

Health Silk Road 2020

A BRIDGE TO THE FUTURE OF HEALTH FOR ALL

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China Investment Research (CIR)
Shanghai Institutes for International Studies (SIIS)

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China Investment Research (CIR)

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摘 要

诞生于 2013 年的“一带一路”倡议自始便包含卫生健康部门，2015 年国家卫计委（国家卫健委的前身）发布《关于推进“一带一路”卫生交流合作三年实施方案》，正式提出“健康‘一带一路’”的概念。与“一带一路”硬件基础设施合作相比，“健康‘一带一路’”更加关注人民健康和直接的获得感。实际上早在疫情暴发前，以中国国内医疗体系发展和抗击传染病的成功经验和对外医疗援助的悠久历史为基础，“健康‘一带一路’”的建设便取得长足进展。“健康‘一带一路’”的亮点和特色包括医院和卫生基础设施的援建、医疗队派遣与技术培训及与世卫组织等卫生领域的国际组织开展“三方合作”等。

2019 年底新冠病毒的突然暴发和全球大流行意外带来了“健康‘一带一路’”的加速发展，并使之成为相关财经媒体、智库及大学研究的关注焦点。位于伦敦的咨询机构 The Grisons Peak 及作为中国外交智库之一的上海国际问题研究院决定第三次携手，对这一重要领域的进展进行联合研究。联合研究团队基于自身搜集的 2019 年第 1 季度至 2020 年第 3 季度间的数据（部分囊括了至 2020 年底的数据），发布了本报告。我们的数据在以下方面具有独特性：囊括了各种形式的官方援助，特别是针对发展中国家的医疗援助；详细描述了中外企业加速布局医疗行业的动向，包括其在中国资本市场的卓越表现；商业数据方面，覆盖对外直接投资（FDI）及股权比例低于 10%及低于 1000 万美元的其他投资；对中国疫苗开发、测试与分配等进行了专门的介绍。报告提供了详细的注释、图表和参考资料供读者参考。

我们的主要发现包括：**第一，中国大大提升了各种形式对外医疗援助的规模，并为世界各国提供了医疗供应链安全和效率保障。**习近平主席于 5 月份举行的世卫大会上承诺采取一系列措施帮助各国应对疫情，包括两年内提供 20 亿美元国际援助、与联合国合作在华设立全球人道主义应急仓库和枢纽，确保抗疫物资供应链安全、建立 30 个中非对口医院合作机制、加快建设非洲疾控中心总部及将中国研发成功的新冠疫苗作为全球公共产品向发展中国家提供等。相关承诺正在稳步落实之中。截止 2020 年 10 月，中国已为 150 个国家和 7 个国际组织提供了援助，出口口罩 1790 亿只、防护服 17.3 亿套及检测试剂 5.43 亿只。目前有 46 支医疗队在非洲工作，包括埃塞、加纳、圭亚那及津巴布韦等国。中国国家开发银行及亚投行、新开发银行等中国作为最重要股东国的新多边开发银行为发展中国家应对疫情提供了数十亿应急贷款。

第二，医药卫生行业的中国企业的发展并没有受到美国技术遏制的影响，其海外投资逆势上扬。

自2016年以来，中国企业宣布的海外股权投资规模逐步下降，但过去2年内卫生行业的相关交易数量和总金额大幅增长。相关交易数据由2019年1季度的22起增加至2020年3季度的52起，同期内交易金额则由3.91亿骤升至27.20亿美元。虽然科技领域“中美脱钩论”日渐流行，但该期间医疗行业224起中国对外投资中，略超过一半流向美国。不过，相关投资基本均是小股东形式，或只是作为美国企业牵头的大规模风险资本/私募股权投资辛迪加中微不足道的参与方之一。考虑到当下地缘政治的紧张化局面，该趋势代表了中国企业对外投资形式的一种结构性特征，即效仿腾讯、阿里两大科技巨头，仅通过增长资本赢得小额股份的形式开展对外投资。中国企业对外医疗投资中，生物科技是最大的增长点，一些季度占比甚至超过50%，而在本报告覆盖的早期阶段，相关比例仅为20-25%。这种趋势是由中国庞大市场对高端医药不断增长的需求决定的。

第三，中国生物医药企业快速发展，并成为中国资本市场上最活跃的主体，规模超过相关领域的吸收外资。资本、技术和市场的强力发展使得中国有能力在维护全球健康中扮演更重要的角色。全球范围内，美国、欧洲、日本等主要经济体医药企业创设的速度呈下降趋势，而中国在过去30年中新增生物医药企业数量稳步上升，过去10年间更是获得了暴发式增长。2010-2020年间，中国诞生了140多家新的生物科技企业。受中国国内健康需求增长的推动，医药卫生和生命科学企业有望成为中国A股市场发展的长期驱动力。2018-2019年间，香港、上海、深圳等三家主要的中国证券交易所均放松了监管规则，或设立了新的交易平台，比如上海证交所的科创板，允许尚不具备营利能力的科技企业上市融资，亦为医药企业提供了重要发展空间。本报告跟踪的期间内，生命科学类的企业是首次公开募股市场中最为活跃的主体。据Dealogic信息，自2018年中至2020年12月13日，香港上市的29家生物科技企业的股价较其上市之日平均上涨了53%，这些企业中有27家为中国本土企业。这一发展亦为中国打造世界最大生物科技融资中心创造了契机，香港计划于2025年超过纳斯达克成世界最大的生物科技融资中心。

第四，中国以“公共产品”的方式为世界各地提供疫苗，在全球疫苗开发和分配中展现出不可或缺的作用。中国于2020年1月中旬与世界分享了新冠病毒基因序列供疫苗开发，并以前所未有的速度于3月16日开始进行第一个新冠疫苗的人体试验。截止2020年中，有5家从事疫苗研发的中国生物科技公司上市，分别是康希诺生物、国药集团及其下属疫苗和生物科学分支机构中国生物技术、重庆智飞、复星医药及规模较小的四川三叶草生物制药。截止2020年第3季度，中国已在全球16个发展中国家开展疫苗测试，超出狭义的“‘一带一路’国家”范畴。第4季度，中国5项疫苗中的2项获得批准，较世界最先进的生物医药企业晚不到3周。获批的中国疫苗已在巴林、智利、埃及、印尼、土耳其、阿联酋及中国本土开始使用，同时，巴西、墨西哥、摩洛哥、巴基斯坦、乌克兰等国已与中

国签署相关协议，孟加拉、约旦、马来西亚、菲律宾及秘鲁等国的相关协议正在审查中。辉瑞（Pfizer）、加州疫苗（Moderna）等的疫苗依靠超低温冷链运输和储存，而中低收入国家不具备这样的条件，中国疫苗可使用常规低温进行运输，为之提供了合理的替代方案。值得注意的是，中国民营企业在提升发展中国家疫苗可及性中将扮演重要的角色。2020年第4季度，菜鸟宣布与埃塞俄比亚航空合作建设一条冷链运输的专用航空集装箱，以运输温控药品，每周两次往返深圳与非洲，同时通过迪拜和亚的斯亚贝巴为全球服务。

I.

Executive Summary

This report represents a story of how quickly, and with considerable focus, the world's most populous country and 2nd largest economy, controlled a virus and then proactively used its firepower to re-launch the Health Silk Road (HSR). During the month of February 2020, many countries, including the EU and its member states, sent tonnes of medical aid to China. By March, China had gripped the virus. Once gaining control of the pandemic, China began aggressively re-launching and re-defining its HSR. We know from President Xi's Keynote Speech at the Opening Ceremony of The Third China International Import Expo that as of 20th October, China had provided assistance to 150 countries and seven international organizations and exported over 179 billion masks, 1.73 billion protective suits, and 543 million testing kits.¹

The Health sector was an integral part of the Belt and Road Initiative (BRI) that was launched in 2013, while the term HSR was formally coined by the Chinese Health authority in 2015 together with a 3-year action plan. Compared to the hard infrastructure pillar of the BRI, the HSR was intended to forge closer people-to-people connection. Despite a much lower profile, the HSR was already in quite a good shape before the COVID-19 broke out, based on the decades of Chinese own experiences in fighting infectious disease and the development of healthcare system at home and well-established tradition in helping other developing countries in this area. Highlights include helping with the building of hospitals and health infrastructure, sending medical workers and doctors abroad for knowledge-sharing, and working together with the World Health Organization (WHO) and other health-related international organizations.

The outbreak of the Coronavirus crisis at the end of 2019 has led to a surprise acceleration and expansion of the HSR and a boom in studies of this topic by global financial press, think tanks and universities. The team from China Investment Research (CIR), Grisons Peak, a London based consultancy focused primarily on emerging markets with a specific focus on the BRI, and the Shanghai Institutes for International Studies (SIIS), a leading foreign policy think tank based in Shanghai,

¹ "Keynote Speech by H.E. Xi Jinping President of the People's Republic of China At the Opening Ceremony of The Third China International Import Expo", Nov. 4, 2020, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1829373.shtml.

collaborate for the third time² in contributing our parts to this rich topic by leveraging our comprehensive data from the 1st quarter of 2019 through the 3rd quarter of 2020 for comprehensive data and through year end 2020 for selected other data.

Our report will be presented to readers in the following structure and path: First, we will introduce the origin and background of HSR, and then discuss China's ability and role in leading and guiding a global health community, China's foreign medical assistance to combat COVID-19 epidemic, and followed by discussion on international cooperation mechanism for building HSR, data-based annual performance analysis, and vaccine diplomacy. Readers will see several different components of data underlying the conclusions. This paper sets out details on each of these –primarily financial–components. This paper therefore develops each of these components, and plots them on a series of quarterly maps, commencing Q3 2019 and continuing through to Q3 2020. Compared with the existing publications as of today, our data are unique in the following aspects: stocktaking of official and private assistance in various forms; detailed coverage of HSR-related commercial activities by both Chinese and international companies, including their performance in Chinese capital market; full calculation of Foreign Direct Investment (FDI) and other investments below the 10% threshold of FDI and/or below US\$ 10 million; focused documentation of COVID-19 vaccination development and testing by Chinese medical entities. Detailed notes, references and visualized tables and maps are provided for reference.

Our major findings include the following: **Firstly, China had already significantly scaled up medical assistance in various forms and secured the operation of medical supply chain for the world.** At the World Health Assembly in May, President Xi promised a series of measures in helping with the world deal with the COVID-19, including providing US\$2 billion assistance over two years, ensuring security and efficiency of anti-epidemic supply chains by establishing global humanitarian response depot and hub in China in collaboration with the UN, pairing up Chinese hospitals with 30 African hospitals, accelerating construction of African CDC headquarters, and providing Chinese-developed vaccine as global public good, etc.. The pledges are being delivered. By October of 2020, China had provided assistance to 150 countries and seven international organizations and exported over 179 billion masks, 1.73 billion protective suits, and 543 million testing kits. At present, 46 resident Chinese medical teams are in Africa helping with COVID-19 containment efforts, such as in Ethiopia, Ghana, Guinea and Zimbabwe. China Development Bank and the two new multilateral development banks with China being the most important shareholder, i.e., Asian Infrastructure Development Bank and the New Development Bank, provided billions of timely COVID-19 related loans abroad.

Secondly, Chinese companies accelerated “going out” in both volume and value in the health

² Henry Tillman, Jian Yang and Egill Thor Nielsson, *The Polar Silk Road China's New Frontier of International Cooperation*; <https://www.worldscientific.com/doi/pdf/10.1142/S2377740018500215> .

Henry Tillman, YANG Jian, YE Qing, *BRI in Oman as an example: The Synergy of Infrastructure, Digitisation and SEZs* (December 2019). <http://www.siiis.org.cn/Research/EnInfo/4809>

sector while the aggregate outbound investment has been declining. While it is true that Chinese announced outbound equity investments have declined annually since the 2016 peak, both deal volume and aggregate amounts in healthcare have increased substantially over the past 2 years. The number of investments more than doubled from 22 in the first quarter of 2019 to 52 in the third quarter of 2020, while the value increased even more significantly from 390.5 million US Dollars to 2.72 billion US Dollars in the same period. Despite the rising concerns on the “decoupling” of China and US technological development, slightly over 50% of the 224 Chinese outbound healthcare investments during this period had some involvement with the USA, even though such investments were virtually all minority investments and/or small components of much larger primarily USA-led VC/PE syndicates. Considering the background of rising geopolitical tensions, this represents a structural trend of Chinese firms’ outbound investment in following the model of the two tech giants Tencent and Alibaba and taking small stakes via growth capital. Biotech increased to about half of these investments in some quarters from 20-25% in early of this period.

Thirdly, bio-tech and bio-pharma companies also became the most active components in Chinese capital market, which dwarfed many FDI inbound sector amounts. Strong developments in capital, technology and markets have enabled China to play a bigger role in maintaining global health. While company formation declined in other major markets such as the US, Europe, and Japan, the number of new Chinese biopharma companies has risen steadily over the past three decades, accelerating dramatically in the last ten years. More than 140 new biotech companies emerged in China from 2010 to 2020. Fueled by an ever-growing demand for healthcare, healthcare/life sciences is expected to be a long-term driving force of the A-share IPO market of China. During 2018-2019, the three major Chinese stock exchanges in Hong Kong, Shanghai and Shenzhen, relaxed their rules or launched new platforms, such as the Science and Technology Innovation Market (STAR) in Shanghai, in allowing companies has yet to earn a profit to raise funds via initial public offerings (IPOs), providing a significant boom to drug developers. By the end of the period, life sciences IPOs were among the most active in all of these exchanges. Shares in the 29 biotech companies that listed in Hong Kong since mid-2018 until 13 December 2020 — 27 of which are Chinese — rose by 53% on average from their IPO prices, according to Dealogic. This is also paving the way for Chinese capital market to become the world’s largest biotech fundraising hubs. Hong Kong plans to overtake NASDAQ as the world’s largest biotech fundraising centre by 2025.

Fourthly, China provides vaccines around the world in a "public product" manner and has played an integral role in global vaccine development and distribution. China published the genetic sequence of SARS-CoV-2 in mid-January triggering a global R&D activity to develop a vaccine. The first COVID-19 vaccine candidate entered human clinical testing with unprecedented rapidity on 16 March 2020. By mid-year 2020, there were five Chinese biotech companies active in the COVID vaccine space that were publicly listed: CanSino Biologics, Sinopharm and its vaccine and bioscience subsidiary the China National Biotec Group Co Ltd (CNBG), Chongqing Zhifei Biological Products, Fosun Pharma, and Sichuan Clover. By the third quarter of 2020, China had been piloting vaccines in

16 developing countries around the world, beyond the narrowly defined “BRI countries”. In the fourth quarter, two of China’s 5 vaccines being trialed were approved, less than 3 weeks after the vaccines from the world’s largest and more established biopharma firms. Approved Chinese vaccines were sent for use in Bahrain, Chile, China, Egypt, Indonesia, Turkey and UAE, while agreements were signed with Brazil, Mexico, Morocco, Pakistan and Ukraine and similar agreements were under review in Bangladesh, Jordan, Malaysia, Philippines and Peru. Chinese vaccines provide reasonable alternates for lower-and middle-income countries that cannot provide the extensive cold storage network required for the distribution of Pfizer and Moderna vaccines. It is most noteworthy that Chinese private sector has been playing an active role in the process. In the fourth quarter of 2020, Cainiao announced its partnership with Ethiopian Airlines to launch a special cold chain air freight to transport temperature-controlled medicines twice a week from Shenzhen to Africa, and to the rest of the world via Dubai and Addis Ababa.

II.

Origin and Evolution of HSR

Similar to the BRI, the HSR is not precisely defined geographically and substantially, covering a wide scope of activities, including bilateral and multilateral health policy meetings and networks, capacity building and talent training, mechanisms to control and prevent cross-border infectious diseases, health aid, traditional medicine, and healthcare industry. Based on the long history of Chinese medical assistance abroad, the HSR was formally coined in 2015 under the framework of BRI plan implementation, while it was the outbreak of COVID-19 that made the HSR the focus of the world and go well beyond the BRI scope.

Background of the HSR

HSR is rooted in China's medical assistance in Africa since the end of 1950's-1960's in the form of Traditional Chinese Medicine (TCM) and medical teams. In the past seven decades, over 200 million people in Africa have received care and treatment from Chinese medical teams.³ China was the first in providing emergency medical assistance when Ebola crisis broke out in Western African countries in early 2014. Up to 1000 doctors were sent to those countries providing technical assistance. It was also the first time that China sent a group of public health experts abroad. Chinese assistance was highly praised by the WHO and other international agencies.

In October 2015, the Ministry of Health of China promulgated the "Three-Year Implementation Plan for Promoting the BRI Health Exchange and Cooperation (2015-2017)". The implementation plan puts forward the concept of HSR. It also lists cooperation mechanism construction, infectious disease prevention and control, capacity building and personnel training, health emergency and medical assistance, traditional medicine, health systems and policies, and health industry development as the key areas of international cooperation.

President Xi first used the term during a visit to Geneva in January 2017, during which he signed an MoU with the WHO committing to the construction of a HSR that would aim to improve public health in countries along China's BRI. In August 2017, the Chinese Government hosted a seminar in

³ "Keynote Speech by H.E. Xi Jinping President of the People's Republic of China At the Opening Ceremony of The Third China International Import Expo", Nov. 4, 2020, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1829373.shtml.

Beijing titled the “*Belt and Road Forum on Health Cooperation: Toward a Health Silk Road*,” where the WHO Director General praised Xi’s “visionary” proposal for utilizing the Belt and Road network to strengthen cooperation in the health sector. Tedros ended his speech by endorsing China’s recommendation that “the health leaders of 60 countries gathered here, and public health partners, build a HSR, together.”⁴

COVID-19 and Evolution of the HSR

It was not until the outbreak of -19 that some Western observers paid increasing attention to the HSR. Commencing in March and accelerating throughout 2020, much has been written about the re-launch of the HSR by global financial press, universities, industry experts and global think tanks. They tried to give their understanding about the HSR. In March, Forbes-this article argues how China is utilising its rail network linking the BRI by offering medical supplies, thus improving its global image through its 2020 medical assistance.⁵ Merics noted that Xi Jinping has pledged that a COVID-19 vaccine from China would be made a “global public good”. The larger Belt and Road Initiative, framed as a necessary component of the world’s post-corona economic recovery, is still relevant, but it’s the HSR that takes pride of place in China’s COVID-era diplomacy. James Crabtree argued in an August conference on Trade within the BRI linked with the National University of Singapore⁶, that the COVID-19 pandemic represents a third distinct phase of the BRI, even as its underlying aims remain the same. While infrastructure projects will face a more challenging environment, he challenges the notion that Beijing will now downplay the BRI. Instead, he suggests that the Initiative is likely to change its focus, especially to the HSR and Digital Silk Road. These projects are less lavish and eye-catching, but the BRI may be more critical to China than ever.

Some Western observers also notice that China’s vaccine diplomacy stands to benefit the country economically and politically. It was stated that China’s “vaccine diplomacy” underscores the development of a global health system in which Chinese influence dominates.⁷ Since Xi’s pledge in May, Beijing has added the words “at a fair and reasonable price” to its offer of a vaccine as global public good. Nevertheless, Beijing is better positioned than the US to assume global leadership in the march to vaccinate the world.⁸

⁴ Kirk Lancaster, Michael Rubin, and Mira Rapp-Hooper, “Mapping China’s Health Silk Road”, Council on Foreign Relations, <https://www.cfr.org/blog/mapping-chinas-health-silk-road>.

⁵ Wade Shepard, “China’s ‘Health Silk Road’ Gets a Boost from COVID-19”, March 27, 2020, Forbes, <https://www.forbes.com/sites/wadeshepard/2020/03/27/chinas-health-silk-road-gets-a-boost-from-covid-19/#347457226043>.

⁶ Conference on Trade and Investment under the Belt and Road Initiative, National University of Singapore, Aug. 27, 2020, <https://iems.ust.hk/events/conference/2020/conference-on-trade-and-investment-under-the-belt-and-road-initiative>.

⁷ Kirk Lancaster, Michael Rubin, and Mira Rapp-Hooper, “Mapping China’s Health Silk Road”, Council on Foreign Relations, <https://www.cfr.org/blog/mapping-chinas-health-silk-road>.

⁸ Jacob Mardell, “China’s vaccine diplomacy assumes geopolitical importance”, Merics, Nov. 24, 2020, <https://merics.org/en/short-analysis/chinas-vaccine-diplomacy-assumes-geopolitical-importance>

China's Early Stated HSR Strategy after COVID-19

The international cooperation against COVID-19 has expanded HSR to other continent beyond Africa. The HSR was first referenced in connection with COVID-19 during a phone call between Chinese Foreign Minister Wang Yi and Italian counterpart Luigi Di Maio on February 28, February 28). Following this, Xi began alluding to the HSR in discussions of coronavirus-related aid with several heads of government in mid-March. On March 24, a *People's Daily* commentary emphasized the renewed importance of HSR as a platform for BRI cooperation and as a means of contributing to global health governance⁹.

In mid-May of 2020, President Xi made a speech, titled *Fighting COVID-19 Through Solidarity and Cooperation Building a Global Community of Health for All*, at the opening of 73rd World Health Assembly.¹⁰ In his speech, He made China's plans very clear by the concepts of "a shared future for mankind", "responsibility to ensure global public health", "international cooperation against COVID-19". To build a global community of health for all, he proposed to provide financial assistance to countries affected by the epidemic, especially developing countries, work with the United Nations (UN), WHO and other international mechanisms, to provide green corridors to ensure that the materials needed to fight the epidemic can be delivered to the recipients, help poor countries through the Debt Service Suspension Initiative of the G20, and provide vaccines to the world as public goods. As we develop each of our components, we also monitored on how President Xi/China delivered against each of these pledges.

