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Social Drivers of Water Utility Privatization in the United States: An Examination of the Presence of Variegated Neoliberal Strategies in the Water Utility Sector*

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Abstract This study uses a logistic regression analysis to investigate the social drivers of water utility privatization in the United States at the local level. In order to do so I combine data gathered from the Environmental Protection Agency's 2012 Safe Drinking Water Information System database and use it in conjunction with the U.S. census's 2008–12 county-level demographic estimates. I use a logistic regression analysis in order to examine the relationship between theoretically relevant social factors and the probability of a privately owned or operated water system being located within a community. Key findings suggest that water utility privatization in the United States follows the logic of a variegated neoliberalism and constitutes a form of environmental injustice.

Introduction

Though private water utility systems have existed since the Industrial Revolution of the nineteenth century made urbanization a primary concern for many governments around the world, their apparent inability to adequately supply a resource that was necessary to the success of industrial cities rendered them a relatively marginal source of water provision when compared to municipal alternatives (Hall and Lobina 2012). Private water utility companies continued to play a rather small role in the provision of public water until the 1990s, when the readoption of liberal economic ideologies by much of the global community led supranational institutions, such as the International Monetary Fund and the World Bank, to impose structural adjustment policies that mandated the privatization of many public water systems in the Global South and eastern Europe (Bakker 2013; Barlow 2009; Conca 2008; Hall and Lobina 2012; Hall, Lobina, and Corral 2011; Harvey 2005; Jaffee and Newman 2013). The presence of privately owned or operated water utility firms continued to grow in the Global South and eastern Europe until the mid-2000s, when high-profile failures of private water

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utility companies, such as the "water war" in Cochabamba, led to a seemingly global rejection of private water utility provision on both ideological and practical grounds (Bakker 2013; Barlow 2009; Hall et al. 2011; Jaffee and Newman 2013). As the unpopularity of water utility privatization rapidly spread, many private water utility firms asserted that they intended to focus on expanding their business in North America, Europe, North Africa, and China (Hall et al. 2011). In some respects these renewed privatization efforts have been less than fruitful, as even in these regions business opportunities for private water utility firms have been dwindling (Hall et al. 2011). However, some studies have found that the total population of individuals served by private water firms has continued to grow, and that in the United States in particular a significant number of municipalities are turning to private water utility providers and managers (Arnold 2009; Bakker 2013; Food and Water Watch 2010, 2012a; Jaffee and Newman 2013; Masons 2011; Varghese 2007).

The aim of this study is to investigate the social drivers of water utility privatization in the United States. In order to do so I use a cross-sectional logistic regression to explore the effect that variation across county-level demographic characteristics has on the likelihood of water utility system privatization during 2012. The subsequent analysis draws on previous sociological and geographical literatures in order to develop an understanding of water utility privatization and public-private partnerships as a form of environmental injustice and economic predation. I argue that the loss of public control over water utility systems suffered by economically and politically disadvantaged communities, which often leads to potentially prohibitive rate increases and public health problems that arise as a result of poor service (Arnold 2009; Food and Water Watch 2012a, 2012b), constitutes a form of environmental injustice.

Literature Review

Following the resurgence of liberal economic ideologies in the 1980s, the international community began to intensely pressure governments around the world to eliminate their involvement in market processes to whatever extent possible (Harvey 2005:87–98). In many instances, international economic pressure to transfer the ownership and operation of government assets into the hands of private entities manifested itself in the International Monetary Fund's or World Bank's mandated privatization of the water and sewage utility systems of large cities in nations of the Global South and eastern Europe (Bakker 2013; Barlow 2009;

Conca 2008; Hall and Lobina 2012; Hall et al. 2011; Jaffee and Newman 2013). This trend of water utility privatization was deeply contested in most instances and, perhaps as a result of this contestation, was granted a significant amount of attention by the academic community (Ahlers, Schwartz, and Perez Guida 2012; Barlow 2009; Boelens et al. 2012; Castro 2008; Conca 2008; Jaffee and Newman 2013; Tan 2012; Torres 2012).

Much of the scholarship concerning water utility privatization has noted the failure of private water service providers to achieve the goals that proponents of privatization initially cited as the purpose of such projects. For example, expansion of water provisions to financially impoverished areas and populations in a manner that was safer and more efficient than techniques employed by the public sector was never achieved and rarely even attempted (Ahlers et al. 2012; Bakker 2005; Barlow 2009; Castro 2008; Hall et al. 2011; Tan 2012). Additionally, research concerning water utility privatization has found that acts of enclosure are typically followed by drastic increases in the cost of services, and notes that these expansive price hikes are necessary if the firms involved wish to maintain levels of profit deemed reasonable (Barlow 2009; Castro 2008; Food and Water Watch 2010; Hall et al. 2011). For example, the nonprofit organization Food and Water Watch has noted that an examination of the 10 largest water utility system sales in the United States revealed a 15 percent per year increase in the average rates paid by consumers for the first 12 years following privatization (Food and Water Watch 2010:7). Further, Karen Bakker has noted that the widespread failures of water utility privatization can often be attributed to the inherent nature of water as an "uncooperative commodity," a term meant to indicate that water is one of many natural resources with physical characteristics that make it difficult to be enclosed, transported, and distributed by privately owned firms while still allowing for an acceptable level of profit to be generated (2005:559).

