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The economic way of thinking in a pandemic

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ABSTRACT
During the pandemic, the economic way of thinking was extraordinarily useful, leading to a quick consensus among economists of widely differing political persuasions on many issues of pandemic policy. Yet speaking to politicians, bureaucrats, and the public revealed many ways in which the economic way of thinking was foreign and sometimes uncomfortable to non-economists, albeit often useful. Instructors can use pandemic policy to engage students on topics like incentives, trade-offs, utilitarianism, Bayesian reasoning, and overcoming cognitive biases.

KEYWORDS
Bayesianism; economic way of thinking; omission-commission fallacy; pandemic; status-quo bias; utilitarianism

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Externalities and O-ring economies

The first lesson of the pandemic was the importance of externalities. Economists could see immediately that to the extent vaccines and masks reduced transmission of the SARS-COV-II virus, there was a case for subsidizing the price of the vaccine, perhaps even paying people to get vaccinated and potentially mandating masks. The logic of externalities, in this respect, was well understood by many non-economists but the logic went considerably deeper.

During the pandemic, billions of dollars of economic production were lost in the United States *per day*. Thus, trillions of dollars of economic activity came to rest on a handful of industries, most notably the vaccine industry. Kremer (1993) discusses O-ring production functions in which errors in a single task can greatly reduce the value of the entire product. During the pandemic, we had O-ring economies. Because the vaccine industry could not possibly recoup the value of its investments to the larger economy, it made sense to subsidize the vaccine industry. Thus, the Accelerating Health Technologies (AHT) team recommended to the U.S. and British governments a plan to accelerate vaccine production by paying firms to build vaccine capacity before approval (i.e., subsidize at-risk capacity) and to guarantee sales of approved vaccines even if the pandemic subsided (an advance market commitment) (Ahuja et al. 2021; Athey et al. 2020).[1] These ideas were subsequently adopted by Operation Warp Speed.

It's telling that the economic way of thinking led economists to worry that the vaccine industry wasn't profitable *enough*, while the natural inclination of many ordinary people and politicians was to worry about *excess* profits. The natural suspicion of profit-making was not without consequence. Australia, for example, took time to dicker over trivial reductions in vaccine prices. The result was a delay in vaccine purchases, which slowed economic recovery and created billions of dollars in losses, far more than any potential cost savings (Leigh and Holden 2022). Similar bargaining and consequent delays occurred in the EU.

More generally, around the world, almost every country underinvested in vaccines (Ahuja et al. 2021; Castillo et al. 2021; Kominers and Tabarrok 2022).

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Natural utilitarianism and the science of trade-offs

Physicians look for rules that maximize the health of the treated. Economists, in contrast, have a natural utilitarianism that makes it easier to think clearly about societal trade-offs. Usually the two approaches cohere, but when supply is limited, the two approaches can lead to different conclusions. In particular, the utilitarian approach led economists to appreciate the value of testing the asymptomatic, to appreciate the benefits of using dose stretching policies such as first doses first and fractional dosing, and to be willing to consider procedures such as human challenge trials.

Early in the crisis, for example, Romer (2020) used a simulation to illustrate the value of mass testing. The upshot of the model was that a policy of testing and isolation was far more cost-effective in reducing transmission than a policy of random isolation or "lockdowns," even when the test had a high error rate.[2] Romer's perspective on testing as producing social benefits butted against the dominant paradigm of testing as diagnostic. The Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC), for example, focused on testing the symptomatic as a diagnostic for treatment, but most people who were infected with the SAR-COV-II virus had only mild symptoms, and many were asymptomatic. Testing the latter group had little value as diagnostic, but because the latter group were responsible for most transmissions, it was crucial to test the asymptomatic from the viewpoint of society (Birx 2022; Mina, Parker, and Larremore 2020, Larremore et al. 2021). Yet, it was surprisingly difficult to convey the idea that a test for infectiousness had a very different use-case and benefit-cost ratio than a test used to decide on treatment. As a result, the FDA delayed the approval of rapid antigen tests—a useful tool for testing for infectiousness—until very late in the pandemic and long after such tests were widely available in other countries.

