


RESEARCH ARTICLE

# The political economy of vaccine distribution and China's Belt and Road Initiative

Krishna Chaitanya Vadlamannati  and Yoo Sun Jung

UCD, School of Politics & International Relations (SPIRe), Dublin, Ireland

**Corresponding author:** Krishna Chaitanya Vadlamannati, email: [krishna.vadlamannati@ucd.ie](mailto:krishna.vadlamannati@ucd.ie)

## Abstract

To what extent do national strategic interests influence countries' distribution of health assistance during a global health crisis? We examine China's global COVID-19 vaccine allocation, focusing on the relationship between its vaccine prioritization and its geopolitical expansion through the Belt and Road Initiative (BRI). We claim China uses its vaccine diplomacy as a comprehensive tool to promote its grand strategy and expand its global leadership and influence. Employing a newly available dataset on Chinese COVID-19 vaccine deliveries for a cross-section of 108 BRI member countries, our study shows that countries with foreign direct investment flows into BRI projects have received more vaccines from China. Our findings confirm that donor strategic concerns affect bilateral foreign assistance. Our results remain robust to several robustness checks, including endogeneity concerns.

**Keywords:** COVID-19; vaccine diplomacy; Belt and Road Initiative; foreign direct investment; China; global health engagement

## Introduction

How do national and strategic interests shape countries' response to a global health crisis, especially in allocating health assistance worldwide? In this study, we examine China's distribution of vaccines during the COVID-19 pandemic. Specifically, our study focuses on the effect of China's geopolitical expansion through its Belt and Road Initiative (BRI) on geoprioritization for COVID-19 vaccine delivery.

Over the years, China has donated medical drugs and equipment, dispatched medical aid teams, trained health personnel, and constructed hospitals and clinics in many countries.<sup>1</sup> China's continuous and growing engagement in global health is rooted in its history of infectious disease outbreaks (e.g., SARS, Ebola, and MERS) and its strategic interests.<sup>2</sup> China launched the BRI to connect with Asia, Africa, and Europe in 2013, seeking to promote economic development through improvements in infrastructure and connectivity.<sup>3</sup> Although the objectives of the BRI are mainly economic,<sup>4</sup> health formed a vital area of cooperation for China even before the BRI came into effect.<sup>5</sup> China has sent a strong message to the world of its objective to build relations beyond investments in BRI partner countries.<sup>6</sup>

China currently provides countries with medical supplies and equipment and is the most prominent vaccine supplier to the developing world.<sup>7</sup> Nevertheless, China's vaccine diplomacy has been met with much skepticism that the Chinese COVID-19 vaccine distribution is based on strategic interests rather

<sup>1</sup>Liu et al. (2014).

<sup>2</sup>Ibid.

<sup>3</sup>Vadlamannati et al. (2022).

<sup>4</sup>The emergence of China as an essential source of external finance for many countries has given rise to questions and motivations behind China's BRI (Morgan, 2021).

<sup>5</sup>Tang et al. (2017); Liu et al. (2014).

<sup>6</sup>Lee (2021); Zhao (2021).

<sup>7</sup>Vadlamannati et al. (2021); Bridge Consulting (2021).

than on need or equity.<sup>8</sup> For example, State Councillor and Foreign Minister Wang Yi stated that China had donated and exported in excess of 400 million vaccines to more than ninety countries, many of which are its BRI partners.<sup>9</sup> He also declared, “We will jointly launch the Initiative for Belt and Road Partnership on COVID-19 Vaccines Cooperation to promote fair international distribution of vaccines and build a global shield against the virus.”<sup>10</sup> All countries to which China has pledged COVID-19 vaccines, except for one, are participants in the BRI project.<sup>11</sup> Our preliminary examination of the data also indicates that BRI countries have received more Chinese vaccines than non-BRI states (see Figures A and B in the online appendix).

There are a growing number of studies on China’s vaccine delivery and its ambitious motivation.<sup>12</sup> Yet, the existing literature is not based on empirical evidence.<sup>13</sup> Our study is a large-N empirical analysis of China’s vaccine diplomacy using a newly available cross-section dataset on Chinese COVID-19 vaccine deliveries. In this article, we examine whether there is a systematic relationship between China’s allocation of COVID-19 vaccines and its BRI partnership. Our results show that compared with other countries, those that host Chinese foreign direct investment (FDI) inflows in BRI projects are more likely to receive vaccines from China. Additionally, exploring different channels of vaccine distribution, that is, purchases versus donations, our analysis shows that BRI nations with Chinese FDI are more likely to receive vaccines regardless of the form of provision of vaccines. Our study contributes to the literature on foreign aid, FDI, and health. The findings further speak to the literature on global governance and economic order by highlighting China’s rise as a global leader.

## The argument

### The rise of the Health Silk Road

As both the origin (e.g., SARS, COVID-19) and the destination (e.g., Ebola, polio) of cross-border infectious transmission, China has shifted its focus from trade to health. Along with the BRI, China’s engagement in global health has grown over time with its membership in the World Trade Organization (WTO) in 2011. In 2012, the Association of Southeast Asian Nations (ASEAN) countries<sup>14</sup> and China entered a Memorandum of Understanding (MoU) to promote health sector security and collaboration in several areas, including the exchange of information, prevention and control of infectious diseases, and the training of health sector professionals among other spheres.<sup>15</sup> In 2012–14, China initiated a far-reaching response to the spread of the Ebola virus that originated in West Africa. Having dealt with the severe acute respiratory syndrome (SARS) epidemic that began in China and spread throughout 2002–3,<sup>16</sup> China was placed in a good position to deal with the Ebola epidemic.

China’s health diplomacy has been implemented through the BRI. Beijing adopted the Health Silk Road (HSR), the strategies of the BRI, to promote health cooperation in a world that has been increasingly hit and shaken by the global pandemic. Several MoUs have been signed between China, BRI countries, and international organizations to pursue health security, health policy, and healthcare.<sup>17</sup>

<sup>8</sup>Kiernan et al. (2021).

<sup>9</sup>Keynote Speech by State Councillor and Foreign Minister Wang Yi at the Asia and Pacific High-level Conference on BRI, “Let Us Strengthen Confidence and Solidarity and Jointly Build a Closer Partnership for Belt and Road Cooperation,” *China News*, 24 June 2021 ([http://sb.chineseembassy.org/eng/zgyw\\_12/t1886403.htm](http://sb.chineseembassy.org/eng/zgyw_12/t1886403.htm)) Accessed on 25 March 2022.

<sup>10</sup>Ibid.

<sup>11</sup>Hillman and Tippet (2021).

<sup>12</sup>e.g., Huang (2021); Lee (2021).

<sup>13</sup>One notable exception is the work of Chen (2022) on China’s strategy for COVID-19 vaccine distribution.

<sup>14</sup>The member states of the ASEAN are the Governments of Brunei Darussalam, the Kingdom of Cambodia, the Republic of Indonesia, the Lao People’s Democratic Republic, Malaysia, the Republic of the Union of Myanmar, the Republic of the Philippines, the Republic of Singapore, the Kingdom of Thailand, and Viet Nam.

<sup>15</sup>Rudolf (2021).

<sup>16</sup>Tang et al. (2017).

<sup>17</sup>Ibid.

The COVID-19 pandemic has shown the weakness and vulnerabilities of the current international system for detecting, assessing, and controlling disease outbreaks. The Lancet Commission on lessons for the future from the COVID-19 pandemic,<sup>18</sup> a leading medical journal, pointed out that the global response to the pandemic has been a “profound tragedy and a massive failure at multiple levels,” resulting in millions of preventable deaths.<sup>19</sup> The massive failure of the pandemic response suggested the need for a more robust and more effective system for global disease outbreak surveillance and global leadership in pandemic response.

The rapid development of the Health Silk Road is an extension of China’s soft power.<sup>20</sup> The absence of much-needed global leadership and cooperation opened the door to China. China filled the vacuum and positioned itself as a leading contributor in fighting against a health crisis like COVID-19.<sup>21</sup> The COVID-19 pandemic has given a favorable environment in which China can expand its Health Silk Road and enhance its geopolitical positioning. Beijing seized the opportunity the unprecedented global crisis presented to gain a better position and leverage, especially in the China–US race to run the world amid and after the pandemic.<sup>22</sup>

China has provided low- and middle-income countries with more vaccines than Western countries and the COVAX facility.<sup>23</sup> In September 2022, China pledged to provide 2.2 billion vaccine doses worldwide compared to the US pledge of 1.1 billion doses and 2.06 billion doses of the COVAX Facility.<sup>24</sup> US vaccine donations were mainly through the COVAX Facility; for instance, the COVAX shipments account for 88 percent of all US vaccines donations deliveries, while the United States has directly delivered 12 percent of vaccine donation doses.<sup>25</sup>

The WHO-backed COVAX—a multilateral initiative—aims to provide fair access to COVID-19 vaccines worldwide and thus uses an equitable allocation mechanism.<sup>26</sup> By contrast, most bilateral vaccine deliveries are not made based on the needs of vaccines in recipient countries, that is, the population size or the severity of the health crisis.<sup>27</sup> While China pledged to make its vaccines a global public good, there has been an apparent discrepancy between its theory and action, as China’s largesse did not benefit all countries equally. Why are some countries more likely to receive vaccines from China than others?

