

Pioneering a New Classification: a Comprehensive Study of Healthcare Products in Global Trade

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ABSTRACT

International trade in healthcare products took off in the 2000s at the height of hyper-globalisation. Twenty years on, the Covid-19 shock drove home to governments the importance of health security and placed the spotlight on the industrial sovereignty issues raised by the international organisation of production. However, the tangled web of international value chains has compromised the traceability of the manufacturing of these essential goods. In addition, the classification of healthcare products across a multitude of industries in the trade and production nomenclatures makes them hard to identify and muddies the picture further. In this paper, we have painstakingly identified these products and classified them together in one industry grouping to assess the scale of and trends in trade to meet the needs of national health systems. Covering a vast range of products (medicinal products and their compounds, medical technology equipment and small medical materials), this healthcare industry grouping has posted the strongest relative growth since 2000, rising to the second highest share of world trade in 2021, just behind electronic products, now equalling or even just above the share of transport equipment. This paper details the nature of world trade in the healthcare industry grouping and its five branches by production stage (intermediate and final), type of trade flows (one-way and two-way) and quality/price range. It goes on to present how the advanced countries are positioned compared with the rest of the world.

Keywords: Health Products, International Trade, Advanced Economies, Emerging and Developing Economies

JEL classification: F13, F14, F15, I11, L65

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NON-TECHNICAL SUMMARY

The guarantee of access to healthcare for all has been compromised for years in advanced countries by the development of shortages of certain healthcare products, including essential medicines. These problems are due to a number of factors such as growth in global demand, the complexity of the organisation of health systems and distribution channel dysfunctions, but also economic decisions and industrial choices by public and private players. In the healthcare industries, the fragmentation of the stages of goods production worldwide and the globalisation of demand have created geographic interdependencies that, in a context of expanding international trade, are impacting on nations' public health security. Following the Covid-19 shock, and in anticipation of other pandemics associated with the spread of animal-origin viruses and global warming, many countries' governments now appear to have taken on board the supply difficulties faced by their health systems. In addition, since Russia's invasion of Ukraine, trade globalisation has entered a phase of geopolitical fragmentation with the transatlantic axis considering healthcare products, and biotechnologies in particular, as highly strategic.

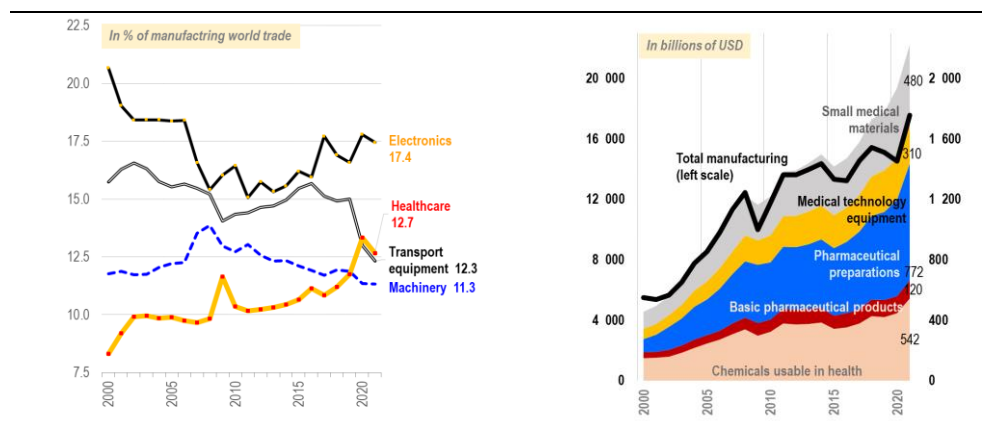
Healthcare products are dispersed across different industries in the international trade and production nomenclatures, which makes it hard to measure their overall weight and growth in global trade. The main contribution of this paper is to consider healthcare as an industry grouping in its own right in international trade alongside the other more usual industrial groupings such as mechanical engineering products, electrical equipment, electronics and transport. The list drawn up in this research aims for comprehensiveness and includes all traded products that can be used by the health system. This healthcare industry grouping comprises 368 products from the six-digit Harmonized System Nomenclature, which are classified in five branches covering medicinal products and all their compounds, medical technology equipment and small medical materials.

Healthcare products are a key industry grouping in trade, accounting for 13% of world flows in manufactured goods in 2021, in second place behind electronics. Healthcare industries have posted the strongest growth since 2000 out of the ten industry groupings in our breakdown. This buoyancy over the 2000-2021 period owes a great deal to the boom in trade in pharmaceutical preparations, with a growing share of these being biotech treatments. In 2020 and 2021, the Covid-19 pandemic triggered massive needs for healthcare products worldwide. International demand exploded for the branches of chemicals usable in health, pharmaceutical preparations and small medical materials. A focus on "Covid-19" products reveals that, during the crisis, national health systems imported products from across the entire healthcare industry grouping for the prevention and treatment of the virus. Demand for healthcare products is also less procyclical than for others products, contributing to a large share in total world trade in 2020 (as well as in 2009).

The international fragmentation of production processes is very pronounced in this industry grouping. In 2021, over half of trade was in intermediate goods and two-way trade in similar products (i.e. imports and exports of products between two countries in the same category at a detailed level of the trade nomenclature) hit a record level, the highest of all the industry groupings (51% of flows). Another particularity is that it has the lowest proportion of trade in the medium quality/price range.

In 2021, nearly three-quarters of world exports in the healthcare industry grouping came from advanced countries and most of these exports correspond to their intra-zone trade (54% of world flows in 2021). Yet this trade between advanced countries has seen a relative decline since the 2000s (-16 percentage points) due to their exports to the emerging and developing countries, which are posting growth in both their exports to advanced countries and their intra-zone trade, albeit mainly in low range products. Recent thinking on decarbonisation, as well as on fragmentation of production within geopolitical blocs, between countries referred to as "friends", are at the centre of debates on the geographic reconfiguration of value chains and the security of supply in healthcare.

Top four industry groupings in manufacturing world trade (excluding energy) and healthcare industry grouping dynamism by branch, 2000-21



Les produits de santé dans le commerce international : une filière à part entière

RÉSUMÉ

Les échanges internationaux de produits de santé ont pris leur essor à partir des années 2000, en pleine phase d'hypermondialisation. Vingt ans après, le choc du Covid a confirmé l'importance de la sécurité sanitaire pour les États et mis en lumière les questions de souveraineté industrielle posées par l'organisation internationale de la production. Or, la traçabilité de la fabrication de ces biens essentiels à la vie est devenue malaisée dans l'écheveau des chaînes de valeur internationales. Par ailleurs, le classement des produits de santé dans de multiples filières au sein des nomenclatures de commerce et de production rend leur repérage difficile et contribue à l'opacité. Un travail minutieux d'identification a permis de les regrouper dans une même filière et d'apprécier l'envergure et l'évolution des échanges visant à répondre aux besoins des systèmes de santé nationaux. Recouvrant un vaste ensemble de produits (médicaments et leurs composants, équipements de technologie et petit matériel), cette filière de santé est celle qui a enregistré la plus forte progression depuis 2000 si bien que sa part dans le commerce mondial se situe en 2021 au second rang, juste après celle des produits électroniques. Ce panorama détaille la nature des échanges mondiaux de la filière de santé et de ses cinq branches en distinguant les stades de production (intermédiaires ou finals), les types de flux (univoques ou croisés) et les gammes de qualité/prix, avant de présenter le positionnement des pays avancés vis-à-vis du reste du monde.

Mots-clés : produits de santé, commerce international, économies avancées, économies émergentes et en développement

Les Documents de travail reflètent les idées personnelles de leurs auteurs et n'expriment pas nécessairement la position de la Banque de France. Ils sont disponibles sur publications.banque-france.fr

1. Introduction

The guarantee of access to healthcare for all has been compromised for years in advanced countries by the development of shortages of certain healthcare products, including essential medicines. These problems are due to a number of factors such as growth in global demand, the complexity of the organisation of health systems and distribution channel dysfunctions, but also economic decisions and industrial choices by public and private players. In the healthcare industries, the fragmentation of the stages of goods production worldwide and the universalisation of demand have created geographic interdependencies that, in a context of expanding international trade, are impacting on nations' public health security. Following the Covid-19 shock, and in anticipation of other pandemics associated with the spread of animal-origin viruses and global warming, many countries' governments now appear to have taken on board the supply difficulties faced by their health systems. In addition, since Russia's invasion of Ukraine, trade globalisation has entered a phase of geopolitical fragmentation with the transatlantic axis considering healthcare products, and biotechnologies in particular, as highly strategic.

The main contribution of this paper is to consider healthcare as an industry grouping in its own right in international trade alongside the other more usual industrial groupings such as mechanical engineering products, electrical equipment, electronics and transport. Healthcare products are dispersed across different industries in the international nomenclatures, which makes it hard to measure their overall weight and growth in trade. However, the identification of all health-related products in international trade is a necessary condition to meet public health challenges. The Covid-19 experience showed that, although some first aid products initially triggered bottlenecks in the import supply chain (such as face masks for this virus transmitted by respiratory routes), shortages of many other products appeared worldwide in the space of a few months.

In the light of this experience, the list drawn up in this paper aims for comprehensiveness and includes all traded products that can be used by the health system. This broad-based industry grouping can be broken down into five branches by economic activity and stage of production for an in-depth analysis of international trade in health-related products since 2000. This nomenclature drawn up at the most detailed level of the Harmonized System (HS 6-digit level) is publicly available [on line](#) on the CEPII website.

The **first section** of this paper describes how “public healthcare” products were identified from different classifications, including the many “Covid-19” lists that appeared during the pandemic. **Section 2** presents the main characteristics of the CEPII list and the five branches making up the healthcare industry grouping. This paper also provides information on transformations in international trade in the healthcare industry grouping since 2000. What is the industry grouping's weight and what are its particularities compared with other manufacturing industries? What does the breakdown by branch tell us about the particularities of each branch? Have any striking developments occurred (**Section 3**)? And is the domination of advanced countries in this industry grouping now being challenged by the emerging and developing countries (**Section 4**).

2. Identification and classification by healthcare product branch

The importance of international trade to the supply of a wide range of goods was evidenced by shortages of certain vital medicines alongside small medical materials (medical face masks, swabs, etc.) and medical technology equipment (ventilators) during the first wave of the Covid-19 pandemic. The major role of international production networks in the provision of health-related products could already be seen back in the 2000s with particularly buoyant trade at the height of hyper-globalisation. Today, no country has the self-sufficiency in medical products and materials to meet the needs of its health system. Short supplies and stock-outs date back to before the pandemic, including in advanced countries,¹ and do not concern purely “Covid products”. Such shortages can have serious repercussions, since they threaten access to treatment and the continuity of healthcare.

In spring 2020, in response to the Covid-19 health crisis, the World Trade Organization (WTO), World Customs Organization (WCO), World Health Organization (WHO) and the European Commission (EC) as well as national bodies such as the United States International Trade Commission (USITC) draw up lists of Covid-19-related products. The initial aim was to gain a better understanding of needs generated by the pandemic worldwide, to track the trade interdependencies that the pandemic was creating between countries, and ultimately to take the necessary measures to facilitate trade in what had become essential products. However, right at the start of the pandemic, many countries’ first reactions to shortages of certain “Covid” products due to the boom in worldwide demand were to introduce temporary restrictions on exports of products deemed critical (WTO, [2020b](#)).

The “Covid” lists expanded as the public health crisis went on, mainly on account of the improved identification of needs. Although medical product classifications existed before the Covid-19 crisis, new classifications extending beyond “Covid” products have also appeared comprising wide ranges of goods, but with highly diverse coverage. Today, the different lists have swathes of products in common, yet not one sets out to achieve comprehensive coverage. By contrast, our approach is holistic. The CEPII list in this paper covers all internationally traded products identified as relating to healthcare.

Constructing such an industry grouping poses substantial problems. First, the nomenclatures of production and international trade contain no specific healthcare grouping. Health-related products are scattered across different industries: pharmaceutical products are classed in the chemical industry, medical instruments in electronics and small materials under several other headings. Second, the lack of granularity (limited level of detail) in the existing classifications makes it tricky to identify certain products and their associated trade flows. For example, it proved hard to satisfactorily track trade in products essential to fight the Covid-19 pandemic because the Harmonized System’s six-digit level (HS-6) was not detailed enough and the national subcategories proposed by some WTO members were not standardised (WTO,

¹ The European Medicines Agency has published a catalogue for the European Union since 2013 presenting pharmaceutical shortages by country (in the absence of harmonised definitions of the concept of “shortage” between EU Member States). The European Parliament reported ([2020](#)) that the number of shortages increased twenty-fold between 2000 and 2018, with the increase being particularly marked in the 2010s. Cancer treatments, antibiotics, vaccines, anaesthetics and medication for hypertension, heart disease and disorders of the nervous system were listed as the main products in particularly short supply. More recently, the Covid-19 health crisis triggered shortages of active pharmaceutical ingredients, reagents for tests, paracetamol, etc. In April 2023, the European Commission proposed a [reform of the pharmaceutical legislation](#) to address this problem of shortages of medicines.

[2021](#)). All of these elements can result in problems with underestimating or overestimating the weight of the trade in question.

2.1. The different lists drawn up since the 1990s

2.1.1. *The Pharma Agreement list put together by the Uruguay Round*

The first list of healthcare products traded in world trade was drawn up by the Uruguay Round of trade negotiations, “[the largest trade negotiation ever, and most probably the largest negotiation of any kind in history](#).” Initially concluded in a general spirit of trade openness in [1994](#), this plurilateral sectoral agreement binds and eliminates customs duties on a large number of finished pharmaceutical products, active pharmaceutical ingredients and their chemical compounds, as well as other chemicals usable in health such as dyes² and radioisotopes³ essential for certain medical analyses. This open trading system was adopted by advanced countries: WTO member signatories to the Pharma Agreement are currently Canada, the European Union, Japan, Macao, Norway, Switzerland, the United Kingdom and the United States. The list of products covered by these open trade measures has been updated and expanded four times since the creation of the WTO (1996, 1998, 2007 and 2010). The pandemic prompted the establishment of a consolidated list in May 2020 including all the products covered by the initial agreement and its revisions (WTO, [2020c](#)). Covering more than 200 HS-6 products (Harmonized System six-digit level), it contains the largest number of goods of all the lists drawn up prior to the list produced by our study (see **Figure 1**).

2.1.2. *The list drawn up by Matthias Helble following the Great Recession*

At the height of globalisation in the 1990s and 2000s, international demand for healthcare products was highly buoyant as shown by an outstanding study by Matthias Helble published by the WTO ([2012](#)), whose title questioned the benefits of more trade in the field of health (*More trade for better health?*). The originality of this analysis resides in particular in the far-reaching coverage of the list of goods used. It represents a first attempt to identify all **public health-related products** (“public health space”, p. 7) in international trade and analyse the impact of increased production interdependencies on national health systems.

Moreover, Helble’s studies ([2012, 2017](#)) [do not stop at trying to identify a comprehensive universe of health products, but also break them down by use into three main groups and six subgroups](#):

- **Pharmaceutical industry (A)** including dosified medicines and medicaments put up packings for retail sale (A1), bulk medicines (A2) and inputs specific to the pharmaceutical industry (A3);
- **Chemical inputs of general purpose (B)** used in the pharmaceutical industry, but also in other industries as active ingredients or other ingredients for pharmaceutical uses;
- **Other health-related inputs and equipment (C)** including hospital and laboratory inputs and small materials such as diagnostic or laboratory reagents, gloves and

² Organic “dyes, pigments and tanning agents”, commonly used as contrast dye in diagnostic imaging, have been [in short supply since the early days of the Covid-19 pandemic](#).

³ A radioisotope is an atom with an unstable nucleus (excess of protons and/or neutrons). Radioisotopes are usually produced in nuclear reactors. In medicine, they are used in [diagnosis, treatment and research](#).

syringes (C1), and medical technology equipment such as electro-diagnostic apparatus (C2).

With respect to the last two product groups, the author points out that his choices might, in certain cases, underestimate or overestimate the weight of the products studied. At the most detailed level of the nomenclature (HS-6), some items include not only products that are not used exclusively in the health sector, but also other goods not intended for healthcare (in particular, in the case of certain residual categories of HS-6 products referred to as “not elsewhere classified”). Helble therefore includes only those items for which he had evidence that the products are used mainly for public health purposes or that they are goods of multiple use, health being one of them.⁴

This classification of healthcare products was used in a 2013 report, [“Promoting Access to Medical Technologies and Innovation: Intersections between public health, intellectual property and trade”, a joint study by three international organisations: WTO, WIPO and the WHO. In 2020, the Helble classification was updated for a new edition of this report.](#)⁵

2.1.3. The lists produced by the Covid-19 pandemic

With the outbreak of the Covid-19 crisis, many advances were made with statistical identification of healthcare products. National and international organisations urgently set about identifying the goods traded between countries to protect themselves from the virus and treat the disease.

As early as 20 March 2020 – nine days after the WHO declared Covid-19 a pandemic – the WCO published a first [classification reference for Covid-19 medical supplies](#). A [second edition](#) of this list was drawn up jointly with the WHO just three weeks later on 9 April 2020. There followed a series of updates of the joint WCO/WHO list: [Edition 2.1](#) on 30 April 2020 and [Edition 3.01](#) on 4 June 2020, which included links to national lists and was [updated](#) on 15 January 2022.

In December 2020, the WCO and the WHO also developed a [Classification of the INN 124 COVID-19 Special Edition list](#) proposing International Nonproprietary Names (INN) for 25 pharmaceutical substances that might be useful in the treatment of Covid-19. The purpose of giving these substances internationally recognised names was to facilitate their cross-border trade in the event that one or more of them proved efficacious in treating the disease.

Among the lists of “Covid” products proposed by national institutes following the outbreak of the pandemic, the list put together by the United States International Trade Commission (USITC) at the request of the US Congress is remarkable for its coverage. The purpose here was to assess the specific needs of the American health system and the particular supply problems facing the country. In early May 2020, a first USITC [investigation](#) produced a database of products imported by the United States in response to the pandemic. The investigation also provided information on the countries exporting these products, the value of imports per product for the years 2017-2019 and the duty rates applied. This USITC list,

⁴ “...we have attempted to include only those subheadings for which we had evidence that the use is predominantly for public health purposes or that included goods of multiple use, health being one of them” (p. 7).

⁵ The new edition of this report details Helble’s third major group further by classing orthopaedic equipment as a separate subgroup.

covering more “Covid” products than the lists produced by the WCO/WHO,⁶ was updated in [June 2020](#).⁷

Again in the context of the pandemic, but with a broader reach than exclusively “Covid” products, the WTO proposed a nomenclature of medical goods in [April 2020](#) based on a number of the abovementioned lists⁸ and the 2015 Expansion of the Information Technology Agreement (ITA-Exp).⁹ Four main groups of products are categorised: medicines, medical supplies, medical equipment and personal protective products.¹⁰ The WTO uses this classification to draw up biannual information notes on developments in trade in medical goods.¹¹ In June 2022, this organisation also published a joint report with the World Bank entitled [Trade Therapy](#) on the need for international cooperation to strengthen global health security. The study covering medical goods and services contains again slightly different product groups.¹²

Another institution that has taken up the question of trade in healthcare products in the context of the pandemic is the European Commission (EC), which launched [discussions](#) within the Ottawa Group¹³ on taking temporary and permanent measures to facilitate trade in healthcare products. The EC recommends, among other things, the elimination of customs duties¹⁴ on a large group of healthcare products. The list includes the products covered by the Pharma

⁶ At the ten-digit level of the *Harmonized Tariff Schedule* (HTS) whereas the international organisations can only refer to the six-digit level of the Harmonized System, which is much less detailed, but comparable across countries.

⁷ The USITC also published a [report](#) in December 2020 on the US industries producing COVID-19 related goods and supply chain challenges and constraints. This report helped improve the running of the country’s health system by giving greater visibility to the scale of supplies required. In October 2023, USITC released another [report](#) about COVID-19 diagnostics and therapeutics and certain flexibilities under the World Trade Organization’s (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), among other topics.

⁸ The Agreement on Pharmaceutical Products (Pharma Agreement) list, Helble’s list of public health-related products and the WCO/WHO list of Covid-19 medical supplies.

⁹ The ITA-Exp covers the HS codes corresponding to medical equipment. Concluded in 1996 by WTO members (29 countries initially and 83 in 2023), the ITA eliminated tariffs on most IT products including a number of HS-6 items relating to medical equipment. In 2015, the ITA Agreement was expanded to cover a larger number of medical products, but the expansion only concerned certain members (Albania, Australia, Canada, China, Colombia, Costa Rica, European Union, Georgia, Guatemala, Hong Kong, China, Iceland, Israel, Japan, Republic of Korea, Macao, Malaysia, Mauritius, Montenegro, New Zealand, Norway, Philippines, Singapore, Switzerland, Chinese Taipei, Thailand, and United States). The WTO estimates ([2020a](#)) that 80% of medical equipment (third group in their classification) are covered by the Expansion of the ITA, which will “eliminate the tariffs [...] for imports of technology-intensive medical equipment by 2023” (p.8).

¹⁰ Intermediate products required for the production of finished medicines are not taken into account. In addition, the WTO excludes protective garments from “personal protective” products due to the difficulty of distinguishing them from other types of clothing in the HS classification.

¹¹ The most recent information note was published in July 2022 for the 2019-2021 period (WTO, [2022b](#)). In December 2020, the publication also started studying developments in trade for a subset of “COVID-19-critical products”.

¹² Pharmaceutical products, medical equipment, orthopaedic equipment, personal protective equipment and other medical supplies. The exact list of products included in each group has not yet been made public.

¹³ Established in 2018 by [“likeminded”](#) WTO members, the group today comprises Australia, Brazil, Canada, Chile, European Union, Japan, Kenya, South Korea, Mexico, New Zealand, Norway, Singapore, Switzerland and the United Kingdom.

¹⁴ The EC recommends abolishing tariffs. However, it points out that the choice of temporary elimination could be envisaged for certain medical and protective equipment also used in other areas than healthcare.

Agreement,¹⁵ but also, as in the WTO classification,¹⁶ medical and protective equipment and medical supplies.¹⁷

2.2. The CEPII list

2.2.1. Exhaustive long-run coverage

Following the Great Recession, the slowdown in international trade raised questions about global value chain (GVC) dynamics and whether they were receding (Gaulier *et al.*, [2020](#)). In healthcare, the international fragmentation of the production chain picked up considerable speed in the 2000s, and the pharmaceutical shortages in the 2010s and stock-outs of critical products during the Covid-19 crisis revealed just how dependent national health systems had become on the smooth running of the GVCs. Since Russia's invasion of Ukraine, trade globalisation has entered a phase of geopolitical fragmentation with the transatlantic axis considering healthcare products, and biotechnologies in particular, as highly [strategic](#). Closer attention is now being paid to the resilience of healthcare supply chains, as shown by the American administration's report ([2021](#)) in its 100-day reviews and the European Commission's reviews of the European Union's strategic dependencies ([2021](#) and [2022](#)).¹⁸

At this pivotal moment in globalisation, the purpose of our work is to better identify developments in trade in healthcare products using an exhaustive nomenclature applicable to the last two decades and grouping branches by activity. This extensive coverage and long-run timeframe paint a clearer picture of GVCs in the healthcare industry grouping.

The classification was constructed by identifying all the health-related products, materials and equipment in each industry grouping using a number of classifications, the World Customs Organization's Harmonized System (HS), Eurostat's Classification of Products by Activity (CPA) and the UN's Broad Economic Categories (BEC).¹⁹ A range of sources was used (detailed below). Medical supplies in the latest edition (3.01) of the WCO/WTO classification reference and pharmaceutical substances on the List 124 were all included in our nomenclature.²⁰ Unlike Helble's classification, based on a selection, all the products on the Pharma Agreement list are included here.²¹

¹⁵ The large number of products in the four appendices to the Pharma Agreement are not included in the concept paper's list, but the EC stresses that an effort should also be made to take liberalising measures with respect to these products.

¹⁶ Nevertheless, the WTO and EC classifications present marked differences (see **methodological appendix**).

¹⁷ The EC's concept paper gave rise in June 2020 to a [joint statement](#) by Ottawa Group members outlining a set of actions to be taken in a number of areas (transparency, trade in medical supplies, e-commerce, trade facilitation, etc.). In November 2020, the Ottawa Group presented the WTO with a [Trade and Health Initiative](#) with recommendations and proposed measures to encourage cooperation, strengthen supply chains and facilitate trade in essential medical goods between WTO members.

¹⁸ In France, reports from the General Inspectorate for Social Affairs & the General Council for the Economy ([2021](#)), the French Senate (Cohen L. & de La Provôté S., [2023](#)) and the "Healthcare Product Regulation" Mission ([2023](#)) also put forward a set of proposals in response to healthcare product supply vulnerabilities.

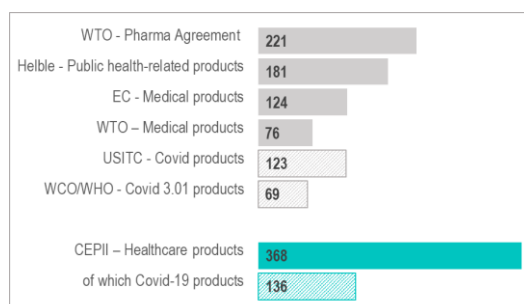
¹⁹ The **methodological appendix (A.I to A.V)** presents the methodology used to construct the production industries and details the composition of the industry grouping and its five branches for health-related products.

