The Response of Recreation Demand to Recessionary Forces: Evidence from Local Lake Usage

Mohammad Mainul Hoque, Joseph A. Herriges, Catherine L. Kling

Land Economics, Volume 96, Number 2, May 2020, pp. 225-243 (Article)

Published by University of Wisconsin Press

The Response of Recreation Demand to Recessionary Forces: Evidence from Local Lake Usage

Mohammad Mainul Hoque *Research fellow, Bangladesh Institute of Development Studies, Dhaka, Bangladesh; mmahoq@gmail.com*

Joseph A. Herriges *Professor, Departments of Economics and Agricultural, Food, and Resource Economics, Michigan State University, East Lansing; jah@msu.edu*

Catherine L. Kling *Tisch University Professor of Environmental, Energy, and Resource Economics, Dyson School of Applied Economics and Management, and faculty director, Atkinson Center for a Sustainable Future, Cornell University, Ithaca, New York; clk228@cornell.edu*

ABSTRACT *During recessions, households may face unemployment, retirement, and/or lower income. These changes can induce an increase or decrease in recreation demand, depending upon whether recreation is a normal or inferior good. Further, income changes lower the opportunity cost of time devoted to recreation, potentially inducing increases in recreation activity. The net effect of these recessionary forces is an empirical question that has received little attention to date. Utilizing a unique panel comprising both prerecession and during-recession data on household employment, recreation usage, and socioeconomic variables, we investigate how changes in employment status during the recession alter lake-based recreation demand.* (JEL Q26)

1. Introduction

The U.S. economy was hit hard by a long recession during 2008–2009, generally considered to be the longest and most severe economic downturn since the end of the Great Depression. The recession affected individual economic well-being through unemployment, a stock market crash, and falling real estate prices, all of which generated low consumer confidence. While much is known about the effect of recessions on macro-level variables, less is known about how the effects of recession alter household-level consumption behavior. Specifically, during periods of high unemployment, many households will experience lower income, which results in lower spending on normal goods. However, with changes in employment status, members of some households will also experience a lower opportunity cost of time, and may therefore undertake more household activities that are time intensive. To study effects of this type requires detailed household-level data before, during, and after a recessionary event.

In this paper, we utilize a panel data set that is uniquely suited to studying the effects of recessionary forces on micro decision-making in terms of household recreation. Specifically, we draw on the panel from the Iowa Lakes Valuation Project,[1] which tracks household employment status, annual trip counts to 132 recreational sites, and a suite of socioeconomic variables from before, during, and after the Great Recession. The paper investigates how employment status changes during the recession affects local lake-based recreation demand. Although quasi-experimental studies for impact evaluation have become popular in the economics literature, an analysis relating a recessionary shock to recreation behavior has not been undertaken. Using the 2009 Great Recession as a natural and exogenous event, we help to fill this gap. To our knowledge this is the first causal study that uses a panel of observed recreational choices to investigate the effects of a recession on household recreation demand.

Recession can affect an individual's recreation demand through several potentially opposing paths. When recession hits the economy, an individual previously employed full-

Land Economics • May 2020 • 96 (2): 225–243
ISSN 0023-7639; E-ISSN 1543-8325

[1] For a summary of the lakes surveys, see https://www.card.iastate.edu/lakes/.

Appendix materials are freely available at http://le.uwpress.org and via the links in the electronic version of this article.

time may become unemployed, get fewer paid work hours, or be forced into retirement, resulting in a fall in income. Decomposing the change in market work hours in the United States between the prerecessionary period (2006–2008) and the recession (2009–2010) into an extensive and intensive margin, Aguiar, Hurst, and Karabarbounis (2013) attribute 74% of the decline in total market work hours to the increase in unemployment and 26% to the reduced market work hours per employed person. However, this change in market work hours also reduced the opportunity cost of people's time and offered more time for leisure and recreation. Aguiar, Hurst, and Karabarbounis (2013) show that approximately 50% of the forgone market work hours were spent in leisure activities during the recession.

Exploiting information on consumers' shopping activities and intensities, Nevo and Wong (2018) report a lower estimated opportunity cost of time during recession. A change in employment status during recession may, therefore, influence one's outdoor recreation demand through two effects: a substitution effect from cheaper time and an income effect from a fall in income. While the substitution effect from cheaper time will positively influence the demand for outdoor recreation, the income effect can work in either direction, depending on whether recreation is a normal or inferior good. For example, local recreation may be viewed as an inferior good, with households substituting more exotic vacations (Disney World, Europe, etc.) with one or more local, less expensive, recreation activities (sometimes referred to as "stay-cations"). Even if employment status remains unchanged during a recession, an individual may demand less recreation due to uncertainty.

The literature investigating the relationship between recession and recreation demand is limited. However, a number of studies document that leisure activities exhibit an increasing trend among the U.S. population (Aguiar and Hurst 2007; Ramey and Francis 2009; Aguiar, Hurst, and Karabarbounis 2013). Using the American Time Use Survey between 2003 and 2010, Aguiar, Hurst, and Karabarbounis show that the allocation of forgone market hours during recession largely goes toward leisure activities, such as television watching and sleeping. Although they include some leisure activities for which time and money are complements, outdoor recreation trips and activities are missing in their categorization of leisure. Loomis and Keske's (2012) is the only study, to the best of our knowledge, that systematically studies outdoor recreation during recession.[2] Utilizing two cross-section surveys conducted in 2006 and 2009 at Quandary Peak, a very popular hiking place in southeast Denver, Loomis and Keske find that the recession had no significant impact on total number of visits, travel expenditure, and willingness to pay for visits. In addition, the study reports that most of the visitors stayed "local" as reflected in fewer number of miles traveled in 2009. However, the respondent groups studied before and after the recession are different.[3] Thus, it is not clear whether the survey respondents themselves experienced any employment or wealth shock during the recessionary period. If not, the individuals did not face the trade-off between time resources and income while choosing recreation activities. Accordingly, longitudinal recreation data incorporating employment information in both the prerecession and recession period can determine whether an individual was affected by recession, and how the affected individual altered recreation behavior in response.

The Outdoor Foundation's (2011) aggregate statistics reveal that, compared to 2008, total participation in outdoor recreation across the United States increased slightly in the recession year 2009. However, nearly 42% of respondents reported that the recession affected their outdoor recreation participation to some extent. At the state level, Iowans' lake visitation rates increased in 2009 relative to 2005 (Evans, Herriges, and Kling 2011). Almost 60% of Iowans participated in some form of lake-based recreation activities in 2009, taking

[2] In contrast to the recreation demand literature, several studies with microdata explored changes in economic behavior during a recession. Examples include studies on the relationship between business cycles and mortality (Ruhm 2000), and recession and child health care (Dehejia and Lleras-Muney 2004; Baird, Friedman, and Schady 2011).

[3] For example, to the extent that the recession induced different types of individuals to visit the study site, the intercept nature of the survey could change the populations represented by the 2006 and 2009 samples.

around eight single-day lake trips on average. In contrast, the consumer-expenditure survey statistics show that expenditures on pleasure and nonbusiness travel declined during the recession years of 2008–2009 (Paulin 2012).

The regional scope of this study raises the question of the external validity of the findings. Although Iowa was not completely resilient to the effects of the recession, the unemployment rates registered in Iowa were more moderate than in many other states. To put Iowa's experience into U.S.-wide context, according to the Bureau of Labor Statistics, the unemployment rate in the United States rose from 5% at the start of the recession (December 2007) to 9.5% by the end (June 2009). During the same time period, the unemployment rate in Iowa increased from 3.75% to 6.6%. Thus, unemployment in Iowa was much lower compared to the rates reported in the most-affected states in June 2009, such as Nevada (12.5%) and California (11.5%), but higher compared to the least-affected neighboring states including Nebraska (5%) and North Dakota (4.3%). However, the county-level unemployment rate in Iowa exhibited wide dispersion and was comparable to the U.S.-wide range of variation, as the county variation ranged from 3.9% to 10% in 2009. Thus, while Iowa is clearly not fully representative of the United States as a whole, the data reported are likely to be widely relevant.

The Iowa Lakes Project survey data contain household recreation demand behavior (participation and number of trips) and employment status both before and during the recession. This random population survey collected a rich set of information on Iowans' lake visitation patterns at 132 lakes, as well as demographics including employment status. The survey was administered in both 2005 and 2009, resulting in a panel of 971 households with complete information that were observed both before and during the recession. We exploit this panel to investigate how households who moved from full-time employment status in 2005 to part-time employment, unemployment, or retirement status in 2009 changed their outdoor lake recreation usage, both at the extensive and intensive margins, compared to households employed full-time both before and during the recession.

