



Here's how to get billions of COVID-19 vaccine doses to the world

Chad P. Bown

Peterson Institute for International Economics

Thomas J. Bollyky

Council on Foreign Relations

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Problems

- There are too few doses of COVID-19 vaccines being manufactured to meet global needs
- Countries are not cooperating to scale up production
 - They are also imposing (explicit or implicit) export restrictions
 - They are also not allocating doses according to global public health

Solution

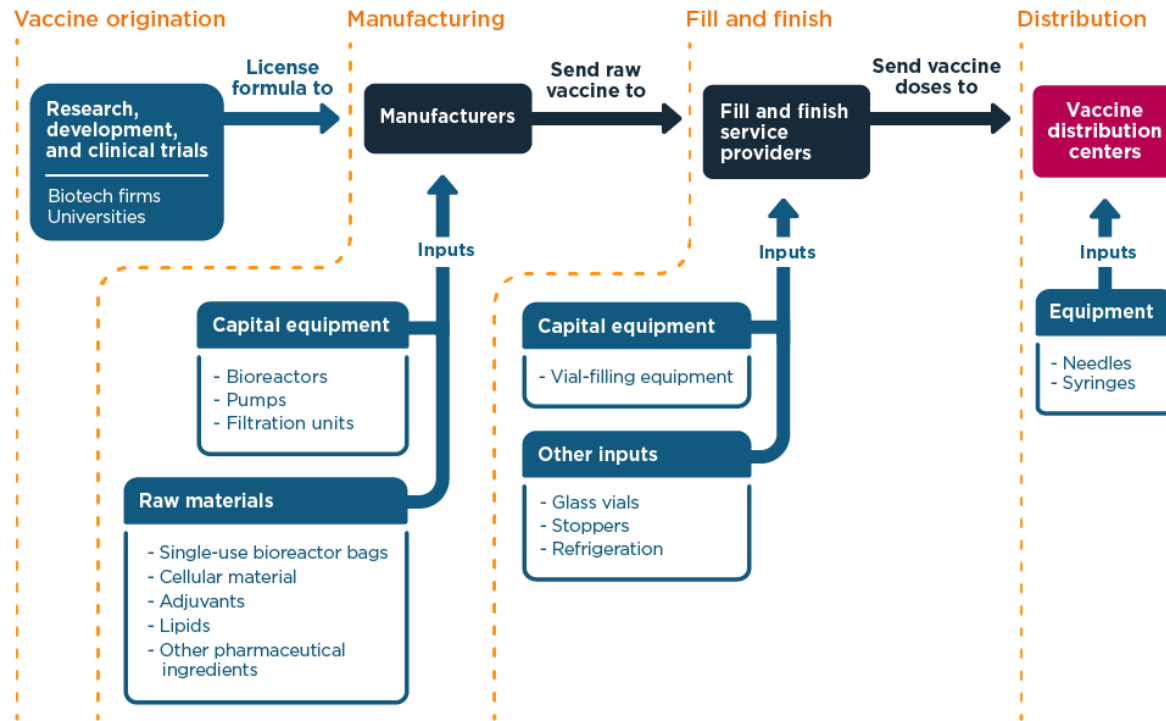
- COVID-19 Vaccine Investment and Trade Agreement (CVITA)

Vaccine Manufacturing: Fragmentation



Vaccine manufacturing is a multi-stage process that often requires extensive collaboration

The stages of vaccine development and manufacturing



Note: Select stages and inputs depicted illustrate general vaccine production process and are not comprehensive.

Source: Constructed by the authors.

