Who Benefits from Special District Service Delivery?: Water Affordability in the United States

Robin Rose Saywitz
Texas A&M University

David Switzer
University of Missouri

Abstract
Despite decades of controversy about the relationship between special districts and public policy, questions remain about the impact of government specialization on service delivery. In this paper, we explore one aspect of this debate, how special districts impact equity in the costs of service delivery, using water affordability as our empirical case. Two dominant views of special districts have emerged from the literature that are relevant to our empirical exploration. The first asserts that special districts are a form of "shadow government," set up for the benefits of developers and other special interests and unaccountable to the general population. The second claims that special districts fit into a polycentric vision of local government, better representing the interests of residents due to their singular policy focus, and improving residents' ability to pinpoint politicians responsible for specific services. Using an original dataset of all public water utility in the United States serving over 40,000 people and two measures of water affordability, we quantitatively test whether special districts have systematically less affordable water rates. We find some evidence that this is the case, additionally finding that the gap in affordability grows as community poverty levels increase.

Points for practittioners:

- General purpose governments provide slightly more affordable drinking water compared to special district governments and have more equitable rate structures.
- Price is only one way to measure the equity of a government service, more affordable but low quality services are not necessarily more equitable or preferable for all customers.
- Hours worked at minimum wage and the affordability ratio are two practical measures used in the water sector that can be valuable for public administration practitioners and scholars

In the United States, special district governments are ubiquitous. There are almost twice as many special districts as municipalities and townships, and special districts provide numerous services that have traditionally been delivered by general purpose governments (United States Census Bureau 2017). Park maintenance, fire protection, flood control, water and sewer services, economic development, transportation, natural resource management and any many other services in the United States can be provided either by special districts or general purpose governments. The provision of public services by specialized local government, however, is extremely controversial, with theoretical debates over their efficacy raging for decades (Ostrom 2000; Burns 1994; Bollen 1957). In recent years, scholars have begun comparing the services and policies of general purpose governments and special

Public Administration Quarterly Vol. 47, Iss. 2 pp. 109-131
 https://doi.org/37808/paq.47.2.2

districts empirically, yielding a great deal of new knowledge on how special districts influence service delivery (Goodman, Leland, and Smirnova 2020, Mullin 2008, Hughes 2012, Zhang, Teodoro, and Switzer 2021).

While these recent studies have shed a significant light on the performance, accountability, and quality of services provided by special districts relative to their general purpose counterparts, numerous questions remain. Specifically, in this paper we seek to explore whether special districts supply more equitable and affordable services when compared to general purpose governments. The literature on special districts has long debated to whom special districts are accountable, which has important implications for the equity of the services they provide. Critics of special districts have argued that due to the quiet nature of special district politics and their common association with development interests, the policies they pursue will seek to benefit special interests, with costs borne by regular citizens (Bollen 1957; Burns 1994). On the other hand, proponents of local government specialization suggest that special districts will be responsive to the concerns of constituents, due to a singular policy focus (Ostrom 2000; Mullin 2009).

In this study we seek to explore the equity of public services supplied by general purpose and special district governments by examining the affordability of water services. Water affordability is a growing topic of concern in the United States. Numerous recent studies have focused on how water has become less affordable in recent years, with low-income residents bearing a larger share of the burden (Teodoro 2018, Mirosa 2015, Rubin 2018, Pierce et al. 2020, Mack and Wrase 2017). Ultimately, when water services are provided by local governments, affordability is the result of political processes that determine the distribution of the costs of service to customers. Since water use is correlated with income and high-volume users contribute more to the costs of the government providing the services, water affordability is ultimately a question of equity (Teodoro 2005; Mullin 2008; Agthe and Billings 1987; Harlan et al. 2009). Who special districts and general purpose governments are accountable to likely influences the ways that they distribute costs among their customers when setting water rates. If the perception that special districts are "shadow governments" accountable to special interests is accurate, then they likely move the costs of service provision away from the high-income, high-volume users they are accountable to, towards low income customers. Conversely, if special districts deliver more equitable services because of their staff's greater focus and the improved ability of residents to hold politicians accountable for their specific services, we should see water rates that are more equitable in the distribution of costs among all customers, and therefore more affordable.

We explore this relationship using an original dataset of every public water utility in the United States serving over 40,000 residents. Using Teodoro's (2018) recently developed measures of water affordability, Hours at Minimum Wage (*HM*) and the Affordability Ratio (*AR*), we quantitatively test whether special districts have systematically less affordable water rates.

We begin by reviewing the core debate about special district governments with regards to service delivery. We then review the literature on water pricing and affordability and provide descriptions of Teodoro (2018)'s two water affordability metrics. We introduce our original dataset of local government water rates, testing the differences in affordability

between special districts and general-purpose governments for the two affordability metrics. To preview our findings, special districts do provide slightly less affordable water services than general-purpose governments, when price is measured as hours at minimum wage (*HM*), although not as a percentage of disposable income (*AR)*. This observed difference in affordability is greater when service areas have higher levels of poverty, where the salience of service costs should be especially high. We conclude with the implications of the research for both scholars and practitioners.