⁹ Elizabeth Chen, "Chinese Vaccine Diplomacy revamps the HSR post COVID-19", The Jamestown Foundation, Nov.12,2020, <https://jamestown.org/program/chinas-vaccine-diplomacy-revamps-the-health-silk-road-amid-covid-19/>.

¹⁰ "Speech by President Xi Jinping at opening of 73rd World Health Assembly", Xinhua, May 18, 2020 http://www.xinhuanet.com/english/2020-05/18/c_139067018.htm.

III.

HSR in Progress 1: China's Role in the Global Community of Health for All

Broadly speaking, the HSR is embedded within the comprehensive program of Health China 2030 and builds on existing practices of China's health diplomacy¹¹. How developed is China's health sector? What about its role in the global community of health for all? If China wants to make a different achievement through HSR, it needs sufficient technology, capital and distribution to support its plan. In addition, HSR is taking place while the United States imposes the technological blockade on China that will affect the supply chain. So this section will focus on the following aspects: Will China's progress in biopharmaceutical and medical technology be affected by U.S.'s sanctions? Are the companies from Western countries in biopharmaceuticals, medical technology decoupling from the Chinese market? How strong is the capital market in Greater China supporting China's biopharmaceuticals and medical technology? As a data-based report, this section will make a capability assessment with the data about market, technology and capital.

Rise of Chinese Health Sector

Chinese health industry is developing fast due to the driving forces from both the supply and demand side. On the demand side, China is entering the high-income level defined by the World Bank Group. With the world's largest population that is growing rich and aging, China is set to create the most explosive demand for high-end medical service. According to the China Association for Medical Devices Industry, the size of the medical devices sector alone has expanded from RMB 43.4 billion in 2006 to RMB 500 billion in 2018, at an annual composite growth rate of 23.5%, much higher than the global average. The comprehensive national health insurance policy reform contributed to the boom of demand. 44.8% of citizens and 79.1% of farmers were not covered by any health insurance in 2004.¹² After a long debate, the policy document *Opinions on Deepening the Reform of the Medical and Health System* was approved by the State Council in 2009, launching the latest round of health system reform aimed at establishing universal and accessible health service. The basic health insurance reached 95%

¹¹ Ngeow Chow-Bing, "COVID-19, Belt and Road Initiative and the Health Silk Road", Friedrich Ebert Stiftung, October 2020, <http://library.fes.de/pdf-files/bueros/indonesien/16537.pdf>.

¹² Zhang Lei, "Ten years of healthcare reform: Major steps", Guangming Daily, Sept. 26, 2012. http://www.cnr.cn/kby/shinianyigai/zxw/201209/t20120926_511003933.shtml

of more than 1.3 billion Chinese people in 2011.¹³ The average share of health cost paid by individuals was reduced to less than 30% by 2015.¹⁴ A new version of *National Essential Medicines Directory* was published in 2018, expanding the number of essential medicines to 685 from 589 in 2012, including 12 innovative medicines for cancer treatment.

On the supply side, After the experience of the *Severe Acute Respiratory Syndrome* (SARS) in the Spring of 2003, China significantly scaled up public investment in its national health system. More importantly, China implemented systematic structural reforms following advanced countries' experiences in the last 5 years, so as to foster a more market-driven, productive and innovative medical sector at home. Major measures include introducing generic drug quality and efficacy consistency evaluation, joining the *International Conference on Harmonization of Requirements for Registration Pharmaceuticals for Human Use* (ICH) and speeding up approval of innovative medicines and medical devices, and forcing down the price of imported medicines significantly to a level closer to international market through collective negotiation among others. China also issued a report titled *the Health China 2030* in 2016, as a measure of implementing the UN Sustainable Development Agenda 2030, committing to “mainstream the health considerations into all policies”. The momentum of reforms is set to continue in the upcoming 14th Five Year Plan period, leading to a fully internationalized health sector.¹⁵

Major health indicators of China rank keep improving and rank higher than the average of upper middle-income countries. For example, the average lifespan of Chinese people reached 77.3 while the maternal death rate, infant mortality rate and under-5 mortality rate declined to 17.8% per 100,000, 5.6‰ and 7.8‰ respectively by the end of 2019.¹⁶ This is not only related to the lifestyle of Chinese people, but also contributed by improved national health-care system in the recent decades.

These dynamics on both demand and supply sides have led to a boom of Chinese medical and broader health industries. Chinese made medicines are substituting imports and entering the BRI countries as well. Worldly advanced inventions were made in China, such as medical robots, 3D printing and wearable devices. This paves way for Chinese medical enterprises taking advantage of the HSR.

China Outbound Healthcare Investments (Q1 2019-Q3 2020)

Since the HSR model was functional, we decided to focus our analysis on data relevant to tracking the

¹³ “Chinese health coverage reaches 95%, initially entering the group of countries with universal health coverage”, people.com.cn, Sept. 23, 2012. [http://www.cnr.cn/kby/shinianyigai/zzxw/201209/t20120926_511004898.shtml.]

¹⁴ “Chinese average expected lifespan rose by 1 year in the 13th Five Year Plan period”, *Beijing News*, Oct. 29, 2020. http://www.xinhuanet.com/fortune/2020-10/29/c_1126670192.htm.

¹⁵ “Entering the 14th Five Year Plan period with comprehensive internationalization”, *Guosen Securities Economic Research Institute*, Nov. 25, 2020.

¹⁶ “Chinese average expected lifespan rose by 1 year in the 13th Five Year Plan period”, *Beijing News*, Oct. 29, 2020. http://www.xinhuanet.com/fortune/2020-10/29/c_1126670192.html.

data generated to the extent possible by COVID. We chose to focus on the period of Q1 2019 through Q3 2020. We saw H1 2019 data as a “clean” indicator of growth – without COVID effects, while the other quarters increasingly possessed the influence of COVID. Further, since COVID-19 was first identified in Q4 2019, we wanted to capture the increased vaccines/drug developments, partnerships which saw rapid growth during these quarters.

There are two differences from our standard quarterly disclosure on this analysis:

- 1) We were much more specific than our standard database titles of “pharma”, “life sciences”, “biotech”, “healthcare”, “medtech/healthcare” and “life sciences” in describing both the industry segment and specialty within the segment.
- 2) We only disclosed total quarterly announced calculated amounts, not by individual investment as these totals are compiled through the use of CIR methodology, which we chose not to disclose for the purposes of this analysis.

Table 1: Chinese Outbound Healthcare, Announced Volume (Q1 2019-Q3 2020)

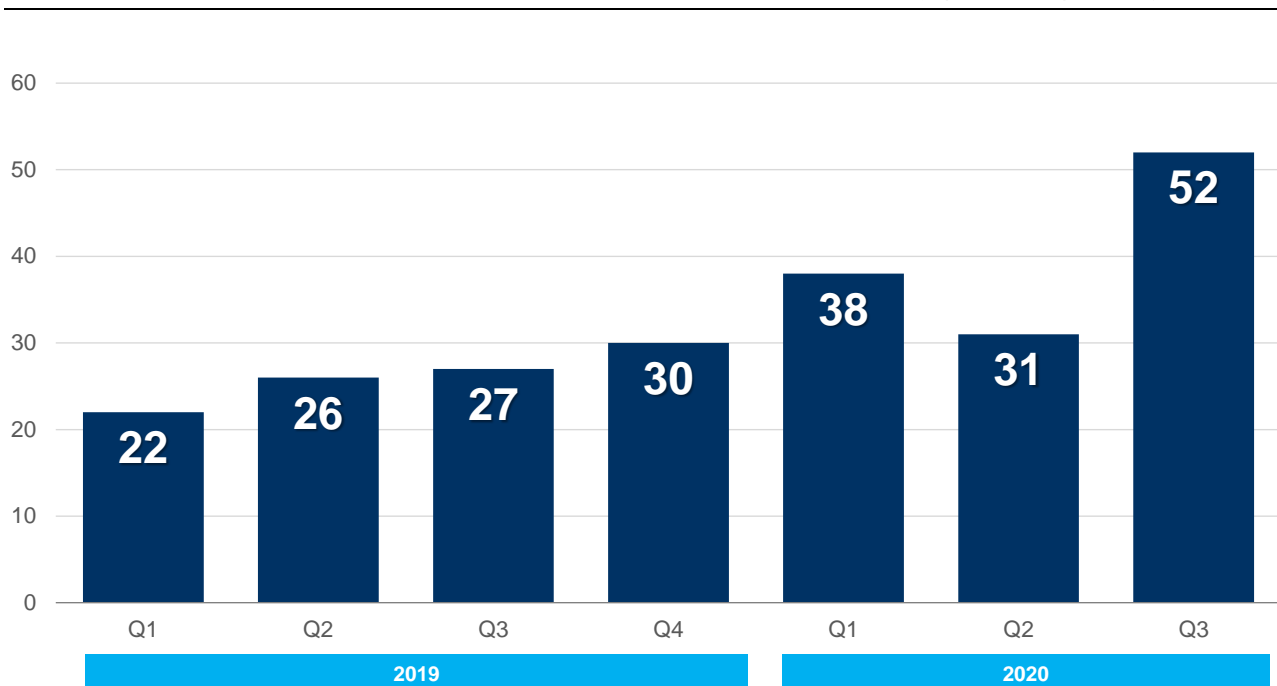
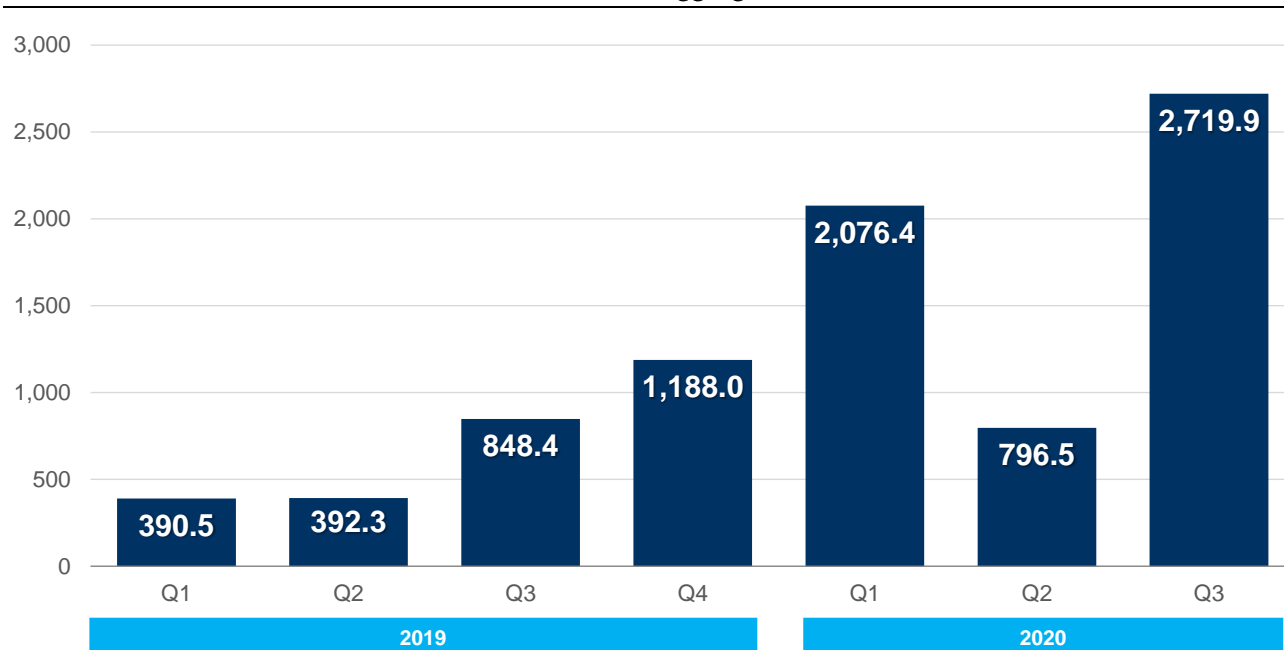


Table 2: Chinese Outbound Healthcare, Aggregate Amounts (Q1 2019-Q3 2020)**Key highlights drawn from Table 1 and 2 include:**

- Volume more than doubled, with consistent quarterly increases (save Q2 2020) from 22 in Q1 2019 to 52 in Q3 2020 over the period;
- Aggregate amounts showed a similar pattern, increasing from \$390.5 million in Q1 2019 to \$2.719 billion in Q3 2020, a 38.2% CAGR during this period;
- There were less than a handful of investments over \$500 million, and only 1 over \$1 billion for Alibaba Health;
- There were also a number of significant licensing agreements in the \$50-\$250 million value range announced during this period;
- As a result, it is clear that many Chinese strategics/PE/VC firms had begun implementing the Tencent/Alibaba models of small stakes via growth capital;
- The number of countries receiving such investment ranged from as low as 9 countries/quarter to 15/quarter. The USA, UK and EU represented the majority of these investments;
- Of the 224 Chinese outbound healthcare investments during this period, slightly over 50% involved the USA, although it is important recognize that such investments were virtually all minority investments and/or small components of much larger primarily USA-led VC/PE syndicates;
- Actually, there were a number of strategic shifts within this time period, consistent with the constraints the overall BRI was facing. Both aggregate amounts and volumes fell during 2018 and 2019 in Australia and the USA. Volume into the UK was halved from 2018 to 2019;

- Biotech/biopharma increased in activity throughout the period. In early quarters, these represented 20-25% of total volume, increasing in some quarters to approximately 50%;
- Vaccines and drug developments began to appear in Q4 2019;
- COVID related vaccines testing began to appear in 2020 data.

Development of the Greater China Biotech Market

Chinese biopharmaceutical organisations offer a major opportunity for both multinational companies (MNCs) and local companies. Following a decade of sustained government support—including policy reform, talent development, and funding—China is now vying aggressively with MNCs for domestic market share in the innovative drugs sector.

China has been heavily investing in biotech R&D lately, with the most recent figure released of \$291 billion invested by China's government. Most of the Chinese biotech companies in China receive government support (grant, land, tax exemption etc.). Local government investment agencies will invest into key sectors (biotech, new materials, renewable energy, AI etc.) in their region. All of this investment portends future growth in biotech activity in coming years. This expectation is supported by the volume of patent applications made by Chinese companies in 2019; Chinese authorities received twice as many patent applications than the US¹⁷.

As the world's second-largest market after the US, China is the only major market expected to grow in the high single digits annually over the next five years. To this end, BCG conducted an in-depth study of the Chinese biopharma industry. BCG found that innovation in the country is occurring in three powerful waves, which are overlapping for the first time and will reshape the global biopharma landscape.

The number of new Chinese biopharma companies has risen steadily over the past three decades, accelerating dramatically in the last ten years. While company formation declined in other major markets such as the US, Europe, and Japan, more than 140 new biotech companies emerged in China from 2010 to 2020¹⁸.

As mentioned previously, while we did analyse China healthcare inbound investments during 2018 and 2019, and indeed some of those partnerships substantially enhanced the visibility and franchises of Greater Chinese biotech/biopharma, we decided to focus this section in the following on inbound investment into biotech via the 3 major Greater China stock exchanges, specifically in 2019 and 2020 as these amounts substantially exceeded the FDI inbound amounts.

¹⁷ John McGuinness, "US Continues to Lead in Biopharma Activity, China's Rapid Pace of Innovation Ramps Up and Europe Continues as Solid Breeding Ground for Biopharma", *Baker McKenzie*, Feb. 10, 2020, <https://www.bakermckenzie.com/en/newsroom/2020/02/capital-raising-in-biopharma>.

¹⁸ John Wong, Chun Wu, Wen Xie, and Vaidyanathan Srikant, "Competing in China's Booming Biopharma Market", *BCG*, Nov. 12, 2020, <https://www.bcg.com/en-gb/publications/2020/competing-in-chinas-biopharma-market>

Hong Kong (HKEX)

Hong Kong has plans to overtake NASDAQ as the world's largest biotech fundraising centre by 2025. It took the first steps in building this global centre for biotech companies in April 2018 when stock market rules were changed to facilitate fund raising when the Rules governing the listing of securities on The Stock Exchange of Hong Kong Limited (listing rules) were modernised. As a result, pre-revenue biotech companies, which previously may not have been able to satisfy the required financial eligibility tests for a public listing, have been able to list on the Main Board of the Hong Kong Stock Exchange (SEHK) under Chapter 18A of the listing rules.¹⁹

Shares in the 29 biotech companies that have listed in Hong Kong from mid-2018 until December 13 2020 — 27 of which are Chinese — rose by 53% on average from their IPO prices, according to Dealogic. In 2019, the sector ranked third in terms of total funds with over \$7 billion an additional \$21.1 billion in 2020.²⁰

Cornerstone investing is a common practice in Hong Kong and frequently helps broaden investor interest as the cornerstones are usually large successful investment groups. This has changed of late: in 2020, non-Asian cornerstone investors on average acquired a record 46% of the shares of each biotech IPO in Hong Kong, according to Dealogic, up from 10.5% in 2019. Such cornerstones have included major US based asset managers Fidelity and BlackRock as well as specialists, RA Capital and Rock Springs.²¹

In a recent interview on CNBC, the CEO of a major Hong Kong based biotech organisation complemented Hong Kong on how quickly it has developed a comprehensive ecosystem around biotech after only two years since launch.

Shanghai (SSE) /Shenzhen (SZSE)

In 2019, Shanghai's financial regulators allowed drug developers that have yet to earn a revenue or profit to raise funds via IPOs on the Science and Technology Innovation Market (STAR), followed recently by a similar green light on the ChiNext stock market in Shenzhen. The changes on the two bourses match Hong Kong's April 2018 listing rule reform, which propelled the local stock exchange to become the world's second-largest market for biotech IPOs after New York.⁽²⁶⁾

Shanghai and Shenzhen stock markets are also positioning themselves as rivals to Hong Kong in the race for the biotech IPO crown. Sixteen pre-profit biotech firms had raised a combined US\$4.5 billion

¹⁹ Out-Law Analysis, "Biotech listings boom in Hong Kong", *Pinsent Masons*, May 28, 2020, <https://www.pinsentmasons.com/out-law/analysis/biotech-listings-boom-in-hong-kong>.

²⁰ Mercedes Ruehl, "Global investors inject momentum into Hong Kong's biotech craze", *Financial Times*, Dec. 23, 2020, <https://www.ft.com/content/145dd9a9-a9b8-4541-8ee7-a1e0c08cafd4>.

²¹ Mercedes Ruehl, "Global investors inject momentum into Hong Kong's biotech craze", *Financial Times*, Dec. 23, 2020, <https://www.ft.com/content/145dd9a9-a9b8-4541-8ee7-a1e0c08cafd4>.

in Hong Kong since April 2018, compared with two listings on NASDAQ that raised US\$264 million in the same period.²²

From 2017 to 2019, capital raising by Chinese biotech companies grew by more than 40%. In 2019, \$17 billion was raised, up from \$12 billion in 2017.²³

2019: Healthcare/Life Sciences A-share IPOs

- The sector was third in terms of number of new listings, backed by the strong performance of Healthcare/Life Sciences IPOs in the STAR Market, which accounted for 23% of IPOs on this new board.
- The companies listed are mainly engaged in the R&D of biotechnology, biopharmaceuticals, medical devices, and pharmaceuticals.
- Healthcare/Life Sciences is expected to be a long-term driving force of the A-share IPO market, fuelled by an ever-growing demand for healthcare.

2020: Healthcare/Life Sciences A-share IPOs

- The sector ranked third in both the number of new listings and total funds raised, backed by a strong showing of healthcare/life sciences IPOs in the STAR Market. It accounts for approximately 13% of the proceeds in the market for 2020.
- Seven pre-profit biotech companies were listed in the STAR Market during 2020.
- The aging population plus the pandemic is expected to propel healthcare/life sciences to become of the driving forces of the A-share IPO market.²⁴

²² Eric Ng, “Shanghai and Shenzhen stock markets are shaping up as viable rivals to Hong Kong in the race for the biotech IPO crown”, *South China Morning Post*, May 18, 2020, <https://www.scmp.com/business/companies/article/3084745/shanghai-and-shenzhen-stock-markets-are-shaping-viable-rivals>.

²³ “The Future of Capital Raising in Biotech and Pharma”, <https://bakermckenzie.turtl.co/story/capital-raising-biotech-pharma/page/3/2?teaser=true>.

²⁴ “Review of the mainland China and Hong Kong IPO markets in 2019, and outlook for 2020”, *KPMG*, Dec. 19, 2019, <https://assets.kpmg/content/dam/kpmg/cn/pdf/en/2019/12/china-hk-ipo-2019-review-and-outlook-for-2020.pdf>

IV.

HSR in Progress 2: China Provides COVID Related Medical Assistance

The HSR was intended to forge closer people-to-people bonds and complement the hard infrastructure pillar that enhances physical connectivity. Historically, Chinese health aid has two distinct strength and highlights. On the one hand, China has sent a large number of medical teams abroad providing technical assistance and training health workers for controlling malaria and cross-border infectious disease among others based on its domestic experience. Right after the launch of BRI, the Ebola crisis broke out in Western African countries in early 2014. China was the first in providing emergency medical assistance and sent about 1,200 medical workers for technical assistance.²⁵ This was directly related to its own experience in successfully combating SARS in 2003 and then the H1N1 influenza and H7N9 avian influenza virus in 2009 and 2013 respectively. 36% of China's health aid to Africa going toward sending medical teams.²⁶ Built on these strengths, Chinese government provided wide emergency assistance to the world, especially the developing countries.

Since 2013, the infrastructure construction and special economic zone (SEZ) construction along the Belt and Road have laid a solid foundation for today's HSR. Some countries that have achieved good performance in infrastructure construction and SEZs over the past few years now may play the role of regional hub in the process of HSR and countering COVID-19. There are such regional hub countries in Africa, Central Asia, Central and Eastern Europe, South Asia, Southeast Asia and LAC. The following analysis can help readers deepen their understanding of this aspect.