### Destination for Chinese vaccines

China has viewed the COVID-19 pandemic and vaccine deliveries as a rare opportunity to pursue its geopolitical interests and increase its global influence.<sup>28</sup> We argue that China uses the distribution of COVID-19 vaccines as an instrument to promote its BRI and its foreign policy. As a consequence, Beijing has strategically given preferential access to COVID-19 vaccine doses to participants in BRI.

Even before the COVID-19 pandemic, BRI projects had attracted criticism from officials in several BRI countries, including Malaysia and Indonesia. In response to the criticism, Beijing cut down the so-called costly and unnecessary projects.<sup>29</sup> The pandemic and the consequent global economic

<sup>18</sup>Sachs et al. (2022). *The Lancet*. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(22\)01585-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)01585-9/fulltext).

<sup>19</sup>Baines (2022).

<sup>20</sup>Lee (2021).

<sup>21</sup>Cao (2020).

<sup>22</sup>Gauttam et al. (2020).

<sup>23</sup>The China COVID-19 Vaccine Tracker setup by Bridge Consulting; the UNICEF’s COVID-19 Market Dashboard and the China COVID-19 Vaccine Tracker setup by Bridge Consulting. <https://bridgebeijing.com/our-publications/our-publications-1/china-covid-19-vaccines-tracker/> (accessed 3 October 2022).

<sup>24</sup>The UNICEF’s COVID-19 Market Dashboard, the China COVID-19 Vaccine Tracker setup by Bridge Consulting, and the US International COVID-19 Vaccine Donations Tracker by Kaiser-Family-Foundation (accessed 3 October 2022).

<sup>25</sup>The US State Department and the US International COVID-19 Vaccine Donations Tracker by Kaiser-Family-Foundation. <https://www.kff.org/coronavirus-covid-19/issue-brief/u-s-international-covid-19-vaccine-donations-tracker/> (3 October 2022).

<sup>26</sup>de Bengy Puyvallée and Storeng (2022).

<sup>27</sup>Kiernan et al. (2021)

<sup>28</sup>CSIS (2021).

<sup>29</sup>Crossley (2020).

recession have hindered the progress of BRI projects and even put an end to some projects.<sup>30</sup> There is a growing concern about the prolonged pandemic and its long-term effects on BRI projects in a post-pandemic world. The pandemic has slowed lending and increased debt distress due to the difficulties of Chinese firms in advancing BRI projects abroad and the increased risk of debt management during the economic downturn that BRI countries perceived. Many BRI projects have encountered implementation challenges with increasing difficulties in financing as banks, including the Chinese development banks—the primary source of BRI projects—decide not to proceed with funding and borrowers cannot repay their Chinese debts.<sup>31</sup>

Lots of ongoing and new projects have been delayed or discontinued. Notably, infrastructure and construction BRI projects have been mainly halted due to the travel restriction of foreign workers and disrupted global supply chains.<sup>32</sup> Due to travel restrictions and lockdowns, Chinese workers fail to continue construction on infrastructure projects in foreign countries. Chinese firms have also become more cautious about committing themselves to new BRI projects during the global economic downturn caused by the prolonged pandemic.<sup>33</sup>

The COVID-19 pandemic disproportionately puts significant strains on vulnerable economies. Developing countries have been hit hardest by the pandemic, and the unprecedented health crisis has posed a comprehensive challenge to many BRI projects.<sup>34</sup> That implies that those countries that successfully manage the pandemic and alleviate the economic hardship will be able to resume their BRI projects.<sup>35</sup> Allocating vaccine doses helps the receiving countries remain committed to sustaining and enhancing BRI projects that the pandemic might have otherwise halted. Hence, Beijing strategically prioritizes BRI countries to secure economic ties with its partners and promotes BRI by supporting member countries to remain committed to the projects as planned.

China's vaccine deliveries are motivated by its need to push on its massive economic collaboration and development plans under the BRI. However, China also views the COVID-19 pandemic crisis as a strategic opportunity to expand its global leadership and increase global influence through health diplomacy.<sup>36</sup> The protracted pandemic in the absence of US global leadership has brought out the need for global public health infrastructure and governance. In response to COVID-19, Beijing has moved quickly, providing its BRI partners with vaccines, masks, medical teams, and medical supplies.

Although the COVID-19 pandemic presented China with anti-Chinese sentiment and economic disruptions, the pandemic has given an excellent opportunity for China to expand its Health Silk Road diplomacy and, accordingly, its geopolitical influence across the world.<sup>37</sup> The Health Silk Road is a comprehensive tool for China to expand its soft power, and it has gathered momentum during the COVID-19 pandemic.<sup>38</sup> China's "mask diplomacy" and "vaccine diplomacy" effectively reinforce and expand China's BRI friendship network.<sup>39</sup> This rapid development of the Health Silk Road has encouraged more countries to join the critical Chinese connectivity project, the BRI, and Health Silk Road.<sup>40</sup>

China's delivery of COVID-19 vaccine doses has mainly been made bilaterally rather than through multilateral channels such as COVAX.<sup>41</sup> In addition to the bilateral delivery method, China has provided countries involved in BRI preferential access to COVID-19 vaccine doses. The recipient countries have increasingly relied on China's support over time. As BRI partners continuously struggled to manage the health crisis and looked for China's support, China's vaccine allocation is more likely to be

<sup>30</sup>Wu et al. (2020).

<sup>31</sup>Malik et al. (2021); Wu et al. (2020).

<sup>32</sup>Wu et al. (2020).

<sup>33</sup>Nedopil Wang (2020).

<sup>34</sup>Crossley (2020); Mouritz (2020).

<sup>35</sup>Wu et al. (2020).

<sup>36</sup>Vadlamannati et al. (2021).

<sup>37</sup>Gauttam et al. (2020).

<sup>38</sup>Nedopil Wang (2020).

<sup>39</sup>Gyu (2021).

<sup>40</sup>Winter (2020); Gauttam et al. (2020).

<sup>41</sup>CSIS (2021).

conditional on the recipient government's support for China's diplomatic positions.<sup>42</sup> BRI countries seem to be a natural choice for Beijing, seeking global influence and international support for its foreign policy. Those friendly countries are likely to welcome China's vaccines and unlikely to discredit China's global efforts fighting the virus.<sup>43</sup> Also, BRI partners heavily reliant on their economic relationship with Beijing are unlikely to agree with criticisms of China's role in starting and mishandling the virus, especially in the early period.<sup>44</sup>

These considerations point in the same direction: Chinese COVID-19 vaccine distribution should be aligned with China's geopolitical interests rather than global vaccine inequity. China prioritizes its BRI member countries to pursue its geopolitical interests in allocating COVID-19 vaccines. Thus, we predict that:

H1: Countries hosting Chinese FDI in BRI projects are more likely to receive COVID-19 vaccines from China.

Vaccine deliveries take two forms: sales and donations. Predominantly, China's vaccine distribution has been made through sales. China sold 1.91 billion vaccine doses and donated 284 million vaccine doses worldwide in September 2022.<sup>45</sup> We expect that the logic of geopolitical self-interest could apply to China's distribution of vaccine sales, which is indeed the primary form of its vaccine deliveries, without difficulty. This leads to our second hypothesis:

H2: BRI countries have a higher chance of purchasing COVID-19 vaccines from China compared to other countries.

Nevertheless, the charitable nature of donations relative to sales begs a further understanding of China's vaccine diplomacy. Why and to whom does China donate COVID-19 vaccines?

