria, Egypt, Jordan, Lebanon,	Export prohibition other than sanitary and phytosanitary measures or technical barriers to trade.	COVID-19 vaccines.	Restricting	Active

Enacting country/ region	Measure description	Measure type	Affected products	Effect on trade	Status
	Libya, Morocco, Palestine, the Syrian Arab Republic, Tunisia, Armenia, Azerbaijan, Belarus, Georgia, Israel, Moldova and Ukraine, exports in the context of humanitarian aid, exports to low- and middle-income countries in the Covax Advance Market Commitment list, as well as exports of goods purchased and/or delivered through Covax, UNICEF and the Pan American Health Organization with destination to any other Covax participating country. 13 March 2020: Measure extended to include active substances, including master and working cell banks used for the manufacture of such vaccines				
Fiji	Temporary elimination of value-added tax on imports of certain products, e.g. vaccines and pharmaceutical products (HS chapter 30); medical equipment (HS chapter 90); scanners and cameras used in medical examinations; hand sanitizers and antibacterial hand wash; gloves, masks; disposable hair nets; disinfectant wipes; tissue papers; face shields (medical use); medical goggles and spectacles; protective garments of rubberized materials; long-sleeved medical gowns; ethanol for companies involved in hand sanitizer production; disinfectants/sterilization products; hospital beds; hydrogen peroxide; paper bed-sheets; thermometers; air purifiers; and boots (specifically used in the medical environment), due to the COVID-19 pandemic.	Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due.	COVID-19 vaccines.	Facilitating	Active
Greece	Prohibition on export of medicinal products (vaccines and medicines) that are or might be in shortage due to the COVID-19 pandemic.	Export prohibition other than sanitary and phytosanitary measures or technical barriers to trade.	Medicinal products (vaccines and medicines.	Restricting	Active

Enacting country/ region	Measure description	Measure type	Affected products	Effect on trade	Status
Indonesia	Exemption from import tariffs and value-added tax on COVID-19 vaccines.	Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due	COVID-19 vaccines.	Facilitating	Active
Norway	Ban on parallel exports of pneumococcal vaccines. 15 June 2020: Measure updated with a modified list of medicines under parallel export ban.	Export prohibition other than sanitary and phytosanitary measures or technical barriers to trade.	Pneumococcal vaccines.	Restricting	Terminated
Philippines	Tax-free and duty-free importation of COVID-19 vaccines.	Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due.	COVID-19 vaccines.	Facilitating	Active
South Africa	Elimination of value-added tax on imports of COVID-19 vaccines.	Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due.	COVID-19 vaccines.	Facilitating	Active
United Kingdom	Temporary elimination of import duties and value-added tax imposed on imports of COVID-19 vaccines.	Tax and duty exemptions, reductions, other fiscal incentives reducing burden of taxes otherwise due.	COVID-19 vaccines.	Facilitating	Active

Source: UNCTAD NTM database, WITS TRAINS database, WTO database and ITC Market Access Map database.

Though trade facilitating NTMs on vaccines were enacted in some countries in response to the COVID-19 pandemic, many of the trade restrictive NTMs that were imposed prior to COVID-19 are still present. Moreover, these trade restrictive NTMs are not vaccine specific, rather they were imposed across many pharmaceutical products. For instance, in Brunei Darussalam import licensing requirements were imposed under the Poison Act in 2001 on various products, including some vaccines under HS eight-digit product codes.[10] Similarly, in Pakistan, the Control of Narcotic Substances Act XXV of 1997 prohibits the import, export, transport or transshipment any narcotic drug. The Act include vaccines (HS code 300220).

3.5 Export restrictions imposed by Asia-Pacific economies for vaccines and vaccine inputs

Among the Asia-Pacific countries, the leading exporter countries of vaccines and vaccine inputs are China, India, Japan, the Republic of Korea, Thailand, Singapore, Türkiye and Malaysia. China is the world's top exporters of COVID-19 vaccines. According to Bloomberg,[11] China has exported more than 1.5 billion doses of COVID-19 vaccines across the globe, and Sinovac Biotech Ltd. is the leading provider globally, having shipped a total of 1.9 billion doses at home and overseas as of late September 2021. Similarly, India is reported to be a major exporter of the AstraZeneca vaccine to South Asia and rest of the world. More than 70 countries have received vaccines made in India.

A large share of the billions of COVID-19 vaccines administered so far have been in high- and upper-middle-income countries. These vaccines have not reached a large part of the world's poorest people, including poor people in the Asia-Pacific region. Given the production capacity, vaccine exporters of the Asia-Pacific region can play a significant role in increasing the supply of vaccines not only to this region but to the other parts of the world, and this can help to reduce the imbalance in the availability of vaccines across countries.