On the other hand, China has taken advantage of its financing capacities and skills in building hard infrastructure. Research estimates 57 percent of China's health aid projects in Africa from 2000 to 2013

²⁵ Kun Tang, Zhihui Li, Wenkai Li and Lincoln Chen, "China's Silk Road and global health", *The Lancet*, Vol. 390, Issue NO. 10112, Dec. 9-15, 2017, pp. 2595-2601.

²⁶ Sean Joyce, "China's Latent Opportunity for Global Health Engagement", *Council on Foreign Relations*, Sept. 26, 2018, <https://www.cfr.org/blog/chinas-latent-opportunity-global-health-engagement>.

was allocated to infrastructure and equipment projects.²⁷ The African Center for Disease Control and Prevention (Africa CDC) under construction is delivered with Chinese assistance. This can facilitate Chinese delivery of the COVID related technical assistance.

COVID-19 is new virus to humankind. When the virus hit China in December of 2019 in large scale, Chinese medical system tried to get the experience to treat the infectious and to control the epidemic with the help from other countries. Once gaining control of the pandemic, China began a programme of providing COVID related medical assistance and experience to a number of countries across the world. These countries are evolving into regional hubs for a global HSR network.

\$2 Billion Chinese Commitment to COVID-19 over the Next Two Years

In May of 2020, President Xi pledged that China will provide US\$2 billion over two years to help with COVID-19 response and with economic and social development in affected countries, especially developing countries. Our calculations show much higher actual amounts committed by China during 2020. As such, China has already committed well in excess of Xi's \$2 billion pledge over 2 years made in May.

- WHO – \$50 million (\$20 million March; \$30 million May)
- Sri Lanka – \$500 million COVID-19 loan from China Development Bank
- LAC – \$1 billion loan for countries in Latin America and Caribbean for vaccines
- AIIB COVID-19 loans: \$1.49 billion (China's 26% share)
- NDB COVID-19 loans: \$1.0 billion (China's 20% share)
- China was a recipient of a \$1.0 billion COVID-19 loan from NDB
- In November, AIIB announced it is planning to set up a healthcare unit. The bank has set aside around \$13 billion to aid members' recovery from COVID-19

As President Xi stated at a Keynote Speech at the Opening Ceremony of The Third China International Import Expo that as at 20th October, China had provided assistance to 150 countries and seven international organizations and exported over 179 billion masks, 1.73 billion protective suits, and 543 million testing kits.²⁸

Countries Receiving Medical Assistance

In the fight against the COVID-19 epidemic, China's assistance to the world was very timely and

²⁷ Sean Joyce, "China's Latent Opportunity for Global Health Engagement", *Council on Foreign Relations*, Sept. 26, 2018, <https://www.cfr.org/blog/chinas-latent-opportunity-global-health-engagement>.

²⁸ "Keynote Speech by H.E. Xi Jinping President of the People's Republic of China At the Opening Ceremony of The Third China International Import Expo", Nov. 4, 2020, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1829373.shtml. Updated totals at year end 2020: 224.2 billion masks, 773 million medical protective suits and 2.92 billion pairs of surgical gloves, Source: People's Daily/twitter, Jan. 14, 2021.

important. As tables 5-7 show, beginning as early as February, China began a programme of providing COVID related medical assistance to across a number of countries. What we have attempted to do in this component is to list the name of the country both the first quarter it disclosed such information and each subsequent quarter when the country received additional medical assistance. All information collected in the boxes was sourced through the use of the Google search engine and thus readily available for all to check.²⁹

Such Chinese medical assistance typically included masks, PPE and test kits. It was not uncommon for this assistance to also include a group of 10-15 Chinese doctors and specialists, who remained in that country for 2-3 weeks for COVID training purposes. However, there were exceptions to this standard package, a few of which we briefly discuss below, both geographically and in Chinese medicine.

President Xi's May WHO address stated that "China has sent a tremendous amount of medical supplies and assistance to over 50 African countries and the African Union. Five Chinese medical expert teams have also been sent to the African continent. At present, 46 resident Chinese medical teams are in Africa helping with COVID-19 containment efforts locally".³⁰ The Guinea, Ghana and Zimbabwe efforts are linked to African hospitals, consistent with President Xi's pledge of China will establish a cooperation mechanism for its hospitals to pair up with 30 African hospitals. But the COVID-19 related HSR has expanded far beyond Africa.

We would like to highlight a few examples of these:

- *Ethiopia (September 2020)* – on 13th September, BGI Ethiopia, a subsidiary of China's BGI Genomics, inaugurated the opening its first ever plant in Africa, as well as in all of Africa, a COVID-19 test kit factory located on the outskirts of Addis Ababa. The capacity of domestic production for the COVID-19 tests kits is about six million test kits per year, although the goal is to domestically product affordable artificial test kits to all African countries. To demonstrate support, Ethiopian Prime Minister Abiy Ahmed attended the inauguration.³¹
- *Guinea (September 2020)* – A Chinese medical team left Beijing for Guinea for a 18-month mission aiming to help improve healthcare services in the West African country. The 21-member team — 19 are from Xuanwu Hospital, a major hospital affiliated to Capital Medical University — is expected to remain for 1.5 years, with most working at China-Guinea Friendship Hospital, a major hospital built with the assistance from the Chinese government in capital Conakry. The experts will work with their counterparts at China-Guinea Friendship Hospital to develop the hospital into a top medical center for nerve diseases, such as stroke and Alzheimer's disease, in Guinea and West

²⁹ We did not footnote each entry as this would be disproportionate to the size of the overall study.

³⁰ "Keynote Speech by H.E. Xi Jinping President of the People's Republic of China At the Opening Ceremony of The Third China International Import Expo", *Chinese Ministry of Foreign Affairs*, Nov. 4, 2020, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1829373.shtml.

³¹ "Roundup: China's biotech giant BGI opens COVID-19 test kit plant in Ethiopia", *Xinhua*, Sept. 23, 2020 http://www.xinhuanet.com/english/2020-09/23/c_139388698.htm.

Africa, so local patients with such diseases could receive high-quality diagnosis and treatment.³²

- *Ghana (January 2020)* – Mindray Medical International, a China based medical equipment manufacturing company, has partnered with Korle Bu Teaching Hospital in Ghana to inaugurate its new laboratory. The Korle Bu Teaching Hospital is a leading national referral center in Ghana and the third largest hospital in Africa. Located in Accra, it is the only public tertiary hospital in the southern part of the country, with an average daily attendance of 1,500 patients and about 250 patient admissions. The company donated a SAL 6000 analyzer to improve local lab test efficiency.³³
- *Zimbabwe (September 2020)* – Zimbabwe's largest referral hospital established a TCM clinic and is applying for an official license to open, according to the Zimbabwe ministry of health and child care. Zimbabwe's Parirenyatwa Group of Hospitals has established the TCM clinic following the signing of a MoU between China and Zimbabwe on cooperation in the field of TCM and acupuncture.³⁴
- *Uzbekistan (August 2020)* – Jiangxi University of Traditional Chinese Medicine (China), one of the leading universities and one of the top 10 universities in China is planning to open its branch in Uzbekistan. The University has two medical clinics and a pharmaceutical plant for the production of medicines developed at the University. Representatives of the university and Chinese guests briefed about the importance of traditional Chinese medicine in the fight against coronavirus, and also discussed the establishment of broad cooperation with Uzbekistan in this field.³⁵
- *Sri Lanka (March 2020)* - In March, the Sri Lankan Government signed a US\$500mn COVID-19 loan agreement with China Development Bank designed to lighten debt repayment pressures at a time of COVID. The loan facility had a 10- year maturity with a 3-year grace period with interest rates linked to US dollar-Libor. The funding was designed to be disbursed by the end of March, with the aim of increasing the official foreign reserves of Sri Lanka to enable it to better manage the financial effects COVID-19.³⁶

³² Wang Xiaodong, "Chinese medical team embarks on mission to Guinea", *China Daily*, Sept. 15, 2020, <https://www.chinadaily.com.cn/a/202009/15/WS5f608da2a31024ad0ba79b65.html>.

³³ "Mindray in Ghana: Better Healthcare More Accessible", *Mindray*, Feb. 28, 2019, https://www.mindray.com/id/presscenter/Mindray_in_Ghana_Better_Healthcare_More_Accessible.html.

³⁴ "Zimbabwe to open traditional Chinese medicine clinic", *Xinhua*, Sept. 23, 2020, http://www.china.org.cn/world/Off_the_Wire/2020-09/23/content_76731716.htm.

³⁵ "Chinese university of traditional medicine to open its branch in Uzbekistan", *UZREPORT*, Aug. 25, 2020 <https://www.uzreport.news/society/chinese-university-of-traditional-medicine-to-open-its-branch-in-uzbekistan>

³⁶ Maddy White, "China extends US\$500mn to Sri Lanka in COVID-19 support", *Global Trade Review*, Mar. 25, 2020, <https://www.gtreview.com/news/asia/china-extends-us500mn-to-sri-lanka-in-covid-19-support/>

Regional COVID Assistance (Q3 2020)

Within the Q3 2020 map box of Medical Assistance, there are three Regional entries: SCO, LMC as well as a third with Afghanistan, Pakistan and Nepal. We added these as they were regional, as opposed to single county agreements, which we describe below.

- Shanghai Cooperation Organization (SCO)* On September 16, when attending the meeting of the SCO Council of Foreign Ministers and during his visits to Russia, Kazakhstan, Kyrgyzstan, and Mongolia, State Councilor and Foreign Minister Wang Yi stated during an interview with *Xinhua*: “Since the outbreak of the epidemic, China has worked with neighbouring countries (including the four SCO countries listed above) to help each other and have carried out effective anti-epidemic cooperation. During this visit, I exchanged views with the foreign ministers on deepening anti-epidemic cooperation....., and committed to building an "anti-epidemic fortress", a "silk road of health" and a global community of health for all. To this end, we will take four measures; strengthen international anti-epidemic cooperation... continually provide assistance to all countries in the fight against the epidemic, including material procurement, expert training, experience sharing and drug cooperation.. actively carry out cooperation in research, development, production and procurement of vaccines.... and to work together to conduct cooperation in traditional Chinese medicine.³⁷
- Lancang-Mekong Cooperation (LMC)* In August, China stepped up its vaccine diplomacy with Premier Li Keqiang promising five Southeast Asian partners priority access to a coronavirus vaccine while also pledging to share water control information for flood-hit nations along the Mekong River. Li made the remarks at a videoconference of the Lancang-Mekong Cooperation (LMC) leaders’ meeting, a cooperation platform between China, Cambodia, Laos, Myanmar, Thailand and Vietnam.
- LMC partners would be given priority access to the vaccine after China had fully developed it and put it into use, Li said, according to a report from state-run China Radio International.³⁸
- The CPEC and the Trans-Himalayan Multi-Dimensional Connectivity Network. China, Afghanistan, Pakistan, Nepal Jointly Fight COVID-19³⁹ Ministers from the three other countries expressed their will to deepen cooperation with China to fight COVID-19, ensure the flow of trade

³⁷ “Interview Given by State Councilor and Foreign Minister Wang Yi to Xinhua News Agency”, *Chinese Ministry of Foreign Affairs*, Sept. 17, 2020, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1815684.shtml.

³⁸ Keegan Elmer, “China promises its Mekong neighbours priority access to a coronavirus vaccine developed in China”, Aug.24,2020, *South China Morning Post*, <https://www.scmp.com/news/china/diplomacy/article/3098610/china-promises-its-mekong-neighbours-priority-access>

³⁹ “Wang Yi: China, Afghanistan, Pakistan, Nepal to jointly fight COVID-19”, *CGTV*, July 28 July, 2020, <https://news.cgtn.com/news/2020-07-27/China-to-enhance-cooperation-with-neighboring-countries-over-COVID-19-Stv2SvH9RK/index.html>.

and transport corridors... build a "Silk Road of health" and a community of a shared future for humanity. The foreign ministers also stressed the importance of promoting the resumption of key cooperation projects and expanding new areas of digital cooperation. More efforts are need to promote the joint efforts of the Belt and Road and explore ways to synergize the CPEC and the Trans-Himalayan Multi-Dimensional Connectivity Network.

Regional COVID Assistance (Q4 2020)

- **SCO** – In November, President Xi offered China's approach to strengthening the SCO cooperation while meeting challenges brought by the COVID-19 pandemic when attending via video link the 20th meeting of the Council of Heads of State of the SCO, a regional bloc representing nearly half of the world's population and over 20% of global GDP (includes Russia, India, China, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan and Uzbekistan. Mongolia, Iran, Afghanistan and Belarus act as observers. Armenia, Azerbaijan, Cambodia, Nepal, Turkey and Sri Lanka have SCO partner status). Xi called on the SCO countries to strengthen joint efforts in the prevention and control of COVID-19, support each other, and safeguard regional and global public health security. China is willing to actively consider the COVID-19 vaccine needs of the SCO countries.⁴⁰
- **ASEAN** – The 23rd ASEAN-China Summit was held via video conference on 23rd November. ASEAN welcomed China's contribution to the COVID-19 ASEAN Response Fund as well as an exclusive allocation of the ASEAN-China Cooperation Fund to support programmes in the public health sector and provision of medical supplies and equipment to ASEAN Member States. ASEAN appreciated China's commitment that its COVID vaccines once developed will be provided to ASEAN countries as a public good and on a priority basis.⁴¹
- **Africa** – In mid-December, construction of the China-aided future headquarters of the Africa CDC commenced in Addis Ababa as part of the ever-growing Sino-Africa cooperation in the public health sector. The landmark project is designed to be equipped with modern office buildings, high-end laboratories, and accessories and completed within 25 months⁴². Again, this launch is fully aligned with China's May pledge to accelerate the building of the Africa CDC headquarters to help the continent ramp up its disease preparedness and control capacity.
- **GCC** – In mid-November, Wang Yi stated that vaccine cooperation has become a highlight of anti-epidemic cooperation between China and Gulf Cooperation Council (GCC) countries. Wang made the remarks when attending the China-GCC ministerial meeting via video conference,

⁴⁰ "Xi offers China's approach for SCO to overcome challenges amid pandemic", *Xinhua*, Nov. 11, 2020, http://www.xinhuanet.com/english/2020-11/11/c_139506958.htm.

⁴¹ "Chairman's Statement of the 23rd ASEAN-China Summit", *ASEAN*, Nov. 23, 2020, <https://asean.org/storage/47-Final-Chairmans-Statement-of-the-23rd-ASEAN-China-Summit.pdf>.

⁴² "Construction of China-aided Africa CDC HQ commences in Ethiopia", *Xinhua*, Dec. 15, 2020, http://www.china.org.cn/world/2020-12/15/content_77013182.htm.

adding that the world's first Phase III clinical trial of COVID-19 vaccine, carried out by China with the UAE and Bahrain, has progressed steadily and efficiently with 44,000 people vaccinated.⁴³

- *Uzbekistan* – in November announced it will carry out a phase III trial of a coronavirus vaccine candidate developed by China's Anhui Zhifei Longcom Biopharmaceutical Co. The deal makes the Zhifei Longcom vaccine the fifth COVID-19 candidate in China. The third phase of the pilot process will be conducted in Uzbekistan for 5,000 volunteers aged between 18 and 59 and would undergo eight medical examinations within a year. Anhui Zhifei Longcom Biopharmaceutical is a unit of Chongqing Zhifei. Uzbekistan has said it was also in talks with China's Sinopharm and the developers of Russian Sputnik V vaccine about potential trials.⁴⁴

⁴³ "China, GCC stress vaccine cooperation", *Xinhua*, Nov. 10, 2020, http://www.xinhuanet.com/english/2020-11/10/c_139503951.htm.

⁴⁴ "Uzbekistan to carry out late-stage trial of Chinese COVID-19 vaccine candidate", *Reuters*, Nov. 11, 2020, <https://uk.reuters.com/article/us-health-coronavirus-uzbekistan-china/uzbekistan-to-carry-out-late-stage-trial-of-chinese-covid-19-vaccine-candidate-idUKKBN27R1FX>.

V.

HSR in progress 3: China Continues Developing the International Cooperation Mechanisms

To curb the global spread of the virus and do our best to stem cross-border transmission, people all over the world need to pursue international cooperation in terms of information sharing, exchange experience and best practice. Similar to other sectors of the BRI, the HSR engaged with health-related international institutions very actively since the very beginning. A Memorandum of Understanding (MoU) was signed between China and the WHO for 3-years cooperation during President Xi's visit to the headquarter of the latter on Jan. 18, 2017 and the corresponding Action Plan followed four months later. A high-level BRI Meeting on Health Cooperation was assembled in August of that year attended by more than 20 countries and international organizations including WHO, Program on HIV/AIDS (UNAIDS), Organization for Economic Cooperation and Development (OECD), Global Alliance for Vaccines and Immunization (GAVI), and Global Fund. The Beijing Communiqué was issued, with China committing to enhance cooperation with BRI countries on controlling major infectious diseases, implementing maternal and child and reproductive health projects, strengthening the interaction of health human resources, supporting the WHO's "2014 - 2023 Traditional Medicine Strategy", dispatching foreign aid medical team and enhancing support to WHO and other international institutions in health among others.⁴⁵ This was commented by The Lancet editorial as a "a significant move" made by China in consolidating its role as a major player in global health policy.⁴⁶ The former WHO Director General, Madam Margaret Chan openly praised Chinese contributions to global health in the last couple of years.⁴⁷

There are structural reasons for this. On the one hand, China emerges as a new source of funding for the WHO that is suffering from an increasing funding gap. China has evolved from a beneficiary to a

⁴⁵ "The Beijing Communiqué of the Belt and Road Health Cooperation & Health Silk Road", for its full text, please see http://subsites.chinadaily.com.cn/ministries/health/2017-08/18/c_110402.htm.

⁴⁶ "Facing forwards along the Health Silk Road", *The Lancet Global Health*, Volume 5, Issue 10, E948, Oct. 1, 2017, Editorial.

⁴⁷ Dr. Margaret Chan, WHO Director General's lecture at the Chinese Academy of Governance, "China's growing contribution to health at home and on the global stage", Nov. 18, 2016, <https://www.who.int/zh/director-general/speeches/detail/china-s-growing-contribution-to-health-at-home-and-on-the-global-stage-lecture-at-the-chinese-academy-of-governance;>

donor in global health system, and is increasing contributions to both the WHO and other health vertical funds launched by traditional donors. For example, as one of the few developing countries donors, China has contributed 63 million US dollars to Global Fund by the end of 2019.⁴⁸ The size of Chinese capital contribution still cannot match traditional donors. However, it is the structural complementarity between the HSR and traditional donors' health aid that matters more for global health cooperation. The WHO leadership stressed the vital role of infrastructure, beyond those for health, in improving the health conditions in developing countries.⁴⁹ China is stepping up efforts in trilateral cooperation in Greater Mekong Region and African countries facilitated by the WHO and related vertical funds in the last few years, including sending its medical teams for the dispatch of the WHO and sharing its experience⁵⁰

After the breakout of COVID-19, the Trump Administration withdrew its membership from the WHO in July 2020, citing the WHO's bias toward China. China enhanced its support of the WHO for it to play a leading role in coordinating global combat of the disease. China stressed the WHO should lead the global response. Under the leadership of Dr. Tedros, WHO has made a major contribution in leading and advancing the global response to COVID-19. Its good work is applauded by the international community. At this crucial juncture, to support WHO is to support international cooperation and the battle for saving lives as well. China calls on the international community to increase political and financial support for WHO so as to mobilize resources worldwide to defeat the virus.”

Chinese Contributions to WHO (Q1 and Q2 2020)

In April 2020, China announced it would donate a further \$30 million to the WHO, which is seeking more than \$1 billion to fund its battle against the coronavirus pandemic that had killed more than 180,000 worldwide as at 23rd April. China's pledge was announced circa one week after President Trump suspended USA funding to the WHO. WHO also confirmed that China had already donated \$20 million to the WHO on March 11, 2020.⁵¹ It is worth noting that these two contributions are consistent with President Xi's pledge (as well as subsequently joining COVAX/CEPI) that the WHO should lead the global response.

⁴⁸ Zhang Xingji, "Story of China and the Global Fund: Transition from a Beneficiary to a Donor", May 27, 2020, https://www.sohu.com/a/398104110_120022585. https://www.sohu.com/a/398104110_120022585.

⁴⁹ "WHO Representative in China: China has achieved tremendous achievement in health in the 40 years of reform and opening-up", *China.com*, Dec. 29, 2018, <https://news.china.com/zw/news/13000776/20181229/34839961.html>.

⁵⁰ "WHO Representative in China: China has achieved tremendous achievement in health in the 40 years of reform and opening-up", *China.com*, Dec. 29, 2018, <https://news.china.com/zw/news/13000776/20181229/34839961.html>.