Despite the difficulties that accompany the privatization of water utility systems, which are now widely recognized, and the general assumption of a decline in water utility system privatization among the academic community, the size of the global population served by private water companies, as well as the number of such companies, has continued to increase (Arnold 2009; Bakker 2013; Food and Water Watch 2010, 2012a; Jaffee and Newman 2013; Masons 2011; Varghese 2007). Though they have not received the same attention from the academy and the media as instances of privatization in the Global South, instances of water utility privatization are common in the United States as well, which is evidenced by a 2007 study that found that nearly

600 cities held contracts with private water utility service providers in the United States (Varghese 2007:2). Similarly, though its study was not comprehensive, Food and Water Watch found that at least 144 water systems were privatized in the United States between 1991 and 2010 (2010:2).

The continual privatization of water utility systems in the United States, and other relatively wealthy countries, in the face of the broadly recognized inadequacies of privately run water systems raises an important question that the current body of literature has yet to answer in an empirical manner. Namely, what social factors drive the relatively wealthy municipalities of the United States to privatize their water utility services?

This study aims to close the gap in the literature concerning the privatization of water systems in the United States. Broadly speaking, I attempt to achieve this outcome by exploring the relationship between county-level demographic factors and the probability of municipalities and other public organizations, within these counties, of housing a privatized water utility system in 2012. Since the specific time at which water utility systems transitioned from private to public ownership is not identifiable within the available data, and because the aim of this study is to examine the across-unit relationship between social factors and the likelihood of water utility privatization within U.S. communities, I perform the following analysis using a cross-sectional logistic regression.

Though I discuss choice of the United States as the focus of this study in greater detail below, it is worth briefly noting that studying the privatization of local water utility systems within the United States is ideal because it grants us insight into the logic of neoliberal capitalism as it pertains to the management of scarce natural resources in wealthy nations during the twenty-first century. Further, considering the myriad social difficulties that arise following the privatization of water utility systems, I postulate that such occurrences are potential instances of environmental inequality and examine the available data in order to understand which communities are most likely to be subjected to the enclosure of their water resources in the United States. Finally, the location of this study sheds light on the current question of whether the management of water and other publicly necessary resources has entered a postneoliberal state, or whether—as Bakker (2013) and Brenner, Peck, and Theodore (2010) argue—neoliberalism within the twenty-first century must be understood not simply as a state or international regime that is unilaterally present or absent but as an economic project that is applied in spatiotemporally deliberate ways directly tied to prospects of financial success and extractive capacity.

According to Bakker (2013)—who directly applies the broader theoretical concept of variegated neoliberalism (Brenner et al. 2010) to the arena of municipal water resource management—the transition of water utility privatization projects from low-income, high-risk countries of the Global South to high-income, low-risk cities located in middle-income countries does not represent a retreat of neoliberal logics, but their refinement. More specifically, rather than seeking the ubiquitous conversion of public utility systems, we should expect to see private water utility companies, such as Veolia or Bechtel, attempting to acquire those water utility systems most likely to be profitable to them, and within communities least likely to be ideologically opposed to their presence (Bakker 2013). Such a refinement of neoliberal strategies would simultaneously enable private water utility providers to extract greater revenue from customers who have the financial means to pay for rate increases, however uncomfortably, and to leave those water utility systems in less lucrative locations to the care of state utility providers (Bakker 2013).

Though Bakker (2013) does not employ her framework to analyze the complicated history of water utility privatization in the United States, many of the cities in the United States fit the description of the relatively high-income, politically low-risk targets that Bakker describes. As a result, this study extends the concept of variegated, or spatially refined, neoliberalism to the United States in order to explore the extent to which such a concept can be used to understand the acquisition of publicly owned water utilities by private entities.

