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Exploring the Local Determinants of Campground Utilization on National Forest Land

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Abstract
Outdoor recreation demand has increased substantially in the Western United States in the last decade. We demonstrate how National Forest campground utilization varies in response to changes in population, per capita income, and unemployment in counties local to that campground. Our findings suggest that a 1 percent increase in per capita income reduces utilization by 0.08 to 0.09 percentage points. Moreover, an increase of 1 percentage point in the unemployment rate increases utilization by 0.3 to 0.6 percentage points. Overall, the results suggest that campground utilization is higher in areas that have seen declines in macroeconomic conditions.

Key words: Public lands management, campground utilization, local economic outcomes, unemployment, outdoor recreation.

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Introduction

Nature-based recreation holds substantial use values and has become an increasingly popular leisure activity in the United States. The annual number of campsite nights reserved on Western US National Forest (NF) land, through recreation.gov[3], grew by more than 95% from 2008 to 2017. The pricing of camping reservations is not directly determined through markets and is instead partially dictated by a desire to ensure equitable access to public lands. This implies that the willingness to pay for a campsite is often greater than the fees that are charged (Christensen, Stewart, and King, 1993). Loomis (2005) reports average per-visitor consumer surplus for camping in the Intermountain West (United States Forest Service (USFS) Regions 1-4) and Pacific Coast (USFS Regions 5-6) to be $34.72 and $104.35 respectively. Based on the number of campsite nights reserved through recreation.gov in NFs in the Western United States, the net economic value from camping amounts to $71.9 million in 2017 alone.[4] These use values reflect the importance of understanding the drivers of camping demand and campground reservation

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[3] The website that can be used for reserving campsites on US National Forest and National Park campsites.
[4] Assuming the average group size per trip was one.

utilization, especially for deciding which campsites and campgrounds can be reserved in advance and when planning the location of new campgrounds.

In this paper, we contribute to the literature by evaluating how reservable capacity utilization of NF campgrounds varies based on local economic changes in unemployment rate, income, and population density. Increases in employment and wages can lead to more affordability and thus increased demand for camping. On the other hand, with increased income, individuals may substitute local camping by camping at more distant sites or substitute with other more expensive forms of leisure. Moreover, increases in wages and employment status also increase the opportunity cost of leisure time, which can lead to a reduction in overall recreation demand. This makes understanding changes in local demand for camping in response to changes in local employment and wages, an important empirical question, which can inform USFS planning decisions.

Most studies of recreation demand utilize travel cost methods, which focus on the likelihood of participation and the number of trips to campgrounds. These studies are valuable and important avenues for estimating non-market values for local amenities, like campsite characteristics (Wheeler, 2018), or in valuing damages due to disruptions, such as impacts of wildfire (Hesseln, Loomis, and González-Cabán, 2004; Englin, Holmes, and Lutz, 2008). However, as the number of sites at campgrounds vary, focusing on the number of trips provides little information from a resource allocation perspective. Moreover, it does not provide information on how busy some campgrounds are relative to others. We contribute to the literature of recreation demand by focusing on capacity utilization, which is determined by the percentage of campsites reserved within a given campground. This allows us to focus on which campgrounds are being underutilized and which are being consistently reserved to their capacity. The data enables suggestion on where reservable campgrounds could be added or expanded in the future.

We also add to the literature by demonstrating how local changes in economic conditions impact campground utilization. Numerous studies have assessed whether outdoor recreation contributes to local economic development (Lawson, 2017; Hjerpe, 2018). However, there has been very little work on understanding how recreation demand is affected by local changes in population, unemployment, and personal income. Nature-based recreation, such as camping, can provide an inexpensive form of leisure value to local communities. Understanding which localities make the most use of such opportunities is an important question that needs more attention.

We also contribute to the literature by providing an estimate of unemployment effects on local campground utilization that is free from possible selection bias in many survey-based studies. Hoque and Kling (2013) estimate how a change in employment status of individuals during the 2008 recession impacted lake-based recreation. They assign treatment based on which individuals experienced a change in employment status between 2005 and 2009. Both observable and unobservable differences exist between individuals who become unemployed during a recession, which makes their treatment assignment non-random. The authors acknowledge they face potential selection bias and must rely on matching methods to reduce the bias. We extend their analysis by making use of local, county-level changes in personal income per capita and unemployment rate, which are determined by a myriad of factors that affect labor supply and demand, to estimate marginal effects that do not suffer from such selection bias.

Background and Data

We use campground reservation data from the recreation information database (RIDB), which provides records of reservations made for campsites on federal public lands through the website recreation.gov. We use reservation data from 2008 to 2017, for all individual campgrounds in National Forests in the Western United States. These include National Forests from USFS Regions 1 to 6. We specifically focus on camping reservations made for individual campsites and ignore group campsites.