The Controversy over Special Districts

Scholars have long held competing views on the ability of special district governments to provide high quality services that meet the needs of their constituents. Opponents of special districts view them as opaque, challenging for residents to hold accountable, and susceptible to capture by special interests. Bollen (1957) famously called special districts "shadow governments," and this general view has been echoed by numerous scholars since (Killian and Le 2012; Burns 1994). Empirical research has shown that special districts may indeed by less visible, with Killian and Le (2012) finding that residents are less likely to be aware of special districts than general purpose governments. Similarly, Zhang, Teodoro, and Switzer (2021) found that residents of special districts were less likely to partcipate in participatory surveillance than those served by general-purpose governments, attributing the difference to the less visible nature of special districts. Killian and Le (2012) point out that awareness is effectively the first step in accountability. If residents are unwarare of a special district's existance, then it will be nearly impossible for those residents to hold that government responsible when they fail to provide adequate services.

Beyond resident awareness, special district operations are often considered less transparent than general purpose governments. For example, special districts are the type of government least likely to respond to the US Census of Governments and least likely to comply with government finance reporting standards (GASB 2010; Killian and Le 2012). As a result, it especially challenging for constituents to learn about the financial operations of the special districts they live within. This lack of visibility may hinder residents in holding special districts accountable for their financial performance, quality of their service delivery, and obscures who benefits the most from their policies and services. If special districts operate out of the public eye, they have little incentive to craft policies and deliver services in ways that benefit residents that are not plugged into local politics. On the other hand, general purpose governments, like municipalities, cannot hide inequitable policies and service provision as easily.

Additionally, many argue that special districts are less accountable to democratic processes. Many special districts have boards that are comprised solely of appointed officials, who may not face direct consequences for their policy actions (Bauroth 2005). Even when special districts do have elected officials, they may not be as visible. Special districts with elected board members often hold their elections off-cycle, and skip them altogether when there are no challengers present (Burns 1994; Galvan 2006). These practices, especially moving elections off-cycle, can reduce voter turnout by almost half

(Berry and Gersen 2010; Hajnal and Lewis 2003). Berry and Gersen (2010) call the resulting phenomenon "selective participation" because as the cost of participating in an election increases, only voters with increasingly more invested in the election will participate. Furthermore, Burns (1994) found that turnout for special district elections typically ranged from two to five percent, which is substantially less than the turnout for other types of local government elections. At the state-level, Galvan (2006), notes that records of special district elections are poorly maintained, which obfuscates how many constituents actively participate in special district board and bond elections. Low and selective turnout in special district elections compared to general purpose elections has the potential to dramatically shape which voters special districts feel beholden to and the equity of the policies they pursue in an attempt to satisfy them. Low participation rates in local government tends to favor inequitable policy outcomes that benefit powered interests over lower income residents (Einstein et al. 2019). If the quiet nature of special district politics privileges powered interests, then it is possible they pursue less equitable policy than general purpose governments.

Additionally, many view special districts as beholden to development interests, specifically. This perspective characterizes special districts as vehicles that enable developers to access public capital and debt more easily than through general purpose governments (Burns 1994; Foster 1996). Special districts allow developers to fund development through revenue bonds, which in turn makes the land more attractive and valuable for further development (Burns 1994). Although it is possible for groups of interested residents to band together and create special districts to provide services, Burns (1994) argues that special districts are more often formed by developers seeking access to resources than residents in need of services. Similarly, Galvan (2006) finds that developers, rather than constituents, predominantly created Municipal Utility Districts in Texas, and that they play a role in selecting the initial board members. That special districts are potentially beholden to development interests adds to the possibility that they will pursue inequitable policy. If accurate, they would be expected to pursue policy that benefits development, rather than policies that reflect a more equitable distribution of the costs and benefits of services.

Some scholars take a less cynical view of special districts. Proponents claim that special districts help constituents better identify which politicians are responsible for particular policy areas, feature politicians with specific issue area expertise, and allow for more direct access. When the same services are provided through a single general-purpose government, residents must figure out how to bundle their preferences and articulate them through only one or two electoral mechanisms, typically city council and mayoral elections.

That voters are able to bundle their preferences in such a way and express them through only one or two (e.g. city councilor and mayor) electoral mechanisms is one of the core assumptions of the "theory of monocentric order." Ostrom (2000) challenges this assumption, finding it unrealistic that city councilors and mayors can glean such fine-grained policy preferences through an instrument as blunt as city-wide elections for political offices responsible for a wide range of services. Under this view, when residents have multiple layers of single and limited function governments, rather than a single general-purpose city or county government, they can isolate their preferences for certain policies

and more accurately punish and reward politicians for their behavior. When the parks in a community are managed through a special district, for example, residents no longer need to figure out how to bundle their preferences for parks maintenance and summer programming with water quality, tax rates, public safety, and other issue areas.