It is important to note that other scholars have posited that the past increases in the number of privatized water utility providers in the United States can be explained by way of municipal economic constraint, and that recently occurring privatization can best be understood as the result of the Great Recession putting many smaller cities into precarious economic situations, which has subsequently prompted them to consider granting private water utility providers control of their water systems (Castro 2008; Food and Water Watch 2010, 2012a; Hall and Lobina 2012; Hall et al. 2011; Jaffee and Newman 2013). While such views are far from incompatible with the concept of variegated neoliberalism, they do not wholly align with the concept either. Generally, studies that explain the recent occurrences of water utility privatization in the United States outside the framework of variegated neoliberalism do so in one of two ways. First, the recent cases of privatization within the United States are depicted as the result of a type of neoliberal inertia from a bygone era in which this economic ideology was hegemonic and unilaterally applied (Hall and Lobina 2012; Hall et al. 2011). And

second, the instances of U.S. water utility privatization are assumed to be aberrational cases of enclosure in a field where the neoliberal ideology is largely seen as having been beaten back to the point of existing only as a minor, insignificant specter, which might regain preeminence if not watched for. In these cases neoliberal logic is seen as having been withdrawn from the water utility sector, but as still being at large elsewhere in the global economy (Castro 2008; Food and Water Watch 2010; Jaffee and Newman 2013). Neither of these explanations of recently privatized U.S. water utilities assumes that such instances represent a spatiotemporally specific application of neoliberal processes inherent in neoliberal capitalism itself, and, in this sense, both differ significantly from variegated neoliberalism.

Whether the contemporary privatization of U.S. water systems is the result of Bakker's refined neoliberalism (2013) or simply the outcome of recession-weary cities seeking new sources of revenue (Food and Water Watch 2010, 2012a; Jaffee and Newman 2013), the negative impacts of these occurrences can best be theoretically understood through the use of David Harvey's (2003) refinement and extension of primitive accumulation (Marx 1867)—accumulation by dispossession. As Harvey explains, accumulation by dispossession is one of many responses by capitalist firms to the problem of overaccumulation, wherein a firm finds new outlets for investment by extending into previously existing, noncapitalist sectors of the economy (2003:140–42). While Harvey's accumulation by dispossession has been regularly employed to interpret the transfer of publicly owned water systems into the hands of private corporations within the Global South (Bakker 2010; Jaffee and Newman 2013; Mingqian 2011; Torres 2012), far fewer academic works have applied this concept to the enclosure of public water utility systems in the United States (Jaffee and Newman 2013).

In keeping with the conceptualization of water utility system privatization as a form of accumulation by dispossession, this study understands the enclosure, or privatization, of publicly owned and managed water utility systems to be an instance of environmental inequality. Here, I utilize Pellow's (2000) notion of environmental inequality, a concept that "focuses on the broader dimensions of intersection between environmental quality and social hierarchies" (582), for a number of reasons. First, as mentioned above, the privatization of water systems has been found to be associated with drastic increases in service rates in many instances in the United States (Arnold 2009; Food and Water Watch 2010). Specific examples of such price hikes can be seen in the cases of Bensalem, Pennsylvania; Edison, New Jersey; and Hawthorne, California, where annual rate increases of 28 percent,

7 percent, and 5 percent were experienced following the privatization of their water utility systems, respectively (Food and Water Watch 2010:7). Such increases not only hurt the communities that experience them financially but they can also severely limit the access of certain socioeconomic groups to clean water in areas that often have no safe, naturally occurring, alternatives.

Second, the privatization of municipally owned and managed water utility systems has, in many instances, been found to result in a notable increase in levels of water pollution (Arnold 2009; Hall et al. 2011). For example, nine years into a twenty-year contract with United Water, the city of Camden, New Jersey, found that many customers were complaining of brown water running from their faucets (Hall et al. 2011:5–6). A similar case can be seen in the privatization of the water utility system that serves the population of Atlanta, Georgia, where "water ran orange to brown for many customers . . . and United Water had to issue numerous 'boil water' orders because low pressure or insufficient water treatment made the water unsafe to drink" (Arnold 2009:800). Considering the racial and socioeconomic makeup of the two cities in these examples,[1] it is reasonable to contend that such examples constitute instances of Pellow's (2000) environmental inequality in terms of both race and economic resources. As was briefly mentioned above, Bakker (2013:255) has noted that "from the mid-1990's onward increasingly cautious companies restricted their involvement to [politically] lower risk contracts, with lower or no investment requirements."

In a discussion of resource mobilization theory, Taylor (2000:519) argues that, in the formation of a social justice movement, "resources and opportunities are more important than strain, grievance and deprivation." If Taylor's understanding of resource mobilization theory is taken seriously, then we should expect, in line with the expectations of variegated neoliberalism, the outcomes of my study to confirm that the privatization of a water utility system is more likely to occur in communities with little access to political resources.