In the past, regional studies of recreation demand that have been done at this scale were based on creating an aggregate report from many separate studies, estimates from which are often non-comparable (Loomis, 2005). Moreover, these studies focused on estimating the total economic value by outdoor recreation activity, rather than focusing on the resource allocation to one specific activity, e.g., camping (McCollum, 1990). The information from the RIDB dataset provides the opportunity to conduct large regional studies. Wheeler (2018) demonstrates the functionality of RIDB data for regional analysis, by using it to value the demand for various campground activities and expected climate conditions at campgrounds in California. However, it is difficult to assess the validity of travel cost estimates attributed to a single site for campers that might be traveling from far away, as they may be traveling to visit multiple locations. In our paper, by focusing on changes in local economic conditions and campground utilization rates, we circumvent such concerns.

Each campground in our dataset, on average, includes 21 separate campsites. We measure capacity utilization, at the campground level, as the percentage of campsites reserved at a campground for each day in the camping season[5]. It is important to mention our measure of capacity utilization does not include walk-in or dispersed camping at the campgrounds. Rather, it is an estimate of how much of the reservable capacity made available through recreation.gov is being utilized through advanced reservations, which represent a growing portion of camping demand (as shown in table 1). Formally, capacity utilization is calculated as

$$Capacity\ Utilization_{it} = \frac{Campsites\ reserved_{it}}{Total\ number\ available_{it}}, \qquad (1)$$

where i represents an individual campground and t represents a day.

We separate the days in the year as peak and non-peak days, where peak days consist of Fridays, Saturdays, Memorial Day, Labor Day, and the 4th of July. As both Memorial Day and Labor Day are always observed on a Monday, we define reservations for the Sunday preceding each of these holidays as a peak day. Also, we include all days in the week of July 4th as peak days. If the 4th of July falls on a Saturday, then the entire week prior to that Saturday is counted as a peak day. If it falls on a Sunday, the days of the following week are considered peak days. We then calculate the average annual capacity utilization on peak days at each campground during the camping season, which is used as the dependent variable in our analysis. If the annual average capacity utilization is zero for any campground, we exclude it from that year, assuming that it was not operational.

Table 1 illustrates the increases in campground reservations that have taken place in between 2008 and 2017. Campsite nights reserved have increased by 95.5%, whereas reservable camping availability has only increased by 30.5% on the extensive margin (number of campgrounds) and 39.7% on the intensive margin (number of campsites). Also, it is interesting to see that campground fees per night have remained relatively unchanged over this 10-year period.

[5] The camping season in this paper is defined as May 15th to September 15th, as nearly all the reservations for campgrounds through recreation.gov take place within this date range.

Given this constant price and growing demand, campground reservations have clearly become a scarce commodity.

Table 1: Trends in Campground Reservations and Revenue (USFS Regions 1 to 6)

Year	Unique Reservable Campgrounds	Campsite Nights Reserved	Unique Reservable Campsites	Revenue from Reservations	Revenue per Reservable Campsite	Revenue per Reserved Night
2008	590	499,472	12,034	11,444,851	951	22.91
2009	622	606,648	13,228	13,460,453	1,018	22.19
2010	630	549,856	13,381	12,237,361	915	22.26
2011	648	628,889	13,841	13,903,865	1,005	22.11
2012	678	684,793	14,532	15,253,313	1,050	22.27
2013	705	730,447	15,219	16,353,281	1,075	22.39
2014	715	767,233	15,482	17,722,436	1,145	23.10
2015	727	842,957	15,931	19,559,341	1,228	23.20
2016	752	926,591	16,347	21,745,289	1,330	23.47
2017	770	976,686	16,818	23,752,302	1,412	24.32

From Figure 1, we can see that over the years there has been a rightward shift in the distribution of annual capacity utilization, as more campgrounds have become heavily utilized. However, there remains many campgrounds that experience average utilization rates below 75%. Decisions related to additional campground and campsite locations can be an important determinant of how well this scarce resource will be utilized.

The independent variables that we use in the empirical analysis include average population, income per capita, and the unemployment rate. We use population and per capita income data at the county level from the Bureau of Economic Analysis (BEA) Regional dataset. County-level unemployment data is from the Local Area Unemployment Statistics (LAUS) program of the U.S. Bureau of Labor Statistics. Annual estimates for these county-level variables were collected for years 2008 to 2017 and make up the primary variables of interest used in the empirical analysis.

