1. Title: The Cost of Staying Open: Voluntary Social Distancing and Lockdowns in the US

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3. Abstract

In combating the spread of COVID-19, some governments have been reluctant to adopt lockdown policies due to their perceived economic costs. Such costs can, however, arise even in the absence of restrictive policies, if individuals' independent reaction to the virus slows down the economy. This paper finds that imposing lockdowns leads to lower overall costs to the economy than staying open. We combine detailed location trace data from 40 million mobile devices with difference-in-differences estimations and a modification of the epidemiological SIR model that allows for societal and political response to the virus. In that way, we show that voluntary reaction incurs substantial economic costs, while the additional economic costs arising from lockdown policies are small compared to their large benefits in terms of reduced medical costs. Our results hold for practically all realistic estimates of lockdown efficiency and voluntary response strength. We quantify the counterfactual costs of voluntary social distancing for various US states that implemented lockdowns. For the US as a whole, we estimate that lockdowns reduce the costs of the pandemic by 1.7% of annual GDP per capita, compared to purely voluntary responses.

4. Data Description

We analyze differential changes in county-level movement patterns and physical distancing after the implementation of shelter-in-place policies in the United States. Daily panel data aggregated to the county-level from GPS pings of more than 40 million mobile devices, obtained from SafeGraph, allow us to track the percentage of devices that stayed home all day. The latter is defined as the ratio of the number of devices that remained home all day in a given county over the total number of devices observed. A device's home is determined as the common night-time over a 6-week period. The underlying data was collected from various secondary sources by SafeGraph and subjected to an exhaustive 6-step process designed to guarantee reliability, granularity, anonymity and accuracy. The panel of devices in the sample is designed to be geographically and demographically representative, with a 97% correlation between the panel's population density and the American Census's population density at the county level.

To mitigate the spread of COVID-19, county and state governments implemented lockdown policies during the second half of March 2020. We collect implementation dates of state- and county-level school and business closures, and shelter-in-place policies, from various sources. When a policy goes into effect after 12pm on a given day, we assign it an implementation date one day later. We measure beliefs about science using data assembled by \cite{howe2015nature} at the county-level. We focus specifically on local attitudes about the anthropogenic (human) causes of climate change. Despite scientific consensus that humans are the primary cause of present and projected climate change dynamics, there is substantial variability in local beliefs about this topic in the United States. We leverage this variation to study how patterns of physical distancing differ across counties with stronger beliefs in science (lower levels of scientific skepticism).

5. JEL Codes
I12, I18, H12, D04, C33, H51.

6. Keywords
COVID-19, difference-in-differences, SIR model, social distancing, lockdown, big data