Do Research Universities Recession Proof Their Regions? Evidence from State Flagship College Towns

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Abstract

Using synthetic differences-in-differences, we study whether U.S. counties containing state flagship universities experienced resiliency via lower unemployment rates during the past three U.S. recessions. We find a small but insignificant effect for the 2001 recession and a large resiliency effect for the 2008-2009 recession such that flagship counties endured 0.5 percentage point lower unemployment rates. However, flagship counties faced higher unemployment rates during the 2020 recession. The results support the hypothesis that stable consumption demand for non-tradable goods and services drives resiliency, which was absent during the 2020 recession when most university campuses were closed to students due to COVID-19 restrictions.

Keywords: Regional Business Cycles, Unemployment, Research Universities, Regional Resilience.

JEL Codes: R11, R23, R53.

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1 Introduction

Resilient regions are able to absorb destabilizing economic shocks without suffering persistent distress (Martin, 2012). This characteristic of local economies became increasingly important in policy discussions after the Great Recession, as a desirable outcome of place-based policies due to the enduring negative impacts that recessions can wreak on regional labor markets (Martin & Sunley, 2015; Hershbein & Stuart, 2022). Regional scholars and economic geographers have continued to explore the determinants of regional resilience after the COVID-19 pandemic (Kim et al., 2023).

Are there certain features of regional economies that make them more resilient? Recently, Howard et al. (2022) and Gagliardi et al. (2023) suggest that higher shares of college graduates and universities provided resiliency for manufacturing-dependent 'rust belt' regions during manufacturing's secular decline in the richest industrialized nations over the latter half of the twentieth century. Is it possible that universities have provided a cushion against more recent destabilizing events, such as the Great Recession or COVID-19 pandemic? Industry mix has historically been predictive of a region's sensitivity to negative shifts in the business cycle (Domazlicky, 1980; Owyang et al., 2005) in that manufacturing-heavy areas tend to suffer more severe recessions than local economies dominated by education or healthcare (Scavette, 2019). But we do not know whether the presence of universities *per se* makes regions resilient to recessionary shocks.

As the long-run economic growth of nations ultimately depend on their policy choices with regard to investments in human, physical and intangible capitals (Romer, 1986; Lucas, 1988; Ortigueira & Santos, 1997), regional economies similarly reap lasting economic benefits through place-based education and research and development expenditure (Gennaioli et al., 2012; Schweiger et al., 2022). The presence of research universities should, therefore, be consequential for the economic trajectories of their encompassing regions through their knowledge production activities. Prominent examples include the high-tech industry clusters in Silicon Valley (e.g., Stanford and UC Berkeley) and Pittsburgh (e.g., Carnegie Mellon and U of Pittsburgh) that were fostered by the shared research efforts and hiring of skilled graduates from nearby universities (Bartik, 2021; Duranton, 2011).

It is, therefore, somewhat unsurprising that recent studies find positive effects of universities on long-term regional economic growth (Cantoni & Yuchtman, 2014; Valero & Van Reenen, 2019). However, research investigating the direct impact of universities on local labor market activity is mixed, with Beeson & Montgomery (1993) and Berlingieri et al. (2022) finding little impact of universities on employment, wages, or income. Ferhat (2022) finds heterogeneous impacts of French university openings on regional labor market outcomes, such that only economically distressed regions experience significant employment and wage effects.

The mechanisms by which universities affect their local economies are hypothesized to operate through changes in human capital, innovation, and local demand. Universities raise the regional stock of human capital by producing graduates and employing faculty engaged in research and development activity (Abel & Deitz, 2011; Amendola et al., 2020; Cantoni & Yuchtman, 2014). Research universities tend to result in higher levels of regional innovation (e.g., productivity, patenting) through their own research and development activities, industry agglomeration, and local knowledge spillovers (Andersson et al., 2009; Kantor & Whalley, 2014; Hausman, 2022). Lastly, consumption by students and faculty raises the demand for local nontradable goods and services (Felsenstein, 1996; Lee, 2019).

Howard et al. (2022) finds that much of the resilience effect from regional public universities is due to consumption within non-tradable sectors. The stability of consumption by the university population (faculty, students, staff) may offer a short-term recession buffer for their surrounding local economy. Faculty and staff employment are highly dependent on government funding via student enrollment through state appropriations and student loans from the U.S. Department of Education. While state appropriations are sensitive to the business cycle (Humphreys, 2000), student enrollment at universities tends to be countercyclical, with more students enrolling during recessions than expansions (Betts & McFarland, 1995; Dellas & Koubi, 2003). Therefore, much of the local demand by students and faculty is driven by income derived outside of the regional economy and likely to be somewhat insensitive to fluctuations in the national economy. These factors may contribute to the regional resilience of state flagship counties as they encounter negative consumption shocks during U.S. recessions.

In this paper, we examine the resilience of local economies in the aftermath of the last three U.S. recessions over three-year treatment horizons: the dot-com recession (2001-2003), the great recession (2008-2010), and the COVID-19 recession (2020-2022). Specifically, we examine whether the presence of a flagship research university makes a county more or less resilient to these events, where resilience is indicated by a negative treatment effect on the local unemployment rate compared to control counties. We use synthetic difference-in-differences models (Arkhangelsky et al., 2021) and data from the Bureau of Labor Statistics to compare changes in state flagship counties' unemployment rates to other U.S. counties that do not contain R1 or R2 research universities.

We focus on state flagship universities rather than private research universities since the former's locations were more likely to be exogenously chosen due to available affordable land. The identifying assumption is that the nation's other counties form a valid counterfactual for state flagship counties after conditioning on county fixed effects, year fixed effects, and differences in preexisting unemployment rate trends.