There has been wide heterogeneity in changes in economic conditions among counties between 2008 and 2017. Population growth in these counties has varied between the ranges of -15% to 115%. Looking at Table 2, we also see that counties have experienced wide ranges in real income per capita growth and changes in unemployment rates.

The spatial distribution of the variation in economic conditions is reflected in Figure 2. The changes over time, along with substantial spatial heterogeneity, allow us to identify how these economic conditions have impacted campground utilization rates. The large changes in regional economic conditions occur due to an array of factors, many of which are independent of initial campground and campsite location decisions. This makes variation in population, per capita income, and unemployment rate at nearby counties of a campground exogenous to capacity utilization rates.

We define the locality of a campground as counties that lie within a 50-mile radius of a campground. We then make use of a fixed-effects methodology to estimate the impact that local changes (in population, per capita income, and unemployment) have on capacity utilization at the campground over time. The use of campground fixed effects controls for time invariant, site-specific quality variables that are unobservable.

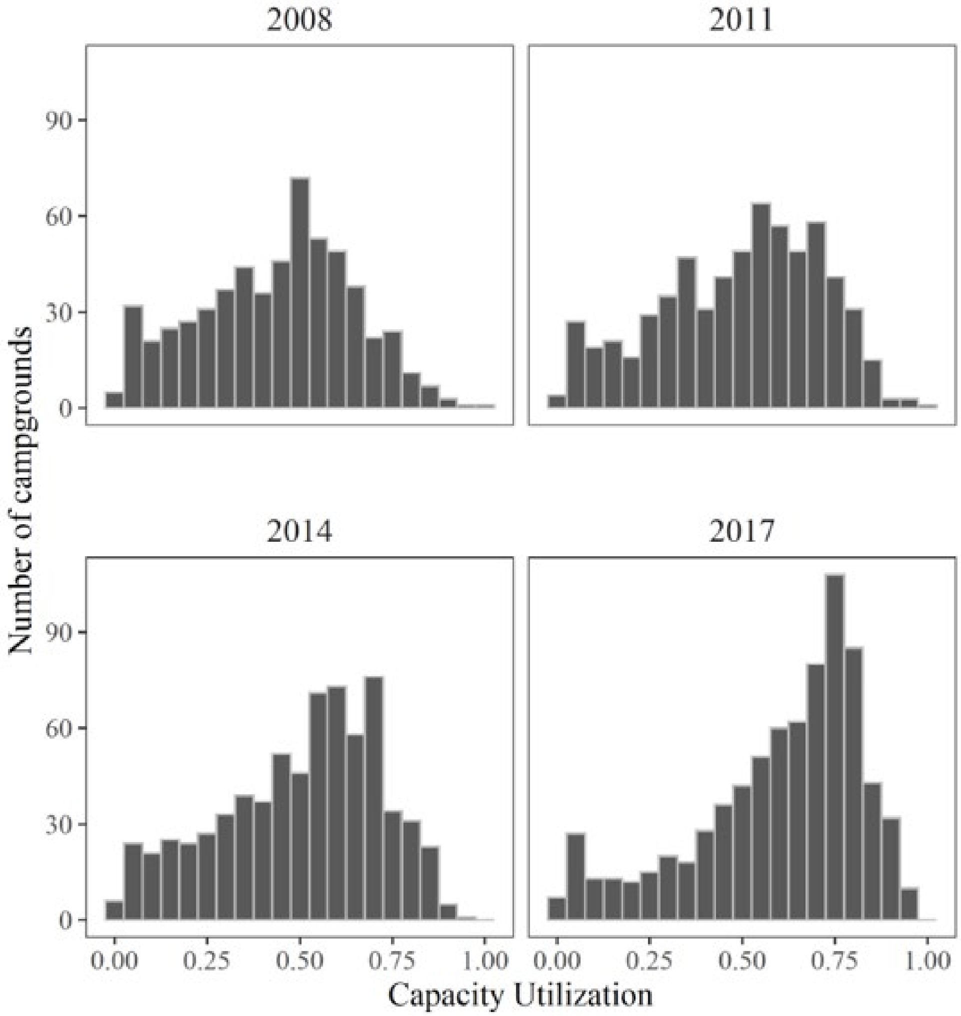

Figure 1. Distribution of Annual Capacity Utilization by Year

Table 2**:** Change in County-Level Economic Conditions between 2008 and 2017

Number of Counties	731		
	Population Growth	Growth in Real Income per Capita	Change in Unemployment Rate
Minimum	-14.97%	-48.26%	-6.60
1st Quadrant	-2.73%	2.79%	-1.70
Median	1.71%	10.52%	-0.70
Mean	2.96%	10.42%	-0.83
3rd Quadrant	7.39%	17.44%	-0.05
Maximum	115.42%	90.25%	4.90

