Research Note

Urban Affairs Review
2023, Vol. 59(2) 611–629

DOI: 10.1177/10780874221080122
journals.sagepub.com/home/uar
SAGE

Specialized Local Government and Water Conservation Policy in the United States

David Switzer[1] and Jun Deng[1]

Abstract

Special districts are an increasingly important part of the local government equation in the United States, representing over forty percent of local governments. The spread of these governments is controversial, however, as some argue that they will have a negative impact on service delivery, due to a perceived lack of political accountability. Others argue that their focus on single policy issues allow them to more efficiently respond to the citizens they serve. Despite the controversy, only a few studies have quantitatively investigated the differences in service delivery between special district and general purpose governments. Building on Mullin's earlier work, in this research note we investigate the relationship between specialized local government and water utility rates. We find little direct difference between special districts and general-purpose governments, with some minimal support for a conditional relationship between special districts and scarcity.

Keywords

special districts, environmental policy, institutions

Special districts, specialized local governments responsible for the delivery of single public services, are an important part of American life, yet the consequences of the massive proliferation of specialized local government remain

[1]Truman School of Government and Public Affairs, University of Missouri, Columbia, MO, USA

Corresponding Author:
David Switzer, Truman School of Government and Public Affairs, University of Missouri, 232 Middlebush Hall, Columbia, Missouri, USA.
Email: switzerd@missouri.edu

understudied. Special districts have been a growing part of the local government equation in the United States for decades and now account for over 40 percent of local governments in the United States (Stephens and Wikstrom 1998; Greer and Scott 2020). A great deal of research has studied the proliferation of special district governments in the United States, investigating the political and administrative reasons for their spread (Frant 1997; Barbara 2000; Carr 2006; Farmer 2010). The use of special districts is controversial, however, as some argue that they will negatively impact service delivery, due to a lack of public attention (Burns 1994; Stephens and Wikstrom 1998; Lewis 2000). Still, others argue that they will more efficiently represent the interests of constituents due to the focus on a single issue (Ostrom, Tiebout and Warren 1961; Mullin 2008).

Despite the controversial nature of special districts, few studies have quantitatively investigated the differences in service delivery between special districts and general purpose local governments (Leland and Smirnova 2008; Mullin 2008; Hughes 2012; Goodman, Leland and Smirnova 2021). In this note, we use an original data set of all public water utilities serving 40,000 or more residents to investigate the policy differences between special districts and general purpose governments. This note provides important updates to Mullin's (2008) analysis of special district and general purpose government water rates. Overall, we find that there is little difference in government types when it comes to water rate policy, with minimal evidence for the conditional effect of water scarcity.

Special District Governments

Special districts are forms of government created to address a single policy issue within a service area. These governments differ from general purpose governments, such as counties and cities, in that they do not provide multiple forms of public services, instead focusing on a single policy area, such as water, fire, or even mosquito abatement. A great deal of research has been done on the proliferation of special districts throughout the United States, attempting to investigate the political and administrative reasons for the spread (and dissolution) of specialized government (Frant 1997; Barbara 2000; Carr 2006; Farmer 2010; Carr and Farmer 2011; Shi 2017; Goodman 2018; Goodman and Leland 2019; Moldogaziev, Scott and Greer 2019).

Crucially, there has been significant debate over the impact of special districts on policy outputs and outcomes, with the majority of the controversy related to the relative responsiveness of special districts to constituents compared to their general purpose counterparts. One school of thought, developed out of public choice, holds that special districts will generally provide more efficient services, due to their focus on a single issue (Ostrom, Tiebout and

Warren 1961; Mullin 2008). This "polycentric" perspective holds that since general purpose governments focus on a number of different policy issues, they may not be equipped to fully represent citizen interests on any single policy issue. Polycentrists argue that special districts are efficient units of government that are better equipped to meet the heterogenous demands of the population, due to their focus on a single policy issue (Bollens 1986; Foster 1996; Stephens and Wikstrom 1998; Berry 2008). A competing perspective, however, argues that special districts will be less responsive and efficient when it comes to service delivery. Critics of special districts argue that special districts exacerbate existing issues with government fragmentation in a decentralized government system (Bollens 1986; Stephens and Wikstrom 1998; Lewis 2000; Bauroth 2015). These arguments suggest that special districts are largely unaccountable and a form of "shadow" government, more responsive to private interests than the public (Gottlieb and FitzSimmons 1991; Burns 1994).

Recent research has investigated the influence of government specialization on a number of policy outputs and outcomes. In the transportation sector, Leland and Smirnova (2008) found that special districts are more likely to operate efficiently than general purpose governments, but found little difference with respect to effectiveness. Interestingly, Goodman, Leland and Smirnova (2021), also studying the impact of special districts on transportation policy, found very little difference between special districts and general-purpose governments with respect to service expansion or operating expenses, even when accounting for the severity of transportation issues. While these studies show minimal difference between government types with respect to transportation policy, studies of water conservation policy, the subject of the analysis here, have found that there is a significant difference in policy. Mullin (2008; 2009) found that special districts are more likely to adopt water rates that encourage conservation than general purpose governments, conditional on issue severity. Similarly, Hughes (2012) found that special districts in California were more likely to both commit to voluntary water conservation programs and to actually conserve water. Mullin and Rubado's (2016) research on water use restrictions during a drought in Texas also investigated how utility type influence policy decisions. They found that utilities run by cities were more likely to adopt water use restrictions, although they compare city utilities to all other utilities, including private and special districts, meaning they don't directly compare special districts and general purpose governments.

