STATEWIDE REOPENING DURING MASS VACCINATION:
EVIDENCE ON MOBILITY, PUBLIC HEALTH AND ECONOMIC ACTIVITY FROM TEXAS

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ABSTRACT

During the first four months of 2021, the United States distributed approximately 250 million
doses of COVID-19 vaccinations, which resulted in the complete vaccination of nearly 45 percent
of the adult population. In the midst of this mass vaccination effort, Texas became the first state
to abolish its statewide mask mandate and fully lift capacity constraints for all businesses.
Governor Greg Abbott's order was met with (i) concern by public health officials that an early
reopening would lead to a resurgence of COVID-19, and (ii) assertions by Texas politicians that a
reopening would generate short-run employment growth. This study provides the first empirical
evidence on these claims. First, using daily anonymized smartphone data on social mobility from
SafeGraph, Inc. — and synthetic control and difference-in-differences approaches — we find no
evidence that the Texas reopening led to substantial changes in social mobility, including foot
traffic at a wide set of business establishments in Texas. Second, using daily data on new
COVID-19 cases from the New York Times, we find no evidence that the Texas reopening
affected the rate of new COVID-19 cases during the five weeks following the reopening. Our
null results persist across more urbanized and less urbanized counties, as well as across counties
that supported Donald Trump and Joe Biden in the 2020 presidential election. Finally, we find no
evidence that the Texas reopening order impacted short-run employment. Together, our null
findings underscore the limits of late-pandemic era COVID-19 reopening policies to alter private
behavior.

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1. Introduction

"With the medical advancements of vaccines and antibody therapeutic drugs, Texas now has the tools to protect Texans from the virus.… Too many Texans have been sidelined from employment opportunities. Too many small business owners have struggled to pay their bills. This must end. It is now time to open Texas 100%"

- Texas Governor Greg Abbott, March 3, 2021

"[The reopening order] really undermines all of the sacrifices that have been made by medical professionals, doctors, nurses, EMS workers, firefighters, police officers, municipal workers, people in the community."

- Houston Mayor Sylvester Turner, March 3, 2021

As of May 2021, the COVID-19 pandemic had claimed approximately 580,000 U.S. lives (Centers for Disease Control and Prevention 2021a). Non-pharmaceutical interventions (NPIs) such as stay-at-home orders (SIPOs), non-essential business closures, emergency declarations, mask mandates, curfews, and limits on in-person gatherings — including capacity constraints at business venues — have been among the most common policy tools used to combat COVID-19 (Courtemanche et al. 2020a,b; Cronin and Evans 2020; Dave et al. 2020a; Dave et al. 2021a,b; Friedson et al. 2021; Gupta et al. 2020; Lyu and Wehby 2020).   However, the mass distribution of COVID-19 vaccinations by Moderna, Pfizer, and Johnson & Johnson — along with declines in COVID-19 hospitalizations and mortality — created intense pressure on state and local policymakers to begin lifting NPIs, with the goals of improving local labor market conditions and permitting in-person gatherings that would signal a return to pre-COVID normality (Hammer 2021).

At the same time, public health experts have warned that lifting mask mandates or repealing capacity restrictions "too early" relative to the distribution of COVID-19 vaccinations (or progress toward herd immunity) could reverse COVID-19-related health gains. In this vein,

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Anthony Fauci, Director of the National Institute of Allergy and Infectious Disease, argued that repealing COVID-19 mitigation policies — including mask mandates and limitations on in-person gatherings — would be premature if the rate of decline in a state's COVID-19 cases had plateaued (Porterfield 2021).[1]

On the other hand, the effects of enacting or repealing NPIs may be more limited than policymakers or public health officials expect. While there is evidence that particular NPIs — notably, SIPOs and statewide mask mandates — were effective in curbing COVID-19 spread early in the U.S. pandemic (Courtemanche et al. 2020a,b; Friedson et al. 2021; Dave et al. 2021a,b; Lyu and Wehby 2020), a number of studies have documented that NPIs account for a relatively small share of the total variation in individuals' COVID-19 mitigation behaviors (see, for example, Gupta et al. 2020; Cronin and Evans 2020). In contrast, most of the variation can be attributed to voluntary (non-policy-related) private demand-side responses, likely due to (i) new or updated information on the novel coronavirus, or (ii) changes in individuals' assessments of contagion risk and developing serious COVID-19 symptoms. Along the same lines, there is evidence that much of the variation in local unemployment during the pandemic is not attributable to lockdown policies, but rather to voluntary demand-side responses (Goolsbee and Syverson 2021).

In addition, the enactment (or repeal) of NPIs could also be accompanied by risk compensating behaviors that may offset expected policy impacts (Yan et al. 2021; Dave et al. 2020a,b,c). Moreover, COVID-19 restrictions (and reopenings) may have very different effects at different phases of the pandemic, in part because the mechanisms through which early policies

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[1] During a Town Hall Meeting on March 3, 2021, Dr. Fauci indicated that repealing mask mandates "is really quite risky… [Plateauing new cases] is a dangerous sign because when that has happened in the past, when you pull back on measures of public health, invariably you've seen a surge back up." (Porterfield 2021)

might have affected behavior (i.e., through information) are less salient late in the pandemic. For instance, a recent study showed that while an initial statewide lockdown in Wisconsin (enacted in late March 2020) increased stay-at-home behavior and curbed the growth of COVID-19 in the state, an unexpected reopening less than two months layer had little effect on social mobility or COVID-19-related health (Dave et al. 2020c). The authors attribute this asymmetry, in part, to (i) a smaller role for information shocks in the period following the initial wave of the U.S. pandemic (March-April), and (ii) the elasticity of demand for mitigation behaviors (i.e., mask-wearing, social distancing) with respect to policy becoming smaller (more inelastic) in absolute value over time.

With these points in mind, the impacts of a full statewide reopening late in the U.S. pandemic — enacted during a period of mass vaccination — on social mobility, COVID-19 cases (and mortality), and economic activity are not prima facie clear. On the one hand, a reopening may increase population mobility, reduce social distancing, and perhaps even shift individuals' risk perceptions downward, thereby reducing individuals' vigilance in engaging in COVID-19 precautionary behaviors. While this may increase economic activity in the short run, effects on COVID-19 spread depend on the extent to which these activities translate into a higher infection risk. As more individuals get vaccinated, for instance, this risk would be moderated, though its degree of moderation could, in theory, be offset by moral hazard effects of vaccinations.

Alternatively, it is also possible that the state's reopening may have much smaller effects on social distancing, COVID-19 cases, and unemployment. If social distancing behavior and economic activity are more a function of the demand shocks caused by the pandemic or more a reflection of voluntary private responses to COVID-related risk assessment rather than a

consequence of the mitigation policies per se, then the state's reopening may do little to change the underlying drivers of individual behavior. This could affect consumers' willingness to make in-person visits to business establishments and employees' willingness to work.

Furthermore, the generosity of unemployment compensation benefits available to workers — which were expanded as part of President Biden's March 2021 coronavirus relief bill to a maximum of $300 per week and were extended through September 6, 2021 — could create disincentives for low-wage employment, particularly in industries where the risk of contagion is relatively higher (i.e., indoor bars and restaurants). In addition, if pre-reopening capacity constraints and mask wearing policies were not well-enforced by the state, then the impact of the reopening itself may be muted. Moreover, even if the initial mitigation policies were binding and effective, Bayesian updating of coronavirus risk perceptions mean that if these policies are later lifted, individual behaviors may remain sticky and not respond straightaway (Dave et al. 2020c).

The lifting of restrictions may also have little to no effect on population-level social distancing or COVID-19 cases if there are offsetting behaviors among different segments of the population. For instance, while the reopening might cause some residents to increase their mobility and activities outside the home, others may respond by readjusting their perceived infection risk upwards and engaging in greater mitigation behaviors. Support for such compensating responses is found in empirical analyses of Black Lives Matter protests in the summer of 2020 (Dave et al. 2020b), President Trump's May 2020 campaign rally in Tulsa, Oklahoma (Dave et al. 2020a), and the January 6, 2021 U.S. Capitol Riot (Dave et al. 2021c). Associated with each of these events, there is evidence that local residents increased stay-at-home behavior and reduced their visits to restaurants and bars in response to perceived higher

risk of violence and infection (Dave et al. 2020a,b; Dave et al. 2021c).[2] The net effect on

COVID-19 spread, therefore, is unclear.[3]

Finally, the effects of a statewide reopening on population-level health depends on who is

nudged by the reopening into altering their social distancing and economic behaviors. While the

reopening policy effect we will estimate is an intention-to-treat (ITT) effect (an average

population effect), the ITT is identified off a "local" margin, based on those individuals who are

actually impacted by the reopening. Effects on community-level COVID-19 spread would then

depend on whether these marginal individuals are higher or lower risk for COVID-19 contagion

relative to the average individual in the community.

This study explores a unique policy shock in Texas to identify the causal impacts of a

statewide reopening on public health and economic activity. Texas was first state in the United

States to enact a "100% reopening." Executive Order GA-34, issued by Governor Greeg Abbott,

(i) eliminated statewide capacity constraints on all businesses, and (ii) abolished the statewide

mask mandate (Abbott 2021). Texas' "first mover" position makes the state's reopening

plausibly exogenous relative to other later-reopening states that followed suit and eased

restrictions. Under Governor Greg Abbott's order, local businesses were free to impose their

own voluntary restrictions. Furthermore, unlike the imposition of local shelter-in-place orders

which were permitted and widely adopted (Dave et al. 2020a), Governor Abbott advanced the

legal position that no local order can supersede the state's reopening order and legally impose

COVID-related capacity constraints on local businesses or fine local residents for not wearing

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[2] There is also evidence that local mask mandates may induce less stay-at-home behavior because individuals are more willing to mix with non-household members wearing masks (Yan et al. 2021).

[3] In addition, the presence of such offsetting behaviors does not preclude compositional shifts in infections across subgroups, only that effects on the net may be small because of these compositional shifts.

masks.[4] At the time the reopening was announced, the state of Texas had administered 5.7 million vaccine shots to its residents, fully vaccinating 11 percent of its adult (ages 16 and older) population (Centers for Disease Control and Prevention 2021b). By March 29, all adults 16 and older were eligible to obtain a vaccine (Harper 2021) and by April 13, 15.2 million vaccines had been distributed in Texas (Johns Hopkins University 2021), with 26 percent of the adult population completely vaccinated.[5] This share had reached nearly 40 percent by mid-May 2021.

This study is the first to examine the impact of a statewide reopening in the midst of a mass statewide vaccination effort. We document three key findings. First, using anonymized smartphone data from SafeGraph, Inc. and a synthetic control approach, we find that the Texas reopening had little impact on stay-at-home behavior or on foot traffic at numerous business locations, including restaurants, bars, entertainment venues, retail establishments, business services, personal care services, and grocery stores. Second, using COVID-19 case and mortality data from the *New York Times,* we find no evidence that the reopening affected the rate of new COVID-19 cases in the five-week period following the reopening.[6] In addition, we find that state-level COVID-19 mortality rates were unaffected by the March 10 reopening. These null results persist when we explore heterogeneity in the state reopening by urbanicity and political ideology of Texas counties. We find no evidence of social distancing or COVID-19 effects of the reopening across more urban versus less urban Texas counties as well as across counties where the majority of residents supported Donald Trump or Joe Biden in the 2020 presidential election.

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[4] The City of Austin and Travis County (of which Austin is a substantial part) challenged this legal position, which we discuss below.

[5] The proportion of the adult population fully vaccinated was calculated using JHU daily vaccination data (2021) and the 2019 SEER population estimates available at: https://seer.cancer.gov/popdata/download.html

[6] Moreover, when we extend the analysis sample to up to six weeks following enactment (with a smaller donor pool), we continue to find no evidence that the Texas reopening increased new COVID-19 cases.

Finally, we explore whether Governor Abbott's reopening order generated short-run economic growth in Texas. Using weekly state-level data on UI claims per 1,000 covered jobs from the Bureau of Labor Statistics (BLS), synthetic control and difference-in-differences estimates show that neither continued UI claims filed nor new UI claims filed (per 1,000 UI covered job) fell in the five "full week" period following the March 10 reopening. Moreover, using state-level data from the St. Louis Federal Reserve Economic Data (FRED), we find no evidence that the Texas reopening reduced the short-run (March 2021) unemployment rate or employment-to-population ratio. Supplemental analysis of microdata from the Current Population Basic Monthly Survey (CPS-BMS) show no evidence that that the reopening affected employment-to-population ratios at bars, restaurants, or entertainment venues. Taken together, our findings underscore the limits of late-pandemic era changes in COVID-19 reopening policies to alter private behavior.

2. Background

Similar to other states, Texas had imposed common mitigation strategies and restrictions to limit the spread of COVID-19 infections. This included the imposition of a shelter-in-place order (SIPO), which was adopted statewide on April 2, 2020 and allowed to expire on April 30, 2020.[7] The state also enacted a mask mandate on July 3, 2020, along with various capacity constraints on businesses. Texas eased restrictions and phased into reopening over the summer of 2020, but then reinstituted some of the restrictions over the second wave of the pandemic during the fall of 2020.

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[7] However, 85 of Texas' 254 counties had enacted their own county-level SIPOs prior to the statewide order, covering almost two-thirds of the state population. While some localities extended their SIPO beyond the state's expiration on April 30, 2020, all local orders had expired by the end of 2020.

Prior to the statewide reopening order made effective on March 10, 2021 (and announced one week prior), restaurants were required to operate at no more than 75 percent capacity, and bars were required to operate at or below 50 percent capacity. Professional sports (indoors and outdoors) were permitted but spectators were capped at 50 percent venue capacity. Additional restrictions, ranging from 50 to 75 percent capacity limits, applied to retail establishments, personal services (i.e. salons, barber shops, gyms), parks and beaches, and other public and private facilities and events (i.e. amusement parks, museums, movie theaters, zoos, libraries, performance venues). Failure to comply with capacity constraints could result in fines (up to $1000), business license restrictions, and even arrest, with enforcement varying considerably at the local level (Beauvais et al. 2020).[8] Texas's July 2020 statewide mask mandate imposed fines of up to $250 for failing to wear a mask in public locations, though fines were most common for repeat offenders, as first offenders received a warning (Svitek 2020).

Governor Greg Abbott's Executive Order GA-34, effective on March 10, 2021, lifted the state mask mandate and increased capacity of all businesses and facilities in the state to 100 percent. Only if COVID-19 hospital bed capacity constraints exceed 15 percent over a consecutive seven-day period in one of Texas's 22 hospital regions, can the County Judge in that region issue a local mitigation order.[9] In announcing the order, the Governor noted the progress that Texas had made, including the rapid deployment of vaccines and the subsequent increase in the state's vaccination rates along with expansions in the state's COVID-19 testing capacity.

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[8] Governor Abbott eventually limited local law enforcement's ability to arrest and criminally prosecute residents for violating some of these restrictions (Beauvais et al. 2020).
[9] The Executive Order specified that no order from a County Judge could impose maximum capacity constraints of less than 50 percent for any business. In the period between the March 10 order and the writing of this paper, no region exceeded 15 percent hospital bed capacity.

While private businesses, at their discretion, could limit capacity or impose safety protocols, the Governor asserted that no local jurisdiction was permitted to issue any orders that could supersede the state-ordered reopening, including the imposition of legal penalties for failing to comply with mask mandates or capacity constraints. However, officials from the City of Austin and Travis County (of which Austin is a part) asserted the legal position that their local mask mandates could be extended beyond March 10.[10] Texas Attorney General Ken Paxton filed a lawsuit to block the Austin and Travis County mask mandates, but on March 26, District Judge Lora Livingston ruled that these local mask requirements could remain in place pending future legal proceedings (Oxner 2021).[11]

The reopening order made Texas the first state in the nation to essentially end all pandemic-related restrictions at this post-vaccine phase of the pandemic. It allowed all businesses to operate "as usual" without any mandated restrictions while lifting the statewide mask mandate. It is important to note, however, that bars had already reopened in the state (with a 50 percent capacity limit), and most businesses were allowed to operate at up to 75 percent capacity. Moreover, while the mask mandate was lifted, anecdotal evidence suggests that many businesses continued to require masks for entry (Sullum 2021), and physicians, public health officials, and (left-of-center) politicians urged residents to continue wearing masks. As a result of these voluntary actions — as well as uncertainty surrounding the elasticity of behavioral responses with respect to the lifting of restrictions during a period of mass vaccinations — the

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[10] The City of Austin and Travis County did proceed with business re-openings along with continued recommendations for 3 to 6 feet of social distancing per CDC recommendations.

[11] By May 4, Austin public health guidelines were updated such that fully vaccinated people were permitted to attend private indoor events while wearing masks and private outdoor events without wearing masks (Chaudhury 2021).

impact of this full reopening is an empirical question. This is the focus of our empirical analyses described below.

3. Data

The empirical analyses that follow use (i) anonymized smartphone data on social mobility from SafeGraph, Inc., (ii) COVID-19 case and mortality data from the *New York Times*, and (iii) unemployment data from the Bureau of Labor Statistics (BLS) to estimate the social mobility, health, and economic impacts of the March 10, 2021 Texas reopening/mask mandate repeal. Below we discuss the datasets, outcomes, and empirical strategies we employ.

3.1 SafeGraph Anonymized Smartphone Data

We begin by drawing daily anonymized smartphone data from SafeGraph, Inc. to measure social distancing behavior.[12] Over 45 million anonymized smartphone devices are included in these data, aggregated to the census block group, county, and state levels. We use these data to measure stay-at-home behavior and time spent away from one's residence. These data have been used widely by researchers estimating the impacts of COVID-19 mitigation policies (i.e., shelter-in-place orders, emergency declarations, non-essential business closures) and large in-person gatherings (i.e., political rallies, sporting events, motorcycle rallies) on stay-at-home behavior (Andersen et al. 2020; Dave et al. 2020a,b,c; Dave et al. 2021a,b,c; Friedson et al. 2021; Abouk and Heydari 2020). These data have also been used by the Centers for Disease Control and Prevention to study social distancing behavior.

The SafeGraph social distancing data defines a person's "home" as the 153-by-153-meter area that receives the largest number of GPS pings between the hours of 6PM and 7AM.