Understanding the privatization of U.S. water utility systems as a form of Harvey's accumulation by dispossession (2003), the form of environmental inequality, whereby the communities involved receive little or no substantial benefit and are often subjected to environmental resource distribution practices that are unsafe and unfair in order to

[1] According to 2010 census data 82.4 percent of Camden's population is made up of racial minorities (U.S. Census Bureau 2010a), while the same can be said for over 60 percent of Atlanta's population (U.S. Census Bureau 2010b). Further, 39.8 percent and 18.3 percent of Camden and Atlanta's populations live below the poverty line, respectively (U.S. Census Bureau 2013).

benefit the bottom line of industry, this study aims to cast further light on the causes behind these occurrences. As noted above, in search of these explanations I explore the common socioeconomic factors of cities in the United States whose water systems were privately owned or operated in the year of 2012 using a cross-sectional logistic regression. I then place these similarities into the context of the current academic literature on the privatization of water utility systems. I expect that the findings of the study will be compatible with the sociological framework of environmental inequality, as well as with the geographical concept of variegated neoliberal capitalism. Such findings would reflect that increases in the probability of privatization are negatively associated with the overall socioeconomic health of the community, and positively associated with the size of a community's racial minority population. Further, we should expect that private utility firms will seek to privatize systems in communities that are able to afford rate increases, yet still lack the financial resources necessary to obtain significant political influence.

Data

Dependent Variable

The dependent variable in this study is the type of entity that owns and operates a water utility system, more specifically, whether the water utility system is owned and managed by a private or public organization. I gathered all data for the dependent variable using the Environmental Protection Agency's "Safe Drinking Water Information System—Federal" (SDWIS-Fed) analyses from 2012. The SDWIS-Fed maintains and tracks information on the roughly 160,000 water systems that serve the public in the United States (EPA 2014).

It is important to note that the U.S. Environmental Protection Agency (EPA) recognizes three different types of public water utility systems: "community water system," "nontransient non–community water system," and "transient non–community water systems." According to the SDWIS-Fed database, community water systems are defined as public water systems that provide water to the same population for the entirety of the year. Nontransient systems are defined as public water systems that provide service to at least 25 of the same people for at least six months of the year, but less than the full year. SDWIS-Fed cites schools, office buildings, hospitals, and factories that have their own dedicated water systems as examples of this second category. Finally, transient noncommunity systems are defined by the SDWIS-Fed as public water systems that serve areas where people visit but do not typically

live, such as campgrounds, rest stops, and gas stations. Since this study is primarily concerned with social drivers of water utility privatization at the community level, only those water systems that have been classified by the EPA as a community water system have been included in the analysis. In addition, those observations with missing values have been dropped using the complete case analysis approach, as the number of cases dropped using this technique is less than 5 percent (2,142 of 49,509) of all cases. This technique is used in order to reduce bias and skew in the analysis (see Jamshidian 2004). As a result, of the 150,669 water utility systems included in the 2012 SDWIS-FED database, only 47,367 are examined here. Of these 47,367 water systems 23,774 are privately owned or operated.

Because the research has found that water utility systems managed by public-private partnerships are rarely more beneficial to the community than fully privatized systems, and that the contract length of private-public partnerships often spans several decades (Food and Water Watch 2012b), water systems managed in this way are considered to have undergone privatization for the purposes of this study. I coded ownership in the form of a binary variable in order to allow the presence of private water systems to be easily tracked. I coded all publicly owned water systems as 0 and all privately owned or operated systems as 1.

Independent Variables

Several independent variables are incorporated into the cross-sectional logistic regression analysis. Broadly speaking, these variables can be split into two categories, which are those concerning the water utility system and those concerning the population that the utility serves.

Independent variables directly tied to the water system are "population served," "geographic region," and "water source." I created these variables using data from the SDWIS-FED's 2012 analysis. The variable "population served" is a continuous variable with a range of 1 to 8 million and a mean of 5,592.25. For the purposes of this study, "population served" indicates the log of the number of individuals served by the water system under consideration. This variable was log transformed in order to normalize the data by limiting the distributional skew of the population served by water utility systems in the United States.

The variable "water source" is a categorical variable that indicates the primary source of water that each water utility system draws from. Following the classifications established by the EPA in the 2012 SDWIS-FED database, "water source" consists of the following six categories:

surface water, purchased surface water, groundwater under the influence of surface water, purchased groundwater under the influence of surface water, groundwater, and purchased groundwater. Rather than being an independent variable of primary interest, the "water source" variable is used here in order to control for the effect that water scarcity and abundance in the geographic environment in which the utility system being examined is embedded has on the probability of privatization. As I did not find these factors to have any consistent or meaningful effect on the likelihood of privatization, I have not depicted them in the models below.

