Fostering Production of Pharmaceutical Products in Developing Countries

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FOSTERING PRODUCTION OF 
PHARMACEUTICAL PRODUCTS IN 
DEVELOPING COUNTRIES

*William Fisher,* Ruth L. Okediji,** and Padmashree Gehl Sampath***

**INTRODUCTION**

The residents of developing countries need pharmaceutical products at least as much as the residents of developed countries. Noncommunicable diseases (such as cancers, cardiovascular disease, and mental-health disorders), which typically are most effectively treated with drugs, are now nearly as common in developing countries as in developed countries. And communicable diseases (such as tuberculosis, HIV, and malaria), the prevention or treatment of which also typically require drugs, continue to be substantially more common in the developing world.1

Today, most of the drugs consumed in developing countries are imported. This is especially true of the relatively new drugs that are subject to patent protection, which typically are produced in industrialized countries.2 For many years, some lawmakers, scholars, and activists have argued that firms located in each developing country (or each regional set of developing countries) should produce more of the drugs that the residents thereof need. They contend that local production would benefit the residents of those countries in two ways. First, it would create many high-paying skilled jobs and support sustainable economic development. Second, local firms could respond more quickly and flexibly to the residents’ changing health needs. Skeptics have responded that local production, by forfeiting economies of scale, would be less efficient and thus would raise the costs of medicines. In addition, they contend that the systems for registering and maintaining the

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2. The production of generic drugs is less concentrated, but most are now manufactured in large middle-income countries (primarily India, China, and Brazil) and then exported to smaller and poorer countries.
quality of drugs are less robust in developing countries, and thus that local production would lead to an increase in sub-standard drugs.\(^3\)

As suggested by this debate, the problem of how best to facilitate access to medicines in developing countries is complex. What is clear, however, is that the existing system of pharmaceutical drug development and distribution is severely deficient with respect to the needs of developing countries.

In this article, we examine challenges to and potential benefits of local production as a response to the persistent deficit of affordable, high-quality pharmaceutical drugs in developing countries. Given the manifest under-preparedness for the COVID-19 pandemic in high-income countries, addressing the supply of vaccines to low-income countries and preparing for the next pandemic seems particularly urgent. We propose specific initiatives to improve the viability of local production consistent with well-established rules and precepts in industrial policy, trade policy, and human rights. An advantage of our approach is that it avoids the need for new modifications of the multilateral intellectual-property agreements that plagued efforts to address access to medicines during the HIV/AIDS pandemic and its aftermath. We conclude that enhanced local production of pharmaceuticals is necessary both to mitigate global public-health risks and to capture more fully the benefits of liberalized trade and regional integration. The proposals we advance address the salient concerns of both proponents and critics of local production.

Part I of this article discusses some recent developments that have altered the relative strength of the competing considerations, sharply increasing the likelihood that fostering local production in developing countries would be beneficial. Part II traces the checkered history of efforts to foster local production, distilling from the narrative some lessons concerning when such efforts have succeeded and when they have failed. Part III uses those lessons to propose five legal reforms and economic initiatives that might be employed to build local pharmaceutical production capacity to harness existing legal authority in regional treaties.

As we will try to show, adoption of the combination of legal and economic reforms we outline would clearly benefit the residents of developing countries. It is less clear that the slate of initiatives would provide a net benefit to the residents of developed countries. Indeed, shifting some capacity to the developing world to produce pharmaceutical products would likely

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somewhat diminish the manufacturing jobs available in some developed
countries, such as the United States, where production is currently concen-
trated. Whether that loss would be offset by the various ways in which the
residents of developed countries would benefit from the improvement in
overall global health and the associated acceleration of the global economic
recovery is unclear. However, any net economic losses suffered in devel-
oped countries would pale beside the number of lives saved in the develop-
ing world.

I. THE NEW GLOBAL LANDSCAPE FOR ACCESS TO MEDICINES

In the past few years, three events have strengthened substantially the
case for local pharmaceutical production: first, the emergence of novel dis-
eases that pose severe threats to the health of the residents of developing
countries; second, the rise of healthcare nationalism; and third, the revela-
tion of the scale of the transnational trade in substandard medicines. We ad-
dress each of these events below, describing in brief the historical context,
scope of the problem, and implications in the wake of the COVID-19 pan-
demic.

A. The Emergence of Novel Diseases

In its 2007 World Health Report, the World Health Organization (“WHO”) observed the unprecedented rate at which new diseases are
emerging. The report identified “at least 39 new pathogens, including HIV,
Ebola hemorrhagic fever, Marburg fever and SARS” and cautioned that
these diseases, and older well-known ones, “pose a threat to health through
a combination of mutation, rising resistance to antimicrobial medicines and
weak health systems.”

Today, the best-known novel diseases are Ebola and COVID-19. Ebola
is now fading from view but was terrifying not so long ago. Starting in
1976, when it was first discovered in humans, the disease simmered in West

https://www.who.int/news/item/03-12-2020-global-access-to-covid-19-vaccines-
estimated-to-generate-economic-benefits-of-at-least-153-billion-in-2020-21 (highlighting a
recent study that suggests that the economic benefits over the next five years of an equitable
system for distributing vaccines in all countries would be roughly $466 billion U.S. dollars,
radically exceeding the total estimated cost of $38 billion U.S. dollars required to implement
it).

5. See Coronavirus: The economic impact – 10 July 2020, U. N. INDUS. DEV.
July-2020.


7. See id. at 35–57
and Central Africa, killing a few hundred people a year. Then, in 2013, it suddenly began to spread, ravaging Guinea, Sierra Leone, and Liberia, and sending tendrils into other countries. A delayed but ultimately fierce public-health initiative was able to halt the outbreak, but not before 28,000 people had died. The threat that Ebola posed, particularly to the residents of African countries, is not fully appreciated. For example, Lagos, Nigeria, the largest city in Africa, with over twenty-one million residents, almost experienced an outbreak. Had that happened, hundreds of thousands of people would have died. Furthermore, the danger of an Ebola pandemic has not disappeared. An outbreak in the Democratic Republic of the Congo between 2018 and July of 2020 killed another 2,300 people. Additional outbreaks are likely.

As readers are surely aware, the COVID-19 pandemic has been far more globally devastating. As of this writing, over 250 million people have been infected and over five million have died. Cold weather and the emergence of increasingly infectious variants of the virus are driving a fourth major wave of cases.

Until recently, most developing countries suffered less from the pandemic than the richest countries, but this comparison no longer holds. Peru now has the highest cumulative death rate in the world, and many other Latin American countries are not far behind. Sub-Saharan African countries,

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which long enjoyed relatively low infection rates, are now severely threatened by new variants.  

When one considers the impacts of COVID-19 infections and deaths on the economy and society of each country, the picture darkens further. Prior to the pandemic, the economies of most developing countries were more fragile than those of the United States or European countries. As a result, they suffered more severely from the lockdowns and the curtailments of exports and travel that the pandemic provoked.  

For the same reason, developing countries are expected to recover economically more slowly than richer countries. The United States, China, and Russia already have per-capita gross domestic products (“GDPs”) that exceed the levels they enjoyed prior to the pandemic. The economies of most other advanced countries will hit this milestone by the middle of 2022, while those of most poorer countries will not do so for another year or two.  

The initial success of developing and least-developed countries (particularly in Africa) in curbing the pandemic was attributable, not to any special characteristics of their populations or climates, but rather to a combination of (a) their ability to prevent or limit the entry of potentially infected persons, (b) their foresight in imposing stringent limitations on social interactions with which most residents complied, and (c) the low average age of their populations. When governments have been unable to curtail transmission through such measures, the results have indeed been catastrophic.

The premier example is Ecuador. Early in the pandemic, one or more infected persons apparently entered Guayaquil, the principal port. The resulting outbreak was fierce. The hospitals and morgues were soon overloaded. Infected doctors waited in wheelchairs for their patients to die so that they could use their ventilators. Bodies piled up in the streets. When a lockdown eventually managed to cap the disease in Guayaquil, it began to

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ravage Quito, and the numbers of new cases continued to rise until May of 2021. The healthcare systems of most developing countries are no better than that of Ecuador. The WHO notes that growth in the numbers of essential medical personnel, such as nurses, is barely keeping pace with population growth in most middle- and low-income countries. Added to this are a shortage of doctors, prohibitive costs, and infrastructure deficits that make access to healthcare infeasible for the poorest. In addition, several other conditions common in developing countries contribute to the risk that infectious diseases will spread rapidly: residences are close together (especially in the poor sectors of urban areas); most residents have neither savings nor credit and thus must work to survive; meager internet access limits opportunities to work at home; lack of refrigeration necessitates daily shopping, and limited sanitation inhibits the adoption of protective measures. These

26. STATE OF THE WORLD’S NURSING 2020, WHO (2020), https://apps.who.int/iris/bitstream/handle/10665/331673/9789240003293-eng.pdf; (The global shortage of nurses is estimated to be 6.6 million in 2016, with “[a]n estimated 5.3 million (89%) of that shortage concentrated in low- and lower middle-income countries.” The greatest gaps in density of nursing personnel to population are in in the African, South-East Asia and Eastern Mediterranean regions and some countries in Latin America.).
factors have compounded the impact of the Delta variant across Africa and Asia. The most recent outbreak, provoked by the Omicron variant, poses an even more severe threat to the global south.

B. Healthcare Nationalism

The second changed circumstance is a surge of what has been called “healthcare nationalism,” which is impeding the ability of developing countries to obtain the pharmaceutical products they need to meet both the new threats and the threats posed by the many diseases that have long been endemic to these countries.

The situation with respect to COVID-19 is the most dire. Drugs that appear capable of suppressing the disease are rapidly emerging. In the United States, the Food and Drug Administration (“FDA”) granted an emergency-use authorization for a monoclonal antibody therapy that has shown promise in reducing the severity of COVID-19 infections. Even more importantly, vaccines developed by Pfizer, Moderna, AstraZeneca, Gamalaya Institute, and Johnson & Johnson have proven to be both safe and efficacious. As a result, eight vaccines are now included in the World Health Organization’s emergency use listing, and twenty-eight vaccines are approved for use by at least one national regulatory authority.

The vaccine manufacturers have been expanding their capacity. Forecasts of manufacturing capacity for 2021 ranged between 9.5 and thirteen million doses per week.


billion doses.\textsuperscript{35} This would be sufficient to vaccinate most people globally (calculated as two doses per person).\textsuperscript{36} However, it remains unclear as we near the end of the year to what extent these self-projections by large companies have materialized.\textsuperscript{37} Meanwhile, the bulk of the supplies generated to date have been purchased by the governments of developed countries. The government of most developing countries lack the resources to make similar anticipatory purchases.\textsuperscript{38} In some of the few instances in which developing countries have been able to place orders, they have not received the promised supplies on time.\textsuperscript{39} The COVID-19 Vaccines Global Access (“COVAX”) Facility, a commendable multilateral effort to create a more equitable system for allocating scarce supplies, has not been able to correct the imbalance.\textsuperscript{40}

The net result: for the foreseeable future, most of the scarce supply of the vaccines will go to the residents of the United States or other developed countries. This situation has not gone unnoticed. Many activists and some government officials have advocated massive investments in drug manufacturing capacity combined with a commitment to make the products produced from such investments available with priority to developing countries.\textsuperscript{41} But thus far such calls have gone largely unheeded. Barring substantial modifications of the policies of developed countries, “most people in low-income countries will be waiting until the end of 2022 or early 2023 for COVID-19 vaccinations.”\textsuperscript{42}

This forecast is not likely to change materially any time soon. The impact of the pandemic on nationalism in general and on so-called “vaccine nationalism” in particular is complex and varies significantly by country and


\textsuperscript{40} See UNICEF, supra note 37.


region. But there is little doubt that, in the United States at least, popular sentiment supports the principle that the government of each country should satisfy the healthcare needs of its own residents before addressing the needs of the residents of other countries. That sentiment guided the U.S. government’s response to the HIV pandemic, has thus far dominated the actions of the Biden administration, and will surely remain influential if one of the many other infectious diseases that pose equally severe threats to the human population becomes rampant.

In sum, we should expect a substantial lag between the widespread introduction of COVID-19 therapies and vaccines in developed countries and the widespread distribution of those same drugs in developing countries—and similar lags when we confront future pandemics. Particularly in light of the weak healthcare systems of most developing countries, such lags will likely give rise to large numbers of unnecessary deaths.

C. The Prevalence of Substandard Medicines

The third changed circumstance is that the widespread distribution of low-quality medicines seriously threatens the health of residents in developing countries. This has likely been true for some time, but the scale of the problem has only recently become apparent. In 2017, the WHO, after aggregating many studies, estimated that 10.5 percent of the drugs distributed


44. Justin Hughes, Biden Decision on COVID Vaccine Patent Waivers is more About Global Leadership than IP, USA TODAY (May 6, 2021) (“During its first 100 days, the Biden administration was laser focused on vaccinating Americans. Critics complained about how unequal the global vaccine rollout was (and is), but Biden understood that whether you’re an autocrat or a democratically-elected leader, your first duty is to protect your own citizens.”).

45. Kupferschmidt, supra note 32 (“A cocktail of powerful antiviral drugs revolutionized HIV treatment in the West in 1996, saving many lives, but it took 7 years for the drugs to become widely available in Africa, the hardest hit continent.”).