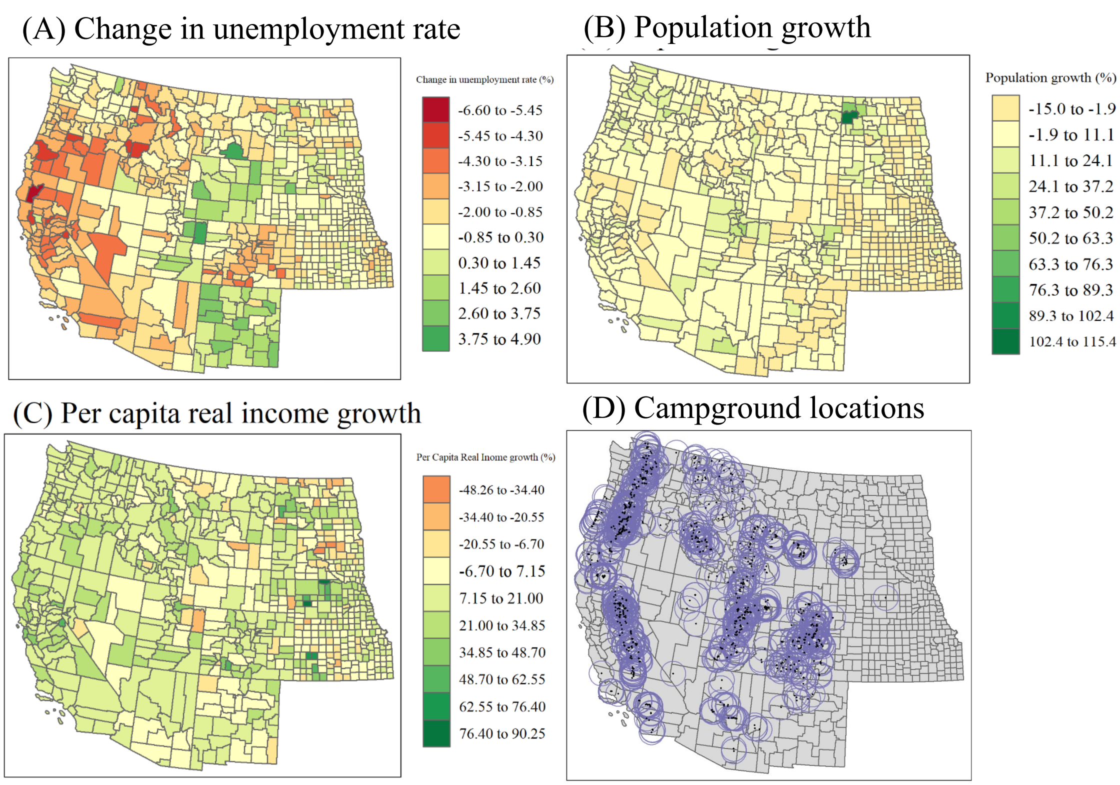

Figure 2: Changes between 2008 and 2017 in: (A) Unemployment rate; (B) Population growth; (C) Per capita real income growth; and (D) Campground locations with 50-mile radii around each campground.

Table 3 shows the average and percentage change in capacity utilization at campgrounds in our sample over time. The table also shows the average changes in population, per capita income, and unemployment experienced by counties that lie within a 50-mile radius of the campgrounds included in our sample. We see that our variables of interest, on average, experience substantial change over time.

Table 3. Mean Annual Values and Changes in Capacity Utilization, Population, Per Capita Income and Unemployment Rate (RFS Regions 1 to 6)

Year	Capacity Utilization		Population		Per Capita Income		Unemployment Rate	
	average	percent change	average	percent change	average	percent change	average	percent change
2008	43.49%	0.00%	230,267	0.00%	36,343	0.00%	6.04	0.00%
2009	49.12%	5.63%	233,559	1.43%	34,698	-4.53%	9.69	3.65%
2010	44.83%	-4.29%	236,287	1.17%	35,471	2.23%	10.60	0.91%
2011	49.29%	4.46%	234,791	-0.63%	37,673	6.21%	9.99	-0.61%
2012	49.90%	0.62%	229,978	-2.05%	39,368	4.50%	9.03	-0.96%
2013	51.08%	1.18%	234,941	2.16%	40,080	1.81%	8.04	-0.99%
2014	49.96%	-1.12%	234,871	-0.03%	42,470	5.96%	6.71	-1.34%
2015	54.61%	4.65%	236,144	0.54%	44,331	4.38%	5.95	-0.76%
2016	59.44%	4.83%	237,212	0.45%	45,076	1.68%	5.47	-0.47%
2017	59.75%	0.32%	238,078	0.37%	46,441	3.03%	4.76	-0.71%

Figure 3 shows the spatial distribution of the USFS Regions. These regions include: (1) Northern Region; (2) Rocky Mountain Region; (3) Southwestern Region; (4) Intermountain Region; (5) Pacific Southwest Region; and (6) Pacific Northwest Region.