Emily Oster's (2021) arguments for the importance of opening schools were another example of the economist's hard-headed willingness to think about trade-offs. The idea of trading off infections, even deaths, with schooling struck many as wrong, even evil. As Tetlock et al. (2000) discuss, people respond to taboo trade-offs that monetize sacred values with moral outrage and attempted cleansing (both personal and social). As a result, Oster was vilified in social media. There are no taboo trade-offs for utilitarians.

Like many economists writing about the pandemic, Oster was also accused of arrogance and not "staying in her lane." One tweeter wrote of Oster, "You are not a medical doctor, a public health expert, an epidemiologist, a virologist or a public health official. What you are saying here is misleading and dangerous."[3] Yet none of the listed authorities were experts in schooling, which raises the question: Who are the experts in evaluating trade-offs? From guns or butter to schooling or health, economists are the experts in evaluating trade-offs. These evaluations demand knowledge of diverse domains, hence necessitating modesty. But difficult trade-offs cannot be avoided; society must sometimes choose between guns and butter, and economics is the best-developed approach for making such decisions. *Trade-offs are the economist's lane.*

A third time when utilitarianism proved to be important was in advocating for giving the second shot at 8–12 weeks instead of the 3–4 weeks used in the initial clinical trials. When the FDA's review of the data from Pfizer's vaccine trial was released on December 8, 2020, I noted that there was evidence that the first dose already had significant efficacy, raising the possibility of delaying the second dose (Tabarrok 2020).[4] Further analysis made it clear that the first shot had an efficacy rate of ~80 percent. Thus, I argued it was better to protect two people with first doses and come back later for second doses, as supply expanded. Put simply, since $2^{*}0.8 > 0.95$, the effort should be on first doses.

The United Kingdom and Canada delayed the second dose, but in the United States, Anthony Fauci and other influential physicians such as Eric Topol argued that delaying the second dose wasn't "following the science" because there hadn't been (at that time) a trial with the second shot at 8–12 weeks.[5] Fauci and Topol, however, may not have been following the science of decision-making under uncertainty. The focus on the clinical trial results as the only "scientific" information revealed a second difference between many physicians and economists: Bayesianism.

Bayesianism

The first rule of Bayesianism is to use all available information. Among the relevant information for evaluating first doses first (FDF) was that the timing of the second shot had been designed to be *as short*

as possible so emergency authorization could be applied for as quickly as possible. If the second shot had been given at 8 weeks, it would have delayed approval by at least 4 weeks, at a time when two to three thousand people in the United States were dying from COVID *every day*. Thus, there were excellent reasons to give the second shot *early* in the clinical trial, but these were not reasons that should have greatly influenced the decision of when to prescribe the second shot in a post-approval regimen.

The second piece of evidence available to a Bayesian was that a second shot of most vaccines was typically given eight or more weeks later because the immune system needs time to develop its full response, including memory B and T cells. In 2012, for example, Castiglione et al. (2012, 7) expressed the standard wisdom:

> It has been suggested that an interval of at least 2–3 months between the prime and the boost is necessary to obtain optimal responses, as memory T cells with high proliferative potential do not form until several weeks after the first immunization, and memory *B* cells have to go through the germinal center reaction and take several months to develop.

Thus, there were clear benefits to using FDF to protect more people quickly at a time when thousands of people were dying daily, and the costs of "delaying" the second dose were likely small and quite possibly negative—i.e., there was reasonable evidence to suggest that a 3–4 weeks interval between prime and boost was too short. In any event, the Bayesians proved correct, and many countries now advise *against* giving the second dose at 4 weeks[6] Imai et al. (2023) estimate that delaying the second dose in the UK averted 58 thousand hospitalizations and saved 10 thousand lives. Thus, the United States lost a significant opportunity to save lives by giving the second dose too early.

