



# Innovation incentives in a pandemic

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The current pandemic has exposed the skewed nature of innovation incentives in American healthcare. Consider the case of a company that makes a medical device like a ventilator. The demands of its customers shape its incentives to innovate. The end consumers are patients who do not themselves pay for the device, whether they are insured or not (an uninsured patient is likely to receive free care or a large discount). The device maker will not increase sales to these customers by choosing a lower price. Purchase decision-makers are often physicians who are unaware of the price of the device (and regulations in the USA prevent the salesperson from telling the doctor the price, as that would be an inappropriate inducement). What will get the physician's attention—and can be easily marketed—is additional quality or features of the device. These will also appeal to technicians or skilled nurses who work with the device; they are not responsible for budgets either. The fancy features might involve more convenience in terms of connecting inputs or positioning the patient, a better screen for observing measurements and settings, a greater choice of settings for pressure, oxygen, drug levels, and so forth. The hospital purchasing department may have some input into which device is chosen—and advocate for cost-effective choices—but at the end of the day, if a physician is convinced a device will provide better care, that device is likely to be chosen regardless of price. Therefore, the device manufacturer is incentivized to invent it.

These incremental quality improvements to the device may hold value for patients and caregivers, but the US medical purchasing process often has so many decision makers spending other people's money that there is no reason to imagine that price is tightly connected to value. A consumer spending her own money on a product she consumes herself, for example, a loaf of bread, sees the nicer bag around the bread and can determine if that is worth a 10 percent price increase. A physician in a hospital is likely to ask if the new feature is an improvement or not, and then want to purchase the device if it has an improvement. Price may not part of that decision. The physician likely does not know how much the device costs, is not spending her own money, and understands that she is not spending her insured patients' money either. Therefore, the manufacturer markets the improved features to physicians, as

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do its competitors, and competition takes place almost entirely on the basis of quality. This leads to expensive machines that have high levels of quality without regard for whether the value of those last units of quality is high for everyone, for a minority of patients, or for no patients.

In the absence of disruptive technology, a better device requires higher costs. In the world described above, the device maker only undertakes one kind of innovation: an improved machine at a higher cost. Over time, ventilators go from \$7000 per machine to \$10,000, to \$25,000. Suppose a 'standard' ventilator has a price of \$25,000. A manufacturer with an idea for how to make a \$10,000 ventilator that is a very little bit worse than the \$25,000 ventilator will have no customers. What physician would recommend purchasing the cheaper machine without all the settings and options of the best machine? Consider how different that is from a more functional market such as automobiles. Suppose a new auto maker found a way to make a BMW equivalent car but without the leather seats at half the price. There would likely be a huge demand for that vehicle.

Now change the setting to a pandemic where we suddenly need many more ventilators that can be manufactured quickly. Suppose that without a ventilator, large numbers of patients will die. The need for all the options and settings may suddenly be secondary if any kind of functional ventilator is better than none. Moreover, due to the COVID pandemic, the Food and Drug Administration (FDA) is ready to approve a ventilator that is inferior to existing machines on the market if it can be provided quickly.<sup>1</sup> In fact, teams from MIT and other institutions came up with inexpensive ventilator designs in a matter of weeks.<sup>2</sup> One might ask why the private sector could not, or did not, achieve this. One answer is the incentive system above did not leave private sector device makers with the right capabilities or incentives. Dollar margins are typically lower on cheaper and simpler products. A private company's design team is used to creating products that are better and cost more; its engineers are used to being able to procure custom parts from abroad; its marketing team is accustomed to selling a product that is better than the last one; its manufacturing is not designed for speed or with the ability to quickly scale up by a factor of three. The fact that we now know it is possible to make a useful ventilator for a fraction of the cost of 'standard' ventilators is exciting and may cause some hospitals to adjust their mix of machine quality after the crisis.

- 1 Food and Drug Administration, 'Enforcement Policy for Ventilators and Accessories and Other Respiratory Devices During the Coronavirus Disease 2019 (COVID-19)' (2020) <<https://www.fda.gov/media/136318/download>> accessed 15 April 2020.
- 2 MIT Emergency Ventilator Project ('E-Vent') Project webpage: <<https://e-vent.mit.edu/>> accessed 15 April 2020. James Temple, 'Can Low-cost, Open-source Ventilator Designs Help Save Lives?' *MIT Technology Review* (2020) <<https://www.technologyreview.com/2020/03/25/950336/an-mit-team-hopes-to-publish-open-source-designs-for-a-low-cost-ventilator/>> accessed 15 April 2020; Alexandra Sternlicht, 'There's a Shortage of Ventilators for Coronavirus Patients, So This International Group Invented an Open Source Alternative That's Being Tested Next Week' (*Forbes*, 2020) <<https://www.forbes.com/sites/alexandrasternlicht/2020/03/18/theres-a-shortage-of-ventilators-for-coronavirus-patients-so-this-international-group-invented-an-open-source-alternative-thats-being-tested-next-week/#5ea796063ba0>> accessed 15 April 2020; Yale team develops multi-patient ventilator, available at: <<https://seas.yale.edu/news-events/news/urgent-need-researchers-develop-multi-patient-ventilators>> accessed 15 April 2020.