Experiencing an employment shock during the recession year 2009 is nonrandom due to both observable and unobservable factors, which creates a potential selection bias issue. Following the nonexperimental treatment effect literature, we adopt both semiparametric cross-sectional and difference-in-differences (DID) matching strategies to address this concern (Rosenbaum and Rubin 1983; Heckman, Ichimura, and Todd 1997; Smith and Todd 2005). We apply four different matching methods to check the consistency of the results.

The main results from this analysis suggest that employment changes during a recession do not reduce outdoor recreation usage. Our first set of findings suggests that households that became unemployed during this period participated more in lake recreation compared to the prerecession period. However, people going into retirement do not change their lake visitation behavior compared to the prerecession period. Our placebo exercise confirms that our findings are not driven by a preexisting differential trend for the treatment group and the control group. Incorporating the county-level unemployment rate as a proxy for aggregate economic conditions, we extend the analysis in a household fixed effects framework. Here, we find some evidence that households in counties with high unemployment during a recession participated more in lake recreation.

The insensitivity of recreation demand to recession implies that there are stable economic benefits from nature-based economic activities. This finding is of direct policy relevance for decisions by public officials concerning nature-based public amenities. Improving water quality and public facilities appears to provide social benefits that are resilient to recessions; the stability of returns to this form of public good provision may raise its value relative to other local public goods.

2. Background and Theoretical Motivation

Two important components that determine recreation behavior are income and the opportunity cost of time (Bockstael, Strand, and

Hanemann 1987; Cesario 1976; Englin and Shonkwiler 1995; Feather and Shaw 1999; Larson and Shaikh 2004; Smith, Desvousges, and McGivney 1983). If recreation is a normal good, the impact of a rise in income is positive, and vice versa if it is an inferior good. Time spent for recreation services has two components: travel time and time spent on site. Phaneuf and Requate (2017) provide a simple recreation demand model to motivate a household's optimization between consumption of nonrecreation necessities and recreation goods and services. The household is naturally endowed with T units of time, out of which the household works for H hours in the market for an hourly wage of w, and allocates the remaining time, $T-H$, between recreation (R) and leisure (l) so that utility from consumption of R, l, and the *numeraire* good (z) is maximized. For simplicity, we assume that the hours of work, H, are determined outside the model and are independent of choices for R, l, and z. Formally, the household wants to maximize the utility function $U(z, R, l; \mathbf{q})$, where $\mathbf{q}$ represents taste parameters, subject to two separate constraints:

1. Money income constraint: $wH = cR + z$, where c is the out-of-pocket cost of a trip.
2. Time resource constraint: $T = H + l + tR$, where time remaining after work hours, $T-H$, is used for leisure and recreation, and t is the time cost for consumption of each unit of R.

The household solves the following two-constraint utility maximization problem:

$$\max_{z,R,l,\mu,\lambda} U(z,R,l;\mathbf{q}) + \lambda(wH - cR - z) + \mu(T - H - l - tR).$$

Manipulation of the first-order conditions results in

$$\frac{U_R}{U_z} = c + \frac{\mu}{\lambda}t = c + \phi t.$$

At the optimum, the marginal benefit from one recreation trip ($U_R / U_z = \delta z / \delta R$) must equal the marginal cost ($c + \phi t$). The recreation price consists of a direct part, c, and an opportunity cost of time, ϕt. Solving the first-order conditions yields demand equations for each of $z^*(c,t,w,H,T,\mathbf{q})$, $R^*(c,t,w,H,T,\mathbf{q})$, $l^*(c,t,w,H,T,\mathbf{q})$, and $\phi^*(c,t,w,H,T,\mathbf{q})$.

The model suggests the possible pathways through which recession might influence recreation demand behavior. If the recession affects any recreationist household directly through a reduction in working hours, or job loss, that household experiences a fall in monetary income but has more available time for leisure and recreation. The fall in income raises the value of λ, the Lagrange multiplier on the monetary budget constraint. The unemployment releases more time for time-intensive consumption and leisure, which implies that the shadow value of time (μ) would fall. The combination of these two changes suggests a fall in ϕ, the opportunity cost of time.

Note that an opposing effect takes place through the decrease in working hours and resulting fall in income if outdoor recreation is a normal good. These two effects are comparable to a substitution and income effect resulting from a price change.[4] Whether the time effect dominates the income effect will determine the overall effect of unemployment on recreation demand under a normal good assumption. If, instead, outdoor recreation is an inferior good, the two effects will reinforce each other. However, empirical evidence suggests that outdoor recreation may be a normal, though income inelastic, good (Loomis and Keske 2009; Phaneuf and Smith 2005).

In modeling local recreation demand, the choice set often includes an element known as the "stay-at-home" option (e.g., Egan et al. 2009). This option captures everything outside the model, including options for other recreation activities such as exotic vacations or an

[4] In a somewhat different context, Loomis and Keske (2009) use a contingent behavior survey to examine the relative strength of income and substitution effects in the context of mountaineering in Colorado's Fourteeners (mountains with peaks in excess of 14,000 feet). The authors find that respondents are generally unwilling to substitute to similar peaks (Thirteeners) in the face of fee increases at the Fourteeners. In this paper, we do not attempt to isolate such income and substitution effects, but rather focus on measuring the net impact of the Great Recession.

international trip. If recreationist households have planned for such a trip but experience a fall in income due to unemployment during a recession, they are less likely to follow through with those expensive trips. In such cases, the "stay-at-home" option becomes less appealing and might induce an increase in demand for cheap, local recreation activities. In the model specified, this is equivalent to saying that corner solution (i.e., $U_R / U_z < c + \phi t$) is less likely to occur. This is equivalent to the case when outdoor recreation is of inferior type. However, since we do not know whether an average household would consider outdoor recreation as an inferior or normal good, the ultimate effect is an empirical question. The net impact on local recreation will ultimately depend on the combination of income effect and substitution effects resulting from unemployment during the recession.

Additional reasons for an ambiguous sign arise in a dynamic setting. Hoque, Kling, and Herriges (2013) introduce a simple two-period model that includes a precautionary motive and consumption smoothing to develop intuition on how dynamic factors affect outdoor recreation demand during a recession. During a recession, the precautionary motive induces risk averse people to increase savings and spend less, thereby reducing spending on all goods, including recreation. This effect would work in the opposite direction for risk loving households. However, a household that becomes unemployed will see a decline in the opportunity cost of leisure, leading to increased consumption of recreation. Unemployment also induces consumption smoothing between time periods. Since money and time are complements for recreation demand, an intratemporal allocation of time from reduced market hours toward nonmarket goods such as outdoor recreation is another consumption smoothing mechanism that households may adopt during recession. Nevo and Wong (2018) documented that U.S. consumers smoothed consumption expenditures during the Great Recession by intratemporal substitution of time across activities. In sum, the combined effect of uncertainty and unemployment on outdoor recreation depends on the relative strength of these effects within and across households. The net effect of a recessionary shock is ultimately an empirical question.

3. Econometric Framework

To provide insight on the empirical question of how recreation use responds in a recession, we study the impact of employment changes during the Great Recession on lake recreation use. The treatment group includes those who experience a change in employment status during a recession, and assignment to this treatment group is nonrandom. This nonrandom treatment assignment, also known as a selection effect, is likely due to both observable and unobservable factors. The selection problem can obscure possible causal effects of a change in employment status during a recession on recreation behavior due to confounding factors that affect both selection into the treatment (change in employment status) and the outcome variable (a recreation visit). The propensity score matching (PSM) method, presented by Rosenbaum and Rubin (1983), is one approach to overcome the selection problem. PSM is widely used in the program evaluation literature (Dehejia and Wahba 2002; Jalan and Ravallion 2003; List et al. 2003; Liu and Lynch 2011; Chabé-Ferret and Subervie 2013). Under certain assumptions, the method solves the problem of missing counterfactuals in nonexperimental settings.

The periods for this analysis are 2005, the prerecession year, and 2009, the recession year. The unit of analysis in this study is the household. We consider three treatment groups, each of which consists of households whose employment status changed during the recession. The control group consists of the households that remained employed full-time in both 2005 and 2009. Each household i may fall in any of the three treatment groups defined as follows:

$$T_{i1} = \begin{cases} 1 \text{ if "}i\text{" is full-time employed in 2005 but unemployed / part-time / retired in 2009} \\ 0 \text{ if "}i\text{" is full-time employed in year 2005 and 2009.} \end{cases} \quad [1]$$

$$T_{i2} = \begin{cases} 1 \text{ if ``}i\text{'' is full-time employed in 2005 but unemployed / part-time employed in 2009} \\ 0 \text{ if ``}i\text{'' is full-time employed in year 2005 and 2009.} \end{cases} \quad [2]$$

$$T_{i3} = \begin{cases} 1 \text{ if ``}i\text{'' is full-time employed in 2005 but retired in 2009} \\ 0 \text{ if ``}i\text{'' is full-time employed in year 2005 and 2009.} \end{cases} \quad [3]$$

The first treatment group includes those households whose employment status changed to unemployed, part-time employed, or retired. Because the retirement option may be fundamentally different than reduced hours or full unemployment, we form two additional treatment groups to consider these categories separately. The second group contains those households that became unemployed or moved to part-time employment status. The third group includes just those that moved into retirement.