In low-income countries were either falsified or substandard. In middle-income countries, the number was barely lower: 10.4 percent. An even more recent and comprehensive study found the overall rate in low- and middle-income countries to be 13.6 percent and the rate in Africa to be 18.7 percent.

The rates vary by type of drug. Least likely to be falsified or substandard are antiretrovirals ("ARVs") because most of them are supplied through channels closely monitored by international donors. The rates for tuberculosis drugs and antibiotics are higher—somewhere between six and seventeen percent. Most likely to be falsified or substandard are anti-malarial drugs. In recent years, substandard vaccines have also been distributed in distressing numbers.

The presence of falsified and substandard medicines in the market has three serious effects. First and most obviously, patients who consume such drugs obtain either zero or reduced therapeutic benefit. This impact is especially severe in the administration of anti-malarial drugs to young children,


49. The WHO defines these two terms as follows: Falsified medical products are those “that deliberately/fraudulently misrepresent their identity, composition or source,” and substandard medical products are “authorized medical products that fail to meet either their quality standards or their specifications, or both.” Id. at 1.


53. See WHO, supra note 48, at 7.; Ozawa et al., supra note 50.

54. In 2018, over 200,000 doses of substandard diphtheria, pertussis, and tetanus ("DPT") vaccines produced by Changsheng Biotechnology were administered to Chinese children and over 400,000 doses of substandard DPT were sold by the Wuhan Institute for Biological Products for further administration, leading to an investigation by the national drug regulator into all vaccine producers in the country. See Editorial Bd., Vaccine Scandal and Confidence Crises in China, 392 THE LANCET 360 (2018), https://www.thelancet.com/action/showPdf?pii=S0140-6736%2818%2931695-7.
who are especially vulnerable to the disease.\footnote{See Vicki Brower, \textit{Falsified and Substandard Malaria Drugs in Africa}, 17 \textsc{The Lancet: Infectious Diseases} 1026, 1026 (2017).} The most comprehensive study estimates that, globally, roughly 122,000 children under the age of five die each year in sub-Saharan Africa alone as a result of consuming falsified or substandard anti-malarials.\footnote{See John P. Renschler, Kelsey M. Walters, Paul N. Newton & Ramanan Laxminarayan, \textit{Estimated Under-Five Deaths Associated with Poor-Quality Antimalarials in Sub-Saharan Africa}, 92 \textsc{American Society of Tropical Medicine and Hygiene} 119, 124 (2015).} As the authors of the study concede, a good deal of uncertainty surrounds these numbers. But there is little doubt that the number of deaths is appalling.\footnote{Cf. Sarah M. Beargie, Colleen R. Higgins, Daniel R. Evans, Sarah K. Laing, Daniel Erim & Sachiko Ozawa, \textit{The Economic Impact of Substandard and Falsified Antimalarial Medications in Nigeria}, \textsc{PLOS ONE}, Aug. 15, 2019, at 1 (estimating the consumption of poor-quality antimalarials causes 12,300 deaths a year in Nigeria).}

Second, when patients consume drugs that are supposed to cure them, but fail to do so, they (and their neighbors) lose faith in medical treatment. In settings where such faith is already shaky, this can diminish their willingness to consult doctors and receive treatment in the future.\footnote{See Kelesidis & Falagas, \textit{supra} note 52, at 458.} In the context of a pandemic, such vaccine skepticism exacerbates an already perilous public-health situation.

Last but not least, consumption of degraded medicines, or a course of treatment in which legitimate and falsified drugs are mixed, accelerates the emergence and spread of drug-resistant strains of the diseases in question.\footnote{See Bate et al., \textit{supra} note 52, at 310; Kelesidis & Falagas, \textit{supra} note 52, at 458; Sachiko Ozawa, Deson G. Haynie, Sophia Bessias, Sarah K. Laing, Emery Ladi Ngamasana, Tatenda T. Yemeke & Daniel R. Evans, \textit{Modeling the Economic Impact of Substandard and Falsified Antimalarials in the Democratic Republic of the Congo}, 100 \textsc{American Society of Tropical Medicine and Hygiene} 1149, 1149 (2019). The two factors emphasized in the text – failure to complete courses of treatment, and the presence of falsified and substandard drugs – are the most widely accepted explanations for the emergence of drug resistance in Tuberculosis. Some scientists, however, contend the causes are more complex. See Keertan Dheda, Tawanda Gumbo, Neel R Gandhi, Megan Murray, Grant Theron, Zarir Udwadia, G B Migliori & Robin Warren, \textit{Global Control of Tuberculosis: From Extensively Drug-Resistant to Untreatable Tuberculosis}, 2 \textsc{Lancet Respiratory Medicine} 321, 324 (2014); WHO, \textsc{Global Surveillance and Monitoring System for Substandard and Falsified Medical Products} 1, 6 (2017).} This, in turn, both makes it harder to suppress the diseases with medicines and may diminish the effectiveness of vaccines when they finally become available.

Identifying the sources of substandard drugs in developing and least-developed countries is a difficult task. However, public-health officials in Africa and officials in various international agencies tend to believe that most substandard and falsified medicines are now coming from manufacturers in China and India.\footnote{Among the few published reports identifying the sources of the bad drugs are Abigail A. Ekeigwe, \textit{Drug Manufacturing and Access to Medicines: The West African Story}, 5} Most informed observers concur.\footnote{Officials associ...}

ated with the International Criminal Police Organization (“Interpol”) are doing their best to locate and punish the firms engaged in this practice. 61 In addition, China recently increased the penalties for distributing falsified medicines. 62 Unfortunately, the large profits that can be reaped by engaging in this practice, and the difficulty of detecting defective medicines, will likely maintain the market for substandard drugs for the foreseeable future.

To summarize: (a) new diseases threaten the lives of the residents of developing countries; 63 (b) the surge in healthcare nationalism in developed countries impedes the ability of developing countries to obtain from overseas manufacturers the vaccines and drugs they need to address public health threats; and (c) the medicines that developing countries are able to import are frequently contaminated with falsified or substandard ingredients. 64 This combination of developments sharply increases the potential benefits to the residents of developing countries of enlarging capacity for local production of pharmaceutical products.

To be sure, these changes do not neutralize entirely the objections that some economists have long made to augmentation of local production—namely, that it may forfeit economies of scale, increase the costs of drugs, and impair quality control. 65 In the remainder of this article, we will note several contexts in which those hazards remain relevant and how the governments of developing countries could, and should, meet them. But all things considered, the argument for enhancing local production is strong.

II. THE HISTORY OF LOCAL PRODUCTION INITIATIVES

The roots of the current low manufacturing capacity in most developing countries, particularly in sub-Saharan Africa, lie in colonial-era policies designed to secure export markets for European goods and to ensure that the


65. See WHO, supra note 48, at 7; see also Ozawa et. al., supra note 50, at 2.

colonies produced and exported agricultural commodities and minerals needed by European countries.\textsuperscript{67} Despite some early successes in the 1920s, (in countries such as Congo, Zimbabwe, and Kenya), industrialization efforts in most colonial economies remained largely subject to the dynamics of the external markets to which they were structurally linked, creating limited opportunities for firms to respond to local needs.\textsuperscript{68}

By the 1960s and 1970s (when most African countries first secured independence), many developing countries were characterized by underdeveloped infrastructure, limited capital savings, and lack of access to technologies.\textsuperscript{69} Many of the countries in Africa and in the Americas initiated import-substitution policies,\textsuperscript{70} but those policies failed quickly and had lingering adverse effects, particularly as international development agencies imposed strict structural adjustment requirements in exchange for access to capital.\textsuperscript{71} A number of the conditions that marked these early industrialization efforts in developing countries—like limited qualified human capital, a weak entrepreneurial class, and lack of access to relevant technologies—remain persistent features of the current challenge of access to medicines.\textsuperscript{72}

The complexity of modern processes for pharmaceutical manufacturing makes these longstanding limitations especially problematic. Producing a drug suitable for delivery to consumers typically involves the following steps:

(a) production of the active pharmaceutical ingredient ("API") that gives the drug its efficacy;

(b) production of the "excipients," the inactive ingredients that provide the vehicle or medium for the drug;

(c) combining APIs and excipients;

\textsuperscript{67} See Daniel R. Headrick, Power Over Peoples. Technology, Environments and Western Imperialism: 1400 to the Present 8 (Princeton Univ. Press 2010).

\textsuperscript{68} This is explored at length in scholarship that explores the notion of center-periphery relationships in global trade. See Gunnar Myrdal, Economic Theory and Underdeveloped Regions 104 (1971); see also U.N. Dep’t Econ. Affs., The Economic Development of Latin America and its Principal Problems, U.N. Doc. E/CN.12/89/Rev.1 (Apr. 27, 2015).


\textsuperscript{70} Import substitution is an industrialization strategy employed by countries to facilitate the manufacture of capital goods by local companies. See Gunnar Myrdal, An International Economy: Problems and Prospects 268 (1956).

\textsuperscript{71} See Farhaad Noorbaksh & Alberto Paloni, Structural Adjustment Programs and Industry in Sub-Saharan Africa: Restructuring or De-Industrialization?, 33 J. Developing Areas 549, 566–67 (1999).

\textsuperscript{72} See Padmashree Gehl Sampath, Reconfiguring Global Health Innovation 3 (2009); see also Making Medicines in Africa: the Political Economy of Industrializing for Local Health 1 (Maureen Mackintosh et al. eds., 2016).
(d) formulating the drug in final dosage form;
(e) packaging those formulations.  

These steps can be performed by different firms in different places. The most difficult and expensive stage of pharmaceutical drug production is typically the first—the production of the API. It is usually achieved through either chemical synthesis, fermentation, or extraction from biological materials. All three processes require considerable skill and advanced technologies. Partly for that reason, it is widely believed that the benefits—to both public health and economic development—of performing these processes locally are highest with respect to API production and diminish as one proceeds down the list.  

The multidimensional character of pharmaceutical manufacturing, plus the limitations of the available data, make it impossible to describe precisely the degree to which global pharmaceutical manufacturing capacity has been geographically concentrated over time. But as suggested above, all observers agree that most developing countries had little to no manufacturing capacity during the twentieth century.  

The exceptions to this situation arose from one of two circumstances. First, on occasion, pharmaceutical firms located in industrialized countries engaged in collaborations with firms in developing countries—either by entering into joint ventures with them or simply through outsourcing production in ways that involved the transfer of technology. For example, in the 1970s, some Japanese pharmaceutical firms established factories in Indonesia. These included PT Takeda Indonesia (“Takeda”), PT Eisai Indonesia (“Eisai”), PT Tanabe Indonesia (“Mitsubishi Tanabe Pharmaceuticals”), PT Otsuka Indonesia (“Otsuka”) and PT Meiji Indonesia (“Meiji”). Technology-transfer arrangements associated with these deals not only helped the local firms establish manufacturing capacity for formulations, but also supported the expansion of product portfolios over time and helped local companies meet the quality standards needed for export markets.  

Second, a few developing countries deliberately refused to extend patent protection to pharmaceutical products, thereby insulating local firms

73. See Kaplan & Laing, supra note 3, at 3.
74. Id.
77. Id.
from patent infringement suits, or even the presence of foreign competition.\textsuperscript{79} The premier example was India, whose robust generic industry and economic progress during the 1970s was partly attributable to the combination of a large domestic market and a patent regime directed at encouraging pharmaceutical innovation for domestic public welfare.\textsuperscript{80}

In sum, by late 1970s, a few developing countries contained firms that participated in some aspects of drug-making, but most developing countries did not. The sequence of efforts to alter this situation is described below. We classify them into early local production efforts (the first wave), and a reinforced set of local production initiatives by countries around the turn of the century (the second wave). We discuss the progress made until now in vaccine manufacturing separately, because the vaccines market has evolved differently.

A. The First Wave

Although desultory efforts to augment local pharmaceutical production capacity occurred as early as the 1960s, it was not until the late 1970s that the issue attracted widespread attention.\textsuperscript{81} The most important source of its


\textsuperscript{81} Paragraph 23 of the of the Report of the International Conference on Primary Health Care states that “[p]rimary health care requires the development, adaptation, and application of appropriate health technology that people can use and afford, including an adequate supply of low-cost, good quality essential drugs, vaccines, biologicals and other supplies and equipment, as well as functionally efficient supportive healthcare facilities.” WHO & U.N. Children’s Fund, \textit{Rep. of the International Conference on Primary Health Care}, ¶23, WHO Doc. CF/HST/1985-034/Anx.04/07 (Sept. 6–12 1978). This report prompted the recognition of the need to build local production in low- and middle-income countries World Health As-
enhanced visibility was a series of meetings in 1978 at the WHO, culminating in Resolution 31.32 of the Thirty-First World Health Assembly. The key passages of that resolution provided:

The Thirty-first World Health Assembly . . . [r]ecognizing the importance of an adequate supply of essential drugs and vaccines to meet the real health needs of the people, through the implementation of national programs of health care; . . . Considering that local production of essential drugs and vaccines is a legitimate aspiration which developing countries have expressed on many occasions, and that considerable progress has been achieved in some countries; Considering that the establishment of a pharmaceutical industry in countries where it does not exist requires transfer of appropriate technology and investment, and that most developing countries cannot afford this without international cooperation; . . . Requests the Director-General: . . . (4) to ensure collaboration with the United Nations Development Programme, the World Bank and regional development banks and funds, the United Nations Children’s Fund and the United Nations Industrial Development Organization with a view to ensuring that technical expertise and financing are made available to interested countries for establishing, wherever feasible, local production corresponding to their health needs, it being understood that financings should be independent of the source of technology; . . .