An alternative model utilized the variable "geographic region" to examine the geospatial patterns of private water utility system distribution in the United States. The geographic region variable is categorical, and was created by aggregating the EPA regions into the four larger regions Northeast, Midwest, South, and West. The category Northeast contains EPA regions 1–3; South contains regions 4 and 6; Midwest contains regions 5, 7, and 8; and West contains regions 9 and 10. The findings of this analysis suggest that counties in the West are most likely to contain a private water system within them. Respectively, the Northeast, the South, and the Midwest follow the West in likelihood of containing counties using private water utility systems.

Independent variables used to measure the association between socioeconomic factors within a community and the risk of water systems within that community transitioning from public to private ownership or management were drawn from county-level census population estimate data for the years 2008–12, and were provided by the National Historic Geographic Information System (Minnesota Population Center 2011). County-level socioeconomic predictors used for this study are unemployment rate, median household income, percent racial minority, and percent without a college degree.

I calculate unemployment rate by dividing the 2008–12 census estimates for the number of unemployed citizens 16 years of age or older in a given county by the census estimates for the total labor force in that same county. According to the U.S. Census Bureau, unemployed individuals are considered part of the labor force if they are 16 years old or older and "(1) were neither 'at work' nor 'with a job but not at work'" in the week the data was collected, "(2) were actively looking for work" in the four weeks prior to data collection, and "(3) were available to start a job" during the time that the data was collected. The Census Bureau also states that civilians who did not work at all during the reference week, were waiting to be called back to a job from which they had been laid off, and were available for work except

for temporary illness are included as part of the unemployed portion of the labor force (U.S. Census Bureau 2014). Following Bakker (2013) in her understanding of variegated neoliberalism, I use "unemployment rate" in this study as a proxy for the economic health of a county. The study uses "unemployment rate" this way to enable the potential identification of trends of predacious applications of neoliberal processes to water utility systems in economically disempowered regions. The variable "median household income" is organized as a continuous variable for the purposes of this study. Each median household income unit represents a $1,000 increase in the relevant county's average income measured in 2012 U.S. dollars. The lowest median household income included in this data is $20,281 while the highest is $122,068 (minimum = $20,281; median = $48,169; maximum = $122,068). Following York, Rosa, and Dietz (2003), I created an additional quadratic variable, "median household income^2," by squaring median household income in order to observe any nonmonotonic correlations between income and the risk of water systems being privatized. I included the quadratic term to capture potential nonlinear relationships in order to examine Bakker's (2013) suggestion that neoliberal processes are most commonly applied to water systems in communities with moderately high income (on a global scale) whose residents tend to be politically disempowered. The variable "percent racial minority" is equivalent to the sum of the black, Hispanic, American Indian, Asian, Asian Pacific Islander, and other population estimates within a given county divided by the total population estimate of that same county. Finally, I created "percent without a college degree" by dividing the sum of county level 2008–12 census estimates for those with some college education (but no degree), those with a high school diploma, and those without a high school diploma by the county's total estimated population.

In utilizing the variables of "median household income," "percent racial minority," and "percent without a college degree" I examine the extent to which Pellow's definition of environmental inequality as a field that outlines the "broader dimensions of the intersection between environmental quality and social hierarchies," which also "addresses more structural questions that focus on social inequality (the unequal distribution of power and resources in society) and environmental burdens" (2000:582), is applicable to water utility privatization in the United States. In particular, the variable "percent racial minority" is meant to capture the degree to which we are able to observe processes of environmental racism in water privatization. Similarly, "median household income" and "percent without college degree" are intended

Table 1. Summary Statistics of Continuous Predictor Variables.

Variables	Mean	SD	Median	Minimum	Maximum
Population served	5,592.25	56,658.52	383	1	8,000,000
Unemployment rate	8.88	3.01	8.58	0	26.79
Median household income	$50,479.88	$12,923.95	$48,169	$19,624	$122,068
Percent racial minority	25.84	18.87	21.14	0.04	98.84
Percent without college degree	68.38	9.97	69.89	25.02	96.34

to capture elements of socioeconomic bias in the occurrence of such events. Table 1 presents summary statistics for all predictor variables.

Methods

To perform the quantitative analysis carried out in this study I utilized a cross-sectional logistic regression on the statistical software package Stata. I chose this method for its ability to apply regression techniques to nonlinear, or binary, response variables (Powers and Xie 2008). Using this technique, I am able to examine the impact of theoretically relevant variables on the likelihood of the water utility system they relate to being privatized.

The logistic regression model used here can be expressed as follows:

$$log\frac{\hat{p}_i}{1-\hat{p}_i} = \beta_0+\beta_1\chi_{i1}+\beta_2\chi_{i2}+\ldots+\beta_n\chi_{in}$$

In this instance, the term $log\frac{\hat{p}_i}{1-\hat{p}_i}$ represents the log odds of the *i*th water system being privatized, this study's dependent variable. The subscript *i* represents each unit of analysis, which in this case is water utility systems. β_0 is the value of the constant, or the logged baseline probability of privatization within a given model. β_n represents the effect of the *n*th predictor on the dependent variable, and x_{in} represents the value of the *n*th predictor in the *i*th water system. The command for carrying out this procedure in Stata is "logit."