²⁰ In April 2020, the WCO and the WHO also produced a [list of priority medicines](#) used during the Covid-19 pandemic. See the WTO Information Note ([2021](#)) for more information on trade data for products essential to fight Covid-19.

²¹ In June 2022, the WTO published a list compiling "[information on the critical inputs for the manufacturing, distributing and administering of COVID-19 vaccines](#)". Based on the 2022 version of the Harmonized System (HS), this purely indicative and vaccine-specific list is not included in our study.

A subgroup of “Covid” products was also identified from this new healthcare nomenclature to paint a clearer picture of the effects of the Covid-19 public health crisis.

Figure 1
Number of health products internationally traded
according to the main lists



Notes: The number of products corresponds to 6-digit codes in the 1996 revision of the HS nomenclature. The “non-CEPII” lists are those mentioned in the previous section. The WCO/WHO “124” small list is not explicitly mentioned, but its seven HS-6 items are also included in the list of several organisations.

2.2.2. An industry grouping approach based on industrial branches and production stages

The purpose of constructing this new healthcare industry classification is to cover all traded products used by the health system. Five industry branches are identified to capture different activities and stages of production.

The first branch, upstream of the production process, covers “**chemicals usable in health**” (see **Appendix A.I**). It concerns mainly substances produced by organic chemistry for multiple purposes and, consequently, also used in other activities than healthcare. The products concerned are mainly *basic chemicals* (oxygen, dyes, etc.) taken from the WTO’s [Pharma Agreement](#) list. Some branch products have also been identified from the “Covid” lists such as *disinfectants*, *soap and cleaning preparations* and *diagnostic or laboratory reagents*. The classification by production stage illustrates the predominance of semi-finished intermediate goods in this branch, even though some consumer goods are also listed.

Also situated upstream, the “**basic pharmaceutical products**” branch is made up exclusively of semi-finished intermediate goods used to manufacture finished consumer goods (see **Appendix A.II**). Included in this branch are active ingredients (substances that provide the therapeutic effect in medicines: acids, alkaloids, antibiotics, essential vitamins, etc.), but also processed blood products, chemically pure sugars, processed glands and extracts of glands. Covering synthetic organic pharmaceuticals, this branch corresponds to one of the two branches of the pharmaceutical industry in product classifications (Section 21.10 of the European Union’s Classification of Products by Activity – CPA).

Further downstream and comprising mainly consumer goods,²² the “**pharmaceutical preparations**” branch covers medicaments (therapeutic sera, vaccines, etc.), contraceptive preparations or drugs, biotech pharmaceuticals, etc. (see **Appendix A.III**). It corresponds to the second branch of the pharmaceutical industry (Section 21.20 of the CPA Classification.²³)

The fourth industry grouping branch is “**medical technology equipment**” (medical imaging, respiration apparatus, implantable devices, etc.). It covers mainly electronics industry products and electrical equipment used in healthcare, as well as other instruments and supplies for medical and dental use (see **Appendix A.IV**). Some of these are covered by the WTO’s Information Technology Agreement (ITA).²⁴ This R&D-intensive branch, with its manufacturing necessitating a skilled workforce, covers mainly capital goods alongside a small number of parts and components and consumption goods.

The last branch, “**small medical materials**”, covers more low value-added products produced by a wide range of industries: textiles, paper, rubber, plastic, glass, metals, electronics, machines, vehicles, etc. It includes materials, garments and accessories that can be classed as intermediate goods (semi-finished, and parts and components), capital goods and consumer goods (see **Appendix A.V**).

Table 1
Breakdown of healthcare products by branch
(number of 1996 hs-6 products over the 2000-2021 period)

	Total	Chemicals usable in health	Basic pharmaceutica l products	Pharmaceutical preparations	Medical technology equipment	Small medical materials
WTO - Pharma Agreement	221	149	61	11		
Helble - Public health-related products	181	64	54	20	27	16
EC - Medical products	124	11	39	19	33	22
WTO – Medical products	76	12	3	16	23	22
USITC - Covid products	123	29	14	13	17	50
WCO/WHO - Covid 3.01 products	69	14	2	1	13	39
CEPII – Healthcare products	368	164	66	21	45	72
<i>of which Covid-19 products</i>	<i>136</i>	<i>32</i>	<i>15</i>	<i>13</i>	<i>19</i>	<i>57</i>

This nomenclature drawn up at the most detailed level of the Harmonized System (1996 HS 6-digit level) is publicly available on the CEPII website ([CSV file on line](#)). The relevant branch is given for each product. The **methodological appendix (A.I to A.V)** also details the list(s) in which each of the products can be found.

²² Most trade flows correspond to consumer goods, but some semi-finished products necessitating minor processing to be usable are also included in this branch.

²³ With the exception of HS 212024 (wadding, gauze, bandages impregnated for medical use, dressings and catgut) classed in the “small medical materials” branch.

²⁴ See footnote 11 on the ITA.

3. A key industry grouping in international trade

3.1. Increasing trade in products, especially in pharmaceutical preparations

Over the last two decades, healthcare product trade has posted virtually constant growth. In 2021, trade stood at 12.7% of world trade in manufactured goods.²⁵ That year, only four industry groupings topped 10% with healthcare in second place just behind electronics and overtaking transport equipment and mechanical engineering (**Figure 2**).²⁶

The healthcare industry grouping also presents the strongest growth of the ten industry groupings in our breakdown²⁷ (+4.4 percentage points from 2000 to 2021). In the 2000s, world trade in healthcare products posted a fairly similar growth rate to the average rate for manufacturing, but it was not as hard hit as manufacturing by the Great Recession of 2008 and has been more buoyant than the manufacturing sector since the mid-2010s (see **Figure A.1** in the appendix). The healthcare industry grouping stood out even more in 2020 and 2021 as the Covid-19 pandemic triggered massive needs for healthcare products worldwide. So the healthcare industries played a full part in the phase of hyper-globalisation up to 2008 and, furthermore, continued its rapid growth in the 2010s despite being the *slowbalisation* decade.²⁸ The key role of international trade in the supply of these essential goods therefore grows steadily stronger.²⁹

²⁵ This paper on the whole excludes energy products from the manufacturing sector due to the sharp variations they create in flow values.

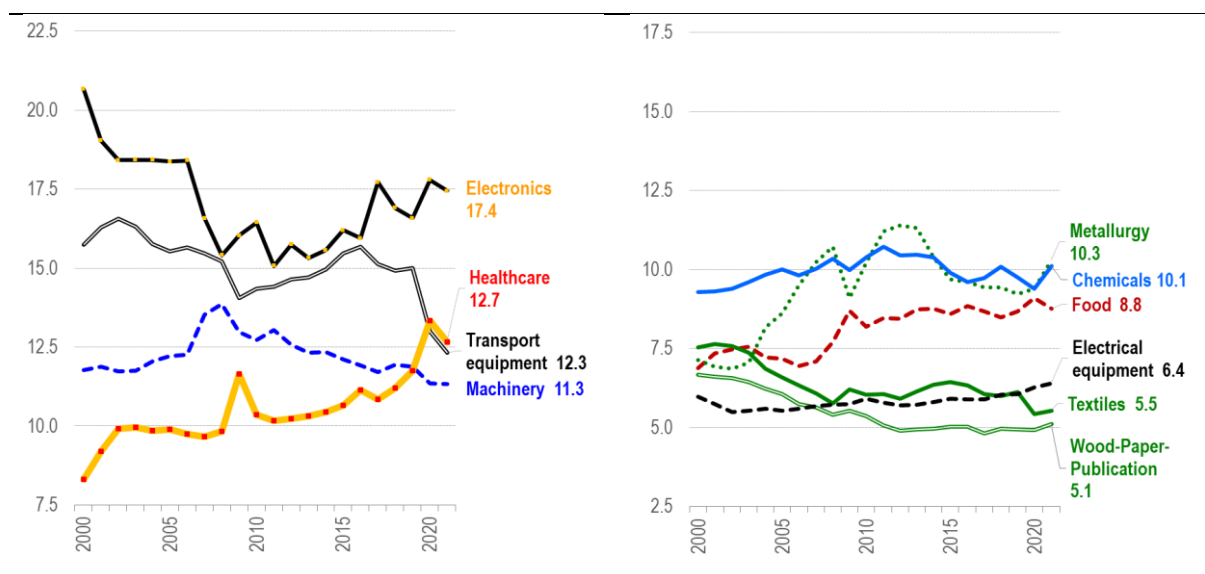
²⁶ **Appendices A.1 to A.7** present the breakdown of world trade in goods by industry groupings, branches, stages, ranges and types over the 2017-2021 period. The energy industry grouping is included here.

²⁷ An 11th residual industry grouping covering waste recycling and products not classed elsewhere (see **Appendices A.1 to A.7**) is not represented here.

²⁸ Following the Great Recession, the steam went out of world trade flows, as seen from both rates of growth in trade and the trade openness indicator, a development that [The Economist](#) called *slowbalisation*

²⁹ The backslide in the share of the healthcare industry grouping in 2021 can be explained by the different impacts of the inflationary shock by industry. Although healthcare products were affected by the upsurge in inflation, the impact of the increase in transport costs and commodities was more marked for other goods (semi-conductors, etc.).

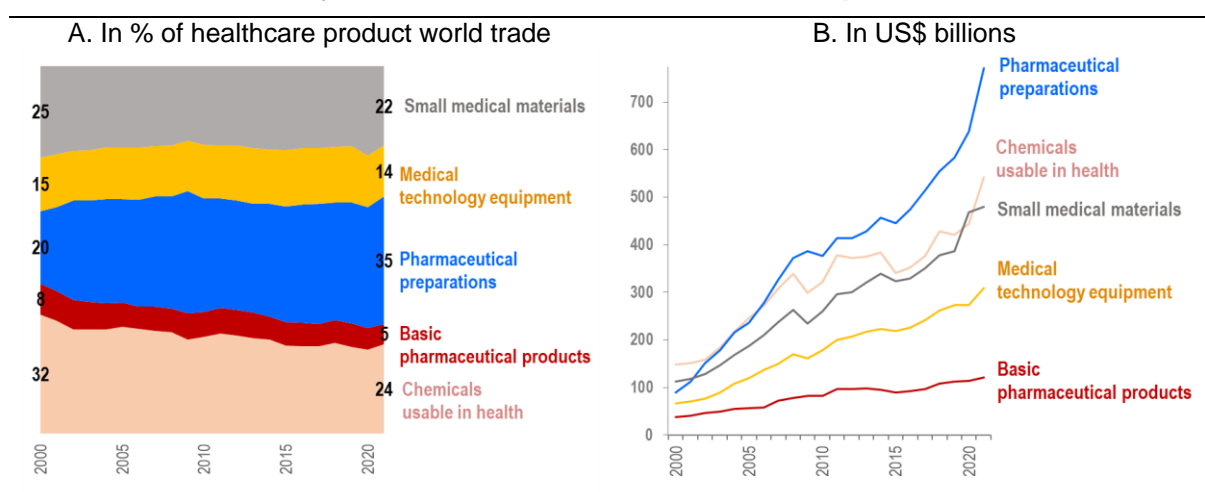
Figure 2
Manufacturing world trade breakdown by industry grouping
(excluding energy), 2000-21 (in %)



Source: authors' calculations based on CEPII, BACI database V202301.

The healthcare industry grouping's buoyancy owes a great deal to the boom in trade in pharmaceutical preparations, which accounted for 35% of the total trade in 2021, an increase of 15 percentage points over 2000 (**Figure 3**). The branches of chemicals usable in health and small medical materials, for which international demand exploded during the Covid-19 crisis, each accounted for more than one-fifth of the industry grouping's trade in 2021 (24% and 22% respectively). The weight of medical technology equipment was smaller (14%) while the weight of basic pharmaceutical products stood at just 5%, even though basic pharmaceutical products play a key role in the manufacture of pharmaceutical preparations.

Figure 3
Breakdown by branch of world trade in healthcare products, 2000-21



Source: authors' calculations based on CEPII, BACI database V202301.

A comparison of healthcare product branches with other branches paints a clearer picture of their buoyancy in international trade. In terms of growth, pharmaceutical preparations rank first

across all 32 branches of the manufacturing sector,³⁰ medical technology equipment ranks third and small medical materials rank fourth (10.8%, 7.6% and 7.1% respectively in terms of average annual growth rate for 2000-21).³¹ Growth is also strong for chemicals usable in health, in 10th place with 6.4%. The boom in pharmaceutical preparations is such that trade in value terms has risen by a multiple of 8.6 since 2000³² (6.5 over the 2000-19 period, which excludes the health crisis years), whereas trade in value terms for the other four branches “only” increased threefold or fourfold.³³

In 2021, the weight of pharmaceutical preparations in world trade in manufactured goods made it the number six branch (4.4%), not very far behind electronic components & circuit boards and the chemical industry (**Figure 4**).³⁴ The overall increase in the branch’s share in manufacturing world trade (+2.8 percentage points since 2000, see **Figure A.2** in the appendix) covers different growth rhythms depending on the manufacturing method for the traded medicaments: pharmaceutical preparations other than “classical” medicine,³⁵ i.e. most biotech medicines, now represent 43% of the branch’s world trade, as opposed to 14% in 2000.

³⁰ Our sector breakdown contains a 33rd residual branch covering products not classed elsewhere (see **Appendices A.1** to **A.7**), which is not taken into consideration here.

³¹ These growth rates obviously also reflect distinct product price dynamics by branch. For example, Cotterlaz *et al.* (2022a) show that prices for pharmaceutical preparations have risen much more sharply than basic pharmaceutical product prices over the last 20 years, especially in the first decade when they rose twice as fast.

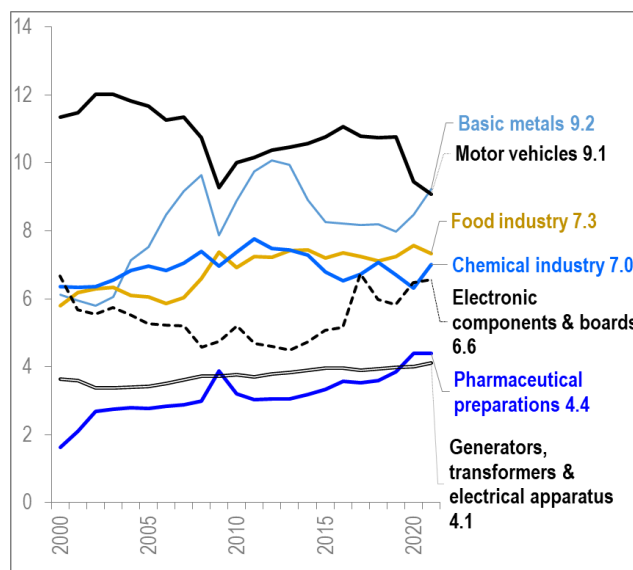
³² In the 2000s, the weight of all pharmaceuticals (basic products and preparations) in world goods trade rose sharply (see Cotterlaz *et al.*, 2020 for an analysis covering the period starting in the late 1960s).

³³ Trade grew by a multiple of 3.7 in chemicals usable in health and 3.1 in basic pharmaceutical products (2.9 and 3 respectively over the 2000-19 period); 4.6 in medical technology equipment (4.1 over 2000-19) and 4.3 in small medical materials (3.4 over 2000-19). By way of comparison, trade rose by a multiple of 3.2 (2.8 over 2000-19) for the entire manufacturing sector excluding energy.

³⁴ Chemicals usable in health and basic pharmaceutical products have posted a stable weight in world trade since 2000 at around 3% for the former and just 0.7% for the latter. The share of small medical materials rose from 2.1% to 2.7% over 2000-2021 and the share of medical technology equipment rose from 1.2% to 1.8% (**Figure A.2** in the appendix).

³⁵ The products included in this category are listed in the note under **Table A.III** in the **methodological appendix**.

Figure 4
Weight of the seven largest manufacturing branches in 2021
(in % of manufacturing world trade excluding energy, 2000-21)



Source: authors' calculations based on CEPII, BACI database V202301.

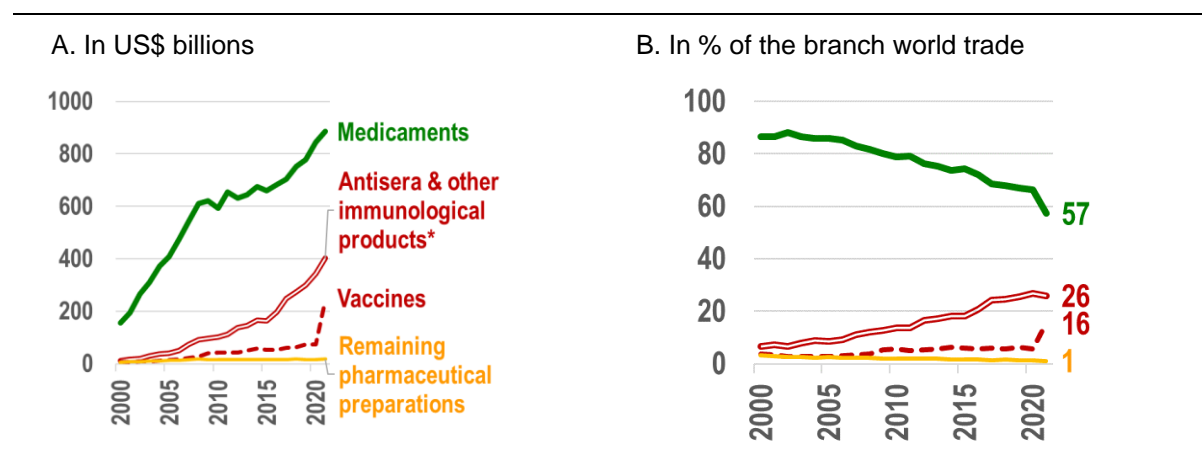
A clearer picture can be gained of the major transformations in the pharmaceutical industry and the effects of the recent healthcare shock by distinguishing a number of product categories in pharmaceutical preparations (**Figure 5**). As pointed out by Kyle and Perrot (2021, p.2), the shift “from chemistry to biotechnology and genomics” considerably changed the nature of innovations in the pharmaceutical industry and the organisation of its activities. These changes naturally influenced international trade trends. For example, over one-quarter (26%) of the branch’s trade in 2021 was in a category of goods covering antisera and other immunological products (such as monoclonal antibodies), an increase of approximately 20 percentage points from 2000. Other pharmaceutical preparations of interest are vaccines, which represented no more than 6% of the branch’s trade before the health crisis, but which saw remarkable growth in trade with the rapid development of Covid vaccines: their weight grew 10 percentage points in 2021 alone. The joint [WTO-IMF COVID-19 Vaccine Trade Tracker](#) reports that the number of doses exported posted virtually constant growth up to December 2021 (800 million) and then fell off (less than 200 million in May 2022 when the tracker was closed).³⁶ Yet this boom in trade did not make for equitable access to Covid-19 vaccines worldwide (WTO, 2022a, WB and WTO, 2022).³⁷ Vaccine equity was made even harder by massive global demand and the complex production process for vaccines and their inputs³⁸ concentrated in a small number of countries (Evenett *et al.*, 2021; Bown & Bollyky, 2022).

³⁶ A joint study by the WTO and the World Bank (2022) finds that 4.4 billion doses of COVID-19 vaccines were exported in 2021 for a total of 11.7 billion doses produced. The main exporters were the European Union, China and the United States. Pre-pandemic, the world manufactured roughly 1.5 billion doses of vaccines per year.

³⁷ “Developing countries in Africa, for example, had received just 3.2 vaccine doses per 100 people, compared to 75 doses per 100 for people in advanced countries, as of June 2021.” (WTO, p. 18, 2022a). Less than 10 percent of the population in poor countries were inoculated by the end of 2021 (WB and WTO, 2022).

³⁸ A WTO report estimates that (p. 87, 2022a), A typical vaccine manufacturing plant uses about 9,000 different materials sourced from some 300 suppliers in approximately 30 different countries. The development of Covid-19 vaccines also drove growth in trade in vaccine ingredients.

Figure 5
International trade in pharmaceutical preparations by product group, 2000-21



Notes: *Antisera & other immunological products are notably derived from biotechnology. The products included in each category are listed in the note under **Table A.III** in the **methodological appendix**.

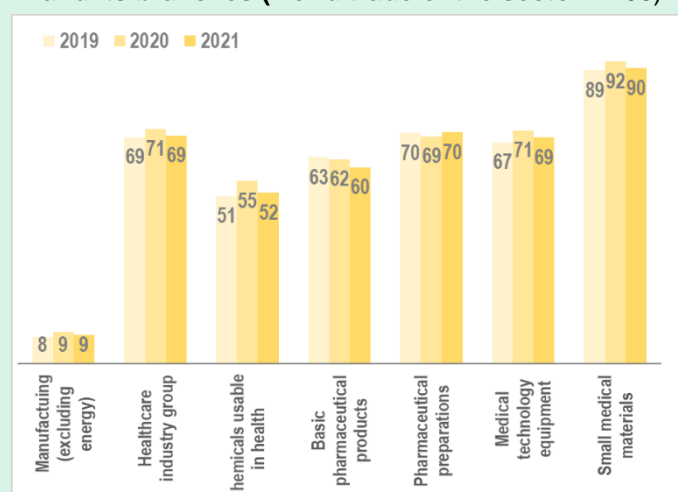
Source: authors' calculations based on CEPII, BACI database V202301.

Box

International trade in “Covid-19” products

A focus on “Covid-19” products reveals that, during the pandemic, national health systems imported products from across the entire healthcare industry grouping for the prevention and treatment of the virus. This can be seen from the growing lists of “Covid-19” products in 2020 and 2021 discussed in **Section 2**. These lists ended up covering some 70% of the industry grouping’s trade (see the figure below). The goods were obviously not used exclusively in response to the public health crisis and the trade they represented contributed to health system action against other pathologies. Their relative weight in the industry grouping’s trade was more or less stable over the 2019-2021 period, i.e. from pre-pandemic year through the outbreak year, when small medical materials were in short supply before being massively traded, to the year when vaccines produced to eradicate the virus were put on the international market. The branch of small medical materials was the most concerned during the Covid-19 pandemic with approximately 90% of trade in products potentially useful against the virus.³⁹

Evolution from 2019 to 2021 of the “covid-19” product share in world trade for manufactured goods (excluding energy), the healthcare industry grouping and its branches (world trade of the sector = 100)



Source: authors' calculations based on CEPII, BACI database V202301.

³⁹ Chiappini and Guillou (2020) show that France had problems securing supplies of medical products and equipment during the pandemic (including medical protective textiles, face masks, ventilators, diagnostic reagents, etc.).

3.2. Predominance of trade in intermediate products

The manufacture of healthcare products is closely associated with the international division of production processes: in 2021, over half of the trade in the industry grouping concerned semi-finished intermediate goods (products already processed for a downstream stage) whereas these goods accounted for “merely” one-third of world trade in manufactured products (**Figure 6.A**).⁴⁰ In the branches, all basic pharmaceutical products and 92% of chemicals usable in health are semi-finished products (**Figure 6.B**). Although the share of this stage is lower, it is still higher than the average for manufacturing in both pharmaceutical preparations (43%) and small medical materials (35%). However, medical technology equipment, by its very nature, posts zero trade in semi-finished intermediate goods. This branch posts trade (barely 4%) solely in parts and components, which are finished intermediate products also for a downstream stage of the production process.

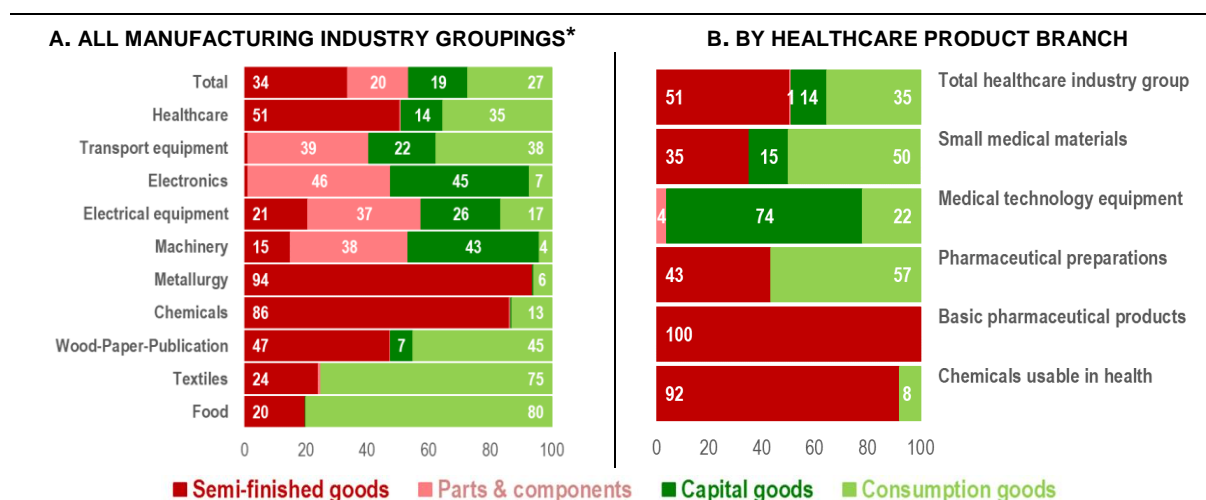
Further downstream, finished goods traded in the healthcare industry grouping are primarily consumption goods: 35% of total trade as opposed to 14% for capital goods (mainly medical technology equipment) in 2021.

