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The geopolitics of vaccines and medical supply chains: Vaccine Nationalism, export controls, and diplomacy under competition

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Abstract
The COVID-19 pandemic transformed vaccine distribution and medical supply chains into a arena of intense geopolitical contestation, where national self-interest frequently overrode multilateral cooperation. This article examines how vaccine nationalism, export controls, and competitive diplomacy functioned as intertwined geopolitical strategies that reshaped global health governance and equity. Drawing on Geopolitical Economy Theory, Soft Power Theory, and Global Supply Chain Governance, the study posits that protectionist measures—including preemptive procurement by developed nations, export bans by manufacturing countries like India, and vaccine diplomacy by China and Russia—collectively fragmented supply chains, undermined COVAX, and entrenched inequities between the Global North and South. While these strategies enabled rapid domestic immunization for powerful nations, they simultaneously delayed access for low-income countries and transformed vaccines into instruments of state power. The research question asks how these geopolitically driven mechanisms reconfigured the global vaccine architecture and with what consequences for health equity. Empirical analysis reveals that the multiplication of export controls and bilateral deals correlates with weakened multilateralism and accelerated geopolitical rivalries. The findings suggest that without binding global governance mechanisms, future health emergencies will likely replicate similar patterns of national hoarding and strategic maneuvering, perpetuating structural asymmetries in global health security.

Keywords: Vaccine nationalism, Export controls, Competitive diplomacy, Medical supply chains.

Introduction

In the wake of the COVID-19 pandemic, the global landscape of vaccine distribution and medical supply chains became a theatre of intense geopolitical contestation. While the world faced a common health emergency, individual nations rapidly resorted to vaccine nationalism, export controls, and strategic diplomacy to secure their populations first [1]. This multiplication of protectionist measures transformed vaccines from global public goods into instruments of state power and diplomatic leverage [2]. Developed nations, particularly the United States, the European Union member states, and the United Kingdom, engaged in preemptive procurement agreements with pharmaceutical giants such as Pfizer-BioNTech, Moderna, and AstraZeneca, effectively cornering early vaccine supplies [3]. This strategy, while ensuring domestic immunization, simultaneously exacerbated global inequities and delayed access for low-income countries in Africa, Asia, and Latin America.

Export controls emerged as a parallel mechanism of vaccine geopolitics. Under the rationale of securing domestic manufacturing capacity, countries like India—traditionally the "pharmacy of the world"—imposed temporary bans on vaccine exports, halting supplies to COVAX, the multilateral facility designed to ensure equitable distribution [4]. Similarly, the European Union implemented a vaccine export authorization mechanism, creating tensions with the United Kingdom and threatening supply chains to neighboring nations. These measures revealed the fragility of global health cooperation when confronted with national self-interest. Diplomatic maneuvering, including vaccine diplomacy by China and Russia, filled the resulting void, as both nations deployed their domestically produced vaccines—Sinopharm, Sinovac, and Sputnik V—to forge alliances, expand geopolitical influence, and gain soft power advantages across the Global South [5].

The problem statement of this article posits that while the COVID-19 pandemic necessitated unprecedented global cooperation in vaccine research, production, and distribution, the actual mechanisms of vaccine nationalism, export controls, and competitive diplomacy remain poorly understood as interdependent geopolitical strategies. Existing literature acknowledges supply chain disruptions and inequitable access, yet it fails to explain how the multiplication of protectionist policies—preemptive procurement, export bans, and bilateral vaccine deals—functions as a "seductive strategy" of national interest under the guise of public health. The central problem is therefore the lack of empirical and theoretical analysis regarding how these geopolitically driven measures shaped the global vaccine landscape, including their effects on multilateralism, health equity, and the restructuring of medical supply chains. Accordingly, the research question asks: "How have vaccine nationalism, export controls, and competitive diplomacy functioned as intertwined geopolitical strategies to reshape the global vaccine and medical supply chain architecture during the COVID-19 pandemic, and what have been the consequences for global health governance and equity?"