Thus, the relationships of the variables in this study to this equation are as follows:

Model 1 (Saturated): Log odds of water utility system privatization = β_0 (baseline odds of any U.S. water system being controlled privately) + β_1(log of population served by water system$_i$) + β_2(unemployment rate of county that is home to water system$_i$) + β_3(estimated percentage of population that is a racial minority in the county that is home to water system$_i$) + β_4(median household income of county that is home to water system$_i$) + β_5(quadratic of average family income of county

Table 2. Water Utility Privatization Predictor Coefficients for Cross-sectional Logistic Regression Analysis.

Variables	Model 1 (Saturated)	Model 2 (Race)	Model 3 (Class)
Water utility variables			
Log population served	−0.779*	−0.645*	−0.774*
	(.008)	(.005)	(.008)
Demographic variables			
Unemployment rate	0.182*	_	0.201*
	(.005)		(.004)
Percent racial minority	0.007*	0.002*	_
	(.0007)	(.0003)	
Median household income	0.091*	_	0.086*
	(.006)		(.006)
Median household income^2	−.0006*	_	−.0006*
	(0)		(0)
Percent without college degree	−0.04*	−0.019*	−0.042*
	(.002)	(.0007)	(.0017)
Constant	2.42	5.08	2.57
Pseudo R^2	0.34	0.22	0.34
N	47,367	47,367	47,367

*$p < .001$. High VIF, 2.15 (median household income). Coefficients/(SE).

that is home to water system$_i$) + β_6(estimated percentage of population without a college degree in the county that is home to water system$_i$).

Model 2 (Racial Inequality): Log odds of water utility system privatization = β_0 (baseline odds of any U.S. water system being controlled privately) + β_1(log of population served by water system$_i$) + β_2(estimated percentage of population that is a racial minority in the county that is home to water system$_i$) + β_3(estimated percentage of population without a college degree in the county that is home to water system$_i$).

Model 3 (Class Inequality): Log odds of water utility system privatization = β_0 (baseline odds of any U.S. water system being controlled privately) + β_1(log of population served by water system$_i$) + β_2(unemployment rate of county that is home to water system$_i$) + β_3(median family income of county that is home to water system$_i$) + β_4(quadratic of average family income of county that is home to water system$_i$) + β_5(estimated percentage of population without a college degree in the county that is home to water system$_i$).

Results and Discussion

Table 2 presents logistic regression results for the three models included in this study. The saturated model (Model 1) is intended to

test the effect of all theoretically relevant variables simultaneously, in order to account for any covariance that might go unnoticed when testing for class- and race-based drivers of privatization individually. Further, the logic of this model is to examine all demographic predictors that might influence the extent to which environmental injustice weighs on a community, and to examine the correlation between these predictors and the probability of a water system in that community being privately owned or managed.

Model fit in the saturated model is relatively good, with a pseudo R^2 score of 0.34. Additionally, all predictor variables are found to have a significant effect on the probability of a water system being privately owned or operated. In examining the saturated model we see that, with the exception of "population served" and "percent without college degree," the predictor variables included all increase the probability of privatization to varying degrees. More specifically, the saturated model indicates that a county's unemployment rate has a powerful effect on the likelihood of water system privatization within that county, increasing the odds of privatization by roughly 20 percent (the antilog of .182 is equivalent to 1.199) for every one-unit increase in unemployment rate across counties. Conversely, the saturated model demonstrates that the size of the population served by a water utility system has a positive effect on whether a community water system was publicly or privately owned and managed in 2012. As Table 2 shows, for every one-unit increase in the size of the population served by the water system, there is a 78 percent decrease in the odds of that system being privately owned or operated.

Model 2, the racial inequality model, is intended to explore the power of race as a primary predictor of private ownership and operation of water utilities in the United States. The level of educational attainment was included to account for varying levels of privilege between such communities. The racial inequality model is much more parsimonious than is either the saturated model or the class inequality model (Model 3). However, what the race model gains in parsimony it loses in explanatory power, as the pseudo R^2 score drops from 0.34 in Model 1 to 0.22 in Model 2. Further, while all explanatory variables included in Model 2 are significant, their effects are notably lower than those displayed in Model 1. This outcome suggests that focusing solely on race when examining the social factors that predict forms of water system ownership might cause one to miss aspects of this process that derive from class inequality and its interaction with environmental racism.