The first outcome variable of interest is a binary variable: $Trip_{ikt} = \{0,1\}$, where 1 indicates that household i in treatment group k took a trip in year $t = \{\text{Y09}, \text{Y05}\}$, and 0 indicates not. The subscript $k = \{0, 1, 2, 3\}$, where 0 indicates control group while 1, 2, and 3 indicate the treatment group. The second outcome variable is $NTrip_{ikt}$, which denotes the total number of trips for household i in group k in year t.

We estimate separate probit regression models for each treatment group for selection into change in employment status during the 2009 recession, using the following specification:

$$\Pr(T_{ik,\text{Y09}} = 1 | \mathbf{X}_{i,k,\text{Y05}}; \boldsymbol{\beta}) = P(\mathbf{X}) = \boldsymbol{\Phi}(\mathbf{X}\boldsymbol{\beta}),$$

where $\mathbf{X}_{i,k,\text{Y05}}$ is the set of observable covariates for household i in treatment group k in prerecession year Y05. To reduce bias, the program evaluation literature (Heckman, Ichimura, and Todd 1997; Smith and Todd 2005; Caliendo and Kopeinig 2008) suggests choosing a rich set of explanatory variables based on economic theory, previous research, and institutional settings.

To estimate the impact of a change in employment status during a recession on outdoor recreation, we need a counterfactual estimate of what recreationist households in the treatment group would have done were they not affected by an employment shock during the recession. This counterfactual works if the conditional independence assumption holds. This states that after controlling for a set of observable covariates $\mathbf{X}$ that are not affected by treatment, potential outcomes are independent of treatment assignment.[5] We use the recreation behavior of households in the control group in 2009 as the counterfactual recreation behavior for households in the treatment group, at both the intensive and extensive margin.

$$\begin{aligned} &E[Trip_{ik,\text{Y09}}(0) \,|P(\mathbf{X}), T_{ik} = 1] = \\ &E[Trip_{ik,\text{Y09}}(0) \,|P(\mathbf{X}), T_{ik} = 0] = \\ &E[Trip_{i,\text{Y09}}(0) | P(\mathbf{X})]. \end{aligned} \quad [4]$$

$$\begin{aligned} &E[NTrip_{ik,\text{Y09}}(0) | P(\mathbf{X}), T_{ik} = 1] = \\ &E[NTrip_{ik,\text{Y09}}(0) \,|P(\mathbf{X}), T_{ik} = 0] = \\ &E[NTrip_{i,\text{Y09}}(0) | P(\mathbf{X})]. \end{aligned} \quad [5]$$

In addition, the common support assumption requires that for a recreationist household that has become unemployed or retired, there must exist comparable recreationist households that are still employed but are otherwise similar with respect to other characteristics.

We estimate the following average treatment effect on the treated (ATT) estimators:

$$\widehat{ATT}_{k,\text{extensive}} = \frac{1}{N_T}\left[\sum_{i \in \boldsymbol{I}_1 \cap S_p}\left(Trip_{ik,\text{Y09}}(1) - \sum_{j \in \boldsymbol{I}_0}(\hat{W}_{ij})\widehat{Trip_{ik,\text{Y09}}(0)}\right)\right], \quad [6]$$

and

[5] One implication of this *unconfoundedness* assumption is the mean equivalence condition, which states that once the propensity score is controlled for, the treatment and the control groups have similar distribution for the covariate vector $\mathbf{X}$: $T \perp \mathbf{X} | P(\mathbf{X})$. In other words, $E[\mathbf{X}|P(\mathbf{X}), T = 1] = E[\mathbf{X}|P(\mathbf{X}), T = 0]$. This is also termed as balancing of covariates, $\mathbf{X}$, which indicates the quality of the matching estimator.

$$\widehat{ATT}_{k,\text{intensive}} = \frac{1}{N_T}\left[\sum_{i\in \boldsymbol{I}_1\cap S_p}[NTrip_{ik,\,Y09}(1) - \sum_{j\in \boldsymbol{I}_0}(\hat{W}_{ij})\widehat{NTrip_{ik,Y09}(0)}]\right], \quad [7]$$

where I_1 is the set of treated observations, I_0 is the set of control observations, S_p is the region of common support, and N_T is the number of observations that belong to the set $I_1 \cap S_p$. Moreover, $\sum_{j\in \boldsymbol{I}_0}(\hat{W}_{ij})\widehat{Trip_{ik,Y09}}$ is the counterfactual for treatment i, which is constructed as the weighted average of all of the matched control outcomes. Note that $\hat{W}_{ij}$ is the weight assigned to each matched control j corresponding to the treatment i that will depend on the distance between the propensity scores of treatment i and match j, and the number of matches as well.

The estimators in equations [6] and [7] are unbiased if selection into employment change during the recession is due to observable factors. However, there may exist unobservable factors, both time variant and time invariant, that affect both the likelihood of a household's exposure to employment change during a recession and that household's recreation behavior. For example, in our context, factors such as distance to lake, residence amenities, local attributes, and labor market conditions might confound the results.

Heckman, Ichimura, and Todd (1997), Smith and Todd (2005), Imbens and Wooldridge (2009), and Arriagada et al. (2012) recommend using a DID approach when geographic and other individual-specific fixed factors play a potentially confounding role. Using the DID matching estimators with our panel structure we are able to difference out all potential time-invariant unobservable factors. The estimation procedure follows equations [6] and [7] except that the impact is measured as the differences of outcomes.[6] Note that the DID matching estimator requires the parallel trend assumption; that is, any differences in the outcome variable between treatment and control groups must remain constant over prerecession periods (Imbens and Wooldridge 2009).

We apply four different matching algorithms including nearest neighbor matching with replacement, four nearest neighbor matching, radius matching within a radius distance of one-half standard deviation of the estimated propensity score, and kernel matching. Standard errors are estimated following Abadie and Imbens (2008, 2016) for nearest neighbor matching estimators, and a bootstrapped procedure for radius and kernel matching estimators.[7] The nearest neighbor matching estimators perform better in terms of bias reduction, while the radius and kernel matching estimators are more efficient, as larger shares of controls are utilized in the construction of the counterfactual mean.

4. Iowa Lakes Survey

We utilize data from the Iowa Lakes Survey of households, a random population survey, which collects a rich set of information on Iowan's lake visitation patterns as well as demographics on gender, age, education, employment status, income, and household composition. The survey was administered in both 2005 and the recession year 2009.[8] The surveys in 2005 and 2009 together comprise a complete panel with all necessary information for 1,778 households, giving us information on their recreation behavior (both participa-

[6] Since the DID matching estimators estimate the treatment effect on the differences of outcome variables, we redefine the outcome variables by taking differences across prerecession and recession years. The difference in participation in lake recreation for the treatment group k is $\Delta Trip_k = Trip_{k,Y09} - Trip_{k,Y05}$, while that for the control group is $\Delta Trip_0 = Trip_{0,Y09} - Trip_{0,Y05}$. Total number of lake trips (intensive margin) is similarly redefined for the treatment group as $\Delta NTrip_k = NTrip_{k,Y09} - NTrip_{k,Y05}$ and for the control group as $\Delta NTrip_0 = NTrip_{0,Y09} - NTrip_{0,Y05}$.

[7] In case of a robustness check exercise, where matching is conducted within a geographic region, standard errors for nearest neighbor matching estimators are estimated following the procedure elaborated by Markus (2014).

[8] The survey in 2009 was sent to 10,000 people, out of which 4,500 responded to a similar survey conducted in 2005. The survey response rate in 2009 was around 60%. Although the surveys in 2005 and 2009 together comprise a panel of 2,773 households, approximately one-third of them do not provide employment information in 2009, which is quite high compared to similar nonresponse in 2005 (5.3%). However, a simple mean comparison reveals that the total number of trips in 2009 of the group with missing employment information is not statistically different from that with nonmissing employment information.