The subsequent Alma Ata Declaration on Primary Health Care, signed by 134 member states of the WHO, also emphasized the advantages of local production.

Spurred by these initiatives, several United Nations (“U.N.”) agencies began to address the question of local production. Discussions focused on stimulating technology transfer and building domestic production capaci-

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82. WHO & UNICEF, Rep. of the International Conference on Primary Health Care, ¶93, WHO Doc. CF/HST/1985-034/Anx.04/07 (Sept. 6-12, 1978) states, in pertinent part that:

In developing a supply system, consideration has to be given both to cost and to national and local production as part of overall development. For example, it may be cheaper to buy certain items abroad, but economically more productive in the long run to produce them within the country. This principle may also apply to the alternatives of national purchasing and local production.

ties at the firm and sector level. Efforts by developing countries to use tax rebates, subsidies, and grants for research and development to incentivize local production intensified.

The results were disappointing. As of 1990, only five developing countries—India, Brazil, Mexico, Egypt, and Argentina—had established significant local capacity for pharmaceutical production. A few others, such as Colombia, and Jordan, have since followed suit. Reasons for this disappointing outcome include, but are not limited to: poor institutional support, low access to technologies, low degrees of industrial infrastructure, a lack of technical skills, and low finances available to private firms in these countries. A 1986 report by the World Bank concluded that only around eleven percent of global pharmaceutical production was being undertaken in developing countries, while over eighty percent occurred in six industrialized countries.

B. The Second Wave

At the turn of the century, there was a second round of initiatives in the developing world. Some occurred at the national level. For example, the Government of Uganda enacted a National Drug Policy in 2002. One of its objectives was “to maximize appropriate procurement of locally produced essential drugs” and to “encourage local pharmaceutical manufacturers to produce essential drugs at competitive prices and encourage procurement agencies to source available essential drugs locally in order to support the local industry.” Uganda’s subsequent National Strategic Plan (2007–2012)

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85. See e.g., Michael Kremer, PHARMACEUTICALS AND THE DEVELOPING WORLD, 16 J. ECON. PERSPS. 67 (2002). see also ROGER BATE, LOCAL PHARMACEUTICAL PRODUCTION IN DEVELOPING COUNTRIES: HOW ECONOMIC PROTECTIONISM UNDERMINES ACCESS TO QUALITY MEDICINES, 3-4 (Int’l Pol’y Network, 2008).

86. Hall, supra note 75.


88. Id.


91. Id. § 3.5.
proposed local production of HIV/AIDS drugs as a priority. Similarly, in 2016, Ethiopia offered firms a range of incentives to encourage local pharmaceutical production. Its government invested in a “Health Sector Development Plan” and partnered with the WHO to launch the National Strategy and Plan of Action for Pharmaceutical Manufacturing Development, which emphasized domestic production and the strengthening of the country’s national medicine regulatory system.

Other initiatives arose at the regional level. For example, in 2005, African heads of states pressed the African Union to boost pharmaceutical production on the continent. The ultimate outcome was the Pharmaceutical Manufacturing Plan for Africa (“PMPA”), adopted in 2008. Since then, the African Union Conference of Ministers of Industry (“CAMI”) has prioritized the local pharmaceutical sector as a potential driver of industrial development and incorporated the PMPA into the Accelerated Industrial Development of Africa (“AIDA”) Plan of Action. This initiative has led to the creation of a reasonably detailed menu of tactics from which African countries are encouraged to draw when seeking to boost local manufacturing capacity. The menu includes:

1. a Good Manufacturing Practice (“GMP”) road map and associated risk assessment of WHO’s Essential Medicines List (“EML”);

2. a syllabus for developing the human resources required for the long-term sustainability of the industry;

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3. a Business Linkages Platform (which would also assist companies in establishing relationships with local, regional, and international players in order to increase product ranges, mobilize investment, etc.); and

4. technical assistance to enable regulators to devise and implement organizational development plans.\footnote{99}

Prior to the COVID-19 pandemic, the African Union had already cited the need to “formulate a plan of action . . . to facilitate increased drug manufacturing in the region and to bolster research and development (‘R&D’).”\footnote{100} In the wake of the pandemic, there have been increased calls at the national, regional, and multilateral level for local production in Africa,\footnote{101} along with unprecedented healthcare-related inventions by domestic inventors.\footnote{102} Some notable inventions include a digital inventory to monitor the availability of ventilators and respirators in hospitals, developed by Lifebank (a Nigerian health-care technology and logistics start-up); a contactless solar-powered handwashing station developed by a young entrepreneur in Ghana; a mobile sprayer produced by Nigeria’s Agency for Science and Engineering Infrastructure (“NASSENI”);\footnote{103} and a ventilator produced in Egypt using designs developed originally by Medtronic that had been released (complete with technical information, printed circuit board drawings and 3-D CAD files) via a stylized open-source license.\footnote{104} Alongside these innovations were policy initiatives aimed at strengthening overall regional capacity for drug production. Recently, ten African countries, led by Ethiopia, asked the WHO...
“for support to develop ‘national policies and evidence-based comprehensive strategies and plans of action for local production.’”

Finally, several international agencies, both governmental and nongovernmental, have expressed support for local production initiatives.\footnote{105} For example, in 2007 the European Parliament issued a resolution urging increased pharmaceutical-related transfers of technology and capacity-building for local production of medicines in developing countries in line with Element 4 of the Global Strategy Plan of Action (“GSPoA”).\footnote{107} This has led to expanded assistance activities from agencies such as the United Nations Industrial Development Organization (“UNIDO”), the United Nations Development Program (“UNDP”), and the United Nations Conference on Trade and Development (“UNCTAD”).\footnote{108}

These various second-wave initiatives have had some impact. For example, Ethiopia continues to invest in institutional, policy, and structural changes to enhance access to medicines and overall healthcare.\footnote{109} In 2007, Ethiopia founded the Pharmaceutical Fund and Supply Agency (“PFSA”) to manage the country’s supply chain and determine strategic plans to improve the availability of medicines throughout the country. In 2010, PFSA implemented the Integrated Pharmaceuticals Logistics System (“IPLS”) to improve the management of pharmaceutical supplies through more refined record keeping, storage, and availability. IPLS provided trainings to improve communication between supervisors and suppliers to better monitor stocks of supplies. By 2014, the availability of essential medicines in Ethiopia had increased from sixty-five percent to eighty-nine percent, nearly

\begin{footnotesize}
\footnote{105} See Cullinan, supra note 101.  
\footnote{106} Local production of pharmaceuticals has been a longstanding emphasis of the United Nations Industrial Organization. See BATE, supra note 85.  
\footnote{109} See Elizabeth Annis & Hannah Ratcliffe, Strengthening Primary Health Care Systems to Increase Effective Coverage and Improve Outcomes in Ethiopia, PRIMARY HEALTH CARE PERFORMANCE INITIATIVE, improvingphc.org/strengthening-primary-health-care-systems-increase-effective-coverage-and-improve-outcomes-ethiopia (last visited Oct. 21, 2021); see also Drive to Increase Local Production of Drugs Presents Vast Opportunities for Ethiopian Pharmaceuticals, AFR. HEALTH (June 4, 2016), https://africa-health.com/news/drive-to-increase-local-production-of-drugs-presents-vast-opportunities-for-ethiopian-pharmaceuticals.}
\end{footnotesize}
reaching the Health Systems Development Programme goal of 100%. Ethiopia is currently working to expand its warehouse and cold-chain capacity for storing and distributing pharmaceuticals and has introduced larger trucks to distribute supplies in an integrated supply chain. Health facilities at all levels are now able to monitor their supply and demand and adjust supply requests accordingly. This progress is in addition to the prioritization of the pharmaceutical sector in Ethiopia’s Growth and Transformation Plan II.

In Africa at large, there are now roughly 600 firms engaged in the production of pharmaceutical products. Especially large numbers can be found in Nigeria (157), Ghana (thirty-three), and Morocco (forty). These numbers are misleading, however. The majority of these firms are not manufacturing APIs; instead, they are either combining imported APIs and excipients or simply repackaging imported combinations. API production remains heavily concentrated in China, with some capacity in the United States, India, and Japan.

Even the success stories turn out, upon close examination, to be discouraging. For example, starting in 1989, the government of Ghana offered local pharmaceutical manufacturers several financial incentives, including

an exemption from corporate taxes in the first three years after establishment, exemption of import duties on sixty-six important ingredients, and an import ban on forty-four medicines that were earmarked for local production. \(^{114}\) Thanks to these incentives, the country was able to develop a relatively large local pharmaceutical sector. \(^{115}\) Several estimates suggest the pharmaceutical sector has a thirty percent share in the market. \(^{116}\) However, this achievement obscures the limited product choice amongst local companies, low capacity utilization, and low technological capacity, resulting in an inability to manufacture APIs or expand production into new therapeutic categories. \(^{117}\) South Africa took a different tack, relying on competition law to try to force international pharmaceutical firms to grant licenses to local manufacturers. \(^{118}\) Although it had some impact, it too has failed to enhance the capacity of local firms to produce their own APIs.

C. Vaccine Manufacturing

The vaccine sector has developed differently. Since 2000, a significant percentage of global vaccine production has shifted to some developing countries. According to the WHO, of the eighty-four vaccine manufacturers worldwide, sixty-five are located outside of the European Union and the United States. \(^{119}\) This statistic is especially striking because most vaccines have complex components, requiring larger scale and more advanced facilities to produce than small-molecule medicines. \(^{120}\) Vaccine manufacturing typically in-


\(^{115}\) McCabe et al., supra note 114, at 16.

\(^{116}\) Id. at 36.

\(^{117}\) Andreas Seiter & Martha Gyansa-Lutterodt, Policy Note: The Pharmaceutical Sector in Ghana 12 (World Bank, Nov. 2009).

\(^{118}\) See, e.g., UNCTAD’s Intell. Prop Unit, Note on Hazel Tau & Others v. GlaxoSmithKline, Boehringer Ingelheim & Others, 2002: South African Competition Commission, Competition Commission Case No. 2002SEP226, at 1, https://unctad.org/ippcaselaw/sites/default/files/ippcaselaw/2020-12/Hazel%20v%20Tau%20SA%20Competition%20Commission%20v.%20Ogilvie%20et%20al%202002pdf (“The complainants alleged that the respondents had both abused their dominant positions by charging excessive prices for their patented ARVs to the detriment of consumers, in violation of section 8(a) of the South African Competition Act.”) (last visited Dec 6, 2021).


\(^{120}\) See, e.g., Roxanne Khamsi, If a Coronavirus Vaccine Arrives, Can the World Make Enough?, Nature (Apr. 9, 2020), https://www.nature.com/articles/d41586-020-01063-8; Julie Steenhuysen & Kate Kendall, Vaccine Makers Face Biggest Medical Manufacturing Chal-
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volves: (a) bulk production of purified antigens; (b) formulation using adjuvants that enhance immune responses, stabilizers to enhance potency, and preservatives for multi-vial preparations; and (c) packaging and distribution. The know-how needed to engage in bulk antigen production is more challenging than that needed for pharmaceutical production for several reasons. Antigens, although comparable to APIs in the drug-production process, require a range of biological competencies, and need highly specialized production facilities that are dictated by the vaccine/s in question. Often, they cannot all be produced with the same methods or the same kinds of equipment, or even in the same facility. The antigens at the heart of the newest vaccines are especially difficult to produce. In addition, the regulatory processes applicable to vaccines are more stringent than those for most therapies, requiring producers even of generic versions to conduct clinical trials to demonstrate safety and efficacy.

These barriers are sometimes exacerbated by intellectual property rights. In contrast to the older vaccines, which have long been outside of patent protection, the newest vaccines enjoy generous shields. Perhaps most importantly, the new vaccine platforms for COVID-19 (mRNA and DNA)

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124. See Richard Strugnell, Fred Zepp, Anthony Cunningham, & Terapong Tantawichien, *Vaccine Antigens*, 1 UNDERSTANDING MOD. VACCINES PERSPS. VACCINOLOGY 61, 70–71 (2011). Vaccine antigens refer to either whole live pathogens (modified to reduce their virulence), individual pathogen components (such as protein or polysaccharides), or the genetic material of the pathogen (that is, “naked” DNA/RNA) which can direct the production of the vaccine antigen in the recipient. Id. at 64.