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[12] These data are available at: https://www.safegraph.com/covid-19-data-consortium

Mobility is measured when a smartphone is observed pinging outside of the home. Our analysis period for social distancing span February 27, 2021 through April 6, 2021, which includes 11 days prior to the Texas reopening and four weeks following the policy change. We choose to begin our panel in late February because Texas experienced weather and electricity grid-related problems due to a large winter storm that began hitting the area on February 13, 2021. As temperatures dropped and roads across the state froze, the power grid collapsed, forcing the Electric Reliability Council of Texas to initiate rolling blackouts (del Rio 2021). This left many Texans trapped in their own homes from February 15, the initial blackout date, until power was restored to all but 350,000 residents on February 18 (Neuman and Romo 2021). Subsequently, reporting of coronavirus cases dropped significantly during this period, leading to a sharp dip and ensuing peak in daily reported cases in the middle of February (del Rio 2021). The outage also resulted in COVID-19 vaccination delays (Traynor 2021).

We generate two measures of state-by-day mobility data that capture both the extensive and intensive margins of stay-at-home behavior. First, *Percent at Home Full-Time* measures the mean percent of individuals who spent the full day at home. This captures stay-at-home behavior on the extensive margin. We find that 24.3 percent of Texas smartphones remained at home full-time prior to the March 10th reopening. Following the reopening 22.4 percent remained at home full-time. Second, *Median Hours at Home* measures the median number of hours that smartphones ping at home on a given day.[13] This measure captures, in part, the intensive margin of stay-at-home behavior. We find that Texas smartphones pinged at home for a median of 12.8 hours prior to the March 10th reopening and 11.7 hours following the reopening.

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[13] For the minutes when smartphones are powered down or pinging outside of the home, hours are coded as 0.

Given substantial day-over-day cyclical variation in stay-at-home behavior (particularly during the weekday versus weekend), results from our main synthetic control analyses presented below use 7-day-moving averages of these measures. However, we also conduct analyses using unsmoothed day-over-day variation, shown in the appendix, with a qualitatively similar pattern of findings. We also explore whether our statewide findings in Texas are sensitive to the exclusion of Travis County (including most of the City of Austin), which permitted a local mask-wearing ordinance. As discussed below, the results are unchanged with the exclusion of Travis County.

Next, we make use of a second SafeGraph dataset — where smartphone ping information is unconnected to information on a smartphone's "home" — that measures industry-specific foot traffic. These data identify millions of "points of interest" across the United States, which are classified based on the industry-specific five-digit National American Industry Classification System (NAICS) codes. The data measure hourly smartphone pings at each of these points of interest to measure specific mobility outside of one's home and to track particular types of economic and social activity.

We begin by using NAICS codes to categorize visits to restaurants and bars from February 27 through April 6 in Texas and anchor these pings to the state population. Specifically, *Foot Traffic at Restaurants* and *Foot Traffic at Bars* measure the number of smartphone pings at each type of establishment per 100,000 state residents. The smartphone data record 2,866.8 pings per 100,000 population at restaurants and bars prior to the March 10 reopening. Following the reopening, this number rose to 3,115.1 pings per 100,000 population. As with the stay-at-home measures, our main (synthetic) analyses use 7-day moving averages of

foot traffic to smooth day-over-day trends, with a similar pattern of findings using individual

day-over-day foot traffic data.

In addition, we also explore foot traffic at other major industries in Texas, including

retail establishments, entertainment venues, which include sporting arenas, personal care

services, and grocery stores. Among these locations, the highest level of pre-treatment foot

traffic was found at retail establishments (3,817.5 per 100,000 population) with the lowest levels

at personal care services (62.5 per 100,000 population).

Together, our anonymized smartphone data will provide important insights on how the

Texas reopening affected state-level social mobility. Additionally, in analyses that assess

heterogeneous impacts of the reopening on sub-state jurisdictions, we utilized data on county-

level stay-at-home behavior and foot traffic. These local data are important in assessing

heterogeneity in the effects of the Texas state policy based on characteristics that have been

documented to have important interactive effects with mitigation policies, in particular,

political/ideological preferences (Barrios and Hochberg 2020; Dave et al. 2021c) and urbanicity

(Dave et al. 2020c; Dave et al. 2021a).

3.2 COVID-19 Case and Mortality Data

We measure confirmed COVID-19 cases and deaths using state- and county-level data

collected from the *New York Times*.[14] Our analysis sample spans the period from February 27,

2021 through April 13, 2021, a period that envelops the March 10 Texas reopening and also

includes a window of five weeks following the reopening. Such a post-treatment window has

been used to identify important effects of COVID-19 mitigation policies, in-person gatherings,

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[14] These data are available at: https://github.com/nytimes/covid-19-data

and holiday-related travel on COVID-19-related health outcomes (Courtemanche et al. 2020a, 2020b; Dave et al. 2020a,b,c; Dave et al. 2021a,b,c; Friedson et al. 2021, Sears et al. 2020; Lyu and Wehby 2020; Ahammer et al. 2020; Carlin et al. 2020).

We generate two measures of daily COVID-19-related health. First, we construct the *COVID-19 New Case Rate*, the ratio of the newly confirmed COVID-19 cases on a given day to the state population. In the pre-treatment period in Texas, the average rate of COVID-19 cases per 100,000 population was 23.3. In the post-treatment period, the daily case rate fell to 13.2. As above, our main (synthetic) analysis smooths daily COVID-19 case growth by examining 7-day moving averages. In addition, as a supplementary outcome, we measure the rate of growth in the new COVID-19 case rate (*COVID-19 Case Growth*), calculated as ln (*COVID-19 New Case Rate*$_t$) - ln (*COVID-19 New Case Rate*$_{t-1}$), where t is the 7-day moving average of the daily COVID-19 case rate ending on day *t*.

Second, we measure COVID-19 mortality in an analogous manner using the measure *COVID-19 New Death Rate*. In the pre-treatment period in Texas, the daily COVID-19 death rate in Texas was 0.767. This number fell to 0.396 in the post-March 10 period. Our supplementary measure, (*COVID-19 Death Growth*), calculated as ln (*COVID-19 New Death Rate*$_t$) - ln (*COVID-19 New Death Rate*$_{t-1}$), also falls following the March 10 reopening. While much of our primary analyses focus on state-level COVID-19 health outcomes, auxiliary analyses also examine county-level daily COVID-19 growth.

Finally, we note that in contrast to prior studies written earlier in the U.S. COVID-19 pandemic (see, for example, Courtemanche et al. 2020; Dave et al. 2020a,b,c; Friedson et al. 2021), we focus on *new* COVID-19 case (death) rates as compared to *cumulative* measures. These alternative measures capture a different margin of COVID-19 growth. This is because

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historical levels of COVID-19 cases (reflected in cumulative cases) may not accurately capture

recent pre-treatment COVID-19 trends, which are better captured in trends in new cases.

Specifically, given the high volume of cumulative cases at this stage of the pandemic, empirical

analyses would be hard-pressed to detect shifting trends in new infections through changes in the

trajectory of cumulative cases. However, we note that auxiliary analyses using the cumulative

COVID-19 case (or death) rates as the outcome of interest produce a qualitatively similar pattern

of findings as we obtain from our preferred dependent variables.

3.3 Unemployment Data

To capture the short-run economic impacts of the Texas reopening, we turn to

unemployment data from the Bureau of Labor Statistics. First, we measure state-by-week

continued Unemployment Insurance (UI) claims filed per 1,000 covered jobs, *UI Claims Rate*.

Changes in continued UI claims pick up flows in leaving unemployment by finding work, and

help us assess whether the reopening increased economic activity to the extent reflected in a

higher job finding rate.[15] The analysis period covers the weeks from January 31-February 6

through April 4-April 10. In the 6 weeks of the pre-treatment period in Texas, there were, on

average, 27.5 claims per 1,000 covered jobs. In the post-March 10 period, there were, on

average, 24.6 UI claims per covered job. We also measure new (initial) filings of UI claims, to

pick up flows in the job separation rate, which follow a similar trajectory.

Next, we turn to measures of the state-by-month unemployment rate and the

employment-to-population ratio (EPR) from January 2021 through March 2021, obtained from

the St. Louis Federal Reserve Economic Data (FRED). These measures capture changes to

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[15] A reduction in continued UI claims could also reflect transitions from being unemployed to leaving the labor force or expiration of UI benefits.

overall worker engagement in the labor market. We find little change in either the overall

unemployment rate or the EPR pre-post Texas reopening. In January 2021, the Texas

unemployment rate and employment-to-population ratio were 6.8 percent and 57.8 percent,

respectively. By March, those numbers were 6.9 percent and 58.1 percent. We also construct

measures of state-by-month, industry-specific employment-to-population ratios — specifically,

we construct the restaurants and bar EPR and the entertainment industry EPR — using microdata

from the Current Population Survey Basic Monthly Surveys (CPS-BMS). This industry-specific

information will capture employment shifts in industries hard hit by the COVID-19 pandemic.

4. Empirical Strategies

4.1 Synthetic Control Approach

Our primary estimation strategy to explore the effect of the Texas reopening on social

distancing, foot traffic, and COVID-19-related health is a synthetic control approach.   This

strategy, introduced by Abadie et al. (2010), relies on data from pre-treatment outcomes and

observable characteristics of states that may influence social mobility, COVID-19-related health,

and economic activity to generate a counterfactual for Texas.

To generate our estimate of how our outcomes would have evolved in Texas had the state

not reopened, we draw on a donor pool of states with COVID-19-related reopening policies and

mask mandate rules that did not change over the period from February 1 through April 6.[16] This

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[16] Only one state in our donor pool changed their reopening policies between April 7 and April 13. The inclusion of
this state is permitted in our COVID-19 analyses given that its reopening would not be expected to have any major
effects on COVID cases until after our post-policy window; based on median incubation period of the virus of about
5 days, and with 97.5 percent of infected individuals who develop symptoms found to do so within 11-12 days post
infection (Lauer et al. 2020).

donor pool includes 23 states.[17] Our pre-treatment window includes the period from February 27

through March 9, and the post-treatment window includes the period from March 10 through

April 13,[18] spanning five weeks of post-reopening data, a window sufficiently long enough to

capture any substantial effects on COVID-19 infections. We also explore the sensitivity of our

estimates to the inclusion of over six weeks of post-treatment COVID-19 case data, which

requires a smaller donor pool given that a number of states started to change their reopening

policies by mid-April 2021 and would contaminate the donor pool. The findings from these

supplemental analyses are, in the main, consistent with the results we present below.

Synthetic control estimates of the impact of the reopening depend critically on the

credibility of the counterfactuals we construct. Given the importance of our selection of (i) states

to be included in the donor pool, and (ii) observable characteristics on which to closely match

Texas to its synthetic counterpart, we explore the sensitivity of our estimates to these choices

(Ferman 2019).

We take two main approaches to construct our counterfactual of Texas. First, we match

on the outcome (stay-at-home behavior, foot traffic, daily COVID-19 case and mortality rates)

on each of pre-treatment days on which we observe them (February 27 through March 9), a

strategy that requires pre-treatment growth in each of these outcomes to be identical between

Texas and its synthetic control.[19] This approach eliminates some concerns of 'p-hacking'

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[17] A total of nine of these states had policies that were identical to Texas's pre-treatment policies over the entire 46-day window of our analysis sample. An additional 10 states included weaker COVID-19 restrictions (i.e, no bar, restaurant, or personal care services capacity restrictions, and/or no state-wide mask mandates), but whose policies did not change from February 1 through April 6 (excluding a five-day median incubation window of COVID-19). Finally, two states had stricter policies for bars, and two included restrictions for personal care services, though again, neither set of states had their policy change from February 1 through April 13.

[18] For social distancing and foot traffic outcomes, our post-treatment period ends on April 6, the last day on which no state changed their reopening policies.

[19] For the outcomes of unemployment insurance claims filed per 1,000 covered claims that covered the period when Texas was reopened (March 14-20).

(Botosaru and Ferman 2019). On the other hand, it effectively eliminates the role of other

observables that could be correlated with social distancing or the spread of COVID-19 (Klößner

et al. 2018).[20]

Our second approach, therefore, is to construct our synthetic counterfactual by matching

on the dependent variable in only one-half of all pre-treatment days and, in addition, matching on

the: (i) cumulative mean COVID-19 vaccination rates in the pre- and post-treatment periods

(using data obtained from Johns Hopkins University), (ii) COVID-19 daily testing rates, which

may play an important role in coronavirus detection (using data obtained from Johns Hopkins

University), (iii) urbanicity and population density, which have been found to impact COVID-19

spread (Dave et al. 2020c; Dave et al. 2021a), and (iv) other COVID-19-related policies (i.e. bar,

restaurant, and personal care services capacity restrictions and closures; shelter-in-place orders

and advisories, and state-level mask mandates).[21] For each of the two matching strategies

discussed above, we conduct placebo tests on each of the donor states following the method

suggested by Abadie et al. (2010) to generate permutation-based p-values for statistical

inference.

Our estimated treatment effect will be unbiased if our constructed counterfactual

accurately captures the trend in outcomes that would have been observed in the absence of

treatment. The various matching strategies we employ help in this regard, at least to the extent

that our observable matching variables help to generate a credible counterfactual. Moreover,

given that Texas was the first restricted state to repeal a statewide mask mandate and mandate a

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[20]As shown by Kaul et al. (2018), matching on all periods of pre-treatment outcomes renders all covariates irrelevant in the prediction of the outcome.

[21] These policies were collected using data obtained by the authors from multiple sources, including individual state Departments of Public Health, the New York Times, and Husch Blackwell. Note that these policies did not change for either Texas or the donor states over the period February 1 through April 6.

statewide reopening, this "first mover" act by Governor Abbott may be viewed as plausibly

exogenous relative to other jurisdictions that were experiencing similar pre-treatment trends in

social distancing, COVID-19 cases (mortality), and vaccination efforts.

4.2 Difference-in-Differences Approach

Following our synthetic control analyses, we explore heterogeneity in the effects of the

Texas reopening policy, by exploring differences in Texas county characteristics. Before doing

so, we pool a sample of counties from Texas and each of the donor states identified in the

synthetic control model and use county-by-individual day outcome data to estimate the following

difference-in-differences specifications:

$$Y_{cst} = \beta_0 + \beta_1 * TexasReop_{cst} + \alpha_c + \gamma_t + \varepsilon_{cst} \tag{1a}$$
$$Y_{cst} = \beta_0 + \beta_1 * TexasReop_{cst} + Z_{st} * \delta + \alpha_c + \gamma_t + \varepsilon_{cst} \tag{1b}$$

where Y_{cst} denotes an outcome described above (stay-at-home behavior, foot traffic at restaurants

or bars per 100,000 population, and new COVID-19 cases) in county c in state s on day t, Z_{st} is a

vector of state-by-day controls for (i) daily COVID-19 testing rates, and (ii) the daily cumulative

COVID-19 vaccination rate.[22] We estimate two models, our more parsimonious model (1a) and

our more saturated model (1b) to allow one to explore the degree to which endogenous COVID-

19 testing or vaccinations may be mechanisms through which the reopening affects the outcomes

under study. Regressions are weighted using the product of the synthetic control weight and the

ratio of the county to state population.[23] To conduct statistical inference with a single treated

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[22] No reopening policies changed over this the time period under study.
[23] For donor states that received zero weight in our synthetic control analysis, the state was assigned a weight of
0.0001 and the remaining synthetic weights adjusted to sum to 1 (equivalent to the weight given Texas).

state, we generate permutation-based p-values generated by a "placebo reopening policy" assigned to each of the donor states (Buchmueller et al. 2011; Cunningham and Shah 2018).

To explore heterogeneity in the effects of the Texas reopening on urban versus rural, and Trump-voting versus Biden-voting counties in Texas, we next estimate the following regressions:

$$Y_{cst} = \gamma_0 + \gamma_1 * TexasReop_{cst} * \mathbf{Urban}_c + Z_{st} * \delta + \alpha_c + \gamma_t + \varepsilon_{cst} \qquad (2a)$$

$$Y_{cst} = \gamma_0 + \gamma_1 * TexasReop_{cst} * \mathbf{Trump}_c + Z_{st} * \delta + \alpha_c + \gamma_t + \varepsilon_{cst} \qquad (2b)$$

where $Urban_c$ is an indicator for whether the county has an urbanicity rate of 50 percent or more and $Trump_c$ is an indicator for whether a majority of the county's voters supported President Trump's re-election in 2020. This allows us to explore whether the Texas reopening differentially affected urban, rural, Republican leaning, and Democratic leaning counties – margins that have been found to be important in explaining variation in social distancing behaviors and the effectiveness of mitigation policies (Barrios and Hochberg 2020; Dave et al. 2020c; Dave et al. 2021a). In sensitivity analyses that appear in the appendix, we explore different cutoffs for each of these measures, including (i) a 75 percent urbanicity rate, (ii) a 40 percent or lower urbanicity rate (to capture the most rural counties), and (ii) a county where President Trump garnered 60 percent or more of the vote (to capture the most conservative counties).

Finally, to estimate the employment effects of the Texas reopening, we use both synthetic control and difference-in-differences approaches. To analyze the effects of the reopening on weekly UI claims, we first use synthetic control analysis, matching on pre-treatment UI claims rates in the six

weeks prior to the reopening, and then estimate two-way fixed effects models comparable to

equations (2a) and (2b), including state and weeks fixed effects.[24]

5. Results

Our main empirical findings are shown in Tables 1 through 8 and Figures 1 through 4.

Supplementary analyses in the appendix (Appendix Figures 1-8 and Appendix Tables 1-3)

provide additional analyses that explore the sensitivity of our main findings to alternative

definitions of our dependent variable or treated units, as well as alternate tests of heterogeneous

policy impacts.

5.1 Social Distancing and Foot Traffic

In Figure 1, we depict synthetic control estimates of the effect of the Texas reopening on

stay-at-home behavior. Panels (a) and (b) explore full-time stay-at-home behavior. In both of

our matching strategies (all pre-treatment days in panel a; half of all pre-treatment days in panel

b plus matching on observables), pre-March 10 trends in full-time stay-at-home behavior were

well-matched between Texas and its synthetic control. This is true even though the composition

of the synthetic control was quite different in each case. Matching on all pre-treatment days

yielded a synthetic control with the largest weight shares for South Dakota (20.3%), North

Dakota (19.0%), Vermont (17.7%), Tennessee (16.4%), and Louisiana (11.7%). Matching on

half of pre-treatment days and observable controls yields a match dominated by Kentucky (33.6

percent), Tennessee (27.9%), and Georgia (26.7%). In panel (a), we find some evidence that the

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[24] With respect to our FRED-based analyses using the January 2021-March 2021 state-by-month data we estimate unweighted difference-in-differences models using all 50 states plus the District of Columbia, and control for state fixed effects, month fixed effects, and the share of the month statewide mitigation policies were in effect. The treatment effect is identified from the interaction of the Texas indicator with the March 2021 survey. Permutation-based p-values generated from placebo tests are used to conduct statistical inference.

