ECONOMIC FINDING

Maximize Utility subject to R ≤ 1: A Simple Price-Theory Approach to Covid-19 Lockdown and Reopening Policy

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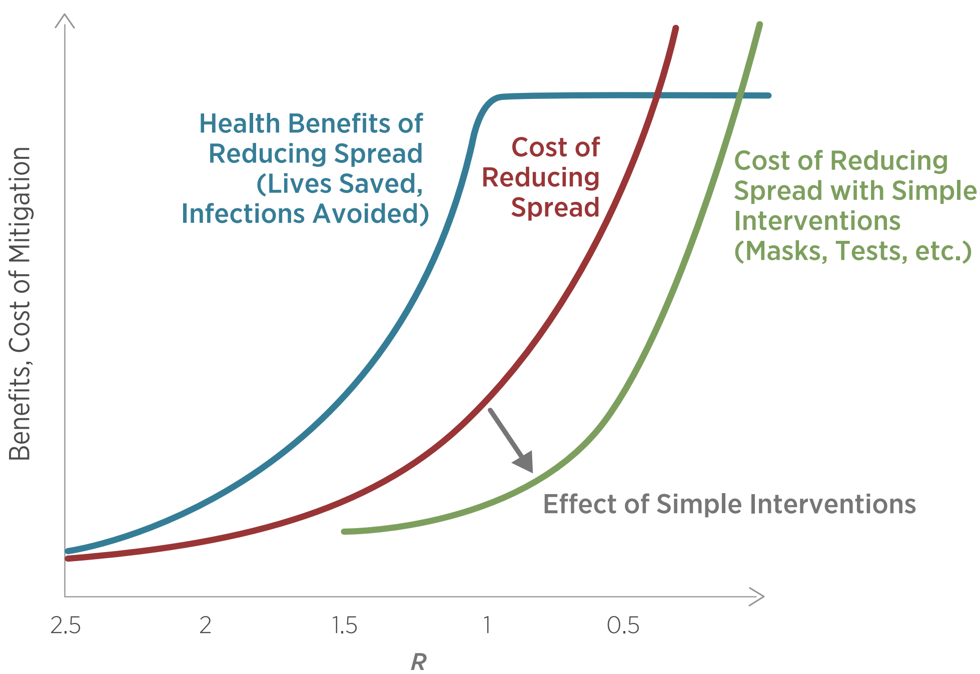
Rather than a total lockdown, society should rank activities by their ratio of utility to disease-transmission risk; coupled with the effective use of face masks, social distancing, mass testing, and related efforts, societies can avoid lockdowns and allow a perhaps surprisingly large fraction of activities (dropping only those with the poorest utility-to-risk) while keeping the virus contained.

To begin, we need to review a couple of key terms. When epidemiologists discuss the transmission of a virus, they often describe something called an R-nought number; namely, if the transmission rate is greater than 1, where every infected person spreads the virus to more than one individual, the virus will continue to spread. This number applies to a world where no mitigation efforts exist—no masks, no social distancing, no mass testing, and so forth.

In the world in which we live, where various mitigation efforts are enacted, R-nought is often referred to as R-effective, among other variations, which this paper terms R. In this case, an R number greater than 1 has the same effect—the virus continues to spread and grow. The goal, then, is to enact policies that result in R ≤ 1.

Figure 1 · Simple Interventions Reduce the Cost of Mitigation



Note: This figure illustrates the effect of simple interventions on the economic cost of mitigation. The blue curve labeled "Health Benefits of Reducing Spread" depicts the predicted number of infetions and deaths in the standard SIR epidemiological model as a function of the reproductive rate R. Note the crucial "kink" in the curve around R=1. Please see Figures 1 and 2 of Budish's paper for details. The red curve "Cost of Reducing Spread" illustrates the cost of achieving a given level of R solely from dropping activities. The green curve illustrates the cost of achieving a given level of R if simple interventions are utilized as well as dropping activities. The reduction is illustrative and is based on the assumption that simple interventions reduce risk by 40% and harm utility by 5%. Please see Sections 4.3 and 5 of the author's paper for further details.

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This has proved difficult, to say the least. Debates have raged over how to manage the COVID-19 pandemic, driven in large part on how determined policymakers are to drive R below 1. Policymakers must weigh a trade-off between viral spread and the pandemic's effect on the economy. Total lockdowns would seem the most effective in driving down R, but they are a blunt instrument with steep economic costs.

This paper offers a middle ground. Budish finds that such trade-offs can—and should—be ranked by a ratio that measures economic utility against disease transmission risk. In other words, all economic activity is not created equal when it comes to disease spread. Likewise, blanket policies that treat all activities the same tend to cause unnecessary harm to an economy. In effect, as Budish describes in his paper, the need to achieve $R \leq 1$ imposes a "disease-transmission budget" on society. Budish crafts a model that shows how society can optimally spend this budget by ranking activities by their ratio of utility to disease-transmission risk, or what he terms the activity's social welfare "bang for buck" per unit of virus risk.

Second, this paper finds that relatively simple interventions like facemasks, mass testing, social distancing, and other related ideas can reduce the transmission risk of activities—their "cost" in terms of the $R \leq 1$ risk budget—at relatively low cost to utility as compared to lockdowns. Such interventions thus expand how much social welfare is achievable while keeping within the disease constraint.

By way of example, Budish offers the following: If R-nought = 2.5 (which is the Center for Disease Control's best estimate as of November 2020) and utility and risk are uniformly distributed, then without simple interventions society has to drop fully 45% of activities, which together constitute 27% of pre-virus utility and 60% of risk, to get to $R \leq 1$. This is a severe societal lockdown with deeply negative economic consequences. In contrast, if simple interventions can reduce transmission risk by 50%, then society can maintain nearly 90% of its pre-virus activities (dropping only those with the very poorest utility-to-risk ratios), while still achieving $R \leq 1$. And Budish stresses that these are conservative estimates—strong enactment of mitigation efforts would likely have even more positive results.

For policymakers, this paper offers an effective middle course between total lockdown and ignoring the virus. By simply employing such mitigation efforts as mask-wearing, social distancing, and mass testing, societies can enjoy a surprisingly large fraction of the activities denied them during lockdowns.