What accounts for the expansion of vaccine manufacturing in the developing world despite this combination of impediments? In retrospect, two factors seem to have been crucial. The first was a deliberate effort by the Global Alliance for Vaccines and Immunizations (“GAVI”), the United Nations Children’s Emergency Fund (“UNICEF”), and the Gates Foundation to diversify the sources of the vaccines they purchase and then distribute to developing countries.\footnote{See Shawn A. N. Gilchrist & Angeline Nanni, Lessons Learned in Shaping Vaccine Markets in Low Income Countries: A Review of the Vaccine Market Segment Supported by the GAVI Alliance, 28 Health Pol’y & Plan. 838, 838–40 (2013).} The result was that several developing-country vaccine manufacturers were encouraged to participate in global procurement processes.\footnote{Id. at 841.} One recent manifestation of the benefits of such vaccine manufacturing capacity in developing countries was the decision by AstraZeneca (UK and Sweden) to license the Serum Institute of India to manufacture AstraZeneca’s COVID-19 vaccine.\footnote{See AstraZeneca Takes Next Steps Towards Broad and Equitable Access to Oxford University’s COVID-19 Vaccine, AstraZeneca (June 4, 2020), https://www.astrazeneca.com/media-centre/press-releases/2020/astrazeneca-takes-next-steps-towards-broad-and-equitable-access-to-oxford-universitys-covid-19-vaccine.html.} Since then AstraZeneca has signed agreements for production with Fiocruz (Brazil), BioKantai (China), Liomont (Mexico) and Siam Bioscience (Thailand), apart from several companies in high income countries.\footnote{See Vaccine Manufacturing, supra note 36.}

The second factor was a few influential technology-transfer agreements. For example, technologies necessary to produce conjugate Hib (Haemophilus influenzae type B) vaccines were transferred by the Netherlands Vaccine Institute (“NVI”) to three Indian manufacturers and by GlaxoSmithKline (“GSK”) to a Brazilian manufacturer.\footnote{Michael Beurret, Ahd Hamidi, & Hans Kreeftenberg, Development and Technology Transfer of Haemophilus Influenzae Type B Conjugate Vaccines for Developing Countries, 30 Vaccine 4897–4906 (2012).} Similarly, in the late 1990s, the technology underlying the recombinant Hepatitis B vaccine was transferred to the Republic of Korea, India, and Brazil.\footnote{WHO, INCREASING ACCESS TO VACCINES THROUGH TECHNOLOGY TRANSFER AND LOCAL PRODUCTION 8–13 (2011).} Both resulted in sharp drops in the prices of the vaccines in the developing world. The WHO estimates that, between 1990 and 2010, eleven developing countries actively partici-
pated in vaccine technology-transfer agreements. India was the recipient of technology in twenty-six such agreements, followed by China (eighteen) and Brazil (ten). The net effect was a significant expansion of the manufacturing capacity of countries in the developing world. Once again, however, the situation turns out to be less encouraging than it first appears. Most of the vaccines manufactured in developing countries today use older or generic vaccine technologies and consequently generate only modest profits. As a result, although in unit terms, seven companies from developing countries account for eighty percent of all vaccine sales, before the pandemic, four companies producing branded products dominated the global market, estimated at $30.6 billion U.S. dollars in 2018. Pfizer’s Prevenar Vaccine for pneumonia, Sanofi’s Vaxigrip for Influenza, Pfizer’s Prevnar13 vaccine for pneumonia, Merck’s Gardasil for the Human Papillomavirus (“HPV”), and GSK’s Shingrix vaccine for shingles accounted for the bulk of these revenues. The COVID-19 vaccine manufacturing landscape recently prepared by the Coalition for Epidemic Preparedness Innovations (“CEPI”) confirms this capacity divide. The landscape shows that the capacity to manufacture more complex vaccines (using DNA and viral vector technologies) is highly restricted worldwide, and lists India as the only country in the developing world currently with the capacity to manufacture vaccines that rely on such technologies.

Recent developments underscore to some extent the difficulties in navigating intellectual property rights in new vaccines and shed some light on how they might impact the sector. The WHO has set up a COVID-19 Technology Access Pool (“C-TAP”) to facilitate the sharing of technologies for

134. Id. at 11–12.
135. Id. at 12.
137. Older vaccines, such as the HiB vaccine, can also be subject to intellectual property protection, but these have not posed significant barriers for technology transfer. See WHO, supra note 133, at 6; FRIEDE, supra note 126, at 5.
138. UNCTAD DEP’T IMMUNIZATION, VACCINE & BIOLOGICALS, supra note 119.
141. COALITION FOR EPIDEMIC PREPAREDNESS INNOVATIONS, COVID-19: MANUFACTURING SURVEY RESULTS ANALYSIS 4, 7 (2020) (comparing capacity for vaccine technologies by country). For a comparison of capacity across different vaccine technologies, see discussion supra p. 4.
COVID-19 treatments, including vaccines, but private companies have preferred to enter into voluntary licensing arrangements.142 The mRNA Hub Initiative of the WHO, in partnership with the Government of South Africa, to promote the first mRNA production facility for COVID-19 vaccines in Africa143 was launched without the support of larger companies willing to share technology for vaccines.144 Although it was initially envisaged that Pfizer-BioNTech would join the initiative to transfer technology to the Biovac Institute of South Africa, many of the intellectual property and technology transfer issues related to the deal are yet to be sorted out.145

D. The TRIPS Agreement

The adoption in 1995 of the Agreement on Trade Related Aspects of Intellectual Property Rights ("TRIPS Agreement") had a profound impact on international debates concerning local production of pharmaceutical products. The principal source of the perturbation was article 27(1), which provides:

1. Subject to the provisions of paragraphs 2 and 3, patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application.146 Subject to paragraph 4 of article 65,147 paragraph 8 of article 70148


144. The WHO’s media briefing on June 21, 2021 estimated that vaccines could be produced in South Africa “within nine to [twelve] months” if a big pharma partner does indeed come forward. See Kerry Cullinan, South Africa to Become Africa’s First mRNA Vaccine Manufacturing Hub – WHO Asks Big Pharma to Support Scaleup, HEALTH POL’Y WATCH (June 21, 2021), https://healthpolicy-watch.news/africas-first-mrna-hub-to-be-set-up/.


146. A footnote to this sentence provides that, “[f]or the purposes of this Article, the terms ‘inventive step’ and ‘capable of industrial application’ may be deemed by a Member to be synonymous with the terms ‘non-obvious’ and ‘useful’ respectively." Agreement on Trade-Related Aspects of Intellectual Property Rights ["TRIPS"] art. 27(2) n.5, Apr. 15, 1994, Marrakech Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299 (1994) [hereinafter TRIPS Agreement].

147. Paragraph 4 of article 65 provides that
and paragraph 3 of this article, patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.  

The main purpose and effect of this provision was to compel developing countries, such as India, to extend patent protection to pharmaceutical products and thus to strengthen the ability of the major pharmaceutical firms to control global markets for products based on their innovations.  

The critics of the TRIPS Agreement argued that it would damage developing countries in two related ways. First, as soon as a developing country complied with the Agreement, pharmaceutical firms would use their enhanced rights to shut down generic manufacturing of compounds covered by the firms’ patents. Even if the pharmaceutical firms then expanded sales of authorized versions of those compounds in the country in question, the prices on these versions would be high and poor residents would be unable

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To the extent that a developing country Member is obliged by this Agreement to extend product patent protection to areas of technology not so protectable in its territory on the general date of application of this Agreement for that Member, as defined in paragraph 2, it may delay the application of the provisions on product patents of Section 5 of Part II to such areas of technology for an additional period of five years.

_id_. art. 65(4).

148. Paragraph 8 of article 70 provides that:

Where a Member does not make available as of the date of entry into force of the WTO Agreement patent protection for pharmaceutical and agricultural chemical products commensurate with its obligations under Article 27, that Member shall:

(a) notwithstanding the provisions of Part VI, provide as from the date of entry into force of the WTO Agreement a means by which applications for patents for such inventions can be filed;

(b) apply to these applications, as of the date of application of this Agreement, the criteria for patentability as laid down in this Agreement as if those criteria were being applied on the date of filing in that Member or, where priority is available and claimed, the priority date of the application; and

(c) provide patent protection in accordance with this Agreement as from the grant of the patent and for the remainder of the patent term, counted from the filing date in accordance with Article 33 of this Agreement, for those of these applications that meet the criteria for protection referred to in subparagraph (b).

_id_. art. 70(8).

149. _Id_. art 70(3).


151. See e.g., Pradeep Agarwal P Saibaba, _TRIPS and India’s Pharmaceuticals Industry_, 36 ECON. & POL. WKLY. 3787, 3787 (2001).
to afford the medicines they needed. The critics contended that this adverse impact would become especially severe when both India and China, where many of the generic manufacturers were located, were forced to comply with article 27. Second, the critics predicted that the few developing countries that had succeeded in creating local manufacturing capacity would lose it—and other developing countries, struggling to achieve sustainable scale, would be unable to gain it. The loss of market share by Argentinian companies in the immediate aftermath of the TRIPS Agreement lent credibility to these predictions.

Especially worrisome to some commentators was the risk that both of these effects would further undermine incentives to invest in treatments for infectious diseases (such as malaria and tuberculosis). Developing countries are highly vulnerable to these diseases, but they are less prominent in developed countries, thus receiving less attention from major pharmaceutical firms primarily concerned with lucrative markets.

Such concerns figured prominently in the efforts of developing countries and their advocates to identify, expand, and exercise “flexibilities” in the TRIPS Agreement. Major battles in that war included:


155. _Id._


• The struggle between the United States and Brazil prompted by Brazil’s threat to impose compulsory licenses on HIV-related patents that were not “worked” in Brazil;

• The effort (ultimately unsuccessful) by pharmaceutical firms to limit the ability of the government of South Africa to curb the prices of patented HIV drugs;

• The effort, begun by the African Group in 2001, to force the TRIPS Council to explore the relationship between the TRIPS Agreement and public health—an effort that ultimately concluded with the Doha Declaration, which clarified the right of all member states to interpret the Agreement in light of their domestic public-health circumstances, and later a formal amendment of the Agreement.

• Several efforts by the WHO to augment countries’ abilities to manage pharmaceutical products to address health emergencies, culminating in the adoption of the GSPoA at the World Health Assembly of 2008, which proposed a series of actions to promote the transfer of technology and production of health products in developing countries.

see: Fall 2022 | Fostering Production of Pharmaceutical Products 29

WTO/TRIPS Agreement (Revised), WHO Doc. WHO/DAP/98.9 (1999); Carlos M. Correa, Implementing the TRIPS Agreement in the Patents Field: Options for Developing Countries, 1 J. WORLD INTELL. PROP. 75 (1998).


165. See World Health Assembly Res. 61.21, reprinted in WHO, SIXTY-FIRST WORLD HEALTH ASSEMBLY: DECISIONS AND RESOLUTIONS 31 (May 19–24, 2008); COMM’N ON
Fraught deliberations in major international fora and within the vast network of non-governmental organizations that ultimately led to various global initiatives, including a 2016 report by the United Nations High-Level Panel on Access to Medicines, which urged all World Trade Organization (“WTO”) member countries to “make full use of the policy space available in article 27 of the TRIPS Agreement” and not to interfere with efforts of other member countries to do so.\(^\text{166}\)

Partly because of these various efforts to curtail the impact of the TRIPS Agreement, the worst fears of its critics have not been realized. By and large, the developing countries that had developed robust manufacturing capacities prior to TRIPS—above all, India and Brazil—have managed to keep them, partly through shrewd and aggressive use of the “flexibilities” described above.\(^\text{167}\) But of the countries that lacked significant manufacturing capability prior to the adoption of the Agreement, Bangladesh is the only one that managed to build a sizeable export-oriented pharmaceutical sector.\(^\text{168}\) In Bangladesh, TRIPS flexibilities, a protected national market, and a number of other provisions aimed at strengthening local production enabled the expansion of the domestic pharmaceutical sector to diversify into numerous therapeutic categories including vaccines.\(^\text{169}\) Today, the Agreement continues to limit the ability of most developing countries to expand local production capacity.

E. Lessons

Some general guidelines lurk in this history. In retrospect, it appears that, in most successful efforts to augment local production capacity, four

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\(^{167}\) WORLD HEALTH ORGANIZATION, LOCAL PRODUCTION FOR ACCESS TO MEDICINES: DEVELOPING A FRAMEWORK TO IMPROVE PUBLIC HEALTH (2011), https://www.who.int/phi/publications/Local_Production_Policy_Framework.pdf; Okediji, supra note 159, at 199.


\(^{169}\) Id.
conditions were present, while in unsuccessful efforts, at least one was missing. Those conditions are:

(1) **Legal Authority.** The local firms had clear legal rights to manufacture the drugs at issue.

(2) **Technological know-how.** The local firms had or were provided the technology and skills necessary to engage in the production processes in question.

(3) **Financial Resources.** The local companies had access to capital.

(4) **Reliable demand for the products.** A sizeable set of customers stood ready to buy the firms’ products.

The first and third factors are obvious and have received considerable attention by lawmakers and scholars. By contrast, the roles played by the second and fourth factors have not been adequately appreciated.

Know-how is especially critical with respect to the production of active ingredients—which, as we have seen, is the most important and challenging dimension of the manufacturing process. Making and packaging pills using imported compounds is a less complex process, and the potential profits generated by those activities are low—indeed, often too low to sustain an enterprise. The greatest potential rewards, as well as the greatest benefits to public health and economic development, are associated with local production of APIs. The skill levels required to begin producing APIs and to engage in sophisticated drug-development processes vary enormously but typically exceed the competence of firms in developing countries. To get off the ground, such firms usually need assistance from the enterprises already engaged in that process. The same is true for vaccines, where the production of bulk antigens remains the most daunting step to be mastered by develop-

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172. In the case of Tanzania, for instance, the inability to obtain technologies necessary for API production is one of the reasons for the lack of competitiveness of the eight local firms. See Robert M. Mhamba & Shukrani Mbirigenda, *The Pharmaceutical Industry and Access to Essential Medicines in Tanzania* 83 (EQUINET Discussion Paper Series, Paper No. 83, July 2010).