Vaccine exports are restricted in many countries, particularly after a surge in delta variant cases. For instance, Restrictions in India on the vaccine exports were enacted to in response to domestic demand and the need to vaccinate the population after significant rise in COVID-19 cases in April 2021. Vaccine exports from India resumed in November 2021. At least 13 WTO members maintain measures that may affect the export of certain inputs, included those on the Joint Indicative List of Critical COVID-19 Vaccine Inputs, and some active ingredients that are classified in the HS together with final vaccines (HS code 300220). Export restrictions continue to impede access to vaccine inputs and thus create uncertainty in vaccine supply chains. Restrictions

[10] Digits are added to the end of the six-digit HS product codes to categorize and define commodities at a more detailed level.
[11] See www.bloomberg.com/news/articles/2021-11-03/made-in-china-covid-vaccines-go-global-so-do-its-shots-for-pneumonia-hepatitis.

persist on exports by vaccine manufacturers to foreign fill-finish sites, both for sites owned by the manufacturer and the contract development and manufacturing organizations (CDMOs) that partner with vaccine manufacturers. In response to export restrictions, measures have been enacted in some countries to require local supplies of inputs, which has added bottlenecks to regulatory approval, added complexity to distribution planning and further restricted vaccine availability in countries without extensive manufacturing infrastructure.[12]

Apart from export restrictions on vaccines, restrictions on vaccine related inputs also affect vaccination targets despite vaccine availability. For instance, the availability of syringes could affect vaccine administration. The global supply of syringes was hampered after a 'quantitative restriction' was enacted in India on the export of certain categories of syringes for three months in October 2021. These restrictions were placed by India to boost the COVID-19 vaccination drive within the country. With India's export restrictions on syringes in place for October to December 2021, there could be a shortfall of two billion to four billion in the global supply of needles in 2022. The World Health Organization and UNICEF have warned that the syringe shortage could have dire consequences for the global vaccination effort.[13]

3.6 Vaccine supply to the Covax initiative

The Covax initiative is the vaccines pillar of the Access to COVID-19 Tools Accelerator, a global collaboration to accelerate the development, production and equitable access to COVID-19 tests, treatments and vaccines. Covax is co-led by GAVI, the Coalition for Epidemic Preparedness Innovations and the World Health Organization (WHO). Its aim is to accelerate the development and manufacture of COVID-19 vaccines, and to guarantee fair and equitable access for every country in the world.

The supply of vaccines through Covax is dependent on the major producers and exporters of the vaccines. In the Asia-Pacific region, two important contributors to Covax are China and India. The Government of China pledged $100 million to Covax in August 2021 towards equitable access to COVID-19 vaccines for lower-income countries. Similarly, before exports from India were restricted in April 2021, Covax was reliant on supplies from the Serum Institute of India to support vaccination in low- and middle-income countries. Of the 700 million vaccines that had been delivered to 144 countries by Covax as of 14 December 2021, around 40 million doses were provided by the Serum Institute of India. Around 28 million of those doses were supplied between January and April 2021.[14]

[12] WTO 'Indicative list of trade-related bottlenecks and trade-facilitating measures on critical products to combat COVID-19', Information Note, 8 October 2021.
[13] www.nytimes.com/2021/11/18/world/asia/covid-syringes-india.html.
[14] www.bbc.com/news/world-asia-india-55571793.

4. Key findings from primary survey with stakeholders in India

The findings of the primary survey of stakeholders concerned with vaccine production and trade in India can provide substantial insights and takeaways for other trading nations. Online personal interviews of selected stakeholders in India were conducted during December 2021 and January 2022 to reflect on how various regulatory frameworks, tariff and non-tariff barriers, production and scaling up, and vaccine nationalism can affect vaccine availability and distribution, and to reflect lessons learned for not only India but other countries too. The survey respondents include representatives of pharmaceutical companies, subject experts, think tanks and academics. The main findings from the survey are summarized below.