Many economists appreciated the logic of FDF and fractional dosing, and most of the pushback came from public health professionals.[7] It should be noted, however, that many physicians, infectious disease experts, and epidemiologists, including Robert Wachter, Ashish Jha, Michael Mina, and others, agreed with the logic (Wachter and Jha 2021; Tufekci and Mina 2020). Moreover, as already noted, the British, led by The Joint Committee on Vaccination and Immunization (JCVI), did delay the second dose to 8–12 weeks, as did Canada following Canada's National Advisory Committee on Immunization (NACI).[8]

Bayesianism and masking

The Bayesian approach was also relevant to the debate over masking. Public health officials in the United States, supported by the WHO and the CDC, initially recommended against masking—sometimes vociferously. Surgeon General Jerome Adams, for example, tweeted in February of 2020:

> Seriously people—STOP BUYING MASKS! They are NOT effective in preventing general public from catching #Coronavirus, but if healthcare providers can't get them to care for sick patients, it puts them and our communities at risk!

The motivation for these arguments appears to have been (a) a legitimate desire to reserve N95 masks for health care workers, (b) a "deeply held disbelief of aerosol transmission" among many public health experts and epidemiologists that later turned out to be based on little more than folklore and c) an idea that, without a clinical trial, there was "no evidence" that masks worked (Jimenez 2020; Tufekci 2021; Wang et al. 2021).

Adams, Fauci, and eventually the WHO and CDC later began recommending masks for the public but the flip-flop generated confusion and uncertainty. The argument for masks was never as weak nor as strong as was presented by public health officials. It's worth emphasizing that Bayesians tend to change their beliefs slowly. The mask flip-flop, therefore, might have been a sign of behavioral bias or perhaps a consequence of trying to simplify the message for public consumption. Speaking in simple terms ("masks work," "masks don't work") may have enhanced clarity, but when the message had to change, it reduced credibility.

It's also worth noting that one reason generalists did reasonably well in analyzing the pandemic is because they were less embedded in knowledge silos. The disbelief, even hostility, to the idea of

aerosol transmission, for example, was mostly limited to one group of public health experts who just happened to be dominant at agencies like the WHO and the CDC. Other equally qualified scientists who worked with aerosols were much more open to the prospect of aerosol transmission (Jimenez 2020). Had the latter group been in charge, we would have been spared the mistake of closing beaches, parks, and playgrounds, and instead, we would have focused much earlier on indoor air quality.[9]

Experimentation and status quo bias

Economists, in my estimation, were more willing to endorse experimentation and somewhat more immune to status quo bias than many others. Human challenge trials, for example, were rejected on so-called ethical grounds despite clear utilitarian benefits, at least in expectation.[10] The arguments against human challenge trials were, at best, strained. Bioethicist Jeffrey Kahn, for example, argued, "We don't ask people to sacrifice themselves for the good of society" (Murphy 2021). Of course, we routinely ask many people, including police, firefighters, and miners to sacrifice themselves for the good of society. Moreover, during the pandemic, it was exceedingly common to ask people to get vaccinated and to wear masks not just for their own benefit but to do so for the good of society. Rather than ethics, the push against first doses first, fractional dosing, and human challenge trials may have been due to status quo bias and the omission-commission distinction or fallacy.

Status quo bias is a very natural bias that privileges the status quo even in hypothetical scenarios (Samuelson and Zeckhauser 1988; Ritov and Baron 1992). There are several reasons for suggesting that the failure to move to first doses first was an example of status quo bias and not simply a disagreement about the numbers. First, the arguments in favor of delaying the second dose were back-of-the-envelope but roughly quantified, while the objectors did not even attempt an expected value calculation.[11] Fear rather than rational calculation appeared to be the argument of the day. Moreover, some of the arguments that were offered against delaying the second dose were inconsistent. Some people raised the issue of creating more variants if the efficacy rate of the vaccine was only 80 percent. Yet, no one used the same argument against approving the "single shot" J&J vaccine. (It's also worth noting that the J&J vaccine was "single-shot" not because it relied on a unique technology but because of a policy choice made by J&J that a single-shot vaccine would be useful in a pandemic.) Nor was this objection raised when the FDA guidance initially suggested that a vaccine of 60 percent efficacy would be approved. Nor did these arguments make much sense when most of the world had a 0 percent efficacious vaccine, i.e., no vaccine at all.