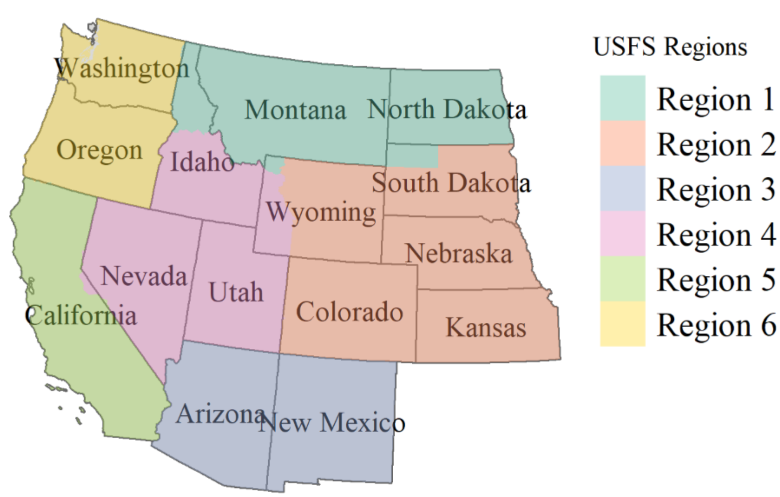

Figure 3: Distribution of USFS regions

Capacity utilization has grown steadily since 2010 in National Forests that lie within Regions 1 to 6. Whereas looking at changes in economic conditions, on average the percentage changes in population, per capita income, and unemployment rate have seen substantial variation over the years. Notably, these averages only represent the counties that lie within a 50-mile radius of each campground and are heavily weighted by counties that have more campgrounds around them. Table 4 breaks these changes down by region and reflects the change in average values experienced between 2008 and 2017. We see large changes in capacity utilization over the period, ranging from increases of 33.23 in Region 1 to 11.50 in Region 5. Large heterogeneity exists in population changes between the regions, ranging from increases of 39.32% in Region 3 to decreases of 6.37% in Region 5. We also see a drop in the average unemployment rate in all six regions.

Table 4: Changes in Average Capacity Utilization, Unemployment rate and Percent Changes in Population, Per Capita Income between 2008 and 2017

	Forest Service Region					
	1	2	3	4	5	6
Capacity Utilization	33.23%	20.23%	14.12%	12.91%	11.50%	14.73%
Population	18.50%	8.44%	39.32%	15.31%	-6.37%	-2.06%
Per capita income	27.97%	25.29%	26.64%	26.34%	34.20%	26.10%
Unemployment rate	-0.99%	-0.88%	-0.85%	-0.41%	-2.53%	-1.89%

Identification Strategy and Methodology

The two major identifying assumptions of our model are: (1) the large spatial variation over time in population, per capita income and unemployment is independent of initial campground location decisions; (2) average capacity utilization during peak days over time at an individual campground does not substantially drive local changes in population, income per capita and unemployment. In this paper, we define local as all counties that have boundaries that lie within a 50-mile radius of a campground.

A substantial body of literature exists that makes use of IMPLAN input-output models to estimate the impact of outdoor recreation on local economic development (Bergstrom et al., 1990; Southwick, Bergstrom, and Wall, 2009; Hjerpe, 2018). Increased visitation to an area can generate additional revenue for businesses in that area. The magnitude of that impact on market wages and unemployment is less clear and would depend on a complex set of labor market supply and demand factors. Hjerpe and Kim (2007) investigate the regional economic impact of rafting in the Grand Canyon and show that over half of all expenditures related to rafting were not captured by the regional economy and jobs created by the rafting industry were often lower wage and seasonal in nature.

Changes in conservation policies near campgrounds might have an impact on local wages and employment, depending on the net effect of the impact of conservation and the amount of tourism it generates. However, studies examining the impact of conservation policies find that changes in timber sales and proportion of USFS land holdings do not have a significant relationship with wage and employment growth (Lewis, Hunt, and Plantinga, 2003; Pugliese, McCann, and Artz, 2015). Nonetheless, aggregate visitations to a region could impact local economic conditions, such as wage and unemployment. This is especially true for regions where nature-based tourism plays a strong role in the economy. In such cases, local economic conditions would be endogenous to aggregate visitations to that area.