The structure of the healthcare branches by production stage remained stable over the 2000-2021 period, with the exception of pharmaceutical preparations where semi-finished products more than doubled (**Figure A.3** in the appendix). This leap in intermediate products might be interpreted as an international value chain development if there were a clear distinction compared with finished goods. Over half of pharmaceutical preparations are consumption goods (57% in 2021) and only minor processing is often performed on the semi-finished products making up the rest to attain their end use. Such is, for example, the case with vaccines, antisera and other immunological products. These “nearly finished products”⁴¹ are behind the sharp increase in trade in pharmaceutical preparations in 2021 (see **Figure A.4** in the appendix).

⁴⁰ Trade in intermediate goods already accounted for 49% of the healthcare industry grouping’s international trade in 2019 prior to the pandemic.

⁴¹ The classification of pharmaceutical preparations contains just 21 product categories and is too aggregate and inappropriate to track technological innovations in this branch. As mentioned in the **methodological appendix**, item HS300490 (medicaments; consisting of mixed or unmixed products, for therapeutic or prophylactic uses, packaged for retail sale not elsewhere classified) is a good illustration of this. It accounted for 44% of world trade in pharmaceutical preparations in 2021 covering an apparently vast range of products.

Figure 6
Breakdown by production stage
2021 (in % of industry grouping or branch world trade)



*Manufactured goods (excluding energy).

Source: authors' calculations based on CEPII, BACI database V202301.

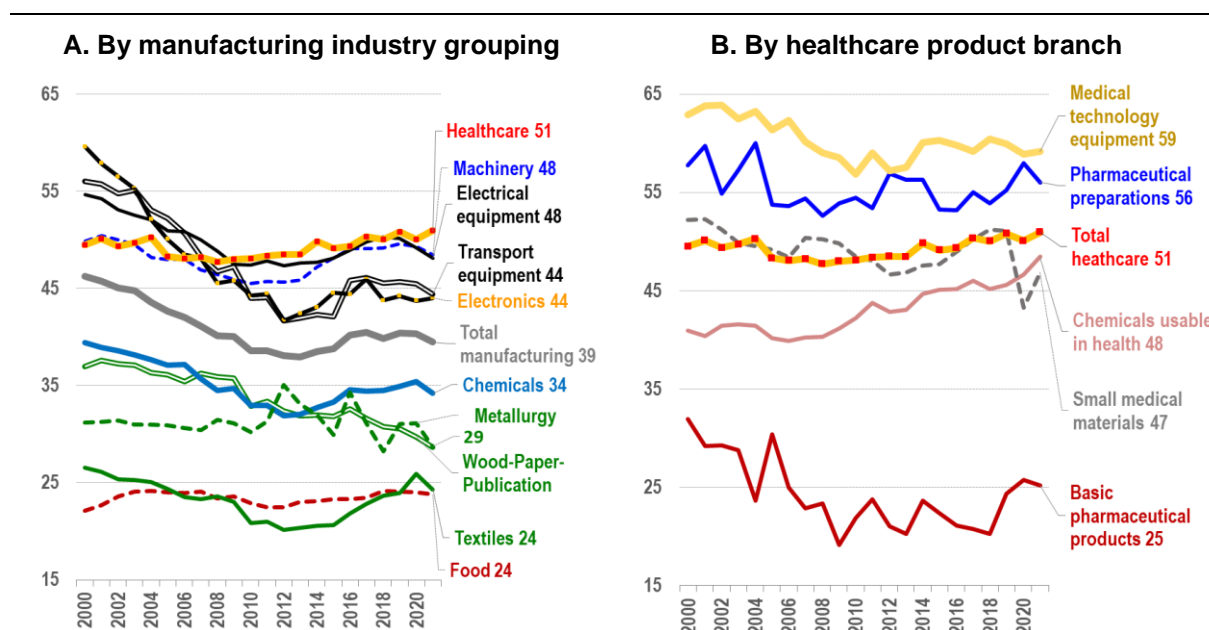
3.3. Leader in two-way trade in products

The tangled web of healthcare product trade channels, in pharmaceuticals in particular, makes it very complicated for public policymakers to identify strategic dependencies and hence vulnerabilities (European Commission, 2021). The importance of two-way trade in similar products between countries provides a good illustration of the complexity of the division of labour in this industry. Unlike one-way trade flows in patently different products, this type of trade consists of simultaneous purchases and sales of a given product (here at the six-digit level of the Harmonized System) between two countries.

There is more to the explanation for two-way trade in products with the same technical characteristics than “traditional” comparative advantages due to differences in the costs of factor inputs and available resources in each country. An entire combination of reasons provides insight into this complex trade such as economies of scale on vast markets (such as the European Union and the United States with consumers with similar tastes and producers with the same technologies), export firm behaviour, consumers’ love of variety and underlying rationales for offshoring activities.⁴²

⁴² See the highly comprehensive WTO [World Trade Report 2008](#) on the subject.

Figure 7
Share of two-way trade in the manufacturing sector*
(in % of sector aggregate world trade, 2000-21)



Notes: * Manufactured goods (excluding energy). Two-way trade flows are calculated here by subtracting one-way trade flows from the total value of the industry grouping's trade (see the methodology in [CEPII Panorama No.2023-01](#)). Two-way trade in similar products is broken down into two-way trade in variety and in quality (see **Figure A.5** in the **appendix of complementary illustrations**).

Source: authors' calculations based on CEPII, BACI database V202301.

Healthcare products represented the industry grouping in which two-way trade in similar products was the highest in manufactured goods in 2021 (**Figure 7.A**): 51% of the industry grouping total as opposed to 48% in both mechanical engineering and electrical equipment, 44% in both transport equipment and electronics, and 39% for the entire manufacturing sector excluding energy. Yet it is not so much the weight of two-way trade as its relatively stable growth that differentiates the healthcare products from the other industry groupings mentioned.

On average in the manufacturing industries, this type of trade posted considerable growth in the 1980s, reaching its peak on the eve of the 2000s. As shown by **Figure 7A**, it then entered a phase of relative decline to the benefit of one-way trade. Inter-industry trade, driven by initially very low labour costs in China, transformed this demographic giant into a global workshop. The trade integration of other emerging countries also contributed to this increase in two-way trade in the 2000s. Yet the Great Recession of 2008 saw advanced countries falling back on their mutual trade and sped up the shift in the Chinese outward-oriented growth model to domestic demand. The 2010s were subsequently marked by a subtle upturn in intra-industry trade.

However, there was no relative decline in two-way trade in the healthcare industry grouping at the height of hyper-globalisation. Other interesting information is brought to light by observing its branches in detail, in particular the extraordinary configuration of basic pharmaceutical products (**Figure 7.B**). One-way flows dominated in this branch throughout the 2000-2021 period (75% in 2021), whereas the weights of two-way flows in the four other branches of the industry largely exceeded the manufacturing average: 59% in medical technology equipment

in 2021, 56% in pharmaceutical preparations, 48% in chemicals usable in health and 47% in small medical materials. The particularity of basic pharmaceutical products could be due to mono-sourcing strategies⁴³ by pharmaceutical multinationals upstream of the production process (in particular, for active ingredients) in the 2000s. Another striking fact in small medical materials is that 2020 saw a transient collapse in two-way trade flows due to the Covid-19 pandemic and temporary restrictions on trade in personal protective equipment (see **Section 2**).

3.4. Polarised unit value ranges

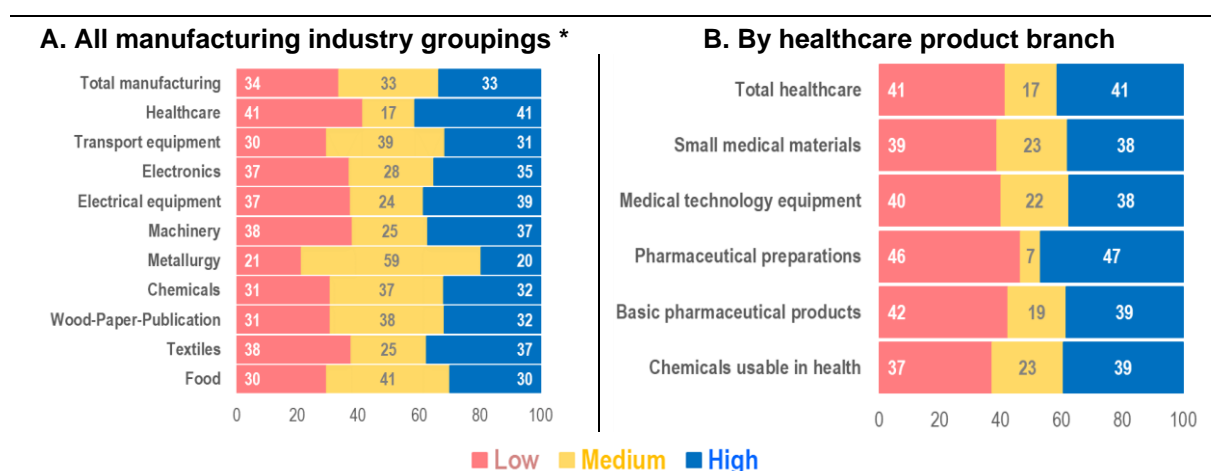
Trade flows can be classified into distinct ranges by using unit value as proxies for prices of internationally traded products. We compare the unit value (i.e. value divided by quantity) of each elementary flow at the exporter-importer-product-year level to a reference unit value at the product level. If the unit value significantly exceeds the reference unit value, it indicates that this specific flow is rather a high range flow. Conversely, if the unit value is substantially lower than the reference unit value, it suggests that the flow belongs to the low range category.⁴⁴

An analysis of the structure of world trade by unit value range reveals another healthcare industry grouping particularity: the proportion of medium range products is not only the smallest (17% in 2021, **Figure 8.A**), but has also been trending sharply downwards for two decades (-9 percentage points since 2000, **Figure A.3.C** in the appendix). The remaining 83% are evenly distributed between the high and low ranges.

⁴³ Nevertheless, two-way trade between two countries does not capture the diversification of supplier firms within a given country. Yet, given the high level of concentration of trade by companies at national level, two-way trade does offer some interesting preliminary insights, especially in the light of recent debates on “friendshoring”.

⁴⁴ A unit value range is assigned to each elementary flow depending on its unit value relatively to a world reference. This reference corresponds to the world median of all unit values weighted by the value of their flow for a given year. The three unit value ranges for each flow at the country-partner-product-year level are defined as follows: high unit value range, if the product unit value exceeds the world reference by at least 15%; medium unit value range, if the product unit value ranges between +/-15% around the reference; low unit value range, if the product unit value is below the reference by at least 15%.

Figure 8
Breakdown by unit value range
2021 (in % of industry grouping or branch world trade)



Notes: * Manufactured goods (excluding energy). For calculations of unit value ranges see the methodology in [CEPII Panorama No.2023-01](#).

Source: authors' calculations based on CEPII, BACI database V202301.

This strong polarisation of trade in terms of ranges observed in all five healthcare branches (**Figure 8.B**) comes as no surprise. The weight of investment in R&D is substantial for certain healthcare products such as medicines and medical technology equipment; the most innovative products are expensive and margins remain high while these products are protected by patents. At the same time, trade has grown in other low-range “generic” products from both advanced and emerging countries (see **Section 4** below), such as generic drugs and active ingredients produced today in India and China.

The polarisation of ranges is striking in pharmaceutical preparations where just 7% of world trade was medium range in 2021 (14% in 2000, **Figure A.3** in the appendix). As mentioned before, this low proportion could be due to the co-existence of very high and low quality products in the branch, with the growth in both high-cost innovative and low-range generic products in trade.⁴⁵

4. Increasing interdependencies between advanced and emerging countries

4.1. Sustained strength of engagement by advanced economies

Although the Covid-19 shock triggered shortages of vital medicines in advanced countries,⁴⁶ these countries continue to dominate the global healthcare products market. Moreover, this superiority is unrivalled across the ten industry groupings in our breakdown. In 2021, 73% of

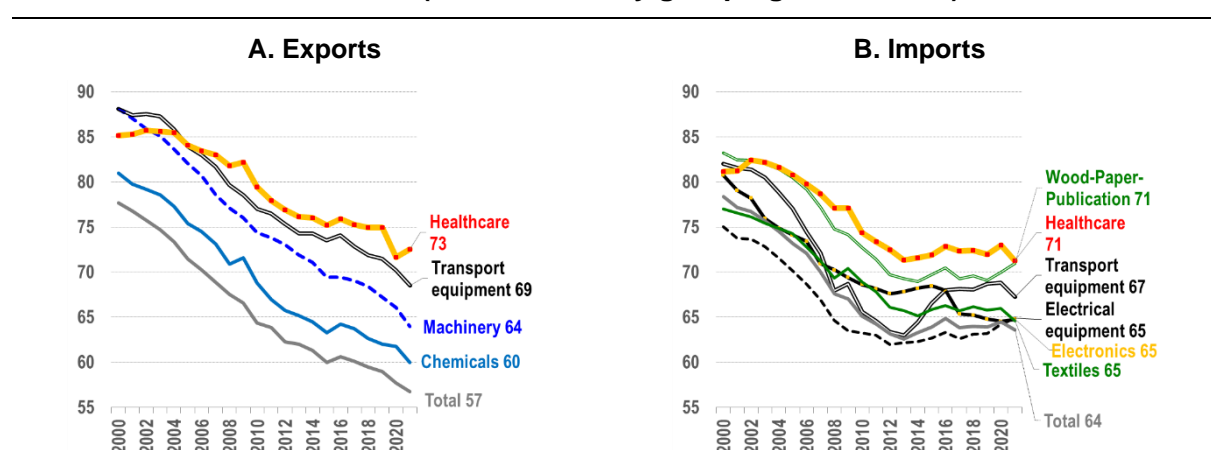
⁴⁵ However, caution should be taken with interpretation here since this low level could also be the result of a statistical artefact due to too high a level of product aggregation at an HS-6 level, which would be responsible for greater product category heterogeneity in pharmaceutical preparations (see **methodological appendix**).

⁴⁶ Advanced countries are defined here in keeping with the [IMF classification](#) and number 41: Andorra, Australia, Austria, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Macao SAR, Malta, The Netherlands, New Zealand, Norway, Portugal, Puerto Rico, San Marino, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom and United States. The emerging and developing countries correspond to the rest of the world (all other countries in the BACI bilateral trade flows database).

world exports in the healthcare industry grouping came from advanced countries, whereas these countries accounted for 57% of global manufacturing sector sales (**Figure 9.A**). Although the advanced economies lost ground in healthcare to the rest of the world (-12.6 percentage points over 2000-2021), they lost much more market share in manufactured products (-20.9 percentage points).

The advanced countries are also the leading importers as the destination for 71% of world healthcare product sales (as opposed to 64% for the manufacturing sector), a level achieved by just one other industry grouping, namely “wood, paper and printing” (**Figure 9.B**). All in all, the advanced countries have made huge earnings in the healthcare industries over the last two decades, with the exception of 2020 marked by the Covid-19 shock. Healthcare products make the second largest contribution to their balance of trade behind the chemical industry grouping and ahead of the mechanical engineering and transport equipment industries (**Figure 10**). Unlike these latter two industry groupings, which are losing ground in terms of their comparative advantages, the advanced countries are increasingly engaging in healthcare products.

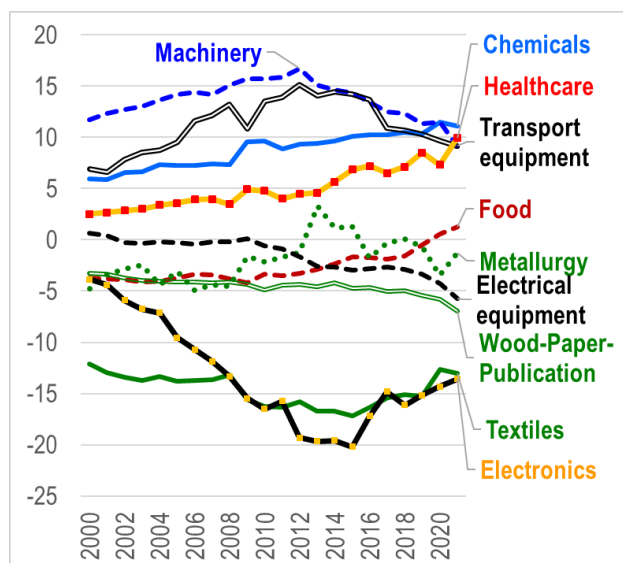
Figure 9
Share of advanced countries in manufacturing trade* by industry grouping
2000-2021 (in % of industry grouping world trade)



Notes: * Manufactured goods (excluding energy). Advanced countries as defined by the IMF. The graphs show only those industry groupings in which the share of advanced countries is greater than their weight in manufacturing world trade (excluding energy) in 2021.

Source: authors' calculations based on CEPII, BACI database V202301.

Figure 10
Advanced countries' trade specialisation*
by manufacturing industry grouping, 2000-2021**



Notes: *Contributions of industry groupings to the trade balance, in thousandths of the advanced countries' total trade (see the methodology in [CEPII Panorama No.2023-01](#)). Advanced countries as defined by the IMF. ** Manufactured goods (excluding energy)

Source: authors' calculations based on CEPII, BACI database V202301.

4.2. Growth in trade between advanced and emerging countries,⁴⁷ but also in trade between emerging countries

In 2021, over half of international trade in healthcare products was between advanced countries (54% of world trade flows, **Figure 11.B**). This trade between advanced countries has declined since the 2000s (-16 percentage points) due to their exports to emerging and developing countries. This shift has not undermined the advanced economies' predominance on the market. Nevertheless, the emerging and developing countries are posting growth in terms of both their exports to advanced countries and their intra-zone trade. Bilateral "advanced/emerging & developing" trade flows are now at comparable levels, at approximately 18% of world healthcare flows in 2021. This fact illustrates the increased interdependencies between the two zones, although this needs to be put into perspective in the light of developments in the manufacturing sector as a whole. The emerging & developing countries' export market shares stood at 28% in total in the healthcare industry grouping in 2021, a much lower percentage than for manufactured products as a whole⁴⁸ (43%, **Figure 11.A**).

The advanced countries' ultra-dominant position in healthcare products is found in all branches with the exception of small medical materials (**Figure A.6** in the appendix). They still corner

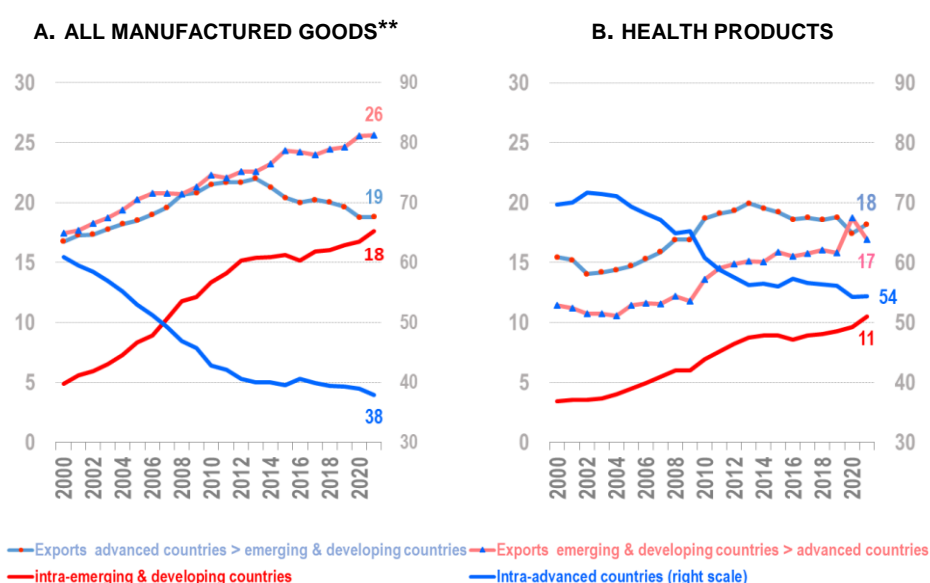
⁴⁷ Here, as in the rest of the document, the term "emerging countries" is often used for the sake of narrative fluidity. It refers in effect to all emerging and developing countries. Therefore, only two blocs are considered: advanced countries versus the rest of the world.

⁴⁸ Moreover, just 10% of trade in healthcare products was between emerging & developing countries as opposed to 20% for the entire manufacturing sector excluding energy.

over 70% of export market shares in four of the five branches. Their supremacy is paramount in pharmaceutical preparations with close on or over 90% of world exports since 2000.⁴⁹

Small medical materials stand out from the other four branches for the substantial penetration of emerging & developing countries in world exports: their share has grown 20 percentage points since 2000 and now stands at over half of world trade. They sell mainly to the advanced countries, whose backslide in these low value-added products comes as no surprise. Nevertheless, as the Covid-19 shock showed, it is important for them to secure supplies overseas, in particular by diversifying the geography of their purchases for certain products such as face masks in which China holds a virtual monopoly.⁵⁰

Figure 11
Advanced* versus emerging & developing countries
bilateral and intra-zone trade (in % of sector world trade, 2000-21)



Notes: * Advanced countries as defined by the IMF. ** Manufactured goods (excluding energy).

Source: authors' calculations based on CEPII, BACI database V202301.

4.3. Predominance of advanced countries in two-way trade

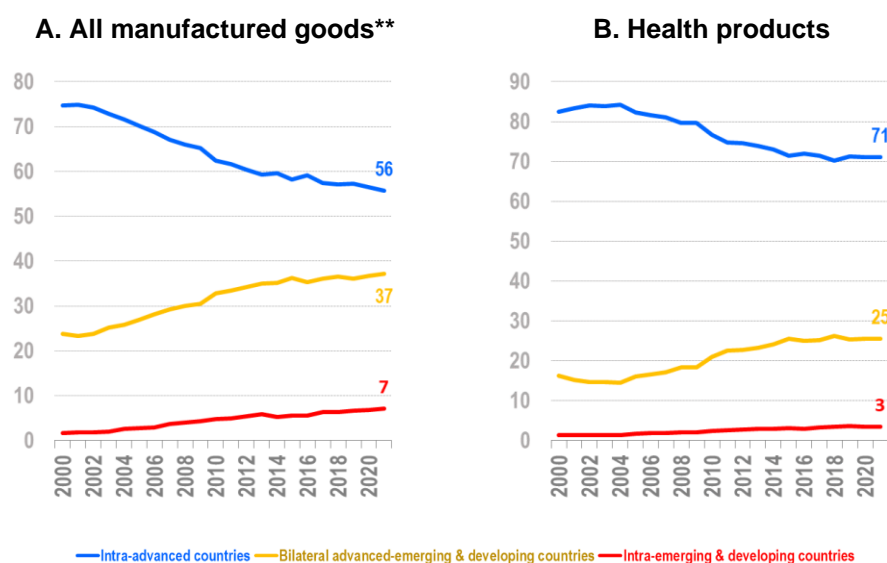
Two-way flows of healthcare products concern mainly trade between advanced countries (**Figure 12.B**). The relative similarity of their production equipment – with similar technological and skilled workforce levels compared with those of the emerging & developing countries – enables them to make economies of scale (see **Section 3**). However, bilateral trade has grown to represent one-quarter of two-way trade today. And even though the emerging & developing countries still play a small role, that role can be decisive in the production of certain products. Although two-way trade between advanced countries still takes the lion's share in each of the

⁴⁹ In pharmaceutical preparations as in basic pharmaceutical products, two closely connected branches, the main developments in terms of geography of trade came about in the 2000s when pharmaceutical industry activities saw a new global structure put in place (see Cotterlaz *et al.*, 2022a).

⁵⁰ Moreover, the situation can differ between advanced countries with a more or less strong dependence on imports of small medical materials. For example, unlike Germany, France has had a trade deficit in this area for 20 years (Cotterlaz *et al.*, 2022b).

five branches (**Figure A.7** in the appendix), in pharmaceutical preparations in particular (87% in 2021), bilateral trade with the rest of the world nonetheless posts fairly high levels in two branches: small medical materials (39%) and also medical technology equipment (36%). It is interesting to note that “advanced/emerging & developing” interdependencies are now mentioned mainly with respect to the manufacture of medicines, when they appear to be much stronger in other healthcare products.

Figure 12
Advanced* versus emerging & developing countries
bilateral and intra-zone two-way trade (in % of sector world trade, 2000-21)



Notes: * Advanced countries as defined by the IMF. ** Manufactured goods (excluding energy). Two-way trade flows are calculated here by subtracting one-way trade flows (exports plus imports) from the total value of the industry grouping's trade (see the methodology in [CEPII Panorama No.2023-01](#)).

Source: authors' calculations based on CEPII, BACI database V202301.