Table 1

Number of Survey Respondents by Employment Status during Prerecession (2005) and Recession (2009) Periods, and Size and Composition of Treatment and Control Groups

	Employment Status in 2009					
Employment Status in 2005	Full-time	Part-time	Student	Unemployed	Retired	Total
Full-time	848	43	4	23	100	1,018
Part-time	29	69	2	8	37	145
Student	8	0	2	1	1	12
Unemployed	17	6	1	20	13	57
Retired	14	24	1	1	506	546
Total	916	142	10	53	657	1,778

Treatment Group	Employment Status in 2009	Number of Treatment Observations	Number of Control Observations
1	Unemployed	42	816
	Part-time employed	21	
	Retired	92	
	Total	155	
2	Unemployed	42	816
	Part-time employed	21	
	Total	63	
3	Retired	92	816
	Total	92	

Note: In the lower panel we exclude all respondents who report more than 52 trips in one single year. Compared to the upper panel, this reduces the control group size from 848 to 816. Similarly, we adjust the treatment group sizes as well.

tion and number of trips) and relevant demographics both before and during the recession.[9] We first identify the households that experienced a change in employment status during the recession to construct the treatment and control group for our study.

The upper panel of Table 1 presents the employment status of the respondents. To study how the movement from full-time employment to unemployment or retirement affects recreation, our initial focus is on the 1,018 households summarized in the first row of the table.[10] Among 1,018 households employed full-time in 2005, 83% (n = 848) reported unaltered employment status in 2009. Approximately 6.5% of the households employed full-time in 2005 reported either unemployment or a decrease in working hours in 2009 (n = 66). In addition, 10% of the previously full-time employed households retired in 2009 (n = 100).[11]

The lower panel of Table 1 shows the composition of the control and three treatment groups. Among the three, treatment group 1 is the largest, consisting of 155 observations in total, as it includes retired, unemployed, and part-time-employed households. Comparing with the counterfactual group size, the treatment control ratio is approximately 1:5. The relatively small treatment group compared to the control legitimately raises a concern of small sample bias; however, we are not aware of any test to detect such small sample bias in matching estimators. Nonetheless, by using a large set of control observations we are able to find strong matches, which helps reduce the bias due to incomplete matches. In addition, we note that it is common in the applied literature to use matching estimators with a small sample and relatively large control group (e.g., Bertram-Huemmer and Kraehnert 2018;

[9] We exclude households that did not report employment status in 2009. Thus, the sample sizes of 1,778 households reported in the text refer to the set of observations that have provided complete information on lake recreation, employment status, and demographics in both 2005 and 2009.

[10] Among the 1,018 households, we finally use 971 households, as we further exclude 47 households that report more than 52 trips in either of the years to avoid casual nonrecreation trips.

[11] For comparison, an investigation into a similar panel from 2004–2005 shows that 3.5% of the full-time employed people in 2004 became unemployed/part-time employed in 2005, and 2.5% of the full-time employed people in 2004 retired in 2005.

Table 2

Participation, Total Trips, Demographics, and Recreation Activities across Treatment Groups during Prerecession (2005) and Recession (2009) Period

	Control Group		Treatment Group 1		Treatment Group 2		Treatment Group 3	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Participation								
Participation in 2005	0.675	0.469	0.600	0.491	0.571	0.499	0.620	0.488
Participation in 2009	0.675	0.469	0.665	0.474	0.746	0.439	0.609	0.491
Total Trips								
Total trips in 2005	7.354	10.188	7.071	11.635	4.698	7.370	8.696	13.620
Total trips in 2009	6.933	9.927	6.806	9.771	5.619	7.458	7.620	11.046
Prerecession Year 2005: Demographics								
Age	4.433	0.750	5.161	0.802	4.746	0.842	5.446	0.635
Gender	1.246	0.431	1.355	0.480	1.429	0.499	1.304	0.463
Education	3.384	1.002	3.271	1.089	3.175	1.025	3.337	1.132
Number of children in the household	0.939	1.210	0.310	0.717	0.492	0.840	0.185	0.592
Rural residence	0.153	0.360	0.103	0.305	0.095	0.296	0.109	0.313
Small town residence	0.211	0.408	0.213	0.411	0.302	0.463	0.152	0.361
Micropolitan residence	0.132	0.339	0.148	0.357	0.175	0.383	0.130	0.339
Metropolitan residence	0.504	0.500	0.535	0.500	0.429	0.499	0.609	0.491
Prerecession Year 2005: Recreation Preference Variables								
Boat activities	0.553	0.498	0.426	0.496	0.429	0.499	0.424	0.497
Hunting	0.065	0.247	0.039	0.194	0.016	0.126	0.054	0.228
Fishing	0.512	0.500	0.503	0.502	0.492	0.504	0.511	0.503
Total number of trips	7.354	10.188	7.071	11.635	4.698	7.370	8.696	13.620
Take overnight trips	0.456	0.498	0.374	0.485	0.270	0.447	0.446	0.500

Note: Control group consists of 816 recreationist households that had been employed full-time both in the prerecession and recession years. Treatment group 1 includes 155 observations of households that became unemployed or retired during 2009. Treatment group 1 is split into treatment groups 2 (unemployed only) and 3 (retired only). Boat activities capture if a household owns a boat or participates in any boating activities such as jet skiing, canoeing, boating, and sailing.

Rao, Brümmer, and Qaim 2012; Arriagada et al. 2012; Liu and Lynch 2011).

Information on participation, average number of trips, and demographics across treatment and control groups is reported in Table 2. Participation, on average, remains unchanged for the control group across the years 2005 and 2009. However, unlike treatment group 3, treatment groups 1 and 2 increased participation in lake recreation in 2009. For total number of trips, the pattern is a little different. For the control group, treatment group 1, and treatment group 3, the mean number of trips fell in 2009, when compared to 2005. In contrast, treatment group 2 exhibits an increase in the mean number of trips in 2009. This suggests possible differences in recreation behavior across retired and unemployed households.

The covariates we include to estimate the propensity score are age; polynomials of age; education; gender; number of children in the household; interaction terms between education, age, and gender; recreation patterns in previous years; and boat ownership as reported in the 2005 survey. The inclusion of education and age are motivated by the earning function literature in labor economics (Mincer 1974; Heckman, Lochner, and Todd 2006). We assume that factors that determine one's earnings are strong predictors for labor market status as well. The Iowa lake surveys also contain information on households' residence county and ZIP code. We match this with the rural-urban commuting area (RUCA) codes maintained by the U.S. Department of Agriculture's Economic Research Service to classify households by four location types:

rural, small town, micropolitan, and metropolitan.[12]

Finally, information on lake recreation activities, such as fishing, boating, and hunting are included to capture preferences for differing activities. Boating, fishing, and hunting are common lake recreation activities (Evans, Herriges, and Kling 2011). Boat activities combine information on household boat ownership as well as participation in any boating activities such as canoeing, boating, jet skiing, and sailing. Habit persistence has been found in the recreation literature (Adamowicz 1994; Moeltner and Englin 2004). This suggests that prerecession recreation behavior might influence recreation choices during the recession. Information on recreation usage (total number of day and overnight trips) taken in the prerecession year is used to group households with similar recreation preferences. The bottom panel of Table 2 presents summary statistics on various covariates observed in the prerecession year.

5. Results and Discussion

We start with propensity score estimation for selection into each of the three treatment groups.[13] Treatment status, education, number of children, age, interaction between age and education, rural area residence, number of recreation trips taken in previous years, and participation in fishing and boat activities are statistically significant factors determining the probability of experiencing a change in employment status during a recession.

Based on the estimated propensity score in each of the cases, we match the treatment with the control group, applying four different matching algorithms. For each matching algorithm, the balancing of covariates is assessed following standard criteria.[14] Prior to matching, statistically significant differences across the treatment and control group are common. After matching is completed, the covariates balance well.[15] To satisfy the overlapping condition while estimating the treatment effects, we exclude the treatments that are out of the common support. In 95% or more cases, treatments lie in the common support region or find a comparable counterfactual from the control group.[16]

Column I in Table 3 presents the impact of a change in employment status during the recession on participation in lake recreation. For treatment group 1 (unemployed, part-time employed, and retired) all four matching estimators indicate that the treatment group participated more in outdoor lake recreation during the recession. These estimates suggest that households that became unemployed or retired during the recession are about 8 to 11 percentage points more likely to have participated in at least one lake trip compared to the households that remained employed full-time.

Table 3 reveals that for treatment group 2 (unemployed and part-time employed) all four matching techniques indicate a statistically significant positive effect on participation in lake recreation. The estimates imply that an average household that was employed in 2005, but moved to part-time or unemployed status in 2009, is 13 to 22 percentage points more likely to have recreated compared to the

[12] Detailed documentation of RUCA codes is available at http://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/documentation.aspx#.Uu8l9fldWlI.

