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School reopenings, COVID-19, and employment

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\textbf{A B S T R A C T}

Using a panel of United States counties, this study compares outcomes before and during the 2020–2021 school year between locations that started K-12 instruction on campus, remotely, or through a hybrid approach. Corroborating recent studies, we find comparatively larger increases of COVID-19 cases and deaths in locations using any in-person instruction. Within the same empirical framework, we present robust new evidence that employment was unaffected by this choice, even in counties with more vulnerable populations. We posit that opening schools did not improve employment due to policy uncertainty, supported by the fact that one-quarter of schools changed teaching methods mid-year.

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1. Introduction

The COVID–19 pandemic wedged policymakers between a rock and a hard place. A first-order priority was to reduce the spread of the deadly disease. However, governments and other planners also sought to sustain the economic livelihoods of households and businesses during this global recession. Balancing these objectives required making difficult decisions based on limited information about how various policy options would affect targeted outcomes.

One particularly salient choice was whether to “reopen” schools and provide at least some instruction in person rather than teaching entirely remotely. While bringing people together onto a campus increases the potential scope for viral transmission, schools have long served an important role in facilitating parents’ access to employment markets. Indeed, the U.S. Bureau of Labor Statistics suggests that the 2020 “decline in labor force participation among parents, especially mothers, likely reflects not only pandemic-related job losses, but also the shift of many schools to distance learning” (BLS, 2021).

Ultimately, policymakers across the world chose to operate local schools during the 2020–2021 academic year using a variety of approaches. In this paper, we use a panel of United States counties to study the impacts of the choice of teaching method on COVID–19 cases and deaths and on employment. We employ difference-in-differences and event study designs to isolate the variation in the outcomes that is most likely attributable to the teaching method chosen at the start of the school year.

We acknowledge that a limitation of this approach is that even the initial choice of teaching method was not (quasi-)randomly assigned, and thus the causality of these findings should be interpreted with caution. Nonetheless, we provide a broad set of supporting evidence for the robustness of our approach and findings.

Several recent studies also explore whether in-person schooling is associated with greater COVID–19 transmission (e.g. Chernozhukov et al., 2021; Goldhaber et al., 2021) or parental employment (e.g. Amuedo-Dorantes et al., 2020; Collins et al., 2021). However, we provide the first evaluation, to our knowledge, that uses a consistent empirical framework to estimate how the local teaching method relates to both of these outcomes. There are also some key differences between our analysis and the related literature. Our study uses data for virtually the entire U.S. population, rather than the geographically limited survey evidence from some prior research. Moreover, much of the related research pertains to school closures in March 2020, whereas we focus on the effects of the teaching methods selected during the pandemic for the 2020–2021 academic year.

Finally, while some related literature also uses a difference-in-differences empirical strategy, these studies allow the choice of instructional modality to vary over time—thereby estimating rather short-run effects identified within-location from schools.
changing teaching methods. In contrast, our approach captures the longer-run intent-to-treat effect of the initially selected teaching method across the full school year. While both methods can have merit depending on the specific research question(s), this is an important distinction given that many school districts revised their teaching method after instruction had started. In Appendix A, we provide a more comprehensive discussion of the related literature and comparisons to our paper.

2. Data and methods

This study uses a balanced panel of U.S. counties from March 2020 through May 2021—effectively spanning the start of the pandemic through the end of the 2020–2021 school year. We source data on the daily COVID-19 deaths and cases (positive tests) from the New York Times, which compiles data from health departments. For monthly employment, we use the Bureau of Labor Statistics’ Local Area Unemployment Statistics. We obtained nationwide K–12 school district policies from MCH Strategic Data. Because some districts changed teaching methods mid-year—potentially endogenously—we use a database version of policies in October 2020, just after the school year started. As counties can host multiple school districts, we spatially joined districts to counties and assign teaching policies based on the highest-enrollment district. Fig. 1 shows counties’ predominant teaching method: Campus, Hybrid, or Remote.

Appendix B discusses details for these panel data and county covariates from 2019. As Fig. 1 indicates, Campus counties are more rural and concentrated in the Great Plains, whereas Hybrid and Remote counties are geographically representative. Table 1 provides summary statistics. The average population is lowest in Campus counties and highest in Remote counties. However, the three groups are quite similar in per-capita characteristics such as income, poverty, family demographics, and influenza.

### Table 1

| Summary statistics by county teaching method. | Average across counties |
|---------------------------------------------|-------------------------|
| **Panel [A] Pre-pandemic covariates in 2019** |                        |
| Latitude                                    | 40.57                   |
| Longitude                                   | −95.6                   |
| Population                                  | 28,687                  |
| Population share under-18 (%)              | 22.66                   |
| Adult labor force part. rate (%)            | 76.13                   |
| Female labor force part. rate (%)           | 71.82                   |
| Mothers labor force part. rate (%)          | 75.51                   |
| GDP per person ($)                          | 56,478                  |
| Median income ($)                           | 54,182                  |
| Poverty rate (%)                            | 13.51                   |
| Influenza vaccinations rate (%)             | 40.19                   |
| Hospital beds per 1k population             | 2.67                    |
| ICU beds per 1k population                  | 0.14                    |
| **Panel [B] Dependent variables during March 2020–May 2021** |                        |
| Daily COVID-19 cases per 1 m pop.           | 238                     |
| Daily COVID-19 deaths per 1 m pop.          | 4.91                    |
| Employment per 1k population                | 465                     |
| Start of 2020–2021 school year              | August 26               |
| Number of counties                          | 357                     |

Note: See Appendix B for details.
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Fig. 2. Event study: COVID-19 deaths in counties teaching Campus/Hybrid v. Remote.