The estimated impact of flagship universities on regional resilience varies across the three recessions. State flagship universities experience an insignificant effect on their county unemployment rates in the dot-com recession and a large negative effect (-0.5 percentage points) in the great recession. However, state flagship counties tended to experience much larger unemployment rates (+0.5 percentage points) in the aftermath of the COVID-19 recession. While the U.S. economy suffered a major negative consumption shock during the great recession, the dot-com recession was unusual in that overall consumption did not decline, so universities had no negative consumption shock from which to insulate their local economies. In comparison, the COVID-19 recession featured the absence of students from university campuses due to pandemic restrictions which compounded the negative demand shock locally. These results are consistent with the local university population insulating their county's economy from negative consumption shocks during recessions.

2 Research universities in the United States

Research universities are post-secondary higher education institutions that emphasize knowledge production as a core component of their activities through the academic research of their faculty and the training of doctoral students across various disciplines. Research universities emerged in early-nineteenth century Prussia as teaching institutions, that were previously only concerned with the transmission of knowledge, began to incorporate the production of knowledge within the humanities (Atkinson & Blanpied, 2008).

The model for the American research university emerged in the latter half of the nineteenth century when several U.S. institutions began to add specialized graduate programs to their undergraduate programs (Crow & Dabars, 2015)[1]. The research-intensiveness within American universities was highly concentrated in these few schools until the second half of the twentieth century. In the aftermath of the Second World War, the U.S. federal government began to invest heavily into research and development across the nation's universities either directly or through university-industry collaborations, which increased the number of universities that could be considered first-class research institutions (Atkinson & Blanpied, 2008).

The origin for many of America's most well-known public research universities is the 1862 Morrill Act, which provided federal funds to aid state development of post-secondary institutions (Croft, 2019). The legislation enabled the establishment of land-grant colleges, funded from the sale of federal lands, for each state which would be devoted to the teaching of agricultural and industrial arts. Several additional acts of legislation were subsequently passed to support research (the Hatch Act of 1887), historically black colleges and universities (the Morrill Act of 1890), extension (the Smith-Lever Act of 1914), and tribal colleges and universities (the Equity in Educational Land-Grant Status Act of 1994), as discussed in Croft (2019). Many of the land-grant institutions that were established in the 1862 Morrill

[1] Crow & Dabars (2015) identify these universities as "five colonial colleges chartered before the American Revolution (Harvard, Yale Pennsylvania, Princeton, and Columbia); five state universities (Michigan, Wisconsin, Minnesota, Illinois, and California); and five private institutions conceived from their inception as research universities (MIT, Cornell, Johns Hopkins, Stanford, Chicago)" (pp. 17-18).

Act have become the primary public research universities in each of their respective states, or 'state flagship' universities.

A state flagship university indicates the leading institution within a network of state public universities. The flagship is typically the oldest, most selective, highest enrollment, and most research-intensive public university within a state (Douglass, 2016). Flagships tend to receive high levels of research funding and investment from the state and federal government. In their 2021 report, the Carnegie Classification of Institutions of Higher Education assigned their highest rating of R1 to forty-three state flagship universities, indicating very high research activity, while seven (in Alaska, Idaho, North Dakota, Rhode Island, South Dakota, Vermont, Wyoming) were designated with their second-highest rating of R2, indicating high research activity (ACE, 2024). Unlike many private research universities which where founded by benefactors or religious organizations in major U.S. cities (e.g., Boston U, Carnegie Mellon, Chicago, Johns Hopkins, Southern California, Vanderbilt), most flagship universities are located outside of the nation's largest metropolitan areas.

We focus on state flagship universities as their locations were more likely to be exogenously selected due to available and affordable land, rather than any pertinent features of the region's economy. While there are some exceptions (U of Minnesota, U of Washington, U of Hawaii), most flagship universities were not established within a state's largest city:

> *"The original university builders had been suspicious of the cities, with their sinful distractions, so most early university campuses were located in rural, bucolic settings. They were, for the most part, built in places like Iowa City; Columbia, Missouri; Champaign-Urbana, Illinois; West Lafayette or Bloomington, Indiana; or Ann Arbor, Michigan or College Station. Some were built in the state capitals: Austin, Madison, Lincoln, St. Paul, or East Lansing. In any event, by the 1960s, it was clear that major cities did not have public universities to serve their rapidly expanding populations so branch campuses were built in Chicago, Milwaukee, Indianapolis, Kansas City, St. Louis, Boston, and elsewhere."* (Berdahl, 1998).

Table 1 lists the nation's fifty state flagship universities, which indicates its name, city, county, and state.[2] Additionally, the percentage of the university's surrounding county that is associated with the university is listed under "County Pop (%)". This ranges from the

[2]We use the list of state flagship universities from Dancy & Voight (2019).