Texas reopening was associated with a small decline in full-time stay-at-home behavior, particularly in the first 10 days following the reopening. This differential tightens in panel (b) using our alternate matching strategy, with a smaller decline in stay-at-home behavior.

Turning to median hours spent at home (Figure 1, panels c and d), which also captures the intensive margin of stay-at-home behavior, we find no evidence of substantial declines in stay-at-home behavior. This is true in both the shorter and longer-runs.

The estimates shown in Table 1 confirm the visual inspection of the synthetic control panels of Figure 1. In Panel I of column (1), we find that the Texas reopening is associated with a 0.496 percentage point decline in full-time stay-at-home behavior, an effect that is marginally significant at the 10 percent level only when using a one-sided (post-treatment) permutation-based p-value. This represents a 2.1 percent decline relative to the pre-treatment Texas mean. As shown in Panel II, the effect is twice as large in the immediate post-treatment period (March 10 through March 24) as compared to the longer-run (March 25 through April 6). However, this result is very sensitive to the matching strategy employed. When we account for observable differences in state characteristics, including the urbanicity and cumulative vaccination rates (column 2), the small declines in full-time stay-at-home behavior become much smaller in absolute magnitude and are statistically indistinguishable from zero at conventional levels.

Columns (3) and (4) present estimates for median hours at home. Across models, we fail to detect any evidence that the Texas reopening led to important or substantial declines in stay-at-home behavior either overall (Panel I) or in the shorter- or longer-run (Panel I). Together, these estimates provide little support for the hypothesis that the statewide mask mandate repeal or full opening of restaurants and bars led to a decline in stay-at-home behavior.

In Figures 2A (matching on all pre-treatment days of foot traffic) and 2B (matching on

half of pre-treatment days plus observables), we explore whether the Texas reopening affected

foot traffic at restaurants and bars (panels a through c), retail establishments (panel d),

entertainment venues (panel e), business services (panel f), personal care services (panel g), and

grocery stores (h). A visual inspection of these figures fails to detect any evidence that foot

traffic per capita —measured either at establishments directly affected by the March 10 state

order (lifting of capacity restrictions at bars and restaurants) or those that could be affected by

the mask mandate repeal or via general equilibrium effects — were impacted by the reopening.

Pre-treatment trends in foot traffic are well-matched across our synthetic models and there is no

evidence that foot traffic diverged between Texas and its synthetic control across any outcome.[25]

The synthetic control estimates shown in Table 2A (matching on all pre-treatment days of

foot traffic) and Table 2B (matching on half of pre-treatment days plus observables), provide no

evidence of statistically significant or economically important changes in industry-specific foot

traffic following the Texas reopening.   While coefficients in the shorter-run are more

consistently positive than in the longer-run (Panel II), the magnitudes of the estimates are always

very small. For example, in Table 2A we find that for restaurant foot traffic, the estimated

reopening-induced increase in foot traffic in the short-run was 0.1 percent; for bars and

entertainment venues, the estimated treatment effect was 0.5 percent. All fall to near zero in the

longer-run.

Taken together, the findings in Figures 1-2 and Tables 1-2 provide little support for the

hypothesis that the Texas reopening had economically important effects on population-level net

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[25] To ensure that our 7-day moving average of stay-at-home behavior or foot traffic was not masking important
effects, in Appendix Figure 1, we present results using non-smoothed individual daily data. These results are
consistent with those shown in panel (a) of Figure 1 and panels (a) through (c) of Figure 2A.

stay-at-home behavior or on foot traffic. Moreover, as shown in Appendix Figures 2 and 3, these findings persist when we exclude Travis County from the "treated" portion of Texas (Austin's city limits and population are largely contained within Travis County) to ensure that Austin's assertion of local authority to extend the mask mandate did not bias our treatment effects towards zero.[26] With these results in mind, we next turn to impacts of the reopening on COVID-19-related public health.

5.2 COVID-19 Cases and Mortality

Figure 3 and columns (1) and (2) of Table 3 show synthetic control estimates of the effect of the reopening on the rate of new COVID-19 cases. Our results in each matching model provide no evidence that the Texas reopening affected daily COVID-19 case rates. Daily cases were declining in the two weeks prior to the Texas reopening and continued on a modest downward trajectory for the five weeks following the reopening. Synthetic Texas — comprised largely of Georgia, Louisiana, South Carolina, and Kentucky — experienced similar COVID-19 case trends both in the pre- and post-treatment periods. The estimates in columns (1) and (2) are consistently negative, small (less than 10 percent), and nowhere near statistically distinguishable from zero. This includes the period in the longer-run (March 25 through April 13), following the two-week incubation period for COVID-19 symptoms (Lauer et al. 2020).

In columns (3) and (4), we asses if the reopening altered the trajectory of new COVID-19 case growth. Using this alternative measure, we find no evidence that the Texas reopening had an economically important or statistically significant impact on COVID-19 cases.[27]

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[26] In panels (a) through (c) of Appendix Figure 4, we also show that our findings are robust to the additional exclusion of Hays County and Williamson County, jurisdictions that include a (small) share of Austin's population.
[27] Appendix Figure 5 shows results for COVID-19 cases when using non-smoothed individual daily data rather than 7-day moving averages. The results are consistent with our main findings in Figure 3. Moreover, the exclusion of

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Finally, if we use an alternative definition of our dependent variable that captures historical accumulation of COVID-19 cases over time — the *cumulative* COVID-19 case rate and *growth* in the level of the cumulative COVID-19 case rate — we continue to find no evidence that the Texas reopening increased COVID-19 cases in the state (Appendix Figure 7). Moreover, the strategy of matching on historic (cumulative) COVID-19 cases yielded a very similar set of positively weighted donor states.

Given the lack of support for the hypothesis that the Texas reopening had a positive effect on net new COVID-19 cases, we do not expect there to be important effects on deaths. Nevertheless, evaluating effects on deaths serves as an additional robustness check, since death counts are an objective indicator of COVID-19 infections that is less likely to be afflicted with measurement error or selection into testing. Indeed, our results for this outcome, shown in Table 4 and Appendix Figure 8, provide no evidence that the Texas reopening affected COVID-19-related mortality. Moreover, the estimated effects following March 25th, which is outside of the two-week incubation period for COVID-19, is uniformly negative in sign. This is also true when we examine the rate of growth in new COVID-19 deaths.[28]

In summary, the weight of the evidence produced in Tables 3-4, Figure 3, and Appendix Figure 8 provide little support for the claim that there would be substantial negative COVID-19-related population health effects of the March 10 reopening. Next, we explore whether these net effects in Texas might be masking heterogeneous treatment effects across local jurisdictions in the state.

Travis County from the treated unit (Appendix Figure 6) as well as the exclusion of Travis, Hays, and Williamson Counties for the treated unit (panel d of Appendix Figure 4).

[28] The donor pool for the mortality analysis is comprised of 23 states, 17 of which have consistent mortality reporting. Given more sporadic reporting of mortality for some states over our sample period, we recode individual daily mortality to the state-specific mean if daily deaths exceed 2 standard deviations from the state mean.

5.3 Heterogeneity in Effects of Reopening

Tables 5 and 6 present difference-in-differences estimates of the effect of the Texas reopening on (i) full-time stay-at-home behavior (Table 5, columns 1-3) (ii) foot traffic in bars (Table 5, columns 4-6), (iii) foot traffic into restaurants (Table 6, columns 1-3), and (iv) the daily rate of COVID-19 cases (Table 6, columns 4-6). Column (1) presents results from our most parsimonious specification, while column (2) adds controls for the rate of daily COVID-19 testing, and column (3) adds controls for the cumulative vaccination rate. In Panel I, we examine the pooled effect of the reopening across all counties in Texas. Consistent with our synthetic control estimates at the state-level, we continue to find no evidence that the Texas reopening significantly affected any of these key dependent variables. The signs on the estimated effects are generally of the opposite sign (negative) than predicted by some public health experts.

In Panel II of Tables 5 and 6, we explore heterogeneity in the effect of the reopening by the county urbanicity rate. Again, we find no support for the hypothesis that stay at home behavior, foot traffic, or the rate of new COVID-19 cases was differentially affected across more urban or less urban counties. Moreover, importantly, the reopening is associated with comparably sized declines in new COVID-19 cases (Table 6, Panel II, columns 4-6).

There is strong evidence that early in the pandemic, ideological/political preferences may have played an important role in private responses to COVID-19 mitigation policies. In Panel III of Tables 5 and 6, we explore whether the effect of the reopening differs by whether the majority of county voters supported President Trump's reelection in November 2020. While there is some suggestive evidence that Trump-voting counties may be modestly more likely to travel to bars following the reopening relative to counties where a majority supported Joe Biden's

election, there is little evidence that the Texas reopening increased the rate of COVID-19 spread across "red" and "blue" counties, as measured by voting patterns in the 2020 presidential election.[29]

In summary, our findings in Sections 5.2 and 5.3 provide no support for the hypothesis that the Texas reopening increased COVID-19 spread across the state as a whole, more versus less urban counties, or Trump-voting versus Biden-voting counties. There are several hypotheses for these results. First, the February through March period was one of mass vaccination, when the cumulative vaccination rate in Texas increased from 18,186 doses per 100,000 population on February 27, to 52,255 doses per 100,000 population on April 13. Such enhanced vaccination may have mitigated the contagion effects of interactions between non-household members. Second, it may be that there was limited compliance with and enforcement of mask mandates or capacity constraint requirements prior to the March 10 reopening. If this were the case, the impacts of the policy would be muted. Third, the margin of indoor capacity constraints relaxed (i.e., moving from 50 to 75 percent maximum capacity at most establishments to full capacity allowance) may have been relatively minor to affect net population-based social mobility and statewide spread of COVID-19. Finally, it may be that the types of individuals who were affected by the policy (which drives the local average treatment effect) were those least likely to affect the trajectory of COVID-19 growth. Or it may be that any increase in social

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[29] Appendix Tables 1 and 2 explore alternate cutoffs for urbanicity and Trump voting, with a qualitatively similar pattern of results. In Panel II of Appendix Table 2, there is some suggestive indication of an increase in the rate of daily COVID-19 cases among counties with a large share of Trump voters ($\geq 60\%$); The point estimates in models (4) and (5) represent an increase of about 10% relative to the mean; however, the estimates are not statistically distinguishable from zero and substantially decline in magnitude when we control for the vaccination rate. This raises the possibility that the reopening might have affected social distancing behaviors and COVID cases for some counties at more extreme thresholds of urban/rural or political preferences; however, on the net, our results do not indicate any meaningful increases in infections at the state population level or across broad homogeneous swaths of the state based on urbanicity or political ideology.

mobility or COVID-19 caused by such individuals was offset by others in the community who engaged in risk avoiding behaviors in response to the reopening.

5.4 Short-Run Economic Activity

Next, we turn to an exploration of the impact of the Texas reopening on short-run economic activity in Texas, proxied by several measures of unemployment and an examination of the restaurant-and-beverage employment to population ratio. Figure 4 and Table 7 show synthetic control estimates of the effect of the Texas reopening on weekly continued unemployment insurance claims filed per 1,000 covered jobs. We find that the Texas reopening is associated with an economically small reduction in the rate of UI claims. Our synthetic control estimates in Table 7 show that the Texas reopening is associated with a (statistically insignificant) 0.429 to 0.512 decline in the rate of continued UI claims, which corresponds to a 1.6 to 1.9 percent decline relative to the mean. This effect is entirely driven by the very short run (the initial week following the reopening and the next week; Panel II) and entirely disappears by weeks beginning March 28 and April 4 (final row of Panel II).

We also use a difference-in-differences strategy to estimate the impact of the Texas reopening on continued UI claims. Using this approach, shown in columns 1 and 2 of Table 8, the estimated effect of the Texas reopening on UI claims remains small in magnitude, but are more positive, and remain statistically indistinguishable from zero.

In columns (3) and (4) of Table 8, we examine newly filed UI claims. Again, we find no evidence that the Texas reopening reduced the rate of new UI claims; in fact, the estimated association is positive.

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Finally, in columns (5) through (8), we draw state-by-month data from the FRED to look at the short-run post-treatment (March 2021) impacts of the Texas reopening on the overall state unemployment rate and the EPR. These estimates are generated from two-way fixed effects regressions on a state-by-month (50 states plus District of Columbia, observed January through March 2021) panel. The treatment effect is identified from an interaction of a Texas dummy and the post-treatment period, with controls in even-numbered columns including additional factors (i.e. state vaccination rates, testing rates, and any state policy changes in January). Statistical inference is conducted using permutation-based p-values from placebo tests.

Our findings in columns (5) through (8) provide little support for the hypothesis that the Texas reopening had important employment effects. The findings in Appendix Table 3, derived from CPS Basic Monthly Survey microdata, also show no evidence of substantial increases in the restaurant/bar or entertainment or employment-to-population ratio.

6. Conclusions

Curbing in-person gatherings, limiting business openings, and mandating mask wearing were among the most common NPIs enacted during the U.S. COVID-19 pandemic. However, the onset of mass vaccinations in 2021 raised hopes that there would soon be a "return to normal" following a long period of lockdowns. However, the optimal timing of fully repealing COVID-19 mitigation policies has been the subject of controversy, with public health experts warning against lifting mask mandates and capacity constraints while politically conservative politicians urging a total reopening of state economies.

Texas became the first state to entirely repeal its central NPIs — in-person capacity constraints on business and a mask-wearing mandate in public spaces — following their

implementation in 2020. We document that the Texas reopening had, at most, a small effect on stay-at-home behavior and had no impact on foot traffic at restaurants, bars, retail establishments, entertainment venues, business services, personal care services, or grocery stores. We also find no evidence of increased COVID-19 case growth following the reopening, consistent with (i) this being a period of mass vaccination, and (ii) the reopening having little impact on net social mobility. These null results generally persisted among more urbanized and less urbanized counties, as well as counties that supported Donald Trump or Joe Biden in the 2020 presidential election. Finally, we fail to detect evidence that the reopening affected short-run state-level employment, as measured by UI claims filed, the overall state unemployment rate, and the employment-to-population ratio.

Together, this study's findings suggest that the predictions of reopening advocates and opponents failed to materialize. The policy appears to have had little impact on social mobility, COVID-19 spread, or on short-run economic activity.

There may be several explanations for why the Texas reopening had little effect on net social mobility. First, if individuals' social distancing behaviors and activity patterns are more a function of (i) their private voluntary responses to perceived risk, or (ii) private demand shocks (job loss; uncertainty; loss in income) unrelated to policy, rather than by supply-side restrictions, then the imposition or lifting of such restrictions may have only small effects on behavior and population-based health outcomes. Moreover, even if the initial adoption of restrictions is effective and elicits a population response (for instance, see Dave et al. 2020c), as individuals update their risk assessment and amass information about the pandemic, their behaviors can become highly inelastic over time. Another reason why the reopening may not have induced a significant response in terms of stay-at-home behaviors and visits to businesses and

restaurants/bars is if Texans were not significantly complying with the pre-March 10 restrictions to begin with. Third, while we did not find any meaningful heterogeneity across margins of urbanicity or political leanings, it is possible that there may be compositional changes at other unmeasured margins. As certain segments of the population may be responding to the reopening by reducing social distancing and increasing their external activities, others may be countering especially if they perceive a higher infection risk from the reopening. In this context, a null effect at the population level does not preclude distributional effects across differentially-responding population subgroups.

Finally, the lack of any short-term effects on UI claims or on the unemployment and employment rates, from the reopening, may reflect rational decision-making among unemployed individuals weighing the costs and benefits of returning to work, which include reassessed post-reopening infection risk in the workplace as well as displacement of UI benefits by earned wages.

Our findings come with the requisite caveats regarding external validity. The Texan experience may not necessarily generalize to the average state undergoing a similar reopening and lifting of restrictions. Nevertheless, the lack of any meaningful population-level response in social distancing metrics, COVID cases, or short-term economic activity highlight important channels and mechanisms at play that regulate the existence and strength of the response, and these mechanisms are also expected to be applicable to other states that enact late-pandemic era reopening policies.

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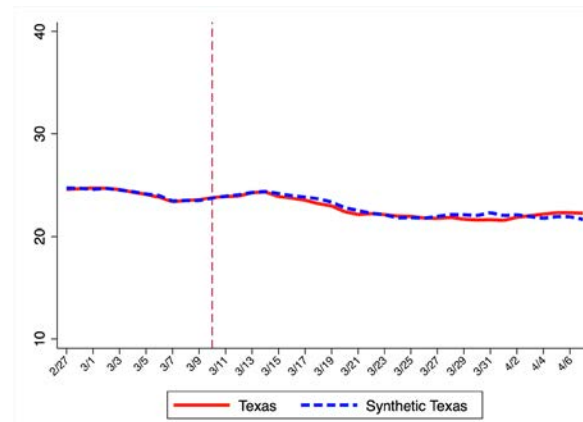
Figure 1. Synthetic Control Estimates of Effect of Texas Reopening on Stay-at-Home Behavior

Panel (a): Percent Staying at Home Full Time
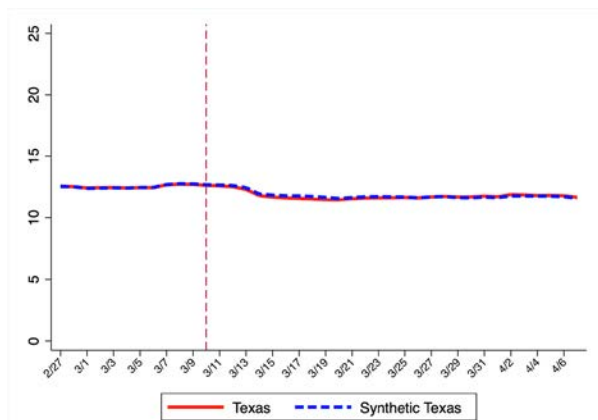*[Matching on All Pre-Treatment Days]*

Panel (b): Percent Staying at Home Full Time
[Matching on Selected Pre-Treatment Days and All Observables]
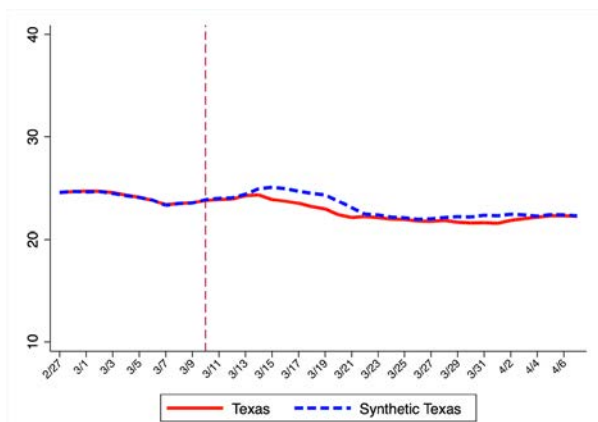
Note: Synthetic Texas is comprised of SD (20.3%), ND (19.0%), VT (17.7%), TN (16.4%), LA (11.7%), CO (8.2%), and GA (6.6%).