1. Regulatory framework for vaccines production and trade and related barriers

- Trade is usually meant to facilitate access to and supply of goods, and the same should hold true for vaccines and vaccine inputs. But this is not happening in practice as pricing and purchase arrangements for vaccines have been dominated by high income countries and selected pharmaceutical companies.
- Vaccines are social goods but the global supply and global trade in vaccines are subject to licensing-based regulatory framework.
- Tariffs are not so important for COVID-19 vaccines in particular, but NTMs play a crucial role in vaccine trade. Most of these measures are from exporting countries or companies rather than importing countries.
- The most significant issue for NTMs is sharing of trade secrets and the control of technology.
- Exclusive rights to produce vaccines are given to selected countries or companies. If many companies are allowed to produce vaccines, there will be no shortages.
- Companies prefer voluntary licensing and do not support competition.
- Licensing agreements can be obtained only for fill-finish but not for vaccine manufacturing. Under contract manufacturing licensing, the contracted company is producing only for the contracting company. For example, Biological E was approved to manufacture the Johnson & Johnson COVID-19 vaccine in India but this vaccine can not be used in India.
- There is support for harmonization of regulatory approval requirements at higher level, as it will increase the compliance requirements for manufacturers from developing countries. Global manufacturers do not want harmonization at a lower threshold.

- India has always been a big market to capture but the regulatory barriers have discouraged pharmaceutical companies from entering the market. Regulatory bodies in India have not explicitly discussed the enforcement of intellectual property rights or technology transfers.

- The way the Government of India dealt with Covaxin regulatory approval from WTO was not appropriate. There were issues with respect to documentation and data sharing. It took months to receive regulatory approval from WHO. The lack of appropriate rigorous documentation for regulatory approval is an obstacle, in particular for vaccine manufacturers in the global south. This will affect global benchmarking of their vaccines, and in the absence of WHO approval they may not be able to supply it to other countries.

- From aggregate trade data, it appears that India is an exporter as well as importer of vaccines, yet more data availability and data crunching are required to analyse these cases. Product differentiation in the line items is needed to show which vaccines are imported and exported.

2. Vaccine production and scaling up

- Vaccine manufacturing is not like drug manufacturing. It is a package that needs to be delivered to targeted countries. Bulk manufacturing formulation can be transported to other countries provided the target country has a fill-finish facility and sufficient technical and human resources capacity.

- Half of the global south does not have the required capacity. Non-vaccine producing countries can enhance their vaccine supply by importing ready to inject vaccines, which are produced and exported by manufacturers, including some in India. Meanwhile, companies such as Moderna and Pfizer are setting up fill-finish facilities in other countries, such as South Africa. Therefore, both models exist for the vaccine trade. The difference is whether the target country has a fill-finish facility or not.

- Adenovirus vaccine platforms such as Sputnik V use a technology that can be transferred as a package. Any generic manufacturer can absorb the technology and produce vaccines. It is surprising that this kind of manufacturing is not scaling up. This may be because of the fear of losing control if there are too many contract manufacturers.

- Post-production processes of vaccine distribution and administration are time consuming and require adequate pre-planning. This was probably a reason for delayed roll-out of vaccines in early 2020, while the delta variant was emerging.

- Inactivated virus vaccines are a low hanging platform. Large amounts of vaccine can be produced through such technology. For example, Covaxin is produced using this technique. However, there are barriers and safety risks, and

containment technology is required at a large scale, including larger bioreactors. Many countries do not have large-scale containment technology. This is why Bharat Biotech is not able to scaleup.

- Building credibility as a contract manufacturer is important for vaccine production. The Serum Institute of India has built that credibility and managed to get multiple contracting partners.

- Vaccine production in India primarily deals with generics. It still has a long way to go to produce more sophisticated drugs/biosimilars.

- In the future, mRNA vaccines will be the dominant type and production capacity in India is still insufficient to produce them. The experience of producing and proving the efficacy of Covaxin is a case in point.

- It is easy to scale up and replicate mRNA technology, and it does not require biological trials. It is a chemical vaccine. But, generic manufacturers in India are not keen on mRNA vaccine manufacturing as they are concerned with the robustness of supply chains and inputs required for producing these vaccines.

3. Vaccine nationalism

- Vaccine nationalism has been evident during the COVID-19 pandemic. It is visible from a comparison of how many doses are supplied through the Covax initiative and bilateral agreements such as Vaccine Maitri I how many vaccines doses have been administered in the global north. Third booster dose is being administered in developed countries despite low empirical evidence of effectiveness of booster dose. This is clearly an example of vaccine nationalism.

- Global tendering of vaccines is not a successful model. Countries have forward orders to ensure vaccine smooth supply. It is very difficult to get supplier in the middle of a pandemic. Tendering model may work for other vaccines such as HPV. But COVID-19 vaccines are different from other vaccines. COVID-19 vaccines require rapidity, stringent storage requirements and robust supply chain and high demand.

- Protection of intellecual property rights by pharmaceutical companies, resulting in no diversification of vaccine manufacturing is also an outcome of vaccine nationalism.