⁵¹ "China pledges \$30 million more for WHO's coronavirus fight", *Reuters*, April. 23, 2020, <https://www.reuters.com/article/us-health-coronavirus-china-who-idUSKCN2250VM>

AIIB COVID Related Loans (Q2 to Q4 2020)

AIIB, a multilateral bank in which China owns a 26% equity stake, provided a number of COVID related loans during Q2 and Q3 2020. AIIB was involved in 10 COVID related loans involving 8 different countries (2 CEP loans each to Indonesia and India) totalling circa \$12 billion. AIIB provided \$4.3 billion, representing 35.8% of total commitments, in these 10 facilities. However, the largest aggregate commitments were from ADB, which provided \$5.6 billion or 46.7%. Local financial institutions provided \$1.84 billion (15.4%), while the remainder was funded by the World Bank. India was the largest recipient with \$3.75 billion (31.3%) followed by Indonesia with \$3.5 billion (29.1%). Pakistan, Mongolia, the Philippines, Georgia, Bangladesh and PRC were the other recipients.⁵²

In Q3, AIIB was involved in 7 COVID related loans in Q3, down from 10 COVID related loans in Q2. Q3 AIIB new exposures declined to \$877.6 million, nearly an 80% decline from Q2's \$4.2 billion. Bangladesh (\$300 million) and Pakistan (\$250 million) were the largest Q3 AIIB commitments, followed by Uzbekistan, Turkey, Kyrgyzstan, Fiji and Georgia.⁵³

In November, AIIB announced it is planning to set up a healthcare unit. The bank's plan to enter the healthcare space was boosted by the COVID-19 pandemic, which has exposed the weakness of the healthcare sector in the region, which it feels needs to be addressed. AIIB, which is 26% owned by China, has set aside around \$13 billion to aid members' recovery from COVID-19. It is reported that around \$6 billion of the fund has already been invested (please refer to our prior analyses).⁵⁴

NDB COVID Related Loans (Q2 and Q3 2020)⁵⁵

The NDB/ BRICS bank, another multi-lateral bank in which China owns a minority stake (20%), has been active in providing COVID loans to its shareholders. In March, NDB approved a CEP loan of 7 billion yuan (US\$1 billion) to China This was the first emergency assistance programme approved by the NDB to support its member countries in the fight against the COVID outbreak and was also the largest single loan issued by NDB to that date.⁵⁶

In Q2, NDB approved two CEP loans, each for \$1 billion, one to South Africa (April)⁵⁷ and one to India

⁵² "BRI PulseQ2 Government Related Loans – COVID Dominated", *China Investment Research*, June 2020, http://www.chinainvestmentresearch.org/wp-content/uploads/2020/07/BRI-Pulse_Q2-Government-Related-Loans_COVID-Dominated.pdf

⁵³ "China outbound and inbound investments Q 3 2020: *Dual Circulation already in Progress*", <http://www.chinainvestmentresearch.org/wp-content/uploads/2020/12/China-Outbound-Investments-Vol-47-%E2%80%93-Q3.pdf>

⁵⁴ "Beijing-based AIIB to set up a healthcare unit", *International Finance*, Nov. 23, 2020, <https://internationalfinance.com/beijing-based-aiib-set-healthcare-unit/>.

⁵⁵ We discuss Q4 loans later in the document.

⁵⁶ "NDB approves 7-bln-yuan loan to China to help fight COVID-19", *Xinhua*, March 20, 2020, http://www.xinhuanet.com/english/2020-03/20/c_138900096.htm.

⁵⁷ "NDB Board of Directors approves USD 1 billion COVID-19 Emergency Program Loan to South Africa", June 20, 2020,

⁵⁸ (when combined with AIIB India saw a Q2 total of \$4.75 billion out of \$14 billion). The June loan to South Africa came days after NDB priced its inaugural \$1.5 billion 3-year COVID Response Bond in international capital markets, which saw strong participation from central banks and major institutions.

In July 2020, NDB approved a *CEP loan of USD 1 billion* to the Government of the Federative Republic of Brazil. The loan is designed to help Brazil protect the income of about 5 million workers in vulnerable situations, including informal, self-employed and unemployed workers.⁵⁹

Joining in the COVAX

Another significant step China took in supporting international cooperation was its decision on Oct. 8, 2020 to join in the COVAX, the global initiative to ensure rapid and equitable access to COVID-19 vaccines for poor countries Coordinated by Gavi, the Vaccine Alliance, the Coalition for Epidemic Preparedness Innovations (CEPI) and the WHO. Although China is leading the world with several vaccines in advanced stages of R&D and with ample production capacity, it still decided to join COVAX with the aim of honoring its commitment to make the developed vaccine a global public good.⁶⁰ Considering the size of its population, Chinese participation was a big gain for COVAX to enhance its negotiating power in accessing the vaccines; but China would supply vaccine doses for 15 million people as part of its first COVAX purchase -- equivalent to just around 1% of its population -- so as not to reduce vaccines available for other countries.⁶¹

https://www.ndb.int/press_release/ndb-board-directors-approves-usd-1-billion-covid-19-emergency-program-loan-south-africa/.

⁵⁸ "NDB fully disbursed Emergency Assistance Program Loan to India to fight COVID-19 outbreak", May 12, 2020, https://www.ndb.int/press_release/ndb-fully-disburses-emergency-assistance-program-loan-india-fight-covid-19-outbreak/.

⁵⁹ "NDB approves USD 1 billion COVID-19 Emergency Program Loan to Brazil", July 21, 2020, https://www.ndb.int/press_release/ndb-approves-usd-1-billion-covid-19-emergency-program-loan-brazil/

⁶⁰ "Foreign Ministry Spokesperson Hua Chunying's Remarks on China Joining COVAX", *Chinese Ministry of Foreign Affairs*, Oct. 9, 2020, https://www.fmprc.gov.cn/mfa_eng/xwfw_665399/s2510_665401/t1822631.shtml.

⁶¹ "China Joins WHO's Vaccine Program, Filling Void Left by Trump", *Bloomberg News*, Oct. 9, 2020, <https://www.bloomberg.com/news/articles/2020-10-09/china-joins-who-s-global-coronavirus-vaccine-program>.

VI.

HSR in Progress 4: Let Maps and Data Tell the Facts and Trends

In 2013, the Chinese government launched the Belt and Road Initiative. Its international cooperation includes many countries and regions along the routes from East Asia to Western Europe. Table 3 is a map of China's proposed new silk road in 2013 and 2014. It is a starting point for us to use maps and data to present the development of the HSR quarter by quarter from Q3 2019 (when we first started seeing the increasing investment flows) ending in Q3 2020.

Now that we have set out our analytics on the various components of China's contributions over the Q1 2019-Q3 2020 time period, we then upload all of this data onto the relevant map, by component.⁶²

By reading Table 4, Table 5, Table 6, Table 7, Table 8, readers can see the number of countries and regions that have received China's Equity Investment and joint ventures from the third quarter of 2019 to the third quarter of 2020 in China's healthcare-related overseas investments. The number of investments or joint ventures is on the rise. (In Q3 of 2019, the number of Health M&A Deals is 27, the aggregated amount of Health M&A Deals is 848.4 million US Dollars. In Q4 of 2019, the number of Health M&A Deals is 30, the aggregated amount of Health M&A Deals is 1,188.0 million US Dollars. In Q1 of 2020, the number of Health M&A Deals is 38, the aggregated amount of Health M&A Deals is 2,076.4 million US Dollars. In Q2 of 2020, the number of Health M&A Deals is 31, the aggregated amount of Health M&A Deals is 796.5 million US Dollars. In Q3 of 2020, the number of Health M&A Deals is 52, the aggregated amount of Health M&A Deals is 2,719.9 million US Dollars. For details of the project, please refer to the appendix). The destinations of the main investment and the joint ventures are developed and emerging market countries, such as the United States, the Netherlands, the United Kingdom, France, Germany, Sweden, Switzerland, France, Japan, Canada, Belgium, Italy, as well as Singapore, Qatar, India, Vietnam, Israel, Poland, South Korea and Hong Kong.

This trend shows that despite the U.S. government's technology containment policy toward China, international capital and related companies remain confident in the Chinese healthcare market.

⁶² The China outbound healthcare investment data can be found in the Appendix. All other base data (except for the country by country medical assistance), resides within the document.

Chinese companies have produced strong momentum and are willing to continue to invest in overseas production and R&D related to the healthcare sector. From the maps, the relevant investments and cooperation have reached beyond the areas designed by the Belt and Road Initiative at its October 2013 launch.

The tables for the first three quarters of 2020 show the increasing number of the countries that received China's medical assistance quarterly. After the COVID-19 epidemic broke out around the world. Each quarter, more than 30 countries receive the incremental assistance from Chinese medical teams. In the second quarter of 2020, 75 countries received assistance from Chinese anti-epidemic medical teams. China's experience in countering the Covid-19 has helped countries around the world to fight the epidemic.

These tables also show that China has carried out international cooperation and anti-epidemic assistance related to the HSR through corresponding economic cooperation organizations and regional cooperation organizations. AIIB is an investment bank with circa 100 country shareholders. In the fight against the epidemic in 2020, AIIB provided anti-epidemic loans to 12 countries since the second quarter of 2020. These countries are Indonesia, Pakistan, India, Mongolia, Bangladesh, Kyrgyzstan, Fiji, Uzbekistan, Turkey, the Philippines and Georgia. The NDB is a bank established by the BRICS. In 2020, the NDB provided loans for Brazil, India and South Africa to fight the epidemic. China's anti-epidemic medical assistance also reflects regional cooperation such as the Shanghai Cooperation Organization(SCO) and the Lancang-Mekong Region. The Chinese government also pledged a \$ 1 billion loan to help Latin American and Caribbean(LAC) countries secure the access to the vaccines.

As the year progressed, there was an enormous and growing desire around the world to control the outbreak through vaccines. With the success of vaccine research and development by Chinese biotech, many countries around the world have increasing expectations and trust in Chinese vaccines (see Table 9). The Chinese government's announcement made by President Xi in May 2020 that it would help countries get vaccines in the form of "public products" was widely welcomed.

Table 3: Official BRI – Pre Launch (2013)



Table 4: Chinese Outbound Healthcare Investments/Partnerships (Q3 2019)

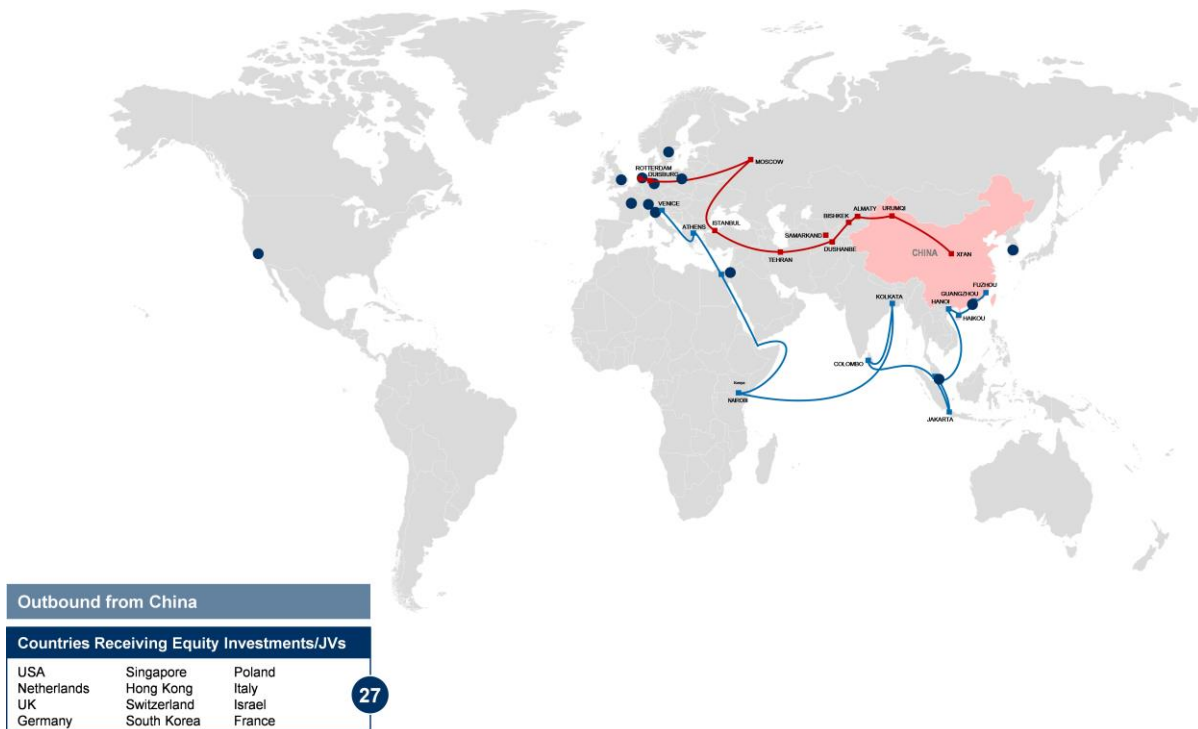


Table 5: Chinese Outbound Healthcare Investments/Partnerships (Q4 2019)

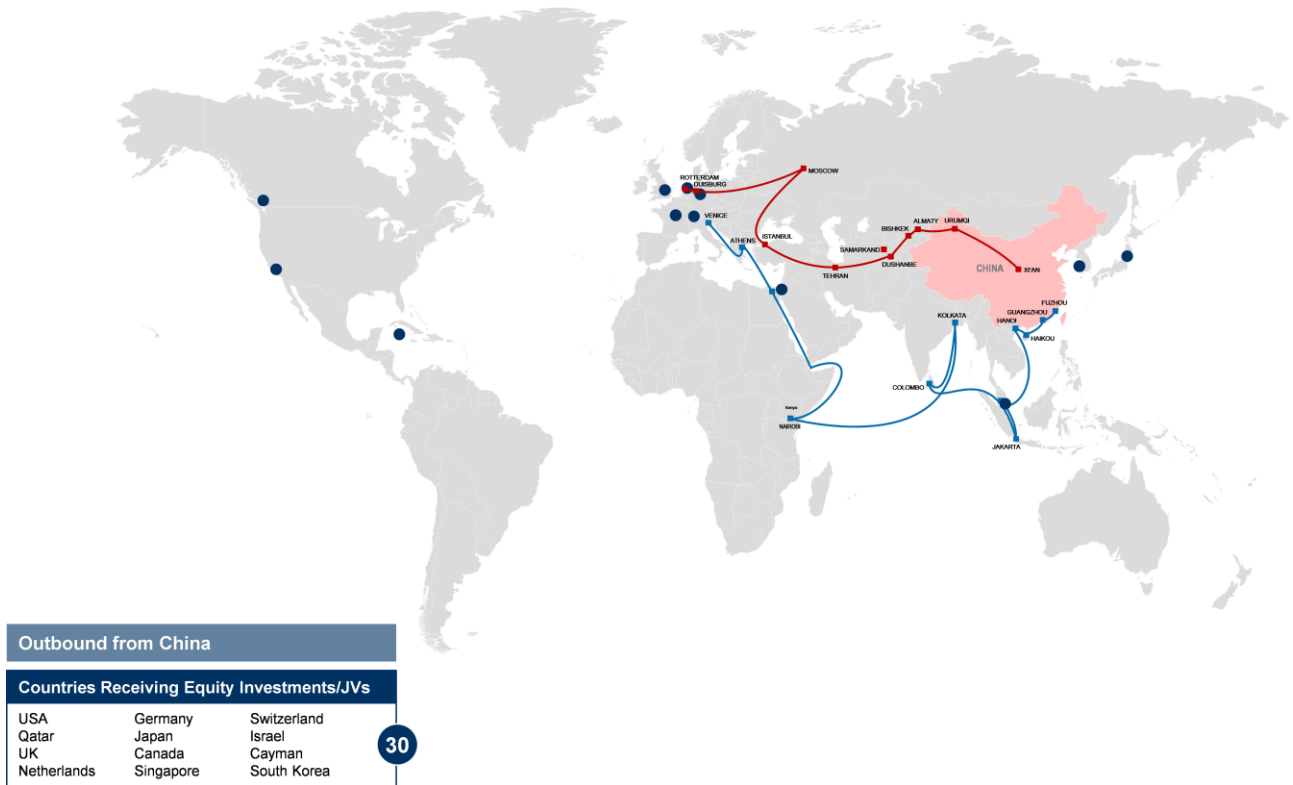


Table 6: Chinese Outbound Healthcare Investments/Loans/Partnerships/Medical Assistance (Q1 2020)

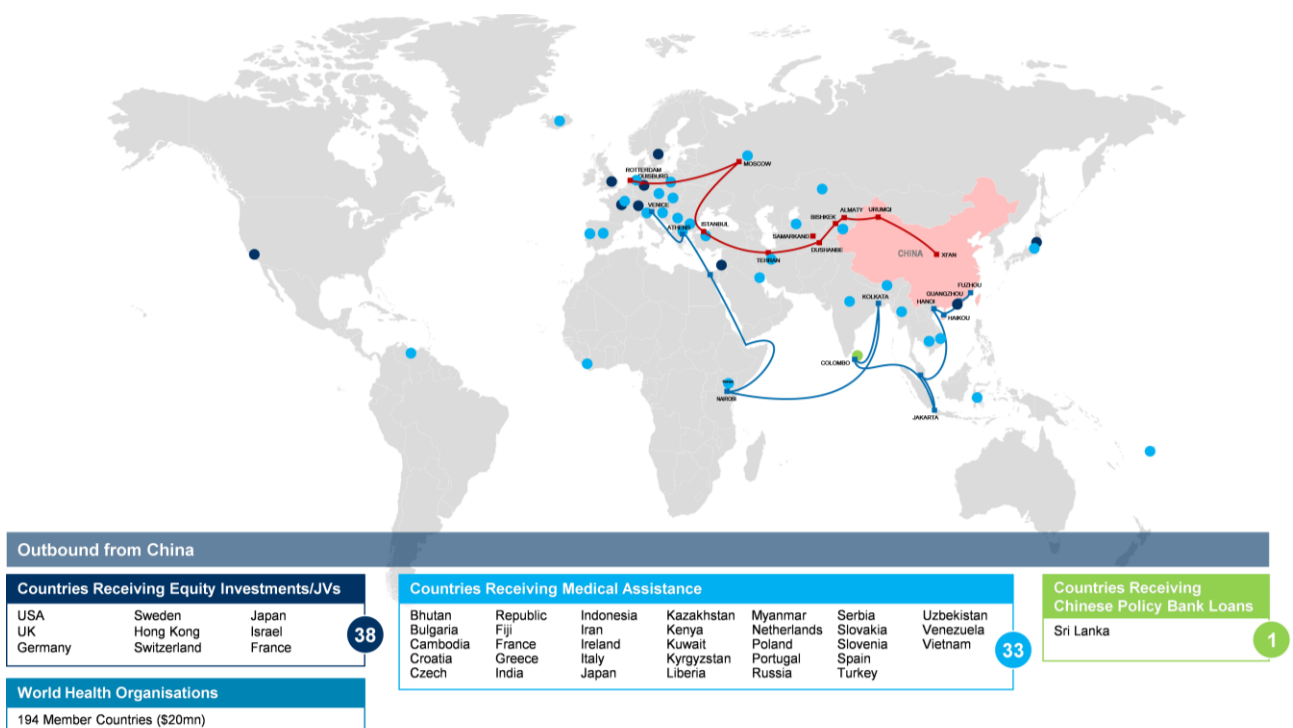


Table 7: Chinese Outbound Healthcare Investments/Loans/Partnerships/Medical Assistance (Q2 2020)

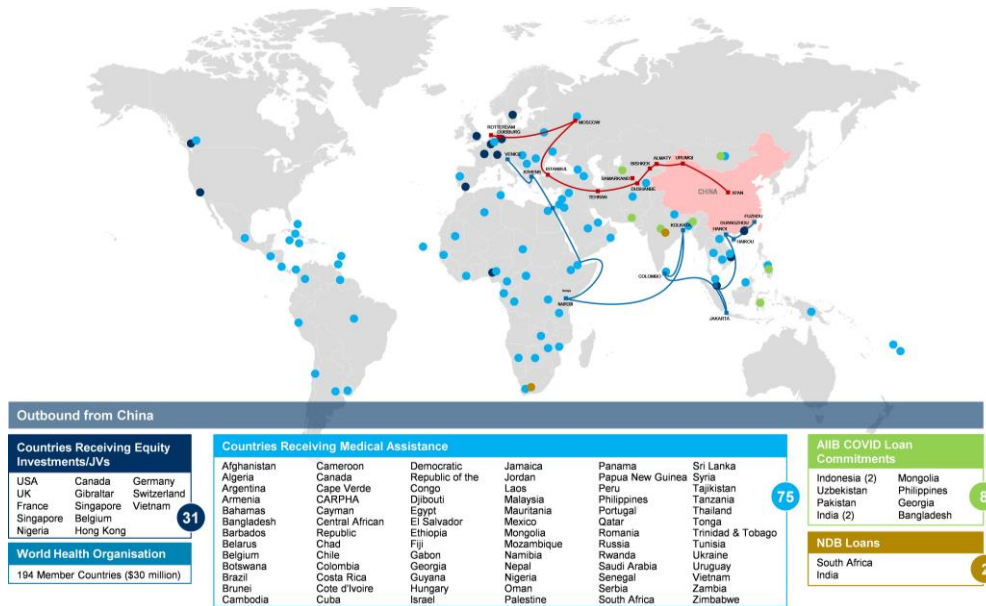


Table 8: Chinese Outbound Healthcare Investments/Partnerships/Loans/Medical Assistance (Q3 2020)