Note: Synthetic Texas is comprised of KY (33.6%), TN (27.9%), GA (26.7%), NV (10.3%), and SD (1.5%).

Panel (c): Median Hours at Home
[Matching on All Pre-Treatment Days]

Panel (d): Median Hours at Home
[Matching on Selected Pre-Treatment Days and All Observables]

Note: Synthetic Texas is comprised of OK (86.2%), NJ (11.6%), and CO (2.2%).
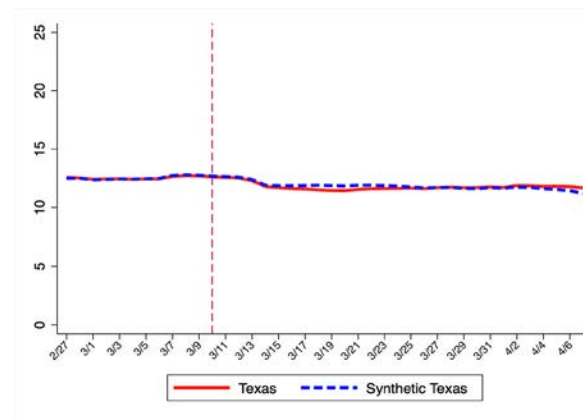
Note: Synthetic Texas is comprised of GA (40.8%), OK (37.3%), NJ (16.9%), and CO (5.0%).

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Notes: Observable matching variables include daily testing per 100k pop and cumulative doses of COVID-19 vaccination per 100k pop population, and number of days of business closures, shelter-in-place orders/advisories, mask mandates, state urbanicity and population density.

Figure 2A. Synthetic Control Estimates of Effect of Texas Reopening on Log (Foot Traffic Per 100,000 Population), Matching on All Pre-Treatment Days

Panel (a): Restaurants and Bars
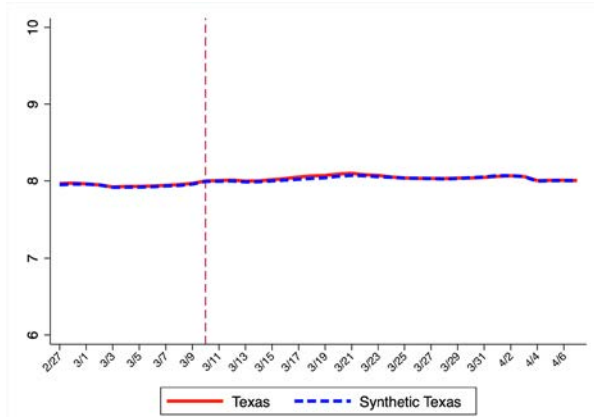
Note: Synthetic Texas is comprised of LA (35.9%), OK (35.7%), KY (16.6%), TN (7.4%), VT (2.7%), and NV (1.6%).

Panel (b): Restaurants
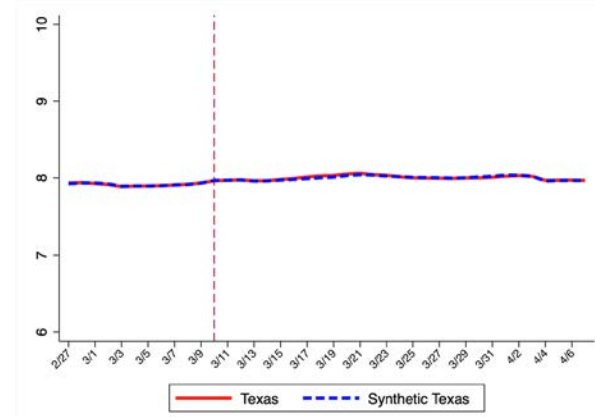
Note: Synthetic Texas is comprised of LA (39.4%), OK (37.3%), KY (20.8%), VT (2.1%), CO (0.3%), and DC (0.1%).

Panel (c): Bars
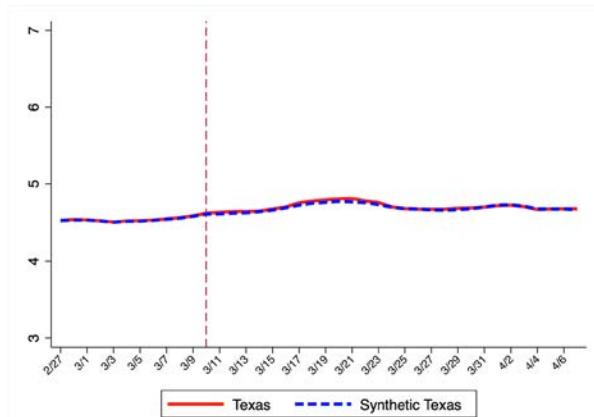
Note: Synthetic Texas is comprised of LA (35.2%), ND (27.9%), NM (17.5%), VT (6.5%), TN (5.2%), NV (4.4%), and KY (3.2%).

Panel (d): Retail
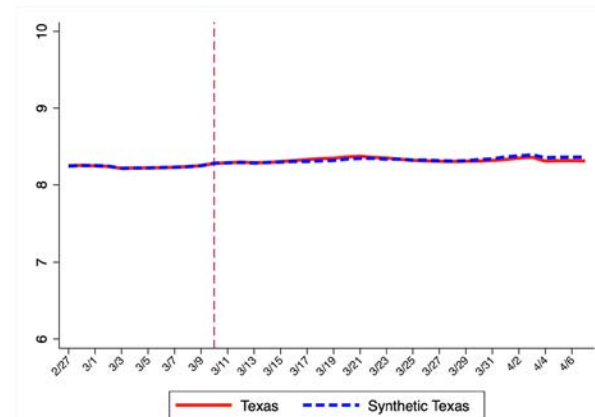
Note: Synthetic Texas is comprised of LA (45.1%), TN (34.5%). NV (13.1%), DC (5.7%), and ND (1.6%).

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Figure 2A, Continued

Panel (e): Entertainment Venues
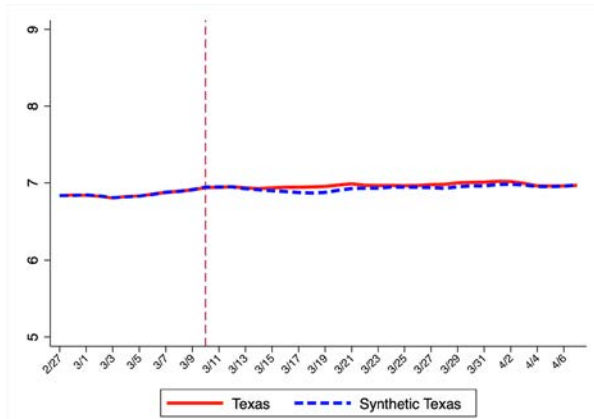
Note: Synthetic Texas is comprised of KY (30.7%), NE (19.6%), ND (16.3%), OK (15.4%), GA (12.2%), and NM (5.8%).

Panel (f): Business Services
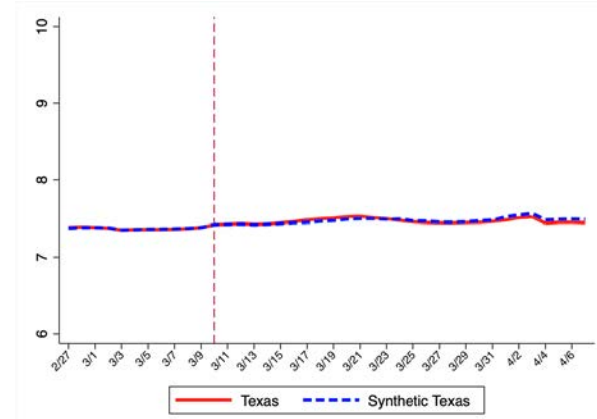
Note: Synthetic Texas is comprised of TN (74.9%), LA (13.7%), and GA (11.4%).

Panel (g): Personal Care Services
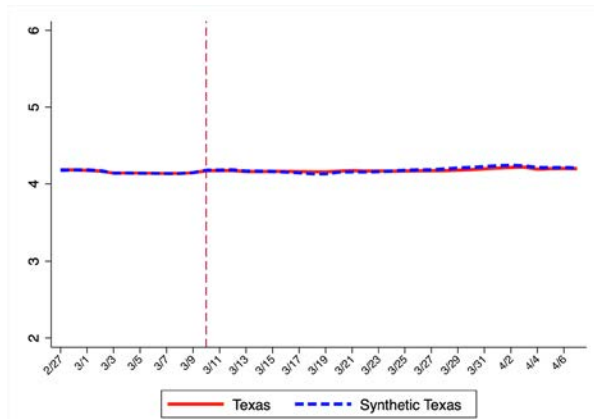
Note: Synthetic Texas is comprised of OK (67.8%), SC (12.4%), LA (11.5%), TN (4.7%), and NV (3.6%).
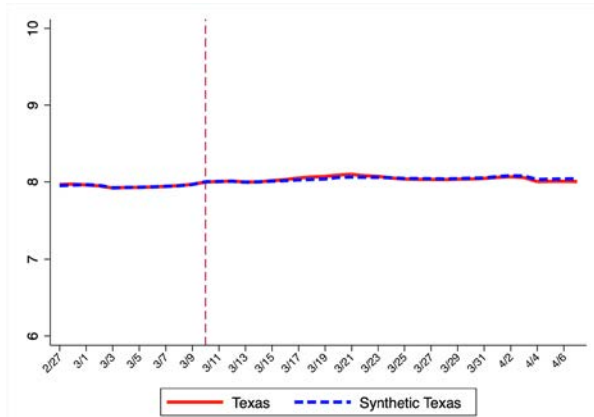
Panel (h): Grocery Stores
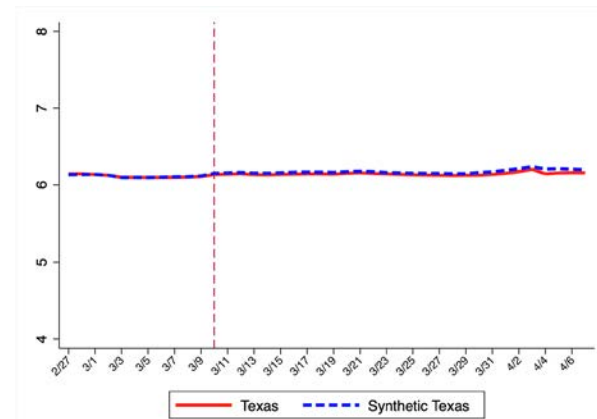
Note: Synthetic Texas is comprised of LA (61.7%), VT (20.0%), and FL (18.3%).

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Figure 2B: Synthetic Control Estimates of Effect of Texas Reopening on Log (Foot Traffic Per 100,000 Population), Matching on Selected Pre-Treatment Days and Observable Controls

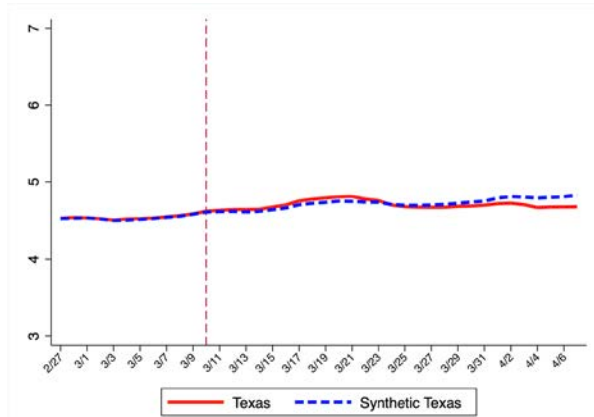*Panel (a): Restaurants and Bars*

Note: Synthetic Texas is comprised of GA (53.8%), OK (26.5%), KY (11.7%), NV (7.5%), and VT (0.5%).
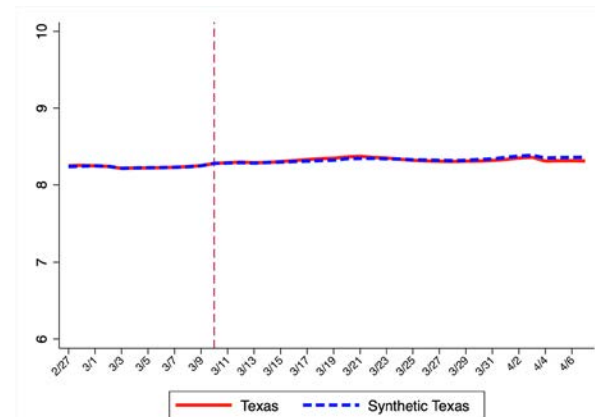
Panel (b): Restaurants
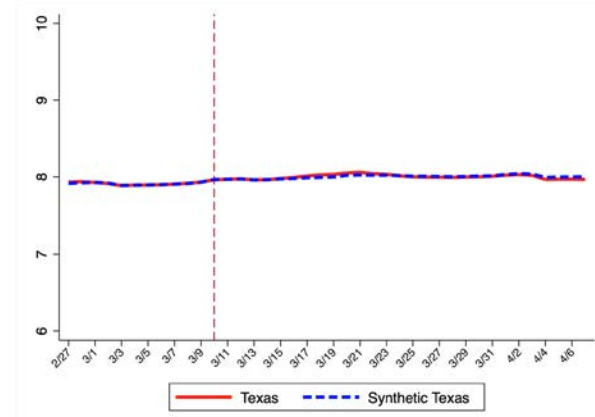
Note: Synthetic Texas is comprised of GA (55.0%), OK (24.9%), KY (12.3%), NV (7.5%), and VT (0.3%).

Panel (c): Bars

Note: Synthetic Texas is comprised of GA (60.0%), NV (27.5%), NM (5.3%), KY (3.0%), MI (2.6%), and ND (1.5%).
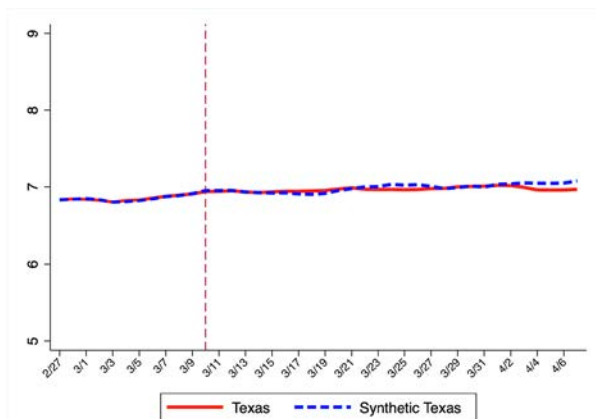
Panel (d): Retail

Note: Synthetic Texas is comprised of GA (41.1%), LA (24.5%), NV (23.7%), KY (6.6%), and TN (4.1%).

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Notes: Observable matching variables include daily testing per 100k pop and cumulative doses of COVID-19 vaccination per 100k pop population, and number of days of business closures, shelter-in-place orders/advisories, mask mandates, state urbanicity and population density.
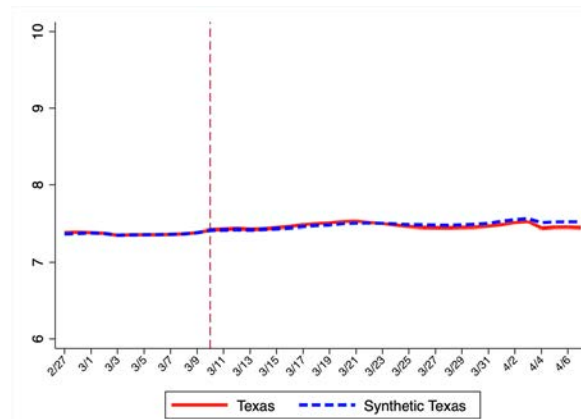
Figure 2B, Continued

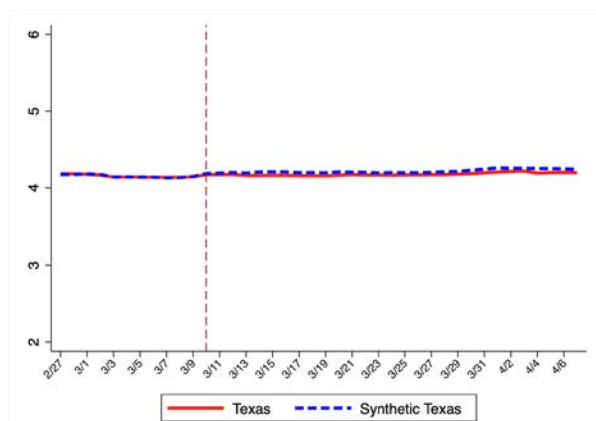*Panel (e): Entertainment Venues*

Note: Synthetic Texas is comprised of KY (34.5%), TN (33.4%), GA (16.4%), and NV (15.7%).
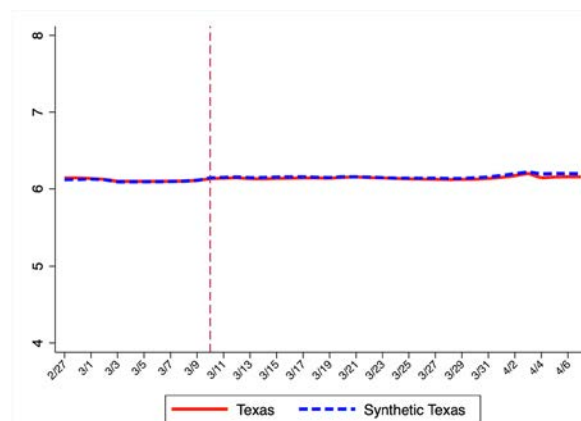
Panel (f): Business Services

Note: Synthetic Texas is comprised of GA (46.4%), NV (42.6%), DC (4.1%), TN (3.9%), and LA (3.0%).