[13] We estimate a separate probit model for each treatment group. Table A1 of Appendix A reports propensity score estimation results.

[14] Four matching algorithms are (1) nearest neighbor matching with replacement, (2) nearest five neighbors matching, (3) radius matching within a caliper of one-half of the standard deviation of the propensity score, and (4) kernel matching. All of the estimation is conducted in STATA utilizing the psmatch2 and teffects psmatch packages. The balancing is based on two different criteria: (1) the difference between the mean of the treated and matched control group, and (2) the standardized mean difference of the covariates between the treatment and control group. The standardized difference of means is calculated as $(Mean_{\text{treated}} - Mean_{\text{control}}) / \sqrt{(1/2)(Variance_{\text{treated}} + Variance_{\text{control}})}$. We consider a standardized difference of means of 25 as large (Rosenbaum and Rubin 1983; Imbens and Wooldridge 2009).

[15] Table A2 in Appendix A reports covariate balance before matching is done. In Tables A3–A5 of Appendix A, the postmatching covariates balance is reported. Across the treatment groups and matching algorithms applied, more than 99.5% of the covariates balance well after a matching is conducted. For treatment group 2, one covariate, gender, did not balance using nearest neighbor matching.

[16] Table E1 of Appendix E shows the number of matched as well as nonmatched treatments in each matching process for each of the three treatment groups.

Table 3
Estimates of Average Treatment Effect on the Treated for Lake Recreation

	Participation in 2009 I	Difference in Participation II	Total Trips in 2009 III	Difference in Total Trips IV
Treatment Group 1: Unemployed, Part-time, and Retired				
Nearest neighbor within caliper	0.113* (0.066)	0.113 (0.073)	1.019 (1.373)	0.725 (1.268)
Nearest five neighbors	0.103* (0.056)	0.103* (0.060)	1.123 (1.104)	0.186 (1.007)
Radius matching within caliper	0.083* (0.048)	0.123** (0.052)	0.719 (0.823)	0.433 (0.772)
Kernel matching	0.084* (0.051)	0.125** (0.056)	0.755 (0.903)	0.411 (0.794)
Treatment Group 2: Unemployed and Part-time				
Nearest neighbor within caliper	0.222*** (0.081)	0.189* (0.115)	0.444 (1.564)	–0.456 (1.324)
Nearest five neighbors	0.137** (0.066)	0.117 (0.087)	0.732 (1.119)	0.302 (1.043)
Radius matching within caliper	0.139** (0.066)	0.138* (0.083)	0.427 (0.958)	0.484 (0.916)
Kernel matching	0.132** (0.063)	0.138* (0.083)	0.2 (0.936)	0.544 (0.933)
Treatment Group 3: Retired				
Nearest neighbor within caliper	0.00 (0.077)	0.034 (0.077)	–1.121 (1.927)	–0.357 (1.482)
Nearest five neighbors	0.034 (0.063)	0.041 (0.072)	–0.238 (1.464)	0.266 (1.268)
Radius matching within caliper	0.008 (0.060)	0.066 (0.065)	–0.492 (1.227)	–0.213 (1.097)
Kernel matching	0.02 (0.063)	0.076 (0.066)	–0.329 (1.269)	–0.008 (1.115)

Note: The caliper is chosen as one-half of standard deviation of propensity score. Standard errors reported for nearest neighbor estimators are Abadie-Imbens robust standard errors. Standard errors reported for radius matching and kernel matching estimators are obtained from bootstrapping with 1,000 replications.
*, **, *** Statistical significance at the 10%, 5%, and 1% levels, respectively.

control. The bottom panel in Table 3 contains results for treatment group 3 (retired). All matching techniques indicate that this group did not increase participation in lake recreation. Thus, it appears that the statistically significant impact we observe for treatment group 1 is driven by the unemployed and part-time employed group (i.e., treatment group 2) rather than the behavior of retirees.

Because these matching results may still be subject to unobservable time-invariant confounding factors, we also estimate DID matching models using the information on households' participation in lake recreation both before and during the recession. This strategy results in netting out the effects of time-invariant unobservable factors that differ between the treatment and control groups. The DID matching results for participation are presented in column II in Table 3. The results are quite similar to the first set of matching results, although the statistical significance is not as strong in a few cases. The bottom panel in Table 3 shows that none of the matching processes indicate any statistically significant impact of retirement on participation in lake recreation.

Columns III and IV from Table 3 contain estimates for the total trips outcome variable. The matching estimates in column III reveal that none of the treatment groups exhibit any significant impact of employment change during the recession on the total number of trips. Column IV reports the DID matching results, which generates the same findings as the matching estimators; namely, employment changes do not change the frequencies of outdoor lake trips.

Contrary to the case for participation, unemployed or partially unemployed households do not increase their trip frequency during the recession. Similar to the analysis for participation, the estimates do not suggest any impact of retirement during the recession on the total number of trips. As a caveat, we recognize that the lack of an effect for retirees or on trip frequencies is hard to pin down due to the relatively small sample size.

We also run a simple ordinary least squares (OLS) model for each of the three treatment groups, where the outcome variables are participation and total number of trips taken in 2009, and the explanatory variables include the variables used in the matching exercises

Table 4

Placebo Effect: Estimates of Average Treatment Effect on the Treated for Lake Recreation

	Participation in 2003 I	Difference in Participation II	Total Trips in 2003 III	Difference in Total Trips IV
Treatment Group 1: Unemployed, Part-time, and Retired				
Nearest neighbor with replacement	0.019 (0.072)	0.007 (0.075)	–0.069 (1.223)	0.226 (0.946)
Nearest five neighbors with replacement	0.035 (0.057)	–0.024 (0.056)	0.748 (1.006)	0.045 (0.789)
Radius matching (caliper = 0.5 × SD)	0.011 (0.047)	–0.031 (0.052)	–0.134 (0.713)	0.252 (0.676)
Kernel matching	0.019 (0.050)	–0.035 (0.058)	0.121 (0.750)	0.224 (0.690)
Treatment Group 2: Unemployed and Part-time				
Nearest neighbor with replacement	0.108 (0.094)	–0.075 (0.100)	–0.564 (1.545)	0.797 (1.225)
Nearest five neighbors with replacement	0.074 (0.073)	–0.044 (0.073)	0.125(1.150)	0.361 (0.659)
Radius matching (caliper = 0.5 × SD)	0.082 (0.065)	–0.072 (0.071)	0.48 (0.741)	–0.491 (0.647)
Kernel matching	0.077 (0.061)	–0.074 (0.068)	0.295 (0.774)	–0.532 (0.637)
Treatment Group 3: Retired				
Nearest neighbor with replacement	–0.039 (0.080)	0.005 (0.075)	–0.228 (1.718)	0.745 (1.305)
Nearest five neighbors with replacement	–0.011 (0.066)	0.017 (0.068)	0.222 (1.350)	0.277 (1.135)
Radius matching (caliper = 0.5 × SD)	–0.051 (0.060)	0.01 (0.064)	–0.542 (1.072)	0.286 (1.043)
Kernel matching	–0.047 (0.061)	0.007 (0.064)	–0.398 (1.141)	0.158 (1.105)

Note: Caliper is chosen as one-half of standard deviation of propensity score. Standard errors reported for nearest neighbor estimators are Abadie-Imbens (AI) robust standard errors. Standard errors reported for radius matching and kernel matching estimators are obtained from bootstrapping with 1,000 replications. No statistical significance at the 10%, 5%, and 1% levels.

and the treatment group indicator. Although the OLS model does not incorporate the selection issues related to change in employment during recession, the estimated parameters are still useful for comparison across methods applied. The results are reported in Table A6 of Appendix A. The estimates reveal that for treatment group 2 (unemployed and part-time employed), treatment status and participation in lake recreation are positively and significantly associated. In contrast, no such association is observed for treatment group 1 and treatment group 3.

6. Robustness

We conduct three robustness checks. First, we use a placebo recession year to check if any preexisting differences across treatment and control groups are contaminating our estimates. Second, we change the specification for propensity score estimation to include a subset of covariates previously used; specifically, we exclude recreation preference variables. Third, we match each treatment observation with controls from the same geographic region to control for time-variant, spatial, unobservable factors, given that rural and urban areas may be affected differently during a recession.