The debate over the influence of special districts on policy outcomes is far from settled. We attempt to provide more clarity, focusing on the influence of special district governance on water conservation policy using a national dataset of large water utilities and a new measure of water conservation policy. Water policy is an area of growing importance for local governments in the United States. As the population of the United States has more than doubled since 1950 and shifted from rural to urban areas, water supplies in many areas have become strained (Kenney et al. 2009). Aging water infrastructure and increasing regulatory costs have put an additional strain on water resources (Griffin 2001). Utilities are facing increasing challenges of water scarcity, and the looming threat of climate change will only exacerbate this issue in the future (Levin et al. 2002). These challenges call for a strong policy response. Understanding how institutional arrangements, such as the prevalence of special districts, influences response to these challenges, is an important policy question. To this point, only Mullin (2008; 2009) has systematically explored the relationship between special districts and water rate conservation policy. This research note provides important updates to her analysis using an original dataset of utility rates, including the use of a newly developed measure of water rate progressivity.

Specifically, Mullin's (2008) analysis suggested that the influence of special districts on policy would be conditional on issue salience. Where issues are more severe, general purpose governments will be as responsive in pursuing policy favorable to the median voter as special districts, since the importance of the issue will push it to the top of the multidimensional policy agenda. When an issue is less severe, however, special districts will be more likely to pursue such a policy due to their singular issue focus. In the case of water conservation policy, the median voter should usually prefer more progressive rates, due to the right skewed nature of consumption (Mullin 2008). Mullin found that it was in areas where water issues are less salient that special districts exhibit the greatest difference in policy from general purpose governments (Mullin 2008). Interestingly, in the transportation policy realm, Goodman, Leland and Smirnova (2021) did not find evidence to support this conditional relationship, finding that other variables were more important than government type, even when accounting for severity.

Data

We use an original dataset of large utility water rates, as well as data from the Safe Drinking Water Information System (SDWIS) database, the American Community Survey (ACS), and the National Oceanic and Atmospheric Administration (NOAA). The dataset contains every public utility in the contiguous United States serving 40,000 or more residents according to the SDWIS as of January 2019, or 1,050 utilities.[1]

The primary variable of interest for this analysis is utility water rate policy, one of the most powerful tools that local governments have to encourage water conservation. Rate structures have important implications for both water conservation and potential redistributive effects as well (Berry 1979; Mullin 2008). Rate design is an attractive policy for utilities specifically because it sends pricing signals to residents about the value of water without the administrative costs that come with a regulatory approach (Chesnutt and Beecher 1998). Demand for water is price sensitive, so rates that charge higher marginal prices for water, especially for high volume users are considered economically efficient ways for utilities to reduce water use (Griffin 2001; Gurung and Martinez-Espineira 2019).

There are many varieties of rate structures, but they can most easily be grouped into five basic types (Mullin 2008; Teodoro 2010). Flat rates charge customers the same price to all customers over a fixed period, regardless of the amount of water consumed. Uniform rates charge the same marginal price for all units of water regardless of the level of consumption. Declining block rates charge higher marginal prices at low volumes of use, but as usage increases, the marginal price decreases. Increasing block rates charge higher marginal prices for high volume users, while charging lower prices per unit for low volume users. Finally, seasonal rates charge higher prices per unit during times of high demand or low supply, primarily the summer. Seasonal rates can be combined with any other type of rate structure.

Studies have usually focused on increasing block and seasonal rates as a policy of interest, since these are considered the most conservation-oriented rates (Mullin 2008; Teodoro 2010). For most utilities, mean customer consumption is higher than median customer consumption (Chestnutt et al. 1997). This means that the median customer should usually benefit from an increasing block rate structure, since high consumption customers will bear the burden of the increased price per unit (Mullin 2008; Teodoro 2010). Previous studies of water rates in the United States have measured rates policy categorically, identifying what type of rate structure a utility adopts (Mullin 2008; 2009; Teodoro 2009; 2010; Boyer et al. 2012).

For our analysis, we collected water rates data from government websites between January and April of 2019. We contacted utilities that did not list their water rates online via email and telephone. As mentioned, most previous studies of utility water rates have relied on dichotomous or categorical measures of rate structure type, emphasizing whether a utility uses some form of conservation water rate. Following this, we develop a dichotomous measure of whether utilities use conservation water rates or not, coding the variable as 1 if the utility uses seasonal or inclining block rates and 0 if they use any other type of rate structure. 58 percent of utilities in the dataset use conservation water rates. Descriptive statistics for this and all other variables included in the analysis can be seen in Table 1.

A dichotomous approach, however, may not be an adequate representation of the conservation orientation of rates.[2] The dichotomous approach masks the incredible variation within rate structures. Utilities that adopt inclining block rates vary greatly in terms of how rapidly the price accelerates with usage. Some utilities set rates that hardly increase the price per unit, while others double the volumetric price as consumption passes into the subsequent blocks. This is important from a policy perspective as it sends clear signals to customers about conservation incentives, and therefore policy priorities. Rai (2020), in her study of climate policy at the state level, suggested that it is important to distinguish between policy adoption and "policy intensity." Essentially, policy adoption can be done for symbolic reasons and won't necessarily lead to actual impacts. Evaluating policy intensity, however, may capture actual commitment to policy goals. In this case, a dichotomous measure of conservation rate adoption says little about how much the rate structure actually encourages conservation, but may simply serve as a symbolic gesture that a utility values conservation.