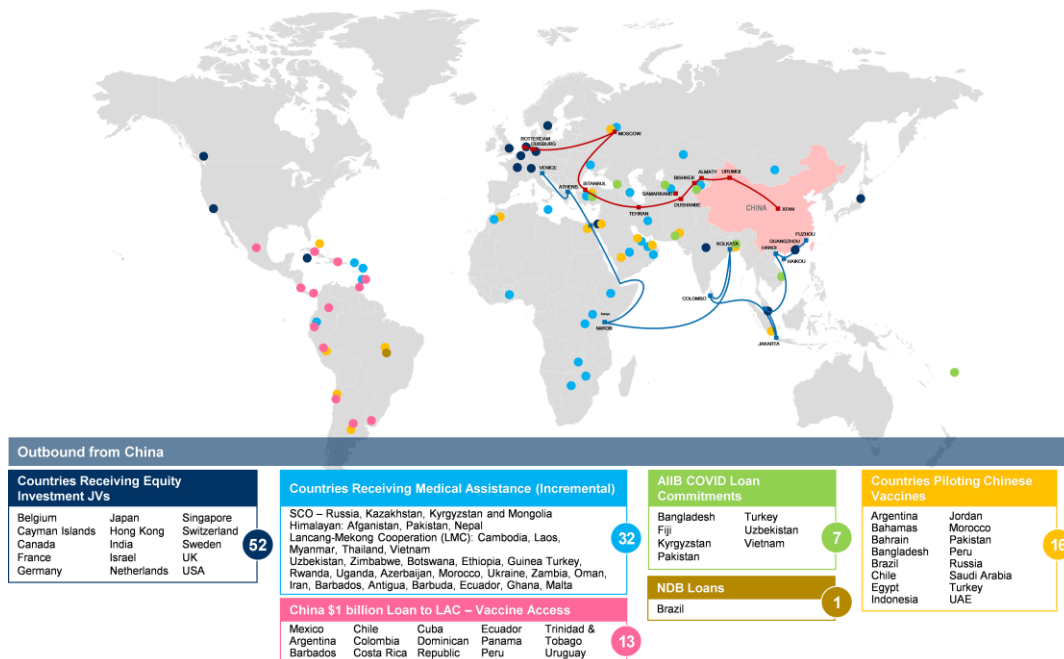
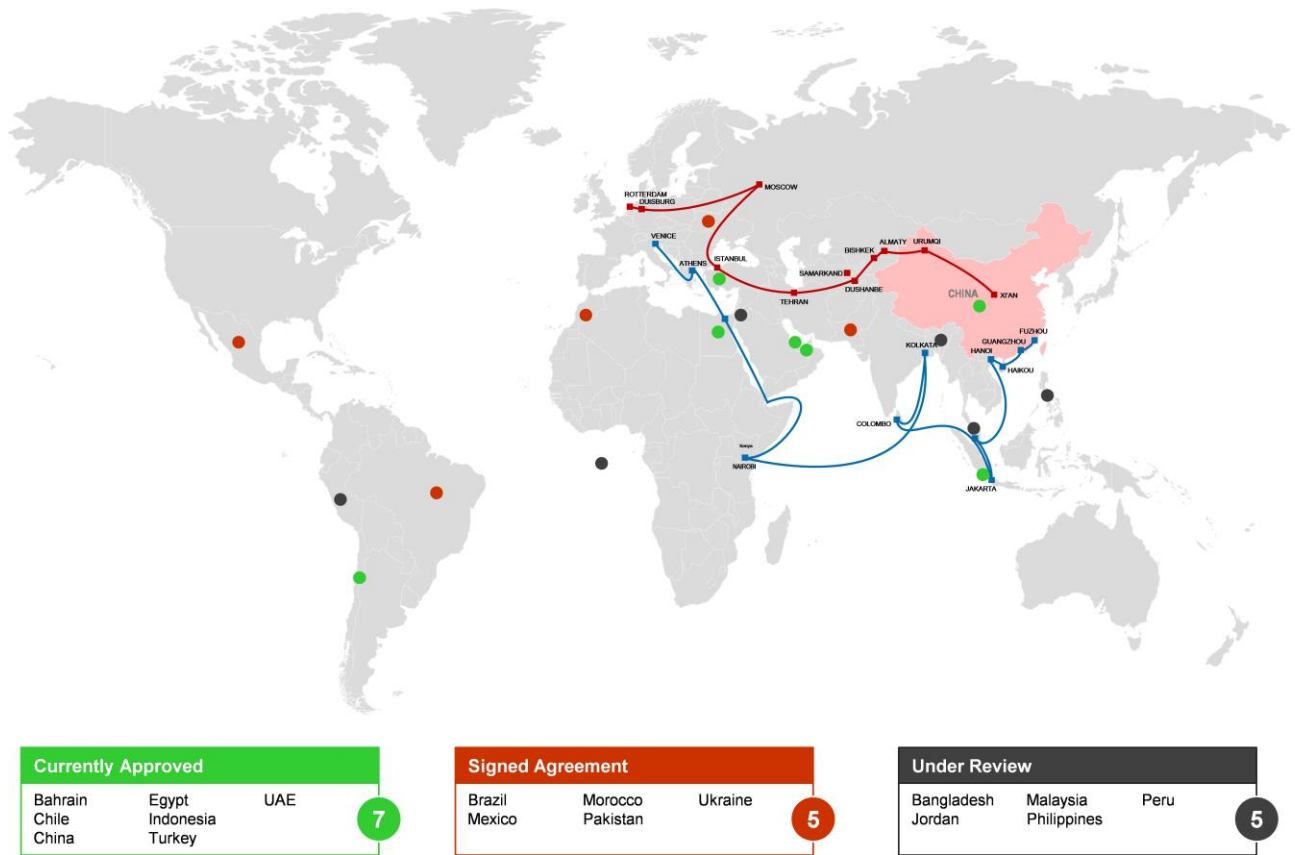


Table 9: Chinese Outbound Vaccine Access (31/12/2020)



VII.

China's Vaccine Diplomacy

- When the COVID-19 virus spread to all continents of the world and the first virus mutation appeared, the experience of treatment tells people that humans are likely to coexist with the COVID-19 virus for some extended period of time. Under these circumstances, the progress of effective vaccine development and equitable distribution have become the key to preventing the spread of the epidemic, protecting human health around the world, and getting the economic activities and social life back to right track. Can the main global R&D and production capacity meet the needs of all parts of the world? In which ways people in all part of world can obtain vaccines? When will major vaccine producing countries provide vaccines to the rest of the world at what prices? These are issues of universal concern around the world.
- WHO warned against the dangers of vaccine nationalism. The current further development of the epidemic could result in greater inequity. Major economies with the capabilities should take more responsibilities. China is one of the leading actors in COVID-19 vaccine development, a big boost for its medical companies. By Dec. 16, there were five vaccines developed by Chinese companies entering the third phase of testing. As there are not enough infected patients available for the test at home, China outsourced the job to BRI countries.
- Fourteen countries were piloting Chinese vaccines in the third quarter. As Chinese medical science still lags behind its western counterparts, Chinese vaccines mainly rely on the traditional vaccine manufacturing techniques such as inactivating the virus; but they may be easier to store and transport through regular fridges and therefore more accessible for the large number of poor countries. More importantly, China is the only major economy committing to contribute its domestically developed vaccines as a global public good.

China's Vaccine Strategy

- Even though the virus was not identified within China until the end of December 2019/early January 2020, the genetic sequence of SARS-CoV-2 was published on 11 January 2020, triggering intense global R&D activity to develop a vaccine. The scale of the humanitarian and economic impact of the COVID-19 pandemic drove scientists globally to utilise new paradigms resulting in

the first COVID-19 vaccine candidate *entered human clinical testing* with unprecedented rapidity on 16 March 2020.⁶³

- In April, Sinovac Biotech, which had approval to begin clinical trials of an experimental vaccine for the new coronavirus, announced it plans to have a new production facility ready in 2020 after quickly obtaining land and loans.
- Its Beijing-based unit aimed to make up to 100 million shots a year if the vaccine is shown to be effective. Sinovac previously developed vaccines for hepatitis A, hepatitis B, H1N1 influenza and gained approval to sell them in China. Sinovac received a low-interest rate credit line for 60 million yuan (\$8.5 million) from the Bank of Beijing and the company has invested a similar amount in the project. It had also secured access to more than 70,000 square metres of land and property sourced for the firm by the Daxing district government in Beijing.⁶⁴
- Table 10 below sets information on several Chinese biotech companies which are active in the COVID vaccine space. As you can see, four of these are sizeable and publicly listed; CanSino Biologics, Sinopharm and its vaccine and bioscience subsidiary the China National Biotec Group Co Ltd (CNBG), Chongqing Zhifei Biological Products and Fosun Pharma. Sichuan Clover is listed but much smaller.

Table 10: Selected China Based Biotech Organisations

Company Names	Year Formed	Headquarters	Segment	Strategic / Capital Rates	Year	Market Cap 31/12 \$bn
CanSino Biologics, In	2009	Tianjin	Clinical Stage Vaccines	<ul style="list-style-type: none"> IPO \$161m HKEX (\$968 VAL) Raised \$748 (SSE/STAR) 	2019	9.6 ⁽¹⁾
Chongqing Zhifei Biological Products	1995	Chongqing	Pharma-Vaccine Products	<ul style="list-style-type: none"> 06/20 – Request approved for human tests 	2010	35.5
CNBG (1919) Sinopharm Group (1998)	1998	Wuhan	Pharmaceuticals (subsidiary of Sinopharm)	<ul style="list-style-type: none"> 06/19 – Novena Global Healthcare Sino Sinopharm Health Fund 01/20 – \$524m H Shares 	2009	7.4
Fosun Pharma (Shanghai)	2012	Shanghai	Pharmaceuticals	<ul style="list-style-type: none"> 03/20 – \$135m JV-vaccines 11/20 – Gland Pharma India (\$873m) 09/19 – Henlius IPO 	2012	18.6
Sinovac Biotech	1999	Beijing	Biopharm Central	<ul style="list-style-type: none"> 12/20 – Sold 15% in Sinovac Life Science for \$515 million 	Delisted ⁽²⁾	0.64
Sichuan Clover Biopharmaceuticals	2007	Chengdu	Clinical stage biotech	<ul style="list-style-type: none"> GSK pivotal trial Series B \$24m 06/20 Series B \$63m 11/19 	NA	0.2

(1) As at 31/12.

(2) NASDAQ, Halted 02/19.

Sinovac Biotech was listed for a number of years and experienced public company shareholder issues on NASDAQ.

⁶³ Tung Thanh Le, Zacharias Andreadakis, Arun Kumar, Raúl Gómez Román, Stig Tollefsen, Melanie Saville & Stephen Mayhew, “The COVID-19 vaccine development landscape”, *Nature Reviews Drug Discovery*, April 9, 2020, <https://www.nature.com/articles/d41573-020-00073-5>.

⁶⁴ “China’s Sinovac gains land and loans to speed up work on coronavirus vaccine”, *NASDAQ*, April 23, 2020 <https://www.nasdaq.com/articles/chinas-sinovac-gains-land-and-loans-to-speed-up-work-on-coronavirus-vaccine-2020-04-23>.

On 7th December, Sinovac Biotech announced that it sold a 15% stake for \$515 million Sinovac Life Sciences, to Sino Biopharmaceutical to raise capital to double production capacity of its coronavirus vaccine. Sinovac said in a separate statement that it would be able to manufacture 300 million vaccine doses annually and aims to complete construction of a second production facility by the end of 2020 to increase annual COVID-19 vaccine production capacity to 600 million doses.⁶⁵

With the high growth and strong financial returns, we anticipate the entry of additional, small biotech players into both Chinese and international markets. During 2020, Beijing-based AIM Vaccine Group successfully raised 1.5 billion yuan, with plans to commence production in 2021.

Sizeable Market for Vaccines – With Many Different Pricing Niches

In an interview with analysts at CSFB and Morgan Stanley, both took the view that the future market for COVID vaccines 'could be worth more than \$10bn a year', based on an annual jab (similar to an annual flu jab) at an average price of \$20.

Matthew Harrison, an analyst at Morgan Stanley, estimated that even if only those who receive an annual flu jab take a COVID-19 shot, this would generate \$10 billion/year in revenues for the pharmaceutical industry in the US, Europe and other developed countries. He put the cost of producing a vaccine at \$5-\$10 a dose. The size of the market depends on frequency, as well as vaccination rates, and could be worth up to \$25bn a year globally, he said.

Evan Seigerman, an analyst at Credit Suisse, said the US market alone could be worth \$10 billion, based on Pfizer's vaccine pricing of \$19.50 a dose, and assuming that 330 million citizens receive two doses each.

AstraZeneca (UK) and Johnson & Johnson (USA) pledged to make their vaccines available on a not-for-profit basis during this pandemic. Pfizer and Moderna (USA), have taken a different stance; Moderna, which has received nearly \$1bn in research funding from the US government, wants to sell its vaccine for up to \$37 a jab. (Moderna reported more than 300% jump in stock price from January to July, and a \$30 billion valuation despite having zero product on the market).

Separate from cost, Pfizer and Moderna's vaccines are based on the mRNA technology that requires the candidates to be kept at sub-zero temperatures during shipments, thus complicating distribution. The vaccine developed by Oxford-AstraZeneca doesn't have to be stored at ultra-cold temperatures, making it easier to distribute, especially in many tropical and sub-tropical countries.

In the opinion of Yanzhong Huang, senior fellow for global health at the Council on Foreign Relations between the doubts cast over the tabulation of AstraZeneca's datasets and potential distribution

⁶⁵ "Sinovac secures \$515m funding to boost COVID-19 vaccine production", *CGTV*, Dec. 7, 2020

<https://news.cgtn.com/news/2020-12-07/Sinovac-secures-515m-funding-to-boost-COVID-19-vaccine-production-W26NPDSMww/index.html>.

limitations of the Pfizer and Moderna vaccines, there is a vacuum in the global supply of vaccines that may be filled by Chinese makers.⁶⁶

Vaccine Diplomacy

China has thus been presenting the candidates developed by its leading vaccine makers, Sinovac and major SOE Sinopharm as reasonable alternates for lower-and middle-income countries that cannot provide the extensive cold storage network required for the distribution of Pfizer and Moderna vaccines. As at early November, Sinovac Biotech was selling its vaccine (CoronaVac), at \$60 for two shots in some cities as part of an emergency use programme.

In his May of 2020 WHO address, President Xi stated that COVID-19 vaccine development and deployment in China, when available, will be made a global public good. This will be China's contribution to ensuring vaccine accessibility and affordability in developing countries.

Huang Yanzhong, a senior fellow for global health at the Council on Foreign Relations (CFR) says that "There is no doubt China is practising vaccine diplomacy in an effort to repair its tarnished image."⁶⁷

Chinese Government Backed Loan to LAC (Q3 2020)

In July 2020, the Chinese Government agreed to provide a \$1 billion loan to make its coronavirus vaccine accessible for countries across LAC. This decision was communicated by Chinese Foreign Minister Wang Yi to ministers from Argentina, Barbados, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, Mexico, Panama, Peru, Trinidad and Tobago and Uruguay.⁶⁸

At the time, Latin America was the region hardest hit by the coronavirus, with Brazil, Mexico and Peru among the world's top 10 countries by total COVID-related deaths.

This pledge is consistent with President Xi's May of 2020 WHO address in which he stated that China will provide US\$2 billion over two years to help with COVID-19 response and with economic and social development in affected countries, especially developing countries.

Countries Piloting Chinese Vaccines (Q3 2020)

During Q3, China began actively piloting its vaccines in clinical trials across a number of lower-to-

⁶⁶ "Future market for COVID vaccines 'could be worth more than \$10bn a year", *The Guardian*, Nov. 5, 2020; <https://www.theguardian.com/business/2020/nov/05/future-market-for-covid-vaccines-could-be-worth-more-than-10bn-a-year>.

⁶⁷ Vaishali Basu Sharma, "China's Vaccine Strategy", *The Kootneeti*, Dec. 26, 2020 <https://thekootneeti.in/2020/12/26/chinas-vaccine-strategy/>.

⁶⁸ Juan Pablo Spinetto and Samy Adghirni, "China gives \$1 billion loan for Latin America Vaccine Access", *Bloomberg*, July 23, 2020, <https://www.bloomberg.com/news/articles/2020-07-23/china-to-give-1-billion-loan-for-latin-america-vaccine-access>.

middle income countries, many of which were already signatories of the BRI MoU:

- *Argentina joined Peru, Morocco and the UAE* in approving Phase 3 clinical trials for the Sinopharm coronavirus vaccine developed by China National Biotec Group (CNBG) as reported on 22nd August⁶⁹
- *Bahamas* – on 28th September, *The Bahamas* announced that it will be among the beneficiaries of Sinopharm’s COVID-19 vaccine when approved for general use⁷⁰
- *Bahrain* – on 10th August, Sinopharm began Phase III clinical trials of a COVID-19 vaccine in *Bahrain*⁷¹
- *Bangladesh* – on 27th August, *Bangladesh* gave approval for the final stage human trial of a prospective COVID-19 vaccine developed by Sinovac Biotech⁷²
- *Brazil* in July, a Sinovac Biotech vaccine for the new coronavirus entered the final stage of testing in Brazil. The vaccine became the third in the world to enter Phase 3 clinical trials.⁷³
- *Chile* – on 4th August, the (Chilean) Government decided to support the clinical trial headed by Universidad Católica and Sinovac, with a state contribution of 2.6 billion Chilean pesos (around US\$3.4 million). Chile announced that the protocol for carrying out phase III clinical trials for the COVID-19 vaccine in Chile will begin to be applied this month.⁷⁴
- *Egypt* – on 13 September, *Egypt’s* Health Minister called for 6,000 volunteers to participate in clinical trials for two Chinese-made *COVID-19 vaccines*. In July, Egypt was selected by China as a future African hub which gets "priority access" to a coronavirus vaccine when one is developed.⁷⁵
- *Indonesia* – on 14th August, Sinovac Biotech Ltd launched a late-stage human trial that will involve as many as 1,620 patients in Indonesia for a COVID-19 vaccine candidate that it is developing with

⁶⁹ "Argentina joins Chinese coronavirus vaccine trial, maker says", Reuters, Aug. 22, 2020, <https://www.reuters.com/article/us-health-coronavirus-vaccine-sinopharm-idUSKBN2510CZ>.

⁷⁰ "China will offer approved vaccine to The Bahamas", Newsbreak, Sept. 28, 2020, <https://www.newsbreak.com/news/2071487876298/china-will-offer-approved-vaccine-to-the-bahamas>.

⁷¹ "China's Sinopharm starts Phase III trial of COVID-19 vaccine in Bahrain, Reuters, Aug. 10, 2020 <https://uk.reuters.com/article/us-health-coronavirus-bahrain-vaccine/chinas-sinopharm-starts-phase-iii-trial-of-covid-19-vaccine-in-bahrain-idUKKCN2561V1>.

⁷² "Bangladesh allows human trial of COVID-19 vaccine developed by Chinese company", *New Indian Express*, Aug. 27, 2020, <https://www.newindianexpress.com/world/2020/aug/27/bangladesh-allows-human-trial-of-covid-19-vaccine-developed-by-chinese-company-2189090.html>

⁷³ "Chinese COVID-19 vaccine starts final tests in Brazil", *New Strait Times*, July 22, 2020 <https://www.nst.com.my/world/world/2020/07/610555/chinese-covid-19-vaccine-starts-final-tests-braz>.

⁷⁴ "Chile initiates clinical study for COVID-19 vaccine", *Chile Reports*, Aug. 4, 2020, <https://chilereports.cl/en/news/2020/08/04/chile-initiates-clinical-study-for-covid-19-vaccine>.

⁷⁵ "Egypt to test Chinese-made coronavirus vaccines on 6,000 unpaid volunteers", *The New Arab*, Sept. 13, 2020, <https://english.alaraby.co.uk/english/news/2020/9/13/egypt-to-test-chinese-made-coronavirus-vaccines-on-6-000-volunteers>.

- Indonesian state-owned peer Bio Farma.⁷⁶
- *Jordan* – on 30th August, The Kingdom (Jordan) has started the phase three clinical trial of China's Sinopharm COVID-19 vaccine on volunteers at Prince Hamzah Hospital.⁷⁷
 - *Mexico* – on 11th August, *Mexico* announced that it aims to conduct late-stage clinical trials for COVID-19 vaccines in development by signing MoUs with Johnson & Johnson and *CanSino Biologics Inc* and *Walvax Biotechnology Co Ltd*.⁷⁸
 - *Morocco* – on 21st August, *Morocco* announced that it will take part in phase 3 clinical trial of a COVID-19 vaccine developed by Sinopharm.⁷⁹
 - *Pakistan* – on 18th August, according to Pakistan's National Institute of Health (NIH), regulators approved the testing of a vaccine under development by *CanSinoBio* and the Beijing Institute of Biotechnology China, in the country's first ever clinical trial of its kind.⁸⁰
 - *Peru* – The health authorities of *Peru* approved the phase 3 clinical trial for the Sinopharm vaccine in August.⁸¹
 - *Russia* – on 2nd September, clinical trials on a COVID-19 vaccine candidate developed by *CanSino Biologics Inc* and a team led by Chinese military expert *Chen Wei* kicked off in *Russia*, which would include more than 40,000 adult volunteers. These trials are conducted with a local company named *NPO Petrovax Pharm*, which is one of the five major immunobiological producers in *Russia*.⁸²
 - *Turkey* – on 17th September, *Turkey* announced that it has started testing the Chinese *Sinovac* vaccine for COVID-19 on three volunteers in its first clinical trials. *Turkey* already gave permission for test trials for a vaccine which is being developed by *Pfizer*. *Russia* had already applied for test trials in *Turkey* for its own.⁸³

⁷⁶ “Sinovac launches Phase 3 trial for COVID-19 vaccine in Indonesia, reports Phase 2 details”, *CGTV*, Aug. 14, 2020, <https://news.cgtn.com/news/2020-08-14/Sinovac-launches-Phase-3-trial-for-COVID-19-vaccine-in-Indonesia-SWXo6NBGfe/index.html>.

⁷⁷ *Maria Weldali*, “Jordan starts phase 3 trial of China’s COVID-19 vaccine”, *The Jordan Times*, Aug. 30, 2020, <https://www.jordantimes.com/news/local/jordan-starts-phase-3-trial-chinas-covid-19-vaccine>.

⁷⁸ *Frank Jack Daniel*, “Coronavirus: Mexico to conduct phase 3 trials for China, U.S. vaccine candidates”, *Global News*, Aug. 11, 2020, <https://globalnews.ca/news/7265403/coronavirus-mexico-phase-3-trial-vaccines/>.

⁷⁹ “Morocco takes part in COVID-19 vaccine trials of Chinese Sinopharm group”, *The North Africa Post*, Aug. 21, 2020, <https://northafricapost.com/43259-morocco-takes-part-in-covid-19-vaccine-trials-of-chinese-sinopharm-group.html>

⁸⁰ “Pakistan to conduct trials of Chinese coronavirus vaccine”, *Medical Xpress*, Aug. 18, 2020, <https://medicalxpress.com/news/2020-08-pakistan-trials-chinese-coronavirus-vaccine.html>.