173. See Kaplan & Laing, supra note 3; Hall, supra note 75 and accompanying text.
ing country manufacturers, in general, and will be even more important in the case of new vaccine platforms. 174

Inattention to the issue of technological know-how has had unfortunate results. When local firms have not had access to the know-how necessary to break into the lucrative and socially beneficial zone of API production, they have had difficulty staying afloat. 175 This has sometimes prompted governments to prop them up by paying exorbitant fees for the modest services that the firms have been able to provide. That, in turn, has resulted in needlessly high drug prices, 176 prompting some commentators to insist that mercantilist industrial policy and access to medicines are incompatible. 177

Close study of such episodes, however, reveals that the source of the problem is the limited scope of the services that the firms in question are equipped to provide. 178 It adversely affects the ability of firms to participate in large local and international tenders. This handicap, in turn, creates barriers to access the financing they need to expand and thrive. The solution is to ensure that local firms have the skills necessary to move up the value chain. 179

The fourth factor, concerning reliable demand for products has received even less attention than the second factor but is equally important. Firms in developing countries have been reluctant to invest in manufacturing capacity absent some assurance that there will be customers able and willing to buy their products. 180 This assurance is especially important in the current

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174. For the complexities involved in vaccine manufacturing employing next-generation vaccine platforms see Debby van Riel & Emmie de Wit, Next Generation Vaccine Platforms for COVID-19, 19 NATURE 810, 811.

175. Abbott et al., supra note 170. Chapters 5 and 6 in particular discuss the difficulties faced by local firms in accessing technologies and finance that are prerequisites for competitive production. See also Gehl Sampath & Walwyn, supra note 170, at 11.

176. For example, a survey conducted by the WHO and the Health Action International (HAI) in Ghana in 2004, which covered fifty medicines, concluded that although the prices of generic products produced locally were lower than those of the branded versions, they were far above the international reference prices obtained from the price lists of large, generic medicine suppliers around the world. See Edith Andrews, Ananga Yamollyia, Charles Allotey, Martin Autin & Martha Gyansa-Lutterodt, Medicine Prices in Ghana: A Comparative Study of Public, Private and Mission Sector Medicine Prices 41 (2004), https://haiweb.org/wp-content/uploads/2015/07/Ghana-Report-Pricing-Surveys.pdf.

177. See Kaplan & Laing, supra note 3; Hall, supra note 75. Even in countries where local production is successful, studies have noted the lack of access to affordable medicines in local pharmacies and other outlets in the health system. On this point, see Wen Chen, Shenglan Tang, Jing Sun, Dennis Ross-Degnan & Anita K Wagner, Availability and Use of Essential Medicines in China: Manufacturing, Supply, and Prescribing in Shandong and Gansu Provinces, 10 BIOMED CENT. HEALTH SERV. RSCH. 211 (2010); Gehl Sampath, supra note 72, at 207.


180. Gehl Sampath & Walwyn, supra note 170.
environment, where generic versions of many of the drugs that the firms might consider producing are already available from Indian, Chinese, or other manufacturers.

Inattention to this fourth factor can be traced in part to ways in which the debate concerning access to medicines in developing countries was reoriented by the TRIPS Agreement. Defenders of the TRIPS Agreement contended that a well-greased global market based in harmonized intellectual property protection would naturally foster technology transfers that would redound to the benefit of developing countries. Critics of the TRIPS Agreement were concerned about rising drug prices in developing countries and emphasized mechanisms, such as compulsory licensing, that could neutralize the enhanced levels of patent protection. Neither group focused on market mechanisms that could entice local producers to generate inexpensive drugs that would meet the needs of the countries’ residents.

III. A Framework to Support Local Production

Building on the historical record outlined above, this section outlines five practicable strategies that, in combination, would more effectively promote local production of pharmaceutical products.

A. Clearing Legal Space

As indicated above, a precondition of local production is that a firm considering making a drug has the legal right to do so. In the past, this requirement has rarely posed a significant barrier, either because the drug in question was no longer subject to patent protection (as is true of most “essential medicines”) or because the patentee granted the local firm a license (as was true of the Indonesian ventures created by the Japanese firms in the 1970s). However, in the future, a developing country may wish (or need) to enable local manufacture of a new therapy or vaccine without the permission of the patent owner. If so, the government of the country will be obliged to identify some reason why, despite the TRIPS Agreement, doing


184. See UNCTAD Secretariat, supra note 76, at 124, 189.
so would be lawful. Most of the potential reasons have been analyzed extensively in the literature, so we simply itemize them here:

(1) Several developing countries are not (yet) bound by the relevant portions of the TRIPS Agreement, either because they are not members of the World Trade Organization (“WTO”) or because they are classified by the Committee for Development Policy of the U.N. as “least developed countries” and thus need not comply until 2033. They are therefore free to structure their national patent laws to give local firms space to engage in reverse engineering and production of drugs.

(2) The Doha Declaration and article 31bis of the TRIPS Agreement leave developing countries considerable freedom to force patentees to grant low-royalty (nonexclusive) licenses to local firms when necessary to meet public-health emergencies.

(3) By following India’s lead in interpreting stringently the inventive-step requirement (also known as the non-obviousness requirement), developing countries could create space for local firms to manufacture some so-called “me-too” drugs—that is, those that provide little or no therapeutic advantage over their predecessors.

185. The nonmember countries can be subdivided into two loosely separated groups: the “observers,” which are obliged (at least in theory) to begin negotiations for WTO membership within 5 years of becoming observers; and the non-observing non-members, most of which have not yet expressed interest in membership. The observers are: Algeria, Andorra, Azerbaijan, Bahamas, Belarus, Bhutan, Bosnia and Herzegovina, Comoros, Curacao, Equatorial Guinea, the Holy See, Iran, Iraq, Lebanon, Libya, Sao Tome and Principe, Serbia, Somalia, South Sudan, Sudan, Syria, Timor-Leste, and Uzbekistan. The non-observing non-members are Eritrea, Kiribati, Kosovo, Marshall Islands, Micronesia, Monaco, Nauru, North Korea, Palestine, San Marino, Turkmenistan, and Tuvalu. See WTO Members and Observers, WTO, https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm. (last visited Oct. 2, 2021).


188. The latitude enjoyed by developing countries to define the inventive-step requirement is sharply contested. For a few views on this issue, see CARLOS CORREA, GUIDELINES FOR PHARMACEUTICAL PATENT EXAMINATION: EXAMINING PHARMACEUTICAL PATENTS
(4) By refusing to follow the lead of the United States in extending the duration of patent protection to offset (partially) the time devoted to clinical trials, developing countries could empower local firms to commence manufacturing of a pioneering drug sooner than would be permissible in the United States or other developed countries. 189

A fifth strategy has received less focus to date and thus merits closer attention. “Working requirements” consist of obligations imposed on patentees to “work” their inventions in the countries in which the patents are granted—in other words, to make the products or processes to which they apply available in those countries. 190 Such obligations were once common components of national patent statutes, but, during the twentieth century, they were abandoned by many developed countries. 191 They have not disappeared altogether, however. A few developed countries (such as the United Kingdom) still have them, and many developing countries have working requirements on their books. 192

Working requirements come in various shapes and sizes. The more stringent ones require patentees to practice the patent within the country (for example, by manufacturing a patented product in a local plant or by granting a license to a local manufacturer); the less stringent permit patentees to satisfy the obligation by exporting to the country patented products produced elsewhere. Some are satisfied if the patent is practiced within any of a set of countries of which the country of issuance is a member. The penalties for violating the requirements range from forfeiture of the patent to various

189. Article 33 of the TRIPS Agreement requires that the term of patents not be shorter than “twenty years counted from the filing date.” TRIPS Agreement, supra note 146, art. 33. However, TRIPS neither requires that patent applications be processed within a specific period of time nor compels countries to extend patents to compensate applicants for the amounts of time they expend prosecuting their applications or securing regulatory approval.


191. Id. at 487–89.

192. See id. Except for a brief period in the early nineteenth century, the United States has never had a formal working requirement, but the U.S. Code still contains some provisions that put pressure on patentees to practice their inventions domestically. See, e.g., 19 U.S.C. 1337 § (a)(3) (2006) (exempting from the coverage of “unfair trade practices” circumstances in which, with respect to a patented article, there exist in the United States “(A) significant investment in plant and equipment; (B) significant employment of labor or capital; or (C) substantial investment in its exploitation, including engineering, research and development, or licensing.”).
forms of compulsory licenses. Some penalties apply as soon as a patent issues; others take hold only after a prescribed period of time.\footnote{See Trimble, supra note 190, at 486–87.}

Those countries that retain working requirements rarely enforce them.\footnote{Id. at 494.} One of the reasons is continued uncertainty regarding whether such requirements are compatible with the Paris Convention (the premier multilateral agreement on patent law) and the TRIPS Agreement. Only once has a dispute presenting this issue come close to authoritative resolution. As was mentioned in Part II of this article, during the early stages of the AIDS pandemic, one of the ways in which Brazil sought to combat the disease was by threatening to enforce a working requirement against the holders of patents on AIDS therapies.\footnote{See discussion supra Part II(D).} The United States formally challenged that initiative as a violation of the TRIPS Agreement but eventually backed down before the claim was resolved.\footnote{See Paul Champ & Amir Attaran, Patent Rights and Local Working under the WTO Trips Agreement: An Analysis of the U.S.-Brazil Patent Dispute, 27 YALE J. INT’L L. 365, 365–66 (2002).} Since then, there have been no WTO dispute-resolution proceedings in which the issue has been presented.

In the absence of an authoritative ruling on the issue, many scholars have ventured opinions. Some contend that all working requirements violate article 27 of the TRIPS Agreement—specifically, the prohibition against discrimination on the basis of “whether products are imported or locally produced.”\footnote{TRIPS Agreement, supra note 146, art. 27.} Others contend that at least the subset of working requirements that are enforced through compulsory licenses are justified by reading articles 27, 30, and 31 together or that the apparent hostility of the TRIPS Agreement to working requirements is neutralized by the more generous stance taken in article 5(A)(2) of the Paris Convention. Still others stake out compromise positions.\footnote{For a range of opinions concerning the permissibility of working requirements, see Thomas Cottier, Shaheeza Lalani, & Michelangelo Temmerman, Use It or Lose It: Assessing the Compatibility of the Paris Convention and Trips Agreement with Respect to Local Working Requirements, 17 J. INT’L ECON. L. 437 (2014); Matthias Lamping, Reto Hilty, Dan L. Burk, Carlos M. Correa, Peter Drahos, N.S. Gopalakrishnan, Henning Grosse Ruse-Khan, Annette Kur, Geertrui Van Overwalle, Jerome H. Reichman & Hanns Ullrich, Declaration on Patent Protection: Regulatory Sovereignty under TRIPS, 45 INT’L REV. INTELL. PROP & COMPETITION L. 679, ¶30 (2014); Michael Halewood, Regulating Patent Holders: Local Working Requirements and Compulsory Licenses at International Law, 35 OSGOOD HALL L.J. 243 (1997); Kevin J. Nowak, Staying Within the Negotiated Framework: Abiding by the Non-Discrimination Clause in TRIPS Article 27, 26 MICH. J. INT’L L. 899 (2005); Cynthia M. Ho, Patent Breaking or Balancing: Separating Strands of Fact from Fiction Under TRIPS, 34 N.C. J. INT’L L. 371, 399 (2008).}

To clear legal space for local pharmaceutical manufacturers, developing countries might make greater use of working requirements than they do at present, and they might then rely on one or more of the arguments summa-
rized above to resist predictable attacks from adversely affected companies and countries. To be of value in the present context, such a requirement would of course have to define “working” as manufacturing the covered product locally, not merely as a willingness to export products to the country in question. Adoption (and enforcement) of such a duty would force patentees either to set up and operate a local manufacturing facility, to grant a license to a local manufacturer, or to acquiesce in unauthorized production by a local manufacturer—any of which would benefit the developing country at issue.

None of these five options, however, would do much good unless local firms could be confident that they enjoyed the legal authority to implement them. One of the main reasons that strategies like this have been infrequently employed is the uncertainty surrounding whether they could withstand opposition or sanctions from the governments of developed countries sensitive to the interests of the patentees.\(^{199}\) Two legal reforms would go far to establish confidence in the legality of these strategies.

First, developing countries should create or clarify declaratory-judgment procedures that enable local firms to initiate civil suits against patentees and obtain authoritative rulings in advance regarding their rights to manufacture specific drugs. In the United States, federal courts have limited the availability of such suits because of the so-called “case or controversy” requirement derived from the U.S. Constitution,\(^{200}\) but most countries (including most developing countries) have no such constitutional constraint. By exploiting this freedom, developing countries could help local firms ascertain, with minimal risk, what they can and cannot do.