### The politics of China's vaccine donations

Non-Western donors, particularly China, are widely criticized for political and commercial aid motives and less-altruistic aid allocation than Western donors.<sup>46</sup> China's political and commercial self-interests also played a significant role in distributing its COVID-19 vaccine donations.<sup>47</sup>

China's vaccine donation accounts for only about 15 percent of all Chinese vaccine deliveries, and most donations have been directly delivered by China rather than the multilateral initiative COVAX.<sup>48</sup> Unlike other Western countries, such as the United States, China sold its vaccines (about 13.5 percent of its vaccine sales) to COVAX.<sup>49</sup> China's COVID-19 vaccine donations have been predominately bilateral.<sup>50</sup> This exclusive method of Chinese vaccine donations reflects Beijing's geopolitical interests because bilateral donations lead to a high level of dependency and, consequently, the augmentation of Beijing's influence among recipients.<sup>51</sup>

While COVAX sticks to an equitable allocation mechanism to donate COVID-19 vaccine doses, China's preferential vaccine donation does not seem to reflect the global vaccine inequity.<sup>52</sup> Instead,

<sup>42</sup>Ibid.

<sup>43</sup>Chen (2022).

<sup>44</sup>Ibid.

<sup>45</sup>The China COVID-19 Vaccine Tracker setup by Bridge Consulting. <https://bridgebeijing.com/our-publications/our-publications-1/china-covid-19-vaccines-tracker/> (accessed 5 October 2022).

<sup>46</sup>Dreher et al. (2011, 2018); Fuchs and Vadlamannati (2013); Fuchs et al. (2020).

<sup>47</sup>Vadlamannati et al. (2021).

<sup>48</sup>The China COVID-19 Vaccine Tracker setup by Bridge Consulting. <https://bridgebeijing.com/our-publications/our-publications-1/china-covid-19-vaccines-tracker/> (accessed 5 October 2022).

<sup>49</sup>The UNICEF's COVID-19 Market Dashboard and the China COVID-19 Vaccine Tracker setup by Bridge Consulting. <https://bridgebeijing.com/our-publications/our-publications-1/china-covid-19-vaccines-tracker/> (accessed 3 October 2022).

<sup>50</sup>CSIS (2021).

<sup>51</sup>de Bengy Puyvallée and Storeng (2022).

<sup>52</sup>China is not alone. The distribution of vaccine donation doses by other donors, including India and Russia, is less altruistic than that of COVAX (Kiernan et al., 2021).

China's distribution of vaccine donations prioritizes participants in BRI. We believe that this strategy is to maximize the efficacy of China's vaccine donations. China uses vaccine donations as an effective diplomatic tool to promote its national and strategic interests and global leadership as it does with vaccine sales. However, the mechanisms between sales and donations are different from each other.

China allocates its vaccine donations to participants in BRI (1) to help the receiving countries make progress on BRI projects by reducing political backlash, (2) to improve its global image by alleviating global backlash against China, and (3) to enhance China's global influence by gaining political supports on its foreign policy.

First, by supporting the receiving countries, China's vaccine donation reduces the risks and obstacles in proceeding with the BRI projects. While China's political and strategic interests play a leading role in the BRI, the domestic interests of the recipient governments are embedded in the BRI.<sup>53</sup> Like many other businesses, many BRI projects have been adversely affected by the pandemic and its aftermath. According to the Ministry of Foreign Affairs in China, about 20 percent of BRI projects have been seriously affected by the COVID-19 crisis.<sup>54</sup> Nevertheless, BRI projects have also been profoundly affected by the pandemic at the BRI partners' end. Many of China's BRI partners are preoccupied with managing the pandemic, and thus, they might not be able to afford to implement BRI projects.<sup>55</sup>

China's vaccine donations contribute to saving lives, ensuring public safety, and meeting the basic subsistence needs of the people affected in the receiving countries.<sup>56</sup> Given the different nature of sales and donations, vaccine donations are more likely than sales to make a favorable environment for China-led BRI projects. China's donations improve its negative image as the origin of the virus and reduce anti-Chinese sentiment sentiments. The recipient countries will likely view China and BRI projects with less suspicion or doubt but more belief. China's vaccine donations, therefore, reduce the risk that BRI projects might come to a halt or even an end in receiving countries. These suggest that China strategically prioritizes its BRI partners in allocating its vaccine donations to avoid discontinuity and disruption in implementing BRI projects.

Second, vaccine donations by China can weaken global backlash against China, which helps China build its image as a benevolent global leader. China seeks to repair its national image and build its image as a global leader.<sup>57</sup> Due to the heavy economic reliance on China, participants in BRI are unlikely to see China's vaccine donations with distrust and to string along with criticisms of China's role in starting and mishandling the pandemic.<sup>58</sup> China expects more positive effects of its vaccine donations on its global image and influence from its friendly and trusted partners—BRI countries—than other countries. Thus, we believe that China donates COVID-19 vaccines to its BRI partners and increases the odds of being rewarded for its efforts to project the impression that China is a benevolent global leader.

Additionally, China uses vaccine donations to reward the recipient countries for their political support for China's foreign policy. China's donations incentivize support for its positions on various political issues, such as recognition of Taiwan, meetings with Dalai Lama, and Xinjiang human rights abuses.<sup>59</sup> China has a history of using aid as a diplomatic means to attract political support; for example, Beijing strategically allocates its aid to support politically aligned countries.<sup>60</sup> Vaccine donations are likely to make the receiving countries rely on China and align themselves with China's political priorities. It is widely known and discussed that China utilizes its aid, trade, and investment as leverage to make other countries support Chinese foreign policy.<sup>61</sup>

<sup>53</sup>He (2019).

<sup>54</sup>Crossley (2020).

<sup>55</sup>Mouritz (2020).

<sup>56</sup>Ibid.

<sup>57</sup>Gyu (2021).

<sup>58</sup>Chen (2022).

<sup>59</sup>Kiernan et al. (2021).

<sup>60</sup>Dreher et al. (2018); Dreher and Fuchs (2015).

<sup>61</sup>Stone et al. (2022); Halper (2010).

Compared with other donors, cost-benefit analysis is less likely to affect China's choice of sales versus donations, given that China has invested and made significant progress on COVID-19 vaccines research and development (R&D), production, and distribution.<sup>62</sup> Nevertheless, vaccine donation always comes with a cost to the donor country, even including the possibility that the donor country might "be left without an effective vaccine if variants do occur."<sup>63</sup> It implies that China carefully decides how many vaccines it donates and to which countries, seeking to maximize its potential benefits from donating vaccines. Hence, China pursues to build relationships that could remain steadfast in supporting China's political positions even in the post-COVID-19 era. With China's continuous efforts to expand its BRI and health diplomacy, giving its BRI partners priority access to vaccine donations is probably the safest choice for China. That is, "[i]n the world of vaccine donation diplomacy, a friend in need, is a friend indeed" as Kiernan et al. put it.<sup>64</sup>

Taken together, China strategically prioritizes BRI countries to avoid BRI disruption and to maximize its vaccine donations' efficiency in promoting China's global image and influence. Hence, we predict that:

H3: BRI countries have a higher chance of receiving COVID-19 vaccine donations from China compared to other countries.

## Data and methods

We utilize cross-sectional data of 108 BRI member countries (see Appendix 1 and Map A in the supplemental file) to estimate our regression models.

### a) Vaccine distribution model:

First, we estimate the probability of country  $c$  receiving COVID-19 vaccines from China during the period  $p$  (i.e., in 2020–21):

$$P(\text{vaccine}_{cs} = 1) = \varphi_c + \beta \ln(\text{FDI\_BRI})_{cp} + \beta Z_{cp} + \lambda_r + \omega_{cp} \quad (1)$$