Similarly, special district board members have additional incentive to provide services that meet the needs of their constituents because, come election time, residents cannot excuse their poor performance in managing parks or providing safe drinking water based on reductions in crime or increases in economic development. This should, in effect, make it easier for residents that believe they are not receiving the services they deserve to express their dissatisfaction at the ballot box. Residents that believe that they are shouldering too much of the overall burden of water services because of the structure of their current water rates have a clear outlet when water service is provided through a special district.

Mullin (2008, 2009) notes that managing multiple issue areas isn't just challenging for voters, but is challenging for politicians as well. She argues that special district board members can develop deeper issue expertise than city council members and mayors. Special district board members work on a much narrower set of issues than city council members and mayors, which theoretically allows them to become more knowledgeable about specific issues, in a way that other local government politicians cannot, due to practical limitations on their time and attention (Mullin 2008, 2009). This greater focus on a specific policy issue may make special district politicians more aware when new issues, including equity concerns like affordability, arise. General purpose politicians, dealing with a multi-dimensional policy space, may not understand the equity implications of every policy decision before them. Officials at special districts, however, likely have a deeper understanding of the specifics of a given service area and how to equitably distribute costs and benefits.

Empirical Investigations of Specialized Local Governments

While the theoretical implications of local government specialization have been debated for decades, more recent research has empirically investigated the differences between special district and general-purpose government policy. In general, this research finds minimal differences in service delivery, and certainly does not suggest that special districts are wholly different from general purpose governments. Indeed, at least in the case of water utilities, there may actually be advantages to special district service delivery. Mullin's (2008) research on water utility adoption of conservation rates found that special districts are more likely to adopt water rates that encourage conservation than their general-purpose counterparts. She argues that this difference is conditional on issue severity/salience, finding that it was in colder regions that special districts were more likely to adopt conservation water rates, since general purpose governments would be less likely to focus on water issues in these areas. Additionally, she found that in low growth areas, special districts tended to have higher line extension fees for new water users, but as growth increased general purpose governments had similar or even higher fees (Mullin 2009).

Crucially, for Mullin, the context of special districts matters. Similarly, Hughes (2012) found that special districts in California were more likely to engage in voluntary conservation programs and more likely to conserve water.

Results in the transportation sector, however, have been more mixed to date, not finding strong differences between special district and general-purpose governments. Leland and Smirnova (2008) found that special districts focused on transportation are more likely to operate efficiently than general-purpose governments, but found little difference in effectiveness. More recently, Goodman, Leland, and Smirnova (2020) compare transportation agencies run by general purpose governments and special districts in terms of their operating expenses and operations expansions in response to a ten-year lag of local vehicle congestion. They find that the two types of governments share substantially similar policy behaviors, and that both respond similarly to vehicle congestion. Goodman, Leland, and Smirnova's (2020) findings suggest that residents receive comparable services from special districts and general purpose governments.

The empirical work on special districts has gone a long way in exploring the implications of local government specialization on policy outcomes and outputs. There are still important empirical questions to be asked. Specifically, we are interested in extending existing literature in exploring whether special district provision of services increases or decreases equity in policy.

Special Districts, Equity, and Water Affordability

Public water utilities provide an excellent venue to explore the effects of local government specialization on equity. Water provision is a critical service, the majority of people receive their drinking water from a public utility, and utility rates are inherently a redistributive policy decision (Berry 1976). Approximately 88% of the United States population receives water services from a public utility, and many of these are special districts. As of the 2017 Census of Governments, water districts are the third most common type of special district, with over 5,000 special districts providing water services to residents.

In the United States, water rates for public utilities are created through local political processes. They are generally proposed by utility bureaucrats and then approved through a vote by the elected officials overseeing the utility, either the city council or a special district board. Water rates consist of a fixed charge, paid by all customers regardless of consumption patterns, and a volumetric charge based on the amount of water a customer uses in a billing cycle. The volumetric portion of the bill can be uniform, where the price per unit of water is the same regardless of consumption, declining, where the price per unit decreases as consumption increases, or inclining, where the price per unit increases as consumption increases. The volumetric portion of the bill can be understood similarly to tax structures. A uniform rate would be like a tax structure that taxes everyone equally regardless of income, a declining rate would be like a tax structure that taxes higher levels of income less than lower levels, and an inclining rate would be like a progressive tax structure, increasing taxes as income increases.