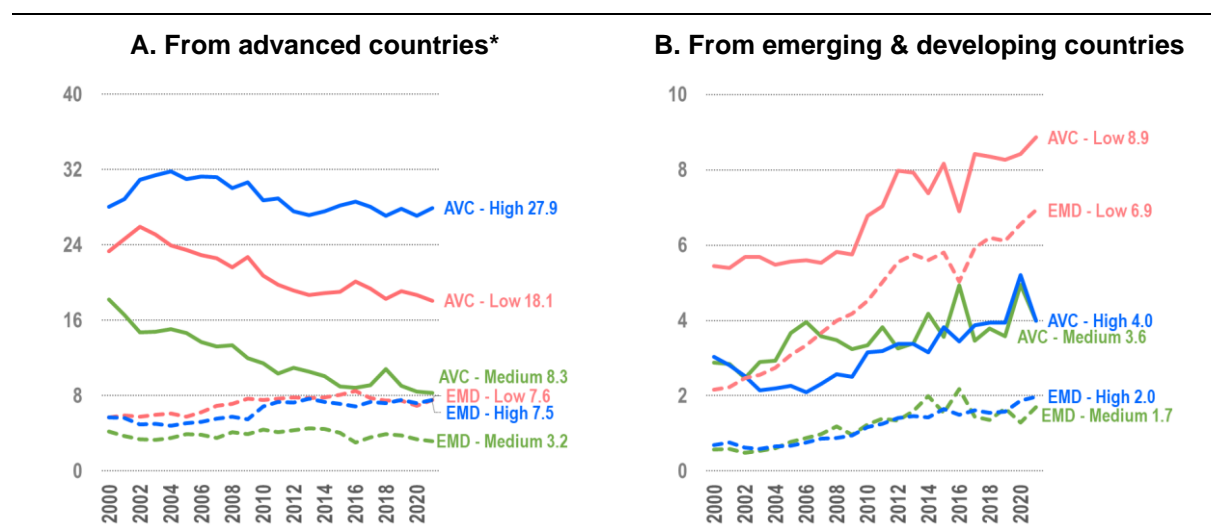
4.4. Emerging countries positioned in the low range

A focus on quality/price ranges⁵¹ reveals a different positioning for the economies based on their level of economic development. The rise of the emerging & developing countries is found mainly in the low range due to sales to advanced countries and the boom in their intra-zone trade (**Figure 13**). At the same time, a steady decrease is found in trade in this range between the advanced countries, which suggests the substitution of part of these flows for purchases from the rest of the world. This type of transfer is also found at work to a lesser extent in the medium range. So the advanced countries' position as a trading power across the entire industry grouping does not prevent them from now sourcing their low-range products more from the rest of the world. The weight of the emerging & developing countries in the low range has grown for each of the five branches, both in bilateral trade with the advanced countries and in intra-zone trade (**Figure A.8** in the appendix). In 2020, the health crisis triggered a

⁵¹ A quality/price range is assigned to each elementary flow (country, partner, product and year) based on the difference in its unit value (value to exported or imported quantity in tonnes) relative to a world reference (see the methodology in [CEPII Panorama No.2023-01](#)). Note that unit value differences may partially reflect the capacity of multinational corporations to place their profits in the most advantageous jurisdictions in terms of tax, which are generally advanced countries.

temporary upward shock in exports of medium and high ranges to advanced countries. This concerned mainly sales of small medical materials, products in which they are now in a position of strength, but demand from the advanced countries rose only in the space of one year.

Figure 13
Exports of healthcare products by partner and unit value range
in % of world trade in the healthcare industry grouping, 2000-21



Notes: * Advanced countries as defined by the IMF. AVC, advanced countries; EMD, emerging & developing countries. For calculations of unit value ranges see the methodology in [CEPII Panorama No.2023-01](#).

Source: authors' calculations based on CEPII, BACI database V202301.

5. Conclusion

International trade in healthcare products took off in the 2000s on a wave of global trade openness prompted by the creation of the WTO following the Uruguay Round in 1994. It was against this backdrop that the plurilateral Pharma Agreement was negotiated for the first time between advanced countries. Its list of products subject to the elimination of customs duties was expanded by subsequent negotiations. The opening up of the emerging countries to trade and the application of more or less binding environmental standards by geographic area also had a decisive impact on healthcare product manufacturing, which has become increasingly internationalised along the value chains. This has further obscured the traceability of these essential goods.

The scattered and inadequately detailed classification of healthcare products in the international trade and production nomenclatures (across chemicals, electrical equipment, electronics and textiles) muddies the picture even further. Mathias Helble is the first person to have grouped these products together in one list to analyse the weight of and growth in imports meeting the needs of the national health systems. His study, conducted following the Great Recession of 2008 marking the end of hyper-globalisation, questioned the benefits of the buoyancy of international trade in such a key domain. In 2020, the Covid-19 shock clearly drove home the importance to governments of health security and trained the spotlight on the industrial sovereignty issues raised by the international organisation of production.

The list of healthcare products used in this paper was drawn up along the lines of Helble's study and works by international and national organisations in response to the Covid-19 pandemic. Available on the CEPII website, this list includes all traded products used by the health system. This is the first time that such a far-reaching list of the healthcare industry grouping has been drawn up, comprising 368 products from the six-digit Harmonized System Nomenclature (1996 version). The products are classified in five branches covering medicinal products and all their compounds, medical technology equipment and small medical materials.

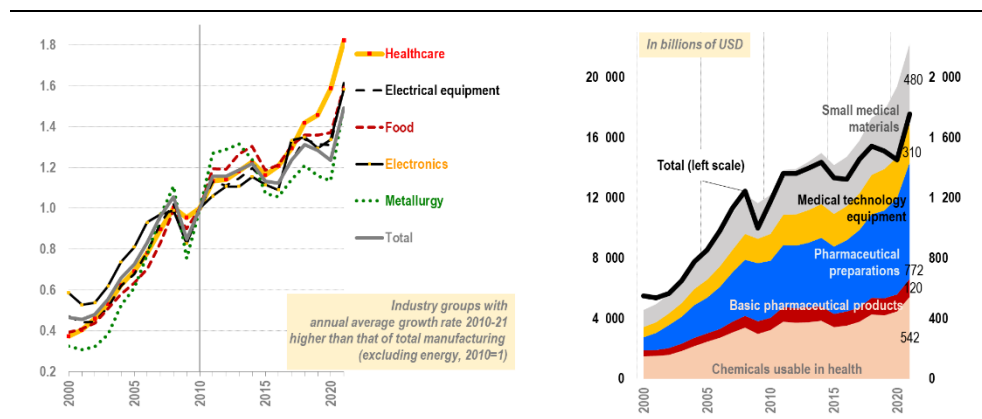
The observations reveal that healthcare products are a key industry grouping in trade, accounting for 13% of world trade in manufactured goods (excluding energy) in 2021, in second place behind electronics out of the ten industry groupings in our breakdown. It is also the industry grouping that has posted the strongest growth since 2000. This buoyancy owes a great deal to the boom in trade in pharmaceutical preparations, with a growing share of these being biotech treatments.

The international fragmentation of production processes is highly pronounced in this industry grouping. In 2021, over half of trade was in intermediate goods and two-way trade in similar products hit a record high, the highest of all the industry groupings (51% of flows). This highlights the complexity of the international division of labour in healthcare products. Unlike one-way trade in clearly different products, this type of trade consists of mutual purchases and sales between two countries of products with identical technical characteristics. Another particularity in this industry grouping is that it has the lowest proportion of trade in the medium quality/price range. This proportion has shrunk over the last two decades to the extent that 83% of trade in 2021 was evenly distributed between the high and low ranges.

The last section of this paper considers all the advanced countries compared with the rest of the world, i.e. the emerging and developing countries, and provides useful input for the current debate regarding a fragmentation of production within geopolitical blocs, between countries referred to as "friends". The North Atlantic Alliance and its partners, comprising the vast majority of the advanced countries, make for a picture of the Global North as the place where intra-zone trade appears to be the most secure. The question of the geographic reconfiguration of value chains and their possible shortening is also a focus of recent thinking on decarbonisation in healthcare. In 2021, nearly three-quarters of world exports in the healthcare industry grouping came from advanced countries and is mainly "local" trade, since the majority of these exports correspond to intra-zone trade between economies with similar levels of development (54% of world flows in 2021). Yet this trade between advanced countries has seen a relative decline since the 2000s (-16 percentage points) due to their exports to the emerging and developing countries, which are posting growth in both their exports to advanced countries and their intra-zone trade, albeit mainly in low range products.

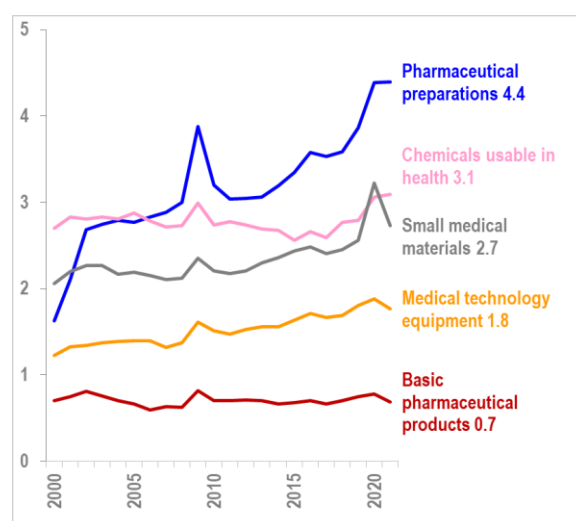
6. Appendix: additional figures and tables

Figure A.1
Evolution of manufacturing world trade (excluding energy)
and healthcare industry grouping dynamism, 2000-21



Source: authors' calculations based on CEPII, BACI database V202301.

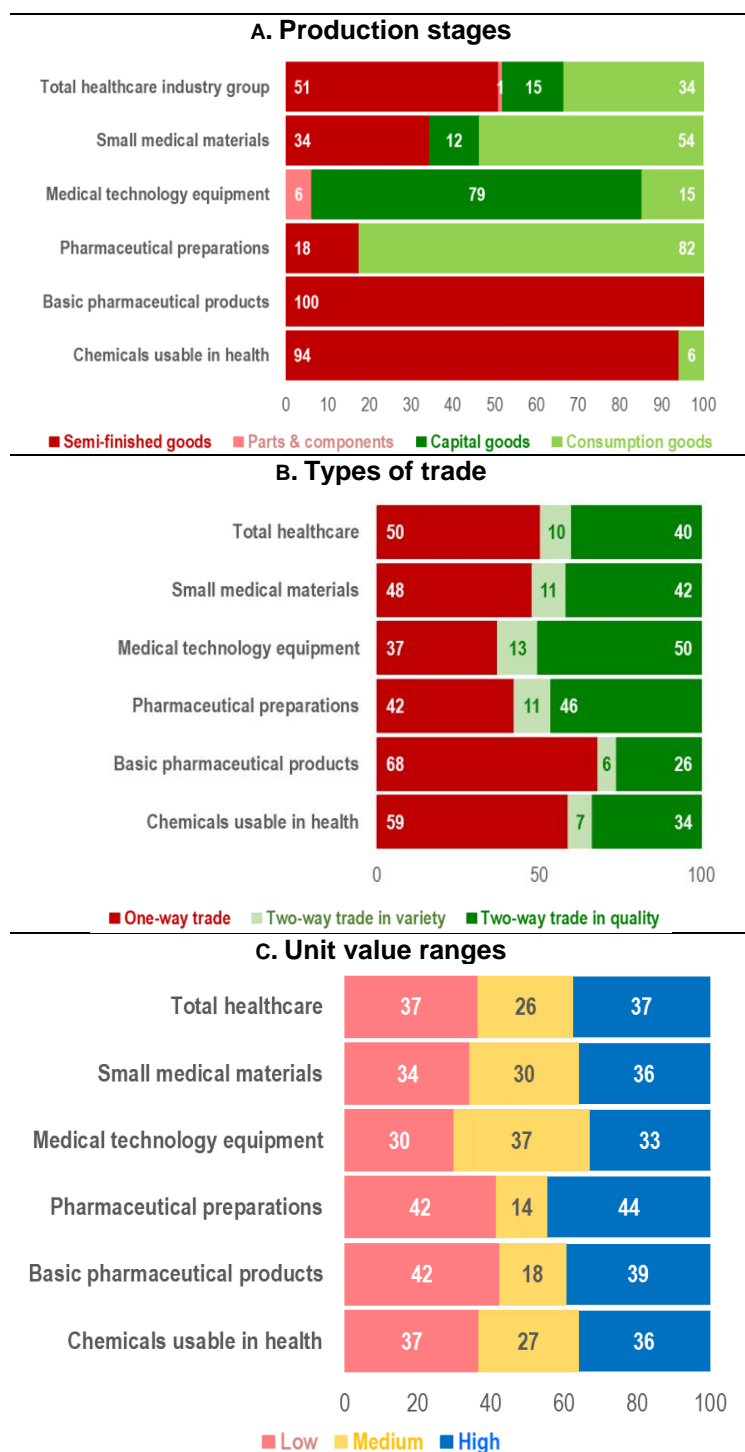
Figure A.2
Share of healthcare product branches
in % of manufacturing* world trade, 2000-21



*Excluding energy

Source: authors' calculations based on CEPII, BACI database V202301.

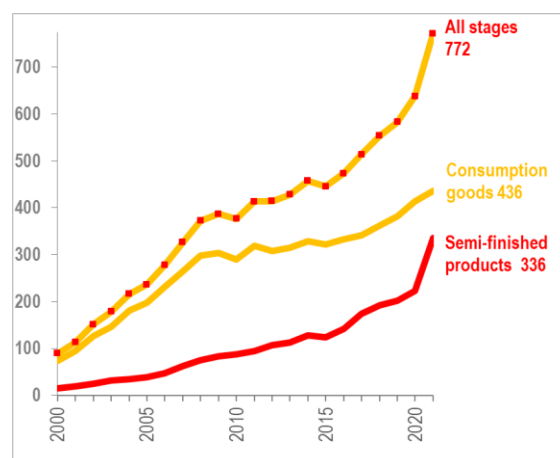
Figure A.3
Breakdown by production stage, type of trade and unit value range
of world healthcare flows in 2000
(in % of industry grouping or branch world trade)



Note: see the methodology in [CEPII Panorama No.2023-01](#).

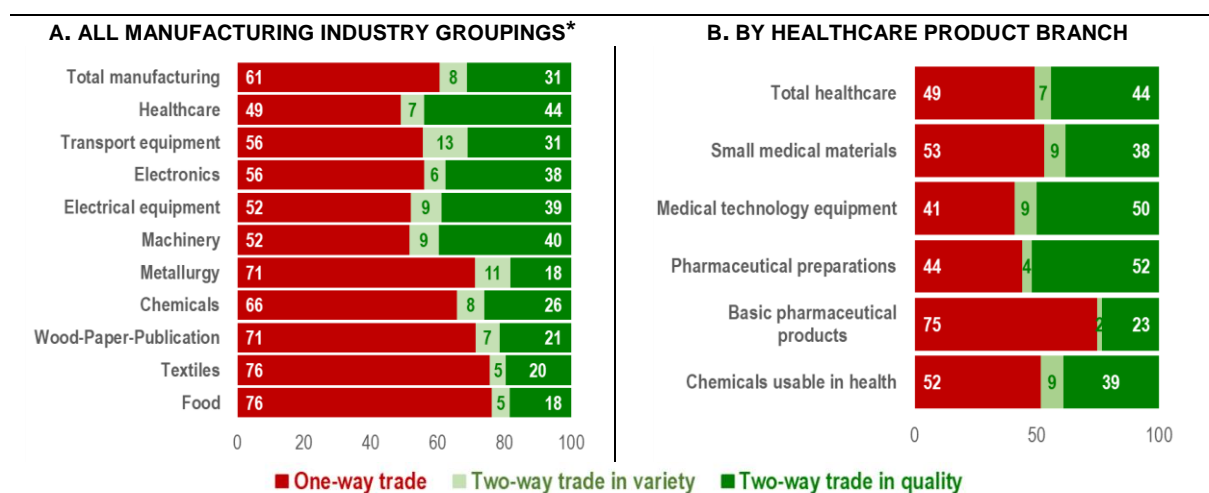
Source: authors' calculations based on CEPII, BACI database V202301.

Figure A.4
Pharmaceutical preparations, 2000-21
by production stage (in US\$ billions)



Source: authors' calculations based on CEPII, BACI database V202301.

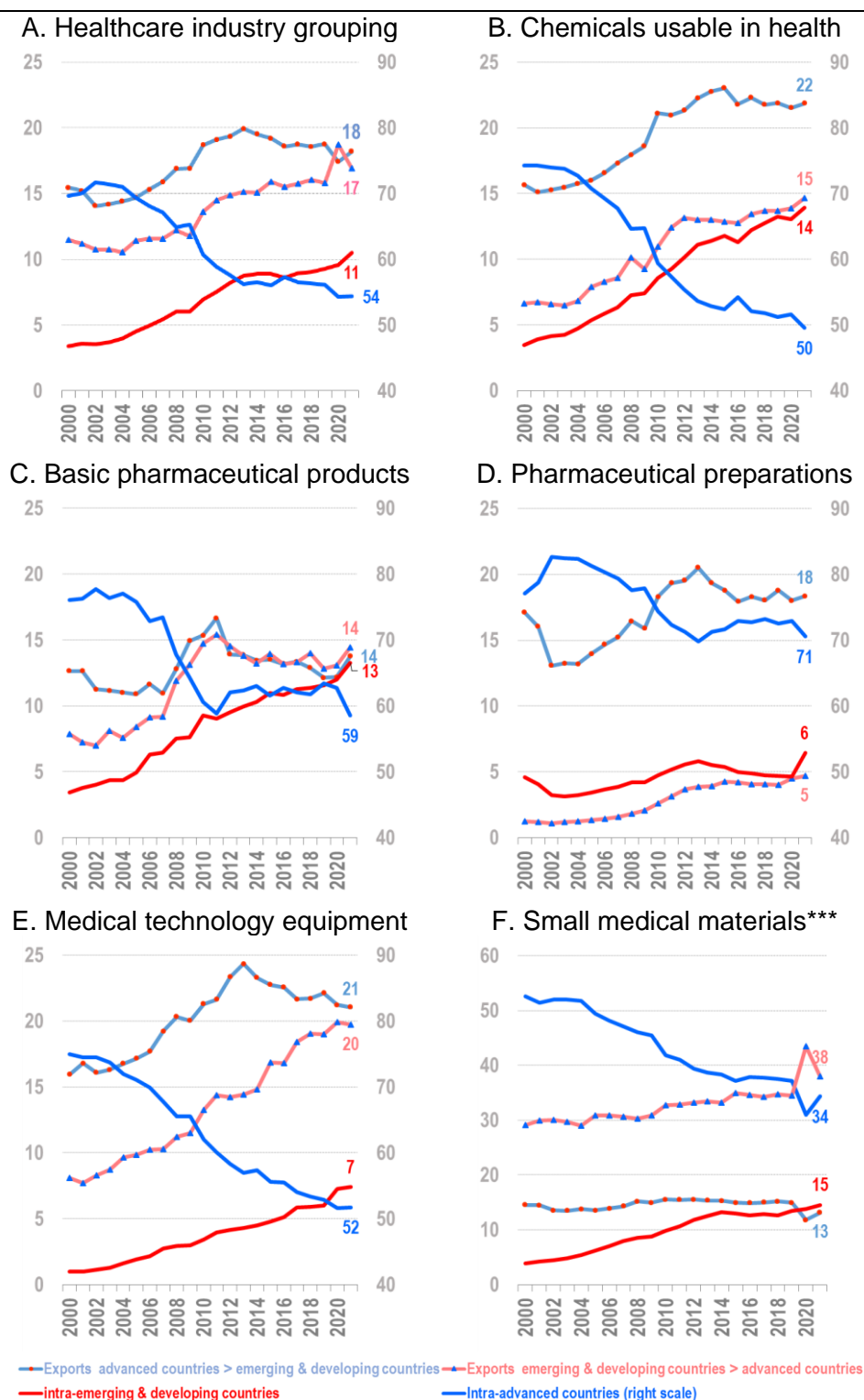
Figure A.5
Breakdown by type of trade
2021 (in % of industry grouping or branch world trade)



Notes: * Manufactured goods (excluding energy). See the methodology for types of trade in [CEPII Panorama No.2023-01](#).

Source: authors' calculations based on CEPII, BACI database V202301.

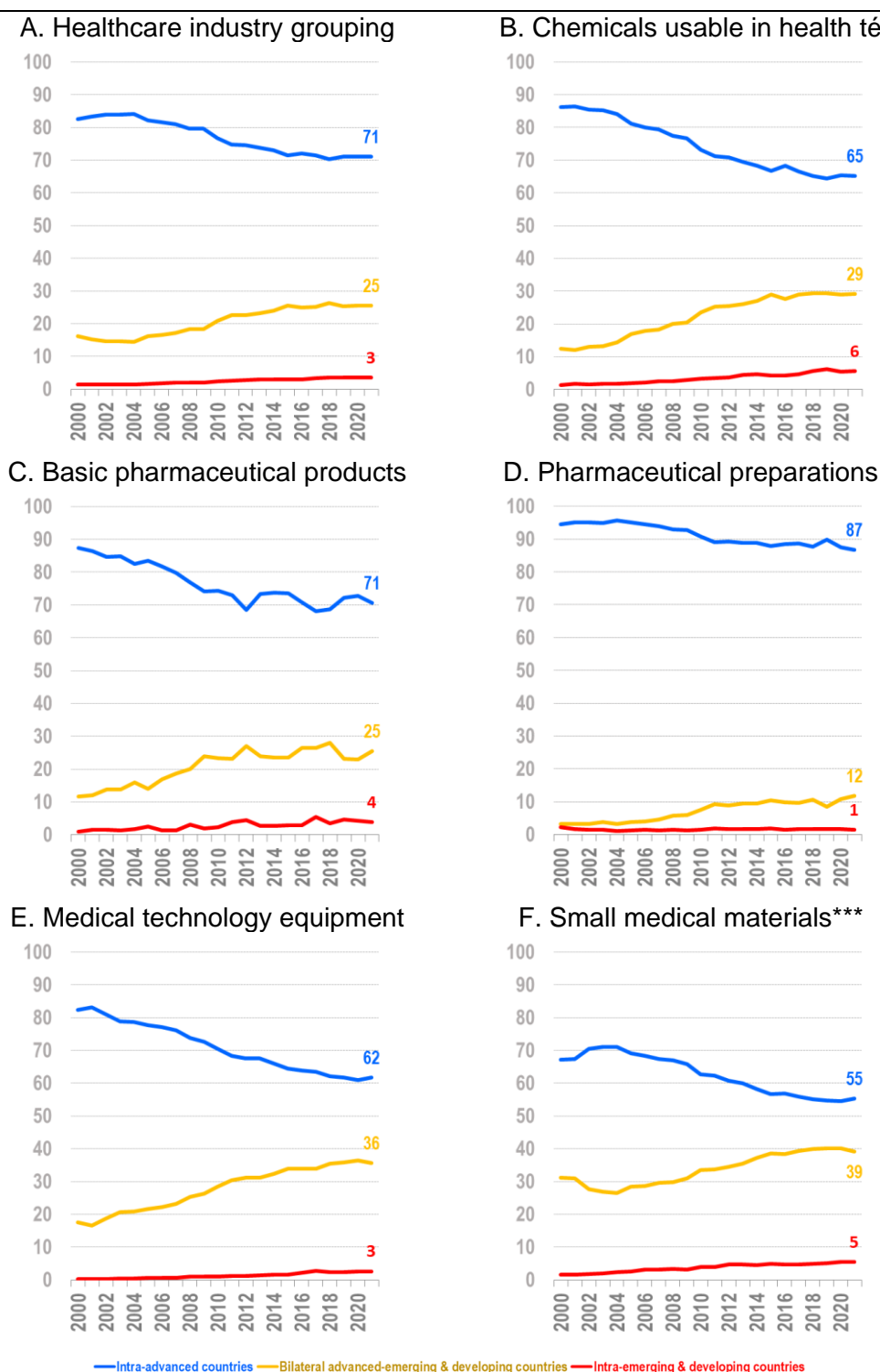
Figure A.6
Advanced* versus emerging & developing countries
bilateral and intra-zone trade
(in % of industry grouping or branch world trade, 2000-21)**



Notes: * Advanced countries as defined by the IMF. ** Manufactured goods (excluding energy). *** In this panel, the "intra-advanced" curve is attached to the left-hand scale.

Source: authors' calculations based on CEPII, BACI database V202301.

Figure A.7
Advanced* versus emerging & developing countries
bilateral and intra-zone two-way trade
(in % of industry grouping or branch world trade, 2000-21)**



Notes: * Advanced countries as defined by the IMF. ** *Manufactured goods (excluding energy). Two-way trade flows are calculated here by subtracting one-way trade flows from the total value of the industry grouping's trade (see the methodology in [CEPII Panorama No.2023-01](#)).

Source: authors' calculations based on CEPII, BACI database V202301.