The objective of the placebo exercise is to check whether it is unemployment during the recession or some preexisting unobservable factors affecting the treatment and control groups differentially. If the treatment and control groups exhibit differentiated trends in the prerecession years, and the recession truly has no impact on recreation, the DID matching estimator can pick up this difference in trends and make it appear as if it is due to the change in employment during the recession. For the placebo exercise, we use 2003 as a placebo recession year, as the Iowa lakes survey was also undertaken in that year. Tables B1–B3 of Appendix B show that balancing of covariates is well satisfied. We report the estimates from the placebo exercise in Table 4. In all of the matching processes, neither participation nor frequencies of trips in lake recreation are statistically different across the treatment and control groups in 2003. As a second placebo check, a comparison of lake-based recreation of the treatment and control households be-

Table 5

Robustness Check of Estimates of Average Treatment Effect on the Treated for Lake Recreation (with Different Group of Covariates)

	Participation in 2009 I	Difference in Participation II	Total Trip in 2009 III	Difference in Total Trip IV
Treatment Group 1: Unemployed, Part-time, and Retired				
Nearest neighbor with replacement	0.046 (0.054)	0.084 (0.058)	–0.378 (1.173)	–0.147 (0.979)
Nearest five neighbors with replacement	0.073 (0.051)	0.114** (0.056)	0.226 (1.040)	0.173 (0.945)
Radius matching (caliper = 0.5 × SD)	0.083 (0.052)	0.122** (0.054)	0.264 (0.973)	0.398 (0.915)
Kernel matching	0.085 (0.052)	0.123** (0.053)	0.397 (1.031)	0.43 (0.891)
Treatment Group 2: Unemployed and Part-time				
Nearest neighbor with replacement	0.082 (0.078)	0.174* (0.091)	–1.69 (1.247)	1.622 (1.204)
Nearest five neighbors with replacement	0.097 (0.066)	0.191** (0.086)	–1.294 (1.083)	1.902* (1.106)
Radius matching (caliper = 0.5 × SD)	0.118* (0.065)	0.185** (0.082)	–1.059 (1.124)	1.336 (1.068)
Kernel matching	0.105 (0.065)	0.185** (0.082)	–1.152 (1.100)	1.352 (1.070)
Treatment Group 3: Retired				
Nearest neighbor with replacement	0.064 (0.070)	0.051 (0.070)	1.875 (1.450)	–0.445 (1.311)
Nearest five neighbors with replacement	0.054 (0.068)	0.043 (0.067)	1.739 (1.448)	–0.312 (1.280)
Radius matching (caliper = 0.5 × SD)	0.058 (0.065)	0.058 (0.062)	1.266 (1.434)	–0.246 (1.241)
Kernel matching	0.064 (0.069)	0.055 (0.061)	1.517 (1.433)	–0.357 (1.259)

Note: Caliper is chosen as one-half of standard deviation of propensity score. Standard errors reported for nearest neighbor estimators are Abadie-Imbens (AI) robust standard errors. Standard errors reported for radius matching and kernel matching estimators are obtained from bootstrapping with 1,000 replications.

*, ** Statistical significance at the 10% and 5% levels, respectively.

tween a prerecession (2005) and postrecession (2014) period is drawn.[17] Due to a significant gap between the two survey years, approximately 30% of the treatment and control households from the original sample are absent in the 2014 survey.[18] Nevertheless, the results from this exercise, as presented in Table B4 of Appendix B, suggest that the mean recreation behavior is not significantly different across treatment and control groups in a postrecession year. This finding gives us confidence that our analyses based on matching exercises as reported in the previous section are not contaminated due to differential group trends.

As a second robustness check, we estimate the propensity score excluding the recreation preference variables, but including the demographics and region types. Table 5 reports the estimates for participation. Covariates balancing results, as reported in Tables C1–C3 of Appendix C, reveal that the quality of the match is good. For treatment groups 1 and 2, the ATT estimates on the level for participation in lake recreation are not robust to the inclusion of a limited set of covariates. However, for these two treatment groups, the DID matching estimates are robust to this different set of observables covariates. Similar to the pattern reported in Table 3, Table 5 reveals that the retired households (treatment group 3) did not alter their participation behavior in lake recreation during the recession.

For the frequency of lake trips, with the new set of covariates, only one out of the 12 matching estimators across the three treatment groups exhibits statistical significance. Our previous finding that the frequency of lake trips does not change due to unemployment or retirement during the recession is robust to the choice of covariates.

Although we account for the effects of time-invariant unobservables through matching on the differences, our estimates may still be confounded by unobservable factors that

[17] We thank an anonymous referee for suggesting this additional placebo check.

[18] This attrition reduces the number of households in treatment group 1 by 32% (from 155 to 106), in treatment group 2 by 32% (from 63 to 42), in treatment group three by 33% (from 92 to 64), and in the control group by 30% (from 816 to 590).

Table 6

Robustness Check of Estimates of Average Treatment Effect on the Treated for Lake Recreation (Matching within Rural, Small Town, Micropolitan, and Metropolitan Cell)

	Participation in 2009 I	Difference in Participation II	Total Trip in 2009 III	Difference in Total Trip IV
Treatment Group 1: Unemployed, Part-time, and Retired				
Nearest neighbor with replacement	0.115 (0.073)	0.128 (0.079)	0.78 (1.416)	0.655 (1.732)
Nearest five neighbors with replacement	0.084 (0.053)	0.119** (0.055)	0.438 (1.062)	0.115 (0.908)
Radius matching (caliper = 0.5 × SD)	0.076 (0.052)	0.122** (0.054)	0.285 (0.975)	0.219 (0.865)
Kernel matching	0.075 (0.053)	0.112** (0.056)	0.099 (1.013)	0.098 (0.876)
Treatment Group 2: Unemployed and Part-time				
Nearest neighbor with replacement	0.147* (0.089)	0.131 (0.109)	1.2 (1.425)	1.983 (1.438)
Nearest five neighbors with replacement	0.132* (0.068)	0.159* (0.083)	0.209 (1.126)	0.68 (1.045)
Radius matching (caliper = 0.5 × SD)	0.129* (0.071)	0.136 (0.085)	0.129 (1.140)	0.195 (1.047)
Kernel matching	0.123* (0.068)	0.150* (0.083)	–0.081 (1.098)	0.446 (1.006)
Treatment Group 3: Retired				
Nearest neighbor with replacement	0.11 (0.083)	0.066 (0.085)	1.784 (1.739)	–0.849 (1.621)
Nearest five neighbors with replacement	0.04 (0.068)	0.056 (0.065)	0.555 (1.452)	–0.505 (1.406)
Radius matching (caliper = 0.5 × SD)	0.041 (0.069)	0.057 (0.066)	0.869 (1.479)	–0.239 (1.352)
Kernel matching	0.055 (0.070)	0.073 (0.069)	1.108 (1.514)	–0.21 (1.417)

Note: Caliper is chosen as one-half of standard deviation of propensity score. Standard errors reported for nearest neighbor estimators are obtained from propensity score weighted regression of outcome variable on treatment indicator based on the matched sample (Marcus 2014). Standard errors reported for radius matching and kernel matching estimators are obtained from bootstrapping with 1,000 replications.

*, ** Statistical significance at the 10% and 5% levels, respectively.

vary across regions with time. For example, employment statistics in a rural agricultural county may not change during the recession, while employment in a metropolitan area may drop sharply. If there are differences across region types, we would wish to avoid matching a rural treatment with an urban counterfactual. Since DID matching estimators cannot control for such region-specific time-variant unobservable confounding factors, we match each treatment observation with controls from the same RUCA region. The results are reported in Table 6, while Tables D1–D3 of Appendix D report covariate balance for the cell matching. In general, the covariates balance well.

The estimates in Table 6 reveal that when matching is done within the RUCA cell, none of the four matching estimators for participation in treatment group 1 are statistically significant. In contrast, for treatment group 2, all four matching estimators are statistically significant. However, once we apply the DID matching, the results for treatment group 1 are statistically significant in three of the four cases. For treatment group 2 (unemployed and partially unemployed), two out of the four DID matching estimators exhibit statistical significance. The finding of unaltered participation in lake recreation during the recession for the retired group is robust to matching within RUCA cells. In the case of frequencies of lake trips, as can be seen in Table 6, matching within RUCA cells generates similar estimates as observed before (reported in Table 3).

7. Extension: County Unemployment and Recreation

In this section, we adopt an alternative approach to investigate lake recreation during the recession by exploiting cross-county cross-period variation in county unemployment rates. Iowa was not resilient to the adversities of great recession. The average yearly unemployment rate in Iowa rose by 49%, from 4.3% to 6.4%, between 2005 and 2009. Moreover, county-level unemployment rates, extracted from the Local Area Unemployment Statistics by the Bureau of Labor Statistics,

exhibit wider variation compared to those reported at the state level. The county-level unemployment rate in our sample varies in the range of 3.9% to 10%, with a median unemployment rate of 4.3% in 2009. In contrast, the corresponding range for the 2005 unemployment rate is 2.9% to 6.6%,with the median at 6%.