For this reason, we also use a new measure of residential rate progressivity (Switzer 2019*a*). This measure extends beyond the type of rate structure used and identifies how the marginal price of water changes as consumption

Table 1. Descriptive Statistics.

National Data	Percentage	Mean	Stand Dev	Min	Max
Binary Variables					
Special District	20.000				
Conservation Rate	58.095				
Groundwater Supply	24.285				
Purchased Water Supply	30.381				
Continuous Variables					
Rate Progressivity		0.151	0.215	–0.582	1.807
Water Scarcity		0.292	1.436	–2.614	3.481
Logged Population		11.439	0.790	10.597	15.928
Socioeconomic Status		–0.004	0.962	–2.614	3.481
% Poverty		15.542	7.825	2.902	42.647
Median House Inc (1000s)		64.119	22.772	26.855	178.389
% w. Bachelor's Degree		32.038	14.262	4.288	83.124
% High School Graduate		87.162	7.612	50.982	98.323
% Black Population		14.419	14.888	0.34	88.331
% Hispanic Population		19.383	19.184	0.801	97.329
Proportion Urban		0.748	0.261	0	1

N = 1,050.

increases. It reflects the average change in the marginal price of one thousand gallons of water (kgal) resulting from a one kgal increase in consumption across the first 13 kgals consumed.[3] A positive progressivity value means that high volume users are paying a higher marginal price for water than low volume users, while a negative value means higher consumption users actually pay a lower marginal price per unit of water, typical of declining block rates. A value of zero means that the price remains the same regardless of consumption, which is the case for uniform rate structures. For the utilities included here, the average rate progressivity is 0.151, meaning that for every kgal increase in consumption, the marginal price per kgal increases by about 15 cents.

Our primary independent variable is whether the utility is owned and operated by a special district or a general-purpose government. We define special districts as single purpose governments that have either appointed or elected officials. Special districts represent 20 percent of the utilities in the data.

Mullin (2008) posited that the effect of special districts would be conditional on issue severity. In order to measure scarcity, our chosen measure of issue severity, we use the Palmer Drought Severity Index (PDSI). PDSI assigns values to the monthly level of water supply/demand in a region (Palmer 1965). The index ranges from dry to moist, with values of −4 or below suggesting an area is in extreme drought, while a value of 4 or above suggests an area has extreme moisture. We matched each utility in the dataset to NOAA climate divisions and calculated the average PDSI for the 10-year period preceding the collection of the rates data, from 2009–2018. We reversed the coding of the variable so that higher numbers represent higher levels of water scarcity.

We include a number of controls related to the utility and the population served. One issue with including demographic controls with special districts is that while municipal and county boundaries are available through national datasets maintained by the Census Bureau, no such dataset exists for special district boundaries. This means the inclusion of demographics for special districts is difficult. While some states have service boundaries available online, others do not provide any information on special district boundaries. While using county level data would be possible, previous research has shown that demographic data that has been poorly matched to environmental policy can lead to bias in results (Baden, Noonan and Turaga, 2007; Bowen and Wells 2002; Mohai and Saha 2006). Through online searches and phone calls to utilities, we were able to obtain maps for every special district utility in the dataset and turn the maps into polygons in a national shapefile for matching to demographic data.

The urban politics literature has long identified race and ethnicity as powerful variables in the dynamics of municipal politics, so it is possible that they will influence water conservation policy as well. We included variables for the percentage of the population in the municipality that was Black and Hispanic in the 2017 ACS 5-year estimates. Additionally, since water rates have major redistributive impacts, and water consumption is likely to be correlated with socioeconomic status (SES), it is also possible that SES can influence conservation policy. To control for SES we created a variable using factor analysis that incorporates median household income, percent high school educated, percent with a bachelor's degree, and percent below poverty. This is a strategy that has been used in recent articles to capture SES (Konisky and Reenock 2013; Liang 2016; Switzer 2020). The factor analysis of the four variables revealed a single factor with an eigenvalue of 2.66, with both of the education variables and median household income loading positively on the first factor and poverty rate loading negatively. This factor variable more fully represents SES than any single measure of income, education, or poverty.[4]

Additionally, urban utilities may have different demand patterns than those in less densely populated areas, which could both incentivize and disincentive the adoption of conservation water rates. Urban populations may put greater stress on the system, necessitating conservation rate adoption. On the other hand, there may be less irrigation in more urban areas, meaning excessive use is unlikely to be as large a portion of the usage patterns as a whole, meaning conservation rates are not as necessary. We include a measure for the proportion of the utility service area defined by the 2010 Census as urban in order to control for this possibility.