- It is difficult to effectively ensure domestic supplies without hurting exports of vaccines. Afterall, COVID-19 it is not a localized but a global challenge, requiring global solutions. Vaccine producers should consider themselves as global citizens in the fight against the pandemic.

- Bilateral agreements are required for supplying vaccines and vaccine inputs among the countries and not global tendering.

- In Asia, a number of practical issues that connect to vaccine manufacturing supply chain play out for vaccine nationalism. COVID-19 vaccine campaigns have three components, and the first is messaging out to reach people who are eager to take vaccines. The second is the availability of trained paramedical personnel, which is not a problem in cities but in rural areas. Resources are scarce in global south, including India. The third component is the supply timetable concerning how the Government plans for distribution, transport and storage. Transport reliability at the far end of supply chain is very important, and unreliability can cause uncertainty among upstream suppliers.

- Vaccine nationalism in India was short lived and was solely due to the emergence of the delta variant. The period from April to August 2020 in India was unusual, and it cannot be compared or used to analyse policymaking as everything was sudden and unforeseen.

4. Lessons for future pandemics

- Trade openness can be instrumental in the production of vaccines as one country alone cannot produce vaccines against all kinds of pathogens.

- Both export and import barriers are important for vaccine trade, distribution and administration.

- Inputs for vaccines should be made more easily available. In some cases, these inputs are produced under trade secrets. Compulsory licensing can be issued, and regulatory agencies can share these data with other manufacturers.

- India has faced severe problems in its procurement systems. It urgently needs an independent agency for procurement. The feasibility of a pooled procurement system in India and its effects on prices of relevant products can be studied.

- An important lesson for India has been that it should not be dependent on big pharmaceutical companies.

- More investment is needed in research and development and technology development for augmenting vaccine production in India.

- Learning from COVID-19 vaccines: 10 years of approval time collapsed into one year, meaning some aspects of regulatory approval for vaccines may not be correct, and these need to be changed.

- Though India had a delayed start, it finally took huge strides in the vaccine roll-out programme. Government policies concerning boosters and vaccine roll-outs are now adapting quicker as needs change during the pandemic, which is a good sign.

- Stakeholders in India should learn from past mistakes, adopt best practices from other countries, be ready with manufacturing facilities for any future public health emergency and serve as an example for other countries to follow.

5. Key findings and recommendations

5.1 Key findings from the trade flow analysis of vaccines and vaccine inputs:

- During 2000–2020, the export of vaccine inputs constituted slightly less than 3 per cent of global exports and less than 2 per cent in the Asia-Pacific region.
- The following are the leading regions for exports and imports of vaccine inputs:
    - Leading exporter and importer regions of vaccine manufacturing are Europe and Central Asia, followed by East Asia and Pacific.
    - Leading exporter region of vaccine administration inputs is East Asia and the Pacific, followed by Europe and Central Asia; leading importer region is Europe and Central Asia, followed by East Asia and Pacific.
    - Leading exporter and importer regions of vaccine storage and distribution inputs are Europe and Central Asia, followed by the East Asia and Pacific.
- Almost three fourth of imports of vaccine storage and distribution inputs, followed by high proportions of vaccine administration and vaccine manufacturing inputs are reported to be from within the Asia-Pacific region, signifying significant intraregional trade in vaccine inputs; the Asia-Pacific region has very high dependence on vaccine imports from rest of the world rather than from within the region.
- Within the Asia-Pacific region, the leading exporters of vaccine inputs are China, Japan, the Republic of Korea, Thailand, Singapore, Türkiye and Malaysia.
- Bioreactors, ultra-violet irradiation equipment and cold boxes are the most traded vaccine inputs globally and also in the Asia-Pacific region.
- For human vaccines, developed countries have been the major importers and exporters globally, and the Asia-Pacific region has been a net importer. The major vaccine exporter countries in the region are India, the Republic of Korea and Australia. The major importer countries are China, Japan and Australia.

5.2 Key findings from tariff policy analyses of vaccines and vaccine inputs

- Majority of the Asia-Pacific countries have remained duty free for vaccine imports. Countries that remained relatively more restrictive are China, India, the Islamic Republic of Iran, the Lao People’s Democratic Republic, Pakistan and others.

- The following tables show high, low and zero duty on vaccine inputs in Asia-Pacific countries and the change in MFN tariffs from 2015 to 2020.