How the United States scaled up so quickly: Operation Warp Speed and Defense Production Act



US federal subsidies or contracts to COVID-19 vaccine supply chain, 2020 through March 12, 2021

Company	Amount	Date	Task
Vaccine sponsors			
Johnson & Johnson (Janssen)	\$21 million	February 11, 2020	Support nonclinical studies and a Phase 1 clinical trial
	\$4.36 million	March 27, 2020	Amendment
	\$1 billion	August 5, 2020	Demonstrate large-scale manufacturing, 100 million doses
	\$85 million	August 21, 2020	(Unknown)
	\$454 million	November 13, 2020	Amendment, funding for Phase 3 clinical trial
Sanofi and GSK	\$31 million	April 10, 2020	Accelerate nonclinical studies and a Phase 1 clinical trial
	\$2.04 billion	July 30, 2020	Phase 3 clinical trial, manufacturing demonstration project
Merck and IAVI	\$38 million	April 15, 2020	Accelerate development of vaccine candidate
Moderna	\$430 million	April 16, 2020	Accelerate development of vaccine candidate
	\$53 million	May 24, 2020	Expand manufacturing capacity
	\$472 million	July 25, 2020	Support Phase 3 clinical trial
	\$1.53 billion	August 11, 2020	Support Lonza's manufacturing, 100 million doses
	\$1.67 billion	December 11, 2020	100 million doses
Novavax	\$1.75 billion	February 11, 2021	100 million doses
	\$60 million	June 4, 2020	Manufacturing components for use in Phase 2/3 clinical trial
	\$1.60 billion	July 6, 2020	Demonstrate commercial-scale manufacturing
Pfizer (BioNTech)	\$1.95 billion	July 21, 2020	100 million doses
	\$2.01 billion	December 22, 2020	100 million doses, option for 400 million more
	\$2.01 billion	February 11, 2021	100 million doses
AstraZeneca (Oxford)	\$1.6 billion	October 28, 2020	Accelerate development and manufacturing to begin Phase 3 clinical trial

Contract manufacturers

Emergent Biosolutions	\$628 million	May 30, 2020	Contract manufacture, fill and finish
	\$20 million	August 6, 2020	
Fujifilm Diosynth Biotechnologies (Texas A&M University)	\$265 million	July 24, 2020	Contract manufacture
Grand River Aseptic Manufacturing (GRAM)	\$161 million	August 6, 2020	Fill and finish, including for Johnson & Johnson's vaccine
Ology Bio	\$106 million	August 17, 2020	Fill and finish
Merck	\$269 million	March 2, 2021	Produce drug substance, formulate and fill vials of Johnson & Johnson's vaccine

Equipment and other input suppliers

SiO2 Materials Science	\$143 million	June 5, 2020	Glass tubing and vials
Corning	\$204 million	June 5, 2020	Glass tubing and vials
Becton, Dickinson and Co.	\$42 million	July 1, 2020	Syringes and needles
Retractable Technologies	\$54 million	July 1, 2020	Syringes and needles
Smiths Medical	\$21 million	July 11, 2020	Syringes and needles
Cytiva	\$31 million	October 13, 2020	Cellular material, mixer bags, and bioreactors
ApiJect Systems	\$590 million ^a	November 19, 2020	Prefilled, single-dose injectors

a. Loan to finance 75 percent of the project's capital costs.