Another element of innovation that is widely recognized within the economics profession, especially inside business schools, but is often missing from antitrust analysis of innovation, is the role of strategy. The device makers described above have a strategy of high cost & high quality. Their legal departments are stuffed with intellectual property (IP) lawyers to protect their innovations. Their workers are high skill and their factories filled with sophisticated equipment in order to make all the complex parts in the ventilator. For decades, their salespeople have visited physician offices, paid physicians to deliver educational lectures, brought lunches to nurses, offered free swag to technicians—all in the pursuit of developing relationships with decision makers and a strong brand name. The relationships support high prices. Suppose that Covidien, a maker of ventilators, had such a strategy. Newport, as reported by *The New York Times*, was working with the Department of Health and Human Services (HHS) to develop a cheaper (and likely simpler) ventilator.<sup>3</sup> The engineers at the Newport start-up must have had a disruptive idea. The founders of the start-up knew they were heading down a different path than was typical in their industry, and they hired engineers to work on the project who were excited about that vision. They likely had no marketing department at all. The head of the project must have developed a plan for finding demand (in addition to HHS) for a cheaper and simpler ventilator.

None of this matched Covidien's strategy. One possibility is that Covidien bought Newport in order to shut down the project, which competed with its ventilator sales. Another possibility is that the management of Covidien did not see any value in a low-priced ventilator. Why would they? Their entire careers were premised on selling machines that could treat increasingly complex patients at ever-higher prices. Perhaps management did not think there would be any, or enough, demand for a basic ventilator. Perhaps they did not understand how the manufacturing would work. Perhaps they thought the IP position of the project was too weak. Perhaps they thought the product would never be approved by the FDA because its functionality was too low. It is very difficult to carry out disruptive innovation *inside* a firm that is successful using the current paradigm.<sup>4</sup> The clash of strategies between the acquirer and target can be an important reason for projects not to survive acquisition.

What is the implication for antitrust policy? As Giulio Federico, Carl Shapiro, and I wrote in a recent paper,<sup>5</sup> it is important to weigh the impact of a merger on the diversity of innovation as well as the amount of innovation. It is not enough to promise that the project will be carried on by the acquirer. If management of that company does not understand why the product should exist, or how it will ever be successful, that company will not be able to incubate the project to fruition. Thirty projects to develop ventilators spread across 10 firms will produce more diversity of approaches

3 Nicholas Kulish, Sarah Kliff and Jessica Silver-Greenberg, 'The U.S. Tried to Build a New Fleet of Ventilators. The Mission Failed' *The New York Times* (2020) <<https://www.nytimes.com/2020/03/29/business/coronavirus-us-ventilator-shortage.html>> accessed 15 April 2020.

4 Clayton M Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Harvard Business School Press 1997).

5 Giulio Federico, Fiona Scott Morton and Carl Shapiro, 'Antitrust and Innovation: Welcoming and Protecting Disruption' in Josh Lerner and Scott Stern (eds), *Innovation Policy and the Economy* (NBER 2019) vol 20.

and strategies than 30 attempts to develop ventilators in only three firms. The latter represents a market with essentially three strategies, though there may be bigger teams at each. The former, on the other hand, is more likely to be a market with 10 strategies. In that setting, one of the strategies might be an inexpensive ventilator because one of those firms sees a way to make that path a success. Moreover, in a market with 10 firms, a mistake or failure by one manager or team is not as fatal to market outcomes. When R&D is risky and uncertain, consumers (who are patients in this setting) are better off with many attempts in different directions than only a few. The current pandemic is highlighting the value of antitrust for policy makers and scholars. The ‘consumer surplus’ that enforcers protect is not a dry abstraction but represents real human lives. Robust, creative, and diverse innovation increases social welfare and saves lives. Enforcers and courts that recognize the value of innovation *variety* in their merger enforcement decisions will see the pay-off in times like these.