Panel (g): Personal Care Services

Note: Synthetic Texas is comprised of LA (60.0%), GA (14.6%), NV (10.3%), DE (6.5%), ND (6.3%), TN (2.3%).
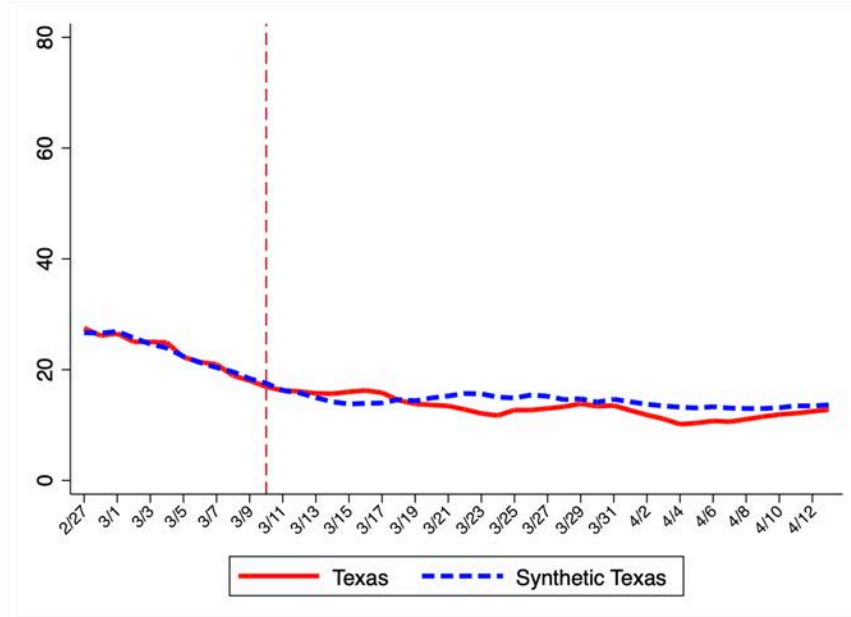
Panel (h): Grocery Stores

Note: Synthetic Texas is comprised of GA (40.5%), LA (38.1%), PA (19.7%), and VT (1.6%).

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Notes: Observable matching variables include daily testing per 100k pop and cumulative doses of COVID-19 vaccination per 100k pop population, and number of days of business closures, shelter-in-place orders/advisories, mask mandates, state urbanicity and population density.
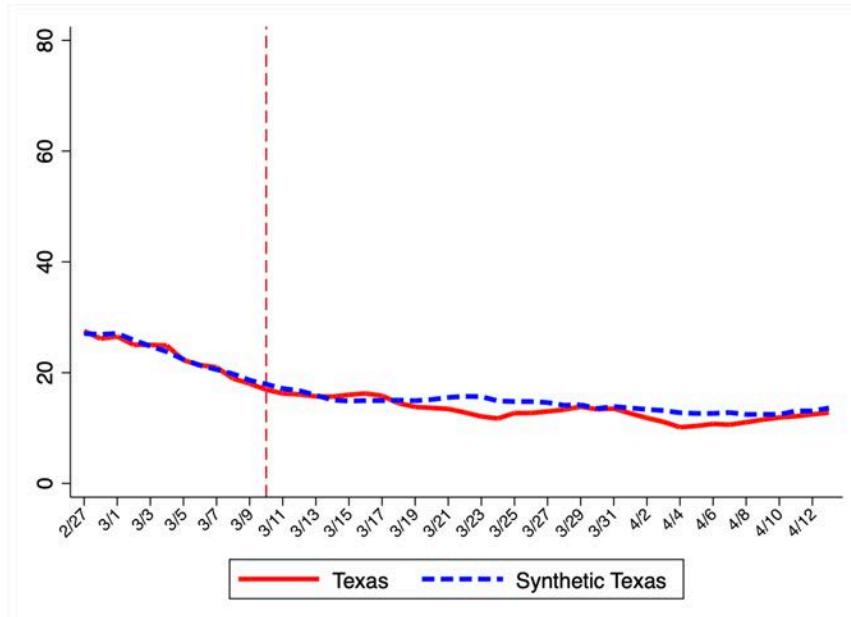
Figure 3. Synthetic Control Estimates of Effect of Texas Reopening on New COVID-19 Cases Per 100,000 Population

Panel (a): COVID-19 Daily Cases Per 100,000
[Matching on All Pre-Treatment Days]

Note: Synthetic Texas is comprised of GA (67.8%), LA (15.0%), SC (9.5%), VT (4.9%), and NM (2.7%).

Panel (b): COVID-19 Daily Cases Per 100,000
[Matching on Selected Pre-Treatment Days and All Observables]
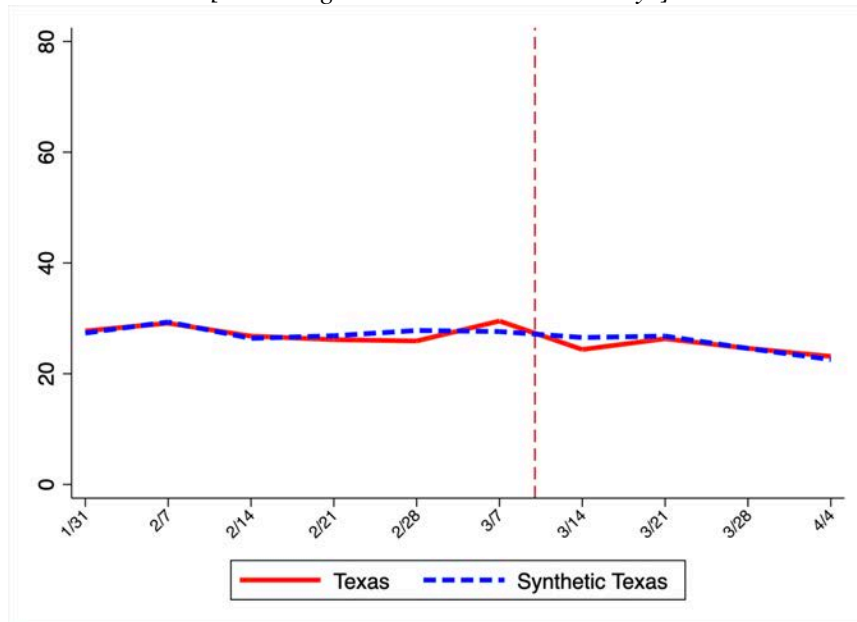

Note: Synthetic Texas is comprised of GA (58.5%), KY (28.2%), LA (6.7%), and SC (6.6%).

Notes: Observable matching variables include daily testing per 100k pop and cumulative doses of COVID-19 vaccination per 100k pop population, and number of days of business closures, shelter-in-place orders/advisories, mask mandates, state urbanicity and population density.

Figure 4. Synthetic Control Estimates of Effect of Texas Reopening on Ratio of Weekly Continued Unemployment Claims Per 1,000 Covered Jobs

Panel (a): Weekly Continued Claims Per 1,000 Covered Jobs
[Matching on All Pre-Treatment Days]

Note: Synthetic Texas is comprised of FL (39.8%), CO (37.6%), OH (14.3%), MI (8.1%), and LA (0.2%).

Panel (b): Weekly Continued Claims Per 1,000 Covered Jobs
[Matching on Selected Pre-Treatment Days and All Observables]

Note: Synthetic Texas is comprised of CO (30.0%), TN (25.7%), FL (17.8%), MI (9.6%), LA (9.4%), and NV (7.4%).

Notes: The dates above indicate the start of the week claims data are measured. Observable matching variables include daily testing per 100k pop and cumulative doses of COVID-19 vaccination per 100k pop population, and number of days of business closures, shelter-in-place orders/advisories, mask mandate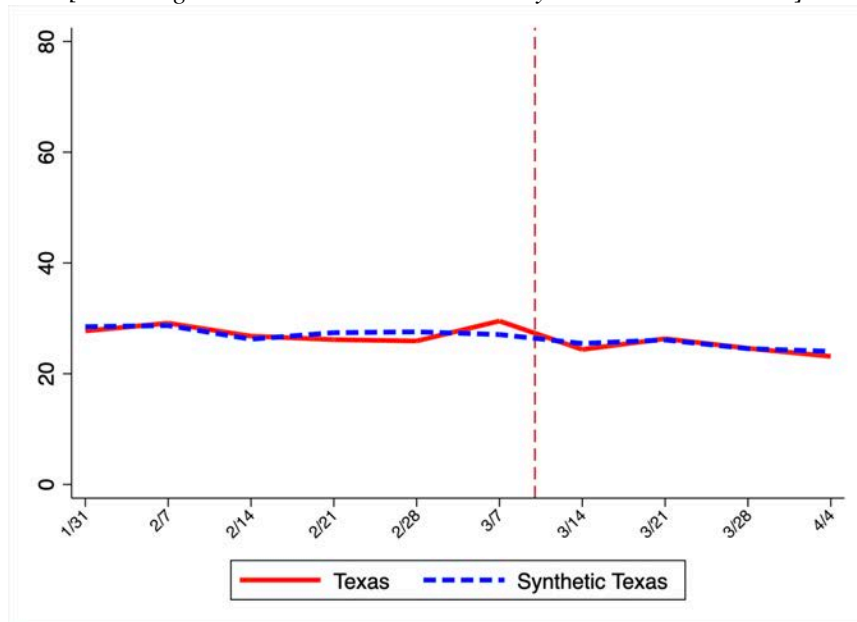s, state urbanicity and population density. Extended donor pool includes Kentucky with recoded daily death rates more than 3 standard deviations from state-specific mean to the state-specific mean.

Table 1. Synthetic Control Estimates of Effect of Texas Reopening on
Stay-at-Home Behavior

	Full-Time Stay-at-Home		*Median Hours at Home*	
	(1)	(2)	(3)	(4)

Panel I: Entire Post-Treatment Window -- March 10 to April 13

Texas Re-Opening	-0.496*	-0.055	-0.025	0.028
P-Value	[0.121]	[0.667]	[0.792]	[0.667]
One Sided P-Value	[0.083]	[0.371]	[0.417]	[0.292]
Texas Pre-Treatment Mean	24.149	24.149	12.521	12.521

Panel II: Short- and Longer-Run Windows

Post-Treatment Window -- March 10 to March 24

Texas Re-Opening	-0.687*	-0.168	-0.127	-0.201
P-Value	[0.121]	[0.621]	[0.621]	[0.458]
One Sided P-Value	[0.083]	[0.417]	[0.208]	[0.167]
Texas Pre-Treatment Mean	24.149	24.149	12.521	12.521

Post-Treatment Window -- March 25 to April 13

Texas Re-Opening	-0.353*	0.029	0.052	0.207
P-Value	[0.167]	[0.417]	[0.833]	[0.583]
One Sided P-Value	[0.083]	[0.250]	[0.417]	[0.250]
Texas Pre-Treatment Mean	24.149	24.149	12.521	12.521
Donor Pool and Matching Variables				
Pre-Opening Matching Days	11	6	11	6
Match on All Observables	No	Yes	No	Yes

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Estimates are generated using synthetic control methods. Observable matching variables include the average of the pre-treatment and post-treatment period testing per 100,000 population and doses of vaccination per 100,000 population, and number of days of restaurant, bar, and personal care services closure policies, shelter-in-place orders and advisories, mask mandates, state urbanicity and population density. Pre-opening matching days in columns (1) and (3) include each day between February 27th, 2021 and March 9th, 2021. In columns (2) and (4), we match on every other day in the pre-treatment period beginning on February 27th. Permutation-based p-values are generated via placebo tests.

Table 2A. Synthetic Control Estimates of Effect of Texas Reopening on Log (Foot Traffic Per 100,000 Population), Matching on Outcome for All Pre-Treatment Days

	Restaurants and Bars	Restaurants	Bars	Retail	Entertainment	Business Services	Personal Care	Grocery
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel I: Entire Post-Treatment Window -- March 10 to April 13								
Texas Re-Opening	0.009	0.000	0.012	-0.005	0.032	-0.007	-0.005	-0.028
P-Value	[0.917]	[0.917]	[0.871]	[0.250]	[0.458]	[0.542]	[0.621]	[0.621]
One Sided P-Value	[0.542]	[0.542]	[0.417]	[0.121]	[0.167]	[0.371]	[0.333]	[0.333]
Texas Pre-Treatment Mean	7.947	7.914	4.533	8.237	6.848	7.370	4.154	6.112
Panel II: Short- and Longer-Run Windows								
Post-Treatment Window -- March 10 to March 24								
Texas Re-Opening	0.017	0.009	0.021	0.012	0.036	0.013	0.007	-0.021
P-Value	[0.871]	[0.792]	[0.750]	[0.333]	[0.333]	[0.458]	[0.667]	[0.583]
One Sided P-Value	[0.583]	[0.500]	[0.292]	[0.167]	[0.121]	[0.292]	[0.371]	[0.292]
Texas Pre-Treatment Mean	7.947	7.914	4.533	8.237	6.848	7.370	4.154	6.112
Post-Treatment Window -- March 25 to April 13								
Texas Re-Opening	0.000	0.000	0.000	-0.024*	0.027	-0.028	-0.019	-0.036
P-Value	[1.00]	[0.917]	[0.958]	[0.167]	[0.542]	[0.333]	[0.500]	[0.371]
One Sided P-Value	[0.583]	[0.417]	[0.458]	[0.083]	[0.208]	[0.208]	[0.371]	[0.208]
Texas Pre-Treatment Mean	7.947	7.914	4.533	8.237	6.848	7.370	4.154	6.112

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Estimates are generated using synthetic control methods. Permutation-based p-values are generated via placebo tests.

Table 2B. Synthetic Control Estimates of Effect of Texas Reopening on Log (Foot Traffic Per 100,000 Population), Matching on Outcome for Selected Pre-Treatment Days and All Observables

	Restaurants and Bars	Restaurants	Bars	Retail	Entertainment	Business Services	Personal Care	Grocery
	(1)	(2)	(3)	(4)	*(5)*	(6)	(7)	(8)
Panel I: Entire Post-Treatment Window -- March 10 to April 13								
Texas Re-Opening	0.000	0.000	-0.018	-0.006	-0.011	-0.015	-0.037	-0.018
P-Value	[0.871]	[0.833]	[0.500]	[0.583]	[0.583]	[0.371]	[0.417]	[0.792]
One Sided P-Value	[0.371]	[0.333]	[0.333]	[0.292]	[0.333]	[0.292]	[0.208]	[0.371]
Texas Pre-Treatment Mean	7.947	7.914	4.533	8.237	6.848	7.370	4.154	6.112
Panel II: Short- and Longer-Run Windows								
Post-Treatment Window -- March 10 to March 24								
Texas Re-Opening	0.013	0.013	0.034	0.011	0.000	0.012	-0.034	-0.011
P-Value	[0.833]	[0.833]	[0.621]	[0.542]	[0.667]	[0.500]	[0.417]	[0.917]
One Sided P-Value	[0.417]	[0.417]	[0.167]	[0.333]	[0.371]	[0.292]	[0.167]	[0.333]
Texas Pre-Treatment Mean	7.947	7.914	4.533	8.237	6.848	7.370	4.154	6.112
Post-Treatment Window -- March 25 to April 13								
Texas Re-Opening	-0.015	-0.014	-0.075	-0.024	-0.042	-0.045	-0.041	-0.025
P-Value	[0.792]	[0.750]	[0.371]	[0.371]	[0.583]	[0.292]	[0.250]	[0.583]
One Sided P-Value	[0.371]	[0.333]	[0.167]	[0.208]	[0.333]	[0.167]	[0.167]	[0.371]
Texas Pre-Treatment Mean	7.947	7.914	4.533	8.237	6.848	7.370	4.154	6.112

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Estimates are generated using synthetic control methods. Observable matching variables include the average of the pre-treatment and post-treatment period testing per 100,000 population and doses of vaccination per 100,000 population, and number of days of restaurant, bar, and personal care services closure policies, shelter-in-place orders and advisories, mask mandates, state urbanicity and population density. Pre-opening matching days in each specification are every other day between February 27th, 2021 and March 9th, 2021. Permutation-based p-values are generated via placebo tests.

Table 3. Synthetic Control Estimates of Effect of Texas Reopening on Daily COVID-19 Cases Per 100,000 Population

	Daily COVID-19 Case Levels		Daily COVID-19 Growth Rate	
	(1)	(2)	(3)	(4)
Panel I: Entire Post-Treatment Window -- March 10 to April 13				
Texas Re-Opening	-1.167	-1.145	-0.002	-0.004
P-Value	[0.871]	[0.917]	[0.833]	[0.750]
One Sided P-Value	[0.583]	[0.667]	[0.500]	[0.417]
Texas Pre-Treatment Mean	23.336	23.336	-0.039	-0.039
Panel II: Short- and Longer-Run Windows				
Post-Treatment Window -- March 10 to March 24				
Texas Re-Opening	-0.341	-0.922	-0.013	-0.008
P-Value	[0.871]	[0.708]	[0.750]	[0.583]
One Sided P-Value	[0.583]	[0.500]	[0.371]	[0.292]
Texas Pre-Treatment Mean	23.336	23.336	-0.039	-0.039
Post-Treatment Window -- March 25 to April 13				
Texas Re-Opening	-1.779	-1.313	0.006	0.000
P-Value	[0.917]	[0.958]	[0.917]	[0.792]
One Sided P-Value	[0.583]	[0.667]	[0.500]	[0.458]
Texas Pre-Treatment Mean	23.336	23.336	-0.039	-0.039
Donor Pool and Matching Variables				
Pre-Opening Matching Days	11	6	11	6
Match on All Observables	Yes	No	Yes	No

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Estimates are generated using synthetic control methods. Observable matching variables include the average of the pre-treatment and post-treatment period testing per 100,000 population and doses of vaccination per 100,000 population, restaurant, bar, and personal care services closure policies, shelter-in-place orders and advisories, mask mandates, state urbanicity and population density. Pre-opening matching days in columns (1) and (3) include each day between February 27th, 2021 and March 9th, 2021. In columns (2) and (4), we match on every other day in the pre-treatment period. Permutation-based p-values are generated via placebo tests.