The hypothesis posits that the strategic multiplication of protectionist vaccine policies positively correlated with domestic immunization success for powerful nations, but simultaneously fragmented global supply chains, weakened COVAX, and accelerated the use of vaccines as geopolitical tools, thereby entrenching health inequities between the Global North and Global South. This study is grounded in

Geopolitical Economy Theory and Soft Power Theory (Nye) [6], complemented by insights from Global Supply Chain Governance.

The Use of Vaccine Nationalism as a Strategic Policy Tool

Vaccine nationalism emerged as a critical and controversial strategy during the tumultuous period of the COVID-19 pandemic, serving as a calculated policy instrument employed by wealthy nations to expedite domestic immunization programs at the expense of global solidarity. As the world grappled with unprecedented health challenges, vaccine nationalism assumed a multifaceted role in fortifying national health security, acting as a catalyst that influenced procurement policies, manufacturing prioritization, border controls, and overall public confidence. In the wake of the global pandemic, nations such as the United States, Germany, France, and the United Kingdom faced the daunting task of swiftly securing vaccine doses for their populations, leading to aggressive pre-market purchasing agreements with pharmaceutical manufacturers [7]. This assistance, provided exclusively for domestic stakeholders, was instrumental in fortifying national healthcare capacity, enhancing vaccination coverage, and ensuring the availability of critical doses essential for curbing transmission and reducing mortality [8].

The impact of vaccine nationalism extended far beyond the mere provision of biological products. It served as a linchpin in shaping the trajectory of public health responses to the pandemic in developed economies. By injecting much-needed political and financial capital into domestic vaccine procurement, nationalism not only bolstered these nations' capacity to respond to immediate health needs but also paved the way for the implementation of rapid and effective mass vaccination campaigns [9]. These campaigns ranged from the establishment of mass vaccination centers to the deployment of mobile clinics and the dissemination of vaccine confidence information to the populace. Moreover, vaccine nationalism played a crucial role in fostering economic resilience, enabling countries to reopen borders, resume trade, and restart economic activities earlier than vaccine-deprived nations [10].

The Implementation of Preemptive Procurement Strategies

Securing vaccine doses through preemptive procurement from pharmaceutical companies was a pivotal and highly complex endeavor that required strategic planning at the highest levels of government, effective negotiation leveraging financial and political capital, and the implementation of aggressive purchasing strategies to attract and secure much-needed supplies ahead of rival nations [11]. In the face of unprecedented global demand that far outstripped initial manufacturing capacity, the acquisition of vaccine doses from entities such as Pfizer-BioNTech, Moderna, AstraZeneca, and later Johnson & Johnson and Novavax played a crucial role in bolstering wealthy nations' capacity to respond rapidly and effectively to the escalating health crisis [12]. One key strategy was the deliberate cultivation of direct bilateral partnerships with vaccine manufacturers, systematically bypassing multilateral mechanisms such as COVAX, which was perceived by wealthy capitals as too slow, underfunded, and lacking in enforceable delivery commitments [13]. By emphasizing the mutual benefits of guaranteed purchase volumes, liability protections, and accelerated regulatory pathways, wealthy nations successfully positioned themselves as priority customers, securing placeholders in manufacturing queues months before clinical trials had even concluded [14].

Furthermore, these nations adopted a financially aggressive approach, offering development funding to underwrite research and development costs, manufacturing subsidies to expand production lines, and advance purchase commitments that guaranteed revenue streams for pharmaceutical companies regardless of eventual regulatory approval. This approach effectively transferred financial risk from private firms to public treasuries while locking in early delivery slots. Policy alignment with domestic regulatory agencies, such as the Food and Drug Administration (FDA) in the United States and the European Medicines Agency (EMA) in the European Union, played a crucial role in expediting emergency use authorizations, compressing review timelines from months to weeks without compromising safety standards [15]. Moreover, capacity building of domestic manufacturing infrastructure emerged as a key focus area, with nations investing billions in local production facilities, raw material stockpiles, and fill-and-finish capabilities to reduce reliance on potentially fragile foreign supply chains. The United States invoked the Defense Production Act to compel domestic manufacturers to prioritize federal vaccine contracts [16], while the European Union established the HERA Incubator to anticipate and counter emerging variants [17]. These preemptive procurement strategies collectively ensured that wealthy nations entered 2021 with sufficient doses to immunize their populations multiple times over, leaving the Global South to compete for residual supplies through underfunded multilateral channels.