3. Results

We first evaluate how in-person teaching relates to community COVID-19 outcomes. Appendix B includes graphs showing that per-capita cases and deaths trended fairly similarly before

the school year across the three groups, especially for Hybrid and Remote counties. Outcomes diverge after schools opened, particularly for the initial few months, with Campus counties experiencing substantially more and Hybrid counties moderately more COVID-19, relative to areas teaching remotely. The difference-in-differences estimates shown in Appendix Table B1 echo these patterns.² Per million population, teaching on-campus leads to 54 more new cases and 1.7 more deaths each day, while teaching Hybrid leads to 22 more new cases and 0.5 more deaths per day.³ These estimates are statistically significant and imply that,

² Recent econometrics literature suggests that differences-in-differences models may yield biased estimates for the effects of policies pertaining to COVID-19 (Korolev, 2021). Because growth rates can be exponential, parallel pre-trends might not serve as a credible identification test. In Appendix C, we address this concern by showing that results are robust to using synthetic controls for each county (Ben-Michael et al., 2021).

³ Several parts of the country (e.g., the West Coast and the Northeast) have very few counties with purely in-person instruction, as shown in Fig. 1. In Appendix Table B2, we show that these results are robust to including only the 36 states that had at least one county using the (fully) Campus teaching modality.
nationally, Campus and Hybrid teaching cause 123 additional deaths per day during the school year, a 6.3 percent increase.4

We reiterate that teaching methods are not randomly assigned, and some of this effect might result from other asymmetric behavioral changes across counties during the school year. In support of a causal interpretation, Fig. 2 presents event study evidence with regression coefficients by weeks-to-open for counties teaching Campus versus Remote and for counties teaching Hybrid versus Remote.5 Residual to county and date fixed effects.

Table 2 provides quantitative evidence of this null effect.6 In both natural logs and employment per-capita regressions, we estimate fairly precise zero difference-in-differences coefficients.

4 As the daily data on COVID-19 cases and deaths might be subject to measurement error, we verify robustness of these results to aggregating the data at the monthly level in Appendix Table B3. All monthly estimates are around 30 times the magnitude of the daily estimates. Because we two-way cluster standard errors by state and month – which yields only 15 clusters in the temporal dimension – the standard errors are somewhat larger, but nearly all estimates remain statistically significant at the five percent level.

5 For counties \( i \) on dates \( t \), the first panel of the graph uses only counties teaching either Campus or Remote and plots \( \theta \) coefficients from the specification: deaths_per_1m_{int} = \sum_{w=-20}^{0} \theta_{w} \text{campus} + \sum_{w=20}^{30} \theta_{w} \text{campus} + \gamma \cdot 1[w < -20] \cdot \text{campus} + \phi \cdot 1[w > 30] \cdot \text{campus} + \mu_{i} + \tau_{t} + \varepsilon_{iwt}. \) The second panel uses only counties teaching either Hybrid or Remote and shows coefficients from the specification: deaths_per_1m_{int} = \sum_{w=-20}^{0} \theta_{w} \text{hybrid} + \sum_{w=20}^{30} \theta_{w} \text{hybrid} + \gamma \cdot 1[w < -20] \cdot \text{hybrid} + \phi \cdot 1[w > 30] \cdot \text{hybrid} + \mu_{i} + \tau_{t} + \varepsilon_{iwt}. The 95 percent confidence intervals use standard errors that are two-way clustered by state and weeks-to-open.

6 Appendix Table B4 shows that these results are robust to including only the 36 states that had at least one county using the (fully) Campus teaching modality.
for the teaching method. If anything, labor markets in fully in-person counties fare worse after schools open. The table shows that employment is unaffected even in poorer counties or those with higher pre-pandemic mother labor force participation – where people likely depend more on schools for childcare – and in counties with fewer COVID-19 deaths through August—where people may have changed behavior by more when schools opened.

4. Conclusions

Policymakers faced many challenging tradeoffs during the COVID-19 pandemic. One difficult decision was whether to use in-person school instruction, risking the spread of the virus but facilitating parents’ access to labor markets (in addition to benefits such as fostering children’s development). As several other recent studies have documented, we find that opening schools increased community prevalence of the disease. Our evidence showing no effects on employment is more puzzling. Likely, there are several relevant explanations. One consideration is that the pandemic “employment deficit is explained by factors that affect workers more broadly, as opposed to challenges specific to working parents” (Furman et al., 2021).

We think that an additional important factor is policy uncertainty. In the data we study, at least one-quarter of schools changed teaching methods at some point over the fall or spring semesters, a pattern also shown at www.returntolearntracker.net. Although schools are undoubtedly related to parents’ employment opportunities, beginning the school year in person may not be enough to support higher employment if parents cannot reliably anticipate the availability of consistent child care.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2022.110310.

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7 Although the pre-treatment trends are similar across county groups, there is a difference in levels. We again verify that synthetic control models provide similar estimates as the difference-in-differences model.