Model 3, the class inequality model, is meant to examine the effect that differences in economic status across counties has on the probability

of a water system being privately owned or managed. The fit in Model 3 is equivalent to that of Model 1. Further, Model 3 provides a slightly more parsimonious explanation of the social drivers underlying neoliberal processes in the water utility sector. As in Models 1 and 2, all included predictor variables remain statistically significant at the $p \leq .001$ level. However, the growth in the magnitude of the unemployment rate coefficient between Model 1 and Model 3 suggests that if the effects of race are ignored they appear to be attributable to considerations of class, obfuscating the true extent to which either race or class inequality is a predictor of the application of spatially variegated neoliberal strategies in the water sector. For this reason the following analysis will center on the saturated model.

As noted above, all explanatory variables included in Model 1 are significant at the highest ($p \leq .001$) level. The size of the population served by the water utility system has a negative effect on the likelihood of a water system being privately owned or operated. This effect offers support to the notion that the privatization of water utility systems in the United States follows the logic of variegated neoliberalism. Bakker (2013) notes that under a spatially variegated neoliberalism we should expect water utility firms to acquire utility systems that are politically and financially low risk. Smaller communities often have a more difficult time mobilizing resources due to their relative lack of collective "time, money, human resources, technical expertise, organizational resources, etc." (Taylor 2000:519), and therefore pose less of a political risk to water utility firms seeking to gain access to new properties and contracts. In addition, smaller communities often pose less of a financial obligation to private water utility firms as they typically have significantly less infrastructure to maintain. As shown above, infrastructural upkeep was a notable obstacle for private firms in the cities of Atlanta, Georgia, and Camden, New Jersey (Arnold 2009; Hall et al. 2011).

County unemployment rate has a positive effect on the probability of a water utility being privately owned or managed. A 1-unit increase in the unemployment rate is associated with a 20 percent increase in the probability of a water system in that county being privately operated. As the range of unemployment rate is 0 to 26.8 percent, this relationship suggests that communities experiencing economic hardship but managing to maintain a fairly high median income have a significantly greater risk of having their water system privatized than those that might be considered fiscally "healthy." This finding offers great support to the notion that neoliberal strategies and corporate predation tactics are applied to the water utility sector in an economically targeted, geographically specific manner. In particular, we should expect that

communities with a high rate of unemployment would be less politically opposed to the privatization of their water utility systems if this process offered the possibility of increased job opportunities in the community and a larger tax base, though research has shown that these possibilities are rarely realized (Food and Water Watch 2010).

Importantly, it should be noted that the positive association found between unemployment rate and risk of water system privatization also offers support to the proposition that the Great Recession has led to an increase in the probability of water system privatization by way of municipal economic constraint. As briefly stated before, the hypothesis that the Great Recession has led to an increased risk of privatization of water systems is not incompatible with the concept of variegated neoliberalism. In fact, one might expect, utilizing the lens of variegated neoliberalism, that heightened levels of municipal economic hardship in the United States would lead to a more active and visible private water utility sector. Unfortunately, without the use of time series data it is not possible to examine whether or not variegated neoliberal patterns extend beyond times of economic crisis. Thus, the ability to claim whether variegated neoliberal logics are enduring in the water utility sector is beyond the scope of this study.

The effect of racial minority population size within a county is relatively small. A 1-unit increase in the size of the minority population within a community is associated with a 0.7 percent increase in the probability of a water system in that county being privatized in some way. However, the incredibly broad range of this variable (0.04 percent –98.84 percent) suggests that some communities have a notably greater probability of being subjected to private management of their water systems than others.[2] This finding offers support not only to the concept

[2] In order to examine nonlinearity in the variable "percent racial minority" I have run an alternative model that includes the percentage of population that is minority within a county as a categorical variable. I created the categories by separating the continuous variable "percent racial minority" into quartiles according to the real distribution of counties' minority population percentage. Thus, the category "low minority population" includes counties with 8 percent minority population or less, "mid-low minority population" those with a minority population between 8 percent and 16.7 percent, "mid-high minority population" those with a minority population between 16.7 percent and 30.5 percent, and "high minority population" any county with a minority population greater than 30.5 percent. When I controlled for all other relevant variables, findings suggest that, relative to counties that are composed of less than 8.7 percent racial minorities, counties with a mid-low minority population are 25.3 percent more likely to have a privatized water system within their boundaries, those counties belonging to the mid-high minority population category are 46.5 percent more likely have a privatized water system in their boundaries, and those counties belonging to the high minority population category are 58 percent more likely have a privatized water system in them.