Table 1: State Flagship Universities

University	City	County	State	County Pop (%)	Rural-Urban	Morrill Act 1862	Carnegie Class
U OF ALABAMA	TUSCALOOSA	TUSCALOOSA	AL	21	3	NO	R1
U OF ALASKA	FAIRBANKS	FAIRBANKS-N. STAR	AK	9	3	YES	R2
U OF ARIZONA	TUCSON	PIMA	AZ	5	2	YES	R1
U OF ARKANSAS	FAYETTEVILLE	WASHINGTON	AR	13	2	YES	R1
U OF CALIFORNIA-BERKELEY	BERKELEY	ALAMEDA	CA	3	1	YES	R1
U OF COLORADO BOULDER	BOULDER	BOULDER	CO	14	2	NO	R1
U OF CONNECTICUT	STORRS	TOLLAND	CT	24	1	YES	R1
U OF DELAWARE	NEWARK	NEW CASTLE	DE	5	1	YES	R1
U OF FLORIDA	GAINESVILLE	ALACHUA	FL	25	2	YES	R1
U OF GEORGIA	ATHENS	CLARKE	GA	39	3	YES	R1
U OF HAWAII AT MANOA	HONOLULU	HONOLULU	HI	2	2	YES	R1
U OF IDAHO	MOSCOW	LATAH	ID	32	4	YES	R2
U OF ILLINOIS URBANA-CHAMPAIGN	CHAMPAIGN	CHAMPAIGN	IL	31	3	YES	R1
INDIANA U-BLOOMINGTON	BLOOMINGTON	MONROE	IN	35	3	NO	R1
U OF IOWA	IOWA CITY	JOHNSON	IA	27	3	NO	R1
U OF KANSAS	LAWRENCE	DOUGLAS	KS	29	3	NO	R1
U OF KENTUCKY	LEXINGTON	FAYETTE	KY	13	2	YES	R1
LOUISIANA STATE U	BATON ROUGE	EAST BATON ROUGE	LA	9	2	YES	R1
U OF MAINE	ORONO	PENOBSCOT	ME	9	3	YES	R1
U OF MARYLAND-COLLEGE PARK	COLLEGE PARK	PRINCE GEORGE'S	MD	5	1	YES	R1
U OF MASSACHUSETTS-AMHERST	AMHERST	HAMPSHIRE	MA	23	2	YES	R1
U OF MICHIGAN-ANN ARBOR	ANN ARBOR	WASHTENAW	MI	19	2	NO	R1
U OF MINNESOTA-TWIN CITIES	MINNEAPOLIS	HENNEPIN	MN	5	1	YES	R1
U OF MISSISSIPPI	UNIVERSITY	LAFAYETTE	MS	63	4	NO	R1
U OF MISSOURI-COLUMBIA	COLUMBIA	BOONE	MO	22	3	YES	R1
U OF MONTANA	MISSOULA	MISSOULA	MT	10	3	NO	R1
U OF NEBRASKA-LINCOLN	LINCOLN	LANCASTER	NE	9	2	YES	R1
U OF NEVADA-RENO	RENO	WASHOE	NV	5	2	YES	R1
U OF NEW HAMPSHIRE	DURHAM	STRAFFORD	NH	13	1	YES	R1
RUTGERS U-NEW BRUNSWICK	NEW BRUNSWICK	MIDDLESEX	NJ	8	1	YES	R1
U OF NEW MEXICO	ALBUQUERQUE	BERNALILLO	NM	4	2	NO	R1
U AT BUFFALO	BUFFALO	ERIE	NY	4	1	NO	R1
U OF NORTH CAROLINA AT CHAPEL HILL	CHAPEL HILL	ORANGE	NC	29	2	NO	R1
U OF NORTH DAKOTA	GRAND FORKS	GRAND FORKS	ND	23	3	NO	R2
OHIO STATE U	COLUMBUS	FRANKLIN	OH	7	1	YES	R1
U OF OKLAHOMA-NORMAN CAMPUS	NORMAN	CLEVELAND	OK	11	1	NO	R1
U OF OREGON	EUGENE	LANE	OR	6	2	NO	R1
PENNSYLVANIA STATE U	UNIVERSITY PARK	CENTRE	PA	69	3	YES	R1
U OF RHODE ISLAND	KINGSTON	WASHINGTON	RI	16	1	YES	R2
U OF SOUTH CAROLINA-COLUMBIA	COLUMBIA	RICHLAND	SC	10	2	NO	R1
U OF SOUTH DAKOTA	VERMILLION	CLAY	SD	78	6	NO	R2
U OF TENNESSEE-KNOXVILLE	KNOXVILLE	KNOX	TN	8	2	YES	R1
U OF TEXAS AT AUSTIN	AUSTIN	TRAVIS	TX	5	1	NO	R1
U OF UTAH	SALT LAKE CITY	SALT LAKE	UT	4	1	NO	R1
U OF VERMONT	BURLINGTON	CHITTENDEN	VT	10	3	YES	R2
U OF VIRGINIA	CHARLOTTESVILLE	C. VILLE-ALBEMARLE	VA	23	3	NO	R1
U OF WASHINGTON	SEATTLE	KING	WA	3	1	NO	R1
WEST VIRGINIA U	MORGANTOWN	MONONGALIA	WV	30	3	YES	R1
U OF WISCONSIN-MADISON	MADISON	DANE	WI	11	2	YES	R1
U OF WYOMING	LARAMIE	ALBANY	WY	37	4	YES	R2

Sources: USDA, IPEDS, U.S. Census, Atkinson & Blanpied (2008), ACE (2024). 'County Pop (%)' is share of total university enrollment and employment of encompassing county's population in 2019. 'Rural-Urban' indicates the 2013 Rural-Urban Continuum Codes as calculated by the USDA where 1 indicates most urban counties and 9 the most rural. 'Morrill Act 1862' indicates if originally founded as a land-grant institution through act of Congress. 'Carnegie Class' indicates the 2021 classification of doctoral universities into its first tier for research activity "R1 - Very high research activity" and its second tier "R2 - High research activity."

University of Washington, whose enrollment and employment only makes up 3 percent of King County's population, to Pennsylvania State University which makes up 69 percent of Centre County's population. The U.S. Department of Agriculture's 2013 Rural-Urban Continuum Codes for each of the flagship counties are displayed under "Rural-Urban", where 1 indicates the most densely populated urbanized areas in the country (e.g., Los Angeles County, California) and 9 indicates the most sparsely populated rural counties. Only fourteen of the flagship counties are located in "1" counties, with the majority being classified as "2" or "3." Lastly, the table indicates whether a flagship university was established through the Morrill Act of 1862 as well as its Carnegie Classification for research intensity.