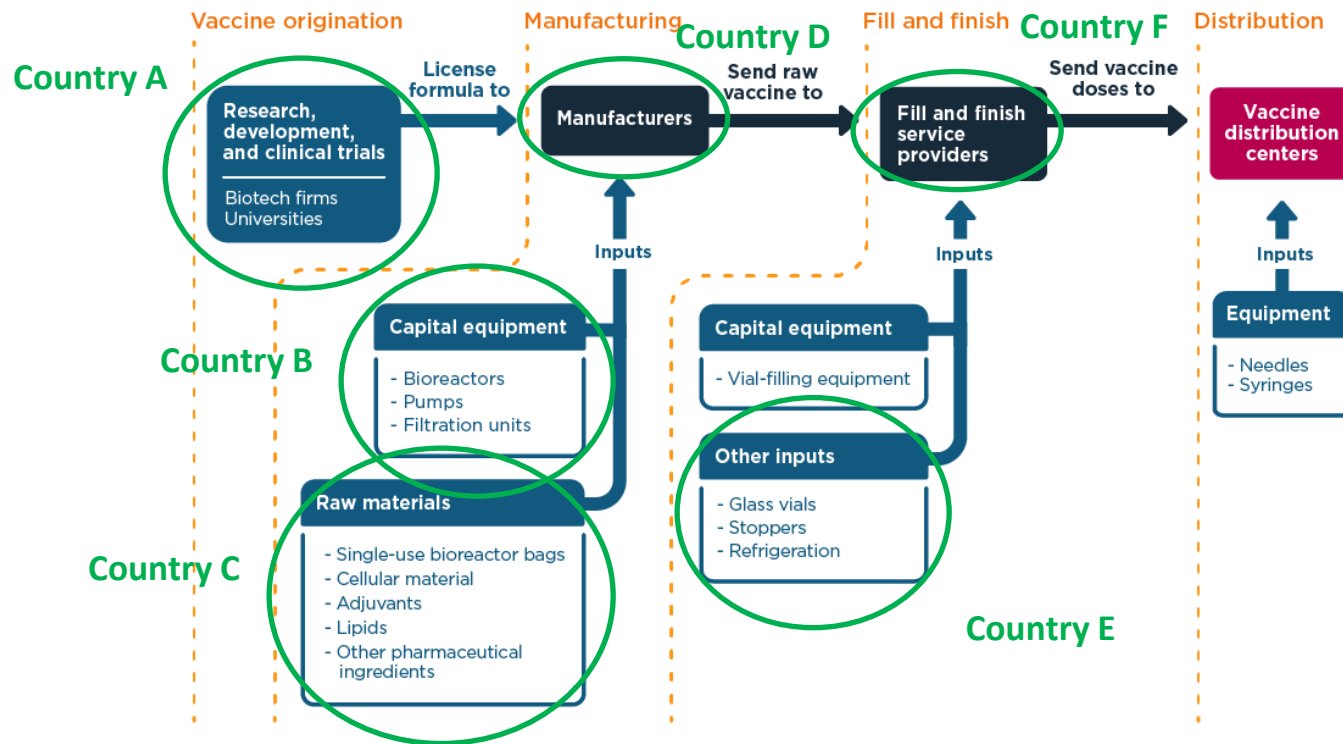
Sources: Compiled by the authors from Biomedical Advanced Research and Development Authority, 2021, BARDA's Rapidly Expanding COVID-19 Medical Countermeasure Portfolio □ and BARDA's COVID-19 Domestic Manufacturing & Infrastructure Investments □; Novavax □; Merck □; □ GRAM □; and US International Development Finance Corporation □.

Complications when *fragmentation* crosses borders



Vaccine manufacturing is a multi-stage process that often requires extensive collaboration

The stages of vaccine development and manufacturing



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Source: Constructed by the authors.

How to scale out globally when fragmentation also crosses borders?



Policy Implications

1. Each country needs to subsidize its part of the supply chain to address the global externality
2. Without coordination/cooperation, everyone subsidizes too little

Practical challenges

1. Fear of noncooperation (e.g., export restrictions) on vaccine *output* leads to too little subsidization of vaccine *inputs*
2. Separately, some vaccine input countries may be *fiscally constrained* and unable to subsidize

Proposal: COVID-19 Vaccine Investment and Trade Agreement (CVITA)



Five principles

1. **Leverage COVAX** – distribute based on global public health (attack externality at its source)
2. **Investment:** coordinate (and fund) subsidies across the full supply chain
3. **Enforcement:** make explicit that export restrictions on vaccine output will be met with (joint) limits on vaccine inputs
4. **Transparency:** AMIS-like information on availability of vaccine inputs and outputs
5. **Administrator:** one part general contractor (DPA/OWS), one part ombudsperson (resolve frictions)



References

- Bown, Chad P. and Thomas J. Bollyky. 2021. [Here's how to get billions of COVID-19 vaccine doses to the world.](#) *PIIE Trade and Investment Policy Watch*, March 18.
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- Bollyky, Thomas J. and Chad P. Bown. 2020. [The Tragedy of Vaccine Nationalism: Only Cooperation Can End the Pandemic.](#) *Foreign Affairs* v99, n5 (September/October): 96-109.