We use data from five years of the Iowa Lake Project surveys 2002, 2003, 2004, 2005, and 2009 (the survey was not conducted from 2006 to 2008). Because many households did not report employment information in all years of the survey, a complete panel with the needed data is quite small.[19] Consequently we use a proxy for employment/economic status: the county unemployment rate. This approach has been adopted in a number of economics studies assessing the change in economic behavior during a recession (Ruhm 2000; Dehejia and Lleras-Muney 2004; Aguiar, Hurst, and Karabarbounis 2013).

We utilize a panel spanning the years 2002–2005 and 2009 to estimate a fixed effects model relating county-level unemployment rates to household participation in lake recreation. In the lake surveys, 3,035 observations from 2009 have a matching observation in at least one of the years from 2002 to 2005. Defining 2009 as the recession year, we estimate the following specification:

$$Trip_{ict} = (RecYr)\beta_1 + (Un_{ct})\beta_2 + (RecYr \cdot Un_{ct})\beta_3 + \gamma_{ct} + \gamma_i + \epsilon_{ict},$$

where $Trip_{ict}$ is a binary variable indicating whether household i in county c takes any lake trip in year t, or not; Un_{ct} indicates unemployment in county c in year t; $RecYr$ is an indicator variable assuming a value of 1 if year t is a recession year; γ_i are household-specific fixed effects to address time-invariant demographics such as race, location, education, preference for recreation or work, risk attitudes, and so forth; and γ_{ct} are county-specific time trends.[20] In this specification, if $\beta_3 > 0$, this provides evidence of a positive effect of unemployment during a recession on outdoor lake recreation. Since the error term, ϵ_{ict}, might exhibit correlation both across counties within year and within a county across years, standard errors are clustered at the county and year levels (Cameron and Miller 2015).

Table 7 shows the fixed effect estimates of the impact of county unemployment rate on recreation participation. Panels (a) and (b) report results for the unbalanced panel, while panel (c) reports results for the subsample used in the matching exercises in the previous section. The coefficient of recession year is negative and significant. The estimates in columns I–IV in panel (a) reveal that in a recession year, participation in outdoor lake recreation decreases, ranging from 14% to 22% relative to a nonrecession year. However, no such pattern is observed for county unemployment rates. Neither the coefficients on county unemployment rate nor those on the recession indicators consistently exhibit statistical significance in panel (c).

In panel (a), the coefficient of the interaction term between county-level unemployment and recession year, after controlling for the level effect of unemployment and recession, is positive and significant in three of the five specifications. Thus, it appears that the average participation rate falls during a recession year, but during a recession a household from a county with a high unemployment rate is more likely to participate in lake recreation compared to one from a low unemployment county. In panel (b), where 2004 is assumed to be a placebo recession year, none of the coefficients on the recession-year indicator or interaction term between recession and county unemployment rates are statistically significant in any of the specifications. Overall, participation in lake recreation responds to unemployment in a different manner, depending on whether there is also a recession at the time.

[19] For example, in 2009, 853 households were silent about their employment status, although they provided relevant employment information in 2005.

[20] We could not include year-specific fixed effects as we include an indicator for the recession year to disentangle the recession year effect from a normal year effect. We estimated several specifications. Specification I does not incorporate any trend, while specifications II and III include linear and quadratic trends. Finally, specifications IV and V incorporate county-specific linear and quadratic trends.

Table 7
County-Level Unemployment and Participation in Lake Recreation

	I	II	III	IV	V
Panel a. Unbalanced Sample; Observations from 2009 with at Least One Additional Observation in Any of the Prerecession Years					
County unemployment rate	–0.053	–0.040*	–0.017	–0.044	–0.009
	(0.028)	(0.018)	(0.009)	(0.021)	(0.025)
Recession year	–0.219**	–0.146**	–0.197***	–0.142*	–0.103
	(0.057)	(0.047)	(0.042)	(0.061)	(0.098)
Recession × County unemployment rate	0.041*	0.033**	0.019*	0.034	0.001
	(0.017)	(0.011)	(0.008)	(0.016)	(0.021)
Linear trend		Yes			
Quadratic trend			Yes		
County-specific trend				Yes	
County-specific quadratic trend					Yes
Sample size	3,035	3,035	3,035	3,035	3,035
Panel b. Unbalanced Sample; 2004 is the Placebo Recession Year					
County unemployment rate	–0.031**	–0.01	–0.012	–0.013	–0.026**
	(0.007)	(0.007)	(0.009)	(0.007)	(0.009)
Recession year	–0.058	–0.052	–0.049	–0.06	–0.077
	(0.051)	(0.047)	(0.045)	(0.045)	(0.068)
Recession × County unemployment rate	0.00	–0.001	–0.001	0.001	0.007
	(0.010)	(0.010)	(0.010)	(0.009)	(0.014)
Linear trend		Yes			
Quadratic trend			Yes		
County-specific trend				Yes	
County-specific quadratic trend					Yes
Sample size	3,035	3,035	3,035	3,035	3,035
Panel c. Sample Used in Matching Exercise					
County unemployment rate	–0.058	–0.044*	–0.017	–0.037	0.055
	(0.031)	(0.017)	(0.013)	(0.024)	(0.038)
Recession year	–0.162*	–0.088	–0.140**	–0.018	0.148
	(0.074)	(0.047)	(0.044)	(0.099)	(0.168)
Recession × County unemployment rate	0.036	0.028*	0.011	0.015	–0.065
	(0.021)	(0.012)	(0.012)	(0.023)	(0.036)
Linear trend		Yes			
Quadratic trend			Yes		
County-specific trend				Yes	
County-specific quadratic trend					Yes
Sample size	971	971	971	971	971

Note: Standard errors are clustered at the county and year levels, and reported in parentheses. In panel (b), we assume 2004 as the placebo recession year. The results are similar if we assume 2002 or 2003 as the placebo recession year.
*, **, *** Statistical significance at the 10%, 5%, and 1% levels, respectively.

8. Conclusion

In this paper, we utilize a panel of household recreation behavior to investigate how changes in employment during a recession alter lake recreation behavior. Exploiting semiparametric matching techniques, including DID matching that utilizes the same household's information before and during the recession, our analysis shows that retirement during the recession has no impact on recreation behavior, either at the extensive or intensive margin. In contrast, there is some evidence that people who become unemployed during the recession participate more in lake recreation. When we replace household employment status with county-level unemployment to capture local economic conditions in a household fixed -effects framework, the estimates reveal that households from counties with high unemployment during a recession participate

more in lake-based recreation. This reinforces the findings from the matching exercises that participation in lake recreation did not decrease during the 2009 recession. These observations are consistent with the notion that "stay-cations" replaced more expensive and distant trips. Our findings of higher participation in lake-based recreation by unemployed workers during a recession are also consistent with recreationists' unwillingness to alter nature-based recreation demand in response to a fall in income (Loomis and Keske 2009), and stable willingness to pay over time, along with a tendency to choose local recreation (Loomis and Keske 2012).

Overall, changes in employment status during the 2009 recession did not affect demand for lake-based recreation trips: households continued visiting lakes as frequently as they did before the recession. This suggests that the demand for lake-based outdoor recreation is relatively unaffected by economic shocks such as a recession. This finding is useful for state legislators and other public officials who must allocate scarce public dollars to their most beneficial uses. Outdoor recreation plays a significant role in Iowa's economy, as it generates local spending of approximately $3.1 billion annually and supports 31,000 jobs (Otto, Tylka, and Erickson 2012). More importantly, recreational visits generate significant consumer surplus to Iowans (Egan et al. 2009). Knowing that local recreation is also resilient to recessionary shocks may tip the balance in favor of investments in these local public goods relative to other uses of those funds. Finally, given that the study site was not among the most affected states during the great recession, it would be interesting to extend this research over a broader geographic context in the future.

References

Abadie, Alberto, and Guido W. Imbens. 2008. "On the Failure of the Bootstrap for Matching Estimators." *Econometrica* 76 (6): 1537–57.

———. 2016. "Matching on the Estimated Propensity Score." *Econometrica* 84 (2): 781–807.

Adamowicz, Wiktor L. 1994. "Habit Formation and Variety Seeking in a Discrete Choice Model of Recreation Demand." *Journal of Agricultural and Resource Economics* 19 (1): 19–31.

Aguiar, Mark, and Erik Hurst. 2007. "Measuring Trends in Leisure: The Allocation of Time over Five Decades." *Quarterly Journal of Economics* 122 (3): 969–1006.

Aguiar, Mark, Erik Hurst, and Loukas Karabarbounis. 2013. "Time Use during the Great Recession." *American Economic Review* 103 (5):1664–1696.