3 Empirical Framework

3.1 Data

We use annual unemployment rates at the county level between 1997 and 2022 from the Bureau of Labor Statistics' Local Area Unemployment Statistics program. We identify our treated "flagship counties" using the definition of state flagship universities from Dancy & Voight (2019). Our control group is defined as counties that do not include R1 or R2 universities, which we identify using the list of universities by level of research activity from ACE (2024). We estimate industry shares of total employment for each county using data from the U.S. Census' County Business Patterns for three years immediately preceding U.S. recessions: 2000, 2007, and 2019. We also use rural-urban continuum codes from the U.S. Department of Agriculture for 2003 and 2013.

Figure 1 plots mean unemployment rates between flagship counties and controls from 1997 through 2022. The mean flagship county tended to be one to two percentage points below controls through from 1997 through 2010, but the series slowly converge to less than one percentage point by 2020. Figure 2 evaluates the changes in the unemployment rate from the national business cycle's peak to trough across U.S. counties for the last three recessions: dot-com (2000-2003), great (2007-2010), and COVID-19 (2019-2020). The left panel displays the distribution in these changes for all U.S. counties with flagship counties

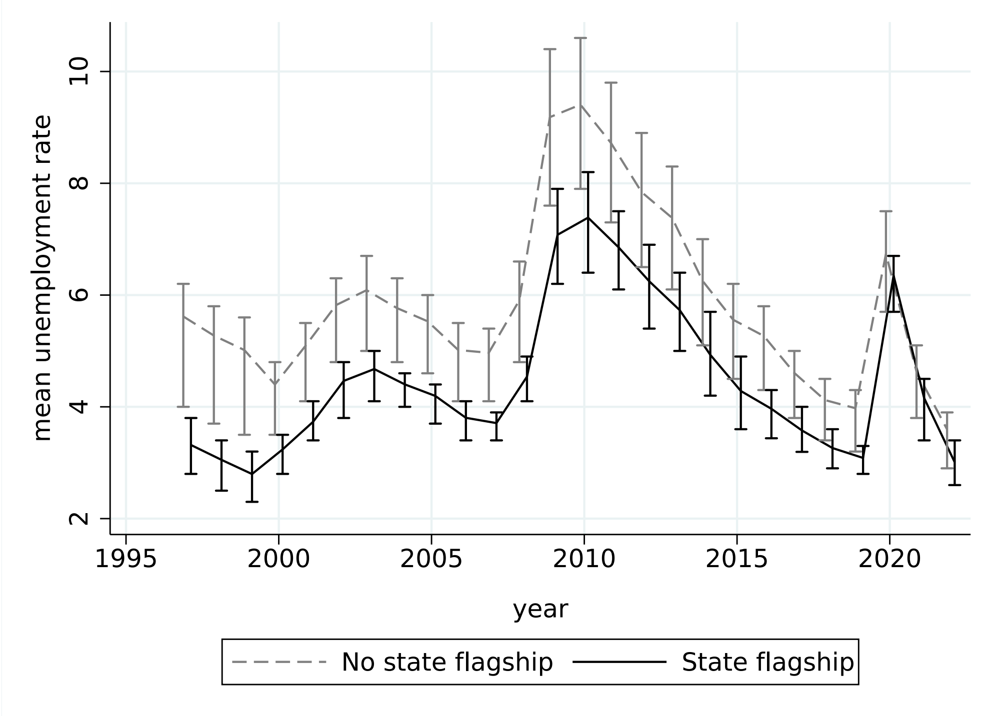


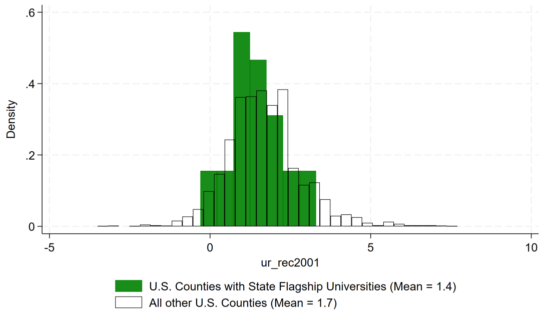
Figure 1: Mean unemployment rates across US counties with and without a state flagship university, 1997 - 2022. Vertical bars correspond to the 33rd and 67th percentiles of the unemployment rate distribution in both groups.

in green and controls in white. For the dot-com recession, the flagship county distribution is to the left of the other counties, indicating that they experienced smaller increases in their unemployment rates (roughly 0.3 percentage points lower on average). This also holds for the Great recession, where the average flagship county experienced a 0.6 percentage point smaller increase in the unemployment rate than controls. However, flagship counties experienced higher unemployment rates during the COVID-19 pandemic (0.5 percentage point). This is consistent with the time series information in figure 1.

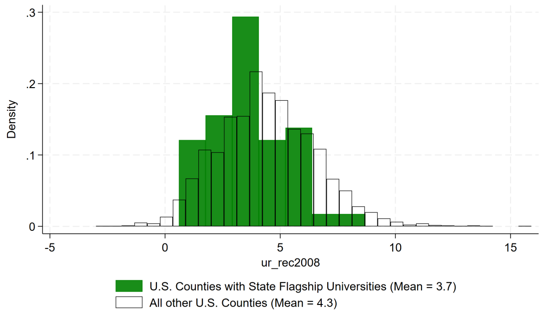
3.2 Model

Our main specification uses synthetic difference-in-differences (SDiD) to estimate an average treatment effect on flagship county unemployment rates by solving,

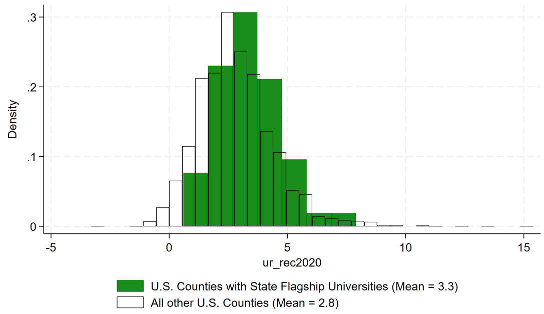
$$\hat{\tau}, \hat{\mu}, \hat{\alpha}, \hat{\beta} = \underset{\tau,\mu,\alpha,\beta}{\arg\min} \left\{ \sum_{i=1}^{J+1} \sum_{i=1}^{T} (Y_{it} - \mu - \alpha_i - \beta_t - D_{it}\tau)^2 \hat{\omega}_i \hat{\lambda}_t \right\}, \tag{1}$$