Effectively applied tariffs in the Asia-Pacific region, 2015–2020			
Vaccine inputs	**Relatively high tariffs**	**Relatively low tariffs**	**Zero duty**
Administration	Pakistan, India, Indonesia	Brunei Darussalam, New Zealand, Malaysia	Hong Kong, China; Macao, China; Singapore; Georgia
Management	Maldives, Afghanistan, India	Brunei Darussalam, Georgia, New Zealand	Hong Kong, China; Macao, China; Singapore
Storage and distribution	Iran (Islamic Republic of), Bangladesh, Malaysia	Brunei Darussalam, Japan, Türkiye	Hong Kong, China; Macao, China; Singapore

Change in MFN tariffs during 2015–2020		
Vaccine inputs	**Increase**	**Decrease**
Administration	China, India, Kyrgyzstan, Mongolia, Sri Lanka	Fiji, Lao People's Democratic Republic, Maldives
Management	India, the Republic of Korea, Sri Lanka, Viet Nam	Kazakhstan, Lao People's Democratic Republic, Pakistan, Russian Federation
Storage and distribution	Sri Lanka, India	China, Lao People's Democratic Republic, Kazakhstan, Japan

5.3 Key findings from NTMs analyses of vaccines and vaccine inputs

- Though some countries have imposed trade facilitating NTMs on vaccines in response to the COVID-19 pandemic, many of the trade restrictive NTMs that were imposed prior to COVID-19 are still present in these countries.
- Trade restrictive NTMs are not vaccine specific, rather they are imposed across many pharmaceutical products.
- Export restrictions on vaccines and related inputs hampered the availability and administration of vaccines in poorer countries.

5.4 Key recommendations

- Most Asia-Pacific countries depend on imports of vaccines and vaccine inputs. Moreover, import dependence became more concentrated from 2015 to 2020 with increased reliance on selected exporting countries for these items. As the supply chains of all products were badly affected during the COVID-19 pandemic, increased import concentration may put the availability of critical inputs for vaccines at increased risk. Therefore, countries with high import concentration need to diversify their sources of imports for vaccines and vaccine inputs.

- The tariff analysis shows prevalence of high tariffs in some Asia-Pacific economies, and they need to bring down tariffs to decrease the cost of imports of vaccines and vaccine inputs. Only a few of these economies have reduced/eliminated tariffs on vaccines in response to the COVID-19 pandemic.
- The analysis of NTMs suggests continuation of many of measures that were imposed on vaccines prior to the COVID-19 pandemic. Most of these measures were not specific to vaccines but were imposed on vaccines and other medical products. These legacy measures have the potential to delay the sourcing of vaccines and vaccine inputs from other countries. Therefore, Governments need to identify and eliminate these NTMs.
- Export restrictions significantly hampered the delivery of vaccines to other countries. While domestic demand is a key determinant of export restrictions, the leading producers of vaccines should consider that no one is safe until all are safe from COVID-19, thus the distribution and availability of vaccines across all countries must be equitable.
- As the two major global producers of vaccines in the Asia-Pacific region, India and China have potential to enhance intraregional trade of vaccines. However, such potential is not fully realized due to regulatory requirements of exporting countries, such as exports authorization, and requirements of importing countries, such as quality control. Therefore, regulatory coherence is required to enhance intraregional trade.
- Free trade agreements between and among Asia-Pacific countries may be used to ease import and export restrictions on vaccines and vaccine inputs. Such agreements need to have specific provisions for enhancing vaccine trade among the contracting parties.
- There is a lack of transparency with respect to the administration of NTMs for the trade of vaccines and vaccine inputs and the changes in these NTMs in response to COVID-19. Only a few selected countries have notified WTO of such NTMs and changes. Countries should notify WTO of the applicable NTMs on vaccines and related inputs so that the manufacturers and exporters/importers of vaccines are aware of them. This will help them to plan their inventory and minimize delays owing to the administration of NTMs.
- Successful vaccine campaigns require not only adequate supply of vaccines but also logistics, storage and distribution capacities. Therefore, apart from ensuring adequate supply of vaccines through trade, equal emphasis should also be given to developing transportation and storage capabilities in poor countries.

6. Self-assessment guide for policymakers

6.1 Policy area 1: Trade in vaccines and vaccine inputs and export and import dependence

Issue 1: Improving availability and accessibility of vaccines and related inputs, domestically and globally through trade.

Guiding questions

- Does the amount of domestic production of vaccines and vaccine inputs match the growing domestic demand?
- How dependent is the nation on trade in vaccines to cater to domestic demand?
- Are there excess capacities for domestic vaccine production that could be used to serve global or regional markets?
- How dependent is the nation on trade in vaccine inputs to facilitate vaccine production for domestic, regional or global markets?