The Granting of Export Controls by Manufacturing Nations

The imposition of export controls emerged as a parallel and mutually reinforcing mechanism that amplified the effects of vaccine nationalism, transforming pharmaceutical supply chains from networks of global cooperation into instruments of strategic competition [18]. India, historically celebrated as the "pharmacy of the world" due to its massive generic pharmaceutical manufacturing capacity, imposed a temporary but devastating ban on vaccine exports in March 2021 under the suspension of its "Vaccine Maitri" (Vaccine Friendship) program [19]. The Serum Institute of India (SII), the world's largest vaccine manufacturer by volume, had been contracted to produce over one billion doses of the AstraZeneca vaccine for the COVAX facility and for direct bilateral agreements with dozens of low-income countries across Africa, Southeast Asia, and Latin America [20]. When India's domestic second wave exploded in April 2021, reaching over 400,000 daily cases and overwhelming healthcare infrastructure, the Indian government invoked national security provisions to halt all vaccine exports indefinitely. This decision had immediate and catastrophic consequences: COVAX deliveries to Africa were slashed by over 80%, with countries such as Ghana, Rwanda, Senegal, and Malawi receiving only a fraction of promised doses [21]. Bangladesh, Nepal, and Sri Lanka, which had relied on Indian-supplied vaccines, faced prolonged delays, forcing their governments to seek alternative suppliers including China's Sinopharm and Russia's Sputnik V. The suspension,

which lasted until October 2021, permanently damaged India's soft power reputation as a reliable partner to the Global South [22].

Similarly, the European Union implemented a transparent export authorization mechanism through Regulation (EU) 2021/111, which came into force in late January 2021. This measure required any vaccine manufacturer operating within the EU—including Pfizer-BioNTech in Belgium and Germany, Moderna in Spain, and AstraZeneca in the Netherlands—to seek explicit approval from EU member states before exporting doses to non-EU countries [23]. The mechanism was triggered by AstraZeneca's announcement that it would deliver only 31 million doses to the EU in the first quarter of 2021, representing a 60% shortfall from contractual commitments of 80 million doses [24]. The EU accused AstraZeneca of diverting doses produced in European factories to the United Kingdom, which had negotiated a separate contract. In March 2021, the EU threatened to block 50 million doses destined for the UK unless AstraZeneca redirected supplies to meet EU obligations, creating a major diplomatic crisis that required direct intervention from European Commission President Ursula von der Leyen and UK Prime Minister Boris Johnson [25]. The export authorization mechanism also delayed deliveries to Canada, Japan, Australia, and other allies, straining transatlantic relations and revealing the fragility of Western alliances under pandemic pressure.

The United States invoked the Defense Production Act (DPA) of 1950 through multiple executive orders, first under President Trump and then expanded under President Biden [26]. The DPA compelled American manufacturers to prioritize federal vaccine contracts over private or foreign orders, restricting the export of raw materials such as specialized filters, single-use bioreactor bags, lipids essential for mRNA vaccine formulation, and finished doses [27]. This policy directly impacted the Serum Institute of India, which relied on US-sourced raw materials, creating a cascading supply chain failure. India's ambassador to the US formally requested intervention in March 2021, and the Biden administration partially relaxed restrictions only in May 2021, pledging 80 million doses for export [28]. These export controls demonstrated conclusively how manufacturing nations weaponized supply chain dependencies—controlling not only finished vaccines but also the specialized inputs required for production—to advance national interests at the expense of global health solidarity.