Both the fixed and volumetric charges have important equity implications. Crucially, water use in the United States is highly correlated with income *and* high-volume users contribute more to the costs of the utility (Teodoro 2005; Agthe and Billings 1987; Harlan et al. 2009; Mini et al. 2014). Consumptive uses like irrigation of large lawns and filling swimming pools are typically pursued by higher income users, while most low-income individuals use water primarily for essential uses like cooking, cleaning, and drinking (Harlan et al. 2009). Consumptive uses drive up the capacity costs of running the utility, as plant sizes need to be larger to account for more water consumption during high consumption periods. The fixed and volumetric portions of the water rate determine whether these costs fall primarily on low or high-volume users. Like progressive taxes, inclining block rates may be beneficial for low-income customers, as these rate structures will focus costs more on consumptive uses that are typical of higher income individuals. Indeed, Mullin (2008) suggests that inclining block rates build equity implications directly into the rate structure. The nature of fixed rates, however, means that this is not always the case. High fixed charges shift the cost burden to low volume users, since these charges are incurred regardless of consumption levels. An inclining block rate with high fixed costs may actually put more of the burden on low-income users than a uniform or declining block rate with low fixed costs.

In the case of utilities run by special districts and general purpose governments, it is ultimately local policymakers who decide who bears the cost of service provision. Who governments are responsive to will likely be a determining factor in how they distribute those costs.

The role that local governments play in distributing the costs of water services is especially important as water affordability has become a larger issue in the United States. A number of recent studies have explored the issue of water affordability, finding that it is an increasing problem across the country (Teodoro 2018, Mirosa 2015, Rubin 2018, Pierce et al. 2020, Mack and Wrase 2017). In general, the cost of water has been going up, and this has the largest effect on lower income individuals, who have experienced stagnating incomes in recent years (Pierce et al. 2020). Despite the recent attention on water affordability, we know very little about the implications of government specialization for affordability. While the affordability of services is not equivalent to equity in all cases, it is a close approximation in the case of water rates. The affordability of water supplied by public utilities is ultimately a result of local government decisions to allocate the costs of services in certain ways. More affordable water means that costs have been shifted away from low-volume (typically low-income) users to high-volume (typically high-income) users, who are responsible for driving up the capacity costs of the utility. When rates are affordable, it means that those who are most able to handle increased costs and most responsible for the size of those costs are the ones bearing them.

The two differing perspectives on special districts have drastically different implications for how they will approach equity issues, like affordability, relative to general purpose governments. The "shadow government" perspective would suggest that special district utilities are more likely to focus on issues relevant to developers and business interests than lower income individuals. In general, developers and business should prefer

water rates that lead to lower cost of service for high volume and income users, which would likely mean putting higher burdens on lower income customers, making rates unaffordable. Additionally, this perspective would suggest that due to the relatively quiet nature of special district politics, low-income residents would be less likely to politically punish politicians for unaffordable utility bills. This suggests that special districts would ultimately have less equitable and affordable water rates.

In contrast, if special districts are more attuned to the needs of their constituents, due to their singular policy focus, we would expect them to be better at dealing with issues of water affordability. General-purpose governments, operating in a multi-dimensional policy space, may not be as aware of affordability consideration in their service area, perhaps focusing on issues in other policy areas. In contrast, special districts, singularly focused on water, would be more attuned to how water rates impact their low-income customers. This perspective would suggest that special districts would likely have more equitable rate structures and more affordable water than their general-purpose counterparts. Mullin's (2008) findings that special districts are more likely to adopt inclining rates in certain contexts hints at this possibility, since all else equal, inclining block rates should be better for water affordability. It is possible, however, that not all else is equal.

We test these two perspectives against each other, exploring whether local government specialization is associated with more or less affordable water rates.

Measuring Water Affordability:

We use Teodoro's (2018) water affordability metrics in order to evaluate the impact of local government specialization on water affordability. These two measures are the number of hours at minimum wage required to pay for essential water services, or *HM*, and the ratio of the price of essential water services to discretionary income, or the affordability ratio (*AR)*. These measures exhibit the impact of water rates on affordability by reflecting essential water use and by relating them to relevant financial metrics for lower income households. Despite their relatively new creation, these measures have been already begun to be used in rate setting processes among practitioners. The California Public Utilities Commission, responsible for regulating the utility rates of private providers, has adopted both the *HM* and *AR* metrics for evaluating utility prices, including the price of essential water use (California Public Utilities Commission 2021). Additionally, the City of Phoenix Water Services Department the City of Evanston, and Metropolitan Planning Commission in Chicago, among others, have begun using these measures in recent years to understand water affordability in their communities.