(a) 2001 (Dot-Com) recession



(b) 2008 (Great) recession



(c) 2020 (COVID-19) recession

Figure 2: Histogram of Changes in County Unemployment Rates Through Recessions

following Arkhangelsky et al. (2021). In equation (1), the dependent variable Y_{it} is the unemployment rate in county i at time t, while the dummy variable D_{it} is equal to one for counties with flagship universities during the 2001 (dot-com), 2008 (great), or 2020 (COVID-19) recession. The treatment effect is denoted by τ, while the fixed effects α_i and β_t control for cross-sectional and time invariant effects. Standard errors are clustered at the county level.

While conceptually similar to a standard difference-in-differences estimator, there are two unusual aspects to our empirical approach. First, as displayed in figure 1, the parallel trends assumption obviously fails in (at least) the 2001 recession. The synthetic difference-in-differences estimator in equation (1) controls for this failure by adding cross-sectional and time weights ω_i and λ_t to force the control and treated group trends to be parallel prior to treatment. The second unusual aspect is our definition of the treatment variable. Usually, one considers a policy intervention that affects one group (the treatment group) without affecting a second group (the control group). In contrast, we consider an economic shock (the dot-com, great or COVID-19 recession) that affects two groups that differ by a pre-existing characteristic (the existence of a state flagship university).

Thus, we do not estimate the causal effect of a treatment versus its absence. Instead, we estimate the causal *difference* between two treatments, i.e., suffering a recession with or without a flagship university. In other words, τ in equation (1) measures the effect of a flagship university on a county's resilience to recession. As discussed in Fricke (2017), this modification of the standard difference-in-differences approach has been used to estimate the effects of school construction, childcare expansion, and minimum wage increases. A relatively well-known application can be found in Fetzer (2019), in which the relationship between support for Brexit and fiscal austerity in the United Kingdom is estimated by interacting a time dummy with differing rates of exposure to welfare reforms.

3.3 Results

Figure 3 plots point estimates and 95% confidence intervals from estimating the synthetic difference-in-differences model in equation (1) on the 2001, 2008, and 2020 recessions. For the 2001 recession, the pre-treatment period runs from 1997-2000 and the post-treatment period runs from 2001-2003. For the 2008 recession, the pre-treatment period runs from 2004-2007 and the post-treatment period runs from 2008-2010. For the 2020 recession, the pre-treatment period runs from 2016-2019 and the post-treatment period runs from 2020-2022.

Interestingly, all three possible effects are present in figure 3. Specifically, flagship universities appear to provide a small positive but insignificant resiliency effect for their host counties during the 2001 recession, a positive resiliency effect during the 2008 recession, and a negative resiliency effect during the 2020 recession. For the latter two recessions these effects are quite large: the effect of the 2008 recession on the unemployment rate in counties with flagship universities was more than 0.5 percentage point lower than its effect on counties without flagship universities. In other words, flagship universities do *not* provide an unambiguous resiliency effect to recessions. Instead, we have a 'varieties of recession' problem, in which universities appear to increase resilience to certain *types* of recession, but not others.

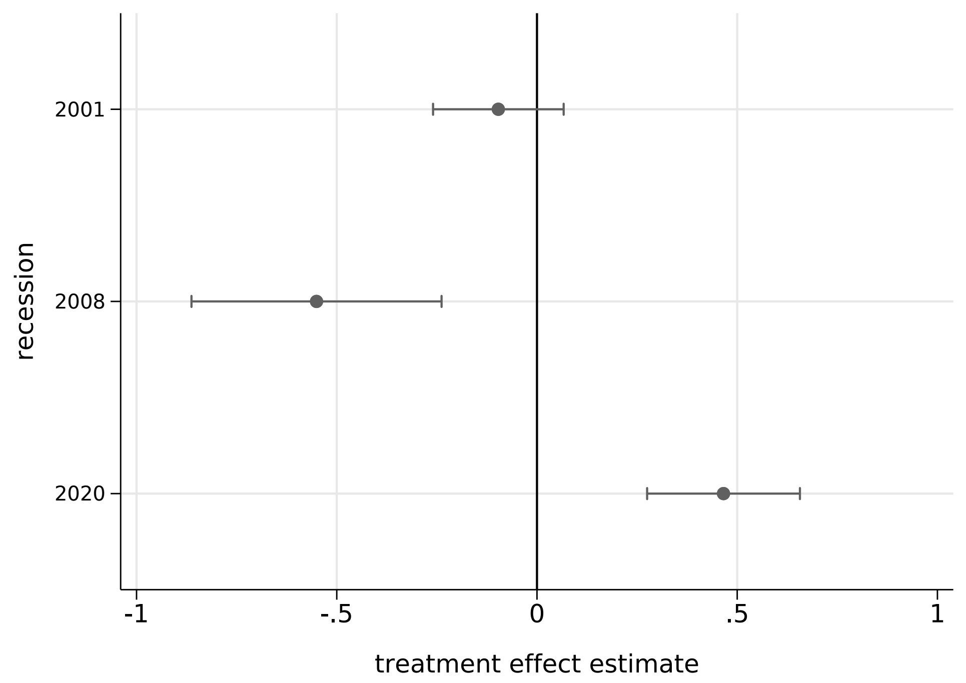


Figure 3: Estimates of the effect of a flagship university on a county's resilience to the 2001, 2008 and 2020 recessions, using the synthetic difference-in-differences estimator in (1). Horizontal bars correspond to 95% confidence intervals.