We also included utility controls. Data on water source came from the SDWIS. Groundwater may be less affected by scarcity and utilities that purchase their water through wholesalers may have less incentive to adopt conservation rates (Teodoro 2010). In order to control for these possibilities, we include dummy variables for whether utilities use groundwater and purchased water. Additionally, large utilities may be more likely to adopt conservation rates, since implementation of complex rate structures may require technical sophistication that small utilities lack (Mullin and Rubado 2016). For this reason, we include a measure of logged population served.[5]

Models

To evaluate the relationship between government type and conservation rates, we estimate interactive statistical models with the following general form:

$$C_i = \alpha_1 + \beta_1 S_i + \beta_2 W_i + \beta_3 S_i * W_i + \beta_4 D_i + \beta_5 U_i + \beta_5 N_i + \varepsilon_i$$

Where C represents the either the adoption of conservation rates or the progressivity of the water rates for utility i, S represents the special district dummy variable, W represents the level of water scarcity, D represents demographic characteristics of the population served by the utility, U represents utility characteristics, and N represents the policy adoption of neighboring utilities. α and ϵ are constant and error terms, respectively. The models include an interaction between special districts and scarcity to account for the potential conditional effect of specialized local government. For the model predicting conservation rate adoption, we use logistic regression. For the model predicting progressivity, we use OLS with robust standard errors due to evidence of heteroskedasticity.

Results

Table 2 displays the results of the models containing the interaction between special districts and water scarcity. Overall, there is little evidence for statistical differences between special district governments and general-purpose governments when it comes to the adoption of conservation rates or water rate progressivity. While the interaction is in the expected direction in the progressivity model, it does not reach statistical significance at conventional levels. The results of interaction models are most usefully interpreted using marginal effects. The marginal effects of specialized local government on conservation rate adoption and progressivity can be seen in Figures 1 and 2, respectively. Table 3 displays the marginal effects of scarcity, conditional on government type.

Beginning with the conservation rate adoption model, Figure 1 shows that regardless of the level of water scarcity, there is no statistical difference in the probability of special districts adoption conservation water rates compared to general purpose governments. Likewise, Table 3 shows that the marginal effect of scarcity is similarly positive for both types of government.

The rate progressivity model also shows little statistical difference between special districts and general purpose governments, although the direction of the results is consistent in Mullin's (2008) argument. Figure 2 shows that at low levels of water scarcity, the effect of special district government is positive albeit only statistically significant at the .10 level. As scarcity increases, the marginal effect of specialized local government decreases, eventually becoming negative. The right columns in Table 3 show the other side of this relationship. For general purpose governments, increasing water scarcity has a positive, but insignificant effect. The effect is negative, but insignificant, for general purpose governments.

Table 2. Special Districts and Conservation Rates.

	Conservation Rates		Progressivity	
	Coefficient	p-Value	Coefficient	p-Value
Special District	−0.115	.539	0.000	.985
	(0.187)		(0.019)	
Water Scarcity	0.487	<.001	0.011	.063
	(0.073)		(0.006)	
Special District × Scarcity	0.002	.991	−0.019	.082
	(0.145)		(0.011)	
Logged Population Served	0.336	.001	0.007	.381
	(0.103)		(0.009)	
SES	0.664	<.001	0.008	<.001
	(0.103)		(0.009)	
% Black Population	0.008	.126	0.001	.014
	(0.006)		(0.001)	
% Hispanic Population	0.019	<.001	0.001	.007
	(0.005)		(0.000)	
Purchased Water	0.179	.319	0.008	.690
	(0.180)		(0.019)	
Groundwater	0.839	<.001	−0.005	.746
	(0.184)		(0.016)	
Proportion Urban	−0.871	.002	−0.136	<.001
	(0.287)		(0.031)	
Constant	−3.629	.002	0.117	.258
	(1.175)		(0.104)	
Observations	1050		1050	

Note: Standard Errors in Parentheses.

Table 3. M.E of Scarcity for General Purpose and Special District Governments.

	Conservation Rate Model			Progressivity Model		
	M.E.	Std. Error	p-value	M.E.	Std. Error	p-value
General Purpose Governments	0.094	(0.013)	<.001	0.011	(0.006)	.063
Special Districts	0.096	(0.022)	<.001	−0.008	(0.010)	.445

Note: Marginal Effects calculated with all other variables held at means.

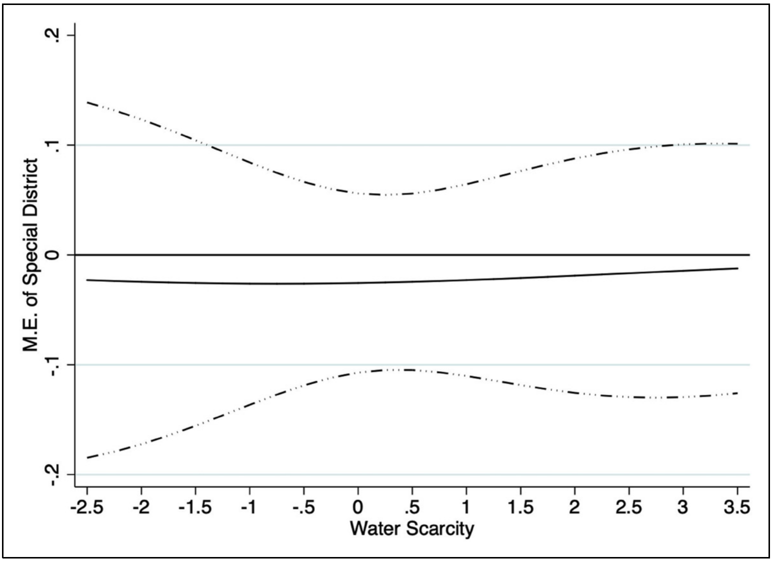

Figure 1. Marginal effect of special district government on conservation rate adoption.