⁸¹ “Wang Yi hails Peru’s decision to test Chinese vaccine in phase 3 trial”, *CGTV*, Nov. 6, 2020, <https://news.cgtn.com/news/2020-11-06/Wang-Yi-hails-Peru-s-decision-to-test-Chinese-vaccine-in-phase-3-trial-VbJStPV2Tu/index.html>.

⁸² “Petrovax and Cansino Biologics are to Launch Phase III International Clinical Trial of the Potential COVID-19 Vaccine in Russia”, *PETROVAX*, Aug. 15, 2020, http://petrovax.com/press_centre/news/2020/1878/.

⁸³ “Turkey begins clinical trials for Chinese virus vaccine”, *Hurriyetdailynews*, Sept. 17, 2020 <https://www.hurriyetdailynews.com/turkey-conducts-clinical-trials-for-chinese-vaccine-158329>

- In August 2020, *Russia's* Petrovax started a late-stage trial of a COVID-19 candidate vaccine from CanSino Biologics Inc in the country, records show, as the Chinese drug firm steps up testing abroad to close in on regulatory approval.⁸⁴
- In August *Saudi Arabia* announced that it will soon begin Phase III clinical trials on around 5,000 people for a COVID-19 vaccine developed by CanSino Biologics Inc. Saudi Arabia plans to test the vaccine alongside a placebo on 5,000 volunteers and is currently preparing trials in the cities of Riyadh, Dammam and Mecca.⁸⁵
- In September, *Turkey* began final Phase III trials of an experimental Chinese coronavirus vaccine developed by Sinopharm. The vaccine will be administered to 1,200- 1,300 health workers over 10 days and a second dose will be given 14 days after the first.⁸⁶
- In July, Sinopharm initiated a Phase III clinical trial to assess its COVID-19 vaccine candidate in *Abu Dhabi, UAE*.⁸⁷

Q4 Global Developments

COVAX – In October, China joined a global scheme for the distribution of COVID-19 vaccine backed by the WHO. As many as 171 nations have joined the programme to back equitable access to COVID-19 vaccines for rich and poor countries alike. Participants include about 76 wealthy, self-financing ones, but neither the USA nor Russia. COVAX is co-led by the GAVI vaccines alliance, the WHO and the Coalition for Epidemic Preparedness Innovations (CEPI).⁸⁸

Vaccine Distribution

- *The UAE and Bahrain* – became the first countries to approve a Chinese COVID-19 vaccine, a significant boost for China's plans to roll out its vaccines worldwide. The UAE approved a vaccine developed by Sinopharm on 9th December, and Bahrain followed days later. The UAE and Bahrain are also the first countries to grant full approval to sell a COVID-19 vaccine. Group 42 (Abu Dhabi)

⁸⁴ Gabrielle Tétrault-Farber and Roxanne Liu, "Testing of CanSino's COVID-19 candidate vaccine begins in Russia", *Reuters*, Aug. 17, 2020, <https://www.reuters.com/article/us-health-coronavirus-vaccine-cansino-idUSKCN25D0SI>.

⁸⁵ "Saudi Arabia to begin human trials with Chinese COVID-19 vaccine", *TRT World*, Aug. 10, 2020, <https://www.trtworld.com/middle-east/saudi-arabia-to-begin-human-trials-with-chinese-covid-19-vaccine-38779>.

⁸⁶ "Turkey begins phase three trials of Chinese COVID-19 vaccine", *TRT World*, Sept. 16, 2020, <https://www.trtworld.com/turkey/turkey-begins-phase-three-trials-of-chinese-covid-19-vaccine-39806>.

⁸⁷ "China's Sinopharm launches Phase III trial of COVID-19 vaccine in UAE", *Clinical Trials*, July 17, 2020, <https://www.clinicaltrialsarena.com/news/sinopharm-covid-vaccine-uae-trial/>.

⁸⁸ Colin Qian, Stephanie Nebehay, "China joins WHO-backed vaccine programme COVAX rejected by Trump", *Reuters*, Oct. 9, 2020, <https://uk.reuters.com/article/us-health-coronavirus-china-covax/china-joins-who-backed-vaccine-programme-covax-rejected-by-trump-idUKKBN26U027>.

has distribution and manufacturing agreements with Sinopharm and other states with plans to produce between 75 and 100 million doses next year in the UAE, he said.⁸⁹

- *Mexico* – Mexican Foreign Minister Marcelo Ebrard said the Health Ministry signed an agreement to buy 35 million doses of Chinese firm CanSino Biologics' COVID-19 vaccine.⁹⁰
- *Egypt* – on 11th December, Egypt received the first batch of the Sinopharm anti-coronavirus vaccine to help fight against the COVID-19 epidemic. The priority of distributing the vaccine would be given to the medical staff in isolation hospitals, people with chronic diseases like cancer and kidney failure, and the elderly.⁹¹
- *Brazil* – on 3rd December, as much as 600 liters of China's novel coronavirus vaccine arrived in Brazil; with 120,000 doses arriving two weeks before (which then still needed) approval from its federal health regulator Anvisa before it can be used. On 17th December, Brazil agreed to purchase 46 million doses of Sinovac's CoronaVac vaccine.⁹²
- *Indonesia* – on 16th December, Indonesia received 1.2 million doses of COVID-19 vaccine from Sinovac Biotech on Dec 6 and is set to receive raw materials to produce 15 million doses from Sinovac later this month. The arrival of the first batch of CoronaVac is part of a deal between Indonesia and Sinovac as the country has been testing the vaccine in a late-stage clinical trial since August. Another 1.8 million doses of the jabs are expected to be sent to Indonesia by January the latest, followed by raw materials to produce 30 million doses of the vaccine in the same month. The deal guaranteed Indonesia priority access to the technical know-how on producing the vaccine, so that its state-owned pharmaceutical firm Bio Farma can produce the jabs with the raw materials.⁹³
- *Philippines* – A number of Philippine soldiers, as well as members of the president's security team and even possibly one cabinet members of the Philippine government may have already received the Chinese COVID-19 vaccine produced by Sinopharm, even though the country's health

⁸⁹ David Cyranoski, "Arab nations first to approve Chinese COVID vaccine — despite lack of public data", *Nature*, Dec. 14, 2020, <https://www.nature.com/articles/d41586-020-03563-z>.

⁹⁰ "Mexico to buy 35 million doses of China's CanSino COVID-19 vaccine", *CGTN*, Dec. 10, 2020, <https://news.cgtn.com/news/2020-12-10/Mexico-to-buy-35-million-doses-of-China-s-CanSino-COVID-19-vaccine-W6uyiFBPAk/index.html>.

⁹¹ "Egypt receives the first batch of Chinese anti-coronavirus vaccine", *CGTN*, Dec. 12, 2020, <https://newsaf.cgtn.com/news/2020-12-11/Egypt-receives-first-batch-of-Chinese-anti-coronavirus-vaccine-W8TXGkQ3Ze/index.html>.

⁹² "Sinovac, Chinese vaccine for COVID-19, to be approved in Chile and Brazil", *PressNZA*, Dec. 24, 2020, <https://www.pressenza.com/2020/12/sinovac-chinese-vaccine-for-covid-19-to-be-approved-in-chile-and-brazil/>; "Chinese firm Sinovac sends second COVID-19 vaccine batch to Brazil", *CGTN*, Dec. 10, 2020, <https://news.cgtn.com/news/2020-12-16/Chinese-firm-Sinovac-sends-second-COVID-19-vaccine-batch-to-Brazil-WgbtSOc3TY/index.html>.

⁹³ Kiki Siregar, "Indonesia has 1.2 million COVID-19 vaccine doses in its possession now. What's next?", *CNA*, Dec. 16, 2020, <https://www.channelnewsasia.com/news/asia/indonesia-covid-19-vaccines-sinovac-china-1-2-million-13769352>.

authorities have yet to officially approve its use. The Philippines aims to finalise negotiations with Sinovac Biotech to acquire 25 million doses of the Sinovac COVID-19 vaccine for delivery by March. Sichuan Clover Biopharmaceuticals is also seeking to conduct late-stage clinical trials in the Philippines of its coronavirus vaccine.⁹⁴

- *Turkey* – The first batch of COVID-19 vaccines, consisting of 3 million doses, from China was brought to Turkey via Turkish Airlines' Beijing-Istanbul flight with 17 containers of vaccines, was expected to land at Istanbul Airport on (30th December). Its Health Minister had previously said Turkey will be receiving a total of 50 million doses of Chinese COVID-19 vaccines, SinoVac, and that the first 20 million doses of vaccines will be delivered during December and January. The minister also announced that Turkey will also purchase up to 30 million doses of German-based BioNTech vaccine.⁹⁵
- *China* – on 30th December, Chinese authorities have given conditional approval for general public use of the vaccine developed by Sinopharm. In July, China approved three different jabs for emergency use in key workers and other people at high risk. More than 4.5 million doses have so far been administered. A vaccine developed by Oxford University-AstraZeneca was approved in the UK on 30 December.⁹⁶
- *Pakistan* – On 31st December, Pakistan has decided to purchase 1.2 million doses of coronavirus vaccine from Sinopharm, Federal Science Minister Fawad Chaudhry confirmed. "The Cabinet Committee has decided to initially purchase 1.2 million doses of the vaccine from the Chinese company Sinopharm, which will be provided free of cost to frontline workers in the first quarter of 2021," the science minister announced on Twitter.⁹⁷
- *Ukraine* – Ukrainian President Zelensky informed about signing the contract of over 1.9 million doses of COVID-19 vaccine manufactured by China's SinoVac Biotec. "We signed the first contract for the supply of the vaccine – no longer a memorandum, but a contract for more than 1.9 million doses," Ukraine already has an agreement on 8 million doses of the vaccine under the COVAX programme, which the state will receive for free, but the authorities are trying to increase this number.⁹⁸

⁹⁴ "China's Clover applies for Philippines COVID-19 vaccine trial", *Reuters*, Oct. 30, 2020.

<https://www.reuters.com/article/us-health-coronavirus-philippines-clover-idUSKBN27F0RQ>.

⁹⁵ "First batch of coronavirus vaccines to be flown in from China to Turkey", *Daily Sabah*, Dec. 29, 2020,

<https://www.dailysabah.com/turkey/first-batch-of-coronavirus-vaccines-to-be-flown-in-from-china-to-turkey/news>.

⁹⁶ "COVID-19: China approves Sinopharm vaccine for general use", *BBC*, Dec. 31, 2020,

<https://www.bbc.co.uk/news/world-asia-china-55498197>.

⁹⁷ "Pakistan to purchase 1.2m doses of coronavirus vaccine from China's Sinopharm: Fawad Chaudhry", *The News*, Dec.

31, 2020 <https://www.thenews.com.pk/latest/767158-pakistan-to-purchase-12m-doses-of-coronavirus-vaccine-from-chinas-sinopharm-fawad-chaudhry>

⁹⁸ "Ukraine to buy 1.9 mln doses of SinoVac COVID-19 vaccine", *Xinhua*, Dec. 31, 2020

<http://en.people.cn/n3/2020/1231/c90000-9804654.html>.

Vaccine (ColdChain) Distribution

On 30th November, Cainiao Smart Logistics Network (“Cainiao”), the logistics arms of Alibaba Group Holdings, announced its partnership with Ethiopian Airlines (“Ethiopian”) to launch a special cold chain air freight for the transportation of temperature-controlled medicines from Shenzhen Airport, China's first medical cross-border cold chain facility. Temperature-controlled medicines will be distributed twice a week from Shenzhen to Africa, and to the rest of the world via Dubai and Addis Ababa.

This is China's first cross-border medical cold chain route to be operated regularly and is certified to transport temperature-controlled medicines including COVID-19 vaccines. The cargo terminal in Ethiopia is outfitted with compartmentalized cold storage facilities with temperature between -23°C to 25°C. It occupies an area of 54,000 square metres

Cainiao's management noted that Cainiao's global logistics network spans over 200 countries and regions, providing end-to-end integrated logistics services, including digital customs clearance capabilities and allows offering a one-stop solution for the global distribution of medical products such as the COVID-19 vaccines.

As a brief reminder, On May 28, the 2019 Global Smart Logistics Summit with the theme of "Digital Acceleration" was held in Hangzhou. At the summit, Daniel Zhang, CEO of Alibaba Group, proposed that the logistics industry is currently entering a comprehensive digital age, and digitalization is the initial and cornerstone of smart logistics. He believes that to maximize the efficiency of goods circulation, logistics must be highly integrated with supply chain management, which is an inevitable trend in the future.

The logistics IoT open platform is jointly established by Cainiao, Alibaba Cloud, and the partners based on Digital Twin, AI, and IoT technologies. After the platform is connected, any logistics scenario can become a digital twin that can be intelligently scheduled, and logistics tasks are automatically planned by algorithms according to orders.

From intelligent logistics to new retail, digital government, agriculture, environment, and finance, cloud computing is accelerating digital transformation of all industries. At present, Alibaba Cloud service has served more than half of China's A-share listed companies, 40% of China's top 500 companies, and 80% of China's new technology companies.⁹⁹

It is also worth noting that Cainiao's launch of the “Green Channel” Initiative to fight the pandemic has helped in the distribution of 250 million pieces of PPEs, including COVID-19 test kits, to medical

⁹⁹ “Alibaba Cloud and Cainiao Network: Digital and Intelligent Upgrade of the Entire Logistics Chain”, *Alibaba Cloud*, Sept.30,2019, https://www.alibabacloud.com/blog/alibaba-cloud-and-cainiao-network-digital-and-intelligent-upgrade-of-the-entire-logistics-chain_595414.

suppliers in over 150 countries and regions.¹⁰⁰

Financial Performance 2020

While this document discusses billions of costs related to the global pandemic, we also at least wanted to set out financial gains already being realised by some of the Chinese biotechs operating in the vaccine segment.

- \$30 billion share price appreciation in 4 leading Chinese biotech/vaccines organisations – will lead to increased capital flows
- Elevated global awareness of Chinese biotech

Table 11: Selected Publicly-listed Chinese Biotech/Vaccine Groups

Company Name	Vaccines	Share Price		Market Cap (US\$bn)
		01/01/20	01/01/21	Increased 2020
CanSino Biologics	▪ Ad5-nCOV (Convidecia) – 06/20 for military	58.9 (HKEX)	176.5 (HKEX)	6.6 ⁽¹⁾
CNBG (Sinopharm)	▪ BBIBP-CorV – approved 31/12/20	20.05	18.38	(NM)
Chongqing Zhifei Biological Products	▪ 06/2020 – Regulator approved clinical trials ▪ 03/12/20 – Launched Phase 3 clinical trials in China	52.0	147.9	13.0
Fosun Pharma	▪ 12/20 – Signed agreement with BioNTech (Germany) with 100 million doses of BNT 162 vaccines approved to China	21.8 ⁽²⁾	54.0	10.2
Sinovac Biotech (Life Sciences)	▪ CoronoVac ▪ Sold 300 million doses to low to middle income countries (NY Times)	Previously delisted	Previously delisted	Likely substantial ⁽³⁾
			TOTAL	\$29.8

(1) Shenzhen share price trades at 1.22 X HK (Source: S&P Market Intelligence).

(2) As at 04 Jan 2020 (closed) 1/12/19.

(3) VAL for Life Science alone at \$3.4 billion.

Note: All financial information available – public companies.

Table 11 lists five of the largest Chinese biotech groups which are active in vaccine development, the vaccines being developed and in some cases, those which are approved are already being marketed.

The above table lists each of the vaccines, and share price information for four of the major groups at calendar year end 2019 and 2020. Our calculations indicate a \$30 billion uplift to shareholders during 2020 alone in the shares in these four publicly-traded organisations. This \$30 billion number does not include shareholder value uplift for Sichuan Clover or some of the smaller firms currently in the process of raising capital.

Granted, the HKEX, SSSE and SZSE stock exchanges all had excellent 2020 in terms of financial performance. The CSI 300 mainland stock index increased by 27% in local currency terms during 2020

¹⁰⁰ “Cainiao Partners Ethiopian Airlines to Launch Cold Chain Air Freight for Temperature-Controlled Vaccine Transportation”, *ETHiopianairlines*, Date unknown, <https://corporate.ethiopianairlines.com/Press-release-open-page/cainiao-partners-ethiopian-airlines-to-launch-cold-chain-air-freight-for-temperature-controlled-vaccine-transportation>.

and indeed, especially within the biotech sector.¹⁰¹ However, Chinese biotech companies are now well enough developed and capitalised to potentially become players in a global vaccine business, which is likely to be both sizeable and high growth – which would not have been conceivable only a few years ago.

Share performance in the biotech/life sciences sector was also strong in 2020 western exchanges, outperforming the S&P 500, as well as the pharmaceuticals sector, since September 2019. Another contributing factor was the biotech sector has delivered the fastest vaccine in history—less than 12 months from start to finish. Astoundingly, the average amount of time required to create vaccines historically has been closer to 10 years. As a result of this historic effort, global supplies of COVID-19 vaccines are expected to be robust in 2021.¹⁰²

Increased Corporate Activity / Future Cross Border Model

These high valuations have not put off Western strategic acquirers. On 12th December, AstraZeneca announced it was acquiring **Alexion** for \$39 billion, or \$175/share, representing a 45% premium over the stock's Dec. 11 closing price, which had previously seen substantial share price appreciation.

Nor have they put off global partnerships involving vaccines. In early November, Generex (USA) Announced the Signing of a Framework Agreement with The China Center for Disease Control and Prevention (CDC), Beijing Guoxin Haixiang Equity Investment Partnership and Beijing Youfeng International Consulting Co., Ltd on the Cooperative Development of Ii-Key Vaccines.

Framework agreement outlines structure for project contracts:

- Ii-Key Vaccine for COVID-19
- Ii-Key Vaccine for Swine Flu
- Ii-Key Platform for Cancer and Infectious Diseases
- Impending contract to establish a Cancer Research Institute in China
- Licensing Deal for Excellagen in China
- 100% funding for manufacturing, development and commercial registration of Ii-Key- SARS-CoV-2 vaccine against COVID-19 in and Ii-Key Swine Flu vaccine in China
- Additionally, upon approval of the Ii-Key-CoV-2 vaccine in China, Generex will earn royalties on sales of the vaccine with the potential for multi-billion-dollar revenues

¹⁰¹ Robin Wigglesworth, "China will vie to become world financial centre, says Ray Dalio", Jan. 9, 2021. *Financial Times*, <https://www.ft.com/content/1af5a599-53c5-4481-82d6-6f768e4b7146>.

¹⁰² Sage Anderson, "Vaccines + (AZN + ALXN) = Booming Biotech", *Luckbox*, Dec. 14, 2020, <https://luckboxmagazine.com/trades/vaccines-azn-alxn-booming-biotech/>.

Similar cross border China outbound inbound partnerships involving other drugs have been happening with increasing frequency post 2018, but we wanted to end our formal analysis with this one, which is directly relevant to COVID-19.¹⁰³

¹⁰³ “Generex Announces the Signing of a Framework Agreement with The China CDC, Beijing Guoxin Haixiang Equity Investment Partnership and Beijing Youfeng International Consulting Co., Ltd on the Cooperative Development of li-Key Vaccines”, *Generex Biotechnology Corp*, Nov. 4, 2020, <https://www.globenewswire.com/news-release/2020/11/04/2120188/0/en/Generex-Announces-the-Signing-of-a-Framework-Agreement-with-The-China-CDC-Beijing-Guoxin-Haixiang-Equity-Investment-Partnership-and-Beijing-Youfeng-International-Consulting-Co-Ltd-.html>.

VIII.

Conclusion

2020 was a difficult year for the world. China's achievements on the HSR are remarkable in the hard time. Over the past year or so, China's development on the HSR has ranged from the original trajectory to the new changes caused by the COVID-19 outbreak. The increase in mutual investment and cooperation in healthcare between China and the developed countries of the world illustrates the increasing importance of China's market, capital and technological development in global common health for all. This part of the development reflects the growth of China's capacity. Even without the COVID-19 outbreak, this part of the development would have followed the original path.

We argued in this report that while many analysts cover focus on the medical assistance component and Asia/Euro rail¹⁰⁴, there were numerous other components to Chinese strategy for rapid expansion along the HSR which we summarise below.

China Outbound Healthcare Investments (Q1 2019-Q3 2020)

In light of prior existing research on the HSR up through year end 2018, we set out a list of all China outbound M&A, equity investments, JVs, partnerships, licensing, mergers during the period of Q1 2019-Q3 2020, the period when our formal research was to have concluded. While it is true that Chinese announced outbound M&A equity investments have declined annually since the 2016 peak, both deal volume and aggregate amounts in healthcare have increased substantially over the past 24 months, as shown in Tables 1 and 2 in the text. We listed 222 such investments in the Appendix by target, by country and by segment niche. We also listed aggregate quarterly amounts, but not by individual transaction.

Even though China's Dual Circulation policy is now in effect, which will further constrain outbound

¹⁰⁴ China State Railway Group announced that 12,400 freight-train trips between China and Europe were made in 2020, an increase of 50% from 2019. The record number of trains transported the equivalent of 1.14 million TEUs last year, up 56% from 2019. The trains covered more than 90 cities in over 20 European countries. In total, 76,000 metric tons or 9.31 million units of epidemic prevention and control supplies were delivered from China to Italy, Germany, Spain, the Czech Republic, Russia, Poland, Hungary, the Netherlands, Lithuania and Belgium. <https://www.rt.com/business/512119-china-europe-freight-trains-record/>.

investment, we believe that healthcare is one such strategic component for China and thus will increase on a pro rata basis. Based upon Dual Circulation, we see many more transactions similar in structure to the Generex deal, discussed previously.