HM is a measure of affordability where the price of water is determined as the number of hours at minimum wage required to pay for basic service costs. We follow Teodoro (2018) in adopting 50 gallons per capita per day and a four-person household in evaluating affordability. For the purposes of our analysis, we assume 6,000 gallons per month to be a reasonable estimate of essential water use. Our measure of HM, then, is the monthly price for 6,000 gallons of water divided by the minimum wage in the area of the utility. The monthly price reflects the fixed price of water services, again reflecting the cost

of water for customers regardless of their consumption, and the volumetric price up to 6,000 gallons, reflecting the per unit price of water charged to customers. The *HM* measure can be reflected by the following formula:

HM= (Cost of essential water services)/(Hourly Minimum Wage)

As a second measure of water affordability, we use the affordability ratio or *AR*, calculated at the 20th percentile of income, again following Teodoro (2018). This measure reflects the ratio of the price of essential water use (again measured at 6,000 gallons per month) to disposable household income for households of a certain size at a given income percentile. Disposable income is calculated by subtracting essential household expenses (other than water services) from household income. While Teodoro (2018) names the measure the affordability ratio, it is measured as a percent. It is operationalized as the percent of disposable household income that goes to essential water use. The formula for *AR* is as follows:

AR= (Cost of essential water services)/(Household income – Essential non-water costs) X 100

While the *AR* can be calculated for any percentile of income, Teodoro (2018) recommends using the 20th percentile income, as this reflects the "working poor," or individuals that are likely to struggle with water bills, but may not be eligible for government assistance.

Tying these two measures of water affordability back to the concept of equity, a lower *HM* and *AR* mean that price of water for basic needs is relatively affordable for low-income residents, reflecting a lower cost burden from policymakers. Rate structures that produce relatively low *HM* and *ARs* put the a higher burden for the cost of services on high -volume customers, who are generally higher-income residential customers.

Data

We collected data for these analyses from a variety of sources. First, we used utility data from the Safe Drinking Water Information System (SDWIS) to identify every public utility with a population of greater than 40,000. The SDWIS also included a number of relevant details about each utility's water source. We were able to collect detailed water rates data for every utility in the dataset by using utility websites as well as through email and phone call communication with those utilities that did not list their water rates online. Demographic data were drawn from the American Community Survey's (ACS) 2017 five-year estimates. We also used data from the National Oceanic and Atmospheric Administration (NOAA). In total, our dataset included 1,049 public water utilities.

As mentioned, the dependent variables of interest are the HM and AR affordability metrics. In order to develop these measures for our utilities of interest, we collected water rates data for each utility between January and April of 2019. We calculated the price of water for customers using 6,000 gallons a month for each utility in the dataset. For the measure of HM, we the divided the price by the state or local minimum wage. The calculation of the AR measure is a bit more complex. While the numerator remains the same, reflecting the price of water at 6,000 gallons per month, the calculation of disposable

income was calculated by subtracting estimated essential expenditures from the 20th percentile income for a given area, drawn for the ACS 5-year estimates. Non-water essential expenditures are estimated using the Bureau of Labor Statistics Consumer Expenditure Surveys, which contains data that includes the money households spend on taxes, health care, food, housing, and energy. Following Teodoro (2018, 2019), we employ a regression model that estimates these expenditures based on a variety of demographic variables. Coefficients from these models are then used with ACS data from each utility to estimate essential expenditures for a family of four. Descriptive statistics for these measures and all other variables included in the analysis can be seen in Table 1. The average HM for the utilities included in this analysis is 3.97, while the average AR is 3.94.