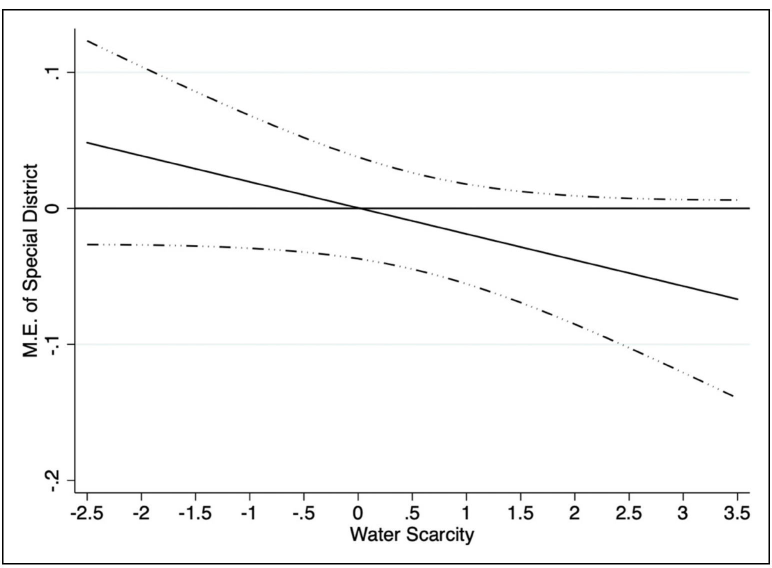

Figure 2. Marginal effect of special district government on progressivity.

Conclusion

Overall, we find little evidence of a difference between special district governments and general purpose governments when it comes to water rates. While the directionality of the results of the progressivity model is consistent with Mullin's (2008) findings, the interaction is not statistically significant in either the conservation rate adoption model or the progressivity model. We don't believe this means that there was necessarily anything wrong with Mullin's previous analysis. Indeed, the data used in this analysis are nearly twenty years newer than the data Mullin used in her analysis. The continuing influence of climate change on water availability and the emergence of water affordability as a major policy concern during that time period mean water rates may simply be more salient everywhere now than they were twenty years ago. Additionally, even if the analyses result in slightly different results, they certainly are more consistent with Mullin's expectations of special districts than the "shadow government" perspective.

We would like to note a few specific limitations here that present avenues for future research. First, our study focused on larger utilities. This allowed us to collect extremely detailed data, but may have come at the cost of a reduction in variation. While these utilities collectively serve 162 million people, or nearly half the population of the United States, a focus on large utilities may mask relevant variation for a few reasons. One potential issue with adopting conservation rates is the impact on revenue stability. While any rate structure can be designed to ensure projected revenue is adequate, an unexpected decrease in demand caused by something like an especially mild summer would have a greater impact on revenues under more progressive rate structures. In general, larger utilities would be better situated to mitigate any problems caused by such a revenue shortfall. This means that by focusing on larger utilities, we may be masking one of the major factors that influences the decision to adopt progressive rates. Future research could use a smaller random sample to better investigate the role that organizational capacity plays in the adoption of conservation rates and how this influences the relationship between specialized local government and policy adoption.

Second, there is a great deal of variation among special districts. Special districts can differ greatly in their level of independence from general purpose governments. Specifically, while some special districts hold elections to select their boards, others are appointed by general purpose governments (Mullin 2009). Additionally, state laws may constrain special district formation as well as authority, which could impact their incentives to adopt policies that are different from general purpose governments (Barbara 2000). There are also a number of different types of special districts that provide water services, and distinguishing between them could yield interesting insights (Scott, Moldogaziev and Greer 2018). While this paper focused simply on the differences between special districts and general purpose governments, future work could further dig into the important distinctions between special districts themselves.

Also, while conservation is important, it certainly isn't the only vital goal for utilities. It is possible that while we found few differences between special districts and general purpose governments here, that they may vary on other policies. For one, a significant amount of recent scholarly attention has been paid to water affordability (Mack and Wrase 2017; Pierce, Chow and DeShazo 2020; Teodoro and Saywitz 2020). Specifically, Teodoro (2018) has developed new measures of water affordability that could easily be recreated using this dataset. Exploring how specialized local government impacts affordability would be worthwhile. Additionally, a great deal of research has been done on water quality and regulatory compliance (Konisky and Teodoro 2016; Allaire, Wu and Lall 2018; Switzer and Teodoro 2018). It would also be possible to explore how special districts differ from general purpose governments with respect to quality and compliance.

Finally, one potential missing variable is ideology. The debate over special districts often comes down to discussions of responsiveness. Based on recent literature in urban politics, we know that municipal governments are quite responsive to the ideology of the citizens they serve, including with respect to water rates (Tausanovitch and Warshaw 2014; Einstein and Kogan 2016; Switzer 2019*b*, 2020; Sances 2021). Exploring the differential influence of ideology on special districts and general purpose governments is a fruitful area for future research.