Development of the Greater China Biotech Market

The development of biotech technology, enterprises and markets in China is the domestic basis for China's international cooperation on the HSR. We briefly discuss China's long term commitment to building this market, both at the national and provincial level. The number of new Chinese biopharma companies has risen steadily over the past three decades, accelerating dramatically in the last ten years. While company formation declined in other major markets such as the US, Europe, and Japan, more than 140 new biotech companies emerged in China from 2010 to 2020. Hong Kong has plans to overtake NASDAQ as the world's largest biotech fundraising centre by 2025.

We also track the success of some of the HKEX IPOs post their innovative regulatory listing decisions during 2018, as well as Shenzhen's (SSE) in 2019. By the end of the period, life sciences IPOs were among the most active in all of these exchanges. Shares in the 29 biotech companies that have listed in Hong Kong since mid-2018 until 13 December 2020 — 27 of which are Chinese — rose by 53% on average from their IPO prices, according to Dealogic.

While we had prepared a number of inbound investments/partnerships into Chinese biotech companies, we wanted to focus on the public markets, where the majority of the new capital was raised as Healthcare/Life Sciences is expected to be a long-term driving force of the A-share IPO market, fuelled by an ever-growing demand for healthcare.

The COVID-19 outbreak in early 2020 has shifted global attention to health issues and the importance of early identification of infectious diseases and minimizing their effects on the world economy. The Chinese government has also made medical assistance to countries around the world the focus of international cooperation along the Belt and Road.

Medical Support for Africa and the World

In May of 2020, China pledged to provide 2 billion US Dollars to help the world fight COVID-19 over the next two years. Africa was one of the earliest regions for China to provide international assistance in the field of health care. China has sent a tremendous amount of medical supplies and assistance to over 50 African countries and the African Union. Five Chinese medical expert teams were also sent to the African continent. In total, in the past seven decades, over 200 million people in Africa have received care and treatment from Chinese medical teams. In addition, in mid-December, construction of the China-aided future headquarters of the Africa CDC commenced in Addis Ababa this follows the launch of the September COVID test kit factory. This is fully aligned with China's May pledge to accelerate the building of the Africa CDC headquarters to help the continent ramp up its disease preparedness and control capacity.

In addition to Africa, China also provided assistance to many regions, such as the *Shanghai Cooperation Organization (SCO)*, *Lancang-Mekong Cooperation (LMC)* and others.

Finally, Also in Q4, Cainiao announced its partnership with Ethiopian Airlines to launch a special cold chain air freight to transport temperature-controlled medicines will be distributed twice a week from Shenzhen to Africa, and to the rest of the world via Dubai and Addis Ababa. This could help forge a public-private partnership of HSR.

China's Vaccine Strategy

Vaccines has always been an important way to help the world solve infectious diseases in the long term and promote human health and social development. In his May WHO address, President Xi stated that COVID-19 vaccine development and deployment in China, when available, will be made a global public good, versus the then USA President stating otherwise.

China published the genetic sequence of SARS-CoV-2 in mid-January triggering a global R&D activity to develop a vaccine. The first COVID-19 vaccine candidate *entered human clinical testing* with unprecedented rapidity on 16 March 2020.

By mid-year 2020, there were several Chinese biotech companies which were active in the COVID vaccine space. Four of these are sizeable and publicly listed; CanSino Biologics, Sinopharm and its vaccine and bioscience subsidiary the China National Biotech Group Co Ltd (CNBG), Chongqing Zhifei Biological Products and Fosun Pharma. Sichuan Clover is listed but much smaller. AIM was later funded later in 2020.

During 2020, China was presenting the candidates developed by Sinovac and Sinopharm as reasonable alternates for lower-and middle-income countries that cannot provide the extensive cold storage network required for the distribution of Pfizer and Moderna vaccines. As at early November, Sinovac Biotech was selling its vaccine (CoronaVac) at \$60 for two shots in some cities as part of an emergency use programme.

Shareholders are already expecting big positives. Combining the industry growth set out about with the preparation costs of these vaccines is in the \$3.50-\$5.00/jab, this could represent significant profits in a new and high-growth vaccine segment.

It is therefore not surprising to see \$30 billion shareholder appreciation in China's 4 major vaccine companies during 2020 alone, or to see Moderna's market cap at \$30 billion when it is operating at a loss.

Chinese Vaccines – from Trials, to Approval and then Distribution.

As seen previously in Q3, China was piloting vaccines in the following (16) countries: Argentina, Bahamas, Bahrain, Bangladesh, Brazil, Chile, Egypt, Indonesia, Jordan, Mexico, Pakistan, Peru, Russia, Turkey, Uzbekistan and UAE.

In Q4, two of China's 5 vaccines being trialled were approved..less than 3 weeks after the vaccines from the world's largest and more established biopharma firms. Approved Chinese vaccines were sent for use in Bahrain, Chile, China, Egypt, Indonesia, Turkey and UAE; agreements were signed for vaccines to be sent to Brazil, Mexico, Morocco, Pakistan and Ukraine while agreements relative to these vaccines were still under review in Bangladesh, Jordan, Malaysia, Philippines, and Peru (see Table 9).

In December, Cainiao announced its partnership with Ethiopian Airlines to launch a special cold chain air freight to transport temperature-controlled medicines to be distributed twice a week from Shenzhen to Africa, and to the rest of the world via Dubai and Addis Ababa.

In a year when Chinese vaccines were not even approved until Q4, shareholders in just four Chinese vaccine providers saw their shares increase by circa \$30 billion in value during 2020 alone – in a year when COVAX estimated the world's vaccine needs would be circa \$35 billion. Both investors and public markets continue to rate this sector at a premium.

Further, the combination of number of Chinese vaccines, already agreed vaccine hubs in Egypt, Ethiopia and UAE, priority commitments to ASEAN, SCO, LMC and Himalayan regions and supported by Cainiao distribution (which also own Liege Airport, Belgium's largest cargo airport)¹⁰⁵, China's biopharma industry appears well positioned to continue to become a growing force in this rapidly forming global industry at a time when the major Western pharmaceuticals remain focused on their own domestic country needs.

Perhaps the greatest success was the development of the “hub and spoke” HSR. Ethiopia will see JVs with Chinese companies in local, mask production, regional CDC research, JVs to manufacture vaccines locally – Chinese and local partners- as well as a regional logistics centre serving all of East Africa. We can see similar hubs being built in countries such as Nigeria, Pakistan, Dubai, Egypt, Hungary, Algeria, Brazil, Indonesia, Kazakhstan, Mexico and Portugal --all linked with WHO, the UNECE and the Gates Foundation. In the process, HSR led by China has moved expeditiously to prepare for the world's next pandemic – as one people, one planet.

The future development of the HSR is a global governance that requires international cooperation. In the Anthropocene, human health requires not only the development of biotechnology, disease prevention and the improvement of medical systems, but also the combination of population size control, environmental protection and social development. The development of the Belt and Road Initiative, including the HSR, therefore contributes to the achievement of the Sustainable Development Goals of the UN.

¹⁰⁵ “The Liege airport air link helped increase EU China trade volume by 5.3% in 2020 to \$695.5 billion. China, Europe predict new momentum in trade ties”, *China Daily*, Jan. 14, 2021, <https://www.chinadaily.com.cn/a/202101/14/WS5fffe459a31024ad0baa2a1b.html>.

Appendix 1: China Outbound Investments - Healthcare

China Outbound Investments – Healthcare (Q1 2019)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
4-Jan-19	Pear Therapeutics Inc	USA	Digital Therapeutics	Trustbridge Partners	ND
4-Jan-19	Schrodinger Inc	USA	Drug Discovery	WuXi AppTec Co Ltd, Qiming Weichuang Venture Capital Management Shanghai	ND
7-Jan-19	Apollomics Inc	USA	Oncology	China Merchants Bank Co Ltd, Orbimed Advisors LLC	ND
7-Jan-19	Atlantic Therapeutics Group Ltd	Ireland	Neuromuscular Devices	China Ireland Growth Technology Fund LP	ND
7-Jan-19	Frequency Therapeutics Inc	USA	Hearing Loss	Yonjin Group Inc	ND
7-Jan-19	Yong Shun Technology Development Ltd	Hong Kong	Cancer	CSPC Pharmaceutical Group Ltd	100%
11-Jan-19	Amacathera Inc	Canada	Gel Therapeutics	Viva Biotech Shanghai Ltd	ND
22-Jan-19	Maria Health PH Inc	Philippines	Healthcare	Gobi Ventures Inc	ND
29-Jan-19	Lyndra Inc	USA	Biotech	Hopu Investment Management Co Ltd, Polaris Venture Partners LP	ND
30-Jan-19	Dewpoint Therapeutics Inc	USA	Biomolecular	Polaris Venture Partners LP, 6 Dimensions Capital Ltd	ND
01-Feb-19	Green International Holdings Ltd	Cayman	Healthcare	Jumbo Faith International Ltd	51.2%
07-Feb-19	HiberCell Inc	USA	Biotech / Cancer	6 Dimensions Capital Ltd, Hillhouse Capital Management Ltd	ND
11-Feb-19	Nuvaira Inc	USA	Medical Devices	Qiming Venture Partners	ND
12-Feb-19	3-V Biosciences Inc	USA	Bioscience	Qianhai Ark Cayman Investment Co Ltd	ND
14-Feb-19	Passage Bio Inc	USA	Gene Therapy	Vivo Capital LLC (Fund: Vivo PANDA Fund LP)	ND
14-Feb-19	SD Sight Diagnostics Ltd	Israel	Biotech / Blood Tests	Longliv Ventures LP	ND
19-Feb-19	Longwood Fund	USA	Healthcare Fund	Wuxi AppTech	ND
05-Mar-19	Media Dokter Investama PT	Indonesia	Healthcare	WuXi AppTec Co Ltd	ND
21-Mar-19	Imago Biosciences Inc	USA	Biotech / Cancer	HighLight Capital	ND
25-Mar-19	RMDS Lab Inc	USA	Pharma	Shunya International Brand Consulting Beijing Co L	20%
27-Mar-19	Vivoiz HealthTech Pvt Ltd	India	Healthcare	Babytree Group, BAce Capital	ND
28-Mar-19	Zentogene Bioscience Laboratory Ltd	Hong Kong	Bioscience	Sanai Health Industry Group Co Ltd	100%

Number of Q1 2019 Health M&A Deals	22
Aggregated Amount of Q1 2019 Health M&A Deals (in USDm)	390.5

China Outbound Investments – Healthcare (Q2 2019)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
1-Apr-19	eXlithera Pharmaceuticals LLC	USA	Biopharma	Haisco Pharmaceutical Group Co Ltd	12.5%
10-Apr-19	Cullgen Inc	USA	Biotech	Sequoia Capital Operations LLC	ND
18-Apr-19	Talaris Therapeutics Inc	USA	Biotech	Qiming Weichuang Venture Capital Management Shanghai	ND
18-Apr-19	Arrakis Therapeutics Inc	USA	Biopharma	WuXi AppTec Venture Fund	ND
23-Apr-19	Sherlock Biosciences Inc	USA	Bioscience	Baidu Ventures	ND
23-Apr-19	RWDC Industries Ltd	Singapore	Biotech	WI Harper Group Inc	ND
23-Apr-19	Rapid Medical Ltd	Israel	Pharma	Microport Scientific Corp, Agate Medical Investments LP, Jam Capital Partners Management LLC, Rocson Medtech Fund LP	ND
30-Apr-19	Congenica	UK	Genomics	DC Health	ND
05-May-19	Pharmapace Inc	USA	Biopharma	WuXi AppTec Co Ltd	ND
07-May-19	Genoks	Turkey	Genetic Sequencing	BGI Group	ND
08-May-19	PrivaPath Diagnostics Ltd	USA	Healthcare/Consumer	Qiming Weichuang Venture Capital Management	ND
15-May-19	China Health Ltd	Hong Kong	Healthcare/Consumer	China Greenfresh Group Co Ltd	ND
17-May-19	Biomedical Research Models Inc	USA	Biomed	Joinn Laboratories China Co Ltd	100%
19-May-19	Schrodinger Inc	USA	Healthcare	WuXi PharmaTech Cayman Inc, Qiming Weichuang Venture Capital Management	ND
21-May-19	Bioformis Pte Ltd	Singapore	Healthtech	Sequoia Capital Operations LLC, Jianke.com	ND
22-May-19	Inhibrx Inc	USA	Healthcare	Wuxi Biologics Cayman Inc	ND
23-May-19	China Ophthalmology Focus Ltd	Hong Kong	Healthcare	Panacea Venture Management Co Ltd, Smart Rocket Ltd	45.5%
29-May-19	LifeSprout Inc	USA	Healthcare	Shenzhen Ginkgo Gofar Asset Management Co Ltd	ND
29-May-19	Pi Therapeutics Ltd	Israel	Medtech	GF Securities Co Ltd	ND
30-May-19	Thrive Earlier Detection Corp	USA	Early Stage Cancer	Shenzhen Cowin Venture Capital Investments Ltd	ND
05-Jun-19	Lyndra Therapeutics Inc	USA	Healthcare	Hopu Investment Management Co Ltd, Orient Life	ND
11-Jun-19	Exscientia	UK	AI Drug Discovery	GT Apeiron Therapeutics	ND
17-Jun-19	Vielia Bio Inc	USA	Biotech/Pharma	Terra Magnum Capital Partners, Cormorant Asset Management LLC	ND
26-Jun-19	Aromyx Corp	USA	Biotech	Creditease Corp	ND
27-Jun-19	Ultivue Inc	USA	Biotech	Shanghai Yonghua Investment Management Co Ltd, 6 Dimensions Capital Ltd	ND
28-Jun-19	Laboratorio Italiano Biochimico Farmaceutico Lisap	Italy	Pharma	Shandong Sita Biotechnology Co Ltd	80%

Number of Q2 2019 Health M&A Deals	27
Aggregated Amount of Q2 2019 Health M&A Deals (in USDm)	392.3

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China Outbound Investments – Healthcare (Q3 2019)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
2-Jul-19	J2 Interactive LLC	USA	Health/Tech	Tencent Holdings Ltd,One 97 Communications Ltd	ND
3-Jul-19	Cityll BV	Netherlands	NET antibodies	BrightGene Bio-Medical Technology Co Ltd	ND
7-Jul-19	Rociale Healthcare Ltd	United Kingdom	Medical products	Zhende Medical Co Ltd	100%
9-Jul-19	BioNTech AG	Germany	Biotech	Bvdf Management Ltd	ND
10-Jul-19	Hummingbird Bioscience Pte Ltd	Singapore	Biotech	Decheng Capital LLC	ND
10-Jul-19	Hong Kong WD Pharmaceutical Co Ltd	Hong Kong	Pharma	China NT Pharma Group Co Ltd	40%
31-Jul-19	Meitheal Pharmaceuticals Inc	USA	Generoc omkectab,e	NANJING KING-FRIEND BIOCHEMICAL PHARMACEUTICAL CO	50%+
2-Aug-19	Essex Biotechnology	United Kingdom	Oncology/tumors	Antikor Biopharma Ltd	ND
08-Aug-19	PermeaDerm Inc	USA	Wound care	Stedical Scientific Co Ltd	ND
15-Aug-19	MyHealthTeams Inc	USA	Social health network	Qiming Weichuang Venture Capital Management Shanghai	ND
16-Aug-19	NVT AG	Switzerland	Cardiac medical devices	Blue Sail Medical Co Ltd	ND
26-Aug-19	ISEC Healthcare Ltd	Singapore	Eye care	Aier Eye Hospital Group Co Ltd	35%
26-Aug-19	Mount Sinai Genomics Inc/Sema4	USA	Genomics	Decheng Capital LLC	ND
27-Aug-19	Celltrion	South Korea	Bio similars	VCell Healthcare Ltd	50%
28-Aug-19	HIFiO Therapeutics	USA	Biotherapeutics	IDG Capital Investment Consultant Beijing Co Ltd,Sequoia Capital Operations LLC,LYFE Capital, Legend Star Capital Co, Delian Capital	ND
30-Aug-19	HumanOptics AG/Medipart	Switzerland	Premium ophthalmology	Private Investor/Chinese	73.4%
02-Sep-19	M.A. Med Alliance SA	Switzerland	Medical devices	Shenzhen Salubris Pharmaceuticals Co Ltd	1.3%
02-Sep-19	Perfect Trend Venture Ltd	BVI/Poland	Insulin	Yifan Pharmaceutical Co Ltd	ND
04-Sep-19	Suzhou Novartis Pharmaceutical Technology Co Ltd	Switzerland	Drug manufacturing	Zhejiang Jiuzhou Pharmaceutical Co Ltd	100%
09-Sep-19	Platelet Biogenesis Inc	USA	Biotech	Qiming Weichuang Venture Capital Management Shanghai	ND
10-Sep-19	Genenta Science SRL	Italy	Biotech/cancer	Shanghai Qianzhan Investment Management Co Ltd	ND
10-Sep-19	Insilico Medicine/HK	Hong Kong	Biotech/AI	Baidu Ventures, Qiming Weichuang Venture Capital Management Shanghai, Sinovation Ventures	ND
12-Sep-19	Healthy.io Ltd	Israel	Healthcare/App	Joy Capital	ND
17-Sep-19	Riverain Technologies LLC	USA	AI/Lungs	Shenzhen Ping An Innovation Capital Investment Co	ND
17-Sep-19	CMR Surgical	UK	Robotic surgery	Zhejiang Silk Road Fund	ND
24-Sep-19	Amphivena Therapeutics Inc	USA	Biotech/cancer	Tekia Capital Management LLC,Kaitai Capital,Qiming Weichuang Venture Capital Management Shanghai	ND
26-Sep-19	Sensorion SA	France	Biopharma/hearing	WuXi AppTec Co Ltd	ND

Number of Q3 2019 Health M&A Deals	27
Aggregated Amount of Q3 2019 Health M&A Deals (in USDm)	848.4

China Outbound Investments – Healthcare (Q4 2019)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
2-Oct-19	Elicio Therapeutics	USA	Biotech/cancer	Livzon Pharmaceutical Group Inc, Shenzhen Yifeng Venture Capital Co Ltd	ND
3-Oct-19	Arcellx Inc	USA	Biotech/cancer	Quan Capital	ND
3-Oct-19	Icosavax Inc	USA	Vaccines	Qiming Weichuang Venture Capital Management Shanghai	ND
9-Oct-19	Mynosys Cellular Devices Inc	USA	Cataract devices	Decheng Capital LLC	ND
14-Oct-19	Mebias Discovery Inc	USA	Drug discovery	Viva Biotech Shanghai Ltd	ND
15-Oct-19	Ansun BioPharma Inc	USA	Immuno biological	YuanMing Capital	ND
21-Oct-19	Precision Research Institute LLC	USA	Clinical trials	China Infrastructure Construction Corp	100% ⁽¹⁾
21-Oct-19	Verseau Therapeutics Inc	USA	Macrophages	Shanghai Yonghua Investment Management Co Ltd	ND
23-Oct-19	Global Healthcare Innovation Atlan	HK	Stemcell Therapy	Fosun Pharma	ND
28-Oct-19	Viracta Therapeutics Inc	USA	Drug development/ cancer/biotech	Shenzhen Salubris Pharmaceuticals Co Ltd	ND
30-Oct-19	Meddy Inc	Qatar	Doctor booking app	212 Capital Partners Inc, Kasamar Holdings, Innoway	ND
31-Oct-19	Denovo Biopharma LLC	USA	Biopharma	Share Capital Partners,Guangzhou Yuexiu Industrial Investment Management, Sangel Capital Corp, Beijing Jiuyou Capital Management Co Ltd, Shenzhen Qian Zhan Information Co Ltd, Zheshang Industrial Integration, Wenfang Technology Co Ltd	ND
06-Nov-19	AstraZeneca	UK	Biopharma	Creation of Fund with CICC (Inbound)	50%
11-Nov-19	Cellular Biomedicine Group Inc	USA	Biopharma/cancers	Wuhan Dangdaiqianyuan Technology Co Ltd, Hillhouse Bio Holdings LP	100%
19-Nov-19	Recros Medica Inc	USA	Skin taxidermy	Haohai Healthcare Holdings Co Ltd	ND
22-Nov-19	PathoFinder Holding BV	Netherlands	Molecular diagnostics	Shanghai GeneoDx Biotech Co Ltd	51%
25-Nov-19	Deep 6 AI Inc	USA	Clinical trials acceleration software	GSR Ventures Management Co Ltd	ND
28-Nov-19	ViGeneron GmbH	Germany	Gene therapy	WuXi AppTec Co Ltd,Sequoia Capital Operations LLC	ND
29-Nov-19	Tigerise Inc	Japan	Drug development	Accerise, Hongzhou Tigermed	50%
03-Dec-19	Bright Angel Therapeutics Inc	Canada	Novel antifungal drugs	Viva Biotech Holdings	ND
03-Dec-19	Impulse Dynamics NV	USA	Cardiac implant	Mlnth Group Ltd	ND
05-Dec-19	Hummingbird Bioscience Pte Ltd	Singapore	Biotherapeutics	Delian Capital	ND
06-Dec-19	Jasper Therapeutics Inc	USA	Stem cell transplant bone marrow	Qiming Weichuang Venture Capital Management Shanghai	ND
12-Dec-19	JOINN Biologics US Inc	USA	Biologics plants	Suzhou Xiangtang Venture Capital Co Ltd	ND
17-Dec-19	A2W Pharma Ltd	UK	Red Drugs	Yaben Chemical Co.	50%
17-Dec-19	Cellestia Biotech AG	Switzerland	Biotech/cancers	FC Capital Shanghai	ND
19-Dec-19	Metabomed Ltd	Israel/USA	Cancers	Yongjin Group Inc (Fund: Shanghai Xianghe Yongan Equity Investment Fund)	ND
20-Dec-19	Techfields Cayman Inc	Cayman	Pharma	Luxin Venture Capital Group Co Ltd	ND
21-Dec-19	Cambridge Business School	UK	Biotech startups	Chinese medical systems	ND
31-Dec-19	Lunit Inc	Korea	Healthcare	Legend Capital Co Ltd	ND