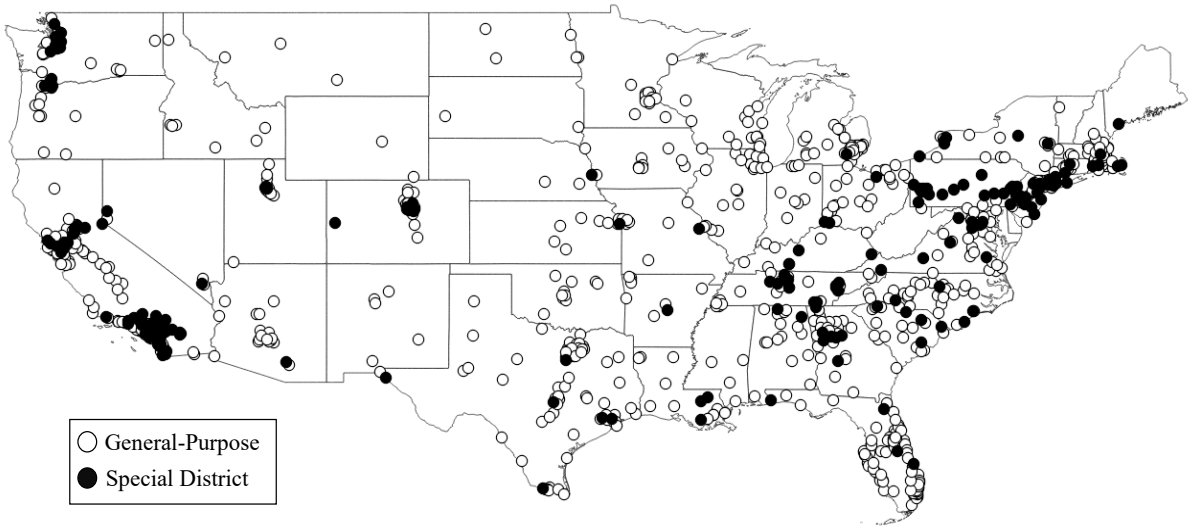
Table 1 Descriptive Statistics

National Data	Percentage	Mean	Stand Dev	Min	Max
Binary Variables					
Special District	19.92				
Groundwater Supply	24.21				
Purchased Water Supply	30.41				
Continuous Variables					
HM		3.97	1.93	0.39	32.62
AR		3.94	7.78	0.21	100
10-year PDSI		-0.29	1.44	-3.51	2.54
Logged Population		11.44	0.79	10.60	15.93
% Poverty		15.55	7.83	2.90	42.65
Median House Inc (1000s)		64.11	22.78	26.86	178.39
% w. Bachelor's Degree		32.04	14.27	4.29	83.12
% Black Population		14.42	14.9	0.34	88.33
% Hispanic Population		19.39	19.19	0.80	97.33

N=1,049

The primary independent variable of interest is whether the utility is operated by a special district or a general-purpose government. The SDWIS does not contain information about government type, so using government websites, we identified whether utilities were owned and operated by general purpose governments or special districts. We coded utility as 1 if it is operated by a special district and 0 if it is operated by a municipality or county government. 209, or about 20 percent, of the public utilities serving over 40,000 people in the United States are owned and operated by special districts. Figure 1 shows a map of the locations of all the utilities included in the dataset, with special districts marked in black.

Figure 1: Special District and General-Purpose Water Utilities in the United States



We included a number of control variables in the analysis. First, utility size may influence pricing. Previous research has found that utility size correlates strongly with rate affordability (Teodoro 2019, Teodoro and Saywitz 2020). This is likely because larger utilities are able to achieve economies of scale that allow them to prioritize policy goals like affordability. We control for this possibility by including a measure of the logged population served by the utility, obtained from SDWIS. It is important to log the population served measure, since it is likely that the relationship is non-linear. We would expect the differences between utilities serving 40,000 and 50,000 residents to be more meaningful than the difference between utilities serving 500,000 and 510,000 residents. We also include measures controlling for water source, including dummy variables for whether utilities use groundwater and if they purchase their source water wholesale. Groundwater may be less expensive to treat than surface water, leading to more affordable rates, while wholesale water may be more expensive, and therefore associated with less affordable rates.

We also included a number of demographic control variables. One potential issue with the inclusion of demographic variables is that while municipal and county boundaries are made available through the census bureau, no such dataset is available for the boundaries of special districts. Some states have datasets that contain special district service boundaries, but many do not provide any information on special district service areas. For special districts in states without publicly available geographic databases, using county level demographics would be inappropriate, as previous research has shown that geographic mismatches between demographic data and relevant environmental policy variables can lead to biased estimates (Mohai and Saha 2006, Baden et al. 2007, Bowen and Wells 2002). We contacted utilities in order to obtain maps for each remaining special district utility in the dataset and used ArcGIS to convert the maps into a national shapefile of water utility boundaries. We then matched the service areas to census tracts, weighting

by geographic overlap and population in order to develop demographic variables for each utility.

The urban politics literature has long identified race and ethnicity as major influences in the policy processes of local governments. We control for the possibility that this influences affordability by including measures of percent Black and percent Hispanic population in each special district from the 2017 ACS five-year estimates. Additionally, we include a number of socioeconomic variables. First, we included a measure for percent of the population below the poverty line. It is possible that higher levels of poverty will necessitate more affordable water services. We also included controls for median household income and percent of the population with a bachelor's degree.

We included a control for the level of water scarcity in the region. The literature on urban water policy has long identified water scarcity as the major driver of local government adoption of conservation policy, including inclining block rates (Mullin 2008, Teodoro 2010, Switzer 2020). Since inclining block rates generally shift the burden of prices from lower income to higher income customers, it is possible that utilities in drier regions offer more affordable rates. It is also possible, however, that resource constraints cause prices to be higher drier regions generally, leading to less affordable water. In order to control for this possibility, 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 and area has extreme moisture. We matched each utility to NOAA climate divisions and calculated the average PDSI for the 10-year period preceding the collection of the rates data, 2009-2018.

Table 2 contains a correlation matrix, displaying the correlations between all of the included variables in the analysis.