Table 4. Synthetic Control Estimates of Effect of Texas Reopening on Daily COVID-19 Deaths Per 100,000 Population

	Daily COVID-19 Death Levels		Daily COVID-19 Death Growth Rate	
	(1)	(2)	(3)	(4)
Panel I: Entire Post-Treatment Window -- March 10 to April 13				
Texas Re-Opening	-0.002	0.006	-0.001	-0.017
P-Value	[0.708]	[0.750]	[0.250]	[0.750]
One Sided P-Value	[0.292]	[0.417]	[0.167]	[0.458]
Texas Pre-Treatment Mean	0.767	0.767	-0.014	-0.014
Panel II: Short- and Longer-Run Windows				
Post-Treatment Window -- March 10 to March 24				
Texas Re-Opening	0.094	0.094	-0.025	-0.008
P-Value	[0.667]	[0.583]	[0.417]	[0.750]
One Sided P-Value	[0.458]	[0.333]	[0.250]	[0.417]
Texas Pre-Treatment Mean	0.767	0.767	-0.014	-0.014
Post-Treatment Window -- March 25 to April 13				
Texas Re-Opening	-0.074	-0.061	0.000	-0.025
P-Value	[0.750]	[0.708]	[0.208]	[0.667]
One Sided P-Value	[0.333]	[0.371]	[0.167]	[0.292]
Texas Pre-Treatment Mean	0.767	0.767	-0.014	-0.014
Donor Pool and Matching Variables				
Pre-Opening Matching Days	11	6	11	6
Match on All Observables	Yes	No	Yes	No

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Estimates are generated using synthetic control methods. Observable matching variables include the average of the pre-treatment and post-treatment period testing per 100,000 population and doses of vaccination per 100,000 population, restaurant, bar, and personal care services closure policies, shelter-in-place orders and advisories, mask mandates, state urbanicity and population density. Pre-opening matching days in columns (1) and (3) include each day between February 27th, 2021 and March 9th, 2021. In columns (2) and (4), we match on every other day in the pre-treatment period. Permutation-based p-values are generated via placebo tests.

Table 5: Exploring Heterogeneity in Effect of Texas' Reopening on Percent Stay at Home Full-Time and Foot Traffic into Bars

	% Stay at Home Full-Time			Foot Traffic in Bars		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel I: Overall						
Texas Reopening	-0.440	-0.441	-0.546	0.014	0.014	0.003
Permutation-based [p-value]	[0.625]	[0.625]	[0.458]	[0.958]	[0.958]	[0.958]
Placebo {Texas Rank / Donors + 1}	{15/24}	{15/24}	{11/24}	{23/24}	{23/24}	{23/24}
Mean of Dependent Variable	20.065	20.065	20.065	2.725	2.725	2.725
Panel II: County Urbanicity						
Texas Reopening * ≥ 50% Urbanicity	-0.508	-0.509	-0.614	0.017	0.017	0.005
Permutation-based [p-value]	[0.458]	[0.458]	[0.899]	[0.958]	[0.958]	[0.958]
Placebo {Texas Rank / Donors + 1}	{11/24}	{11/24}	{10/24}	{23/24}	{23/24}	{23/24}
Mean of Dependent Variable	20.922	20.922	20.922	3.488	3.488	3.488
Texas Reopening * < 50% Urbanicity	0.202	0.202	0.096	-0.010	-0.010	-0.021
Permutation-based [p-value]	[0.800]	[0.800]	[0.899]	[0.949]	[0.949]	[0.850]
Placebo {Texas Rank / Donors + 1}	{16/24}	{16/24}	{18/24}	{19/24}	{19/24}	{17/24}
Mean of Dependent Variable	19.322	19.322	19.322	2.063	2.063	2.063
Panel III: County % Voted for Trump						
Texas Reopening * ≥ 50% Vote Trump	-0.199	-0.200	-0.305	0.001	0.001	-0.010
Permutation-based [p-value]	[0.856]	[0.856]	[0.666]	[1.00]	[1.00]	[1.00]
Placebo {Texas Rank / Donors + 1}	{18/24}	{18/24}	{14/24}	{21/24}	{21/24}	{21/24}
Mean of Dependent Variable	19.679	19.679	19.679	2.663	2.663	2.663
Texas Reopening * < 50% Vote Trump	-0.686	-0.686	-0.792	0.027	0.027	0.016
Permutation-based [p-value]	[0.522]	[0.522]	[0.391]	[0.912]	[0.870]	[0.912]
Placebo {Texas Rank / Donors + 1}	{12/24}	{12/24}	{9/24}	{21/24}	{20/24}	{21/24}
Mean of Dependent Variable	24.587	24.587	24.587	3.447	3.447	3.447
N	63,800	63,800	63,800	63,800	63,800	63,800
Controls: Daily Testing	N	Y	Y	N	Y	Y
Controls: Testing & Cum Vaccine Doses	N	N	Y	N	N	Y

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Regressions include Texas and each donor state. The weights are generated by multiplying share of state population by the synthetic weights. Each column includes county and day fixed effects; (2) and (5) include daily testing per 100,000 population; and columns (3) and (6) include daily cumulative doses of a COVID-19 vaccination administered per 100,000 population in addition to the controls used in columns (2) and (5). P-values, generated using permutation test, are reported inside brackets and ranking of the treated unit is included in braces.

Table 6: Exploring Heterogeneity in Effect of Texas' Reopening on Foot Traffic into Restaurants and Daily COVID-19 Case Rate

	Foot Traffic into Restaurants			Daily COVID-19 Case Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel I: Overall					
Texas Reopening	-0.005	-0.005	-0.004	-1.035	-1.034	-2.450
Permutation-based [p-value]	[0.916]	[0.916]	[0.958]	[0.958]	[0.958]	[0.833]
Placebo {Texas Rank / Donors + 1}	{22/24}	{22/24}	{23/24}	{23/24}	{23/24}	{20/24}
Mean of Dependent Variable	8.152	8.152	8.152	17.429	17.429	17.429
	Panel II: County Urbanicity					
Texas Reopening * ≥ 50% Urbanicity	-0.007	-0.007	-0.006	-1.198	-1.198	-2.614
Permutation-based [p-value]	[0.916]	[0.916]	[0.833]	[0.958]	[0.958]	[0.875]
Placebo {Texas Rank / Donors + 1}	{22/24}	{22/24}	{20/24}	{23/24}	{23/24}	{21/24}
Mean of Dependent Variable	8.557	8.557	8.557	16.668	16.668	16.668
Texas Reopening * < 50% Urbanicity	0.009	0.009	0.010	0.515	0.516	-0.900
Permutation-based [p-value]	[0.850]	[0.850]	[0.800]	[1.00]	[1.00]	[0.800]
Placebo {Texas Rank / Donors + 1}	{22/24}	{17/24}	{16/24}	{20/24}	{20/24}	{16/24}
Mean of Dependent Variable	7.801	7.801	7.801	18.089	18.089	18.089
	Panel III: County % Voted for Trump					
Texas Reopening * ≥ 50% Vote Trump	-0.006	-0.006	-0.005	-1.068	-1.068	-2.484
Permutation-based [p-value]	[0.904]	[0.904]	[1.00]	[0.952]	[0.952]	[0.762]
Placebo {Texas Rank / Donors + 1}	{19/24}	{19/24}	{21/24}	{20/24}	{20/24}	{16/24}
Mean of Dependent Variable	8.147	8.147	8.147	16.822	16.822	16.822
Texas Reopening * < 50% Voted Trump	-0.005	-0.005	-0.004	-1.000	-0.999	-2.416
Permutation-based [p-value]	[0.870]	[0.870]	[1.00]	[1.00]	[1.00]	[0.870]
Placebo {Texas Rank / Donors + 1}	{19/24}	{20/24}	{23/24}	{23/24}	{23/24}	{20/24}
Mean of Dependent Variable	8.219	8.219	8.219	24.528	24.528	24.528
N	63,800	63,800	63,800	73,370	73,370	73,370
Controls: Daily Testing	N	Y	Y	N	Y	Y
Controls: Testing & Cumulative Vaccine Doses	N	N	Y	N	N	Y

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Regressions include Texas and each donor state. The weights are generated by multiplying share of state population by the synthetic weights. Each column includes county and day fixed effects; (2) and (5) include daily testing per 100,000 population; and columns (3) and (6) include daily cumulative doses of a COVID-19 vaccination administered per 100,000 population in addition to the controls used in columns (2) and (5). P-values, generated using permutation test, are reported inside brackets and ranking of the treated unit is included in braces.

## Table 7. Synthetic Control Estimates of Effect of Texas Reopening on Weekly Continued Unemployment Claims Per 1,000 Covered Jobs

	(1)	(2)
	Panel I: Entire Post-Treatment Window – *Weeks of March 14th to April 4th*	
Texas Re-Opening	-0.512	-0.429
P-Value	[0.861]	[1.00]
One Sided P-Value	[0.391]	[0.609]
Texas Pre-Treatment Mean	27.536	27.536
	Panel II: Short- and Longer-Run Windows	
	Post-Treatment Window -- Weeks of March 14th and March 21st	
Texas Re-Opening	-1.318	-0.437
P-Value	[0.652]	[0.783]
One Sided P-Value	[0.435]	[0.522]
Texas Pre-Treatment Mean	27.536	27.536
	Post-Treatment Window -- Weeks of March 28th to April 4th	
Texas Re-Opening	0.294	-0421
P-Value	[1.00]	[0.957]
One Sided P-Value	[0.652]	[0.478]
Texas Pre-Treatment Mean	27.536	27.536
Donor Pool and Matching Variables		
Pre-Opening Matching Weeks	All	4
Match on All Observables	No	Yes

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Estimates are generated using synthetic control methods. Observable matching variables include the average of the pre-treatment and post-treatment period testing per 100,000 population and doses of vaccination per 100,000 population, restaurant, bar, and personal care services closure policies, shelter-in-place orders and advisories, mask mandates, state urbanicity and population density. Pre-opening matching weeks in column (1) include all weeks between February 21st and Match 7th. In column (2), we match on the weeks beginning February 7th, February 21st, February 28th, and March 7th. Permutation-based p-values are generated via placebo tests

Table 8: Difference-in-Differences Estimates of the Effects of Texas Reopening on Unemployment Insurance Claims, Unemployment Rate and Employment-to-Population Ratio

	Continued UI Claims		Initial UI Claims		Unemployment Rate		Employment-to-Population Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Texas Reopening	1.896	0.763	0.080	0.138	0.264	0.331	-0.104	-0.774
Permutation-based [p-value]	[0.458]	[0.750]	[1.00]	[0.958]	[0.136]	[0.118]	[0.764]	[0.157]
Placebo Test {Texas Rank /# Donors + 1}	{11/24}	{18/24}	{24/24}	{23/24}	{7/51}	{6/51}	{39/51}	{8/51}
Texas Pre-Treatment Mean	27.536	27.536	4.087	4.087	6.850	6.850	57.788	57.788
State and Month Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observable Controls?	No	Yes	No	Yes	No	Yes	No	Yes

 * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Regressions include data from the January 2021 through March 2021 Current Population Survey from Texas and representing 158,381 (columns 1-2) to 264,149 (columns 3-4) individuals across 153 state-month observations. All models include state and month fixed effects. Observable controls include number of days of business closures, shelter-in-place orders/advisories, mask mandates, average daily testing, and average daily doses. P-values, generated using permutation test, are reported inside brackets and ranking of the treated unit is included in braces.

Appendix Figure 1: Sensitivity of Stay-at-Home and Foot Traffic Synthetic Results to Use of Daily Stay-at-Home and Foot Traffic Data, Matching on All Pre-Treatment Days

Panel (a): Percent Staying at Home Full Time
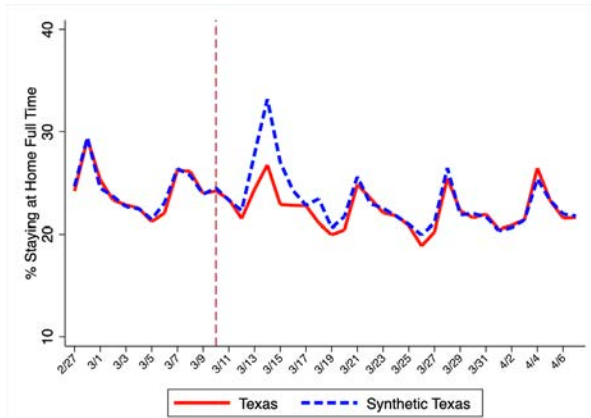
Note: Synthetic Texas is comprised of SC (33.8%), NE (25.1%), CO (18.5%), RI (15.5%), and LA (7.2%).

Panel (b): Restaurants and Bars
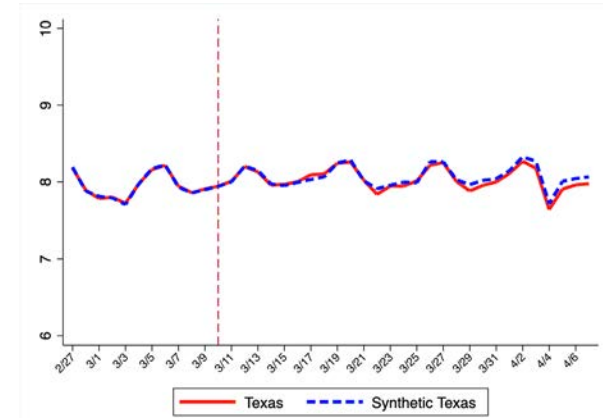
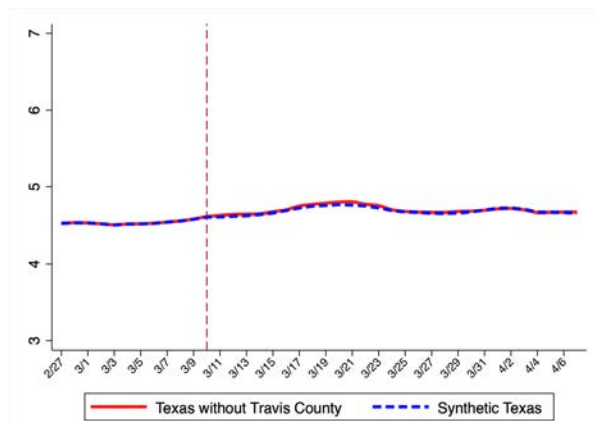Note: Synthetic Texas is comprised of OK (32.0%), TN (26.8%), GA (15.5%), FL (14.2%), and NV (11.5%).

Panel (c): Restaurants
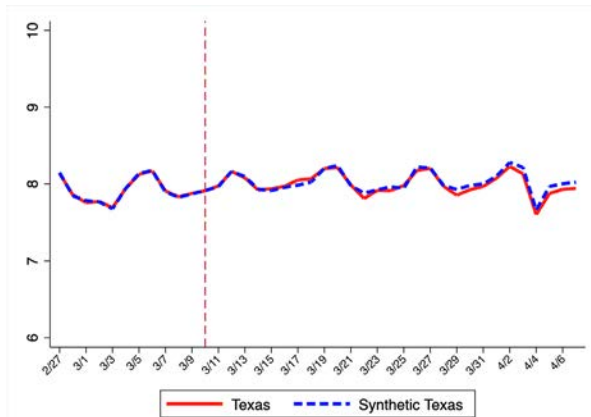
Note: Synthetic Texas is comprised of OK (30.7%), TN (30.0%), GA (17.7%), NV (11.7%), and FL (9.9%).

Panel (d): Bars
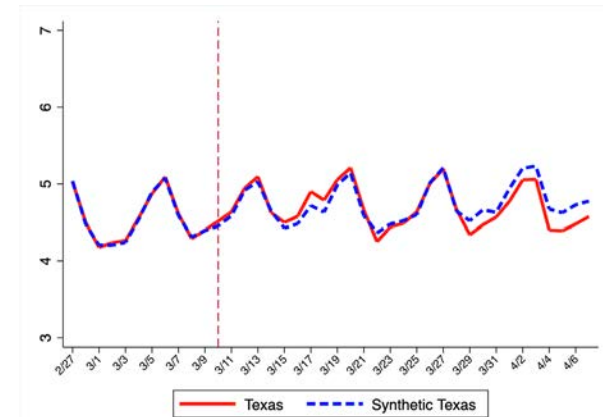
Note: Synthetic Texas is comprised of GA (64.0%), FL (18.8%), DC (12.3%), and NV (4.8%).

Appendix Figure 2. Sensitivity of Synthetic Control Estimates on Stay-at-Home Behavior to the Exclusion of Travis County from Treated Unit, Matching on All Pre-Treatment Days

Panel (a): Percent Staying at Home Full Time
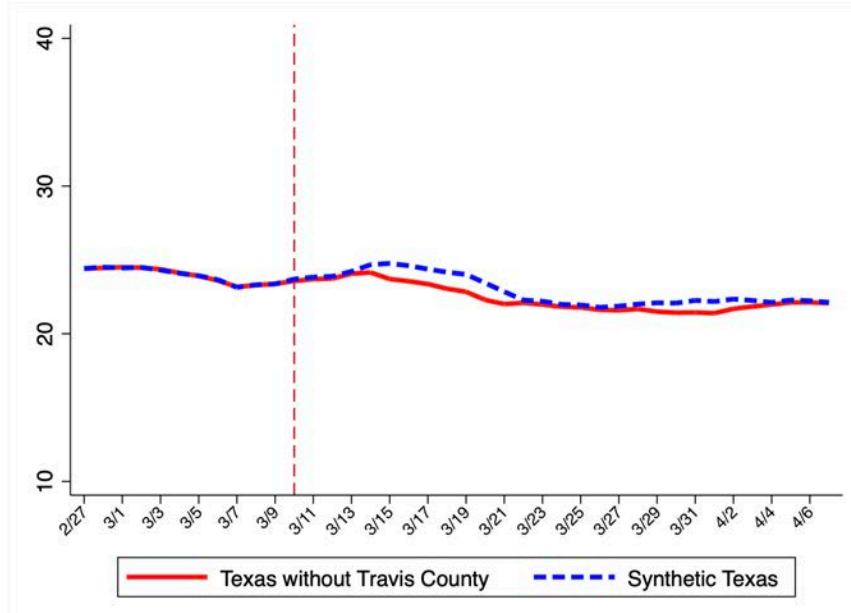
Note: Synthetic Texas is comprised of ND (22.4%), TN (19.7%), SD (16.7%), VT (15.6%), LA (11.2%), GA (7.3%), and CO (7.1%).