While there is more exciting work to be done on specialized local government, we do think that these results have major implications for how we should consider the status of special districts. As noted, there has been a great deal of controversy about the implications of specialized local government for local accountability. These results suggest that there may be less of a difference between special districts and general purpose governments than the literature suggests. In many ways, these controversies are about the relative "publicness" of special districts relative to general purpose governments. Bozeman (1987) has argued that one important way of distinguishing organizations is by understanding their relative level of "publicness." Essentially, instead of just thinking about public or private ownership, Bozeman suggests we should consider the relative influence of private and public authorities on an organization. Polycentric arguments essentially suggest that special districts are quite accountable to public authorities and therefore highly "public," while critics of special districts argue they are often more accountable to private interests and therefore less "public" than general purpose governments. These results certainly suggest that special districts are as likely to adopt publicly beneficial water conservation policy as general purpose governments. Importantly, the literature on private provision of water services has found strong differences between public and private utilities (Konisky and Teodoro 2016; Teodoro, Zhang and Switzer 2020). The null results here stand in stark contrast, suggesting that special districts are not just publicly owned, but also "public" in their actions.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Supplemental Material

Supplemental material for this article is available online.

ORCID iD

David Switzer https://orcid.org/0000-0002-9827-4194

Notes

1. Alaska and Hawaii were not included due to a lack of data availability with respect to the water scarcity measure drawn from NOAA data.
2. See Switzer (2019a) for a full review of both the problems with a dichotomous model and of the new progressivity measure.
3. The choice of 13 kgals is not arbitrary, but reflects what DeOreo et al. (2016) found to be two standard deviations above median consumption in their study of the end uses of water.
4. The factor analysis can be seen in the statistical appendix. The appendix also includes models with each of the individual variables included instead of the SES factor variable.
5. It is possible that the policy decisions of neighboring utilities influence the adoption of conservation water rates. In the appendix, we follow Hughes, Runfola, and Cormier (2018) in including a measure of the policy adoption of the two nearest neighbors to each of the utilities included in the analysis. The substantive results are not changed by the inclusion of this measure.

References

Allaire, Maura, Haowei Wu, and Upmanu Lall. 2018. "National Trends in Drinking Water Quality Violations." *Proceedings of the National Academy of Sciences* 115 (9): 2078–83. https://doi.org/10.1073/pnas.1719805115.

Baden, Brett M, Douglas S. Noonan, and Rama Mohana R. Turaga. 2007. “Scales of Justice: Is There a Geographic Bias in Environmental Equity Analysis.” *Journal of Environmental Planning and Management* 50 (2): 163–85. https://doi.org/10.1080/09640560601156433.

Barbara, Coyle McCabe. 2000. “Special-District Formation Among the States.” *State and Local Government Review* 32 (2): 121–31. https://doi.org/10.1177/0160323X0003200204.

Bauroth, Nicholas. 2015. “Hide in Plain Sight: The Uneven Proliferation of Special Districts Across the United States by Size and Function.” *Public Administration Quarterly* 39 (2): 295–324. http://www.jstor.org/stable/24772856.

Berry, William D. 1979. “Utility Regulation in the States: The Policy Effects of Professionalism and Salience to the Consumer.” *The American Journal of Political Science* 23 (2): 263–77. https://doi.org/2111002.

Berry, Christoper. 2008. “Piling On: Multilevel Government and the Fiscal Common-Pool.” *American Journal of Political Science* 52 (4): 802–20. https://doi.org/10.1111/j.1540-5907.2008.00344.x.

Bollens, Scott A. 1986. “Examining the Link between State Policy and the Creating of Local Special Districts.” *State & Local Government Review* 18 (3): 117–24. https://www.jstor.org/stable/4354886.

Bowen, William M., and Michael V. Wells. 2002. “The Politics and Reality of Environmental Justice: A History and Considerations for Public Administrators and Policy Makers.” *Public Administration Review* 62 (6): 688–98. https://doi.org/10.1111/1540-6210.00251.

Boyer, Christopher N, Damian C. Adams, Tatiana Borisova, and Christopher D. Clark. 2012. “Factors Driving Water Utility Rate Structure Choice: Evidence from Four Southern U.S. States.” *Water Resources Management* 26: 2747–60. https://doi.org/10.1007/s11269-012-0043-z.

Bozeman, Barry. 1987. *All Organizations Are Public: Comparing Public and Private Organizations*. Washington, DC: Beard Books.

Burns, Nancy. 1994. *The Formation of American Local Governments*. Oxford: Oxford University Press.

Carr, Jered B. 2006. “Local Government Autonomy and State Reliance on Special District Governments: A Reassessment.” *Political Research Quarterly* 59 (3): 481–92. https://doi.org/10.1177/106591290605900315.

Carr, Jered B., and Jayce Farmer. 2011. “Contingent Effects of Municipal and County TELs on Special District Usage and Formation.” *Publius: The Journal of Federalism* 41 (4): 709–33. https://doi.org/10.1093/publius/pjr031.

Chesnutt, Thomas W., and Janice A. Beecher. 1998. “Conservation Rates in the Real World.” *Journal of the American Water Works Association* 90 (2): 60–70. https://doi.org/10.1002/j.1551-8833.1998.tb08378.x.

Chestnutt, Thomas W., Janice A. Beecher, Patrick C. Mann, Don M. Clark, W. Michael Hanemann, George A. Raftelis, Casey N. McSpadden, David M. Pekelney, John Christianson, and Richard Krop. 1997. *Designing, Evaluation, and Implementing Conservation Rate Structures*. Sacramento: California Urban Water Conservation Council.

DeOreo, William B., Peter W. Mayer, Benedykt Dziegielewski, and Jack Kiefer. 2016. *Residential End Uses of Water Version 2*. Denver, CO: Published by the Water Resources Foundation.