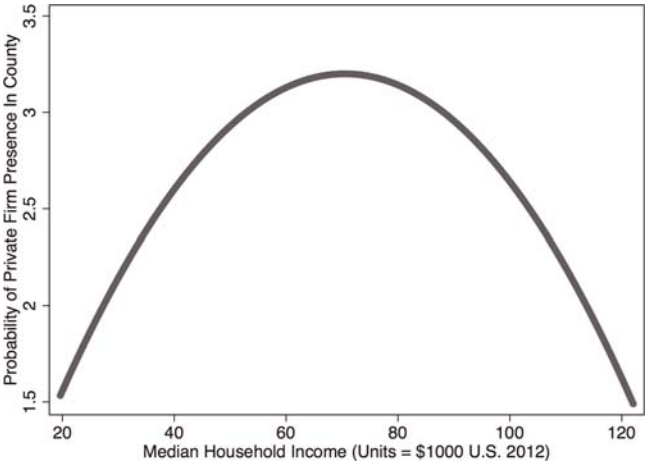

Figure 1. Probability of Private Water Utility Presence as a Function of Median Household Income.

of variegated neoliberalism, which suggests that communities that have traditionally been politically marginalized are at greater risk of being subjected to neoliberal processes, but also to the notion that water utility privatization should be thought of as an instance of environmental inequality. For in such instances communities that are typically at a social and political disadvantage are alienated from the means to control one of life's most valuable resources in order to achieve market-oriented goals.

The quadratic variable "median household income^2" has a rather interesting effect on the odds of a water system being privately owned or operated. When median household income^2 is taken into consideration we see that, as shown in Figure 1, the probability of privatization only grows with a community's median household income until a community reaches a threshold of, roughly, $70,846, at which point increases in median household income are associated with a decrease in the probability of privatization. This offers support to the suggestion that there are variegated neoliberal processes at work in the water utility sector for two reasons. First, as was mentioned above, Bakker's (2013) treatment of variegated neoliberalism anticipates that relatively high income communities are at the greatest risk of being exposed to such processes. Second, under the logic of variegated neoliberalism one would expect politically high-risk targets to be avoided. Thus, it is reasonable to suspect that under a spatially refined neoliberal model firms would desire to acquire water systems in wealthy

communities, where it is possible to collect greater rates, so long as those communities are not so wealthy as to have significant political and commercial influence.[3]

Interestingly, the coefficient for the variable "percent without college degree" suggests that as the proportion of a county's college-educated population grows by one unit, the probability of a privately owned water system being located in that county decreases. It is possible that this is due to the fact that the vast majority (94.3 percent) of water utilities are in counties where less than half the population has a college degree. In such counties an increase in percentage of the population that has no college degree also suggests an increase in equality of educational attainment within such communities. Perhaps a more uniform, or equitable, educational distribution enables members of a community to mobilize themselves politically in an effort to prevent a loss of community resources more easily. However, more research is necessary to confirm such speculation.

Conclusion

Taken together, the above findings suggest that the water utility industry in the United States is subject to the logic of variegated neoliberalism. Additionally, findings lend support to the notion that, in many instances, water utility privatization can be understood as a form of environmental injustice, where particular communities are placed at a greater risk of experiencing the often negative outcomes found to be associated with such privatization. Here I highlight the above findings that suggest that the greatest predictors of water utility privatization, when holding all other theoretically relevant variables constant, are a community's economic health (as represented by unemployment rate), racial composition, and class position. It is important to note, however, that, contrary to the logic of environmental justice studies, the communities with the greatest probability of having a privatized water system within them are those whose median household income is roughly $70,000 dollars a year. This finding suggests that water utility firms seek to acquire contracts and properties in areas that are capable of paying the rate increases that

[3] Note that, while a median household income of $70,000 is 1.7 standard deviations above the population's median household income, in an *absolute* sense it is unlikely that a community that is composed of households sharing this level of income would be able to greatly influence political or economic outcomes. According to the 2009–13 U.S. census estimates, the average number of persons per household is 2.63, which only amounts to an average income of $26,616 dollars per resident in a household that makes $70,000 a year (U.S. Census Bureau 2013).

often accompany privatization, but that are not wealthy enough to wield significant political influence. I acknowledge that, without further examination of the causal mechanisms underlying the patterns presented within this study, it is difficult to discuss remedies for the type of environmental injustice discussed here. However, it seems clear that until water is viewed as an essential public good, and not a commodity, the communities described above will continue to be put in a position that exposes them to potentially exploitative water prices and likely increases in levels of water pollution.

Further sociological research into the nature of water utility privatization in the United States should orient itself in two directions. First, there is still a great deal that can be learned about the causal mechanisms that underlie the trends found here. With that in mind I hope that subsequent research will examine U.S. water utility privatization qualitatively. Second, sociological researchers should examine the trends of water system privatization, and its effect on local communities, over time by using panel data and longitudinal analyses. Finally, I hope that the findings presented here will encourage researchers to consider neoliberal processes in a more nuanced manner than has been common in the past.

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