We hypothesize that the main driver of flagship universities' resilience effect on their regions is through stable demand for consumption of non-tradable goods and services, as suggested by Howard et al. (2022). Figure 4 displays the growth of real personal consumption expenditures in the United States over the past 35 years, with the most recent four recessions shaded in gray. Our resiliency treatment effect for the dot-com (2001) recession is small and insignificant (-0.1 percentage point) indicating that flagship counties only had slightly lower unemployment rates from 2001-2003. However, this is not surprising given that overall U.S. consumption only slowed and never declined in the wake of the dot-com recession (only spending on durable goods declined; Petev et al., 2012). Therefore, flagship counties did not have much of a negative consumption shock to absorb.

However, the 2008 (great) recession was characterized by a broad decline across consumption categories, which was protracted compared to previous recessions and matched with a decline in consumer confidence (Petev et al., 2012). It is therefore remarkable that flagship counties performed considerably better than the rest of the country in terms of their unemployment

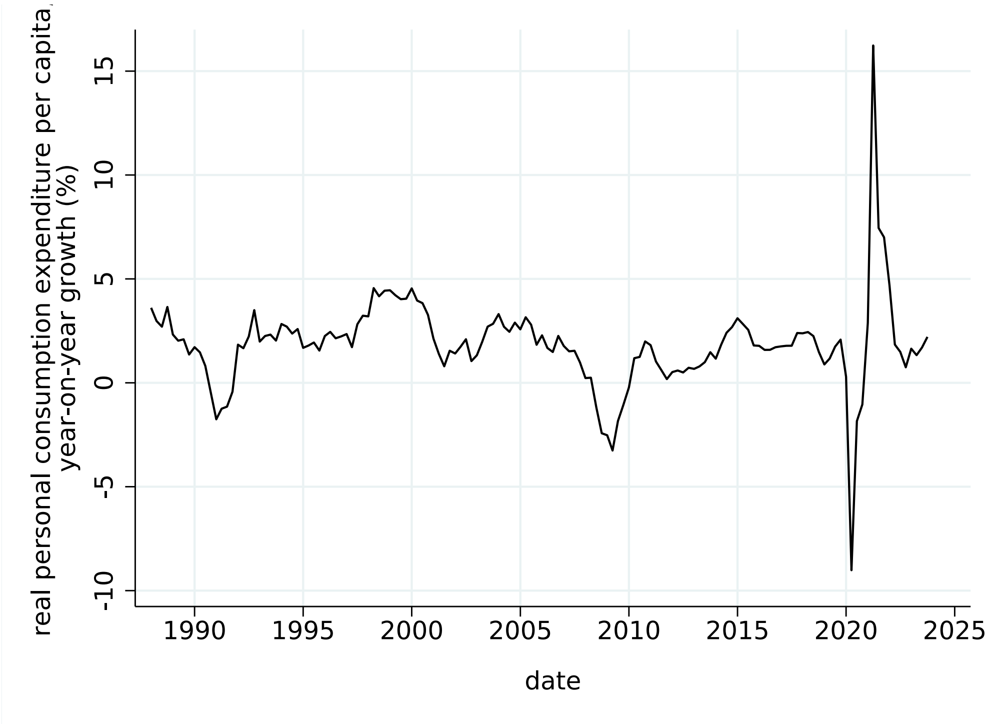


Figure 4: Year-on-year growth (%) of U.S. real personal consumption expenditure per capita. Source: BEA via Federal Reserve Bank of St. Louis (code A794RX).

rates, which tended to be more than 0.5 percentage point lower than other U.S. counties without research universities. Local consumption by flagship university students (whose enrollment tends to be countercyclical) may have assuaged the impact of the most severe recession in a generation.

Lastly, the 2020 (COVID-19) recession was caused by the interaction of virus contagion fears and statutory stay-at-home policies that forced many parts of the economy to shut down (Alexander & Karger, 2023). Firms and industries that are heavily reliant on face-to-face interaction suffered more than firms and industries that could operate remotely in this recession, and higher education was particularly hard hit (Birmingham et al., 2023). Most American universities shut their campuses down to students in the Spring 2020 and through fall 2020 semesters (Qiyue Cai & Dworkin, 2022), so many students chose to live with their parents rather than reside in their university towns. As a result, counties that are heavily reliant on higher education were badly affected by the 2020 recession, as the absence of students further compounded the negative consumption shock from the business cycle downturn.

Table 2: Additional regressions for 2008 recession.

	Diff-in-diff	Between	Random Effects
$\hat{\tau}$	-0.542	-0.598	-0.598
	0.001	0.000	0.000
Overall R^2	0.367	0.428	0.428
Observations	20153	20153	20153

Note: p-values in second row.

3.4 Robustness of Great Recession Resiliency Effect

We examine the robustness of the resiliency effect of flagship universities during the great recession. Table 2 presents the full results of a standard (unweighted) difference-in-differences model, a between-estimator that controls for observable fixed effects, and a difference-in-differences model with random effects that controls for observable fixed effects.[3] From table 2, we can see that the positive resiliency effect of flagship universities during the 2008 recession is robust to the inclusion of observable time-invariant controls (including, most notably, the proportion of a county's workforce employed in education and healthcare).

