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When to Lock, Not Whom: Managing Epidemics Using Time-Based Restrictions

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The COVID19 pandemic has created a global health and economic crisis of a magnitude not experienced since the Great Influenza Pandemic of 1918-1919. After 33 months, about 630 million people have become infected, about 6.6 million people worldwide have died, and estimates of excess deaths are more than three times as high; IMF (2022) reported a 3.1% drop in world GDP in 2020, and a 4.5% drop in the advanced economies. Looking forward, the COVID19 pandemic is unlikely to be the last one. There are dozens of coronaviruses, new influenza strains can be as deadly as the ones that have killed millions in the pandemics of the twentieth century, and Zoonotic infections (like Ebola, SARS, or zoonotic influenza) have increased significantly over time. These diseases pose an increasing and critical threat to global health security, with ever growing connectivity and mobility of people, animals, and goods. The June 2021 report of a high level G20 panel states that "We are in an age of pandemics.... There is every likelihood that the next pandemic will come within a decade --- arising from a new influenza strain, another coronavirus, or one of several other dangerous pathogens. Its impact on human health and the global economy could be even more profound than that of COVID-19."

We address the issue of policy responses to a pandemic, providing an analysis of new time-based tools to manage them. These policy strategies were proposed in epidemiologically-grounded work by Karin et al (2020). The idea is that for every 14 day period, there will be k days of work and 14-k days of lockdown. This number, k, uses the timescales of the virus against itself, taking into account a latent period after exposure, whereby the infected person does not infect others. In other words, the epidemiological cost of open days is mitigated by the fact that individuals do not become infectious immediately. The epidemiological benefit of lockdown days is enhanced because the schedule locks down the economy when individuals are at their most infectious.

The contribution of our paper is the economic analysis of these new policy tools. We present both normative and positive analyses. The former applies to future pandemics or epidemics while the latter evaluates policy against real world benchmarks in the U.S. using data.

The proposed policy tools are particularly relevant in light of the difficulties experienced by policymakers in finding a policy strategy that lessens the trade-offs involved. In theory, targeted population lockdowns could constitute "fine tuning" of lockdown measures, which would serve to lessen any economic cost. In practice, however, it turned out to be challenging to identify sub populations to be allowed unrestricted economic activity, while imposing restrictions on other population groups. Political and moral issues, as well as practical implementation issues, have come

into play. The current experience of China reinforces the appreciation of the difficulties involved. The time-based public health management policy avoids these difficulties, taking time, rather than population, as the medium of restrictions.

Key findings on the outcomes of such policy strategies include: a significant improvement of social welfare, substantially lessening the trade-offs between economic activity and health outcomes; optimally-derived timings of interventions are shown to suppress the disease, while maintaining reasonable economic activity; and outcomes are superior to the actual experience of New York State and Florida over the course of 2020.