The second reform, by contrast, would require a change in the law and behavior of the United States—and perhaps some other developed countries. In the past, the United States Trade Representative (“USTR”) has frequently threatened or punished developing countries that invoked the TRIPS Agreement flexibilities.\(^{201}\) The USTR could be required to do the opposite. Several U.S. government agencies already routinely and conscientiously provide private parties with guidance concerning the permissibility of proposed courses of conduct. For example, the Internal Revenue Service issues

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199. See Bagley, supra note 183, at 498.


“private revenue rulings” to individuals or firms who want assurance concerning the tax implications of business plans, and the Federal Trade Commission indicates in advance whether specific mergers would be permissible.\(^{202}\) U.S. law could be amended to require the USTR to do something analogous when asked for guidance by a developing country.

Suppose, for example, that the government of Ghana were considering imposing a compulsory license or a “working” requirement on a COVID-19 vaccine. Prior to doing so, the government could submit a description of the plan to the USTR (and perhaps to either the WTO or the World Intellectual Property Organization) and request rulings from them concerning the permissibility of the initiative in question. The ideal response would consist of a published, reasoned analysis of the compatibility of the proposed initiative with TRIPS and other multilateral agreements. A more modest and practicable response, in light of the limited resources and authority of the USTR, would consist of a simple statement that the agency would or would not initiate proceedings to challenge the initiative. The United States would be bound by the USTR’s response, much as the IRS is bound by its “revenue rulings.”

To be sure, the creation of such a mechanism would entail a significant adjustment of the USTR’s responsibilities. For many years, the agency has staunchly defended the interests of the pharmaceutical firms based in the United States whenever they have objected to initiatives by developing countries to promote access to medicine.\(^{203}\) To provide countries good-faith determinations of whether it intended to challenge proposed initiatives, the USTR would have to change its practices and culture considerably.

The reorientation might be justified in either of two ways. First, the USTR might be persuaded to take more seriously its current statutory charge. In its own mission statement, the agency interprets that charge as follows: “American trade policy works toward opening markets throughout the world to create new opportunities and higher living standards for families, farmers, manufacturers, workers, consumers, and businesses.”\(^{204}\) This


\(^{204}\) See, Mission of the USTR, OFF. U.S. TRADE REP. (“USTR”), https://ustr.gov/about-us/about-ustr (last visited Sept. 27, 2021). The way in which the USTR describes “the benefits of trade” is consistent with this mission statement. See Benefits of Trade, USTR, https://ustr.gov/about-us/benefits-trade (last visited Sept. 27, 2021) (“Trade is critical to America’s prosperity—fueling economic growth, supporting good jobs at home, raising living standards and helping Americans provide for their families with affordable goods and services . . . . Trade expansion benefits families and businesses by: Supporting more productive, higher paying jobs in our export sectors; Expanding the variety of products for purchase by consumers and business; Encouraging investment and more rapid economic growth. Trade
statement appropriately recognizes that U.S. trade policy can and should be shaped to promote the welfare of all sectors of the population, not just businesses concerned with maximizing their export markets. As noted earlier in this article, it is not certain that increasing the ability of firms in developing countries to manufacture drugs will always directly benefit the United States, but surely the resultant improvements to public health and economic development in those countries would sometimes redound to the net benefit of U.S. residents. For example, if augmentation of local production significantly reduced the presence of substandard antibiotics in developing countries, the resulting inhibition of the development of drug-resistant strains of bacteria would be, in the long run, hugely beneficial to everyone on the planet, including U.S. residents. Similarly, the universal provision of vaccines could lead to a speedier recovery of the global economy from global pandemics, benefiting everyone, including U.S. residents, in the long run. A preclearance system of the sort proposed above would enable the agency to identify such situations and thus to provide governments and firms in developing countries clarity concerning their authority to proceed.

The second route would be more sweeping and would likely require statutory change. Arguably, the aggressive way in which the USTR has been defining U.S. trade policy since at least 1988 is no longer consistent with U.S. foreign policy as a whole. The latter certainly includes some de-
gree of attention to the welfare of the residents of the rest of the world. To consistently privilege the interests of businesses based in the United States over the health of the residents of the developing world is no longer (if it ever was) compatible with the overall aspirations of the United States as a player on the world stage. It is also inconsistent with the globalized nature of scientific research today, which is characterized by transnational networks of research institutions and systems of knowledge creation, sharing, and exploitation. Adjusting to the realities of deeply integrated R&D systems requires changes, not only in the science and technology policy of the United States, but also in its trade policy. It may well be time to amend the USTR’s charge to reduce the tension.

B. Production Triangles

In 2007, the government of Uganda catalyzed an innovative joint venture between Quality Chemicals, a local distributor with no pre-existing production capacity, and Cipla Pharmaceuticals, India’s largest generic producer. Cipla was given an equity share of 38.55 percent; Quality Chemicals was given 61.45 percent. The companies shared equally in the profits of the venture. The government underwrote the venture by guaranteeing a twenty-three percent stake (as part of Quality Chemical’s local equity) for the first plant, which was completed in 2008. The agencies responsible for the project were the Ugandan Ministry of Health and the Ugandan Investment Agency, which drew inspiration and authority from the Ugandan Drug Policy of 2002 and the Ugandan Investment Code Act of 1991.

As part of the venture, Cipla Pharmaceuticals was required not only to build the plant using the blueprints of its WHO-Good Manufacturing Practices (“WHO-GMP”) compliant plants elsewhere, but also to train all segments of the Ugandan staff—management personnel as well as scientists, chemists and engineers—over a period of five years. The deliverables specified in the agreement included: implementation of good laboratory practices, engineering for plant maintenance, information on selecting and

207. See, e.g., Policy Issues: Climate Crisis, U.S. DEP’T STATE, https://www.state.gov/policy-issues/climate-crisis/ (“Bold action to tackle the climate crisis is more urgent than ever. The record-breaking heat, floods, storms, drought, and wildfires devastating communities around the world underscore the grave risks we already face. Through our actions at home and our leadership abroad, the United States is doing its part to build a zero-carbon future that creates good jobs and ensures a healthy, livable planet for generations to come.”).

208. This section is based on the field work and survey conducted by one of the authors of this paper in Uganda during 2007, 2009, 2014 and 2020, tracing the development of this partnership. See Padmashree Gehl Sampath & Christoph Spennemann, Case Study 8: Uganda, in LOCAL PRODUCTION OF PHARMACEUTICALS AND RELATED TECHNOLOGY TRANSFER IN DEVELOPING COUNTRIES: A SERIES OF CASE STUDIES BY THE UNCTAD SECRETARIAT 261–301 (2011).

209. Id. at 266.

210. Id. at 266–68.

211. Id. at 266–67.
sourcing of raw materials, organizing supply of other inputs, and planning for contingencies in production, marketing, and distribution.\textsuperscript{212} In addition, Cipla was expected to submit dossiers for GMP compliance to the WHO, thereby enabling Quality Chemicals to compete in international bidding processes.\textsuperscript{213} Last, but not least, the Ugandan government agreed to purchase all products produced in the plant for a period of seven years.\textsuperscript{214}

A few analogous ventures are currently in the works. For example, the government of Mozambique has initiated a similar venture that includes the government of Brazil (playing the roles of sponsor and patent licensor) and a local manufacturer, Sociedade Mocambique de Medicamentos.\textsuperscript{215} But joint ventures of this sort remain highly unusual.

Such “triangular ventures” hold enormous promise for enhancing local production capacity. Their key features are:

1) An experienced pharmaceutical firm, a local manufacturer, and the government of a developing country enter into a long-term collaboration.

2) The pharmaceutical firm provides know-how, training, guidance in creating manufacturing facilities capable of producing APIs, and advice to ensure compliance with protocols established by international organizations.

3) The government provides some initial investment in the venture and, equally important, a commitment to purchase substantial quantities of the products of the venture.

4) The local firm provides management, marketing, most of the personnel and much of the financing.\textsuperscript{216}

One of the things that makes this model promising is that in many developing countries the largest purchaser of drugs is the national government.

\begin{itemize}
\item \textsuperscript{212} Id. at 267.
\item \textsuperscript{213} Id. at 283; see also Making Drugs into Profit in Uganda, BBC NEWS, April 9, 2021, https://www.bbc.com/news/world-africa-17639822.
\item \textsuperscript{214} Gehl Sampath & Spennemann, supra note 208.
\item \textsuperscript{215} See Giuliano Russo & Geoffrey Banda, Re-Thinking Pharmaceutical Production in Africa; Insights from the Analysis of the Local Manufacturing Dynamics in Mozambique and Zimbabwe, 50 STUD. COMPAR. INT’L DEV. 50 (2015). The contributions made by the Brazilian government parallel those made by Cipla in the Uganda model: “The Government of Brazil committed to providing funds for staff training and capacity building, equipment, technical assistance, raw materials, design of the factory and management.” Giuliano Russo & Geoffrey Banda, Re-Thinking Pharmaceutical Production in Africa; Insights from the Analysis of the Local Manufacturing Dynamics in Mozambique and Zimbabwe, 50 STUD. COMPAR. INT’L DEV. 258, 265 (2015). The contributions by Mozambique are even more substantial than those made by the government of Uganda: “The Government of Mozambique took responsibility to purchase the infrastructure for the factory, to undertake rehabilitation works, and for the factory’s recurrent expenditures, including local staff’s salaries, and to purchase drugs from SMM.” Id.
\item \textsuperscript{216} See Gehl Sampath & Pearman, supra note 139.
\end{itemize}
which then distributes them through the public-health system.\textsuperscript{217} The government thus has the purchasing power necessary to provide the local firm with a sufficiently large and assured market to get off the ground. To be sure, the government’s purchases are often underwritten by international donor organizations, which oversee the tender process.\textsuperscript{218} However, those agencies typically favor increasing local production and thus would not balk at arrangements like Uganda’s. Moreover, the government’s purchasing power need not be wielded profligately. An unqualified commitment to purchase unlimited quantities of drugs at whatever price the local company set would obviously be inappropriate. Benchmarks and time limits can and should be employed to avoid waste.

Crucial to the feasibility of triangular ventures is the commitment by the government to empower the local firm to manufacture APIs (in the case of drugs) or antigens and adjuvants (in the case of vaccines) by supporting the venture, and also, if possible, to participate in risk-sharing.\textsuperscript{219} As indicated above, experience has shown that the production of active ingredients of these sorts is essential to make such ventures profitable, thus minimizing and eventually eliminating the price premium that the government needs to pay for the drugs.

Of course, the details of such triangular collaborations will vary by country and product. Further experimentation as well as adjustments of ongoing projects would be necessary to determine the optimal arrangement in each jurisdiction. But triangular arrangements could go far toward boosting local production of pharmaceutical products, thereby promoting both health and prosperity in nations desperately short of both.

C. Apprenticeships

An alternative way to stimulate transfers of the kind of technological know-how that has proven to be critical to local-production initiatives would be to create an apprenticeship program. To see how this might work requires a bit of background.

In early modern Europe, the apprenticeship system emerged as a highly effective mechanism for transmitting technical knowledge. During this period, if an individual wanted to learn a skilled trade (for example, baking or

\textsuperscript{217} For example, in South Africa, the public sector provides healthcare services and medicines to almost eighty-four percent of the population. See Joanna C. Meyer, Natalie Schellack, Jacobus Stokes, Ruth Lancaster, Helene Zeeman, Douglas Defty, Brian Godman & Gavin Steel, Ongoing Initiatives to Improve the Quality and Efficiency of Medicine Use Within the Public Healthcare System in South Africa: A Preliminary Study, FRONTIERS PHARMACOLOGY, NOV. 2017.


\textsuperscript{219} See Gehl Sampath & Spennemann, supra note 208.
metalworking), he did not go to school or read a book; he became an apprentice to a master in that trade. The form of such apprenticeships varied significantly by region, but the most successful and influential variant was the model formalized (partly by law and partly by custom) in London, and then mimicked in many other English cities.\footnote{See Prak Maarten & Patrick Wallis, Apprenticeship in Early Modern Europe (Cambridge Univ. Press, 2019).} In brief, an apprentice worked for a minimum of seven years, the termination of which had to be after the apprentice turned twenty-four years old. The master provided the apprentice training, food, and housing—but usually not wages. The apprentice, in turn, provided labor—which, over the course of the apprenticeship, gradually became increasingly skilled. Masters were required to register apprenticeship indentures (that is, contracts) with city authorities. An apprentice who completed his term of service frequently set up shop on his own, became a freeman of the city, and eventually took on apprentices of his own. This system was widely used. In the sixteenth and seventeenth centuries, roughly ten percent of the population of London were apprentices, and two-thirds of adult male residents of the city had at some point served as apprentices.\footnote{See Patrick Wallis, Apprenticeship and Training in Premodern England, 68 J. ECON. Hist. 832 (2008).}

Apprenticeship during this period had several social and economic functions, including the socialization of unruly adolescents, the maintenance of class hierarchies, and, in conjunction with the guild system, limiting the supply of skilled labor and thus sustaining the prices that skilled laborers could charge. Historians continue to debate the relative importance of these functions.\footnote{See, e.g., id. at 832–33.} But on one issue there is little disagreement: The apprenticeship model proved a highly effective mechanism for preserving and transmitting technical information.\footnote{See, e.g., Stephen R. Epstein, Craft Guilds, Apprenticeship, and Technological Change in Preindustrial Europe, 58 J. ECON. Hist. 684 (1998).} After the industrial revolution, apprenticeship was displaced in most fields by other forms of technical training (or by no training at all), but it survives and indeed flourishes today in some sectors of the economy—notably, medicine in the United States (through the residency system in “teaching hospitals”); private law practice (through the “associate” system in law firms—itself a vestige of the dominant system of legal education in the eighteenth and early nineteenth centuries); boatbuilding; and in many industries in Germany.\footnote{See, e.g., Richard Heitmiller, Vinay K Gupta, Christopher J You, Apprenticeships: Preserving the Commitment in Surgical Education, 65 J. SURGICAL EDUC. 259, 259–62 (2008); Stan Grayson, The Little Engine that Could — 100 Years of Beetle Cats, WOODENBOAT, Sept.–Oct. 2020, at 24, 26–27; Lutz Raphael, Knowledge, Skills, Craft? The Skilled Worker in West German Industry and the Resilience of Vocational Training, 1970–2000, 37 GER. Hist. 359 (2019); Dietmar Harhoff & Thomas J. Kane, Is the German...}
This system could be adapted to strengthen the technical and soft skills necessary to build capacity for local drug production. Assume, plausibly, that a U.S. or European manufacturer of a new drug or vaccine refused (or was forbidden by its national government) to export any of its products to developing countries until the needs of consumers in its country of residence were fully satisfied. Without impairing the pace of production, the firm could take on, as apprentices, scientists employed by existing or prospective pharmaceutical firms in developing countries. Working alongside the firm’s managers and scientists, the apprentices would absorb crucial technical knowledge and then return to their own countries of residence to set up and run similar production facilities. They would be replaced by another cohort of apprentices, who would in turn return to their countries of origin, and so forth. In this way, firms in developing countries would gain access to the most current knowledge concerning how best to produce safe and efficacious drugs.