The Use of Competitive Vaccine Diplomacy

In parallel with vaccine nationalism and export controls, competitive vaccine diplomacy emerged as a strategic instrument employed by rival powers—principally China, Russia, and later India—to deliberately fill the geopolitical vacuum left by Western nations' protectionist policies [29]. As developed countries, including the United States, the United Kingdom, and members of the European Union, hoarded hundreds of millions of vaccine doses for their domestic populations while imposing export controls that blocked supply chains to the Global South, China and Russia seized the opportunity to deploy their domestically produced vaccines—Sinopharm's BBIBP-CorV, Sinovac's CoronaVac, CanSino's Convidecia, and Gamaleya's Sputnik V—as powerful tools of soft power projection and geopolitical influence across Africa, Asia, and Latin America [30]. This multiplication of diplomatic strategies fundamentally transformed vaccines from neutral public health commodities into instruments of statecraft, enabling donor nations to forge new strategic alliances, expand bilateral economic partnerships, secure access to valuable natural resources, and gain lasting strategic footholds in regions that had traditionally aligned with Western powers such as France, the United Kingdom, and the United States [31].

The competitive nature of this diplomacy became most evident in regions such as Sub-Saharan Africa, where China and Russia competed directly for influence. China's Health Silk Road, an explicit extension of the Belt and Road Initiative, delivered over one billion doses to more than one hundred countries by mid-2022, often conditioning donations on diplomatic support for Beijing's positions on issues ranging from Taiwan to the South China Sea [32]. Russia, operating through the Russian Direct Investment Fund, secured regulatory approvals for Sputnik V in over seventy nations while establishing local manufacturing partnerships in India, Brazil, South Korea, and Serbia [33]. Hungary, a European Union member state, broke ranks with Brussels by unilaterally approving and deploying Sputnik V, demonstrating how vaccine diplomacy could fracture even established Western alliances [34]. This competitive dynamic permanently altered the landscape of global health governance, establishing vaccines as enduring instruments of geopolitical competition.

Chinese Vaccine Diplomacy

China emerged as the world's largest exporter of COVID-19 vaccines, deploying over one billion doses to more than 100 countries by mid-2021, a scale of global health engagement unprecedented in modern history [35]. Through its "Health Silk Road"—an explicit and strategic extension of the Belt and Road Initiative (BRI)—China provided vaccines bilaterally, deliberately bypassing the COVAX multilateral facility and conditioning aid on political recognition, economic cooperation agreements, and diplomatic alignment [36]. Countries across Latin America, Africa, and Southeast Asia received millions of doses of Sinopharm and Sinovac vaccines in exchange for tangible geopolitical and economic concessions.

In Latin America, Brazil received over 100 million doses of Sinovac's CoronaVac through a partnership with São Paulo's Butantan Institute, while simultaneously securing Chinese investment in lithium mining operations critical for battery production. Chile, which received 60 million doses, aligned its diplomatic positions with Beijing on issues ranging from Taiwan to human rights voting at the United Nations. In Africa, Zimbabwe received two million doses of Sinopharm vaccine and subsequently provided diplomatic cover for China at the UN Human Rights Council [37], while Senegal's President Macky Sall visited Beijing in November 2021 to secure 200,000 doses alongside infrastructure financing agreements. In Southeast Asia, Indonesia and the Philippines received millions of doses while participating in Chinese-led infrastructure projects under BRI frameworks [38].

This strategy profoundly enhanced China's global standing, positioning Beijing as a responsible and reliable global health actor while Western nations appeared insular and focused inward [39]. By filling the vaccine access vacuum created by Western nationalism and export controls, China

systematically undermined Western-led multilateralism, demonstrating that health emergencies could be effectively leveraged as instruments of geopolitical competition and soft power projection. [40]

Russian Vaccine Diplomacy

Russia deployed Sputnik V, developed by the Gamaleya Research Institute, through the Russian Direct Investment Fund (RDIF), a sovereign wealth fund that functioned as a commercial-diplomatic hybrid entity [41]. By mid-2021, Russia had secured regulatory approvals for Sputnik V in over 70 countries spanning Africa, Asia, and Latin America, often achieving authorizations weeks or months before Western vaccines received local approval [42]. Unlike China's state-driven, centralized model of direct government-to-government donations, Russia utilized a distinctive decentralized, commercial approach, actively partnering with local manufacturers in India, Brazil, South Korea, Argentina, Kazakhstan, and Serbia to produce Sputnik V domestically under licensing agreements [43]. This strategy ingeniously circumvented both export controls and supply chain bottlenecks entirely, as recipient nations manufactured doses within their own territories, immunizing populations while simultaneously generating local economic activity, technology transfer, and employment.