Potential challenges

- Uncertainties regarding disease outbreaks and vaccine hesitancy contribute to demand bottlenecks while insufficient infrastructure and production capacity create supply bottlenecks. These bottlenecks often result in demand-supply mismatches.
- While the dependence of a country on trade may improve availability and accessibility of vaccines, it may also make the country susceptible to trade disruptions
- Unforeseen changes in trade policies due to exogenous factors may impede the flow of vaccine inputs. Such changes can have unforeseen spillover effects on the vaccine production process, thereby destabilizing the market

Recommended actions

- Monitoring of trends and patterns of demand and supply factors related to vaccines and vaccine inputs at regular intervals for better assessment of gaps and to plan for domestic or global sourcing of these products.
- Supporting domestic manufacturing of vaccines and related inputs, alongside trade in order to bring a balance between the two.
- Collecting and reporting data on domestic production and demand for vaccines and vaccine inputs at regular intervals to identify the need for trade in these products and to be better prepared for future pandemics.
- Analysing disaggregated data on trade policies, trade flows of vaccine inputs and vaccine production processes at regular intervals to assess export and import dependence

Issue 2: Diversifying trading partners for the exports and imports of vaccines and related inputs.

Guiding questions

- Are the export destination countries for vaccines and vaccine inputs adequately diversified?
- Are the source countries for the import of vaccines and vaccine inputs adequately diversified?
- Is there excessive dependence on a particular country or a group of countries for procurement of vaccines and related inputs?
- What are the barriers to tap alternate sources/destinations for vaccines and vaccine inputs?

Potential challenges

- Existence of only a few major exporter or importer countries may result in market power of those countries in global trade of vaccines and vaccine inputs, thereby affecting the alternative procurement sources of vaccines and related inputs
- Licensing or other kinds of agreements may prevent alternative sources of imports
- Tariff and non-tariff barriers in the importing countries may affect exports of vaccines and related inputs to these countries

Recommended actions

- Identifying the potential source and destination countries for diversification of trade in vaccines or vaccine inputs.
- Holding meetings with relevant stakeholders at regular intervals to understand what prevents them from diversifying their export/imports.
- Ensuring that Government procurement of essential vaccines has diversified sources of supply, which may be done through competitive bidding or licensing agreements with multiple producers.
- Using regional cooperation to reduce inequalities in vaccine manufacturing, distribution and administration and help to reduce concentrated import dependence in some countries.
- Diversifying import sources or export destinations through trade agreements.

6.2 Policy area 2: Trade policy responses for vaccines and vaccine inputs

Issue: Identification of trade barriers impeding trade flows of vaccines and vaccine inputs.

Guiding questions

- What are the prevalent barriers for trade in vaccines and vaccine inputs?
- How have trade barriers been altered due to the pandemic?
- What are the effects of trade barriers on the availability and prices of vaccines and vaccine inputs?
- What are the differences between countries with the most restrictive trade practices versus those which are most liberal in the trade of vaccines and vaccine inputs in terms of availability and affordability of vaccines?

Potential challenges

- Disaggregated information on tariff and non-tariff trade barriers may not be available thereby making it difficult to identify relevant trade barriers affecting trade flows of vaccines and vaccine inputs before and after the outbreak of COVID-19.
- Assessing the cascading effects of trade restrictive policies on prices of vaccines and vaccine inputs may be difficult.
- Identifying and linking population health conditions with trade policies of countries to understand their trade practices related to vaccines and vaccine inputs.

Recommended actions

- Identifying major inputs used in domestic production of vaccines and examining whether tariffs on these inputs can adversely affect the availability and affordability of vaccines.
- Assessing the scope for reducing tariffs, if higher than the global average.
- Facilitating regional supply chains for vaccine production through regional cooperation.

6.3 Policy area 3: Vaccine trade and NTMs

Issue 1: Use of NTMs for non-trade policy objectives.

Guiding questions

- What non-trade policy objectives, if any, are served by NTMs?
- Are NTMs the right instruments to serve these non-trade policy objectives?
- Are there other instruments available to serve these non-trade policy objectives?

Potential challenges

- Trade policy and non-trade policy objectives are interlinked and they may be difficult to segregate.

- Political economy considerations may require the use of NTMs for non-trade policy objectives even though economic reasoning does not favour use of such NTMs.

Recommended actions

- Limiting the use of NTMs for non-trade policy objectives to only those cases which require special attention.
- Applying time-bound NTMs and removing them as soon as the objectives are met.

Issue 2: Trade facilitating versus trade restricting NTMs.