Figure A.8 (top)
Exports of healthcare products by partner and unit value range
in % of branch world trade, 2000-21

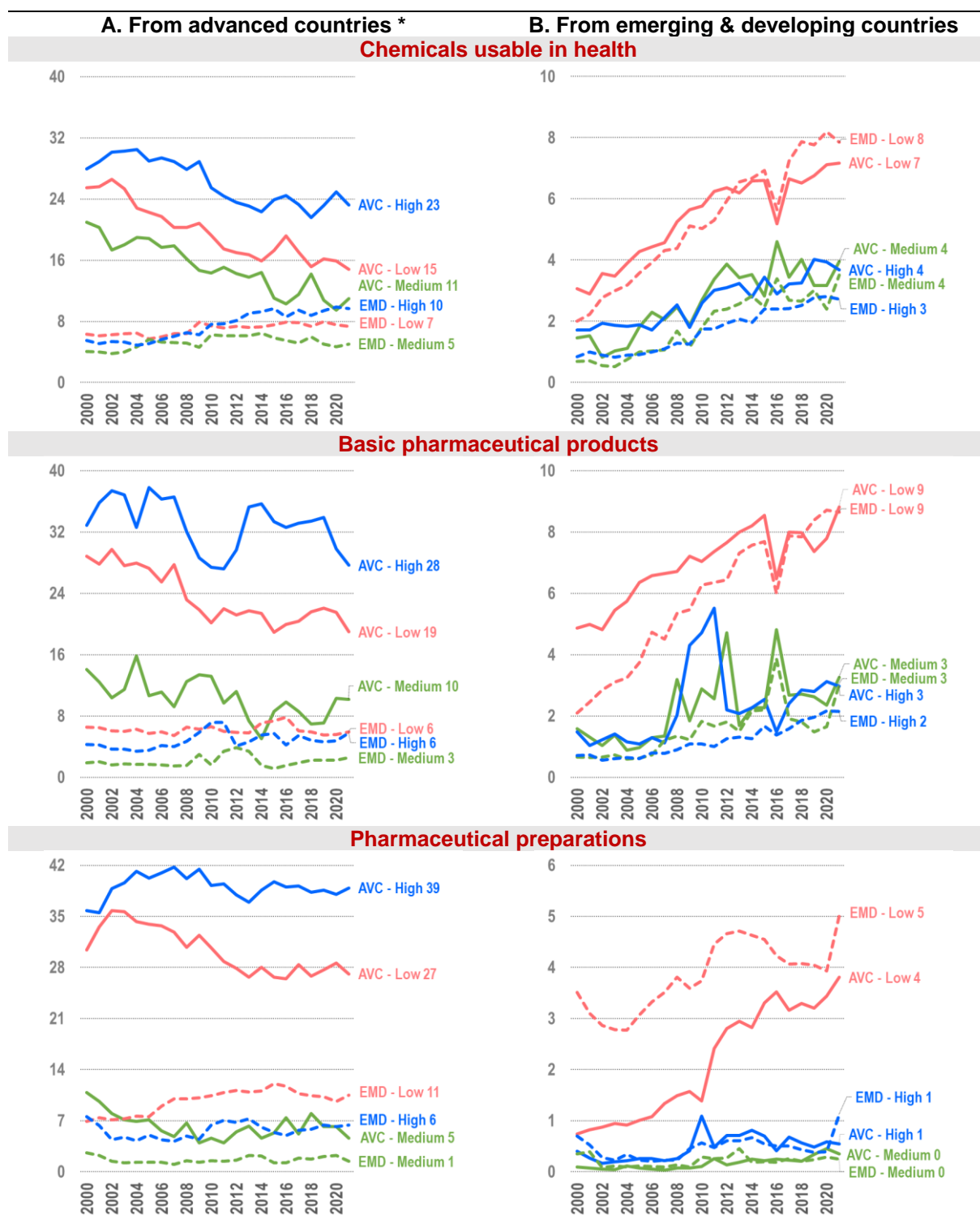
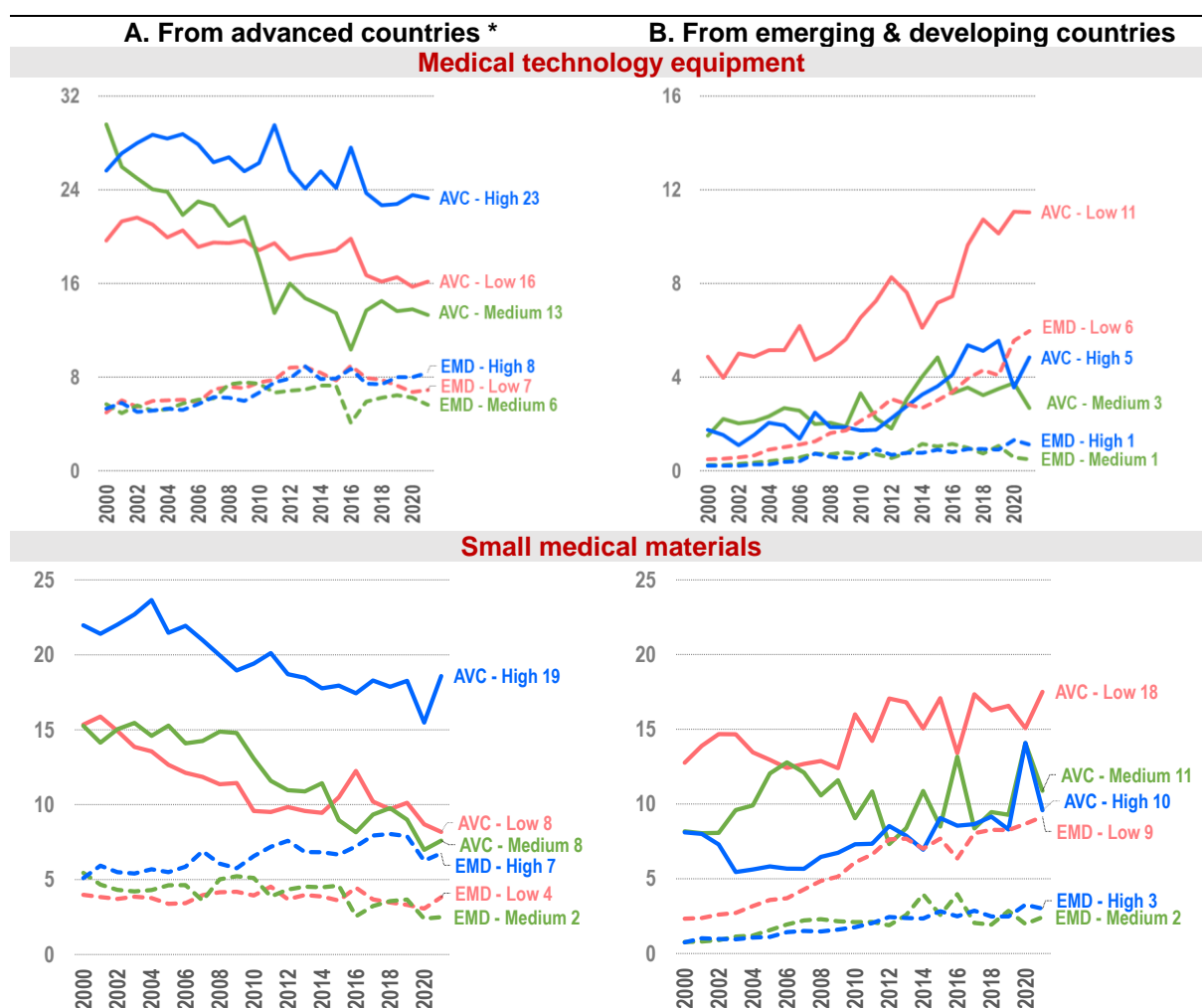


Figure A.8 (end)
Exports of healthcare products by partner and unit value range (end)
in % of branch world trade, 2000-21



Notes: * Advanced countries as defined by the IMF. AVC, advanced countries; EMD, emerging & developing countries. For calculations of unit value ranges see the methodology in [CEPII Panorama No.2023-01](#).

Source: authors' calculations based on CEPII, BACI

**BREAKDOWN OF WORLD TRADE IN GOODS
BY INDUSTRY GROUPINGS, BRANCHES, STAGES, RANGES AND TYPES, 2017-21**

Table A.1
World trade in goods 2017-21 – Sum of industry groupings and stages = 100

	Primary	Semi-finished	P&C	Capital	Consumption	Total
Energy	6.3	5.1				11.4
Mining energy products	6.3	0.7				7.0
Transformed energy products	0.0	4.4				4.4
Agriculture & Food	2.0	1.4		0.0	6.0	9.3
Pr. of agriculture, hunting, forestry, fish	1.8	0.0		0.0	1.2	3.0
Food, tobacco pr. & beverages	0.2	1.4			4.8	6.4
Textiles	0.0	1.2	0.0		3.7	4.9
Textiles	0.0	1.1	0.0		0.4	1.5
Wearing apparel	0.0	0.0			2.2	2.2
Leather & related products		0.1	0.0		1.1	1.2
Wood-paper-publishing	0.1	2.0	0.0	0.3	1.8	4.2
Wood-paper-furniture	0.1	1.8		0.2	0.8	2.9
Publishing & other manuf. nec		0.2	0.0	0.1	1.0	1.3
Chemicals	0.2	7.1	0.0	0.0	1.1	8.4
Other mining pr. & construct. pr.	0.2	1.0	0.0	0.0	0.1	1.3
Chemicals & chemical products	0.0	4.9		0.0	0.8	5.7
Rubber & plastic products	0.0	1.3	0.0		0.2	1.5
Metallurgy	1.7	7.5		0.0	0.5	9.7
Iron & non ferrous ores	1.7	0.4		0.0	0.5	2.6
Basic metals	0.0	7.1		0.0		7.1
Machinery		1.4	3.8	4.2	0.4	9.7
Metallic structures		1.4	0.3	0.4	0.2	2.3
Turbines & pumps			0.9	0.7		1.6
Miscellaneous hardware		0.0	1.1	0.4		1.5
General-purpose machinery			0.4	0.9	0.1	1.4
Machine tools & special-purpose machinery			1.1	1.8	0.0	2.9
Electrical equipment		1.1	1.9	1.4	0.8	5.2
Generators, transformers & electrical apparatus		0.8	1.7	0.7	0.1	3.3
Domestic appliances & other electrical equipment		0.3	0.2	0.6	0.7	1.8
Electronics		0.2	6.6	6.7	1.0	14.5
Electronic components & boards			5.2	0.1		5.3
Computers & peripheral equipment			0.6	2.3		3.0
Telecommunication equipment			0.5	2.4	0.0	2.9
Consumer electronics			0.1	0.3	0.5	0.9
Measuring & optical equipment		0.2	0.2	1.5	0.6	2.5
Transport equipment		0.1	4.6	2.7	4.4	11.7
Motor vehicles, trailers & semi-trailers		0.0	3.3	1.1	4.0	8.5
Air & spacecraft & related machinery		0.1	1.1	0.8	0.0	1.9
Other transport equipment			0.2	0.7	0.4	1.3
Health equipment & products		4.8	0.1	1.4	3.8	10.1
Chemicals usable in health		2.2			0.2	2.4
Basic pharmaceutical products		0.6				0.6
Pharmaceutical preparations		1.2			2.1	3.3
Medical technology equipment			0.1	1.1	0.3	1.5
Small medical materials		0.8	0.0	0.3	1.1	2.2
Waste recycling & nec	0.7	0.0	0.0			0.8
Waste recycling	0.7	0.0	0.0			0.8
Not elsewhere classified	0.0					0.0
Total	11.0	31.9	17.1	16.6	23.4	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

Table A.2
World trade in goods 2017-21
Sum of stages by industry grouping or branch = 100

	Primary	Semi-finished	P&C	Capital	Consumption	Total
Energy	55.3	44.7				100.0
Mining energy products	89.8	10.2				100.0
Transformed energy products	0.2	99.8				100.0
Agriculture & Food	21.6	14.5		0.1	63.8	100.0
Pr. of agriculture, hunting, forestry, fish	59.8	0.0		0.3	39.9	100.0
Food, tobacco pr. & beverages	3.5	21.4			75.1	100.0
Textiles	0.8	24.1	0.7		74.3	100.0
Textiles	1.0	71.4	2.3		25.3	100.0
Wearing apparel	1.1	0.1			98.8	100.0
Leather & related products		9.4	0.0		90.6	100.0
Wood-paper-publishing	1.4	47.7	0.1	7.1	43.7	100.0
Wood-paper-furniture	2.0	63.2		6.6	28.1	100.0
Publishing & other manuf. nec		14.2	0.4	8.1	77.4	100.0
Chemicals	2.2	84.2	0.4	0.3	12.9	100.0
Other mining pr. & construct. pr.	13.3	77.1	0.4	0.6	8.5	100.0
Chemicals & chemical products	0.3	85.4		0.3	14.0	100.0
Rubber & plastic products	0.2	85.3	2.2		12.4	100.0
Metallurgy	17.2	77.0		0.3	5.5	100.0
Iron & non ferrous ores	63.4	15.5		0.9	20.2	100.0
Basic metals	0.0	99.9		0.1		100.0
Machinery		14.4	39.2	42.8	3.7	100.0
Metallic structures		61.2	12.8	16.5	9.5	100.0
Turbines & pumps			56.4	43.6		100.0
Miscellaneous hardware		1.2	70.2	28.6		100.0
General-purpose machinery			31.7	60.9	7.4	100.0
Machine tools & special-purpose machinery			37.3	61.5	1.2	100.0
Electrical equipment		20.9	37.2	26.3	15.6	100.0
Generators, transformers & electrical appara		24.3	51.8	21.3	2.6	100.0
Domestic appliances & other electrical equip		14.6	10.0	35.6	39.8	100.0
Electronics		1.3	45.6	46.0	7.2	100.0
Electronic components & boards			98.6	1.4		100.0
Computers & peripheral equipment			21.3	78.7		100.0
Telecommunication equipment			16.2	83.5	0.3	100.0
Consumer electronics			8.1	38.7	53.3	100.0
Measuring & optical equipment		7.5	8.6	60.7	23.2	100.0
Transport equipment		1.1	39.1	22.6	37.2	100.0
Motor vehicles, trailers & semi-trailers		0.5	39.0	13.3	47.2	100.0
Air & spacecraft & related machinery		4.2	54.9	40.5	0.5	100.0
Other transport equipment			16.0	56.8	27.2	100.0
Health equipment & products		48.0	0.7	13.9	37.4	100.0
Chemicals usable in health		91.6			8.4	100.0
Basic pharmaceutical products		100.0				100.0
Pharmaceutical preparations		36.8			63.2	100.0
Medical technology equipment			4.1	73.5	22.4	100.0
Small medical materials		35.8	0.2	13.8	50.2	100.0
Waste recycling & nec	96.2	3.4	0.4			100.0
Waste recycling	96.2	3.4	0.4			100.0
Not elsew here classified	100.0					100.0
Total	11.0	31.9	17.1	16.6	23.4	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

Table A.3
World trade in goods 2017-21
Sum of industry groupings or branches by stage = 100

	Primary	Semi-finished	P&C	Capital	Consumption	Total
Energy	57.3	16.0				11.4
Mining energy products	57.2	2.2				7.0
Transformed energy products	0.1	13.8				4.4
Agriculture & Food	18.3	4.3		0.1	25.5	9.3
Pr. of agriculture, hunting, forestry, fish	16.3	0.0		0.1	5.1	3.0
Food, tobacco pr. & beverages	2.0	4.3			20.4	6.4
Textiles	0.4	3.7	0.2		15.6	4.9
Textiles	0.1	3.4	0.2		1.6	1.5
Wearing apparel	0.2	0.0			9.3	2.2
Leather & related products		0.4	0.0		4.7	1.2
Wood-paper-publishing	0.5	6.3	0.0	1.8	7.9	4.2
Wood-paper-furniture	0.5	5.7		1.2	3.5	2.9
Publishing & other manuf. nec		0.6	0.0	0.6	4.4	1.3
Chemicals	1.7	22.3	0.2	0.1	4.7	8.4
Other mining pr. & construct. pr.	1.5	3.0	0.0	0.0	0.5	1.3
Chemicals & chemical products	0.2	15.3		0.1	3.4	5.7
Rubber & plastic products	0.0	4.0	0.2		0.8	1.5
Metallurgy	15.2	23.5		0.2	2.3	9.7
Iron & non ferrous ores	15.2	1.3		0.1	2.3	2.6
Basic metals	0.0	22.2		0.0		7.1
Machinery		4.4	22.3	25.1	1.5	9.7
Metallic structures		4.3	1.7	2.3	0.9	2.3
Turbines & pumps			5.4	4.2		1.6
Miscellaneous hardware		0.1	6.3	2.6		1.5
General-purpose machinery			2.6	5.1	0.4	1.4
Machine tools & special-purpose machinery			6.4	10.8	0.2	2.9
Electrical equipment		3.4	11.2	8.2	3.4	5.2
Generators, transformers & electrical apparatus		2.6	10.2	4.3	0.4	3.3
Domestic appliances & other electrical equipment		0.8	1.1	3.9	3.1	1.8
Electronics		0.6	38.7	40.2	4.4	14.5
Electronic components & boards			30.7	0.5		5.3
Computers & peripheral equipment			3.7	14.0		3.0
Telecommunication equipment			2.8	14.6	0.0	2.9
Consumer electronics			0.4	2.0	1.9	0.9
Measuring & optical equipment		0.6	1.3	9.1	2.5	2.5
Transport equipment		0.4	26.9	16.0	18.6	11.7
Motor vehicles, trailers & semi-trailers		0.1	19.4	6.8	17.1	8.5
Air & spacecraft & related machinery		0.3	6.3	4.7	0.0	1.9
Other transport equipment			1.2	4.5	1.5	1.3
Health equipment & products		15.2	0.4	8.4	16.1	10.1
Chemicals usable in health		6.9			0.9	2.4
Basic pharmaceutical products		1.9				0.6
Pharmaceutical preparations		3.8			9.0	3.3
Medical technology equipment			0.4	6.5	1.4	1.5
Small medical materials		2.5	0.0	1.9	4.8	2.2
Waste recycling & nec	6.6	0.1	0.0			0.8
Waste recycling	6.6	0.1	0.0			0.8
Not elsewhere classified	0.0					0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

Table A.4
World trade in goods 2017-21
Sum of unit value ranges by industry grouping or branch = 100

	Low	Medium	High	Total
Energy	17.0	63.4	19.6	100.0
Mining energy products	12.3	73.7	13.9	100.0
Transformed energy products	24.8	46.0	29.3	100.0
Agriculture & Food	26.6	45.0	28.4	100.0
Pr. of agriculture, hunting, forestry, fish	20.7	55.6	23.7	100.0
Food, tobacco pr. & beverages	29.4	40.0	30.5	100.0
Textiles	37.7	24.9	37.4	100.0
Textiles	33.6	31.1	35.3	100.0
Wearing apparel	40.1	21.4	38.6	100.0
Leather & related products	38.5	23.5	38.0	100.0
Wood-paper-publishing	30.8	37.9	31.3	100.0
Wood-paper-furniture	28.9	41.4	29.7	100.0
Publishing & other manuf. nec	34.9	30.2	34.8	100.0
Chemicals	30.1	38.5	31.4	100.0
Other mining pr. & construct. pr.	36.6	26.6	36.8	100.0
Chemicals & chemical products	27.4	43.5	29.0	100.0
Rubber & plastic products	34.9	29.0	36.1	100.0
Metallurgy	21.6	57.6	20.8	100.0
Iron & non ferrous ores	29.3	41.5	29.2	100.0
Basic metals	18.8	63.5	17.7	100.0
Machinery	37.7	26.5	35.7	100.0
Metallic structures	37.9	25.6	36.5	100.0
Turbines & pumps	38.4	25.5	36.1	100.0
Miscellaneous hardware	39.1	24.1	36.8	100.0
General-purpose machinery	37.4	29.7	32.9	100.0
Machine tools & special-purpose machinery	36.6	27.7	35.7	100.0
Electrical equipment	36.5	28.2	35.2	100.0
Generators, transformers & electrical appara	37.1	27.8	35.1	100.0
Domestic appliances & other electrical equip	35.5	28.9	35.5	100.0
Electronics	37.6	28.0	34.4	100.0
Electronic components & boards	41.9	16.7	41.4	100.0
Computers & peripheral equipment	30.5	43.2	26.4	100.0
Telecommunication equipment	37.7	31.7	30.6	100.0
Consumer electronics	31.5	43.0	25.5	100.0
Measuring & optical equipment	39.3	24.0	36.7	100.0
Transport equipment	29.3	40.7	30.0	100.0
Motor vehicles, trailers & semi-trailers	27.0	44.9	28.1	100.0
Air & spacecraft & related machinery	36.0	29.7	34.3	100.0
Other transport equipment	35.1	28.1	36.7	100.0
Health equipment & products	41.0	18.1	40.9	100.0
Chemicals usable in health	38.0	23.0	39.0	100.0
Basic pharmaceutical products	43.0	15.6	41.4	100.0
Pharmaceutical preparations	45.7	8.4	45.9	100.0
Medical technology equipment	39.0	24.0	37.0	100.0
Small medical materials	37.8	24.3	37.9	100.0
Waste recycling & nec	26.8	45.1	28.1	100.0
Waste recycling	26.8	45.1	28.1	100.0
Not elsewhere classified	30.8	52.0	17.2	100.0
Total	31.0	38.1	30.9	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

Table A.5
World trade in goods 2017-21
Sum of industry groupings or branches by unit value range

	Low	Medium	High	Total
Energy	6.2	18.7	7.2	11.3
Mining energy products	2.8	13.7	3.2	7.1
Transformed energy products	3.4	5.1	4.0	4.2
Agriculture & Food	8.1	11.1	8.7	9.4
Pr. of agriculture, hunting, forestry, fish	2.0	4.4	2.3	3.0
Food, tobacco pr. & beverages	6.1	6.7	6.3	6.4
Textiles	6.0	3.2	6.0	5.0
Textiles	1.6	1.2	1.7	1.5
Wearing apparel	2.9	1.2	2.8	2.2
Leather & related products	1.5	0.8	1.5	1.2
Wood-paper-publishing	4.2	4.2	4.3	4.2
Wood-paper-furniture	2.7	3.2	2.8	2.9
Publishing & other manuf. nec	1.5	1.1	1.5	1.3
Chemicals	8.2	8.6	8.7	8.5
Other mining pr. & construct. pr.	1.5	0.9	1.5	1.3
Chemicals & chemical products	5.1	6.6	5.4	5.7
Rubber & plastic products	1.7	1.1	1.7	1.5
Metallurgy	6.8	14.7	6.6	9.8
Iron & non ferrous ores	2.5	2.9	2.5	2.6
Basic metals	4.3	11.9	4.1	7.1
Machinery	12.0	6.8	11.4	9.8
Metallic structures	2.8	1.5	2.7	2.3
Turbines & pumps	2.0	1.1	1.9	1.6
Miscellaneous hardware	1.9	1.0	1.8	1.5
General-purpose machinery	1.7	1.1	1.5	1.4
Machine tools & special-purpose machinery	3.5	2.1	3.4	2.9
Electrical equipment	6.1	3.8	5.9	5.2
Generators, transformers & electrical appara	4.0	2.4	3.8	3.3
Domestic appliances & other electrical equip	2.1	1.4	2.1	1.8
Electronics	17.5	10.6	16.0	14.4
Electronic components & boards	7.0	2.3	6.9	5.2
Computers & peripheral equipment	2.9	3.4	2.5	3.0
Telecommunication equipment	3.5	2.4	2.9	2.9
Consumer electronics	0.9	1.0	0.7	0.9
Measuring & optical equipment	3.2	1.6	3.0	2.5
Transport equipment	11.1	12.5	11.4	11.7
Motor vehicles, trailers & semi-trailers	7.5	10.1	7.8	8.6
Air & spacecraft & related machinery	2.3	1.5	2.2	2.0
Other transport equipment	1.3	0.9	1.4	1.2
Health equipment & products	13.2	4.8	13.3	10.0
Chemicals usable in health	2.9	1.4	3.0	2.4
Basic pharmaceutical products	0.8	0.2	0.8	0.6
Pharmaceutical preparations	4.9	0.7	5.0	3.3
Medical technology equipment	1.8	0.9	1.7	1.5
Small medical materials	2.7	1.4	2.8	2.2
Waste recycling & nec	0.7	0.9	0.7	0.8
Waste recycling	0.7	0.9	0.7	0.8
Not elsewhere classified	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

Table A.6
World trade in goods 2017-21
Sum of types of trade by industry grouping or branch = 100