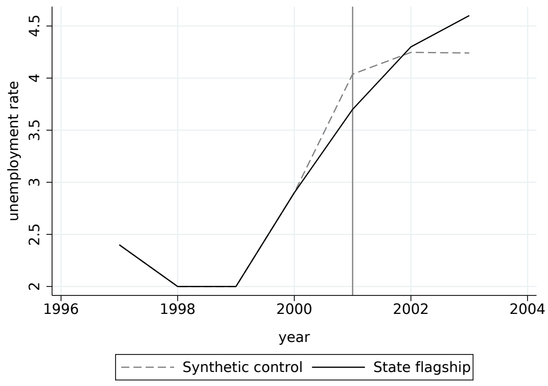
4 Case Studies using Synthetic Control Method (SCM)

To bolster our main results with illustrative case studies, we also make use of a synthetic control method (SCM). Following Abadie et al. (2010), suppose that of the $J + 1$ counties in question, all suffer a recession at time $t = t_0$ but only the first county has a flagship university. Denote by Y_{1t}^N the unemployment rate that *would have been* observed in the first county at time $t > t_0$ if it did not have a flagship university. Then we estimate Y_{1t}^N by,

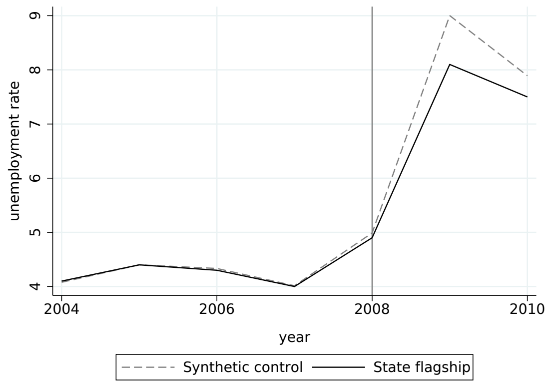
$$\hat{Y}_{1t}^N = \sum_{i=2}^{J+1} \hat{w}_i Y_{i,t}, \tag{2}$$

in which the weights $w = (w_2, ..., w_{J+1})$ are positive and sum to one, and are computed by constrained optimization to match the flagship county on pre-recession unemployment

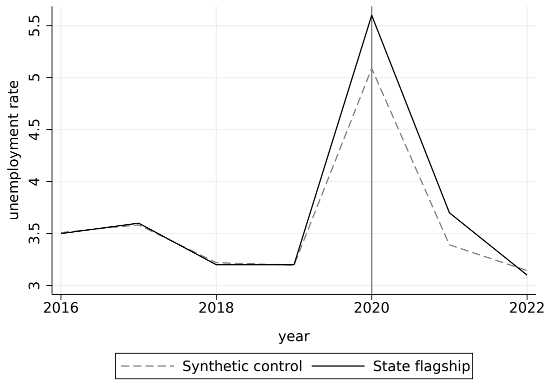
[3]These models are explained further in the appendix. The observable fixed controls are the rural-urban index and the proportions of a county's working population employed in goods industries, education and healthcare, and other services, as described in section 3.1.



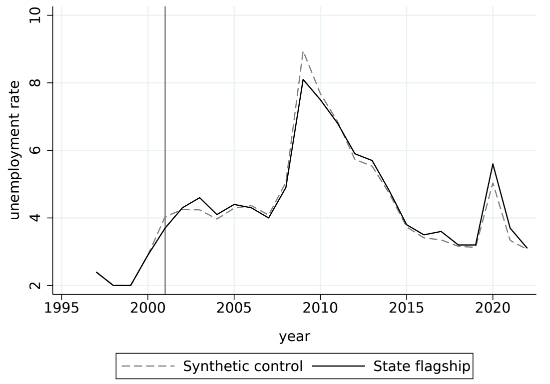
(a) 2001 recession



(b) 2008 recession



(c) 2020 recession



(d) Full sample

Figure 5: Synthetic controls for Kentucky in the 2001, 2008 and 2020 recessions. Panel (d) runs the 1997-2000 synthetic control forward for the entire sample. Solid black line is the trajectory of the treated county (Fayette County, home to the University of Kentucky), dashed grey line is the trajectory of the synthetic control.

rates. The synthetic control estimator of τ_t, the effect of a flagship university on a county's resilience to recession at a specific time $t > t_0$, is simply the difference between the actual unemployment rate of that county and the estimated $\hat{Y}_{1t}^N$. The donor pool for each flagship county model consists of the state's other counties not containing R1 or R2 research universities.

To illustrate the full-sample results in more detail, figures 5 and 6 present synthetic controls for the states of Kentucky and West Virginia. Panel A plots the 2001 recession, panel B the 2008 recession, panel C the 2020 recession, and panel D plots the full samples, in which the pre-2001 synthetic controls are run through to 2022. In both cases, the pool of donor units for the synthetic controls is limited to within-state counties.

Figures 5 and 6 both illustrate the full sample results discussed above. There is no obvious resiliency effect during the 2001 recession, a positive resiliency effect during the 2008 recession, and a negative resiliency effect during the 2020 recession. Interestingly, we also see these effects when the pre-2001 synthetic control is allowed to run forward to 2022, in panel D of each figure.