However, it is reasonable to expect that capacity utilization at an individual campground would not impact the average annual income and unemployment rates in all counties within a 50-mile radius. Moreover, our average capacity utilization estimates only experience variation due to visitation changes on peak days, whereas the annual average change in local economic conditions vary due to changes experienced throughout the year. This specification, paired with campground and year fixed effects, allows us to identify how campground utilization, on average, responds to exogenous variation in population, income per capita and unemployment rates over time. We specify the model as

$$CU_{it} = \beta_1 \ln(PN_{it}) + \beta_2 \ln(PI_{it}) + \beta_3 U_{it} + \boldsymbol{Controls_{it}} + \alpha_i + \gamma_t + \epsilon_{it}, \qquad (2)$$

where i represents a campground and t represents year. The dependent variable is the average, peak-day capacity utilization (CU) at a campground in a given year. The independent variables include the natural log of average population (PN), the natural log of average personal income per capita (PI) and the average unemployment rate (U), for every year at the counties with boundaries that lie within a 50-mile radius of where the campground is located. Campground fixed effects and year fixed effects are represented by α_i and γ_t respectively.

In equation 2, 'Controls' is a vector of variables that account for the number of reservable campsites at campground i, the number of nearby campgrounds, and gasoline prices. Capacity utilization for a given campground could be affected by the number of campsites at that campground that are available for reservation. Over time, we also expect additional campgrounds near a given campground to become available for reservation on recreation.gov. The empirical model controls for both the number of reservable campsites at each campground and the number of other reservable campgrounds within a 50-mile radius. Additions to the list of reservable campgrounds on recreation.gov are made during the study period. In the base model, campgrounds enter and exit based on whether they have a non-zero average peak-day capacity utilization in a given year. In order to check the sensitivity of our estimates, we also estimate a model with only the initial campgrounds that were reservable in 2008.

We also estimate a model which includes average capacity utilization over all days in the camping season, as opposed to only peak days. The empirical model also controls for annual average gasoline prices at the state level, as fuel prices could be correlated with both the cost of traveling to a campground and the economic conditions in the region. The average annual gasoline price data come from the State Energy Data System (SEDS) dataset of the US Energy Information Administration (EIA).

Results

The five models in Table 5 include estimates of equation 2: without controls for state oil prices, number of reservable campsites and number of other campgrounds within that lie inside a 50 mile radius (1); with the control variables (2); with excluding the unemployment variable and including the control variables (3); using only the 626 campgrounds with reservable capacity in 2008 and including the control variables (4); and using the average capacity utilization over all days in the camping season as the dependent variable and including the control variables (5). It is important to note that the capacity utilization is a proportion, so a 56% capacity utilization is represented by 0.56 in the data.

Table 5: Regression Results for All Regions

	Dependent variable:				
	Average capacity Utilization				
	Peak days	Peak days	Peak days	Peak days	All days
	(1)	(2)	(3)	(4)	(5)
ln(Population)	0.026	-0.078	-0.062	-0.011	-0.038
	(0.075)	(0.076)	(0.076)	(0.078)	(0.057)
ln(Personal income per capita)	-0.094*	-0.068	-0.093**	-0.083*	-0.032
	(0.049)	(0.049)	(0.047)	(0.05)	(0.036)
Unemployment rate	0.006***	0.003**		0.005***	0.004***
	(0.001)	(0.002)		(0.002)	(0.001)
Controls	No	Yes	Yes	Yes	Yes
Using only initial campgrounds	No	No	No	Yes	No
Campground fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	6,756	6,756	6,756	5,914	6,820
R^2	0.861	0.863	0.863	0.858	0.885
Adjusted R^2	0.842	0.844	0.844	0.84	0.869
Residual Std. Error	0.089	0.089	0.089	0.087	0.067
	(df = 5,940)	(df = 5,937)	(df = 5,938)	(df = 5,274)	(df = 6,000)

*Note: Standard errors are provided in brackets below the coefficient estimates. *p<0.10, **p<0.05, ***p<0.01*

The impact of per capita income is significant in three of the five models. Based on the models where we see a significant impact, the coefficient estimates indicate that a 1% increase in local personal per capita income results in a 0.08 to 0.09 percentage point reduction in capacity utilization of a campground. The impact of the unemployment rate on capacity utilization is significant across all five models. The results also show that a 1 percentage point increase in the unemployment rate[6] results in a 0.3 to 0.6 percentage point increase in capacity utilization. Population is not found to have a significant impact on campground utilization in any of the five

[6] The unemployment rate is not represented as a fraction, so a 1.5 percentage point unemployment rate is represented as 1.5 and not 0.015.

models. We expect changes in local personal income per capita and changes in unemployment rate to be highly correlated. Thus, it can be difficult to estimate significant marginal effects for each when both variables are included in the model.