Arriagada, Rodrigo A., Paul J. Ferraro, Erin O. Sills, Subhrendu K. Pattanayak, and Silvia Cordero-Sancho. 2012. "Do Payments for Environmental Services Affect Forest Cover? A Farm-Level Evaluation from Costa Rica." *Land Economics* 88 (2): 382–99.

Baird, Sarah, Jed Friedman, and Norbert Schady. 2011. "Aggregate Income Shocks and Infant Mortality in the Developing World." *Review of Economics and Statistics* 93 (3): 847–56.

Bertram-Huemmer, Veronika, and Kati Kraehnert. 2018. "Does Index Insurance Help Households Recover from Disaster? Evidence from IBLI Mongolia." *American Journal of Agricultural Economics* 100 (1): 145–71, https://doi.org/10.1093/ajae/aax069.

Bockstael, Nancy E., Ivar E. Strand, and W. Michael Hanemann. 1987. "Time and the Recreational Demand Model." *American Journal of Agricultural Economics* 69 (2): 293–302.

Caliendo, Marco, and Sabine Kopeinig. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching." *Journal of Economic Surveys* 22 (1): 31–72.

Cameron, A. Colin, and Douglas L. Miller. 2015. "A Practitioner's Guide to Cluster-Robust Inference." *Journal of Human Resources* 50 (2): 317–73.

Cesario, Frank J. 1976. "Value of Time in Recreation Benefit Studies." *Land Economics* 52 (1): 32–41.

Chabé-Ferret, Sylvain, and Julie Subervie. 2013. "How Much Green for the Buck? Estimating Additional and Windfall Effects of French Agro-environmental Schemes by DID-Matching." *Journal of Environmental Economics and Management* 65 (1): 12–27.

Dehejia, Rajeev, and Adriana Lleras-Muney. 2004. "Booms, Busts, and Babies' Health." *Quarterly Journal of Economics* 119 (3): 1091–130.

Dehejia, Rajeev H., and Sadek Wahba. 2002. "Propensity Score Matching Methods for Non-experimental Causal Studies." *Review of Economics and Statistics* 84 (1): 151–61.

Egan, Kevin J., Joseph A. Herriges, Catherine L. Kling, and John A. Downing. 2009. "Valuing Water Quality as a Function of Water Quality Measures." *American Journal of Agricultural Economics* 91 (1): 106–23.

Englin, Jeffrey, and J. S. Shonkwiler. 1995. "Modeling Recreation Demand in the Presence of Unobservable Travel Costs: Toward a Travel Price Model." *Journal of Environmental Economics and Management* 29 (3): 368–77.

Evans, Keith S., Joseph A. Herriges, and Catherine L. Kling. 2011. *Iowa Lakes Survey 2009: The Iowa Lakes Valuation Project 2009 Summary and Findings.* Ames, IA: Center for Agricultural and Rural Development. Available at https://www.card.iastate.edu/lakes/iowa-lakes-report-2009.pdf.

Feather, Peter, and W. Douglass Shaw. 1999. "Estimating the Cost of Leisure Time for Recreation Demand Models." *Journal of Environmental Economics and Management* 38 (1): 49–65.

Heckman, James, Hidehiko Ichimura, and Petra E. Todd. 1997. "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme." *Review of Economic Studies* 64 (4): 605–54.

Heckman, James J., Lance J. Lochner, and Petra E. Todd. 2006. "Earnings Functions, Rates of Return and Treatment Effects: The Mincer Equation and Beyond." In *Handbook of the Economics of Education*, Vol. 1, ed. Eric A. Hanushek and Finis Welch, 307–458. Amsterdam: Elsevier, North-Holland.

Hoque, Mohammad Mainul, Catherine L. Kling, and Joseph A. Herriges. 2013. "Is Outdoor Recreation Recession-Proof? An Empirical Investigation on Iowan's Lake Recreation Behavior during 2009 Recession." Paper presented at the Agricultural and Applied Economics Association's 2013 AAEA and CAES Joint Annual Meeting, Washington, DC, August 4–6, 2013.

Imbens, Guido W., and Jeffrey M. Wooldridge. 2009. "Recent Developments in the Econometrics of Program Evaluation." *Journal of Economic Literature* 47 (1): 5–86.

Jalan, Jyotsna, and Martin Ravallion. 2003. "Does Piped Water Reduce Diarrhea for Children in Rural India?" *Journal of Econometrics* 112 (1):153–73.

Larson, Douglas M., and Sabina L. Shaikh. 2004. "Revealed Leisure Time Values." *Economic Inquiry* 42 (2): 264–78.

List, John A., Daniel L. Millimet, Per G. Fredriksson, and W. Warren McHone. 2003. "Effects of Environmental Regulations on Manufacturing Plant Births: Evidence from a Propensity Score Matching Estimator." *Review of Economics and Statistics* 85 (4): 944–52.

Liu, Xiangping, and Lori Lynch. 2011. "Do Agricultural Land Preservation Programs Reduce Farmland Loss? Evidence from a Propensity Score Matching Estimator." *Land Economics* 87 (2): 183–201.

Loomis, John B., and Catherine M. Keske. 2009. "Mountain Substitutability and Peak Load Pricing of High Alpine Peaks as a Management Tool to Reduce Environmental Damage: A Contingent Valuation Study." *Journal of Environmental Management* 90 (5): 1751–60.

———. 2012. "Did the Great Recession Reduce Visitors' Spending and Willingness to Pay for Nature-Based Recreation? Evidence from 2006 and 2009." *Contemporary Economic Policy* 30 (2): 238–46.

Marcus, Jan. 2014. "Does Job Loss Make You Smoke and Gain Weight?" *Economica* 81 (324): 626–48.

Mincer, Jacob. 1974. *Schooling, Experience, and Earnings*. New York: Columbia University Press.

Moeltner, Klaus, and Jeffrey Englin. 2004. "Choice Behavior under Time-Variant Quality: State Dependence versus 'Play-It-by-Ear' in Selecting Ski Resorts." *Journal of Business and Economic Statistics* 22 (2): 214–24.

Nevo, Aviv, and Arlene Wong. 2018. "The Elasticity of Substitution between Time and Market Goods: Evidence from the Great Recession." *International Economic Review* 60 (1): 25–51.

Otto, Daniel, Kristin Tylka, and Susan Erickson. 2012. *Economic Value of Outdoor Recreation Activities in Iowa.* Ames: Iowa State University. Available at https://www.card.iastate.edu/research/resource-and-environmental/items/DNR-AmenityRevised_9-25-12.pdf.

Outdoor Foundation. 2011. *Outdoor Recreation Participation Report*. Boulder, CO: Outdoor Foundation. Available at https://outdoorindustry.org/wp-content/uploads/2017/05/2011OutdoorRecreationParticipationReport.pdf.

Paulin, Geoffrey. 2012. "Travel Expenditures, 2005–2011: Spending Slows during Recent Recession." In *Beyond the Numbers: Prices and Spending,* Vol. 1, No. 20, December. Washington, DC: U.S. Bureau of Labor Statistics. Available at https://www.bls.gov/opub/btn/volume-1/travel-expenditures-2005-2011-spending-slows-during-recent-recession.htm.

Phaneuf, Daniel J., and Till Requate. 2017. *A Course in Environmental Economics: Theory, Empirics, and Practice*. Cambridge, UK: Cambridge University Press.

Phaneuf, Daniel J., and V. Kerry Smith. 2005. "Recreation Demand Models." In *Handbook of Environmental Economics: Valuation of Environmental Changes,* Vol. 2, ed. Karl-Göran Mäler and Jeffrey R. Vincent, 671–61. Amsterdam: Elsevier.

Ramey, Valerie A., and Neville Francis. 2009. "A Century of Work and Leisure." *American Economic Journal: Macroeconomics* 1 (2): 189–224.

Rao, Elizaphan J. O., Bernhard Brümmer, and Matin Qaim. 2012. "Farmer Participation in Supermarket Channels, Production Technology, and Efficiency: The Case of Vegetables in Kenya." *American Journal of Agricultural Economics* 94 (4): 891–912.

Rosenbaum, Paul R., and Donald B. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70 (1): 41–55.

Ruhm, Christopher J. 2000. "Are Recessions Good for Your Health?" *Quarterly Journal of Economics* 15 (2): 617–50.

Smith, V. Kerry, William H. Desvousges, and Matthew P. McGivney. 1983. "The Opportunity Cost of Travel Time in Recreation Demand Models." *Land Economics* 59 (3): 259–78.

Smith, Jeffrey A., and Petra E. Todd. 2005. "Does Matching Overcome Lalonde's Critique of Non-experimental Estimators?" *Journal of Econometrics* 125 (1–2): 305–53.