Guiding questions

- Are the applied NTMs aimed at facilitating vaccines exports and imports or restricting them?
- Are there NTMs which were imposed in previous years but are not currently relevant?
- Are there NTMs which are not vaccine specific but that impact vaccines?
- What is the purpose of applying such non-vaccine NTMs, if any, on vaccines?
- Can trade facilitating NTMs applied on the imports of COVID-19 vaccines also be applied to other vaccines to facilitate imports and enhance domestic availability?

Potential challenges

- Disaggregated information on all NTMs may not be available.
- Lack of proper database on NTMs at domestic level.
- Mindset to continue with the legacy NTMs even if they are not serving any purpose.

Recommended actions

- Preparing a database of NTMs applied on vaccines and related inputs over the years.
- Identifying the differences in NTMs across major trading partners.
- Reducing/eliminating NTMs with countries/region bilaterally/regionally through mutual recognition of standards.
- Analysing the performance of countries that imposed trade facilitating NTMs during the COVID-19 pandemic to assess possible learnings for future pandemics.
- Exploring possibilities of applying trade facilitating NTMs for non-COVID-19 vaccines to increase their availability to domestic constituencies.

Issue 3: Exports restrictions on vaccines and vaccines related inputs.

Guiding questions

- Are export restrictions imposed due to domestic demand considerations?
- Are export restrictions related to binding agreements, such as licensing agreement and technology transfer?
- Are export restrictions imposed based on objective criteria?
- Are export restrictions on vaccine inputs affecting administration of final vaccines in other countries?

Potential challenges

- Political economy considerations may require exports restrictions. It may be difficult to ignore such considerations.
- Companies may prefer to continue with their monopoly/oligopoly rather than to support export diversification.

Recommended actions

- Applying time bound export restrictions and removing them as soon as domestic demand considerations are met.
- Promoting regional and bilateral agreements to support the supply of vaccines and vaccine inputs to the countries in the region.

List of references

Helble, M., and B. Shepherd (2017). Win-win: how international trade can help meet the sustainable development goals. Asian Development Bank Institute.

Organisation for Economic Cooperation and Development (OECD) (2021). Using trade to fight COVID-19: Manufacturing and distributing vaccines. Paris. Available at https://read.oecd-ilibrary.org/view/?ref=1060_1060354-ie4a355ojd&title=Using-trade-to-fight-COVID-19-Manufacturing-and-distributing-vaccines.

Sorescu, S., J.L. González and A. Andrenelli (2021). Using trade to fight COVID-19: Manufacturing and distributing vaccines.

United Nations Conference on Trade and Development (UNCTAD) (2021). COVID-19 Non-Tariff Measures: The Good and the Bad, through a Sustainable Development Lens. UNCTAD Research Paper No. 60, UNCTAD/SER.RP/2021/3.

UNCTAD (2019). International Classification of Non-tariff Measures - 2019 version.

World Customs Organization (WCO) (2021). “Joint Indicative List of Critical COVID-19 Vaccine Inputs issued by the joint effort of WCO/WTO and other organizations”. Available at www.wcoomd.org/en/media/newsroom/2021/july/joint-indicative-list-of-critical-covid-19-vaccine.aspx.

World Health Organization (WHO) (2020). Developing and Delivering COVID-19 Vaccines Around the World.

World Trade Organizaiton (WTO) (2021). Joint Indicative List of Critical COVID-19 Vaccine Inputs for Consultation (Version 1.0). 7 July. Available at www.wto.org/english/tratop_e/covid19_e/bottlenecks_report_e.pdf.

WTO (2021). Indicative list of trade-related bottlenecks and trade-facilitating measures on critical products to combat COVID-19. Information Note, 20 July. Available at www.wto.org/english/tratop_e/covid19_e/bottlenecks_report_e.pdf.

WTO (2021). WTO technical symposium feeds into continuing efforts to deal with COVID-19 pandemic. Available at www.wto.org/english/news_e/news21_e/heal_29jun21_e.htm.

Appendix

Countries and economies studied

Afghanistan*; American Samoa*; Armenia*; Australia; Azerbaijan*; Bangladesh*; Bhutan*; Brunei Darussalam; Cambodia*; China*; Cook Islands; Fiji*; French Polynesia; Georgia*; Guam; Hong Kong, China; India*; Indonesia*; Iran (Islamic Republic of)*; Japan; Kazakhstan*; Kiribati*; Republic of Korea; Kyrgyzstan*; Lao People's Democratic Republic*; Macao, China; Malaysia*; Maldives*; Marshall Islands*; Micronesia (Federated States of)*; Mongolia*; Myanmar*; Nauru; Nepal*; New Caledonia; New Zealand; Niue; Northern Mariana Islands; Pakistan*; Palau; Papua New Guinea*; Philippines*; Russian Federation*; Samoa*; Singapore; Solomon Islands*; Sri Lanka*; Taiwan, China; Tajikistan*; Thailand*; Timor-Leste*; Tonga*; Türkiye*; Turkmenistan*; Tuvalu*; Uzbekistan*; Vanuatu*; Viet Nam*.