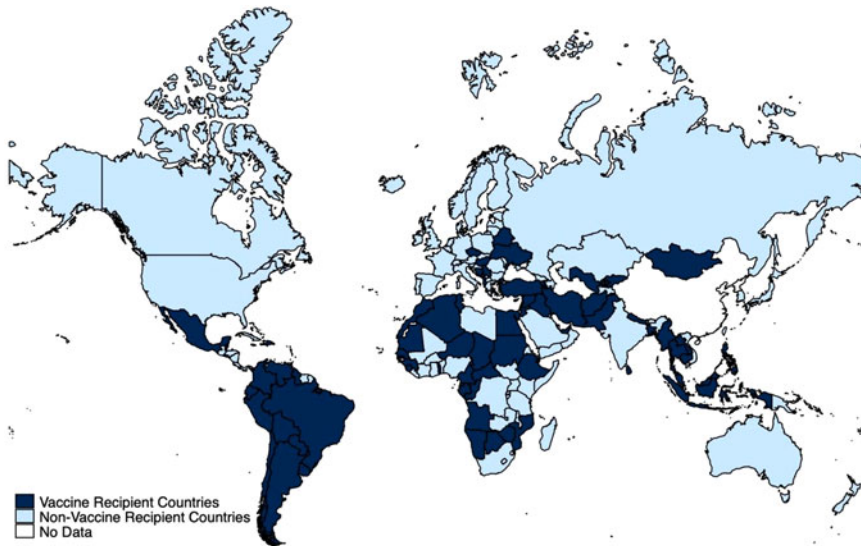
Wherein,  $\text{vaccine}_{cp}$  is a dummy variable taking the value 1 if country  $c$  has received vaccines from China at least once in period  $s$  that is, during 2020–21, and 0 otherwise. We rely on the China COVID-19 Vaccine Tracker setup by the Bridge Consulting Firm based in Beijing that tracks data related to China's international vaccine outreach. The tracker conducts daily searches on public search engine platforms such as Google and social media channels like Twitter to find the latest updates on Chinese vaccine deliveries, purchases, and donations. The information on Chinese vaccines is also sourced from official Chinese government press releases, credible local news sources, and social media posts by Chinese government offices and other state officials. The tracker is updated every week on Mondays at 7:00 PM (BJT GMT+8). Exhibit 1 outlines the daily searches conducted by the team of associates at Bridge Consulting to source the data for the vaccine tracker. An entry is only recorded upon confirmation by at least two sources of reporting. Once the entries are verified, it is compiled and organized by recipient countries. This data containing a breakdown of each country's purchases, donations, and deliveries is inserted into an online data visualization software and posted onto the consultancy website where information and brief insights on Chinese vaccine program is shared for public consumption. The descriptive statistics suggest that about 40 percent of the countries in our sample, that is about eighty-three countries (marked bold in Map 1), received Chinese vaccines at least on one occasion as of August 2021. About a quarter of the eighty-three vaccine recipient countries are in sub-Saharan Africa, while 22 percent happen to be Latin America. This is followed by Middle East North Africa and Southeast Asia.

Our main explanatory variable,  $\ln(\text{FDI\_BRI})_{cp}$ , is Chinese FDI inflows for BRI projects in country  $c$  in the period  $p$  over 2013–19, measured in US\$ current prices (log). This data is sourced from the

<sup>62</sup>Suzuki and Yang (2022).

<sup>63</sup>Lampert et al. (2022, 3).

<sup>64</sup>2021, para.19.



Map 1. Recipients of Chinese COVID-19 vaccines.

China Global Investment Tracker (CGIT) developed by Scissors.<sup>65</sup> Covering more than 4,000 Chinese FDI transactions since 2005, arguably this is the most comprehensive dataset available in the public domain. The CGIT (2021) obtains information on FDI transactions from corporate sources and Chinese participants who undertake these investments in host countries. The CGIT team verifies the information obtained and revises the data biannually.<sup>66</sup>

The dataset has two different components namely, aggregate FDI flows and investments in the construction sector. The FDI data in both components is marked by BRI projects. We use two measures namely, (i) *total Chinese FDI flows (log)* and (ii) *FDI flows in the construction sector (log)* which is devoted to BRI projects. Figure 1 provides a breakup of Chinese FDI data by geographic regions. Much of the FDI in BRI projects is concentrated in sub-Saharan Africa, Southeast Asia, and the Middle East–North Africa. The mean value of total FDI during the 2013–19 period is US\$7.13 billion and US\$4.47 billion for FDI in construction with maximum values of US\$51.99 and US\$37.49 billion, respectively.

In equation (1)  $Z_{cp}$  is a vector that includes the control variables capturing other determinants of vaccine distribution, selected from the literature on the subject. Click or tap here to enter text.<sup>67</sup> We account only for the important factors that affect Chinese vaccine distribution to avoid the “kitchen-sink models” trap.<sup>68</sup> We add more variables in the robustness checks. We include *per capita income (log)* measured in US\$ 2010 constant prices. The level of income of a country affects vaccine distribution through its impact on COVID-19 deaths as poorer countries scramble for vaccines. We also control for *population (log)* as large countries naturally tend to have a higher need for vaccinations. Both variables are sourced from the World Development Indicators.<sup>69</sup> We also account for altruistic motives of China to help poorer countries scrambling for vaccination doses. We thus include *COVID-19 deaths per million (log)* in country  $c$  as of 30 August 2020 (as the first Chinese vaccine delivery began from the month of September 2020).<sup>70</sup> The data is sourced from the Worldometer COVID-19 dataset (2021), which manually sources real-time information on the COVID-19 pandemic from countries around the world.<sup>71</sup>

<sup>65</sup>2021.

<sup>66</sup>Scissors (2020).

<sup>67</sup>Chen (2022); Kobierecka and Kobierecki (2021); Vadlamannati et al. (2021).

<sup>68</sup>Achen (2005).

<sup>69</sup>World Bank (2020).

<sup>70</sup>Note that our results hold to using more recent data on COVID-19 deaths.

<sup>71</sup>See <https://www.worldometers.info/coronavirus/about/> (accessed 10 January 2022)



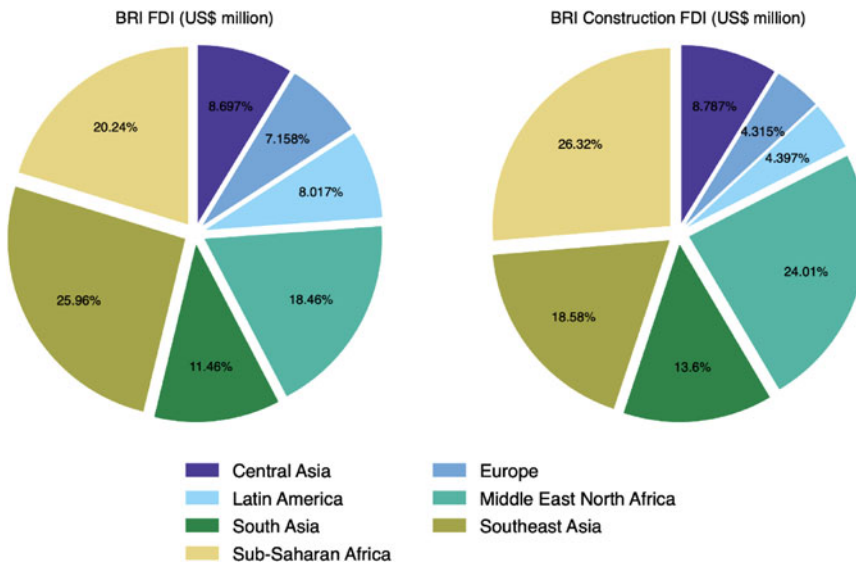


Figure 1. BRI FDI and BRI Construction FDI by Geographic Regions

Next, we control for a measure of *democracy* using the Freedom House’s civil and political liberties index coded on a scale of 0 to 7 wherein values closer to 7 denotes greater civil and political liberties. Previous studies on Chinese aid allocation suggest a link between regime type and China’s aid allocation.<sup>72</sup> One could extend similar argument to vaccine distribution and hence we control for democracy in our models. We also control for commercial interests as Kobierecka and Kobierecki<sup>73</sup> suggest that China is providing medical aid and assistance to boost trading ties with other countries. We include a measure of *trade with China as a share of recipient country’s GDP* to capture both commercial ties as well as trade dependence of country *c* on China. Trade dependence of partner countries on China is found to be a significant determinant of vaccine distribution by Vadlamannati et al.<sup>74</sup> Next, we rely on McGill COVID-19 Vaccine Tracker to secure information on whether country *c* has approved of vaccines for use from other sources than China (e.g., Covaxin, Covishield, Moderna).<sup>75</sup> Availability of vaccines from other sources may decrease the reliability on Chinese vaccine and vice versa. We dummy code 1 if country *c* has access to other vaccines and 0 otherwise. Finally, we include a *distance* measure to capture remoteness using distance in kilometers (log) between Beijing and respective country capital cities. The descriptive statistics, data sources, and definitions are in Appendices 2 and 3.

Note that we use the five-year averages (2015–19) for all control variables. To estimate equation (1) we utilize a *logit* estimator with heteroskedasticity consistent robust standard errors. We also include geographic regional dummies ( $\lambda_r$ ) to account for regional heterogeneity.

**b) Vaccine purchase and donation model:**

Next, we estimate vaccine purchase and donations as:

$$\begin{aligned}
 y_{cs} &= \max(0, x_c \beta + \xi_r + \mu_c) \\
 \mu_c | x_c, \xi_r &\approx \text{Normal}(0, \sigma_\mu^2) \\
 \xi_r | x_c &\approx \text{Normal}(0, \sigma_\xi^2)
 \end{aligned}
 \tag{2}$$

<sup>72</sup>Dreher et al. (2021).