Excluding the unemployment rate from the model increases the significance of the coefficient estimate of local personal income per capita. The sign of the coefficient estimates for per capita income and unemployment are robust across all specifications. Separate results for models that exclude unemployment and income per capita, as well as coefficients and standard errors for the control variables are explicitly reported in Table A1 in the Appendix.

An increase in income can enable individuals to travel to more distant sites or engage in other expensive forms of leisure, both of which act as substitutes to local camping. Moreover, the result may be driven by an increase in the opportunity cost of time, reflected by increased wages. The opportunity cost of an individual's leisure time is directly proportional to some fraction of the market wage rate (McConnell and Strand, 1981). As the opportunity cost of visitations exceed the benefit from camping, campgrounds would experience a decline in visitation, resulting in lower utilization rates. The signs of the estimates for per capita income suggest that areas experiencing a decline in per capita income have experienced higher rates of capacity utilization at their local campgrounds. This result highlights how camping can provide an inexpensive means of recreation in such areas.

It is reasonable that in areas of high unemployment, outdoor recreation can provide a relatively cheap means of leisure activity. Individuals who face a loss of employment might substitute away from more expensive leisure activities and visit their local campgrounds more frequently. Hoque and Kling (2013), in their study of lake recreation in Iowa, had found that a change in employment status makes an individual 10.8% more likely to participate in at least one lake trip. However, they were unable to make a definitive comment on how unemployment affected the number of visits, as their results varied across the different matching methods and the different samples. Moreover, with matching on observables there is still possibility of selection bias. We extend that literature by providing evidence that, for camping, an increase in the unemployment rate, holding income constant, results in a significant increase in local campground utilization rates.

We now proceed to evaluate the extent to which the impacts of changes in population, income, and unemployment vary by USFS region. The same econometric model, as specified in equation (2) is estimated separately for each region. Looking at how population growth impacts capacity utilization in these regions, we are able to estimate marginal effects with some significance for regions that have a substantial number of campgrounds located near high, negative-growth counties (such as those in the Pacific Southwest and Northern Regions) or those in regions with a good mix of very high and very low population growth rate counties (such as those in the Intermountain, Rocky Mountain and Pacific Northwest Regions). The results are provided in Table 6.

We see that in Region 2 (Rocky Mountain) and Region 4 (Intermountain West), population growth has a negative impact on campground capacity utilization. One reason for this negative impact may be that people see camping as an activity enjoyed better in more secluded locations, as a result there is less utilization of campgrounds in areas with large increases in population growth. Alternatively, capacity utilization near highly populated areas was near one in the baseline, so all of the growth in utilization has occurred at campsites in less populated areas. The magnitude of the effect is also quite large, with a 1% increase in population lowering capacity utilization at a campground by 0.534 percentage points in the Rocky Mountain Region and by 0.28 percentage points in the Intermountain Region.

Table 6: Regression Results by Region

	Dependent variable:					
	Average capacity Utilization on peak days during the year					
Regions	1	2	3	4	5	6
Region Name	Northern Region	Rocky Mountain Region	Southwestern Region	Intermountain Region	Pacific Southwest Region	Pacific Northwest Region
ln(Population)	1.156**	-0.534***	*0.945*	-0.280***	0.781**	1.537***
	(0.541)	(0.143)	(0.826)	(0.097)	(0.336)	(0.27)
ln(Personal income per capita)	0.359	-0.081	-0.635	0.364***	-0.630***	-0.37
	(0.277)	(0.082)	(0.843)	(0.082)	(0.24)	(0.244)
Unemployment rate	0.013	0.010**	0.001	-0.002	-0.011*	-0.029***
	(0.009)	(0.004)	(0.022)	(0.003)	(0.006)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Campground fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	457	1,329	252	1,693	1,498	1,528
R^2	0.855	0.863	0.779	0.902	0.858	0.868
Adjusted R^2	0.831	0.844	0.727	0.888	0.838	0.846
Residual Std. Error	0.100 (df = 390)	0.079 (df = 1,162)	0.151 (df = 203)	0.071 (df = 1,489)	0.086 (df = 1,310)	0.086 (df = 1,308)

Note: Standard errors are provided in brackets below the coefficient estimates. *p<0.10, **p<0.05, ***p<0.01

Interestingly, as we go north towards the Northern and Pacific Northwest Regions, the direction of the relationship between population growth and capacity utilization reverses. Over time, an increase in population by 1% has increased campground peak day capacity utilization by 1.16 percentage points in the Northern Region and 1.54 percentage points for the Pacific Northwest Region. Although, the coefficient for population growth in the Southwestern Region is large, it is not significantly different from zero. The number of observations in that region is small, resulting in relatively large standard errors. Per capita income has a significant impact on capacity utilization in Regions 4 and 5. The direction of the effect is positive for the Intermountain Region, but negative for the Pacific Southwest Region. A 1% growth in per capita income is predicted to cause a 0.364 percentage point increase in capacity utilization for campgrounds in the Intermountain Region.