The feasibility of such a system is strengthened by the fact that apprenticeships have long been used effectively in German chemical and pharmaceutical firms. \(^{225}\) Increasingly, pharmaceutical firms in other countries are relying on them to train skilled workers. \(^{226}\) To be sure, the level at which the proposed program would operate is different. Instead of training technicians, the goal would be to train the scientists and managers who would be responsible for establishing and overseeing new and complex manufacturing processes. But if apprenticeship can be employed to teach advanced surgical techniques, \(^{227}\) it ought to work in teaching novel pharmaceutical manufacturing methods.

Recently, the Organization for Economic Cooperation and Development (“OECD”) has emphasized the importance for African countries to

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prioritize ways of providing African firms affordable access to technology and know-how. 228 One of the OECD’s specific recommendations is that African countries should encourage leading scientists and laboratories to participate in international research consortia and should incentivize local research centers to join international research partnerships. 229 Apprenticeship programs of the sort described above would be one way of implementing this recommendation.

Creation of a system of this sort would require three things. First, mechanisms for selecting, coordinating, and supporting the apprentices would have to be established by the governments of developing countries—in much the same way that apprenticeship was regulated by the City of London in the seventeenth century. Second, in order to avoid corroding the primary markets of the sponsoring companies, the firms in developing countries who benefitted from this model would have to commit credibly not to export drugs to developed countries, and the governments in those countries would have to back the firms’ commitment. Finally, the pharmaceutical firms would have to be persuaded to participate genuinely in the system.

The first two of these tasks would of course be the responsibility of the developing countries. Our recommendation is that they move forward on both fronts promptly. Ideally, developing countries should use the regional organizations already in place (such as the African Union) to create such systems. Not only would that be more efficient than constructing country-specific regimes, but it would also reduce the logistical challenges for the pharmaceutical firms.

The third task will likely be the hardest. There is little chance that the major pharmaceutical firms would participate in this system voluntarily. Thus far, the firms that have developed the leading COVID-19 vaccines have shown little interest in sharing any of the information or discoveries they are generating. 230 Thus, to prompt them to pass on information to scientists from the developing world, they would have to be encouraged in some way, but how?

Three possibilities seem promising. The first capitalizes on the fact that almost all of the firms in the COVID-19 vaccine race have received substantial funding from the governments of the United States or the European Union.


229. Id. at 24.

230. See Francis et al. supra note 136 and accompanying text; Stephanie Nolen & Sheryl Gay Stolberg, Pressure Grows on U.S. Companies to Share Covid Vaccine Technology, N.Y. TIMES (Nov. 9, 2021) (“Moderna accepted $2.5 billion in taxpayer money to develop its Covid-19 vaccine. But officials in the U.S. and overseas are having trouble persuading the company to license its technology.”).
The funding provided by the U.S. government has come at various times and in various forms, but in the aggregate already exceeds $9 billion USD. This amount is unprecedented, but public funding for pharmaceutical research is not; the percentage of new drugs that are fueled in part by grants from governments is large and growing. In such circumstances, the governments dispensing the grants that help sustain the research could and should insist, as a condition of acceptance, that the recipients commit to participate in the apprenticeship system described above if the research leads to new products.

Second, when developing new drugs and vaccines, private pharmaceutical firms often rely upon innovations made by government scientists. In some instances, this reliance may be sufficiently important that, to comply with patent law, the firm would be obliged to include the government scientists in the list of inventors in its patent applications. That, in turn, gives the government substantial leverage, which it could use to insist that the firms participate in the apprenticeship program.

The third possibility capitalizes on the fact that pharmaceutical firms regularly conduct clinical trials of new vaccines and therapies in developing countries. Several trials of COVID-19 vaccines are already underway in African countries. Such trials require the permission of the governments of the states in which they are conducted. It would be entirely reasonable for a government to condition its approval, not only upon a commitment by the

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235. For this suggestion, we are indebted to Professor Amy Kapczynski of Yale Law School.

firm to abide by safety requirements, as is routine, but also upon a commitment to participate in the apprenticeship program.

Fulfilling such a commitment would cost a pharmaceutical firm little. Indeed, the firm might well benefit from the insights and efforts of the apprentices. The supplies of drugs to the citizens of developed countries would in no way be impaired. And, by augmenting production capacity within developing countries, the apprenticeship system would save many lives.

D. Quality Control

One of the reasons for the disturbingly high number of falsified and substandard medicines in developing countries is that the governments of those countries have inadequate control over drug supplies. This is partly because, as we have seen, most medicines are imported into those countries, and, all too often, neither the foreign manufacturers nor the governments of the exporting countries are committed to ensuring that the products meet quality standards. A major potential benefit of an increase in local production capacity is that it would reduce reliance on substandard foreign manufacturers and create opportunities for purging developing countries of defective drugs and vaccines.

In one important respect, this benefit would be realized automatically. Currently, the introduction of substandard and falsified pharmaceutical products into the supply chains in developing countries is often triggered by stockouts—that is, exhaustion of the supply of drugs. When distributors and pharmacies are unable to meet demand for particular medicines by purchasing them through regular channels, they turn to irregular sources, which, as one might expect, contain much higher percentages of nonconforming products. Displacing imports with locally produced products will decrease the frequency of such stockouts in three ways. First, the time necessary to transport products from manufacturers to distributors and retailers will of course be shorter, thus enabling quicker responses to surges in demand. Second, local production eliminates customs barriers, where batches of drugs often languish. Finally, local producers are much more likely to prior-


itize local needs than are foreign manufacturers—and thus to ensure that scarce supplies do not end up elsewhere.

It would be a serious mistake, however, to rely entirely on these direct benefits of local production. The profits that unscrupulous suppliers can earn would remain high, and corruption in some developing countries would ensure that such suppliers could continue to ply their nefarious trade. To prevent the persistence or even exacerbation of the problem, it is essential that initiatives to augment local production be married with enhanced efforts to promote quality.

Such efforts can and should be made at three levels. First, the processes for determining which pharmaceutical products are approved for sale in each country should be improved. Second, manufacturing facilities must be built, maintained, and operated in ways that ensure their products are reliable and untainted. Finally, robust systems of post-marketing surveillance must be deployed to prevent contamination of the supply chain with falsified or poor-quality medicines. Fortunately, major initiatives on all three of these levels are already underway, but they must be amplified and adequately funded.

With respect to the drug-approval process, developing countries are increasingly recognizing, and capitalizing upon, the potential benefits of regional collaborations in creating and operating counterparts to the U.S. FDA and the European Medicines Agency (“EMA”). In Africa, for example, the African Medicines Regulations Harmonization Initiative (“AMRH”) is making good progress toward accelerating and improving the processes by which drugs are first approved for distribution. Among its results is the African Union Model Law on Medical Products Regulation, which has now been adopted in twenty-five countries.

240. See, e.g., Bate et al. supra note 52 (discussing the wide profit margin enjoyed by pill counterfeiters in the United Kingdom).


concluded in 2019 that, if fully implemented, would establish a continental African Medicines Agency analogous to the EMA. The fifteenth instrument of ratification of the African Medicines Agency Treaty was recently deposited at the African Union Commission, and the Treaty has now entered into force. It will enable considerable improvement and streamlining of the mechanisms for securing registration of new drugs in multiple jurisdictions.

With respect to manufacturing quality, although few developing countries have already established systems for bringing local manufacturing facilities into compliance with the WHO’s GMP certification requirements, several are currently creating such systems. The UNIDO has developed a “roadmap” for countries pursuing this objective, which has already been successfully implemented in Kenya and Ghana. In short, this is not an easy objective for many developing countries, but it is surely attainable.

Effective post-marketing surveillance systems have proven to be harder to implement, in part because of the ingenuity that unscrupulous counterfeiters have shown in circumventing systems for detecting their wares. But technologies are now available that, in combination, enable inspectors


246. See Kay Weyer, A Stepwise Approach for Pharmaceutical Companies in Developing Countries to Attain Who Gmp Standards, 30 WHO DRUG INFO. 186 (2016); UNIDO, A Stepwise Approach for Pharmaceutical Companies in Developing Countries to Attain Who Gmp Standards (White Paper on UNIDO’s GMP Roadmap Concept, 2015).

to identify substandard or falsified medicines at any point in the distribution chain. The most promising varieties are listed below:

(a) Some technologies facilitate tracking of products from the moment they leave the manufacturers until they are delivered to patients. Comprehensive systems of this type are now in use—or in the process of deployment—in the United States, the European Union, China, India, Brazil, and a few other countries. With sufficient funding, such systems could be deployed in developing countries.

(b) A second group of technologies does not rely on tracking, but instead uses visible or “scratchable” codes embedded in the drugs’ packaging to enable consumers to verify the authenticity of pills. The purchaser of a packet uses his or her cell phone to transmit the associated code to the manufacturer and receives, in response, a text message indicating whether its contents are authentic. Systems of this sort include Sproxil (developed in Nigeria) and Pharmsecure (developed in Nigeria and India).

(c) A third set of technologies relies upon testing the chemical composition of medicines at various points in the distribution chain. They include:

1. High-performance liquid chromatography ("HPLC") testing of samples in laboratories that have been qualified by the WHO to conduct such testing;

2. The “MiniLab,” developed in the 1980s by the Global Pharma Health Fund (and subsequently updated periodically), which makes possible analogous testing in the field.


249. See Rasheed et al., supra note 251, at 3; Matthew Wall, Counterfeit Drugs: “People Are Dying Every Day,” BBC NEWS, September 26, 2016.


251. See, e.g., Ifeyinwa Fadeyi, Mirza Lalani, Naiela Mailk, Albert Van Wyk & Harparkash Kaur, Quality of the Antibiotics—Amoxicillin and Co-Trimoxazole from Ghana, Nigeria, and the United Kingdom, 92 AM. J. TROPICAL MED. HYGIENE 87 (2015) (comparing HPLC testing and the MiniLab); Stephanie Kovacs, Stephen E. Hawes, Stephen N. Maley, Emily Mosites, Ling Wong & Andy Stergachis, Technologies for Detecting Falsified and
Systems that use a combination of portable scanners (relying on Raman, near-infrared, or Fourier-transform Infrared (“FTIR”) spectroscopy) and portable digital libraries (containing the spectral profiles of authenticated drugs) to determine, in the field, whether pills contain the ingredients they purport to contain. Examples of initiatives of this sort include the Southern African Quality Assurance Network (“SAQAN”) (a non-profit venture with initial deployments in Namibia and Malawi) and RxAll (a for-profit venture with initial deployments in five other African countries).

Systems of the first two types dovetail with patent and trademark law. In other words, they facilitate detection of pills that have been produced or distributed by companies lacking legal rights to do so. They are thus dependent upon quality-control measures (of the sort discussed above) that the authorized manufacturers employ. Systems of the third type instead determine whether tested medicines have the right amount of active ingredients (and are uncontaminated by unwanted substances) regardless of whether they have been lawfully manufactured. In most instances, the two systems will lead to the same results, but not always.

The various mechanisms currently available have features that may prove more useful in some countries than in others, depending on local factors, including the number and capacity of testing labs available, level of coordination across the responsible government agencies, expertise of testing staff, quality of telecommunications networks, transportation, and access to hospitals where drugs are distributed to patients. Regardless of the comparative advantages of any system, the point is that some reliable system of post-market surveillance is essential if the benefits of local production of pharmaceutical products are to be fully realized.

E. Regional Organizations and Economic Communities

The final strategy we propose to support local production of pharmaceutical products leverages existing but under-utilized regional frameworks to address legal and economic considerations necessary to strengthen the institutional environment in which local producers operate.