Einstein, K. L., and V. Kogan. 2016. "Pushing the City Limits: Policy Responsiveness in Municipal Government." *Urban Affairs Review* 52 (1): 3–32. https://doi.org/10.1177/1078087414568027.

Farmer, Jayce L. 2010. "Factors Influence Special Purpose Service Delivery Among Counties." *Public Performance and Management Review* 33 (4): 535–54. https://doi.org/10.2753/PMR1530-9576330401.

Foster, Kathryn A. 1996. "Specialization in Government: The Uneven Use of Special Districts in Metropolitan Areas." *Urban Affairs Review* 31 (3): 283–313. https://doi.org/10.1177/107808749603100301.

Frant, Howard. 1997. "Reconsidering the Determinants of Public Authority Use." *Journal of Public Administration Research and Theory* 7 (4): 571–90. https://doi.org/10.1093/oxfordjournals.jpart.a024366.

Goodman, Christopher B. 2018. "Usage of Specialized Service Delivery: Evidence from Contiguous Counties." *Publius: The Journal of Federalism* 48 (4): 686–708. https://doi.org/10.1093/publius/pjx065.

Goodman, Christopher B., and Suzanne M. Leland. 2019. "Do Cities and Counties Attempt to Circumvent Changes in Their Autonomy by Creating Special Districts." *The American Review of Public Administration* 49 (2): 203–17. https://doi.org/10.1177/0275074018804665.

Goodman, Christopher B., Suzanne M. Leland, and Olgam Smirnova. 2021. "The Consequences of Specialised Governance on Spending and Expansion of Public Transit." *Local Government Studies* 47 (2): 296–311. https://doi.org/10.1080/03003930.2020.1744571.

Gottlieb, Robert, and Margaret FitzSimmons. 1991. *Thirst for Growth: Water Agencies as Hidden Government in California*. Tucson, AZ: University of Arizona Press.

Greer, Robert A., and Tyler A. Scott. 2020. "A Network Autonomy Framework: Reconceptualizing Special District Autonomy in Polycentric Systems." *Perspectives on Public Management and Governance* 3 (1): 59–76. https://doi.org/10.1093/ppmgov/gvz006.

Griffin, Ronald C. 2001. "Effective Water Pricing." *Journal of the American Water Resources Association* 37 (5): 1335–47. https://doi.org/10.1111/j.1752-1688.2001.tb03643.x.

Gurung, Aditya, and Roberto Martinez-Espineira. 2019. "Determinants of the Water Rate Structure Choice by Canadian Municipalities." *Utilities Policy* 58: 89–101. https://doi.org/10.1016/j.jup.2019.04.003.

Hughes, Sara. 2012. "Voluntary Environmental Programs in the Public Sector: Evaluating and Urban Water Conservation Program in California." *Policy Studies Journal* 40 (4): 650–73. https://doi.org/10.1111/j.1541-0072.2012.00468.x

Hughes, Sara, Daniel Miller Runfola, and Benjamin Cormier. 2018. "Issue Proximity and Policy Response in Local Governments." *Review of Policy Research* 35 (2): 192–212. https://doi.org/10.1111/ropr.12285.

Kenney, Joan F., Nancy L. Barber, Susan S. Hutson, Kristin S. Linsey, John K. Lovelace, and Molly A. Maupin. 2009. *Estimated Use of Water in the United States in 2005*. Reston, VA: US Geological Survey.

Konisky, David M., and Christopher Reenock. 2013. “Compliance Bias and Environmental (In)Justice.” *The Journal of Politics* 75 (2): 506–19. https://doi.org/10.1017/S0022381613000170.

Konisky, David M., and Manuel P. Teodoro. 2016. “When Governments Regulate Governments.” *American Journal of Political Science* 60 (3): 559–74. https://doi.org/10.1111/ajps.12221.

Leland, Suzanne, and Olga Smirnova. 2008. “Does Government Structure Matter? A Comparative Analysis of Urban Bus Transit Efficiency.” *Journal of Public Transportation* 11 (1): 63–83. http://doi.org/10.5038/2375-0901.11.1.4.

Levin, Ronnie B., Paul R. Epstein, Tim E. Ford, Winston Harrington, Erik Olson, and Eric G. Reichard. 2002. “US Drinking Water Challenges in the Twenty-First Century.” *Environmental Health Perspectives* 110 (suppl 1): 43–52. https://doi.org/10.1289/ehp.02110s143.

Lewis, Paul G. 2000. “The Durability of Local Government Structure: Evidence from California.” *State and Local Government Review* 32 (1): 34–48. https://doi.org/10.1177/0160323X0003200103.

Liang, Jiaqi. 2016. “The Shadow of the Politics of Deservedness? The Implications of Group-Centric Policy Context for Environmental Policy Implementation Inequalities in the United States.” *Journal of Public Administration Research and Theory* 26 (3): 552–70. https://doi.org/10.1093/jopart/muv027.

Mack, Elizabeth A., and Sarah Wrase. 2017. “A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States.” *PloS one* 12 (1): e0169488. https://doi.org/10.1371/journal.pone.0169488.

Mohai, Paul, and Robin Saha. 2006. “Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research.” *Demography* 43 (2): 383–99. https://doi.org/10.1353/dem.2006.0017.