The most telling piece of evidence in favor of status quo bias, however, was the speed at which expert opinion changed once the status quo changed. Prior to the British Joint Committee on Vaccination and Immunization (JCVI) recommending moving the second shot to 8–12 weeks, British experts, like American experts, were against first doses first. The moment the new regimen was approved, however, many British experts switched their opinion (Harford 2021). Of course, this test isn't definitive as other events were changing, but, notably, U.S. experts did not switch. This pattern is exactly what one should expect, given status quo bias.

U.S. experts didn't switch opinions on delaying second doses, but there was an unacknowledged switch when it came to delaying third doses. When booster shots began to be discussed in August of 2021, many U.S. experts argued that the focus should be on "second shots first." In other words, when second shots were the status quo, the arguments were against delaying the second shot but in favor of delaying the third shot. This pattern could be explained if the U.S. status quo was fortuitously optimal, but it seems more likely that not delaying the second shot and delaying the third shot were both examples of status quo bias.

The omission-commission asymmetry

The omission-commission asymmetry is the idea that errors of commission are much more serious than errors of omission. One reason for vaccine hesitancy, for example, is that it's common for parents to think that if they have their child vaccinated and that leads to a (rare) side effect, then their decision was the

cause of the child's injury, and the parent should feel guilty. If, on the other hand, the parent decides not to vaccinate their child and the child is infected, that injury was caused by nature and, while regrettable, is not a reason for parental guilt (Ritov and Baron 1990, 1992).

The omission-commission asymmetry is driven by the personal role of the decision maker. How will *I* feel if there is an error of omission versus one of commission? Utilitarianism has no place for the omission-commission asymmetry because a utilitarian maximizes social utility, not the decision maker's utility.

The language that decision makers used to justify their decisions often reflected the omission-commission asymmetry. For example, when the AstraZeneca vaccine was paused in Europe, and later the J&J vaccine was paused in the United States, this was said to be done "out of an abundance of caution."[12] It's unclear how an abundance of caution differs from an excess of caution. More importantly, the caution appeared asymmetric—it extended only to the *decision*, not to the totality of risk. In pausing the vaccine rollout, for example, no authority ever made the case for a pause by arguing that the benefits of the vaccine were less than the risk, even assuming that the vaccine risk was accurately measured. Instead, only the vaccine risk mattered because that risk might be said to be due to the decision maker, i.e., an error of commission, whereas, the risk of infection if the vaccine were paused was one of omission and thus not considered relevant.[13] Similarly, the omission-commission asymmetry likely deterred physicians from supporting human challenge trials. In COVID RCTs, people can (and did) die in the placebo arm, yet these deaths weren't deemed ethically significant, unlike those in HCTs, because they resulted from omission rather than commission.

In the classroom

The response of economists to COVID illustrates key aspects of the economic way of thinking, which may be usefully introduced into many economics courses, including economic principles, health economics, behavioral economics, and economics and philosophy. Here, for example, are some potential questions that may be used to stimulate discussion in a wide variety of courses:

- In the COVID pandemic, were profits in the vaccine industry a) too high or b) too low? Contrast the economic way of thinking with political or "person in the street" thinking, outlining different assumptions, perspectives, and goals.
- Should medical care aim to maximize the health of patients or the health of society? When will these differ?
- Is it ever acceptable to trade off lives for goods and services?
- What is science? Can it be scientific to make risky decisions based on incomplete information?
- In an emergency, should the public authorities focus on providing clear and actionable guidance, even in the absence of certainty, or on explaining trade-offs and unknowns?
- Do the risks of human challenge trials differ from those of randomized controlled trials?
- Contrast status quo bias with "action-bias." Give examples of each. When is each form of bias more likely?
- What is the role of the economist in society?