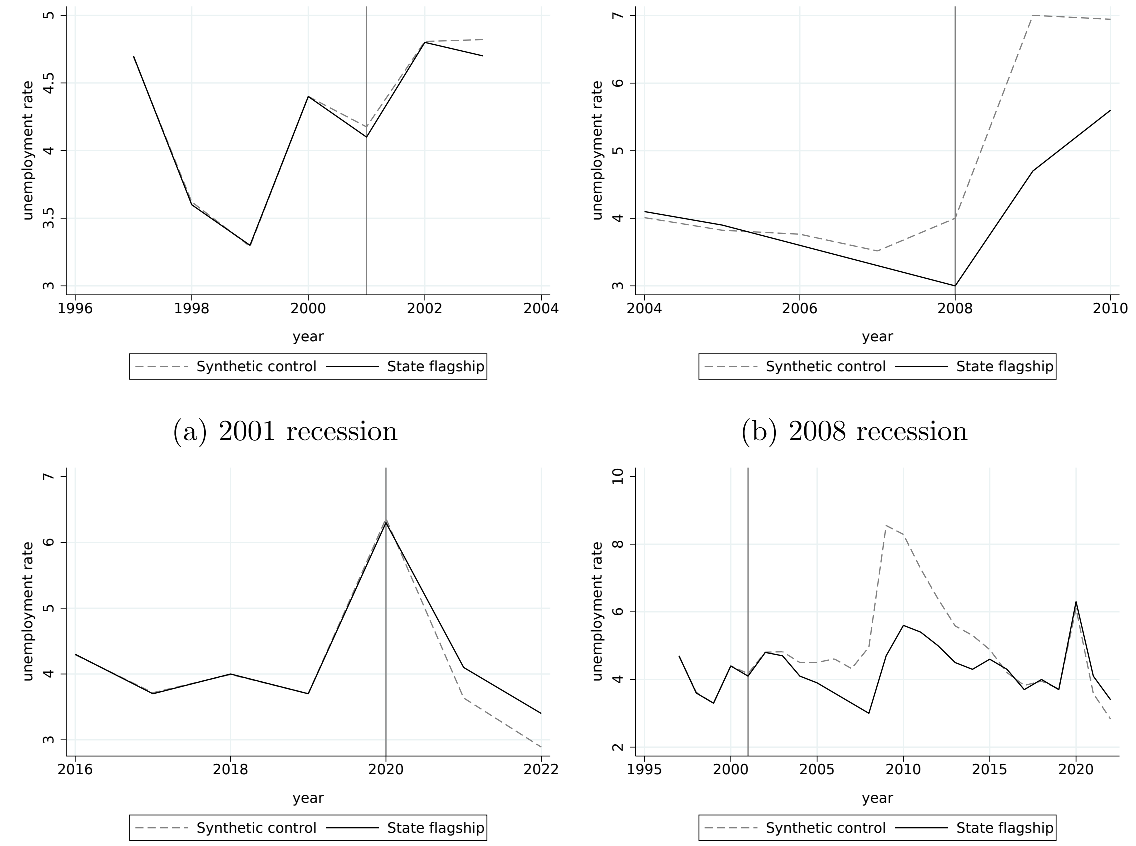
In panel D of figure 5, for example, the synthetic control is chosen by matching on pre-2001 unemployment rates of the treated county (Fayette County, home to the University of Kentucky). The unemployment rate of this 'doppelganger' Fayette closely tracks the unemployment rate of Fayette County itself until 2008, when it becomes elevated relative to Fayette during that recession. The 'doppelganger' recovers by 2011, however, after which it closely tracks Fayette until 2020. During the Covid-19 pandemic and after, the unemployment rate in Fayette County is higher than its synthetic counterpart. We observe similar patterns for Monongalia County, West Virginia in Figure 6.[4]

5 Conclusion

In this paper we provide evidence on the regional resiliency impact of research universities by estimating the effects of recent U.S. recessions on local unemployment. We use data from the Bureau of Labor Statistics from 1997-2022 to identify resiliency effects by comparing the unemployment rate trajectories in counties that contain state flagship universities to other U.S. counties not containing research universities. Using synthetic difference-in-differences models, we find a small but insignificant resiliency effect during the dot-com (2001) recession, a large and significant resiliency effect for the great (2008) recession, and a negative resiliency effect for the COVID-19 (2020) recession.

Our estimate for the great recession resiliency effect suggests that counties containing state flagship universities tended to experience unemployment rates more than 0.5 percentage point lower than other U.S. counties, while the effect from the COVID-19 recession suggests

[4]Note that we have specifically chosen Kentucky and West Virginia *because* this effect is so clear, in order to illustrate the full sample results from the synthetic difference-in-differences model in greater detail. There are other states with similar synthetic control results, but most are less clear-cut.



(a) 2001 recession

(b) 2008 recession

(c) 2020 recession

(d) Full sample

Figure 6: Synthetic controls for West Virginia in the 2001, 2008 and 2020 recessions. Panel (d) runs the 1997-2000 synthetic control forward for the entire sample. Solid black line is the trajectory of the treated county (Monongalia County, home to West Virginia University), dashed grey line is the trajectory of the synthetic control.

that flagship counties experienced 0.5 percentage point higher unemployment rates.

Our results are consistent with the hypothesis that university communities provide stable consumption demand, especially for non-tradable goods and services (Howard et al., 2022). The dot-com recession did not result in a drastic reduction in U.S. consumption, which is consistent with our weak and insignificant resiliency effect. However, the long-lasting and broad negative consumption shock during the great recession was more clearly absorbed by counties containing state flagship universities, resulting in lower local unemployment rates. In contrast, the absence of students from university campuses reversed the resiliency effect of state flagship universities during the COVID-19 recession, which resulted in their counties suffering higher unemployment rates in 2020 compared to the rest of the U.S.A.

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Appendix

As the 2008 recession yields the only statistically significant positive resiliency effect, table 2 presents three additional models to assess the robustness of this result. The first of these is a standard difference-in-differences model, i.e.,

$$Y_{it} = \alpha_i + \beta_t + \tau D_{it} + u_{it},$$

which is an unweighted version of the model used in the headline results. The second model jettisons the cross-sectional fixed effects and replaces these with a vector of time-invariant observable controls,

$$Y_{it} = \alpha + \gamma X_i + \beta_t + \tau D_{it} + u_{it},$$

in which X_i includes the rural-urban index and the proportions of a county's working population employed in goods industries, education and healthcare, and other services, as described in section 3.1. Finally, the third model adds random effects to this, i.e.,

$$Y_{it} = \alpha + \gamma X_i + \beta_t + \tau D_{it} + w_i + u_{it},$$

in which the random effects w_i and the county-year-specific errors u_{it} are uncorrelated. In each of these models, standard errors are clustered at the county-level.