<sup>73</sup>2021.

<sup>74</sup>2021.

<sup>75</sup>For full list, see <https://covid19.trackvaccines.org/vaccines/approved/> (accessed 10 January 2022)

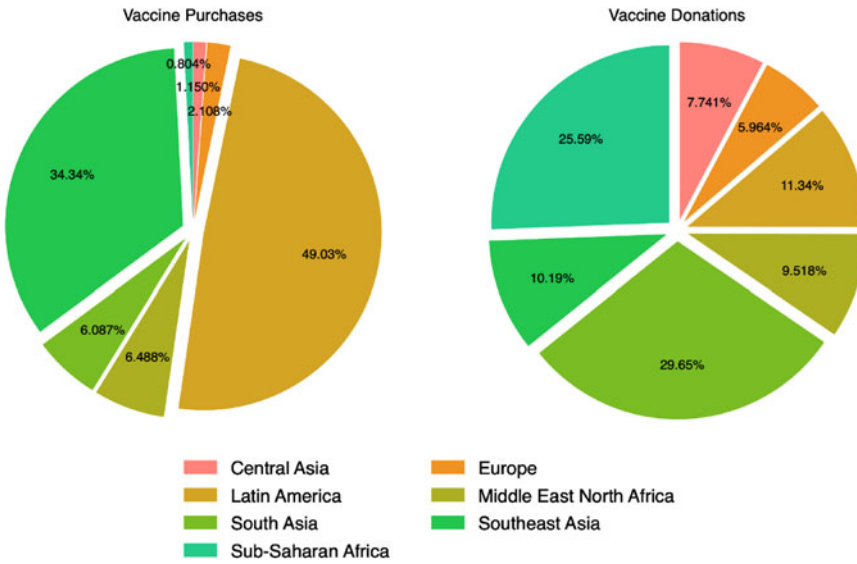


Figure 2. Chinese Vaccine Purchases and Donations by Geographic Regions

where, the dependent variable  $y_{cs}$ , sourced from Bridge consulting, is (a) *purchase of vaccines*, and (b) *donations of vaccines* to country  $c$  from China between the period  $s$ , that is, September 2020 until August 2021, respectively, measured in millions of vaccine doses. While the mean of purchases is 2.95 million doses, it is 0.1 million for donations. Figure 2 provides geographic regional breakdown of purchases and donations, respectively. Some interesting trends are noteworthy. While 49 percent of the total purchases are from Latin America, only 11.3 percent of donations have gone to that region. Likewise, 34.3 percent of purchases are from Southeast Asia but only 10.2 percent of the donations have been to this region. While most of the donations have gone to sub-Saharan Africa and South Asia, the two poorest regions, their share in purchases is miniscule. This breakdown of vaccine purchases and donations by geographic region provides some evidence of an altruistic motive in vaccine distribution by China that cannot be ruled out.

Given these two dependent variables have zero observations of more than 70 percent, we use a Tobit maximum likelihood procedure with heteroskedasticity consistent robust standard errors<sup>76</sup> Click or tap here to enter text. over an Ordinary Least Squares (OLS) estimator. Using the later would violate the zero mean assumption for the OLS errors thereby causing biased estimates.<sup>77</sup>  $x_c$  refers to the main variable of interest and the control variables discussed earlier;  $\xi_c$  are geographic regional fixed effects, while  $\mu_c$  is an independently distributed error term assumed to be normal with zero mean and constant variance  $\sigma^2$ . We calculate the marginal effects of the explanatory variables on either  $P(y_{cp} > x_c | )$ ,  $E(y_{cp} | x_c, y_{cp} > 0)$  or  $E(y_{cp} | x_c)$ . We interpret the regression results using marginal effects.

### Empirical results

Table 1 reports the results estimated using logit assessing the impact of the Chinese FDI in BRI projects on receiving Chinese vaccines. Tables 2–3 provide results on Chinese vaccine purchases and donations, respectively, using a Tobit estimator.

We begin our analysis with some stylized facts on Chinese vaccine delivery in BRI vis-à-vis non-BRI member countries. We present Figure A in the supplemental file that shows that out of a total of eighty-three countries that have received vaccines from China, fifty-four are BRI member states.

<sup>76</sup>Beck and Katz (1995).

<sup>77</sup>Neumayer (2002).

**Table 1.** FDI flows in BRI projects and Chinese vaccine distribution.

	(1) <i>vaccine</i>	(2) <i>vaccine</i>	(3) <i>vaccine</i>	(4) <i>vaccine</i>
BRI FDI inflows (log)	<b>0.455***</b>	<b>0.746***</b>		
	<b>0.746***</b>	<b>(0.222)</b>		
BRI construction FDI inflows (log)			<b>0.395**</b>	<b>0.545**</b>
			<b>(0.162)</b>	<b>(0.238)</b>
Per capita GDP (log)		−0.817***		−0.672**
		(0.298)		(0.270)
Population (log)		−0.477**		−0.344**
		(0.206)		(0.175)
Freedom House index		−0.523***		−0.518***
		(0.166)		(0.171)
COVID-19 deaths per million (log)		0.579***		0.575***
		(0.214)		(0.220)
China Trade/GDP		0.0482		0.0713*
		(0.0350)		(0.0408)
Distance to Beijing (log)		−0.165		−0.136
		(0.750)		(0.800)
Other vaccines approved		−0.312		−0.299
		(0.223)		(0.224)
Constant	−3.210***	6.908	−2.686**	5.528
	(1.131)	(7.508)	(1.227)	(7.347)
Estimator	Logit	Logit	Logit	Logit
Regional dummies	Yes	Yes	Yes	Yes
Number of countries	108	107	104	104
Observations	108	107	104	104

Note: Standard errors in parenthesis.

\*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1.

On an average, BRI member countries have received Chinese vaccines on multiple occasions compared to non-BRI countries. Of the forty-two countries that have received Chinese vaccines multiple times, 72 percent of them are BRI countries. Likewise, in Figure B (supplemental file) shows that member states of BRI have received vaccination doses (purchases and donations) from China which are three times larger than non-BRI states. These stylized facts show that non-BRI countries lag in terms of receiving Chinese vaccines and BRI countries, which host large number of Chinese FDI, receive preferential treatment. These bivariate statistics may lead to spurious conclusions without examining data on actual FDI flows and without controlling for factors like COVID-19 risk because pandemic or the level of income, rather than FDI in BRI projects, may explain the variation in outcome variable of interest. We thus present our regression results in [Table 1](#).

[Table 1](#) reports the impact of Chinese FDI flows on the chances of receiving vaccines from China. Columns 1–2 present results on aggregate FDI flows in BRI projects and columns 3–4 show results on FDI in construction activity. As seen in column 1, total FDI flows are associated with vaccine receipts from China, a result that is statistically significant at the 1 percent level. Notice that these results are robust to including geographic regional dummies and other control variables in column 2.

**Table 2.** FDI flows in BRI projects and Chinese vaccine purchases.

	(1) <i>purchase</i>	(2) <i>purchase</i>	(3) <i>purchase</i>	(4) <i>purchase</i>
BRI FDI inflows (log)	<b>3.288**</b>	<b>2.835**</b>		
	<b>(1.501)</b>	<b>(1.184)</b>		
BRI construction FDI inflows (log)			1.947	0.733
			(1.638)	(1.517)
Per capita GDP (log)		-1.118		-0.225
		(1.433)		(1.399)
Population (log)		2.075*		3.440**
		(1.096)		(1.574)
Freedom House index		0.772		0.891
		(0.708)		(0.792)
COVID-19 deaths per million (log)		3.074*		2.787
		(1.843)		(1.815)
China Trade/GDP		-0.0177		0.0807
		(0.114)		(0.119)
Distance to Beijing (log)		8.753		9.819
		(5.647)		(6.349)
Other vaccines approved		0.421		0.570
		(0.954)		(0.882)
Constant	-21.84**	-129.3*	-11.45	-142.7*
	(10.95)	(70.52)	(11.51)	(79.47)
Estimator	Tobit	Tobit	Tobit	Tobit
Regional dummies	Yes	Yes	Yes	Yes
Number of countries	106	105	103	103
Observations	106	105	103	103

Note: Standard errors in parenthesis.  
 \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1.