Panel (b): Median Hours at Home
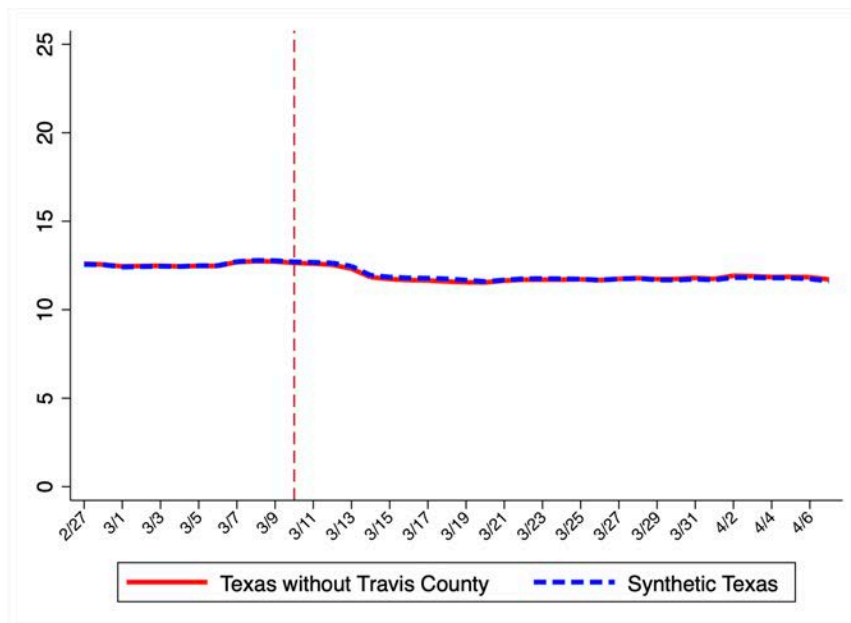
Note: Synthetic Texas is comprised of OK (85.8%), and NJ (14.2%).

Appendix Figure 3. Sensitivity of Synthetic Control Estimates on Foot Traffic to the Exclusion of Travis County from Treated Unit, Matching on All Pre-Treatment Days

Panel (a): Restaurants and Bars
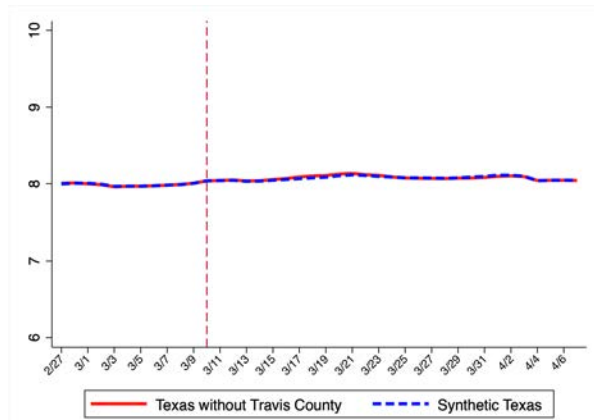
Note: Synthetic Texas is comprised of OK (42.4%), LA (36.2%), KY (16.0%), TN (4.2%), and VT (1.2%).

Panel (b): Restaurants
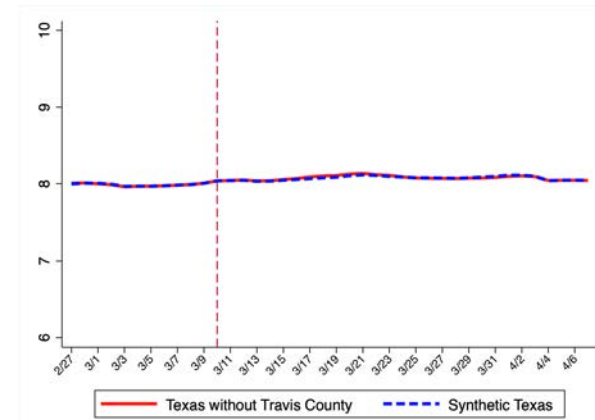
Note: Synthetic Texas is comprised of OK (42.9%), LA (38.1%), KY (18.5%), and VT (0.5%).

Panel (c): Bars

Note: Synthetic Texas is comprised of LA (36.4%), ND (29.9%), NM (18.1%), VT (7.1%), TN (6.5%), NV (1.6%), and KY (0.4%).

Panel (d): Retail
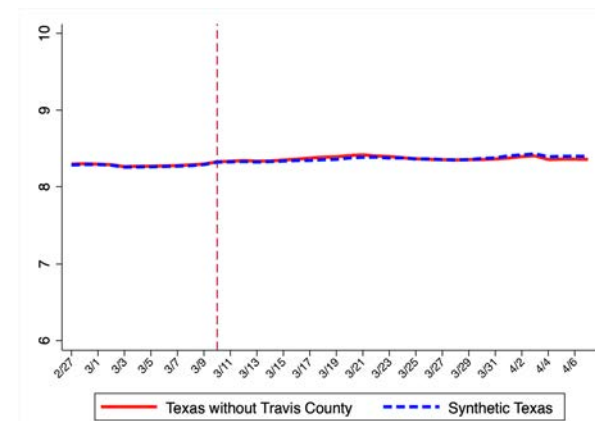
Note: Synthetic Texas is comprised of LA (44.9%), TN (35.8%), NV (16.8%), and DC (2.4%).

Appendix Figure 3, Continued
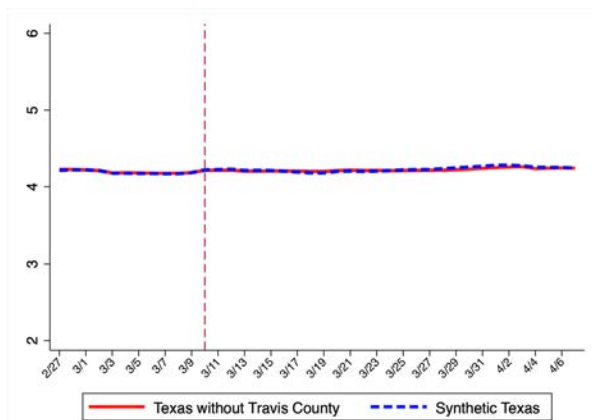
Panel (a): Entertainment Venues
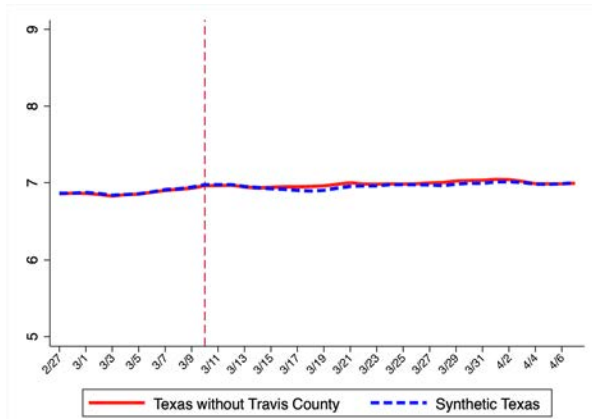
Note: Synthetic Texas is comprised of KY (30.5%), OK (21.0%),
ND (17.5%), NE (16.2%), GA (12.0%), and NM (2.9%).
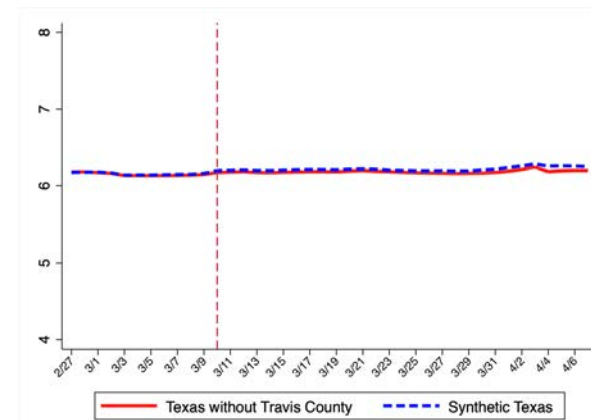
Panel (b): Business Services
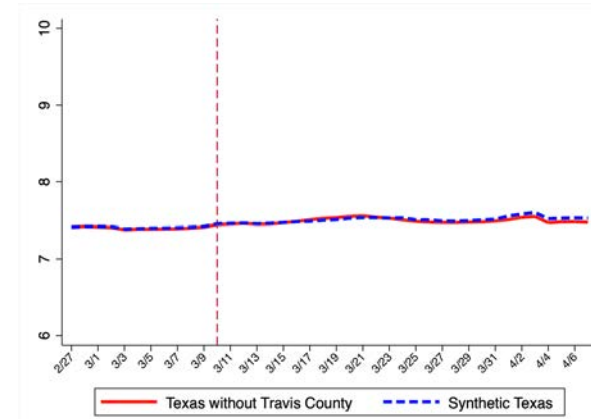
Note: Synthetic Texas is comprised of TN (72.2%), GA (20.8%),
and LA (7.1%).

Panel (c): Personal Care Services

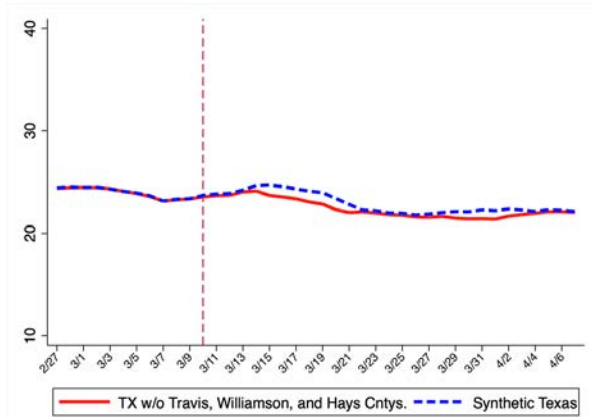Note: Synthetic Texas is comprised of OK (58.2%), LA (27.2%),
and SC (14.5%).

Panel (d): Grocery Stores

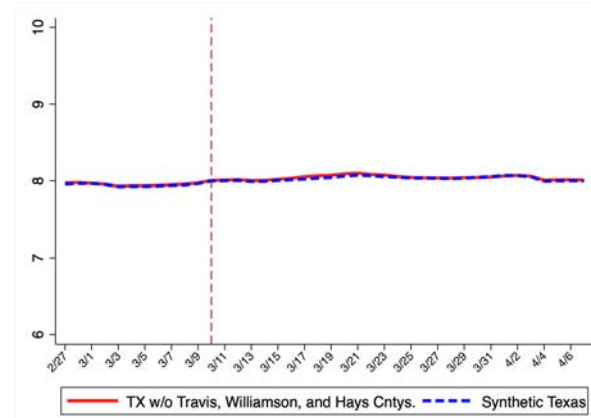Note: Synthetic Texas is comprised of LA (65.6%), FL (21.2%),
and VT (13.3%).

Appendix Figure 4. Sensitivity of Synthetic Control Estimates to the Exclusion of Travis, Hays, and Williamson Counties from Treated Unit, Matching on All Pre-Treatment Days
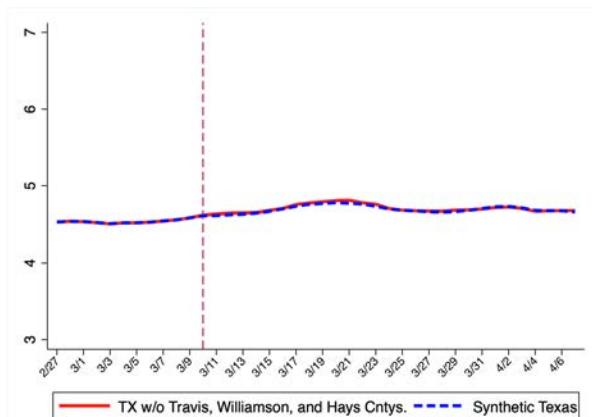
Panel (a): Staying at Home Full Time

Note: Synthetic Texas is comprised of ND (23.5%), TN (21.2%), SD (15.5%), VT (15.2%), LA (11.4%), CO (6.7%), and GA (6.6%).

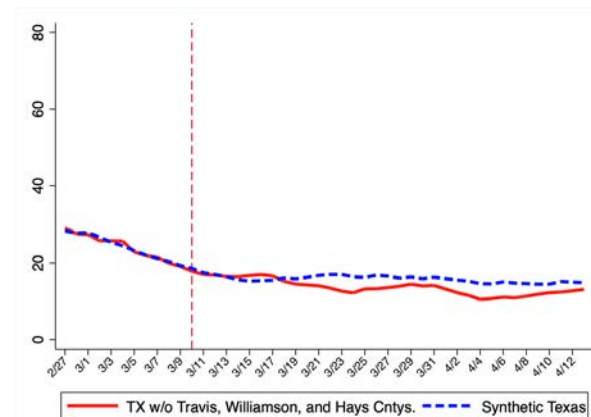*Panel (b): Foot Traffic into Restaurants*

Note: Synthetic Texas is comprised of OK (41.7%), LA (38.4%), KY (19.5%), and VT (0.3%).

Panel (c): Foot Traffic into Bars

Note: Synthetic Texas is comprised of LA (41.1%), ND (27.3%), NM (18.6%), VT (8.5%), NV (3.0%), and TN (1.5%).
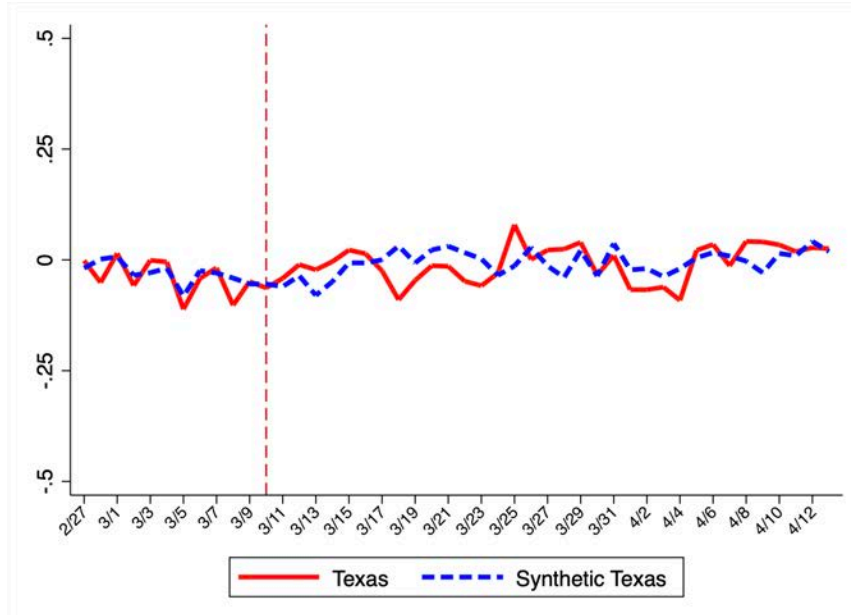
Panel (d): Daily COVID-19 Cases Per 100,000

Note: Synthetic Texas is comprised of GA (55.2%), SC (22.5%), LA (11.1%), VT (6.2%), NM (2.8%), and DE (2.2%).

Appendix Figure 5. Sensitivity of Synthetic Control Estimates on New COVID-19 Cases to Use of Individual Daily Data, Matching on All Pre-Treatment Days

Panel (a): Daily COVID-19 Case Growth Rate

Note: Synthetic Texas is comprised of GA (65.2%), NM (18.2%), OK (7.2%), VT (6.1%), and PA (3.3%).

Panel (b): Daily COVID-19 Cases Per 100,000

Note: Synthetic Texas is comprised of GA (51.1%), ND (27.4%), RI (14.6%), and SD (6.8%).
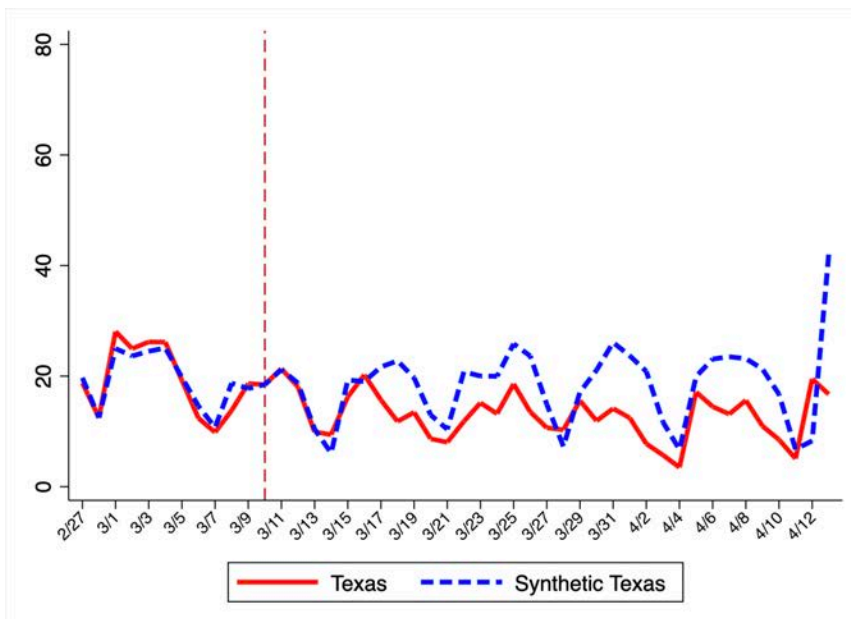
Appendix Figure 6. Sensitivity of Synthetic Control Estimates on new COVID-19 Case Rate to Exclusion of Travis County, Matching on All Pre-Treatment Days
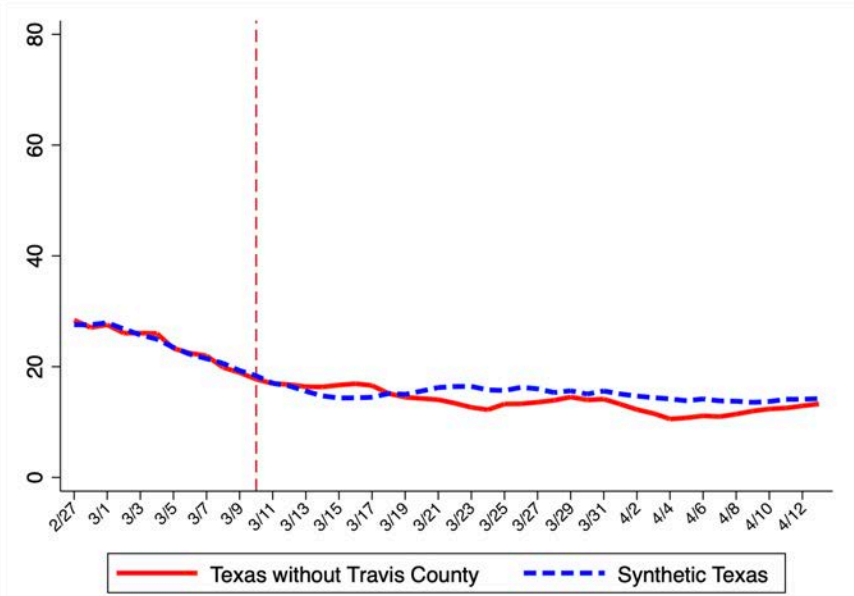
Note: Synthetic Texas is comprised of GA (74.4%), SC (11.0%), LA (7.8%), and VT (6.8%).