Number of Q4 2019 Health M&A Deals	30
Aggregated Amount of Q4 2019 Health M&A Deals (in USDm)	1,188.0

(1) Both UK and Chinese healthcare planned

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China Outbound Investments – Healthcare (Q1 2020)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
6-Jan-20	Rootpath Genomics Inc	USA	Biotech (Toellis)	Oriza Seed Venture Capital, Sequoia Capital Operations LLC, Baidu Ventures, Shanghai Volcanics Investment Management Co Ltd	ND
8-Jan-20	Excellent Harvest International Corp/Winshine Science	BVI/HK	Biotech/cancer therapy	Shanghai Xinhua Commercial Gold Holdings Group Ltd	100%
8-Jan-20	Eyeventus	USA	Ophthalmic gene therapy	GF Securities	ND
9-Jan-20	Omniome Inc	USA	Biotech/DNA sequencing	Decheng Capital LLC, Nan Fung Life Sciences	ND
10-Jan-20	ReadCoor Inc	USA	Biotech/In situ tech	Decheng Capital LLC	ND
13-Jan-20	LumThera Inc	USA	Medical devices	Pengshi Asset Management Shanghai Partnership LP	ND
15-Jan-20	Elekta AB	Sweden	Linacs (cancer)	Guangzhou HEDY Group Co Ltd	100%
16-Jan-20	cGMP/Bayer AG	Germany	Drug production	Wuxi Biologics Cayman Inc	100%
24-Jan-20	HRA Pharma	France	Dermatology	Profex	50%
28-Jan-20	Raziel Therapeutics	Israel	Fat disorders	GF Securities	ND
30-Jan-20	Mammoth Biosciences Inc	USA	CRISPR diagnostics	Decheng Capital LLC	ND
02-Feb-20	Evonetix Ltd	UK	DNA synthesis	Morningside Group Holdings Ltd	ND
05-Feb-20	JenaValve Technology Inc	Germany	Aortic Valves	Legend Capital Co Ltd	ND
06-Feb-20	Ceva Sante Animale SA	France	Veterinary health	Hopu Investment Management Co Ltd	ND
07-Feb-20	Ali JK ZNS Ltd	Hong Kong	Digital Health	Alibaba Health Information Technology Ltd	100%
11-Feb-20	Stilla Technologies SAS	France	Digital genetic analysis	Tus-Holdings Co Ltd	ND
17-Feb-20	Adhim SASU	France	Chromatography	Beijing Bohui Innovation Biotechnology Co Ltd	100%
18-Feb-20	Canbridge Pharmaceuticals Inc	Hong Kong	Biopharmaceutical	WuXi AppTec Co Ltd	ND
19-Feb-20	Inotec Armd Ltd	UK	Med tech	Zhejiang Puhua Tianqin Equity Investment Management	ND
24-Feb-20	Arima Genomics Inc	USA	DNA Synthesis	Suzhou Cowin Zhengde Investment Management Co Ltd	ND
26-Feb-20	Cyagen Biosciences	USA	Lab mice	GF Securities Co Ltd	ND
27-Feb-20	NeuroVasc Technologies Inc	USA	Neurovascular diseases	Shandong Weigao Group Medical Polymer Co Ltd	ND
27-Feb-20	WOW Tech International GmbH	Germany	Sex healthcare	CDH Investments Fund Management Co	ND
28-Feb-20	Intarcia Therapeutics Inc	USA	Long term chronic treatment	Luxin Venture Capital Group Co Ltd	ND
02-Mar-20	AlgoDx AB	Sweden	Algorithm Diagnostics	Private Investor	ND
02-Mar-20	Cn Bio Innovations Ltd	UK	Lifesciences	CITIC Securities Co Ltd, CN Innovations Holdings Ltd	ND
02-Mar-20	Immunocore Ltd	UK	Biotech	CCB International Healthcare Industry Private Equity, WuXi AppTec Co Ltd	ND
03-Mar-20	Akouos Inc	USA	Gene therapy	Wu Capital	ND
03-Mar-20	Element Science Inc	USA	Healthtech	Qiming Weichuang Venture Capital Management Shanghai	ND
04-Mar-20	Amunix Pharmaceuticals Inc	USA	Biopharma/cancers	Dalian Capital	ND
06-Mar-20	Sparta Software Corp	USA	Musculoskeletal	GSR Ventures Management Co Ltd	ND
09-Mar-20	Numab AG	Switzerland	Oncology drug	3SBio Inc/Sunshine Guojian	ND
16-Mar-20	BioNTech	Germany	Vaccine	Fosun	ND
20-Mar-20	Design Therapeutics Inc	USA	Healthcare	Quan Capital Management LLC	ND
25-Mar-20	Regenacy Pharmaceuticals LLC	USA	Biopharma	Yongjin Group Inc, Viva Biotech Holding	ND
26-Mar-20	Avail Medsystems Inc	USA	Healthcare	Baidu Ventures	ND
30-Mar-20	Shionogi & Co Ltd	Japan	Lifesciences	Ping An Insurance Group Co of China Ltd	2.1%
31-Mar-20	Certain assets/Sorrento Therapeutics	USA	Healthcare	Nanjing Hongjing Investment Co Ltd	100%

Number of Q1 2020 Health M&A Deals	38
Aggregated Amount of Q1 2020 Health M&A Deals (in USDm)	2,076.4

China Outbound Investments – Healthcare (Q2 2020)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
2-Apr-20	Rgenta Therapeutics Inc	USA	Biotech/RNA targeting	Kaitai Capital, Legend Star Capital Co, Hangzhou Jingwei Investment Management Co Ltd	ND
8-Apr-20	Ferrum Health Inc	USA	Healthtech	GSR Ventures Management Co Ltd	ND
14-Apr-20	Perspectum Diagnostics Ltd	UK	Chronic liver disease	Zhejiang Puhua Tianqin Equity Investment Management	ND
23-Apr-20	UK med council	UK	Med research	Chinese Govt	ND
27-Apr-20	Erasca Inc	USA	Biotech/cancer	Terra Magnum Capital Partners	ND
29-Apr-20	Minderoo	Australia	Covid testing	BGI	ND
29-Apr-20	Aladdin Healthcare Technologies China Ltd	UK	AI Healthcare	IAT	ND
29-Apr-20	Robocath SAS	France	Robotic surgery	Tus-Holdings Co Ltd, Zhejiang SilkRoad Fund Management Co Ltd	ND
04-May-20	Medable Inc	USA	Clinical trials platform	PPD Inc, GSR Ventures Management Co Ltd	ND
05-May-20	RWDC Industries Ltd	Singapore	Biotech	WI Harper Group Inc	ND
06-May-20	PrivaPath Diagnostics Ltd	USA	Covid portable test kits	Qiming Weichuang Venture Capital Management Shanghai	ND
07-May-20	One Global Medical Technology Ltd	Nigeria	Health app	Tencent Holdings Ltd	ND
20-May-20	ARTMS Products Inc	Canada	Healthcare	GF Securities Co Ltd, Quark Ventures LLC	ND
20-May-20	Zentalis	USA	Biological/cancer	Tybourne Capital (inbound)	ND
26-May-20	Insitro Inc	USA	Biotech	Wuxi Venture Capital Group Co Ltd	ND
28-May-20	Plusdental dentallabor GmbH	Germany	Digital chemistry	Shenzhen Ping An Innovation Capital Investment Co	ND
28-May-20	Sonic Incytes Medical Corp	Canada	Medical devices	TMFOX Venture Partners	ND
30-May-20	Arterys Inc	USA	AI clinical platform	Fosun Capital Group	ND
01-Jun-20	Gibraltar Government	Gibraltar	Elderly care	Beijing Liujiang Construction Group	50%
10-Jun-20	Cue Health Inc	USA	Healthcare/Tech	Sherpacapital LLC, Decheng Capital LLC	ND
10-Jun-20	Checkmate Pharmaceuticals Inc	USA	Cancer/immunotherapy	Decheng Capital	ND
15-Jun-20	Perennial Real Estate Holdings Ltd	Singapore	Elder care/senior housing	Hopu Investment Management Co Ltd	17.6%
15-Jun-20	eTheRNA Immunotherapies NV	Belgium	Healthcare/cancer immunology	China Grand Pharma, Xijing Capital (plus outbound JV)	ND
15-Jun-20	Elgia Therapeutics Inc	USA	Inflammation	Changrong Venture Capital, Viva Biotech Holdings	ND
16-Jun-20	510 Kardiac Devices Inc	USA	Healthcare/heart	Venus MedTech Hangzhou Inc	ND
17-Jun-20	C4 Therapeutics Inc	USA	Biotech	Yonjin Venture, 3E Bioventures Capital	ND
18-Jun-20	Tasly Pharmaceuticals Inc	Hong Kong	Biological medicine	CQ Pharmaceutical Holding/Fosun	99.94%
24-Jun-20	Simcha Therapeutics Inc	USA	Biotech/immunobiology	WuXi AppTec Co Ltd, Sequoia Capital Operations LLC	ND
25-Jun-20	Polares Medical SA	Switzerland	Medtech	Decheng Capital LLC	ND
29-Jun-20	Denovo Biopharma LLC	USA	Biopharma/genotherapy	CICC Capital, Share Capital, Sangel Capital	ND
30-Jun-20	Goldfinch Biopharma Inc	USA	Biotech/kidney disease	Yongjin Capital	ND

Number of Q2 2020 Health M&A Deals	31
Aggregated Amount of Q2 2020 Health M&A Deals (in USDm)	796.5

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China Outbound Investments – Healthcare (Q3 2020)

Announce Date	Target Name	Target Country	Target Industry Sector	Acquirer Name	Percent Sought
02-Jul-20	Citryll BV	Netherlands	Life Science	BrightGene Bio-Medical Technology Co Ltd	ND
06-Jul-20	MicroPort Cardiac Rhythm Management Ltd	France	Healthcare	Microport Scientific Corp, Yunfeng Capital Co Ltd, Hillhouse Capital Management Ltd	ND
08-Jul-20	VelosBio Inc	USA	Biopharma	Decheng Capital LLC	ND
10-Jul-20	Positrigo AG	Switzerland	Neurologen Operative Brain Disorders	Great Filter Ventures	ND
10-Jul-20	Hope Biotech HongKong Ltd	Hong Kong	Bio Sciences	China Environmental Technology Holdings Ltd	51%
13-Jul-20	Citrine Medicine	USA	Rare diseases	Quan Capital	ND
13-Jul-20	NovaSight Ltd	Israel	Healthcare/vision	Rimonci Capital	ND
13-Jul-20	Ping An Shionogi Hong Kong Co Ltd	Japan	Pharma Healthcare	Ping An	49%
15-Jul-20	Axis360 Surgical Inc / Kahna	United States	Medical Devices	Shanghai Kinetic Medical Co Ltd	ND
16-Jul-20	Ascendum Capital Hong Kong Co Ltd	Hong Kong	Healthcare	Venus MedTech, Qiming Partners	ND
20-Jul-20	NDR Medical Technology Pte Ltd	Singapore	Robotic Surgery	Microport Scientific Corp, Singapore Innovate Pte Ltd	ND
21-Jul-20	Belkin Laser Ltd	Israel	Healthcare	Rimonci Capital, China Resources Capital Management Ltd	ND
21-Jul-20	Elevation Oncology Inc	USA	Biopharma	Qiming Weichuang Venture Capital Management Shangh	ND
28-Jul-20	Rapid Novor Inc	Canada	Protein Sequencing	Suzhou Cowin Zhengde Investment Management Co Ltd - Co-USA Venture	ND
28-Jul-20	Schrodinger	USA	Structure based drug discovery	Viva Biotech	ND
29-Jul-20	Thrive Earlier Detection Corp	USA	Life Science	Shenzhen Cowin Venture Capital Investments Ltd	ND
29-Jul-20	Siema 4	USA	Data science/oncology	Decheng Capital	ND
31-Jul-20	Harbor Bio-med	USA	Incubate biotech startups	Viva Biotech	ND
03-Aug-20	Anze Premium Health and Beauty Pte	Singapore	Chinese medicine/R&D	ECM Otto Ltd	30%
11-Aug-20	Atomwise Inc	USA	AI/Drug Development	Tencent Holdings Ltd	ND
12-Aug-20	Cellular Biomedicine Group Inc	USA	Biomedicine/cancer	TF Capital, Wuhan Dangdaiqianyan Technology Co Ltd, Mission Right Ltd, Hillhouse Bio Holdings LP	100%
12-Aug-20	EyeFree Assisting Communication Ltd	Israel	Wearable communication device	Rimonci Capital	ND
12-Aug-20	F2G Ltd	UK/Austria	Fungal infections	Morningside Ventures	ND
13-Aug-20	CARB-B	USA	Vaccine	Micux Pharma	ND
17-Aug-20	Practo Technologies Pvt Ltd	India	Healthcare	AIA Group Ltd, Matrix Partners Management Services LP, Sequoia Capital (Win-Win Fund)	ND
18-Aug-20	Jinxin International Medical Services Co Ltd	Cayman Islands	IVF	Jinxin Medical Investment Group Ltd, Management	51%
24-Aug-20	RNAimmune Inc	USA	Vaccines/Therapeutics	Terra Magna	ND
02-Jul-20	Citryll BV	Netherlands	Life Science	BrightGene Bio-Medical Technology Co Ltd	ND
06-Jul-20	MicroPort Cardiac Rhythm Management Ltd	France	Healthcare	Microport Scientific Corp, Yunfeng Capital Co Ltd, Hillhouse Capital Management Ltd	ND
08-Jul-20	VelosBio Inc	USA	Biopharma	Decheng Capital LLC	ND
10-Jul-20	Positrigo AG	Switzerland	Neurologen Operative Brain Disorders	Great Filter Ventures	ND
25-Aug-20	Prescriptive Health Inc	USA	Prescription intelligence platform	Morningside Group Holdings Ltd	ND
25-Aug-20	ReViral Ltd	UK/Australia	Artificial therapeutics	CR-CP Life Sciences Fund	ND
27-Aug-20	Snapdragon Chemistry Inc	USA	Drug substance manufacturing	Asymchem Laboratories Tianjin Co Ltd	ND
27-Aug-20	Trumvia Immunologies USA Inc	USA	Adoptive cell therapy	Viva Biotech Holdings	ND
31-Aug-20	Eucure Biopharma Boston Corp.	USA	Biotech immunotherapy	Beijing Biocytogen Co Ltd.	100%
02-Sep-20	Miracor Medical Systems SA	Belgium	Severe Cardiac	Shanghai Yonghua Investment Management Co Ltd	ND
04-Sep-20	Abbey Vie	USA	Monoclonal antibody	I-MAB	ND
04-Sep-20	HUB	Netherlands	Next gen diagnostics	BGI	ND
06-Sep-20	Imperial Life Sciences	India	Gene Sequencing		ND
07-Sep-20	Milvik AB	Sweden	Healthtech	Creditease Corp (Africa Asia)	ND
09-Sep-20	Oncimmune Inc	USA	Covid-19/Life Sciences	Kaitai Capital, GF Xinde Investment Management Co Ltd, 3E Bioventures Capital, GBA Fund	ND
10-Sep-20	Korro Bio Inc	USA	RNA Editing	MP Healthcare Venture, Management Inc, Qiming Weichuang Venture Capital	ND
10-Sep-20	Tolient Inc	USA	Drug Discovery	Kaitai Capita, Viva Biotech Holdings	ND
14-Sep-20	Joint Venture	Ethiopia	Test Kits Covid-19/Hospital	BGI Health	50%
14-Sep-20	NiKang Therapeutics Inc	USA	Biotech / Oncology	RTW Investments LP, Lilly Asia Ventures	ND
18-Sep-20	GNC Holdings	USA	Nutrition	Harbin Pharma	100%
21-Sep-20	SYNthesis med chem	Hong Kong	Preclinical / Drug Discovery	Viva Biotech Holdings	100%
21-Sep-20	Ossor VR Inc	USA	Medical Devices	GSR VenturesManagement Co Ltd	ND
23-Sep-20	Libra Therapeutics Inc	USA	Neurodegenerative Diseases	Yonjin Venture LLC	ND
27-Sep-20	XtalPi Inc	USA	Digital drug discovery	People's Insurance Co Group of China Ltd/The CITIC Securities Co Ltd, Tencent Holdings Ltd, CITIC Capital	ND
28-Sep-20	Imvaq therapeutics	USA	Cancer immunotherapy	Hanne capital/Zuhai chengze investment management	ND
30-Sep-20	Flame Biosciences Inc	USA	Biopharm/lung cancer	Terra Magnum Capital Partners	ND

Number of Q2 2020 Health M&A Deals	52
Aggregated Amount of Q2 2020 Health M&A Deals (in USDm)	2,719.9

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Appendix 2

Note on Data Selection

CIR is a data provider, and sees several different components of data underlying these conclusions. This report sets out details on each of these – primarily financial – components. This report therefore develops each of these components, and plots them on a series of quarterly maps, commencing Q3 2019 and continuing through to Q3 2020 (when all data have been reconciled). In light of production delays, We also include some Q4 2020 additions, but these are not in the details of the prior 5 quarters.

In 2017, and influenced by the Tencent and Alibaba business models, which include hundreds of non-controlling stakes/partnerships, CIR began to include investments below FDI (10%) and/or below \$10 million. We thus began including JVs, partnerships, licensing agreements and non-equity deals. Since launching this set of data, we have seen a significant increase in the percentage of Chinese outbound investments in sub FDI/below \$10 million amounts. In light of recent regulations in many countries, we do not see these percentages decline. We do start with data from major providers such as Bloomberg and Deal Logic, but then take the time to separate Chinese investment from all other investors in the increasingly large investor syndicates. This process is time consuming and loss making, but helps make us unique as a Chinese data provider.

In 2018, when China began its next round of opening up, we began tracking Chinese inbound investments/pledges which also include partnerships, JVs, licensing agreements. We collect data from numerous global sources as well as from connections based in these markets. We then account for these on a “stock” basis. We were the first research firm to break the news on CNBC that in Q1 2019, China inbound announced were greater than outbound announced, a trend which has continued through 2020. (Henry Tillman, “China Seeing Shift Towards Inbound Investment”, CNBC, Apr 18, 2019, <https://www.cnbc.com/video/2019/04/18/china-seeing-shift-towards-inbound-investment-expert-says.html>.)

The combination of increased activity in both China outbound and inbound healthcare, plus our unique data set, led CIR to be invited to join the Advisory Board of China Data Analysis & Research Hub – CDA, an Austrian based think tank with a focus on EU/China healthcare. This led our firm to launch increasingly detailed quarterly healthcare research in Q1 and Q2 2020, which include mapping each of the investments. We circulated these pilots to a number of Chinese investors – both strategic and financial – as well as selected western private equity and venture capital firms.

When conducting a review of existing HSR related research, we came across a number of existing research papers. One of those which we found prescient was a research paper titled “Combating infectious disease epidemics through China’s Belt and Road Initiative”. In it the authors concluded that “A major part of the BRI focuses on support and communication to build a new mechanism for global health, prioritising the prevention and control of infectious diseases, preventing outbreaks becoming epidemics, ... thus overcoming the vicious circle of poverty and ill health. China will strengthen cooperation with particular regard to the control of TB, echinococcosis, and dengue within the 69 countries and deliver enhanced communication and research leading to the elimination of LF, malaria, and schistosomiasis. Based on opportunities the BRI provides and the cooperative experience gained, the framework should become available and applicable to the response to these challenges by sharing information, joint control, and technical know-how”. (Jin Chen, Robert Bergquist, Xiao-Nong Zhou, Jing-Bo Xue and Men-Bao Qian, “Combating infectious disease epidemics through China’s Belt and Road Initiative”, NCPI, April 18, 2019, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6472722/>.)

While there are numerous publications analysing the 2020 HSR developments including financial institutions, financial press, universities, Government and private think tanks, we believe that there were many other components of the 2020 rapid growth of the HSR, focused on economic, which have not been captured to date. Once identifying and then analysing these components, we then upload into a series of detailed quarterly maps by component, which we hope can form the basis for future analyses. A list of these investments, including announcement date, target name, target country, target industry sector, acquirer/investor name, and available percentage sought are set out in the Appendix 1.

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Abbreviations

AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of Southeast Asian Nations
BRI	Belt and Road Initiative
BRICS	the Combined Economies of Brazil, Russia, India, China and South Africa
CDC	Centers for Disease Control and Prevention
CIR	China Investment Research
CNBG	China National Biotech Group Co Ltd
COVAX	the Vaccines Pillar of the Access to COVID-19 Tools (ACT) Accelerator
COVID	Corona Virus Disease
CEPI	the Coalition for Epidemic Preparedness Innovations
CPEC	China–Pakistan Economic Corridor
FDI	Foreign Direct Investment
GAVI	Global Alliance for Vaccines and Immunization
GCC	Gulf Cooperation Council
HSR	Health Silk Road
IPOs	Initial Public offerings
JVs	Joint Ventures
LMC	Lancang-Mekong Cooperation
MoU	Memorandum of Understanding
MFA	Ministry of Foreign Affairs
MNCs	Multinational Companies
NASDAQ	National Association of Securities Dealers Automated Quotations
NDB	New Development Bank
OECD	Organization for Economic Cooperation and Development
SARS	Severe Acute Respiratory Syndrome
SCO	Shanghai Cooperation Organization
SEHK	Stock Exchange of Hong Kong
SIIS	Shanghai Institutes for International Studies
SSE	Shanghai Stock Exchange
STAR	Science and Technology Innovation Market
SZSE	Shenzhen Stock Exchange
TCM	Traditional Chinese Medicine
VC/PE	Venture Capital/Private Equity
WHO	World Health Organization
UN	United Nations
UNAIDS	United Nations Program on HIV/AIDS

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