In Latin America, Argentina became a regional manufacturing hub, producing millions of Sputnik V doses through Laboratorios Richmond, which secured a license to produce the vaccine locally while deepening economic ties with Moscow. Brazil received 10 million doses and entered negotiations for technology transfer agreements with RDIF. In Europe, Hungary broke decisively with the European Union's centralized procurement strategy, unilaterally approving Sputnik V in January 2021 and becoming the first EU member state to deploy Russian vaccines extensively [44]. Serbia, an EU candidate country, achieved the fastest vaccination rate in continental Europe by April 2021 through massive deployment of Sputnik V, significantly diminishing EU influence in the Western Balkans [45]. In Asia, India's Hetero Pharmaceuticals signed an agreement to produce over 100 million doses annually, creating competition between Russian and Chinese vaccine influence in the subcontinent. Across Africa, the RDIF secured approvals in Egypt, Nigeria, Kenya, and Angola, establishing Sputnik V as a leading vaccine brand [46].

Russian vaccine diplomacy served as a powerful geopolitical tool to restore Moscow's influence in regions where its presence had significantly waned since the end of the Cold War, particularly in Latin America and sub-Saharan Africa [47]. By positioning Russia as a scientific and technological power capable of competing with Western pharmaceutical giants, while simultaneously offering local manufacturing partnerships rather than charitable donations, the RDIF model created lasting economic and political dependencies that extended far beyond the immediate pandemic response.

The Fragmentation of COVAX and Multilateralism

The multiplication of vaccine nationalism, export controls, and competitive diplomacy severely undermined COVAX, the multilateral facility co-led by the World Health Organization (WHO), GAVI the Vaccine Alliance, and the Coalition for Epidemic Preparedness Innovations (CEPI) [48]. COVAX was designed as the central mechanism to ensure equitable global vaccine access, pooling resources from wealthy donor nations to procure doses for low- and middle-income countries through its Advanced Market Commitment (AMC) facility, which targeted 92 eligible nations [49]. By January 2022, however, COVAX had delivered only a fraction of its projected doses. Of the 2 billion doses promised by the end of 2021, fewer than 500 million had actually been delivered—a shortfall of 75% [50]. Wealthy nations that had pledged financial contributions and dose donations delayed fulfillment of their commitments, while manufacturing nations including India imposed export bans that directly blocked COVAX supply lines from the Serum Institute, which had been contracted to produce over one billion doses for the facility [51].

The consequences of this fragmentation were devastating for low-income countries. Ghana, which had been the first nation to receive COVAX deliveries in February 2021, faced repeated delays in subsequent shipments, with only 600,000 of a promised 2.4 million doses arriving by May 2021 [52]. Rwanda, Senegal, Malawi, and the Democratic Republic of Congo similarly received less than 20% of their allocated doses. Bilateral deals between vaccine-producing nations and recipient countries further marginalized COVAX. China provided over one billion doses bilaterally to more than 100 nations, deliberately bypassing the multilateral mechanism. Russia's RDIF secured over 70 bilateral agreements [53]. The European Union and United States, despite pledging support to COVAX, simultaneously pursued bilateral donation arrangements with individual African and Asian nations, fragmenting the coordinated global response [54].

This fragmentation demonstrated the fundamental limits of global health governance when confronted with realist geopolitics [55]. The WHO lacks binding enforcement authority under the International Health Regulations, which contain no sanctions for export bans or procurement hoarding [56]. GAVI's dependency on voluntary donor funding proved catastrophic when donors failed to fulfill pledges [57]. Bilateral competition between China, Russia, the EU, and the US for geopolitical influence via vaccine donations reduced COVAX to a residual mechanism dependent on intermittent charitable donations rather than a robust, enforceable global distribution system [58]. These failures raised profound questions about the future of multilateral cooperation in health emergencies, leading directly to negotiations for a binding Pandemic Treaty at WHO, though geopolitical tensions continue to undermine its prospects [59].