	One-Way trade	Two-way in variety	Two-way in quality	Total
Energy	79.7	8.2	12.1	100.0
Mining energy products	92.4	6.0	1.6	100.0
Transformed energy products	59.5	11.3	29.1	100.0
Agriculture & Food	78.9	5.1	16.0	100.0
Pr. of agriculture, hunting, forestry, fish	89.1	2.5	8.3	100.0
Food, tobacco pr. & beverages	74.1	6.4	19.6	100.0
Textiles	76.0	4.7	19.3	100.0
Textiles	81.3	3.7	15.0	100.0
Wearing apparel	74.9	5.0	20.1	100.0
Leather & related products	71.5	5.3	23.2	100.0
Wood-paper-publishing	70.0	8.2	21.8	100.0
Wood-paper-furniture	72.2	9.0	18.8	100.0
Publishing & other manuf. nec	65.4	6.3	28.3	100.0
Chemicals	65.8	8.1	26.1	100.0
Other mining pr. & construct. pr.	71.7	4.8	23.5	100.0
Chemicals & chemical products	69.9	7.8	22.3	100.0
Rubber & plastic products	44.8	12.4	42.7	100.0
Metallurgy	74.1	9.4	16.5	100.0
Iron & non ferrous ores	73.0	4.3	22.7	100.0
Basic metals	74.5	11.2	14.3	100.0
Machinery	50.9	10.2	38.9	100.0
Metallic structures	55.6	8.4	36.0	100.0
Turbines & pumps	39.6	13.7	46.7	100.0
Miscellaneous hardware	40.9	12.0	47.2	100.0
General-purpose machinery	54.7	11.4	33.8	100.0
Machine tools & special-purpose machinery	56.9	8.3	34.8	100.0
Electrical equipment	50.6	11.3	38.2	100.0
Generators, transformers & electrical apparatus	44.5	13.1	42.5	100.0
Domestic appliances & other electrical equipment	61.9	7.9	30.2	100.0
Electronics	55.7	6.2	38.1	100.0
Electronic components & boards	40.2	5.7	54.1	100.0
Computers & peripheral equipment	71.9	5.4	22.7	100.0
Telecommunication equipment	67.2	6.1	26.7	100.0
Consumer electronics	73.5	6.9	19.6	100.0
Measuring & optical equipment	49.9	8.0	42.2	100.0
Transport equipment	54.6	15.6	29.9	100.0
Motor vehicles, trailers & semi-trailers	53.1	18.4	28.4	100.0
Air & spacecraft & related machinery	46.1	9.2	44.7	100.0
Other transport equipment	76.3	6.0	17.7	100.0
Health equipment & products	49.5	7.1	43.3	100.0
Chemicals usable in health	53.5	8.7	37.8	100.0
Basic pharmaceutical products	76.6	2.0	21.3	100.0
Pharmaceutical preparations	44.3	3.7	52.0	100.0
Medical technology equipment	40.5	9.9	49.6	100.0
Small medical materials	51.8	10.1	38.1	100.0
Waste recycling & nec	73.7	6.5	19.9	100.0
Waste recycling	73.6	6.5	19.9	100.0
Not elsewhere classified	98.5	0.0	1.5	100.0
Total	63.5	8.6	27.9	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

Table A.7
world trade in goods 2017-21
sum of industry groupings or branches BY type of trade

	One-Way trade	Two-way in variety	Two-way in quality	Total
Energy	14.3	10.8	4.9	11.4
Mining energy products	10.2	4.9	0.4	7.0
Transformed energy products	4.1	5.8	4.6	4.4
Agriculture & Food	11.6	5.5	5.4	9.3
Pr. of agriculture, hunting, forestry, fish	4.2	0.9	0.9	3.0
Food, tobacco pr. & beverages	7.4	4.7	4.5	6.3
Textiles	5.9	2.7	3.4	4.9
Textiles	1.9	0.6	0.8	1.5
Wearing apparel	2.6	1.3	1.6	2.2
Leather & related products	1.4	0.8	1.0	1.2
Wood-paper-publishing	4.6	4.0	3.3	4.2
Wood-paper-furniture	3.3	3.0	1.9	2.9
Publishing & other manuf. nec	1.4	1.0	1.4	1.3
Chemicals	8.7	7.9	7.9	8.4
Other mining pr. & construct. pr.	1.4	0.7	1.1	1.2
Chemicals & chemical products	6.3	5.1	4.6	5.7
Rubber & plastic products	1.0	2.1	2.3	1.5
Metallurgy	11.3	10.5	5.7	9.7
Iron & non ferrous ores	3.0	1.3	2.2	2.6
Basic metals	8.3	9.1	3.6	7.1
Machinery	7.8	11.5	13.6	9.8
Metallic structures	2.0	2.2	3.0	2.3
Turbines & pumps	1.0	2.6	2.7	1.6
Miscellaneous hardware	1.0	2.1	2.6	1.5
General-purpose machinery	1.2	1.9	1.7	1.4
Machine tools & special-purpose machinery	2.6	2.8	3.7	2.9
Electrical equipment	4.1	6.7	7.1	5.1
Generators, transformers & electrical appara	2.3	5.1	5.1	3.3
Domestic appliances & other electrical equip	1.8	1.7	2.0	1.8
Electronics	12.7	10.4	19.9	14.5
Electronic components & boards	3.4	3.5	10.3	5.3
Computers & peripheral equipment	3.3	1.8	2.4	3.0
Telecommunication equipment	3.1	2.1	2.8	2.9
Consumer electronics	1.0	0.7	0.6	0.9
Measuring & optical equipment	2.0	2.3	3.8	2.5
Transport equipment	10.1	21.2	12.6	11.8
Motor vehicles, trailers & semi-trailers	7.1	18.1	8.7	8.5
Air & spacecraft & related machinery	1.4	2.1	3.1	2.0
Other transport equipment	1.6	0.9	0.8	1.3
Health equipment & products	7.8	8.3	15.6	10.1
Chemicals usable in health	2.0	2.4	3.3	2.4
Basic pharmaceutical products	0.7	0.1	0.5	0.6
Pharmaceutical preparations	2.3	1.4	6.2	3.3
Medical technology equipment	0.9	1.7	2.6	1.5
Small medical materials	1.8	2.6	3.1	2.2
Waste recycling & nec	0.9	0.6	0.5	0.8
Waste recycling	0.9	0.6	0.5	0.8
Not elsewhere classified	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0

Source: authors' calculations based on CEPII, BACI database V202301.

7. Methodological appendix

7.1. Databases used

The trade flows used in this paper were drawn from CEPII's BACI bilateral trade flows and World Trade Flows Characterization (WTFC) databases.

The industry groupings were identified based on the ISIC classification. The conversion from Harmonized System codes to ISIC categories used a HS-CPA conversion table provided by Eurostat (via RAMON). A few modifications were made to the ISIC categories to identify a healthcare industry grouping based on the lists described at the start of this paper.

The lists of healthcare products use HS codes, but these are not necessarily from the same revision. We converted all the codes into the 1996 revision using conversion tables provided by the United Nations.

The paper's sector-based nomenclature is freely available on the CEPII website.

7.2. Breakdown by branch of HS-6 products in the CEPII list

7.2.1. *The chemicals usable in health branch*

With 164 HS-6 items over the 2000-2019 period, this branch contains the largest number of products on our list (see **Table A.I**). The vast majority (149 items) are drawn from the WTO Pharma Agreement and concern *basic chemicals* (oxygen, dyes, pigments, aluminium hydroxide, hypochlorites, aluminium sulphate, compounds of colloidal precious metals and rare-earth metals, medical isotopes, derivatives of hydrocarbons, monohydric and polyhydric alcohols, phenols, monocarboxylic and polycarboxylic acids, amino-compounds, ureines, other nitrogen-function compounds, organo-sulphur compounds and other organo-inorganic compounds, heterocyclic compounds with hetero-atoms and nucleic acids, phosphoric esters, aldehyde-, ketone- and quinone-function compounds, ethers, enzymes, undenatured ethyl alcohol, polyacetals-polymers-polyesters in primary forms, urea-phenolic resins in primary forms, etc.). The other 15 branch products were identified from the Covid lists. They correspond to *disinfectants, soap and cleaning preparations* and to *diagnostic or laboratory reagents*.

The weights of these HS-6 products (cumulative value for the 2000-2019 period) in the branch's world trade and their unit values (for the last three years) are relatively evenly distributed. Although the top ten products account for 47% of flows in the branch, the concentration is much higher in basic pharmaceutical products and pharmaceutical preparations, for example.

In first place, the relative share of "chemical products, preparations and residual products of the chemical or allied industries, n.e.s. or included in heading number 3824" (HS 382490, Pharma Agreement + Covid lists) is 11%, with a median unit value (see the **Table A.I** note) of approximately \$4,000 per tonne.

In second place, HS 382200 "Reagents: diagnostic or laboratory reagents on a backing and prepared diagnostic or laboratory reagents whether or not on a backing, other than those of heading No. 3002 or 3006" is not covered by the Pharma Agreement. It is taken solely from

the Covid lists (nearly 6% of the relative weight in the branch with a unit value of approximately \$106,000 per tonne).

In the three branches of our list concerning mainly the pharmaceutical industry,⁵² “heterocyclic compounds with nitrogen hetero-atoms” (HS4-2933) are systematically in the group of the top ten trade products (in 2000-2019 cumulative value). Such is the case with “heterocyclic compounds n.e.s. in Heading No. 2933” under code HS-293390: in third place with 6% of the branch’s trade and a unit value of approximately \$128,000 per tonne.

The ranking of products by their unit values reveals three HS-6 items far outstripping the others with values exceeding one million dollars:

- HS-284330 “gold compounds” (\$9.7 million per tonne);
- HS-284390 “inorganic or organic compounds of precious metals (excluding gold and silver) whether or not chemically defined, amalgams of precious metals” (\$2.8 million per tonne);
- HS-284590 “isotopes (excluding those of heading no. 2844); compounds, inorganic or organic, of such isotopes, whether or not chemically defined” (\$1.3 million per tonne).

⁵² The first three branches: chemicals usable in health, basic pharmaceutical products and pharmaceutical preparations.

Table A.I (top)
Chemicals usable in health

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebille - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
220710	Undenatured ethyl alcohol: of an alcoholic strength by volume of 80% vol. or higher	1.54	99 325	1 139				+	+	+
220890	Spirits, liqueurs and other spirituous beverages: n.e.s. in heading no. 2208	0.99	64 080	5 202					+	+
280440	Oxygen	0.05	3 512	1 145					+	+
281830	Aluminium hydroxide	0.35	22 772	887	1					
282890	Hypochlorites: n.e.s. in heading no. 2828	0.09	5 558	958					+	
283322	Sulphates: of aluminium	0.04	2 495	390	1					
284210	Salts: double or complex silicates	0.10	6 736	2 066	1	B				
284290	Salts: of inorganic acids or peroxyacids, excluding azides	0.09	6 001	4 128	1	B				
284329	Silver compounds: excluding silver nitrates	0.05	3 310	403 185	1					
284330	Gold compounds	0.35	22 294	9 704 111	1					
284390	Inorganic or organic compounds: of precious metals (excluding gold and silver), whether or not chemically defined, amalgams of precious metals	1.13	73 024	2 866 980	1					
284440	Radioactive elements, isotopes, compounds, n.e.s. in heading no. 2844 alloys, dispersions (including cermets), ceramic products and mixtures containing these elements, isotopes or compounds: radioactive residues	0.38	24 335	588 620	1					
284590	Isotopes (excluding those of heading no. 2844): compounds, inorganic or organic, of such isotopes, whether or not chemically defined	0.07	4 494	1 291 093	1					
284690	Compounds, inorganic or organic (excluding cerium), of rare-earth metals, of yttrium, scandium or of mixtures of these metals	0.26	16 956	72 189	1					
284700	Hydrogen peroxide: whether or not solidified with urea	0.20	13 128	668			+	+	+	+
290219	Cyclic hydrocarbons: cyclanes, cyclenes and cycloterpenes, excluding cyclohexane	0.25	16 356	5 520	1					
290290	Cyclic hydrocarbons: n.e.s. in heading no. 2902	0.31	19 871	3 648	1	B				
290330	Fluorinated, brominated or iodinated derivatives of acyclic hydrocarbons	0.65	41 805	9 910	1					
290344	Halogenated derivatives of acyclic hydrocarbons containing two or more different halogens: dichlorotetrafluoroethanes and chloropentafluoroethane	0.00	96	13 538	1					
290347	Halogenated derivatives of acyclic hydrocarbons containing two or more different halogens: perhalogenated derivatives n.e.s. in item no. 2903.41 to 2903.46	0.01	391	164 941	1					
290349	Halogenated derivatives of acyclic hydrocarbons containing two or more different halogens: n.e.s. in item no. 2903.4	0.21	13 786	4 726	1	B				
290359	Halogenated derivatives of cyclanic, cyclenic or cycloterpenic hydrocarbons: other kinds n.e.s. in item no. 2903.5	0.06	4 145	112 407	1					
290362	Halogenated derivatives of aromatic hydrocarbons: hexachlorobenzene and DDT (1,1,1-tri-chloro-2,2-bis (p-chlorophenyl) ethane)	0.00	223	60 951	1					
290369	Halogenated derivatives of aromatic hydrocarbons: n.e.s. in item no. 2903.6	0.24	15 781	8 137	1	B				
290410	Derivatives of hydrocarbons: containing only sulpho groups, their salts and ethyl esters, whether or not halogenated	0.20	12 654	2 072	1	B				
290490	Derivatives of hydrocarbons: n.e.s. in heading no. 2904, whether or not halogenated	0.12	7 553	4 512	1	B				
290512	Alcohols: saturated monohydric, propan-1-ol (propyl alcohol) and propan-2-ol (isopropyl alcohol)	0.39	25 435	1 546					+	+
290522	Alcohols: unsaturated monohydric, acyclic terpene alcohols	0.10	6 344	13 722	1	B				
290529	Alcohols: acyclic, unsaturated monohydric, (other than acyclic terpene alcohols)	0.10	6 206	23 776	1	B				
290539	Alcohols: acyclic, diols, n.e.s. in item no. 2905.3	0.48	31 118	2 797	1					
290549	Alcohols: polyhydric, n.e.s. in item no. 2905.4	0.11	7 237	4 103	1					
290550	Alcohols: acyclic: halogenated, sulphonated, nitrated or nitrosated derivatives thereof	0.09	5 542	10 770	1					

Table A.I (continued 1)
Chemicals usable in health

SH Code	Intitulé	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebelle - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
290611	Alcohols: cyclanic, cyclenic or cycloterpenic and derivatives, menthol	0.17	10 693	29 391	1					
290619	Alcohols: cyclanic, cyclenic or cycloterpenic and derivatives, n.e.s. in item no. 2906.1	0.13	8 145	20 686	1	B				
290629	Alcohols: aromatic and derivatives, other than benzyl alcohol	0.10	6 481	15 414	1	B				
290719	Monophenols: n.e.s. in item no. 2907.1	0.21	13 572	4 864	1				+	
290729	Polyphenols: n.e.s. in item no. 2907.2	0.17	10 822	12 002	1	B				
290810	Phenol or phenol-alcohol derivatives: containing only halogen substituents and their salts	0.15	9 484	11 645	1					
290820	Phenol or phenol-alcohol derivatives: containing only sulpho groups, their salts and esters	0.01	407	40 577	1					
290890	Phenol or phenol-alcohol derivatives: containing only nitrated or nitrosated groups, their salts and esters	0.06	3 624	15 209	1					
290919	Ethers: acyclic, and their halogenated, sulphonated, nitrated or nitrosated derivatives, other than diethyl ether	2.13	137 322	5 147	1	B				
290920	Ethers: cyclanic, cyclenic or cycloterpenic and their halogenated, sulphonated, nitrated or nitrosated derivatives	0.02	1 417	28 598	1					
290930	Ethers: aromatic, and their halogenated, sulphonated, nitrated or nitrosated derivatives	0.29	18 411	16 963	1	B				
290949	Ether-alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives: n.e.s. in item no. 2909.4	0.46	30 010	2 511	1	B				
290950	Ether-phenols, ether-alcohol-phenols and their halogenated, sulphonated, nitrated or nitrosated derivatives	0.08	5 407	24 294	1	B				
291020	Epoxides, epoxyalcohols, epoxyphenols and epoxyethers: with a three-membered ring and their halogenated, sulphonated, nitrated or nitrosated derivatives, methylloxirane (propylene oxide)	0.66	42 661	1 620	1					
291030	Epoxides, epoxyalcohols, epoxyphenols and epoxyethers: with a three-membered ring and their halogenated, sulphonated, nitrated or nitrosated derivatives, 1-chloro-2,3-epoxypropane (epichlorohydrin)	0.18	11 391	1 728	1					
291090	Epoxides, epoxyalcohols, epoxyphenols and epoxyethers: with a three-membered ring and their halogenated, sulphonated, nitrated or nitrosated derivatives, n.e.s. in heading no. 2910	0.08	5 463	5 677	1					
291100	Acetals and hemiacetals: whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrosated derivatives	0.03	1 785	17 293	1					
291219	Aldehydes: acyclic, without other oxygen function, n.e.s. in item no. 2912.1	0.17	11 103	6 224	1					
291229	Aldehydes: cyclic, without other oxygen function, other than benzaldehyde	0.11	7 166	10 126	4	B				
291249	Aldehyde-ethers, aldehyde-phenols and aldehydes with other oxygen function: n.e.s. in item no. 2912.4	0.04	2 685	19 086	1	B				
291300	Aldehydes: halogenated, sulphonated, nitrated or nitrosated derivatives of products of heading no. 2912	0.02	1 607	12 897	1					
291419	Ketones: acyclic, without other oxygen function, n.e.s. in item no. 2914.1	0.08	5 104	9 001	1	B				
291429	Ketones: cyclanic, cyclenic or cycloterpenic, without other oxygen function, n.e.s. in item no. 2914.2	0.22	14 002	17 410	1					
291439	Ketones: aromatic, (without other oxygen function), excluding phenylacetone (phenylpropan-2-one)	0.08	5 019	14 248	1					
291440	Ketone-alcohols and ketone-aldehydes	0.06	3 661	6 568	1	B				
291450	Ketone-phenols and ketones with other oxygen function	0.12	7 809	21 535	1					
291469	Quinones: other than anthraquinone	0.10	6 542	165 046	1	B				
291470	Ketones and quinones: halogenated, sulphonated, nitrated or nitrosated derivatives	0.14	8 813	24 051	1					
291511	Acids: saturated acyclic monocarboxylic acids: formic acid	0.09	5 499	1 047						+
291512	Acids: saturated acyclic monocarboxylic acids: salts of formic acids	0.08	5 371	973						+
291539	Acids: saturated acyclic monocarboxylic acids: esters of acetic acid n.e.s. in item no. 2915.3	0.36	23 143	2 363	1	B				
291550	Acids: saturated acyclic monocarboxylic acids: propionic acid, its salts and esters	0.11	7 055	2 003	1	B				
291560	Acids: saturated acyclic monocarboxylic acids: butyric, valeric acids: their salts and esters	0.13	8 690	2 965	1					
291570	Acids: saturated acyclic monocarboxylic acids: palmitic acid, stearic acid, their salts and esters	0.23	15 001	2 371	1					

Table A.I (continued 2)
Chemicals usable in health

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebelle - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
291590	Acids: saturated acyclic monocarboxylic acids: anhydrides, halides, peroxides, peroxyacids and halogenated, sulphonated, nitrated or nitrosated derivatives, n.e.s. in heading no. 2915	0.67	43 185	4 401	1	B				
291615	Acids: unsaturated acyclic monocarboxylic acids: oleic, linoleic or linolenic acids, their salts and esters	0.05	3 248	3 219	1					
291619	Acids: unsaturated acyclic monocarboxylic acids: n.e.s. in item no. 2916.1	0.17	10 881	5 664	1	B				
291620	Acids: cyclanic, cyclenic or cycloterpenic monocarboxylic acids, their anhydrides, halides, peroxides, peroxyacids and their derivatives	0.15	9 742	52 785	1	B				
291631	Acids: aromatic monocarboxylic acids, benzoic acid, its salts and esters	0.14	8 865	2 820	1					
291639	Acids: aromatic monocarboxylic acids, n.e.s. in item no. 2916.3	0.19	12 515	16 211	1	B				
291713	Acids: acyclic polycarboxylic acids: azelaic acid, sebacic acid, their salts and esters	0.08	4 981	6 550	1	B				
291719	Acids: acyclic polycarboxylic acids: n.e.s. in item no. 2917.1	0.20	12 663	3 782	1	B				
291734	Acids: aromatic polycarboxylic acids: other esters of orthophthalic acids	0.15	9 461	2 227	1	B				
291739	Acids: aromatic polycarboxylic acids: n.e.s. in item no. 2917.3	0.48	31 030	1 895	1	B				
291811	Acids: carboxylic acids, (with alcohol function but without other oxygen function), lactic acid, its salts and esters	0.15	9 756	2 878	1	B				
291813	Acids: carboxylic acids, (with alcohol function but without other oxygen function): salts and esters of tartaric acid	0.03	1 696	6 750	1	B				
291816	Acids: carboxylic acids, (with alcohol function but without other oxygen function), gluconic acid, its salts and esters	0.05	3 483	2 833	1	B				
291817	Acids: carboxylic acids, (with alcohol function but without other oxygen function), phenylglycolic acid (mandelic acid), its salts and esters	0.00	27	3 588	1					
291819	Acids: carboxylic acids, (with alcohol function but without other oxygen function), n.e.s. in item no. 2918.1	0.44	28 608	3 958	1	B				
291829	Acids: carboxylic acids, (with phenol function but without other oxygen function), their anhydrides, halides, peroxides, peroxyacids and their derivatives, n.e.s. in item no. 2918.2	0.22	13 895	6 478	1	B				
291830	Acids: carboxylic acids, (with aldehyde or ketone function but without other oxygen function), their anhydrides, halides, peroxides, peroxyacids and their derivatives	0.18	11 814	25 420	1	B				
291890	Acids: carboxylic acids, with additional oxygen function and their anhydrides, halides, peroxides and peroxyacids, n.e.s. in heading no. 2918	0.45	28 863	13 162	1					
291900	Esters: phosphoric, and their salts, including lactophosphates, their halogenated, sulphonated, nitrated or nitrosated derivatives	0.24	15 237	5 225	1					
292010	Esters: thiophosphoric (phosphorothioates) and their salts: their halogenated, sulphonated, nitrated or nitrosated derivatives	0.04	2 797	7 097	1					
292090	Esters of inorganic acids (excluding esters of hydrogen halides) and their salts, their halogenated, sulphonated, nitrated or nitrosated derivatives, n.e.s. in heading no. 2920	0.36	23 356	4 668	1	B				
292112	Amine-function compounds: acyclic monoamines and their derivatives: diethylamine and its salts	0.01	371	9 932	1					
292119	Amine-function compounds: acyclic monoamines and their derivatives, and salts thereof, n.e.s. in item no. 2921.1	0.34	21 661	5 631	1	B				
292129	Amine-function compounds: acyclic polyamines and their derivatives, and salts thereof, n.e.s. in item no. 2921.2	0.23	14 977	4 492	1	B				
292130	Amine-function compounds: cyclanic, cyclenic or cycloterpenic mono- or polyamines and their derivatives: salts thereof	0.15	9 874	5 903	1	B				
292142	Amine-function-compounds: aromatic monoamines and their derivatives, aniline derivatives and their salts	0.10	6 597	6 573	4	B				
292143	Amine-function compounds: aromatic monoamines and their derivatives, toluidines and their derivatives: salts thereof	0.08	5 345	7 676	1					
292145	Amine-function compounds: aromatic monoamines and their derivatives: 1-naphthylamine (alpha-naphthylamine), 2-naphthylamine (beta-naphthylamine) and their derivatives: salts thereof	0.15	9 471	23 916	1					

Table A.I (continued 3)
Chemicals usable in health

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebelle - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
292149	Amine-function compounds: aromatic monoamines and their derivatives: salts thereof: n.e.s. in item no. 2921.4	0.35	22 565	72 708	1	B				
292151	Amine-function compounds: aromatic amines and their derivatives: o-, m-, p-phenylenediamine, diaminotoluenes and their derivatives: salts thereof	0.27	17 231	5 133	1					
292159	Amine-function compounds: aromatic polyamines and their derivatives, other than item no. 2921.51	0.16	10 628	7 595	1	B				
292211	Amino-alcohols, their ethers and esters: (other than those containing more than one kind of oxygen function), monoethanolamine and its salts	0.10	6 666	1 657	1	B				
292219	Amino-alcohols, their ethers and esters: (other than those containing more than one kind of oxygen function), n.e.s. in item no. 2922.1	0.57	36 956	9 330	1	B				
292222	Amino-naphthols and other amino-phenols: their ethers and esters, (other than those containing more than one kind of oxygen function), anisidines, dianisidines, phenetidines and their salts	0.00	266	59 530	1					
292229	Amino-naphthols and other amino-phenols: their ethers and esters, (other than those containing more than one kind of oxygen function), n.e.s. in item no. 2922.2	0.15	9 773	9 207	1	B			+	
292230	Amino-aldehydes, amino-ketones and amino-quinones: other than those containing more than one kind of oxygen function: salts thereof	0.05	3 074	176 847	1					
292249	Amino-acids: their esters, (other than those containing more than one kind of oxygen function), n.e.s. in item no. 2922.4	1.87	120 446	7 054	1	B				
292250	Amino-alcohol-phenols, amino-acid-phenols and other amino-compounds with oxygen function	0.99	64 049	9 822	1	B			+	
292421	Cyclic amides (including cyclic carbamates) and their derivatives, ureines and their derivatives: salts thereof	0.08	5 203	13 863	1					
292519	Imides and their derivatives: other kinds, excluding saccharin	0.09	5 885	11 576	1	B				
292520	Imines and their derivatives: salts thereof	0.23	14 644	12 885	1				+	
292690	Nitrile-function compounds: n.e.s. in heading no. 2926	0.71	45 547	12 060	1	B				
292700	Diazo-, azo- or azoxy compounds	0.14	9 327	7 900	1	B				
292800	Organic derivatives of hydrazine or of hydroxylamine	0.32	20 413	5 687	1	B				
292990	Nitrogen-function compounds: n.e.s. in chapter 29, excluding isocyanates	0.13	8 275	7 174	1	B				
293010	Organo-sulphur compounds: dithiocarbonates (xanthates)	0.01	444	5 603	1					
293020	Organo-sulphur compounds: thiocarbamates and dithiocarbamates	0.09	6 102	4 081	1					
293030	Organo-sulphur compounds: thiuram mono-, di- or tetrasulphides	0.02	1 305	5 545	1					
293040	Organo-sulphur compounds: methionine	0.50	31 988	2 530	1					
293090	Organo-sulphur compounds: n.e.s. in heading no. 2930	1.71	110 242	6 940	1	B			+	
293100	Organo-inorganic compounds: n.e.s. in heading no. 2930	1.82	117 252	6 183	1	B				
293219	Heterocyclic compounds: containing an unfused furan ring (whether or not hydrogenated) in the structure, n.e.s. in item no. 2932.10	0.26	16 763	56 600	1				+	
293299	Heterocyclic compounds: with oxygen hetero-atom(s) only, (other than lactones or compounds containing an unfused furan ring (whether or not hydrogenated) in the structure), n.e.s. in item no. 2932.9	0.80	51 371	39 818	1	B				
293329	Heterocyclic compounds: containing an unfused imidazole ring (whether or not hydrogenated) in the structure, other than hydantoin and its derivatives	0.34	21 973	77 006	1	B			+	
293339	Heterocyclic compounds: containing an unfused pyridine ring (whether or not hydrogenated) in the structure, other than pyridine and its salts, other than piperidine and its salts	3.17	204 906	89 388	1				+	
293340	Heterocyclic compounds: containing a quinoline or isoquinoline ring-system (whether or not hydrogenated) in the structure, not further fused	0.78	50 195	195 362	1				+	
293379	Heterocyclic compounds: lactams: other than 6-hexanelactam (epsilon caprolactam)	1.70	109 532	15 689	1				+	
293390	Heterocyclic compounds: n.e.s. in heading no. 2933	5.71	368 603	128 449	1		+		+	