Conclusion

Economists had a useful set of tools to analyze the pandemic and offer policy advice. Ideas such as externalities were critical, but perhaps even more important were ways of thinking often characteristic of economists, namely utilitarianism, Bayesianism, an openness to experimentation, and a broad estimation of risk reflected in a lower susceptibility to status quo biases and the omission-commission asymmetry. Explaining how these issues arose in the making of COVID policy presents opportunities for contrasting, confronting, and challenging the economic way of thinking.

Notes

1. As part of Accelerating Health Technologies (AHT) (https://www.acceleratinght.org/home), an ad hoc team of economists led by Michael Kremer, the author was an official and unofficial advisor during the pandemic to the U.S. government, the World Bank, and COVAX, among other governments and organizations.
2. In illustrative calculations, Romer used a 20 percent false negative rate and a 1 percent false positive rate and also showed that the similar lessons held with much higher false negative rates. See https://paulromer.net/covid-sim-part3/.
3. Amusingly, this tweeter's bio indicated that they were a "cartoonist.".
4. https://marginalrevolution.com/marginalrevolution/2020/12/the-vaccine-works-fast.html.
5. See, e.g., Wu (2021), https://www.nytimes.com/2021/01/01/world/dr-fauci-advises-against-the-british-approach-of-delaying-a-second-dose-of-vaccine.html.
6. E.g., Britain no longer offers second doses at 4 weeks and recommend at least 8 weeks. For young people, they note "The Joint Committee on Vaccination and Immunisation (JCVI) currently advises that you should have your second dose around 12 weeks after your first dose. Having a 12 week gap may extend the length of time your protection will last after the second dose." https://www.gov.uk/government/publications/covid-19-vaccination-resources-for-children-and-young-people/covid-19-vaccination-a-guide-to-a-second-dose-for-young-people-aged-16-to-17.
7. On fractional dosing, see Więcek et al. (2022).
8. Statement from Britain's JCVI: https://www.gov.uk/government/publications/priority-groups-for-coronavirus-covid-19-vaccination-advice-from-the-jcvi-30-december-2020/joint-committee-on-vaccination-and-immunisation-advice-on-priority-groups-for-covid-19-vaccination-30-december-2020.
   Statement from Canada's NACI, https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/rapid-response-extended-dose-intervals-covid-19-vaccines-early-rollout-population-protection.html.
9. Bayesian generalists looking at the literature were more open to the importance of aerosol transmission because they had fewer strong priors.

   Speaking for myself, I was more cognizant of aerosol transmission early on simply because my wife, who is not a public health expert but runs experiments on aerosolized pathogens, told me it was very likely that SARS-COV2 was aerosolized. Wisely, I took my wife's word over the WHO's.
10. Space precludes a discussion of the efficacy of human challenge trials, but they are hard to reject as part of a larger portfolio of approaches to the crisis. On HCTs, see Eyal and Lipsitch (2021), Eyal, Lipsitch, and Smith (2020) but compare Berry et al. (2020).
11. https://marginalrevolution.com/marginalrevolution/2021/01/first-doses-first-show-your-work.html.
12. https://www.bloomberg.com/news/videos/2021-04-13/fauci-says-j-j-shots-paused-out-of-abundance-of-caution-video.
13. Status quo bias and the omission-commission asymmetry are difficult to separate because commission usually requires deviating from the status quo. The vaccine pause was an interesting case where commission required a change to the status quo, which suggests that the omission-commission asymmetry rather than status quo bias per se is the more powerful driving force.

Disclosure statement

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