The Impact of Vaccine Geopolitics on Global Health, Equity, and Governance

The geopoliticization of vaccines during the COVID-19 pandemic produced profound and lasting impacts across multiple domains, fundamentally reshaping global health equity, international relations, and the architecture of medical supply chains [60]. First, the most devastating impact was on human lives and health outcomes in low-income countries. While high-income nations achieved vaccination rates exceeding 70% by the end of 2021, many African countries had vaccinated less than 5% of their populations [61]. According to WHO data, vaccine inequity directly contributed to preventable deaths, with Africa experiencing successive deadly waves driven by the Delta and Omicron variants while doses sat unused in European and American

warehouses [62]. Mozambique, for example, had vaccinated only 3% of its population by November 2021, despite being highly vulnerable to variant importation from neighboring South Africa.

Second, vaccine geopolitics produced lasting economic damage across the Global South. The International Monetary Fund estimated that vaccine nationalism cost the global economy over $2.3 trillion in lost output, with low-income countries bearing disproportionate losses due to prolonged lockdowns, collapsed tourism industries, disrupted supply chains, and restricted access to international markets [63]. Thailand's economy, heavily dependent on tourism, contracted by 6.1% in 2020 and remained depressed throughout 2021 due to delayed vaccination and border closures. Ethiopia, facing both pandemic disruptions and civil conflict, saw its GDP growth drop to -6.1% [64].

Third, the geopolitical competition produced a permanent restructuring of medical supply chains [65]. The vulnerability of just-in-time globalized production networks, exposed by India's export ban and US raw material controls, prompted regionalization initiatives. Africa CDC launched the Partnership for African Vaccine Manufacturing (PAVM) targeting 60% local production by 2040 [66]. South Africa's Afrigen Biologics, supported by WHO, established the continent's first mRNA vaccine technology transfer hub. Similarly, Latin American nations strengthened PAHO's Revolving Fund for vaccine procurement, while Southeast Asian countries including Indonesia and Thailand expanded domestic manufacturing capacity [67].

Fourth, the fragmentation of multilateralism eroded trust in the WHO and COVAX, leading directly to negotiations for a binding Pandemic Treaty [68]. However, geopolitical tensions between China, Russia, the US, and EU have undermined these efforts, raising profound questions about whether future global health emergencies will generate cooperation or renewed competition [69].

Conclusion

This analysis has demonstrated that the multiplication of vaccine nationalism, export controls, and competitive diplomacy functioned as intertwined geopolitical strategies that fundamentally reshaped global vaccine and medical supply chain architecture during the COVID-19 pandemic. The evidence confirms the hypothesis that protectionist policies enabled wealthy nations to achieve rapid domestic immunization, but simultaneously fragmented global supply chains, weakened COVAX, and entrenched vaccine inequity between the Global North and Global South [70]. Preemptive procurement by the United States and European Union ensured domestic supply at the expense of low-income countries; India's export ban halted COVAX deliveries; and the European Union's export authorization mechanism created diplomatic friction [71]. Concurrently, Chinese and Russian vaccine diplomacy filled the resulting void, deploying doses as instruments of soft power to expand geopolitical influence.

However, the findings also reveal the dual-edged nature of this geopoliticized vaccine landscape. While emerging powers like China and Russia gained diplomatic advantage, their vaccines often faced efficacy questions and regulatory hurdles [72]. Moreover, the fragmentation of multilateralism exposed the structural weakness of global health governance when confronted with sovereign self-interest. Grounded in Geopolitical Economy Theory [73] and Soft Power Theory [74], this study concludes that the geopolitics of vaccines serves as both a necessary lens for understanding pandemic response and a cautionary tale for future health emergencies. The international community must urgently reform multilateral mechanisms, strengthen binding legal frameworks for equitable distribution, and invest in regional vaccine manufacturing capacity to reduce dependency and ensure genuinely cooperative global health security.

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