The substantive effects are quite large.<sup>78</sup> Computing odds ratios suggest that a standard deviation increase in aggregate FDI flows (log) increases the probability of receiving vaccines from China by 58 percent (column 1). Notice that we also find a positive effect of FDI in construction activity in columns 3–4, which is significantly different from zero at the 5 percent level. The substantive effect suggest that holding other controls constant at their mean, a standard deviation increase in construction FDI flows (log) increases the likelihood of receiving Chinese vaccines by 67 percent, a result that is significantly different from zero at the 5 percent level (column 3). These results support our first hypothesis that countries with Chinese FDI in BRI projects are more likely to receive COVID-19 vaccines from China.

We use the ROC curve to examine the predictive performance of our results from regression models reported in Table 1. According to Fawcett,<sup>79</sup> the ROC curve plots the true positive rate (or the model’s sensitivity) on the x-axis vis-à-vis the true negative rate (i.e., the specificity) on the y-axis. Figure 3 shows the ROC curves for two different model specifications from columns 1 and 3 in Table 1.

<sup>78</sup>Table 1 reports coefficients and not marginal effects.  $\frac{\partial P(y_i = 1 | x_i)}{\partial x_i} = \frac{\partial E(y_i | x_i)}{\partial x_i} = \phi(x_i' \beta) \beta$   
<sup>79</sup>2006.

**Table 3.** FDI flows in BRI projects and Chinese vaccine donations.

	(1) <i>donation</i>	(2) <i>donation</i>	(3) <i>donation</i>	(4) <i>donation</i>
BRI FDI inflows (log)	<b>0.112***</b>	<b>0.107***</b>		
	<b>(0.0381)</b>	<b>(0.0367)</b>		
BRI construction FDI inflows (log)			<b>0.121***</b>	<b>0.0962***</b>
			<b>(0.0414)</b>	<b>(0.0344)</b>
Per capita GDP (log)		−0.132***		−0.109***
		(0.0305)		(0.0277)
Population (log)		−0.0103		0.00246
		(0.0180)		(0.0200)
Freedom House index		−0.0308*		−0.0267
		(0.0165)		(0.0179)
COVID-19 deaths per million (log)		−0.00726		0.00294
		(0.0376)		(0.0384)
China Trade/GDP		0.00110		0.00133
		(0.00237)		(0.00269)
Distance to Beijing (log)		−0.105		−0.164
		(0.0974)		(0.106)
Other vaccines approved		−0.0142		−0.0185
		(0.0220)		(0.0224)
Constant	−0.425**	2.013**	−0.425**	2.260**
	(0.182)	(0.914)	(0.196)	(0.979)
Estimator	Tobit	Tobit	Tobit	Tobit
Regional dummies	Yes	Yes	Yes	Yes
Number of countries	108	107	104	104
Observations	108	107	104	104

Notes: Standard errors in parenthesis.

\*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1.

A parsimonious model in column 1 includes only the aggregate FDI flows (log) and excludes all control variables from the model. While the specification results in column 2 comprise all control variables in the model.

As seen there, the performance of the baseline model with only the FDI flows (log) is better given its location relative to the 45° line, at which point the outcome of random guessing lies. The Area Under Curve (AUC) extends from 0 to 1, with 0.5 corresponding with random performance. The shape of the curve depicts an inverse relationship between sensitivity and specificity at different cut points. As can be seen, the AUC shown is at 0.61, which is a significant improvement over guessing. However, by including all other relevant control variables into the model (column 2, Table 1) the AUC increases to just 0.66, which is only a five-point raise over using the FDI variable alone in the earlier model. In panel 2 on right-hand side is the ROC curve from specifications in columns 3 and 4 in Table 1 capturing FDI in construction sector (log). Once again, the AUC is 0.61, which is again a sizeable improvement over guessing. But the AUC, derived from results from column 4 including all variables, increases only to 0.67, which is only a six-point increase over column 3. Overall, the results from Table 1 suggest that the China's response to COVID-19 pandemic through distribution of vaccines

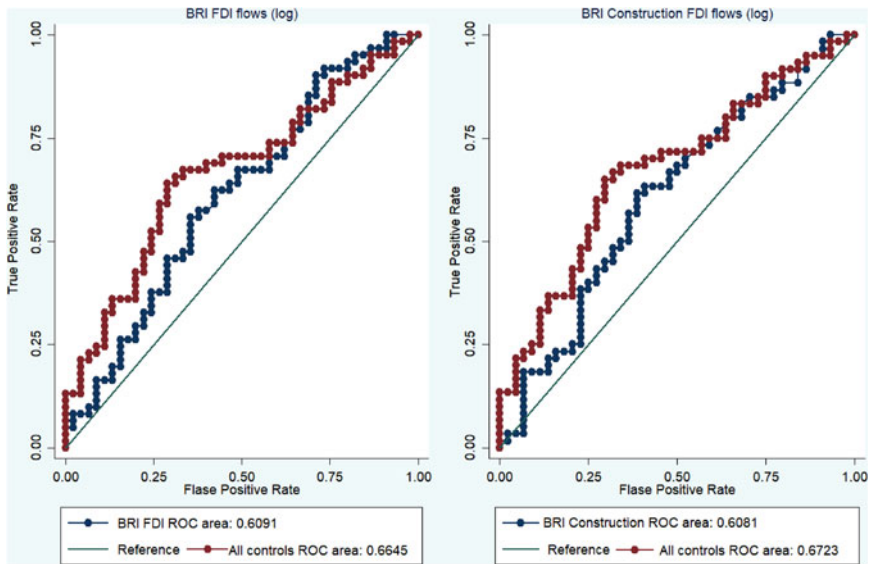


Figure 3. In Sample ROC curve (Estimates from Table 1)

in BRI countries hosting Chinese FDI are complementary and reinforcing, in which China has not only reached out to countries that are strategically important but also positioned itself as a panacea to the ills of the pandemic faced by many member states of BRI.

With respect to control variables, we find deaths from COVID-19, level of income, and regime type to be prime determinants as these variables are significantly different from zero at the 1 percent levels, respectively. These results support those who suggest that altruistic motive also play a crucial role in determining vaccine distribution by China.<sup>80</sup> While others argue that by rolling out vaccines in large number of developing countries in response to COVID-19 pandemic China has been able to portray itself as a responsible world leader, in contrast to Western countries.<sup>81</sup> Furthermore, we find that democracies are less likely to receive vaccines from China. The results on commercial ties, though positive, are weak.

Next, in Tables 2 and 3 we present results from Tobit estimator on vaccine purchases and donations, respectively. As seen in Table 2, while aggregate FDI flows remain positive and statistically significant at 5 percent level across columns 1–2, FDI in construction activity remains statistically insignificant (columns 3–4).

However, in Table 3 we find evidence that vaccine donations do respond to both aggregate as well as construction FDI flows. These results remain significantly different from zero at the 1 percent level. The substantive effect from columns 2 and 4 suggests that FDI flows (log) and construction FDI (log) are associated with 0.11 and 0.10 points increase the predicted value of vaccine donation doses, respectively, which is roughly 33 percent to 30 percent of the standard deviation in vaccine donations. Both these results remain robust to controlling other control variables and geographic regional dummies in Tables 2 and 3, respectively. These results are not surprising because of two reasons. First, as mentioned earlier, preferential treatment is provided to countries hosting Chinese FDI due to the advent of health diplomacy in which health has become an essential part of China's belt and road project.<sup>82</sup> Second, provision of vaccines in the form of donations to these countries also enables China to be perceived as responsible global power coming to the rescue of developing countries struggling to secure vaccines for their population.

<sup>80</sup>Tang et al. (2017).

<sup>81</sup>Lee (2021).

<sup>82</sup>Rudolf (2021).

## Checks on robustness

We test our results for robustness in several ways. We report all robustness tests and tables in the online appendix supplemental file. One could argue that FDI in BRI projects could be plagued by endogeneity concern if such FDI flows, for example, are an outcome rather than cause of vaccine distribution by China. Moreover, endogeneity could be an issue if the Chinese FDI flows in BRI member country resulted in vaccine distribution mainly to placate American and Western influence. Furthermore, FDI in BRI projects could be determined by other factors that could also explain vaccine rollout, such as trade in pharma sector, promoting outward FDI, protecting Chinese business from pandemic, building regional influence thereby undercutting US influence, and allocating health aid.<sup>83</sup> To address endogeneity concern, we employ an instrumental variable estimator. As an instrument we use an event count measure of *policies favouring FDI* implemented by country  $c$  since 2013 onward when BRI project has been enacted by China.<sup>84</sup> These policies include approval procedures, incentives, sectoral restrictions, operational conditions, foreign exchange, investment guarantees, and corporate regulations meant to attract FDI. The data is sourced from the UNCTAD, which generates the information on these parameters by sourcing from private consulting firms and government official sources such as investment promotion agencies and/or respective government ministries. The data collected through the information secured is then verified with the respective government ministries in countries the information is sourced from. Upon verification, the data is published in UNCTAD's annual World Investment Reports.