**Table A.I (continued 4)
Chemicals usable in health**

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebelle - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
293410	Heterocyclic compounds: containing an unfused thiazole ring (whether or not hydrogenated) in the structure	0.48	30 729	104 337	1				+	
293420	Heterocyclic compounds: containing a benzothiazole ring-system (whether or not hydrogenated), not further fused	0.33	21 170	4 978	1					
293490	Nucleic acids and their salts, other heterocyclic compounds, n.e.s. in heading no. 2934	5.16	333 071	126 888	1				+	
294200	Organic compounds: n.e.s. in chapter 29	0.41	26 499	24 952	1	B				
320300	Colouring matter of vegetable or animal origin, including dyeing extracts not animal black, whether or not chemically defined: preparations based on colouring matter of vegetable or animal origin	0.29	18 675	20 438	1	B				
320412	Dyes: acid, whether or not premetallised and preparations based thereon, mordant dyes and preparations based thereon	0.31	19 744	13 060	1					
320413	Dyes: basic dyes and preparations based thereon	0.10	6 735	11 959	1					
320419	Dyes: n.e.s., including mixtures of colouring matter of two or more of those from item no. 3204.11 to 3204.19	0.53	34 504	12 934	1	B				
320490	Dyes: synthetic organic products n.e.s. in heading no. 3204 (eg of a kind used as luminophores), whether or not chemically defined	0.13	8 145	10 927	1					
340111	Soap and organic surface-active products: in the form of bars, cakes, moulded shapes, and paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent, for toilet use (including medicated products)	0.85	54 909	3 205			+	+	+	+
340119	Soap and organic surface-active products: in the form of bars, cakes, moulded shapes, and paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent, not for toilet use	0.44	28 577	2 824			+		+	
340120	Soap: in forms n.e.s. in item no. 3401.11	0.58	37 379	2 424			+		+	+
340212	Organic surface-active agents: cationic (other than soap), whether or not put up for retail sale	0.18	11 593	2 933	1		+	+		
340213	Organic surface-active agents: non-ionic (other than soap), whether or not put up for retail sale	1.24	80 277	2 890	1			+		
340219	Organic surface-active agents: whether or not put up for retail sale, n.e.s. in heading no. 3402	0.25	16 335	2 444					+	
340220	Washing and cleaning preparations: surface-active, whether or not containing soap (excluding those of heading no. 3401), put up for retail sale	4.13	266 990	2 846			+	+	+	+
350400	Peptones and their derivatives: other protein substances and their derivatives n.e.s. or included, hide powder, whether or not chromed	0.61	39 688	7 384	1			+		
350790	Enzymes and prepared enzymes: other than rennet and concentrates thereof	1.28	82 913	13 652	1	C1		+		
380840	Disinfectants and similar products: in forms, packings or articles for retail sale	0.50	32 082	4 047	1		+	+	+	+
382100	Culture media, prepared: for development of micro-organisms	0.43	27 466	58 240			+	+	+	+
382200	Reagents: diagnostic or laboratory reagents on a backing and prepared diagnostic or laboratory reagents whether or not on a backing, other than those of heading no. 3002 or 3006	5.94	383 509	106 459		C1	+	+	+	+
382420	Acids: naphthenic acids, their water-insoluble salts and their esters	0.02	1 179	2 830	1					
382490	Chemical products, preparations and residual products of the chemical or allied industries, n.e.s. or included in heading no. 3824	10.85	700 266	4 328	1	C1	+	+	+	+
390190	Ethylene polymers: in primary forms, n.e.s. in heading no. 3901	3.60	232 667	1 752	1					
390290	Propylene, other olefin polymers: n.e.s. in heading no. 3902, in primary forms	0.66	42 541	2 992	1					
390599	Vinyl acetate, vinyl ester polymers, vinyl polymers: n.e.s. in heading no. 3905, in primary forms, other than copolymers	0.27	17 268	9 363	1				+	
390690	Acrylic polymers: (other than polymethyl methacrylate), in primary forms	3.49	225 071	2 408	1					

Table A.I (end)
Chemicals usable in health

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebelle - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
390710	Polyacetals: in primary forms	0.51	33 016	2 651	1					
390720	Polyethers: in primary forms, excluding polyacetals	2.93	189 314	2 369	1					
390730	Epoxide resins: in primary forms	1.69	108 927	5 307	1					
390799	Polyesters: n.e.s. in heading no. 3907, saturated, in primary forms	2.23	143 683	3 553	1					
390890	Polyamides: n.e.s. in heading no. 3908, in primary forms	0.75	48 388	4 511	1					
390910	Amino-resins: urea and thiourea resins, in primary forms	0.29	19 027	1 761	1					
390940	Phenolic resins: in primary forms	0.54	34 951	3 054	1					
391190	Polysulphides, polysulphones and similar products of chemical synthesis n.e.s. in chapter 39: in primary forms	1.25	80 563	4 867	1					
391231	Cellulose ethers: carboxymethylcellulose and its salts, in primary forms	0.23	15 038	4 429	1					
391239	Cellulose ethers: (other than carboxymethylcellulose and its salts), in primary forms	0.63	40 824	6 244	1					
391290	Cellulose and its chemical derivatives: n.e.s. in item no. 3912, in primary forms	0.26	16 842	5 999	1					
391390	Polymers, natural and modified natural: in primary forms (excluding alginic acid, its salts and esters)	0.53	34 229	11 052	1					
391400	Ion-exchangers: based on polymers of heading no. 3901 to 3913, in primary forms	0.44	28 258	5 230	1					
	Sum of HS6 products in the branch	100.00	6 456 993							

Notes: HS-6 categories in this branch are classified in two production stages based on the UN's BEC Classification: semi-finished intermediate goods (in black in the table) and consumption goods (in red).

The figures in the "WTO Pharma Agreement" column of the table refer to the numbers in appendices (1-4) of the Agreement which classify the consolidated list dated May 2020 (see **section 2**). The vast majority of HS-6 products concerned are listed in appendix 1 (pharmaceutical active ingredients that bear an "international non-proprietary name" (INN) from the WHO); and the remainder in appendix 4 (additional products used for the production and manufacture of finished pharmaceuticals).

In case of missing data for some HS-6 products, the average of median unit values has been calculated over the last three years available, namely: 2015-17 for HS 290344; 2012-13-15 for HS 290820; 2005-07 for HS 291817; 2014-16 for HS 292112; 2012-15-16 for HS 292222; 2014-16 for HS 293010; and 2014-16 for HS 382420.

Source: authors' calculations based on CEPII, WTCF database V202108.

7.2.2. The basic pharmaceutical products branch

This branch corresponds precisely to Section 21.10 of the CPA Classification covering organic pharmaceuticals. Our database counts 66 HS-6 items covering the 2000-2019 period (**Table A.II**). With one exception (HS-291821 "salicylic acid and its salts" found only on the WCO/WHO Covid 3.01 list), these products are all on the list defined by the Pharma Agreement. They are also all classified as semi-finished intermediate goods by the UN's BEC Classification.

These products are active ingredients used in the manufacture of medicines (acids, alkaloids, antibiotics, essential vitamins, etc.), processed blood products, chemically pure sugars, processed glands and extracts of glands. The relative shares of these HS-6 products (the top ten of which account for 68% of world trade in the branch in cumulative value for the 2000-2019 period) and their unit values for the last three years are highly diverse:

- In first place, the relative share of "heterocyclic compounds; containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure" (HS 293359) stands at 16%, with a median unit value of nearly \$142,000 per tonne;
- In tenth place, other "heterocyclic compounds; containing an unfused triazine ring (whether or not hydrogenated) in the structure" (HS 293369) post a relative share of 2% with a median unit value of \$3,000 per tonne;

- In 14th place of the relative share ranking (1.7%), “hormones and steroids used primarily as hormones: insulin and its salts” (HS 293791) is a very expensive basic pharmaceutical product with a median unit value de \$8.4 million per tonne.

The distribution of unit values in this branch is more dispersed than in the four other branches.

- The five most expensive HS-6 items all stand at over \$3 million per tonne: HS-293961 “Alkaloids, vegetable: of rye ergot and their derivatives, ergometrine (INN) and its salts” (\$12 million per tonne); HS-293791 “hormones and steroids used primarily as hormones: insulin and its salts” (\$8.4 million); HS-293969 “alkaloids, vegetable: of rye ergot and their derivatives, salts thereof, n.e.s. in item no. 2939.6” (\$4.2 million); HS-293962 “Alkaloids, vegetable: of rye ergot and their derivatives, ergometrine (INN) and its salts” (\$3.1 million); and HS-293990 “Alkaloids, vegetable: natural or reproduced by synthesis, and their salts, esters and other derivatives n.e.s. in heading no. 2939” (\$3.1 million).
- The last five items weigh in at less than \$4,000 dollars per tonne: HS-292241 “Amino-acids: their esters (other than those containing more than one kind of oxygen function), lysine and its esters: salts thereof” (\$1,400 per tonne); HS-292242 “Amino-acids: their esters (other than those containing more than one kind of oxygen function), glutamic acid and its salts” (\$1,900); HS-292320 “Lecithins and other phosphoaminolipids” (\$2,300); HS-292310 “Quaternary ammonium salts and hydroxides; choline and its salts” (\$2,500); and HS-293369 “heterocyclic compounds; containing an unfused triazine ring (whether or not hydrogenated) in the structure” (\$3,700).

Table A.II (top)
Basic pharmaceutical products

HS Code	Label	Share in the brand's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Helble - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
291821	Acids: carboxylic acids, (with phenol function but without other oxygen function), salicylic acid and its salts	0.12	2 005 368	5 804						
291822	Acids: carboxylic acids, (with phenol function but without other oxygen function), o-acetyl/salicylic acid, its salts and esters	0.11	1 804 241	5 455	1	B				
291823	Acids: carboxylic acids, (with phenol function but without other oxygen function), other esters of salicylic acid and its salts n.e.s. in item no. 2918.2	0.22	3 600 313	6 025	1	B				
292241	Amino-acids: their esters, (other than those containing more than one kind of oxygen function), lysine and its esters: salts thereof	1.85	30 191 299	1 427	4	B				
292242	Amino-acids: their esters, (other than those containing more than one kind of oxygen function), glutamic acid and its salts	1.30	21 281 414	1 889	1					
292310	Quaternary ammonium salts and hydroxides: choline and its salts	0.27	4 451 550	2 488	1	B				
292320	Lecithins and other phosphoaminolipids	0.76	12 475 697	2 264	1					
292390	Quaternary ammonium salts and hydroxides: n.e.s. in heading no. 2923	1.11	18 158 177	4 080	1	B			+	
292410	Acyclic amides (including acyclic carbamates) and their derivatives: salts thereof	1.85	30 208 453	5 106	1					
292422	Cyclic amides (including cyclic carbamates) and their derivatives: 2-acetamidobenzoic acid	0.005	81 211	15 671	1					
292429	Cyclic amides (including cyclic carbamates) and their derivatives: n.e.s. in item no. 2924.2	6.18	100 993 622	20 894	1	B			+	
293221	Heterocyclic compounds: lactones, coumarin, methylcoumarins and ethylcoumarins	0.03	460 254	16 565						
293229	Heterocyclic compounds: lactones, other lactones excluding those of item no. 2932.21	3.66	59 744 372	21 810	1					
293311	Heterocyclic compounds: containing an unfused pyrazole ring (whether or not hydrogenated) in the structure, phenazone (antipyrin) and its derivatives	0.17	2 697 807	27 036	1	B				
293319	Heterocyclic compounds: containing an unfused pyrazole ring (whether or not hydrogenated) in the structure, other than those of item no. 2933.11	1.67	27 271 094	73 335	1					
293321	Heterocyclic compounds: containing an unfused imidazole ring (whether or not hydrogenated) in the structure, hydantoin and its derivatives	0.20	3 315 953	6 980	1	B				
293351	Heterocyclic compounds: containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, malonylurea (barbituric acid) and its derivatives: salts thereof	0.07	1 197 021	126 465	1					
293359	Heterocyclic compounds: containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, (other than malonylurea (barbituric acid) and its derivatives and salts thereof)	15.79	258 004 232	141 577	1	B	+		+	
293369	Heterocyclic compounds: containing an unfused triazine ring (whether or not hydrogenated) in the structure, others excluding melamine	2.15	35 169 540	3 658	1	B				
293430	Heterocyclic compounds: containing a phenothiazine ring-system (whether or not hydrogenated), not further fused	0.19	3 036 437	139 401	1				+	
293500	Sulphonamides	8.65	141 328 205	86 306	1					
293610	Provitamins: unmixed	0.04	588 250	10 460	1	A3				
293621	Vitamins: vitamins A and their derivatives, unmixed	0.75	12 207 214	65 540	1	A3	+			
293622	Vitamins: vitamin B1 and its derivatives, unmixed	0.34	5 488 093	49 379	1	A3	+			
293623	Vitamins: vitamin B2 and its derivatives, unmixed	0.32	5 242 914	49 951	1	A3	+			
293624	Vitamins: D- or DL-pantothenic acid (vitamin B3 or vitamin B5) and its derivatives, unmixed	0.47	7 607 501	27 723	1	A3	+			
293625	Vitamins: vitamin B6 and its derivatives, unmixed	0.23	3 814 261	40 223	1	A3	+			
293626	Vitamins: vitamin B12 and its derivatives, unmixed	0.27	4 363 929	65 494	1	A3	+			
293627	Vitamins: vitamin C and its derivatives, unmixed	1.34	21 824 821	9 694	1	A3	+			
293628	Vitamins: vitamin E and its derivatives, unmixed	1.75	28 600 313	19 071	1	A3	+			
293629	Vitamins: n.e.s. in item no. 2936.2, and their derivatives, unmixed	1.73	28 249 327	26 505	1	A3	+			
293690	Vitamins: n.e.s. in heading no. 2936, including natural concentrates	1.04	16 957 161	26 553		A3	+			

Table A.II (end)
Basic pharmaceutical products

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebber - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid3.01
293710	Hormones: pituitary (anterior) or similar hormones and their derivatives	0.76	12 461 187	2 663 404	1	A3				
293721	Hormones: cortisone, hydrocortisone, prednisone (dehydrocortisone) and prednisolone (dehydrohydrocortisone)	0.36	5 865 329	930 766	1	A3	+		+	
293722	Hormones: halogenated derivatives or adrenal cortical hormones	1.27	20 789 271	3 081 680	1	A3	+			
293729	Hormones: adrenal cortical hormones and their derivatives, n.e.s. in item no. 2937.2	0.98	16 085 904	1 909 774	1		+		+	
293791	Hormones and steroids used primarily as hormones: insulin and its salts	1.73	28 327 315	8 372 272	1	A3	+			
293792	Hormones and steroids used primarily as hormones: oestrogens and progestogens	0.92	15 025 034	1 881 495	1	A3	+			
293799	Hormones and steroids used primarily as hormones: (other than insulin and its salts, oestrogens and progestogens)	8.66	141 446 167	2 308 162	1	A3	+		+	
293810	Glycosides: rutoside (rutin) and its derivatives	0.16	2 613 049	64 790	1	B				
293890	Glycosides: natural or reproduced by synthesis, other than rutoside (rutin) and its derivatives	1.06	17 301 189	118 246	1	C1				
293910	Alkaloids, vegetable: of opium and their derivatives: salts thereof	0.65	10 606 466	685 577	1	A3	+		+	
293921	Alkaloids, vegetable: of cinchona and their derivatives, quinine and its salts	0.02	335 841	108 908	1	A3				
293929	Alkaloids, vegetable: of cinchona and their derivatives: salts thereof, other than quinine and its salts	0.07	1 211 983	128 390	1	A3	+			
293930	Alkaloids, vegetable: caffeine and its salts	0.29	4 781 570	14 514		A3	+			
293941	Alkaloids, vegetable: ephedrine and its salts	0.02	262 812	90 410	1	A3	+			
293942	Alkaloids, vegetable: pseudoephedrine (INN) and its salts	0.09	1 511 121	70 678	1	A3	+			
293949	Alkaloids, vegetable: ephedrines and their salts, other than ephedrine and its salts and other than pseudoephedrine (INN) and its salts	0.03	429 587	101 028	1	A3	+			
293950	Alkaloids, vegetable: theophylline and aminophylline (theophyllineethylenediamine) and their derivatives: salts thereof	0.10	1 617 378	47 670	1	A3	+			
293961	Alkaloids, vegetable: of rye ergot and their derivatives, ergometrine (INN) and its salts	0.01	91 801	12 145 149	1	A3	+			
293962	Alkaloids, vegetable: of rye ergot and their derivatives, ergotamine (INN) and its salts	0.01	167 529	3 484 126	1	A3	+			
293963	Alkaloids, vegetable: of rye ergot and their derivatives, lysergic acid and its salts	0.00	52 936	533 704		A3	+			
293969	Alkaloids, vegetable: of rye ergot and their derivatives, salts thereof, n.e.s. in item no. 2939.6	0.19	3 141 917	4 180 145	1	A3	+			
293970	Alkaloids, vegetable: nicotine and its salts	0.12	1 941 542	1 792 087	1	A3	+		+	
293990	Alkaloids, vegetable: natural or reproduced by synthesis, and their salts, esters and other derivatives n.e.s. in heading no. 2939	1.17	19 180 387	3 147 496	1	A3	+			
294000	Sugars: chemically pure, other than sucrose, lactose, maltose, glucose and fructose: sugar ethers and sugar esters, and their salts, other than products of heading no. 2937, 2938 or 2939	1.02	16 676 009	6 855	1	B				
294110	Antibiotics: penicillins and their derivatives with a penicillanic acid structure: salts thereof	2.42	39 522 667	42 745	1	A3	+		+	
294120	Antibiotics: streptomycins and their derivatives: salts thereof	0.10	1 698 887	59 668	1	A3	+			
294130	Antibiotics: tetracyclines and their derivatives: salts thereof	0.87	14 276 996	48 810	1	A3	+		+	
294140	Antibiotics: chloramphenicol and its derivatives: salts thereof	0.18	2 920 842	73 589	1	A3	+			
294150	Antibiotics: erythromycin and its derivatives: salts thereof	1.34	21 921 709	132 910	1	A3	+			
294190	Antibiotics: n.e.s. in heading no. 2941	10.56	172 645 005	188 859	1	A3	+		+	
300110	Glands and other organs: dried, whether or not powdered	0.03	495 279	51 472	1	C1				
300120	Glands: extracts of glands, other organs or of their secretions, for organo-therapeutic uses	0.30	4 983 340	275 598	1	C1	+	+		
300190	Glands: heparin and its salts: other human or animal substances prepared for therapeutic or prophylactic uses, not elsewhere specified or included	3.78	61 842 470	895 123	1	C1	+	+	+	
300290	Toxins, cultures of micro-organisms (excluding yeasts) and similar products	6.09	99 493 556	174 911	1	C1	+	+	+	+
	Sum of HS6 products in the branch	100.00	1 634 144 120							

Notes: HS-6 categories in this branch are all classified as semi-finished intermediate goods based on the UN's BEC Classification which lists traded goods by production stage.

The figures in the "WTO Pharma Agreement" column of the table refer to the numbers in appendices (1-4) of the Agreement which classify the consolidated list dated May 2020 (see **section 2**). The vast majority of HS-6 products concerned are listed in appendix 1 (pharmaceutical active ingredients that bear an "international non-proprietary name" (INN) from the WHO); and the remainder in appendix 4 (additional products used for the production and manufacture of finished pharmaceuticals).

Due to erratic evolution or lack of data availability, the average of median unit values has been calculated over the years 2009-11 for HS 293221, 2015-17 for HS 293610, and 2008-10 for HS 293921 and HS 300110.

Source: authors' calculations based on CEPII, WTFC database V202108.

7.2.3. The pharmaceutical preparations branch

This branch, which corresponds to Section 21.20 of the CPA Classification⁵³ contains three times fewer HS-6 products (**Table A.III**) than the previous branch. The 21 pharmaceutical preparations are, with a few exceptions, practically all identified in the Helble, EC and WTO lists. Only half are covered by the Pharma Agreement list, while the WCO/WHO Covid 3.01 list only includes one product from this branch.

Pharmaceutical preparations include medicaments (therapeutic sera and other blood fractions, vaccines and miscellaneous medicaments, including homeopathic preparations); chemical contraceptive products for external use and hormonal contraceptive medicaments; medical diagnostic preparations, including pregnancy tests; radioactive in-vivo diagnostic substances; biotech pharmaceuticals; and botanical products for pharmaceutical use. The concentration is even higher than that observed for the products in the first branch: the two leading products alone account for 75% of world trade in pharmaceutical preparations in 2000-2019 cumulative value:

- Trade in “medicaments; consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale” (HS 300490 covering consumer goods) accounts for 58% of world trade in pharmaceutical preparations, with a median unit value of \$60,000 per tonne for the 2017-2019 period. The item’s heading and the weight of its relative share stand as evidence of the heterogeneity of its content;
- In second place, “blood: human or animal, antisera and other blood fractions and modified immunological products, whether or not obtained by means of biotechnological processes” (HS 300210 covering semi-finished intermediate goods) account for 17% with a nine times higher median unit value (\$537,000 per tonne);
- The share of vaccines prior to the Covid-19 shock was relatively modest (in fourth place with 4.4% of the branch’s world trade in value), but vaccines are the number two most expensive product in terms of unit values (\$415,000 per tonne) just behind “antisera, etc.”.

The unit values for pharmaceutical preparations are much less dispersed than those for the previous two branches, ranging from \$537,000 to \$153,000 dollars per tonne for the five most expensive HS-6 items, and from \$31,000 to \$60,000 for the five least expensive items.

⁵³ With the exception of HS 212024 (wadding, gauze, bandages impregnated for medical use, dressings and catgut) classed in the “small medical materials” branch.