Table 2: Correlation Matrix

	AR	HM	Spec. D	Purchased	Ground water	Log Pop	PDSI	% Bach	Med Inc.	% Poverty	% Black	% Hisp
AR	1											
HM	0.20	1										
Special District	0.00	0.07	1									
Purchased Water	0.02	0.14	0.05	1								
Groundwater	-0.02	-0.24	-0.10	-0.36	1							
Logged Population	-0.02	-0.05	0.00	-0.12	-0.15	1						
10-year PDSI	-0.14	0.17	-0.10	-0.09	-0.01	-0.11	1					
% w. Bachelor's	-0.03	0.04	0.04	0.24	-0.13	0.04	0.09	1				
Median Inc.	-0.14	0.00	0.19	0.40	-0.15	-0.05	-0.13	0.74	1			
% Poverty	0.21	-0.01	-0.18	-0.36	0.08	0.15	0.02	-0.47	-0.81	1		
% Black Population	0.02	0.04	-0.11	-0.15	0.01	0.24	0.13	-0.23	-0.36	0.41	1	
% Hispanic Population	0.02	-0.14	-0.03	0.00	0.04	0.12	-0.53	-0.39	-0.15	0.21	-0.19	1

Methods

In order to evaluate the relationship between government type and water affordability, we estimate statistical models with the following general form:

$$A_i = \alpha_1 + \beta_1 S_i + \beta_2 U_i + \beta_3 D_i + \beta_4 W_i + \varepsilon_i$$

Where A represents water affordability for utility i, measured either as HM or AR. S represents the special district dummy variable, U represents utility characteristics, D represents the suite of demographic variables included in the analysis, and W represents the PDSI variable. α and ε are constant and error terms, respectively. We use OLS with robust standard errors due to evidence of heteroskedasticity.

It is also possible that state level factors influence water affordability and special district politics. Special district formation is often the result of state level institutions (Barbara 2000). Additionally, state minimum wage laws may account for variation in the HM measure, while a number of different state policies could influence levels of disposable income, influencing AR. In order to control for the potential of cross-state variation to influence the results, we include state fixed effects in the models.

Results

Before estimating the multivariate models, it is useful to first look at the bivariate relationships between government type and water affordability. The mean HM is slightly

higher for special districts than it is for general purpose governments, with values of 4.25 and 3.90, respectively. This means that on average, customers of special districts making minimum wage would need to work about 20 minutes longer each month than customers of general-purpose governments in order to afford essential water services. A simple bivariate t -test suggests that the values of *HM* for special districts and general-purpose governments are statistically distinguishable from one another (t=-2.34, p=.010).

Table 3: The Relationship between Special Districts and Water Affordability

	(1)		(2)	
	HM		*AR*	
	Coefficient	p-Value	Coefficient	p-Value
Special District	0.30	.028	0.383	.670
	(0.14)		(0.90)	
PDSI	0.25	.005	-2.21	.006
	(0.09)		(0.80)	
Logged Population Served	-0.16	.031	-0.42	.140
	(0.08)		(0.28)	
% Poverty	0.00	.717	0.20	.014
	(0.02)		(0.08)	
% Bachelor's	0.00	.638	0.09	.023
	(0.01)		(0.04)	
Median Income	-0.00	.759	-0.00	.040
	(0.00)		(0.00)	
% Black Population	0.00	.913	-0.03	.048
	(0.01)		(0.02)	
% Hispanic Population	-0.01	.100	-0.08	.001
	(0.00)		(0.03)	
Purchased Water	0.35	.022	1.42	.038
	(0.15)		(0.68)	
Groundwater	-0.80	<.001	0.37	.630
	(0.15)		(0.77)	
Constant	6.81	<.001	10.27	.017
	(1.24)		(4.30)	
R^2	.25		0.15	
Observations	1049		1049	

Note: Standard Errors in Parentheses. Models also include state fixed effects

While there was a statistically significant difference in HM, there was no statistically significant bivariate difference in AR between special districts and general-purpose governments (t=-0.087, p=.931). Special districts have a mean AR of 3.98, while general-purpose governments have a mean AR of 3.93, meaning that the price of water is about four percent of disposable income for both specialized and general-purpose local governments.

In general, the multivariate results largely mirror the bivariate findings. Model 1 in Table 3 shows the results of the models with HM as the dependent variable, while Model 2 shows the results of the models with AR. The results show that special districts have significantly less affordable water rates, as measured by HM. The magnitude of the result is also similar to the bivariate model. The model suggests that when controlling for other potential factors, customers of special districts are expected to have to work about .301 more hours at minimum wage in order to afford essential water use compared to general-purpose governments, or just under 20 minutes a month.

Similar to the bivariate results, special districts and general-purpose governments do not statistically differ when it comes to the AR measure, although the coefficients are in the same direction. In general, the results point to some potential differences between special districts and general-purpose governments, although the differences seem to apply more in the case of HM than AR.

The Conditional Effect of Special Districts?