We utilize the *ivprobit* estimator and include all control variables along with controlling for geographic regional dummies. Our results from *ivprobit* estimator on both aggregate FDI flows (log) and FDI in construction (log) on the probability of vaccine distribution remain robust, reflecting the results from our baseline models. The results are presented in Table A in the online appendix.

The instrument validity rests on two conditions namely, instrument relevance and exclusion criteria. First, the instrumental variable must be correlated with the main explanatory variable in question. Our results (in Table A, online appendix) show first-stage regressions in which we find a positive effect of the instrument on both measures of FDI flows, which is significantly different from zero at the 5 percent levels, respectively.<sup>85</sup> These results are in line with previous studies that find that liberalization of FDI policies tend to attract foreign capital flows, especially in developing countries.<sup>86</sup> Likewise, other studies find that policy openness,<sup>87</sup> tax incentives,<sup>88</sup> administrative barriers<sup>89</sup> and deregulation<sup>90</sup> entice FDI. Second, the instrumental variable, in the second stage of the equation, cannot differ systematically with the error term. This would mean ruling out any theoretical proposition or empirical test linking the changes in FDI policies in various countries with vaccine distribution by China. In other words, China's vaccine distribution to country  $c$  is not determined by FDI policy changes adopted by that country. However, FDI policy changes affect a country's openness to attract FDI from everywhere,<sup>91</sup> which may also influence vaccine distribution. We therefore control for FDI flows from rest of the world (log) in all our IV models.

Next, in Table C we estimate a Poisson pseudo max likelihood estimation.<sup>92</sup> While columns 1–2 capture results on total Chinese FDI flows, columns 3–4 report findings on FDI flows in construction

<sup>83</sup>Vadlamannati et al. (2021).

<sup>84</sup>As an alternative instrument, we also use capital account restrictions index developed by Chinn and Ito (2008) using the information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Our results remain robust to using this index instead, developed by Chinn and Ito (2008). These results are reported in Table B of the online appendix supplemental file.

<sup>85</sup>Note that in both models we include all the aforementioned control variables as well as geographic regional dummies. As the dependent variables in the first-stage models are FDI flows (log) and construction FDI (log), we estimate OLS estimator.

<sup>86</sup>Cooray et al. (2014).

<sup>87</sup>Asiedu and Lien (2004).

<sup>88</sup>Banga (2006).

<sup>89</sup>Morisset and Neso (2002).

<sup>90</sup>Golub (2003); Gastanga et al. (1998).

<sup>91</sup>Cooray et al. (2014).

<sup>92</sup>Santos Silva and Tenreiro (2006).

activities in the BRI project. Once again, we find a positive effect of FDI flows (log) on the dependent variable, which is significantly different from zero at the 1 percent level (columns 1–2). Notice that these results remain robust to replacing aggregate FDI flows with FDI in construction activity that is significantly different from zero at the 1 percent level, in columns 3–4. This suggests that compared with other countries, BRI countries hosting Chinese FDI are more likely to receive Chinese vaccines multiple times. These results are robust when controlling for geographic regional dummies and other control variables.

Third, we use alternative operationalization of our main variable of interests. We replace FDI flows measured in US\$ million (log) with per capita (log) measure. Utilizing aggregate FDI and construction FDI per capita (log), respectively, does not change our main results (Table D, online appendix). Fourth, we replace our vaccine deliveries variables with a per capita measure along with utilizing per capita measures of FDI flows from China. Both measures are logged to address the problem of skewness. These models are now estimated using OLS reported in Table E. The results based on per capita measure corroborates our earlier findings that total FDI flows are associated with per capita purchases and donations. While the effect of FDI in construction on purchases per capita remains weak. Fifth, another hypothesis worth testing is related to weight that Chinese FDI in BRI has over a given country's total FDI inflows. Relative proxies such as this one serves as a means of robustness check. Thus, we use Chinese FDI in BRI projects relative to total FDI inflows of a country during our study period. We examine the impact of this relative weight on vaccine distribution, donations, and purchases. Though we do not find any impact of this relative weight measure on vaccine distribution and purchases, we find a positive and significant effect on vaccine donations (Table F, online appendix). These findings using, various alternative measures of Chinese investments in BRI, confirm that bilateral foreign assistance on vaccines is influenced by donor strategic concerns.

Next, we replace FDI flows with a membership in Belt and Road Initiative dummy which is coded 1 if country  $c$  is a member of the BRI during the period  $s$ , 2013 to 2021 August, and 0 otherwise. We use the information from the China's Foreign Affairs Ministry,<sup>93</sup> under the BRI section, to verify if a MoU on BRI, Silk Road Economic Belt (SRB) or 21st Century Maritime Silk Road (MSR) was signed between country  $c$  and China during the 2013–21 period. Using a simple BRI membership dummy instead of FDI inflows into BRI projects of host countries does not alter our main findings (Table G). Finally, we follow a kitchen sink approach to include range of other control variables into our main models in Tables 1–3 that affect Chinese vaccine distribution but may also relate to Chinese FDI flows. These include trade openness (trade/GDP), debt to GDP measuring indebtedness of a country, GDP measured in US\$ 2010 constant price (log), corruption index, a dummy variable capturing Bilateral Trade Agreement with China, and strategic partnership index coded on 0–10 scale wherein higher value denotes strategic cooperative partnership, natural resources dummy that takes the value of 1 if natural resource contribute more than 25 percent of total exports and 0 otherwise. Some argue that these variables are determinants of Chinese vaccine distribution.<sup>94</sup> Likewise, previous scholarship finds relevance of raw material supply in shaping FDI destination from China and hence can also influence its vaccine distribution strategy.<sup>95</sup> Furthermore, we also control for US FDI inflows (log) to capture dependence on US investments by states<sup>96</sup> that received Chinese vaccines either through donation or purchase. Our main results remain firmly robust to the inclusion of other controls which is presented in Table H. The BRI FDI inflow measures continue to be positive and statistically significant at the conventional levels. Taken together, our main results are firmly robust to employing alternative data, variables, and addressing the endogeneity concerns.

<sup>93</sup>See Ministry of Foreign Affairs, the People's Republic of China. [http://www.fmprc.gov.cn/mfa\\_chn/ziliao\\_611306/zt\\_611380/dnzt\\_611382/ydyt\\_667839/zyxw\\_667918/](http://www.fmprc.gov.cn/mfa_chn/ziliao_611306/zt_611380/dnzt_611382/ydyt_667839/zyxw_667918/) (accessed 10 January 2022).

<sup>94</sup>Vadlamannati et al. (2021).

<sup>95</sup>Kolstad and Wiig (2012).

<sup>96</sup>Sanfilippo (2010).



## Conclusion

This article explores the patterns of China's vaccine deliveries during the COVID-19 pandemic. Critics view China's mask and vaccine deliveries as a geopolitical maneuver to promote China as a global leader and advance its global influences.<sup>97</sup> We suggest that China gives its BRI partners priority access to COVID-19 vaccines in pursuit of the successful implementation of the BRI projects and global leadership in the new world order.

We utilize the newly available novel dataset on Chinese COVID-19 vaccines developed by Bridge Consulting Firm in Beijing, which has a vaccine tracker to track vaccine deliveries worldwide. Using a cross-section data covering 108 BRI member countries and a logit estimator, we find that countries hosting Chinese FDI flows in BRI projects were more likely to receive COVID-19 vaccines from China. Furthermore, results from our Tobit estimator reveal that China donates more vaccines to BRI countries with a substantial Chinese FDI presence. Yet, we find mixed results when it comes to vaccine purchases.

While the United States, under the Trump administration, had opted out of the COVID-19 Vaccine Global Access (COVAX) facility, China's global health engagement in combating the COVID-19 pandemic has become even more apparent, with multilateral efforts to deliver vaccines to developing countries and halt the spread of the virus.<sup>98</sup> The rise of China as a global leader in filling the global governance gap began in earnest during the global health crisis. Being a responsible global leader is essential to China's global health diplomacy objective. In fact, our study demonstrates that the supply of vaccines by China meets its geopolitical goals, such as gaining a reputation as a "responsible great power" and increasing its influence in host countries.

