# Economics of vaccines

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**COVID-19 brought the world to its knees. The Covid vaccine has been the most sought-after product. However, as governments around the world rush to vaccinate their citizens, some aspects need deliberation and clarity. For instance, what explains the short supply of vaccines? And there's the lesser discussed (but very important) aspect of non-production of vaccines in Pakistan.**

A lot of what is taking place has economics at its core. First, the all-important question of vaccine supply. Despite the significant price incentive at present, why can't pharma companies ramp up production to address the huge supply-demand gap?

Vaccine production is a complex process. It requires research worth millions of dollars. Then there is the need to set up production facilities to precise specifications (eg stainless steel bio-reactors), arrange for needed raw materials (tubing, plastic bags, etc), and finding relevant human capital. In short, it's an expensive endeavour, which won't be undertaken unless the right incentives are in place. Even with all the facilities, ramping up production in the short run is very difficult because certain requirements can be difficult to meet.

Two recent examples illustrate this well. The Serum Institute of India (SII), which is the world's largest vaccine producer, hurriedly set up a new facility last year to increase production, but it caught fire. Similarly, Moderna had to discontinue production at a facility in Belgium because it couldn't meet the quality criteria.

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Supply constraints are another factor. The head of SII recently complained of the US ban on raw material exports (such as specialised bags, which the US wants to be available for domestic production first, aka 'vaccine nationalism'). There are other raw material shortages too (cell

culture media, single-use tubing, specialised chemicals, etc) because every supplier wants these to be present for domestic production given that it's difficult to meet added demand in the short run.

Another way to ramp up production would be for firms with underutilised infrastructure to share facilities with vaccine-producing firms. Two main issues emerge here: firms would be reluctant to share vaccine formulation (it is expensive intellectual property acquired after substantial investment) and facilities may not be of the same quality.

Briefly, pushing present infrastructure to produce more can have negative repercussions, which explains, to a great extent, why there's a substantial difference between the supply and demand of vaccines.

An important aspect is the funding of vaccines by governments. The US, for example, has been funding vaccine research since the 1960s. The mRNA technology (used in Moderna and Pfizer vaccines) came about, partly, due to $150 million grant to pharma firms by the Obama administration. Similarly, Russian Sputnik vaccine research was financially supported by Moscow's health agency.

Why publicly fund research into vaccines? As Covid-19 and historic episodes like the Spanish flu and bubonic plague ('black death') aptly demonstrated, viruses have the potential to bring the world to its knees, causing massive financial and economic losses plus utter misery. It is perfectly sensible and logical to pre-empt such a catastrophe. Since viruses also mutate over time, it requires constant research plus investment in infrastructure, which in turn requires extensive financial resources. Pharma firms will only be willing to devote the required resources if there is a good demand for vaccines. In a manner of speaking, government support ameliorates fears of investment going to waste. It's a win-win situation for both the industry and government: companies get much-needed financial support to lessen uncertainty, while the government gets the vaccines it requires for public welfare.

Now we come to another very important topic. In Pakistan, not a single vaccine of any kind is being produced despite over 700 pharma firms. Why is there no domestically produced vaccine, or even a semblance of an effort to produce it? In our immediate neighbourhood, India has the world's leading producers such as SII (Oxford-AstraZeneca vaccine — known locally as Covishield — and Covaxin), Bharat BioTec (Covaxin, CoraVax), Biological E (Johnson & Johnson), Zydus Cadila (ZyCov-D), Hetero BioPharma (Sputnik V) and Dr Reddy's Lab (Sputnik V). SII, aside from providing millions of Covid-19 doses within India, is in commercially contracted to providing 900 million doses of AstraZeneca vaccine and 145m doses of Novavax globally. While exports are held up at the moment, imagine the scale of

Indian vaccine production with the local authorities aiming to administer 600m doses within seven months, meaning about 85m doses a month.

As stated, pharma firms are incentivised to take up vaccine and drug research through public financial support. Contrast this to Pakistan's predicament, where the pharma industry is being charged tax in the name of 'research' (the Central Research Fund or CRF) since 1976, equivalent to one per cent of its gross sales. Put another way, the government's message to the industry is: leave research to us and just pay for it. While the industry has obliged, the government has utterly failed. There is little or zero research to show for. Where did all that money since 1976 go? Officials remain tightlipped. What we do know is that there is not a single FDA-approved lab (international gold standard) nor any international-level infrastructure established through public expense.

The CRF is only one example of adverse regulations that dis-incentivises research. For example, successive governments have been obsessed with regulated drug prices that have led to many adverse outcomes (Indian government did away with this fascination in the 1980s, following which the industry really took off). Imagine that from 2001-2013, drug prices were 'frozen' while production costs went through the roof. Since that time, the shortage of critical drugs has become a regular feature and many leading multinational firms have packed up and left Pakistan. Similarly, India is earning $34 billion from 'toll manufacturing' in the pharma industry, while our government doesn't allow it, or only to a limited extent.

Thus, to put it briefly, there is complete absence of right incentives to produce vaccines in Pakistan. Given what the world and Pakistan has been through, likely effects of any future pandemic, and the adverse outcomes of our regulations, it's time to get our policies right in terms of pharmaceutical industry.

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