Moldogaziev, Tima T., Tyler A. Scott, and Robert A. Greer. 2019. “Organizational Dissolutions in the Public Sector: An Empirical Analysis of Municipal Utility Water Districts.” *Journal of Public Administration Research and Theory* 29 (4): 535–55. https://doi.org/10.1093/jopart/muy081.

Mullin, Megan. 2008. “The Conditional Effect of Specialized Governance on Public Policy.” *American Journal of Political Science* 52 (1): 125–41. https://doi.org/10.1111/j.1540-5907.2007.00303.x.

Mullin, Megan. 2009. *Governing the Tap: Special District Governance and the New Local Politics of Water*. Cambridge, MA: MIT Press.

Mullin, Megan, and Meghan E. Rubado. 2016. “Local Response to Water Crisis: Explaining Variation in Usage Restrictions During a Texas Drought.” *Urban Affairs Review* 53 (4): 752–74. https://doi.org/10.1177/1078087416657199.

Ostrom, Vincent, Charles M. Tiebout, and Robert Warren. 1961. “The Organization of Government in Metropolitan Areas: A Theoretical Inquiry.” *The American Review of Political Science* 55 (4): 831–42. https://doi.org/10.1017/S0003055400125973.

Palmer, Wayne C. 1965. *Meteorological Droughts*. Washington, DC: Department of Commerce.

Pierce, Gregory, Nicholas Chow, and J. R. DeShazo. 2020. "The Case for State-Level Drinking Water Affordability Programs: Conceptual and Empirical Evidence from California." *Utilities Policy* 63: 101006. https://doi.org/10.1016/j.jup.2020.101006.

Rai, Saatvika. 2020. "Policy Adoption and Policy Intensity: Emergence of Climate Adaptation Planning in US States." *Review of Policy Research* 37 (4): 444–63. https://doi.org/10.1111/ropr.12383.

Sances, Michael W. 2021. "When Voters Matter: The Limits of Local Government Responsiveness." *Urban Affairs Review*. 57 (2): 402–427. https://doi.org/10.1177/1078087419878812.

Scott, Tyler A., Tima Moldogaziev, and Robert A. Greer. 2018. "Drink What You Can Pay for: Financing Infrastructure in a Fragmented Water System." *Urban Studies* 55 (13): 2821–37. https://doi.org/10.1177/0042098017729092.

Shi, Yu. 2017. "The Rise of Specialized Governance in American Federalism: Testing Links between Local Government Autonomy and Formation of Special Districts." *Publius: The Journal of Federalism* 47 (1): 99–130. https://doi.org/10.1093/publius/pjw025.

Stephens, G. Ross, and Nelson Wikstrom. 1998. "Trends in Special Districts." *State and Local Government Review* 30 (2): 129–38. https://doi.org/10.1177/0160323X9803000205.

Switzer, David. 2020. "The Context of Responsiveness: Resident Preferences, Water Scarcity, and Municipal Conservation Policy." *Review of Policy Research* 37 (2): 260–79. https://doi.org/10.1111/ropr.12377.

Switzer, David. 2019b. "Citizen Partisanship, Local Government, and Environmental Policy Implementation." *Urban Affairs Review* 55 (3): 675–703. https://doi.org/10.1177/1078087417722863.

Switzer, David. 2019a. "Introducing a New Measure of Residential Water Rate Progressivity." *AWWA Water Science* 1 (2): e1132. https://doi.org/10.1002/aws2.1132.

Switzer, David, and Manuel P. Teodoro. 2018. "Class, Race, Ethnicity, and Justice in Safe Drinking Water Compliance." *Social Science Quarterly* 99 (2): 524–35. https://doi.org/10.1111/ssqu.12397.

Tausanovitch, Chris, and Christopher Warshaw. 2014. "Representation in Municipal Government." *American Political Science Review* 108 (3): 605–41. https://doi.org/10.1017/S0003055414000318.

Teodoro, Manuel P. 2009. "Contingent Professionalism: Bureaucratic Mobility and the Adoption of Water Conservation Rates." *Journal of the Public Administration Research and Theory* 20 (2): 437–59. https://doi.org/10.1093/jopart/mup012.

Teodoro, Manuel P. 2010. "The Institutional Politics of Water Conservation." *Journal of the American Water Works Association* 102 (2): 98–111. https://doi.org/10.1002/j.1551-8833.2010.tb10055.x.

Teodoro, Manuel P. 2018. "Measuring Household Affordability for Water and Sewer Utilities." *Journal–American Water Works Association* 110 (1): 13–24. https://doi.org/10.5942/jawwa.2018.110.0002.

Teodoro, Manuel P., and Robin Rose Saywitz. 2020. "Water and Sewer Affordability in the United States: A 2019 Update." *AWWA Water Science* 2 (2): e1176. https://doi.org/10.1002/aws2.1176.
Teodoro, Manuel P., Youlang Zhang, and David Switzer. 2020. "Political Decoupling: Private Implementation of Public Policy." *Policy Studies Journal* 48 (2): 401–24. https://doi.org/10.1111/psj.12287.

Author Biographies

David Switzer is an Assistant Professor in the Truman School of Government and Public Affairs at the University of Missouri. His research lies at the intersection of public administration, political science, and environmental policy, focusing primarily on local government water policy in the United States.

Jun Deng is a PhD student in the Truman School of Governance and Public Affairs at the University of Missouri. She is primarily interested in renewable energy policies and local energy management in the United States.