Appendix Figure 7. Robustness of Findings to Use of Cumulative COVID-19 Case Rate and Daily Growth in Cumulative COVID-19 Case Rate, Matching on All Pre-Treatment Days

Panel (a): Cumulative COVID-19 Cases Per 100,000
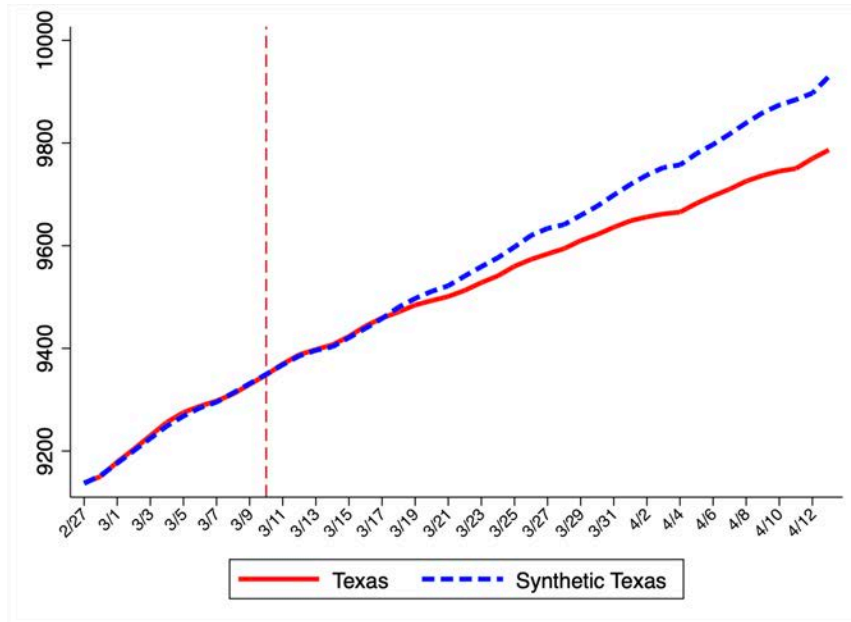
Note: Synthetic Texas is comprised of GA (58.5%), OH (28.2%), RI (9.3%), MI (2.3%), and LA (1.7%).

Panel (b): Daily Cumulative COVID-19 Case Growth Rate
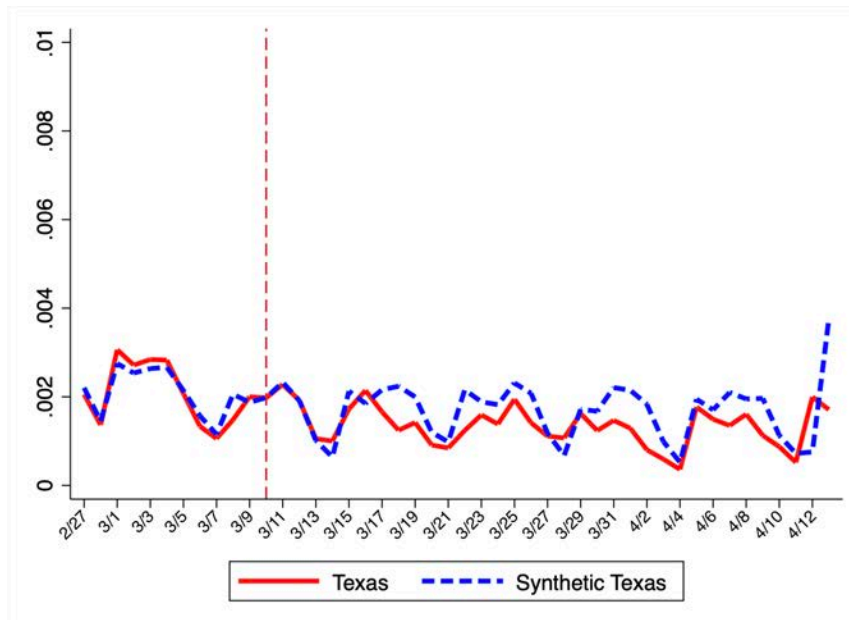
Note: Synthetic Texas is comprised of GA (49.4%), RI (19.3%), KY (16.8%), ND (9.0%), and SD (5.6%).

Appendix Figure 8. Synthetic Control Estimates of Effect of Texas Reopening on Daily COVID-19 Deaths, Matching on All Pre-Treatment Days

Panel (a): COVID-19 Daily Deaths Per 100,000
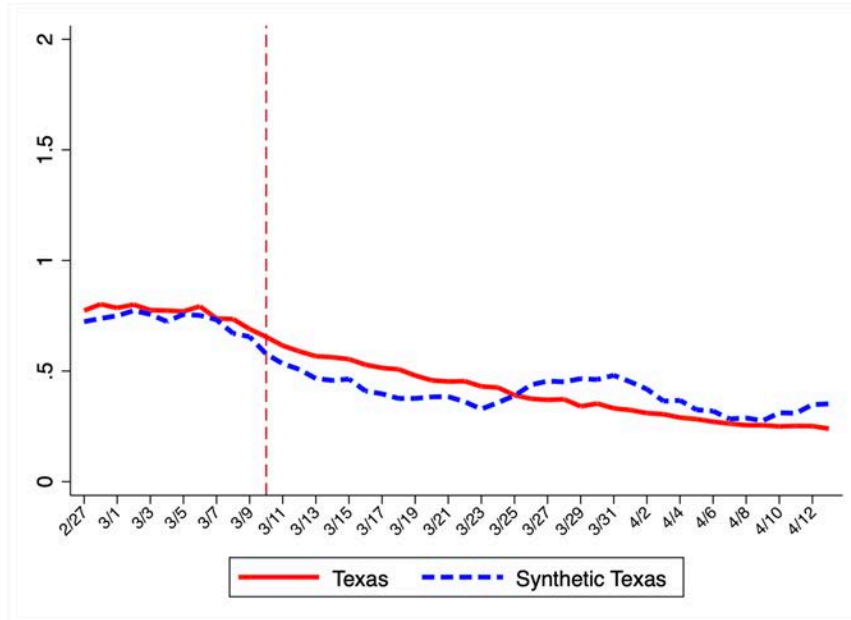
Note: Synthetic Texas is comprised of GA (77.8%), OK (14.4%), and DE (7.8%).

Panel (b): COVID-19 Daily Death Growth Rate
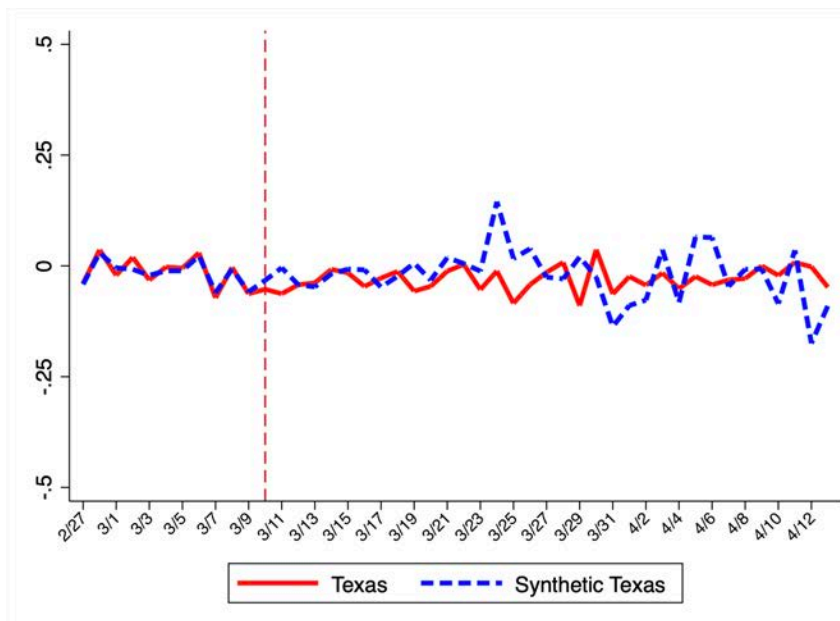
Note: Synthetic Texas is comprised of MA (33.8%), KY (21.3%), NV (15.6%), DC (10.8%), PA (5.5%), GA (5.5%), NE (5.5%), and ND (2.0%).

Appendix Table 1: Sensitivity of Heterogeneity Estimates to Alternate Urbanicity and Voting Behavior Cutoffs, Stay at Home Behavior and Foot Traffic into Bars

	% Stay at Home Full-Time			Foot Traffic in Bars		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel I: County Urbanicity					
Texas Reopening * ≥ 75% Urbanicity	-0.560	-0.561	-0.066	0.015	0.015	-0.002
Permutation-based [p-value]	[0.435]	[0.435]	[0.435]	[0.912]	[0.912]	[1.00]
Placebo {Texas Rank / Donors + 1}	{10/24}	{10/24}	{10/24}	{21/24}	{21/24}	{23/24}
Mean of Dependent Variable	21.675	21.675	21.675	3.789	3.789	3.789
Texas Reopening * < 75% Urbanicity	0.067	0.066	-0.039	0.010	0.010	0.004
Permutation-based [p-value]	[0.957]	[0.957]	[0.957]	[0.912]	[0.957]	[0.957]
Placebo {Texas Rank / Donors + 1}	{22/24}	{22/24}	{22/24}	{21/24}	{22/24}	{22/24}
Mean of Dependent Variable	19.568	19.568	19.568	2.396	2.396	2.396
Texas Reopening * ≤ 40% Urbanicity	0.138	0.138	0.032	-0.010	-0.010	-0.021
Permutation-based [p-value]	[0.788]	[0.788]	[0.894]	[0.894]	[0.894]	[0.894]
Placebo {Texas Rank / Donors + 1}	{15/24}	{15/24}	{17/24}	{17/24}	{17/24}	{17/24}
Mean of Dependent Variable	19.322	19.322	19.322	1.892	1.892	1.892
Texas Reopening * > 40% Urbanicity	-0.482	-0.482	-0.588	0.016	0.016	0.005
Permutation-based [p-value]	[0.500]	[0.500]	[0.458]	[1.00]	[1.00]	[0.958]
Placebo {Texas Rank / Donors + 1}	{12/24}	{12/24}	{11/24}	{24/24}	{24/24}	{23/24}
Mean of Dependent Variable	20.671	20.671	20.671	3.403	3.403	3.403
	Panel II: County % Voted for Trump					
Texas Reopening * ≥ 60% Vote Trump	0.079	0.079	-0.027	0.014	0.014	0.003
Permutation-based [p-value]	[0.947]	[0.947]	[1.00]	[0.894]	[0.894]	[1.00]
Placebo {Texas Rank / Donors + 1}	{18/24}	{18/24}	{19/24}	{17/24}	{17/24}	{19/24}
Mean of Dependent Variable	19.365	19.365	19.365	2.515	2.515	2.515
Texas Reopening * < 60% Voted Trump	-0.645	-0.645	-0.751	0.014	0.014	0.003
Permutation-based [p-value]	[0.416]	[0.416]	[0.375]	[1.00]	[1.00]	[1.00]
Placebo {Texas Rank / Donors + 1}	{10/24}	{10/24}	{9/24}	{24/24}	{24/24}	{24/24}
Mean of Dependent Variable	23.927	23.927	23.927	3.883	3.883	3.883
N	63,800	63,800	63,800	63,800	63,800	63,800
Controls: Daily Testing	N	Y	Y	N	Y	Y
Controls: Testing & Cumulative Vaccine Doses	N	N	Y	N	N	Y

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Regressions include Texas and each donor state. The weights are generated by multiplying share of state population by the synthetic weights. Each column includes county and day fixed effects; (2) and (5) include daily testing per 100,000 population; and columns (3) and (6) include daily cumulative doses of a COVID-19 vaccination administered per 100,000 population in addition to the controls used in columns (2) and (5). P-values, generated using permutation test, are reported inside brackets and ranking of the treated unit is included in braces.

Appendix Table 2: Sensitivity of Heterogeneity Estimates to Alternate Urbanicity and Voting Behavior Cutoffs, Foot Traffic into Restaurants and Daily COVID-19 Rate

	Foot Traffic into Restaurants			*Daily COVID-19 Case Rate*		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel I: County Urbanicity					
Texas Reopening * ≥ 75% Urbanicity	-0.007	-0.007	-0.006	-1.682	-1.681	-3.098
Permutation-based [p-value]	[0.912]	[0.912]	[0.912]	[0.957]	[0.957]	[0.782]
Placebo {Texas Rank / Donors + 1}	{21/24}	{21/24}	{21/24}	{22/24}	{22/24}	{18/24}
Mean of Dependent Variable	8.585	8.585	8.585	21.521	21.521	21.521
Texas Reopening * < 75% Urbanicity	0.005	0.005	0.006	1.699	1.700	0.283
Permutation-based [p-value]	[0.912]	[0.912]	[0.12]	[0.12]	[0.912]	[1.00]
Placebo {Texas Rank / Donors + 1}	{21/24}	{21/24}	{21/24}	{21/24}	{21/24}	{23/24}
Mean of Dependent Variable	8.018	8.018	8.018	16.163	16.163	16.163
Texas Reopening * ≤ 40% Urbanicity	0.012	0.012	0.013	0.482	0.483	-0.933
Permutation-based [p-value]	[0.842]	[0.842]	[0.788]	[1.00]	[1.00]	[0.788]
Placebo {Texas Rank / Donors + 1}	{16/24}	{16/24}	{15/24}	{19/24}	{19/24}	{15/24}
Mean of Dependent Variable	7.680	7.680	7.680	16.685	16.685	16.685
Texas Reopening * > 40% Urbanicity	-0.006	-0.006	-0.005	-1.144	-1.143	-2.559
Permutation-based [p-value]	[0.958]	[0.916]	[0.916]	[0.958]	[0.958]	[0.875]
Placebo {Texas Rank / Donors + 1}	{23/24}	{22/24}	{22/24}	{23/24}	{23/24}	{21/24}
Mean of Dependent Variable	8.536	8.536	8.536	18.034	18.034	18.034
	Panel II: County % Voted for Trump					
Texas Reopening * ≥ 60% Vote Trump	0.001	0.001	0.002	1.514	1.515	0.098
Permutation-based [p-value]	[0.947]	[0.947]	[1.00]	[0.842]	[0.842]	[1.00]
Placebo {Texas Rank / Donors + 1}	{18/24}	{18/24}	{19/24}	{16/24}	{16/24}	{19/24}
Mean of Dependent Variable	8.112	8.112	8.112	15.546	15.546	15.546
Texas Reopening * < 60% Voted Trump	-0.008	-0.008	-0.007	-2.039	-2.038	-3.454
Permutation-based [p-value]	[0.916]	[0.916]	[0.916]	[0.958]	[0.958]	[0.833]
Placebo {Texas Rank / Donors + 1}	{22/24}	{22/24}	{22/24}	{23/24}	{23/24}	{20/24}
Mean of Dependent Variable	8.375	8.375	8.375	27.687	27.687	27.687
N	63,800	63,800	63,800	73,370	73,370	73,370
Controls: Daily Testing	N	Y	Y	N	Y	Y
Controls: Testing & Cumulative Vaccine Doses	N	N	Y	N	N	Y

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Regressions include Texas and each donor state. The weights are generated by multiplying share of state population by the synthetic weights. Each column includes county and day fixed effects; (2) and (5) include daily testing per 100,000 population; and columns (3) and (6) include daily cumulative doses of a COVID-19 vaccination administered per 100,000 population in addition to the controls used in columns (2) and (5). P-values, generated using permutation test, are reported inside brackets and ranking of the treated unit is included in braces.

Appendix Table 3: Difference-in-Differences Estimates of the Effects of Texas Reopening on Bar and Restaurant and Entertainment Employment-to-Population Ratios

	Restaurant and Bar Employment-to-Population Ratio		Entertainment Employment-to-Population Ratio	
	(1)	(2)	(3)	(4)
Texas Reopening	-0.255	-0.254	0.058	-0.162
Permutation-based [p-value]	[0.725]	[0.725]	[0.824]	[0.587]
Placebo Test {Texas Rank /# Donors + 1}	{37/51}	{37/51}	{42/51}	{30/51}
Texas Pre-Treatment Mean	4.126	4.126	0.669	0.669
State and Month Effects?	Yes	Yes	Yes	Yes
Observable Controls?	No	Yes	No	Yes

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

Notes: Regressions include data from the January 2021 through March 2021 Current Population Survey from Texas and representing 158,381 (columns 1-2) to 264,149 (columns 3-4) individuals across 153 state-month observations. All models include state and month fixed effects. Observable controls include number of days of business closures, shelter-in-place orders/advisories, mask mandates, average daily testing, and average daily doses. P-values, generated using permutation test, are reported inside brackets and ranking of the treated unit is included in braces.