Table A.III
Pharmaceutical preparations

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebille - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
293329	Heterocyclic compounds: containing an unfused imidazole ring (whether or not hydrogenated) in the structure, other than hydanbin and its derivatives	0.29	21 972 790	77 006	1	B			+	
300210	Blood: human or animal, antisera and other blood fractions and modified immunological products, whether or not obtained by means of biotechnological processes	17.43	1 322 874 393	537 082	1	C1				
300220	Vaccines: for human medicine	4.42	335 564 700	414 512	1	A1	+	+	+	
300230	Vaccines: for veterinary medicine	0.70	52 786 449	119 480			+			
300310	Medicaments: containing penicillins, streptomycins or their derivatives, for therapeutic or prophylactic uses, (not in measured doses, not packaged for retail sale)	0.22	16 574 780	86 043	1	A2	+		+	
300320	Medicaments: containing antibiotics other than penicillins, streptomycins and their derivatives, for therapeutic or prophylactic uses, (not in measured doses, not packaged for retail sale)	0.30	22 471 191	55 552	1	A2	+	+	+	
300331	Medicaments: containing insulin (but not containing antibiotics), for therapeutic or prophylactic uses, not packaged for retail sale	0.04	2 669 877	101 540	1	A2	+	+		
300339	Medicaments: containing hormones (excluding insulin), (but not containing antibiotics), for therapeutic or prophylactic uses, not packaged for retail sale	0.25	19 330 899	60 343	1	A2	+	+	+	
300340	Medicaments: containing alkaloids or their derivatives, (but not containing hormones or antibiotics), for therapeutic or prophylactic uses, (not packaged for retail sale)	0.04	3 395 742	82 462	1	A2	+	+	+	
300390	Medicaments: (not containing antibiotics, hormones, alkaloids or their derivatives), for therapeutic or prophylactic uses, (not packaged for retail sale)	1.92	145 908 620	43 719	1	A2	+	+	+	
300410	Medicaments: containing penicillins, streptomycins or their derivatives, for therapeutic or prophylactic uses, packaged for retail sale	0.90	67 987 421	38 432		A1	+	+	+	
300420	Medicaments: containing antibiotics (other than penicillins, streptomycins or their derivatives), for therapeutic or prophylactic uses, packaged for retail sale	3.33	252 738 698	61 462		A1	+	+	+	
300431	Medicaments: containing insulin (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	2.05	155 758 064	206 293	1	A1	+	+		
300432	Medicaments: containing adrenal cortex hormones (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	1.58	119 625 386	107 480		A1	+	+	+	
300439	Medicaments: containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	4.90	372 127 359	185 159		A1	+	+	+	
300440	Medicaments: containing alkaloids or their derivatives (but not hormones or antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	1.09	82 860 862	106 929		A1	+	+	+	
300450	Medicaments: containing vitamins or their derivatives, for therapeutic or prophylactic use, packaged for retail sale	1.06	80 649 188	30 890		A1	+	+		
300490	Medicaments: consisting of mixed or unmixed products n.e.s. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale	57.91	4 396 212 273	60 125		A1	+	+	+	+
300620	Pharmaceutical goods: blood-grouping reagents	0.11	8 093 163	153 196		C1	+	+		
300630	Pharmaceutical goods: opacifying preparations for x-ray examinations, diagnostic reagents designed to be administered to the patient	0.73	55 270 971	145 356	1	C1	+	+		
300660	Pharmaceutical goods: chemical contraceptive preparations based on hormones or spermicides	0.74	56 147 958	135 268		A2	+			
	Sum of HS6 products in the branch	100.00	7 591 020 785							

Notes: HS-6 categories in this branch are classified in two production stages based on the UN's BEC Classification: semi-finished intermediate goods (in black in the table) and consumption goods (in red).

The figures in the "WTO Pharma Agreement" column of the table refer to the numbers in appendices (1-4) of the Agreement which classify the consolidated list dated May 2020 (see **section 2**). The vast majority of HS-6 products concerned are listed in appendix 1 (pharmaceutical active ingredients that bear an "international non-proprietary name" (INN) from the WHO); and the remainder in appendix 4 (additional products used for the production and manufacture of finished pharmaceuticals).

The four groups of products in **Figure 5** of **Section 3.1** correspond to the following groupings:

- medicaments
300310+300320+300331+300339+300340+300390+300410+300420+300431+300432+300439+300440+300450+300490; =
- antisera & other immunological products = 300210;
- vaccines = 300220+300230;
- other pharmaceutical preparations = 293329+300620+300630+300660

Source: authors' calculations based on CEPII, WTFC database V202108.

7.2.4. The medical technology equipment branch

The branch counts 45 HS-6 products, which are mainly electronics and electrical industry products used in healthcare, as well as other medical and dental instruments and supplies (**Table A.IV**).

None of these products is included in the Pharma Agreement, but some are covered by the WTO's Information Technology Agreement (ITA).⁵⁴ The European Commission's list of medical products includes the most products (33) and the WCO/WHO list the least (13). Our list adds in an extra item (exposure meters, HS-902740), absent from the other lists.

The value of trade in the five most traded products over the 2000-2019 period accounts for approximately half of the branch's world trade.

- In first and second place, the heterogeneous groupings of "instruments and appliances used in medical, surgical, dental or veterinary sciences, not elsewhere classified (HS-901890) and "electrical machines and apparatus having individual functions not elsewhere classified in chapter 85"⁵⁵ (HS-854389) account respectively for one-fifth and one-tenth of world flows over the 2000-2019 period, with relatively low unit values for the 2017-2019 period (\$87,000 and \$106,000 per tonne);
- "Appliances; worn, carried or implanted in the body, to compensate for a defect or disability, not elsewhere classified" (HS-902190), in third place with 5% of world flows in the branch, have a much higher unit value (\$631,000 per tonne);
- The next two items of "medical, surgical instruments and appliances; electro-diagnostic apparatus (including apparatus for functional exploratory examination or for checking physiological parameters), not elsewhere specified" (HS-901819) and "instruments and apparatus; for physical or chemical analysis, for measuring or checking viscosity, porosity, expansion, surface tension or quantities of heat, sound or light, not elsewhere classified" (HS-902780) each represent approximately 5% of international trade flows in the branch with similar unit values (\$265,000 and \$231,000 per tonne).

In the ranking of unit values, two products far outstrip the others: "pacemakers; for stimulating heart muscles (excluding parts and accessories) (HS-902150) and "hearing aids (excluding parts and accessories)" (HS-902140) with \$3 million and \$1.7 million per tonne.

⁵⁴ Concluded in 1996 by 82 WTO members, the ITA eliminated tariffs on most information technology (IT) products including a number of HS-6 items relating to medical equipment. In 2015, the agreement was expanded to cover other products, notably medical products, but the expansion only concerned certain members.

⁵⁵ HS-85 corresponds to electrical machinery and equipment and parts thereof; sound recorders and reproducers; television image and sound recorders and reproducers, and parts and accessories of such articles.

Table A.IV
Medical technology equipment

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Hebille - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
841920	Sterilizers: for medical, surgical or laboratory use, not used for domestic purposes	0.54	19 761 990	52 679		C2	+	+	+	+
853949	Lamps: ultra-violet or infra-red lamps, (excluding arc-lamps)	0.42	15 334 561	114 169						+
854319	Electrical machines and apparatus: particle accelerators, (other than ion implanters for doping semiconductor materials), having individual functions n.e.s. in chapter 85	0.13	4 696 866	199 991					+	
854389	Electrical machines and apparatus: n.e.s. in heading no. 8543, (other than proximity cards or tags), having individual functions n.e.s. in chapter 85	13.34	485 035 995	106 349						+
900630	Cameras, photographic (excluding cinematographic): specially designed for underwater use, aerial survey, medical or surgical examination of internal organs: comparison cameras for forensic or criminological use	0.10	3 762 997	689 825		C2				
901050	Photographic laboratory apparatus and equipment: n.e.s. in item no. 9010.10 or 9010.4, for photographic (including cinematographic) laboratories: negaboscopes	0.27	9 899 375	65 820				+		
901110	Microscopes, compound optical: stereoscopic microscopes	0.90	32 604 549	167 655			+	+		
901180	Microscopes, compound optical: (other than stereoscopic and microscopes for photomicrography, cinephotomicrography or microprojection)	0.40	14 398 430	161 358			+	+		
901190	Microscopes, compound optical: parts and accessories (including those for photomicrography, cinephotomicrography or microprojection)	0.38	13 732 169	270 410			+			
901811	Medical, surgical instruments and appliances: electro-cardiographs	0.47	16 912 906	167 779		C2	+	+	+	+
901812	Medical, surgical instruments and appliances: ultrasonic scanning apparatus	2.11	76 895 792	322 625		C2	+	+	+	+
901813	Medical, surgical instruments and appliances: magnetic resonance imaging apparatus	2.02	73 488 968	157 931		C2	+	+		
901814	Medical, surgical instruments and appliances: scintigraphic apparatus	0.16	5 878 219	286 558		C2	+	+		
901819	Medical, surgical instruments and appliances: electro-diagnostic apparatus (including apparatus for functional exploratory examination or for checking physiological parameters), n.e.s. in item no. 9018.1	4.90	178 387 293	265 256		C2	+	+	+	+
901820	Medical, surgical instruments and appliances: ultra-violet or infra-red ray apparatus	0.17	6 325 715	142 040		C2	+	+		
901841	Dental instruments and appliances: dental drill engines, whether or not combined on a single base with other dental equipment	0.21	7 690 068	144 198		C2	+			
901849	Dental instruments and appliances: other than dental drill engines	1.98	72 182 525	173 329		C2	+			
901850	Ophthalmic instruments and appliances	1.58	57 579 510	273 812		C2	+			
901890	Medical, surgical or dental instruments and appliances: n.e.s. in heading no. 9018	20.54	746 983 264	87 037		C2	+	+	+	+
901920	Therapeutic respiration apparatus: ozone, oxygen, aerosol therapy apparatus: artificial respiration or other therapeutic respiration apparatus	2.89	105 066 417	77 146		C2	+	+	+	+
902111	Orthopaedic or fracture appliances: artificial joints	3.51	127 671 433	802 228		C2	+			
902119	Orthopaedic or fracture appliances: crutches, surgical belts and trusses, splints and other fracture appliances	3.49	126 936 615	124 698		C2	+			
902121	Dental fittings: artificial teeth	0.29	10 511 081	232 690		C2	+			
902129	Dental fittings: other than artificial teeth	1.06	38 463 271	785 951		C2	+			
902130	Artificial parts of the body	3.82	138 873 012	650 476		C2	+			
902140	Hearing aids (excluding parts and accessories)	1.65	60 032 104	1 651 774		C2	+			
902150	Pacemakers: for stimulating heart muscles (excluding parts and accessories)	3.21	116 851 557	3 101 629		C2	+	+		
902190	Appliances: worn, carried or implanted in the body, to compensate for a defect or disability	5.02	182 753 140	631 273		C2	+			
902212	Apparatus based on the use of x-rays: including radiography or radiotherapy apparatus, whether or not for medical, surgical, dental or veterinary uses, computed tomography apparatus	1.64	59 805 064	116 865		C2	+	+	+	+
902213	Apparatus based on the use of x-rays: including radiography or radiotherapy apparatus, for dental uses, excluding computed tomography apparatus	0.37	13 340 212	116 126		C2	+			
902214	Apparatus based on the use of x-rays: including radiography or radiotherapy apparatus, for medical, surgical or veterinary uses, not dental uses, excluding computed tomography apparatus	2.56	93 260 800	89 110		C2	+	+	+	
902219	Apparatus based on the use of x-rays, including radiography or radiotherapy apparatus: for other than medical, surgical, dental or veterinary uses	1.13	40 995 748	119 870				+		
902221	Apparatus based on the use of alpha, beta or gamma radiations, including radiography or radiotherapy apparatus: for medical, surgical, dental or veterinary uses	0.24	8 773 797	111 117		C2	+	+		
902229	Apparatus based on the use of alpha, beta or gamma radiations, including radiography or radiotherapy apparatus: (for other than medical, surgical, dental or veterinary uses)	0.19	6 882 373	221 413				+		
902230	X-ray tubes	0.81	29 320 449	365 684			+	+	+	
902290	Apparatus based on use of x-rays and similar: parts and accessories (x-ray generators, tubes, high tension generators, control panels and desks, screens, examination or treatment tables, chairs and like	3.54	128 637 113	222 036			+	+	+	
902680	Instruments and apparatus: for measuring or checking variables of liquids or gases (excluding pressure or the flow and level of liquids and those of heading no. 9014, 9015, 9028 and 9032)	1.42	51 566 770	165 385					+	+
902740	Exposure meters	0.01	295 729	357 136						
902750	Instruments and apparatus: using optical radiations (UV, visible, IR), (other than spectrometers, spectrophotometers and spectrographs)	3.21	116 692 816	340 654					+	
902780	Instruments and apparatus: for physical or chemical analysis, for measuring or checking viscosity, porosity, expansion, surface tension or quantities of heat, sound or light, n.e.s. in heading no. 9025	4.84	175 958 917	230 777			+	+	+	+
902820	Meters: liquid supply or production meters, including calibrating meters thereof	0.54	19 663 459	43 405					+	+
902920	Meters: speed indicators and tachometers: stroboscopes	1.96	71 126 709	168 804					+	
903020	Cathode-ray oscilloscopes and cathode-ray oscillographs	0.30	11 027 730	371 599			+	+		
940210	Chairs: dentists', barbers' or similar chairs having rotating as well as both reclining and elevating movements, and parts thereof	0.22	7 879 162	17 317		C2	+			
940290	Furniture: for medical, surgical, veterinary use (eg operating tables, examination tables, hospital beds with mechanical fittings) and parts thereof	1.46	53 234 126	19 228		C2	+	+	+	+
	Sum of HS6 products in the branch	100.00	3 637 170 796							

Notes: HS-6 categories in this branch are classified in three production stages based on the UN's BEC Classification: parts and components (in green in the table), capital goods (in bleu) and consumption goods (in red).

Due to lack of data availability, the average of median unit values has been calculated over the years 2016-18 for HS 902740.

Source: authors' calculations based on CEPII, WTCF database V202108.

7.2.5. The small medical materials branch

The small medical materials branch covers 72 HS-6 products in our list of healthcare products (**Table A.V**). The vast majority of these (57 products) are drawn from the two Covid-19 lists produced during the pandemic in 2020. The USITC Covid list identifies 50 products and the joint WCO/WHO list counts 39 products. The WTO and EC lists of medical products each cover 22 products and Helble's list covers 16. Our list includes six HS-6 items relating to lenses, frames and mountings for spectacles that are absent from the other lists.

These products come from a wide range of industries: textiles; paper; rubber, plastic, glass, metals, electronics, machines, vehicles, etc. The value for the five most traded products worldwide over the 2000-2019 period represents 40% of the branch's trade, and most have relatively low unit values over the 2017-2019 period:

- The "plastics: other articles n.e.s. in chapter 39" (HS-392690) classed in medical and dental instruments and supplies are in first place with 16.5%, with a unit value of \$13,000 per tonne;
- They are followed by "trousers, bib and brace overalls, breeches and shorts; women's or girls', of cotton (not knitted or crocheted)" (HS-620462) and "medical, surgical instruments and appliances; catheters, cannulae and the like" (HS-901839) with 7% for each of the two items (and respective unit values of \$38,000 and \$80,000 per tonne);
- In fourth and fifth position are "machinery; for filtering or purifying gases, other than intake air filters for internal combustion engines" (HS-842139) and "textiles; made up articles (including dress patterns), not elsewhere classified" (HS-630790) with 5.4% and 4.2% (and respective unit values of \$28,000 and \$19,000 per tonne).

The unit values for the HS-6 items are relatively low and close in magnitude in this branch, ranging from \$289,000 to \$185,000 per tonne for the five highest and from \$4,200 to \$1,200 for the lowest.

Table A.V (top)
Small medical materials

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Helble - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
300510	Dressings, adhesive: and other articles having an adhesive layer, packed for retail sale for medical, surgical, dental or veterinary purposes	0.99	54 782 031	26 237		C1	+	+	+	+
300590	Wadding, gauze, bandages and similar articles: (excluding adhesive dressings), impregnated or coated with pharmaceutical substances, packaged for retail sale	1.14	62 861 610	17 472		C1	+	+	+	+
300610	Pharmaceutical goods: sterile surgical catgut, suture materials, tissue adhesives, laminaria, laminaria tents and absorbable surgical or dental haemostatics	1.15	63 628 930	236 187		C1	+	+		
300640	Pharmaceutical goods: dental cements and other dental fillings, bone reconstruction cements	0.60	33 390 325	157 699		C1	+			
300650	Pharmaceutical goods: first aid boxes and kits	0.08	4 637 982	23 827		C1	+	+		
370110	Photographic plates and film: for x-ray, in the flat, sensitised, unexposed, of any material other than paper, paperboard or textiles	0.40	21 871 355	31 463			+	+	+	+
370210	Photographic film: for x-rays, in rolls, sensitised and unexposed	0.12	6 720 921	36 629			+	+	+	+
392321	Ethylene polymers: sacks and bags (including cones), for the conveyance or packing of goods	3.16	174 558 088	4 408					+	
392329	Plastics: sacks and bags (including cones), for the conveyance or packing of goods, of plastics other than ethylene polymers	1.48	81 823 703	5 736					+	+
392330	Plastics: carboys, bottles, flasks and similar articles, for the conveyance or packing of goods	2.53	140 002 575	6 196					+	
392350	Plastics: stoppers, lids, caps and other closures, for the conveyance or packing of goods	2.22	122 793 762	6 431					+	
392620	Plastics: articles of apparel and clothing accessories (including gloves)	1.25	69 362 384	14 177				+	+	+
392690	Plastics: other articles n.e.s. in chapter 39	16.49	911 947 090	13 417		C1	+	+	+	+
401490	Rubber: vulcanised (other than hard rubber), hygienic or pharmaceutical articles (excluding sheath contraceptives), with or without fittings of hard rubber	0.23	12 688 708	21 934		C1	+			
401511	Rubber: vulcanised (other than hard rubber), surgical gloves	0.48	26 706 690	7 478		C1	+	+	+	+
401519	Rubber: vulcanised (other than hard rubber), gloves other than surgical gloves	1.64	90 425 033	8 993				+	+	+
401590	Rubber: vulcanised (other than hard rubber), articles of apparel and clothing accessories (other than gloves)	0.09	4 965 266	26 622				+	+	
401699	Rubber: vulcanised (other than hard rubber), articles n.e.s. in heading no. 4016, of non-cellular rubber	3.63	201 025 383	15 630				+	+	
481850	Paper articles: apparel and clothing accessories of paper, cellulose wadding or fibres	0.09	4 961 946	9 313				+	+	
481890	Paper articles: articles of paper, cellulose wadding or fibres n.e.s. in heading no. 4818	0.46	25 570 335	4 020				+	+	
482390	Paper, paperboard, cellulose wadding or fibres: articles n.e.s. in heading no. 4823	1.24	68 639 342	4 912				+		
560121	Wadding: other articles thereof, of cotton	0.21	11 781 542	6 986				+		
560122	Wadding: other articles thereof, of man-made fibres	0.33	18 136 936	9 566				+		
560312	Nonwovens: whether or not impregnated, coated, covered or laminated, of man-made filaments, (weighing more than 25g/m2 but not more than 70g/m2)	0.88	48 787 447	5 707				+		
560392	Nonwovens: whether or not impregnated, coated, covered or laminated, not of man-made filaments, (weighing more than 25g/m2 but not more than 70g/m2)	0.59	32 751 512	6 884				+		
611300	Garments: made up of knitted or crocheted rubberised textile fabrics, or fabrics otherwise impregnated, coated, covered or laminated	0.32	17 673 979	37 017				+		
611610	Gloves, mittens and mitts: knitted or crocheted, impregnated, coated or covered with plastics or rubber	0.61	33 998 105	22 319				+	+	
620462	Trousers, bib and brace overalls, breeches and shorts: women's or girls', of cotton (not knitted or crocheted)	7.08	391 386 085	38 235				+		
620463	Trousers, bib and brace overalls, breeches and shorts: women's or girls', of synthetic fibres (not knitted or crocheted)	1.82	100 659 938	46 393				+		
620630	Blouses, shirts and shirt-blouses: women's or girls', of cotton (not knitted or crocheted)	1.84	101 884 519	61 231				+		
620640	Blouses, shirts and shirt-blouses: women's or girls', of man-made fibres (not knitted or crocheted)	1.77	97 987 441	58 007				+		
621010	Garments: of felt or non-wovens (not knitted or crocheted)	0.92	51 032 791	15 165				+		
621040	Garments: men's or boys', n.e.s. in item no. 6210.2, of the fabrics of heading no. 5602, 5603, 5903, 5906 or 5907 (not knitted or crocheted)	1.12	61 974 581	48 036					+	
621050	Garments: women's or girls', n.e.s. in item no. 6210.3, of the fabrics of heading no. 5602, 5603, 5903, 5906 or 5907 (not knitted or crocheted)	1.03	56 785 067	41 502				+	+	
621142	Track suits and other garments n.e.s.: women's or girls', of cotton (not knitted or crocheted)	0.46	25 209 268	38 174				+	+	
621143	Track suits and other garments n.e.s.: women's or girls', of man-made fibres (not knitted or crocheted)	1.06	58 430 927	45 779				+		

Table A.V (end)
Small medical materials

HS Code	Label	Share in the branch's world trade (cumulative sum 2000-19, %)	Value of world trade (cumulative sum 2000-19, thousands USD)	Median unit value (2017-19 average, USD / ton)	WTO Pharma agreement	Helble - Health products	EC medical products	WTO medical products	USITC Covid	WCO-WHO Covid 3.01
621600	Gloves, mittens and mitts (not knitted or crocheted)	0.33	18 028 368	41 344					+	+
630622	Tents: of synthetic fibres	0.50	27 750 978	13 187						+
630629	Tents: of textile materials other than cotton or synthetic fibres	0.11	5 897 074	11 329						+
630790	Textiles: made up articles (including dress patterns), n.e.s. in chapter 63, n.e.s. in heading no. 6307	4.18	231 211 080	18 649				+	+	+
650590	Hats and other headgear: knitted or crocheted, or made up from lace, felt or other textile fabrics, in the piece (but not in strips), whether or not lined or trimmed	1.45	80 255 722	37 219					+	+
701010	Glass: ampoules, of a kind used for the conveyance or packing of goods	0.07	3 986 292	9 098					+	
701092	Glass: carboys, bottles, flasks, jars, pots, phials and other containers of glass, (not ampoules), used for the conveyance or packing of goods, of a capacity exceeding 0.33l but not exceeding 1l	2.69	148 580 242	1 189					+	
701510	Glasses for corrective spectacles: curved, bent, hollowed or the like, not optically worked	0.03	1 832 803	54 663						
701710	Glassware: laboratory, hygienic or pharmaceutical, whether or not graduated or calibrated, of fused quartz or other fused silica	0.09	4 999 947	130 744		C1	+	+		+
701720	Glassware: laboratory, hygienic or pharmaceutical, whether or not graduated or calibrated, having a linear co-efficient of expansion not over 5 x 10-6 per kelvin with a temperature of 0-300 degrees C	0.08	4 286 014	46 386		C1	+	+		+
701790	Glassware: laboratory, hygienic or pharmaceutical, whether or not graduated or calibrated, of glass n.e.s. in heading no. 7017	0.19	10 433 376	37 445		C1	+	+		+
731100	Containers for compressed or liquefied gas, of iron or steel	1.03	56 943 361	4 810					+	+
732490	Iron or steel: sanitary ware and parts thereof, excluding sinks, wash basins and baths	0.45	24 865 481	14 640					+	+
761300	Aluminium: containers for compressed or liquefied gas	0.14	7 505 129	20 155					+	+
842119	Centrifuges: n.e.s. in heading no. 8421, including centrifugal dryers (but not clothes-dryers)	0.67	36 917 712	46 232					+	
842139	Machinery: for filtering or purifying gases, other than intake air filters for internal combustion engines	5.45	301 317 649	27 560					+	+
842489	Mechanical appliances: for projecting, dispersing or spraying liquids or powders, for other than agricultural or horticultural use, whether or not hand-operated	1.33	73 446 064	26 815						+
870590	Vehicles: break-down lorries, road-sweepers, spraying lorries, mobile workshops, mobile radiological units, and other special purpose vehicles n.e.s. in heading no. 8705	2.00	110 822 777	8 957					+	+
871310	Invalid carriages: not mechanically propelled	0.24	13 292 253	19 939		C2	+		+	+
871390	Invalid carriages: mechanically propelled	0.20	10 921 255	25 016		C2	+		+	+
871420	Invalid carriages: parts and accessories thereof	0.27	14 752 585	31 000			+			
900130	Lenses, contact unmounted, of any material, excluding elements of glass not optically worked	1.68	92 761 675	215 581			+			
900140	Lenses, spectacle: unmounted, of glass, excluding elements of glass not optically worked	0.14	7 580 844	148 222			+			
900150	Lenses, spectacle: unmounted, of materials other than glass	1.44	79 370 623	164 707						
900311	Frames and mountings: for spectacles, goggles or the like, of plastics	0.56	30 813 457	244 868						
900319	Frames and mountings: for spectacles, goggles or the like, of materials other than plastics	0.87	47 899 286	288 600						
900390	Frames and mountings: parts for spectacles, goggles or the like	0.18	10 029 134	185 455						
900410	Sunglasses: corrective, protective or other	1.69	93 456 870	179 444						
900490	Spectacles, goggles and the like: (other than sunglasses) corrective, protective or other	0.78	43 346 106	51 899				+	+	+
901831	Medical, surgical instruments and appliances: syringes, with or without needles	1.36	75 121 704	36 157		C1	+	+	+	+
901832	Medical, surgical instruments and appliances: tubular metal needles and needles for sutures	0.68	37 797 291	56 603		C1	+	+	+	+
901839	Medical, surgical instruments and appliances: catheters, cannulae and the like	7.01	387 576 701	80 463		C1	+	+	+	+
901910	Mechano-therapy appliances: massage apparatus and psychological aptitude-testing apparatus	1.30	71 925 870	31 354			+			
902000	Breathing appliances and gas masks: excluding protective masks having neither mechanical parts nor replaceable filters and excluding apparatus of item no. 9019.20	0.46	25 383 096	64 916			+	+	+	+
902511	Thermometers and pyrometers: liquid filled, for direct reading, not combined with other instruments	0.06	3 138 331	71 699				+		
902519	Thermometers and pyrometers: (other than liquid filled, for direct reading), not combined with other instruments	0.80	44 476 935	145 735				+	+	+
	Sum of HS6 products in the branch	100.00	5 530 567 684							

Notes: HS-6 categories in this branch are classified in four production stages based on the UN's BEC Classification: semi-finished intermediate goods (in black in the table), parts and components (in green), capital goods (in blue) and consumption goods (in red).

Source: authors' calculations based on CEPII, WTFC database V202108.

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