* Countries categorized as developing Asia-Pacific countries. Herfindahl-Hirschman indices (HHI) of import dependence have been calculated for these countries.

Table A.1: Product descriptions and product codes of the Harmonized Commodity Description and Coding System, 1996 and 2017, for vaccines and vaccine inputs included in the Joint Indicative List of Critical COVID-19 Vaccine Inputs for Consultation (Version 1.0)

1996 codes	2017 codes	Product description
170199	170199	Inactive ingredients
220710	220710	Inactive ingredients
220720	220720	Vaccine administration
220890	220890	Vaccine administration
250100	250100	Inactive ingredients
280610	280610	Inactive ingredients
281121	281121	Vaccine storage and distribution
281511	281511	Inactive ingredients
281512	281512	Inactive ingredients
282731	282731	Inactive ingredients
283330	283330	Other ingredients
283522	283522	Inactive ingredients
283524	283524	Other ingredients
285210	293490	Other ingredients
285390	284800	Inactive ingredients
290544	290544	Other ingredients
290613	290613	Inactive ingredients
291211	291211	Other ingredients
291521	291521	Inactive ingredients
291529	291529	Inactive ingredients
291814	291814	Inactive ingredients
291815	291815	Inactive ingredients
292219	292219	Inactive ingredients
292249	292249	Inactive ingredients

1996 codes	2017 codes	Product description
292250	292250	Inactive ingredients
292320	292320	Inactive ingredients
293329	293329	Inactive ingredients
294190	294190	Other ingredients
300220	300220	Active ingredients
300510	300510	Vaccine administration
310420	310420	Inactive ingredients
340213	340213	Inactive ingredients
350300	350300	Other ingredients
350510	350510	Inactive ingredients
350790	350790	Other ingredients
382200	382200	Consumables
391740	391740	Consumables
392310	392310	Vaccine storage and distribution
392321	392321	Consumables
392329	392329	Consumables
392330	392330	Consumables
392690	392690	Consumables
401511	401511	Vaccine administration
401519	401519	Vaccine administration
401699	401699	Packaging
482110	482110	Consumables
482190	482190	Consumables
701090	701092	Packaging
701710	701710	Consumables
701720	701720	Consumables
701790	701790	Consumables
830990	830990	Packaging
841830	841830	Vaccine storage and distribution
841840	841840	Vaccine storage and distribution
841920	841920	Equipment
841989	841989	Equipment
842129	842129	Consumables
842230	842230	Equipment
847982	847982	Equipment
847989	847989	Equipment
854370	854389	Vaccine administration
901831	901831	Vaccine administration
901832	901832	Vaccine administration
902720	902720	Vaccine manufacturing
902790	902790	Equipment
903289	903289	Equipment

Source: See www.wto.org/english/tratop_e/covid19_e/vaccine_inputs_report_e.pdf and https://unstats.un.org/unsd/trade/classifications/tables/HS2017toHS1996ConversionAndCorrelationTables.xlsx.

The Asia-Pacific Research and Training Network on Trade - ARTNeT - is an open network of research and academic institutions and think-tanks in the Asia-Pacific region. Since its inception, ARTNeT aims to increase the amount of high quality, topical and applied research in the region by harnessing existent research capacity and developing new capacities. ARTNeT also focuses on communicating these research outputs for policymaking in the region including through the ARTNeT Working Paper Series which provide new and policy–relevant research on topics related to trade, investment and development. The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations and ARTNeT secretariat or ARTNeT members.

Readers are encouraged to quote or reproduce material from ARTNeT Working Papers for their own publications, but as the copyright holder, ARTNeT requests due acknowledgement and a copy of the publication.

This and other ARTNeT publications are available from **artnet.unescap.org**

ARTNeTontrade

@ARTNeTontrade

ARTNeT Group

artnetontrade@un.org

ARTNeT Secretariat, United Nations ESCAP

Rajadamnern Nok Avenue

Bangkok 10200, Thailand

Tel: +66(0) 22881425

Fax: +66(0) 22881027