China's global COVID-19 vaccine distribution saved many lives. China has supported many developing countries needing vaccines in the wake of the pandemic. In this sense, China's contribution to COVID-19 vaccines to the world, especially to those recipient countries, is valuable. However, China's vaccine deliveries have prioritized its friendly economic partners, which is motivated by its national and strategic needs to push on its BRI and to gain international support for its foreign policy and global leadership. China's political and commercial self-interests in its vaccine allocation raise a question on whether China's vaccine contribution to the world is indeed valuable?

**Supplementary material.** To view supplementary material for this article, please visit <https://doi.org/10.1017/bap.2022.26>.

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<sup>97</sup>Roberts and Kelman (2022).

<sup>98</sup>Later, the Biden administration joined the COVAX and reengaged with global partners to make the COVID-19 vaccine available to those around the world.

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## Appendices

### Appendix 1: List of countries.

Afghanistan	China	Guyana	Moldova	Sierra Leone
Albania	Colombia	Haiti	Monaco	Singapore
Algeria	Comoros	Honduras	Mongolia	Sint Maarten
Andorra	Congo, Dem. Rep.	Hong Kong	Montenegro	Slovakia
Angola	Congo, Rep. Hungary	Montserrat	Slovenia	
Anguilla	Costa Rica	India	Morocco	Solomon Islands
Antigua and Barbuda	Croatia	Indonesia	Mozambique	Somalia
Argentina	Cuba	Iran	Myanmar	South Africa
Armenia	Curaçao	Iraq	Namibia	South Korea
Aruba	Cyprus	Isle of Man	Nepal	South Sudan
Azerbaijan	Czechia	Israel	Nicaragua	Spain
Bahamas	Djibouti	Ivory Coast	Niger	Sri Lanka
Bahrain	Dominica	Jamaica	Nigeria	St. Barth
Bangladesh	Dominican Republic	Japan	North Macedonia	St. Vincent Grenadines
Barbados	Ecuador	Jordan	Oman	Sudan
Belarus	Egypt	Kazakhstan	Pakistan	Suriname
Belize	El Salvador	Kenya	Palestine	Syria
Benin	Equatorial Guinea	Kosovo	Panama	Taiwan
Bermuda	Eritrea	Kuwait	Papua New Guinea	Tajikistan
Bhutan	Eswatini	Kyrgyzstan	Paraguay	Tanzania
Bolivia	Ethiopia	Laos	Peru	Thailand
Bosnia and Herzegovina	Faeroe Islands	Latvia	Philippines	Timor-Leste

Botswana	Falkland Islands	Lebanon	Poland	Togo
Brazil	Fiji	Lesotho	Qatar	Trinidad and Tobago
British Virgin Islands	French Guiana	Liberia	Réunion	Tunisia
Brunei	French Polynesia	Libya	Romania	Turkey
Bulgaria	Gabon	Macao	Russia	Turks and Caicos
Burkina Faso	Gambia	Madagascar	Rwanda	UAE
Burundi	Georgia	Malawi	Saint Kitts and Nevis	Uganda
Cabo Verde	Ghana	Malaysia	Saint Lucia	Ukraine
Cambodia	Gibraltar	Maldives	Saint Martin	Uruguay
Cameroon	Greece	Mali	Saint Pierre Miquelon	Uzbekistan
Caribbean Netherlands	Greenland	Malta	San Marino	Venezuela
Cayman Islands	Grenada	Martinique	Sao Tome and Principe	Vietnam
Central African Republic	Guadeloupe	Mauritania	Saudi Arabia	Yemen
Chad	Guatemala	Mauritius	Senegal	Zambia
Channel Islands	Guinea	Mayotte	Serbia	Zimbabwe
Chile	Guinea-Bissau	Mexico	Seychelles	

## Appendix 2: Descriptive statistics.

Variables	Mean	Standard Deviation	Minimum	Maximum	Observations
Vaccine dummy	0.387	0.488	0.000	1.000	212
Vaccine purchase	2.946	15.555	0.000	160.00	210
Vaccine donation	0.098	0.330	0.000	3.200	210
BRI membership	0.422	0.495	0.000	1.000	211
BRI FDI flows	7135.4	9703.5	100	51990	110
BRI construction FDI	4470.6	6094.4	100	37490	106
BRI FDI flows (log)	7.979	1.493	4.605	10.859	110
BRI construction FDI (log)	7.575	1.389	4.605	10.532	106
Trade with China/GDP	8.246	11.315	0.364	84.808	187
Per capita GDP (log)	8.736	1.530	5.438	12.081	192
Population (log)	8.582	2.543	1.216	16.048	204
Freedom House index	4.546	2.007	1.000	7.000	185
Covid deaths per million (log)	1.725	1.747	0.000	7.073	207
Distance to Beijing (log)	8.567	0.512	6.394	9.394	212

## Appendix 3: Data sources and definitions.

Variables	Data definition and sources
FDI flows (log)	Total FDI flows from China into country <i>c</i> in BRI projects during the 2013–2019 period measured in US\$ current prices (log), sourced from the China Global Investment Tracker (CGIT) developed by Scissors (2021).
FDI construction (log)	FDI flows in construction activity from China into country <i>c</i> in BRI projects during the 2013–2019 period measured in US\$ current prices (log), sourced from the China Global Investment Tracker (CGIT) developed by Scissors (2021).
Vaccine distribution	Takes the value 1 if country <i>c</i> is a recipient of vaccines from China until August 2021 and 0 otherwise. The information on vaccine distribution is sourced from Bridge consulting firm based in Beijing, China which was founded in 2016 as a joint venture with Global Health Strategies (GHS), a New York-headquartered international consultancy.
Vaccine distribution on multiple counts	Event count of number of times country <i>c</i> is a recipient of vaccines from China until August 2021. No recipients of vaccines get the value of 0. The information on country-wise breakup is sourced from the Bridge consulting firm based in Beijing, China.
Vaccine purchases	Vaccine doses purchased by country <i>c</i> from China until August 2021, measured in millions, is sourced from Bridge consulting firm.
Vaccine donations	Vaccine doses donated to country <i>c</i> by China until August 2021, measured in millions, is sourced from Bridge consulting firm.
Per capita GDP (log)	Five-year average of GDP per capita (log) for 2015–2019 years measured in US\$ 2010 constant prices sourced from the World Development Indicators 2020, World Bank.
Covid-19 tests and deaths per million (log)	Number of Covid-19 tests and deaths per million (log) recorded for country <i>c</i> as on 1st September 2020 by The Worldometer COVID-19 Data, sourced from <a href="https://www.worldometers.info/coronavirus/#countries">https://www.worldometers.info/coronavirus/#countries</a>
Population (log)	Five-year average of total population (log) for 2015–2019 years sourced from World Development Indicators 2020, World Bank.
Freedom House democracy index	Five-year average for 2015–2019 years of Civil and Political Liberties index coded on a scale of 0 to 7 where highest value denotes higher civil and political liberties sourced from Freedom House.
Trade with China to GDP	Five-year average of total trade with China for 2015–2019 years measured as a percentage of GDP of country <i>c</i> sourced from the UNCTAD Statistics on international trade 2020.
Distance to Beijing (log)	Distance from capital city of of country <i>c</i> to Beijing, China measured in kilometers (log).
Other vaccines approved	Codes the value 1 if country <i>c</i> has access to other vaccines and 0 otherwise sourced from the McGill COVID-19 Vaccine Tracker, 2022.

**Exhibit 1: Daily searches conducted by the Bridge Consulting Firm on China COVID-19 vaccine tracker.**

Platform	English Search Terms	Chinese Search Terms
<b>Twitter</b>	General research: <ul style="list-style-type: none"> <li>• China</li> <li>• Vaccine</li> </ul> Targeted research: <ul style="list-style-type: none"> <li>• China Vaccine</li> <li>• Sinovac</li> <li>• Sinopharm</li> </ul>	-
<b>Google</b>	“China” and “vaccine” and “donate” “China” and “vaccine” and “deliver” “China” and “vaccine” and “arrive” China AND vaccine AND buy China AND vaccine AND purchase China AND vaccine AND donate China AND vaccine AND deliver China AND vaccine AND arrive AND batch China AND vaccine AND receive AND batch Keywords: China, vaccine, Sinopharm, Sinovac, buy, purchase, batch, arrive, receive	“中国” and “疫苗” and “捐助” “中国” and “疫苗” and “抵达” “中国” and “疫苗” and “抵” “中国” and “疫苗” and “接受” “中国” and “疫苗” and “接收” “中国” and “疫苗” and “接”

Source: Own construction based on the information sourced from Bridge Consulting Firm, Beijing.