Regional integration has long been a significant feature of the international economic order. Starting with European regionalism in the 1958 Treaty of Rome, which established the European Economic Community, regionalism has gradually intensified and today is deeply entrenched in the multilateral trade system. Indeed, the idea of regional integration was codified in the General Agreement on Tariffs and Trade (“GATT”), which noted explicitly the “desirability of increasing freedom of trade by the development, through voluntary agreements, of closer integration between the economies of the countries parties to such agreements.”

The abiding interest in closer trade integration and liberalization has fueled sub-regional coalitions of countries politically committed to tackling economic development challenges. For many developing and least-developed countries, the formation of such regional economic communities (“RECs”) was a strategic response to overwhelming development challenges that individual countries lacked resources and capacity to address. The first U.N. Economic Commission for Africa (“ECA”) study on regional integration identified a number of benefits from regional integration, including increased foreign and domestic investment; increased global competitiveness; promotion of regional public goods; prevention of conflict; consolidation of economic and political reform and economies of scale. These benefits, and the effectiveness of the regional institutions that support the integration process generally, offer important benefits with respect to local pharmaceutical production.

The treaties that establish RECs are especially complex (and, for our purposes, important) in sub-Saharan Africa, which boasts several regional communities, including the leading South African Development Community (“SADC”) and the Economic Community of West African States (“ECOWAS”) with different purposes and overlapping memberships. Without much exception, however, all RECs anticipate deeper regional integration and are largely justified by concerns relating to overcoming major constraints to competitiveness such as economies of scale in production, achieving leverage in global fora, and enhancing mutual benefit from improved growth and development. These considerations are strongly aligned with the rationale for local pharmaceutical production.

Five aspects of the RECs can be employed to increase the feasibility of enhancing local production of pharmaceutical products. The first and most obvious is scale. Not all developing countries are large enough to support commercially viable pharmaceutical manufacturing firms selling products (directly or indirectly) to domestic consumers. If they are to participate in the initiatives set forth above, they must be combined into groups that enable economies of scale. The RECs provide ready-made combinations of this

The populations (in millions) encompassed by the principal developing-country regional communities are set forth below:\footnote{255}{Uwe Miesner, Contributions of Quality Infrastructure to Regional Economic Integration: Insights and Experience Gained from Technical Cooperation of PTB 1, at 8 fig. 2 (Physikalisch-Technische Bundesanstalt Discussion Paper, Paper No. 2, 2009). For a comprehensive list of regional trade agreements, see Regional Trade Agreements Database, WTO, http://rtais.wto.org/UI/PublicAllRTAList.aspx (last visited Oct. 21, 2021).}

<table>
<thead>
<tr>
<th>REC</th>
<th>Population in Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andean Community (South America)</td>
<td>98</td>
</tr>
<tr>
<td>MERCOSUR (South America)</td>
<td>284</td>
</tr>
<tr>
<td>CARICOM (Caribbean)</td>
<td>18</td>
</tr>
<tr>
<td>UMA (North Africa)</td>
<td>102</td>
</tr>
<tr>
<td>ECOWAS (West Africa)</td>
<td>349</td>
</tr>
<tr>
<td>ECCAS (Centre Africa)</td>
<td>121</td>
</tr>
<tr>
<td>COMESA (Southeast Africa)</td>
<td>390</td>
</tr>
<tr>
<td>EAC (East Africa)</td>
<td>177</td>
</tr>
<tr>
<td>SADC (South Africa)</td>
<td>345</td>
</tr>
<tr>
<td>GCC (Middle East)</td>
<td>54</td>
</tr>
<tr>
<td>SAARC (South Asia)</td>
<td>1713</td>
</tr>
<tr>
<td>ASEAN (Southeast Asia)</td>
<td>647</td>
</tr>
</tbody>
</table>

With the possible exception of the Caribbean Community ("CARICOM") and the Gulf Cooperation Council ("GCC"), all of these are sufficiently large to sustain vibrant and efficient regional pharmaceutical industries.

Second, precisely because the RECs are regional in nature, the member countries of the RECs typically have similar disease footprints and thus need similar portfolios of drugs.

Third, freedom of trading within these blocs means that shipments of goods can move easily and quickly from a manufacturer in one member country to distributors and consumers in other member countries.

Fourth, many of the agreements underlying the RECs provide explicitly for cooperation in health matters and thus create legal frameworks that local firms can exploit. For example, article 110(1)(b) of the Treaty Establishing the Common Market for Eastern and Southern Africa ("COMESA") requires that member states cooperate in health “through the facilitation of movement of pharmaceuticals within the Common Market and control of their quality.”\footnote{256}{Treaty Establishing the Common Market for Eastern and Southern Africa art. 110(1)(b), Nov. 5, 1993, 2314 U.N.T.S. 265.} COMESA member states undertake to, among other things:

i) devise and implement systems to ensure that pharmaceuticals entering the Common Market from third countries, produced in the
Common Market or moving within the Common Market conform to internationally acceptable standards in terms of quality and therapeutic value;

ii) develop a national drug policy that would include establishing quality control capacities, national formularies and good procurement practices;

iii) harmonize drug registration procedures to achieve good control of pharmaceutical standards without impeding or obstructing the movement of pharmaceuticals within the Common Market;

iv) accord each other mutual recognition of drugs registered in the Common Market;

v) co-operate, within the framework of co-operation in industrial development, in the local production of pharmaceutical products; and

vi) establish an audit team to assist local pharmaceutical industries in producing high quality products that are safe, effective, and free from harmful side effects, and to assist the Member States in controlling the standards of pharmaceuticals manufactured within their territories in conformity with the WHO Certification.  

Similarly, article 29 of the SADC requires that parties cooperate and assist one another in “(a) harmonization of procedures of pharmaceuticals, quality assurances and registration; (b) production, procurement and distribution of affordable essential drugs; (c) development and strengthening of an Essential Drugs Programme and the promotion of the rational use of drugs; [and] (d) development of mechanisms for quality assurances in the supply and conveyances of vaccines, blood and blood products.”

In the ECOWAS region, the West African Health Organization (“WAHO”) is responsible for leading the harmonization of health policies, pooling resources, and strengthening cooperation to address health-related challenges in the subregion. Like SADC and COMESA, ECOWAS adopted a Protocol to establish WAHO that gave the institution a broad policy mandate to address health matters on a regional basis.

257. *Id.* art. 110(2).
259. See *Who We Are*, W. Afr. Health Org., https://www.wafoas.org/web-ooas/en/who-we-are (last visited Sept. 18, 2021) (“Article III of the Protocol establishing WAHO stipulates that ‘the objective of the West African Health Organisation shall be the attainment of the highest possible standard and protection of health of the peoples in the sub-region through the harmonisation of the policies of the Member States, pooling of resources, and cooperation with one another and with others for a collective and strategic combat against the health problems of the sub-region.’”).
These provisions and associated regional institutions establish clear authority for policymaking and a legal framework that would enhance the viability of local pharmaceutical production, including prospects to address many of the dimensions of the initiatives described in Parts II and III of this article.

Some RECs have already experimented with stronger regional commitments to address access to pharmaceutical products. For example, a SADC Pharmaceutical Business Plan was published in 2007 with the overall goal of reducing the disease burden in the region by enhancing sustainable availability and access to affordable, safe, and efficacious essential medicines. To achieve these targets, SADC identified several strategies aligned with the region’s Protocol on Health: harmonizing standard treatment guidelines and essential medicine lists; strengthening regulatory capacity, supply, and distribution of basic pharmaceutical products through ensuring a fully functional regulatory authority with an adequate enforcement infrastructure; promoting joint procurement of therapeutically beneficial medicines of acceptable safety, proven efficacy, and quality to the people who need them most, at affordable prices; and facilitating trade in pharmaceuticals within SADC. Although implementation is slow and progress on the goals is difficult to monitor, the Pharmaceutical Business Plan provides an institutional platform on which the political commitments of states to local production of pharmaceuticals can be sustained and strengthened over time. Such action-oriented frameworks also offer important context to justify new legal or regulatory tools necessary to deploy strategic initiatives in response to public-health challenges in the region.

Even absent formal provisions specific to health or medicines, regional organizations may operate under more general provisions concerning free movement of goods, security, or human welfare to undertake initiatives to support local production along one of the dimensions we have described. For example, under the general purpose of eliminating technical barriers to trade, the Association of Southeast Asian Nations (“ASEAN”) Pharmaceutical Product Working Group (“PPWG”) was established by the ASEAN Consultative Committee for Standards and Quality (“ACCSQ”) with the objective of harmonizing pharmaceutical regulations of ASEAN member countries. The PPWG’s purpose is to develop a harmonization scheme for pharmaceutical regulation to ensure the safety and efficacy of pharmaceutical products in the ASEAN market. In March 2006, the harmonization of labelling standards for pharmaceutical/medicinal products in the ASEAN market. In March 2006, the harmonization of labelling standards for pharmaceutical/medicinal products in the ASEAN

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region was achieved. The work of harmonizing pharmaceutical regulations in ASEAN member states is ongoing.

Similarly, within CARICOM, the Council for Trade and Economic Development (“COTED”) has the responsibility for establishing standardization programs under the Treaty. On this basis, COTED has endorsed a roadmap for the implementation of the Caribbean Regulatory System for Medicines (“CRS”), which includes programs on the harmonization of standards and technical regulations for medicines and pharmaceutical products.

On the opposite page is a chart comparing the provisions of select regional organizations and economic communities that could support local manufacture of pharmaceutical products. It suggests that most RECs are already well positioned with the requisite legal and policymaking authority to launch and support local production initiatives.


## FEATURES IN SELECT RECS TO ENHANCE LOCAL PRODUCTION

<table>
<thead>
<tr>
<th>REC</th>
<th>Free movement of goods</th>
<th>Harmonization of medicines regulation</th>
<th>Pooled Procurement of medicines</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEAN</td>
<td>✓</td>
<td>✓ (Harmonization of labelling standards for pharmaceutical/medicinal products achieved.)</td>
<td>×</td>
</tr>
<tr>
<td>CARICOM</td>
<td>✓</td>
<td>✓ (Caribbean Regulatory System for Medicines (CRS) which seeks, <em>inter alia</em>, to harmonize regulations for medicines and pharmaceuticals.)</td>
<td>✓</td>
</tr>
<tr>
<td>COMESA</td>
<td>✓</td>
<td>✓ (Specifically, for medicines registration.)</td>
<td>×</td>
</tr>
<tr>
<td>ECOWAS</td>
<td>✓</td>
<td>✓ (Provides generally for harmonization of standards and measures.)</td>
<td>✓ (WAHO reportedly is developing a Regional Drug Revolving Fund (DRF) for pooled procurement of essential medicines in ECOWAS.)</td>
</tr>
</tbody>
</table>

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Finally, most of these regional organizations already have in place governance systems that could be employed to prevent paralyzing struggles among member countries concerning where pharmaceutical manufacturing plants will be located, which courts will have jurisdiction over the firms (particularly for triangular agreements), and which regulations are applicable.\textsuperscript{267} In their efforts to combat the COVID-19 pandemic, the institutions responsible for the implementation of regional integration agreements have already demonstrated impressive capacity to draw on the authority provided in the relevant treaties and protocols to accomplish novel things such as standardization and deployment of common technology platforms needed to secure public trust in testing data, coordination of pooled procurement of diagnostics and other medical products, and establishment of regional lab-referral networks to assist the poorest countries that lack diagnostic capacity.\textsuperscript{268}

In sum, in parts of the developing world, there exist large differences between countries’ infrastructure, human capital, and security. These differences impede countries from relocating their pharmaceutical manufacturing capacity; therefore, organizing regional initiatives would be especially promising to remedy these issues. Even in areas (such as the South Asian Association for Regional Cooperation (“SAARC”)) where individual countries are large enough on their own to sustain local industries, regional initiatives may still offer advantages such as possible manufacturing complementarity between nations and common trading tariffs.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
MERCUSOR & ✓ & × \\
\hline
SADC & ✓ & ✓ \\
\hline
\end{tabular}
\caption{Regional Initiatives for Pharmaceutical Manufacturing}
\end{table}


\textsuperscript{268} See Africa’s Response to COVID-19, supra note 231, at 21.
CONCLUSION

In combination, the recent emergence of new infectious diseases, the associated surge of healthcare nationalism, and the prevalence of falsified and substandard drugs have strengthened substantially the net benefits of augmenting the capacity of developing countries to produce pharmaceutical products locally. Most previous efforts to do so have foundered. The chance of success in the future would be maximized by the adoption of five strategies: (a) clearing the legal space to ensure that local firms have the freedom to operate; (b) using “production triangles” (collaborations among developing-country governments, local firms, and developed-country pharmaceutical firms) to reduce regulatory impediments and to ensure that there exist adequate markets for locally produced products; (c) building the human capital base in developing countries through initiatives such as an international apprenticeship system to facilitate the acquisition by local firms of crucial technological know-how; (d) strengthening the legal and administrative apparatus for preventing the dissemination in developing countries of substandard and falsified drugs; and (e) relying on regional economic communities to create economies of scale and to ensure that medicines are made available to all residents of all developing countries, while also stimulating competition among networks of local firms. Initiatives that incorporated these recommendations could both save many lives and catalyze economic development in the Global South.