The heterogeneity of the impact of per capita income growth is also relatively large across regions where it is statistically significant, ranging from a reduction of 0.63 percentage points to an increase in 0.364 percentage points in capacity utilization. This large heterogeneity brings forward an important puzzle that could be addressed in future research. Additionally, it points out the importance regional differences play when estimating the relationship between recreation demand and local economic factors.

Looking at the regional effects of unemployment, we see the effect is statistically significant in three of the six regions. The estimates have magnitudes large enough to be economically significant. A 1 percentage point increase in the unemployment rate increases peak-day capacity utilization at a campground by 1.0 percentage points in the Rocky Mountain Region. However, a percentage point increase in unemployment reduces peak-day capacity utilization of campgrounds by 2.9 percentage points in the Pacific Northwest Region and by 1.1 percentage points in the Pacific Southwest Region. Given this heterogeneity, campground location decisions based on local economic conditions should also depend on the region in which a county is located.

Conclusion

In this paper we explore how changes in local economic conditions, namely population, per capita income and unemployment rate, impact average peak-day capacity utilization at NF campgrounds. We define local as counties with borders that lie within a 50-mile radius of a NF campground. Our definition of local enables us to make use of the spatial variation in economic conditions around each campground. This specification along with campground and year fixed effects enable us to identify the impact. Our results suggest that growth in per capita income reduces capacity utilization at nearby campgrounds. Areas with falling wage rates increase the use of their campgrounds as means of accessible leisure activity.

We also show that increases in the unemployment rate lead to higher utilization. These changes are likely to be driven by changes in the opportunity cost of time and due to substitution to other leisure activities as a result of increases in income. In this paper we are unable to estimate the relative magnitude of the impact of opportunity cost of time and the impact of substitution. When the model is estimated separately by Forest Service region the results show considerable variation by region. Although perplexing, this provides motivation for future research to explore the regional differences that may lead to such heterogeneity.

Understanding the determinants of capacity utilization can aid in resource management and allocation decisions in National Forests. Looking at how these utilization rates vary in response to environmental changes and shocks, such as the impact wildfire, beetle kill, and drought stress, provide an important avenue that we wish to explore in future research.

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Appendix

The models included in Table A1 include our base model without controls (1); base model with control variables of number of campsites, number of campgrounds within a 50-mile radius and oil prices (2); model that excludes the unemployment rate from the base model and includes all the control variables (3); model that excludes the natural log of personal income per capita from the base model and includes the control variables (4); base model with all the control variables estimated using only the initial set of campgrounds reservable in 2008 (5); and a model using the average capacity utilization over all days in the camping season as the dependent variable and including the control variables.

Table A1: Models to check sensitivity and with explicitly mentioned controls

	Dependent variable:					
	Average capacity Utilization					
	Peak days (1)	Peak days (2)	Peak days (3)	Peak days (4)	Peak days (5)	All days (6)
ln(Population)	0.026	-0.078	-0.062	-0.088	-0.011	-0.038
	(0.075)	(0.076)	(0.076)	(0.076)	(0.078)	(0.057)
ln(Personal income per capita)	-0.094*	-0.068	-0.093**		-0.083*	-0.032
	(0.049)	(0.049)	(0.047)		(0.05)	(0.036)
Unemployment rate	0.006***	0.003**		0.004**	0.005***	0.004***
	(0.001)	(0.002)		(0.002)	(0.002)	(0.001)
Number of campsites		0.00004	0.0001	0.00004	0.0001	-0.0002
		(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Number of nearby campgrounds within 50 miles		0.002***	0.001***	0.002***	0.002***	0.002***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
Oil prices		-0.015***	-0.017***	-0.015***	-0.013***	-0.014***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	6,756	6,756	6,756	6,756	5,914	6,820
R^2	0.861	0.863	0.863	0.863	0.858	0.885
Adjusted R^2	0.842	0.844	0.844	0.844	0.84	0.869
Residual Std. Error	0.089 (df = 5,940)	0.089 (df = 5,937)	0.089 (df = 5,938)	0.089 (df = 5,938)	0.087 (df = 5,274)	0.067 (df = 6,000)

Note: Note: Standard errors are provided in brackets below the coefficient estimates. *p<0.10, **p<0.05, ***p<0.01