One thing that the models presented above do not consider is whether the impact of special districts is conditional on issue severity/salience. As noted earlier, Mullin (2008; 2009) has argued that the effect of special districts would be conditional on the level of issue severity in a given area, due to the multidimensional nature of the policy space for general-purpose governments. Mullin argued that this multi-dimensional focus would mean that when issues in a given policy space are not severe or salient, public officials are less likely to adopt policies that benefit the general public within that policy area, being more likely to be influenced by special interests. Mullin argues that in contrast, special district governments, due to their unidimensional policy focus, should be less subject to the influence of issue severity/salience.

In the case of conservation rates, Mullin (2008) found strong support for this theorized conditional relationship. Special districts in colder regions, where water scarcity is less likely to be an issue, were more likely to adopt inclining block rates than general purpose governments. As temperature increased, however, the observed differences declined. Additionally, Mullin (2009) found evidence of conditionality in the case of impact fees for the extension of water services. Specifically, she found that in low growth areas, where impact fees should be less salient, special districts typically charged higher rates for the extension of water lines than general purpose governments, but as growth rates increased, special districts and general purpose governments charged similar amounts. Interestingly, where growth rates were extremely high, however, special districts actually charged less for line extensions. In the case of transportation, however, Goodman, Leland, and Smirnova

(2020) found that there was little difference between special districts and general-purpose governments, regardless of issue severity.

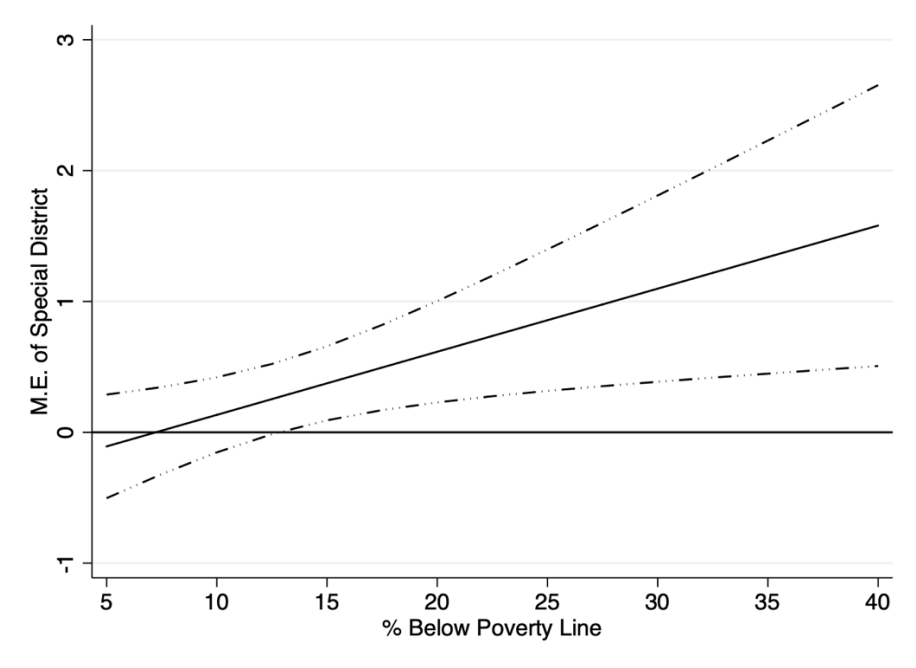
It is useful to explore whether this conditional relationship appears in the case of water affordability. Extending Mullin (2008, 2009)'s logic, we should find that when poverty is especially salient, both special districts and general purpose governments will adopt more affordability conscious water rates at roughly the same rate. However, when poverty is less salient we should find that special districts are more likely to adopt affordable water rates than general purpose government. For this reason, we test models that include interactions between our special district dummy variable and the percent of the utility's population that is below the poverty line.

Results of these models can be seen in Table 4. Model 3 shows the results of the interactive model with HM as the dependent variable, while Model 4 shows the results of the interactive model with AR as the dependent variable. To ease interpretation of the interaction effects, Figures 2 and 3 shows how the marginal effect of the special district dummy variable differ across poverty. The interaction is statistically significant in the HR model. As can be seen in Figure 2, there is no statistically significant difference in HR between special districts and general-purpose governments for utilities serving populations with low poverty rates. As poverty increases, however, the effect of special districts on HR increases. This means that as poverty in the utility service area increases, essential water services are more expensive for special districts when compared to their general-purpose counterparts. Two standard deviations above the mean poverty rate, or at a poverty rate of about 32 percent, we would expect that a special district customer with a family of four making minimum wage would have to spend 1.16 more hours working in order to afford essential water use than a customer of a general-purpose government. Meanwhile, in communities with poverty between 5 and 10 percent, there is no statistically observable difference between special districts and general-purpose governments with respect to HR. This provides some evidence that the models are improved by considering the potential conditional effect of government specialization.

Table 4: The Conditional Effect of Special Districts

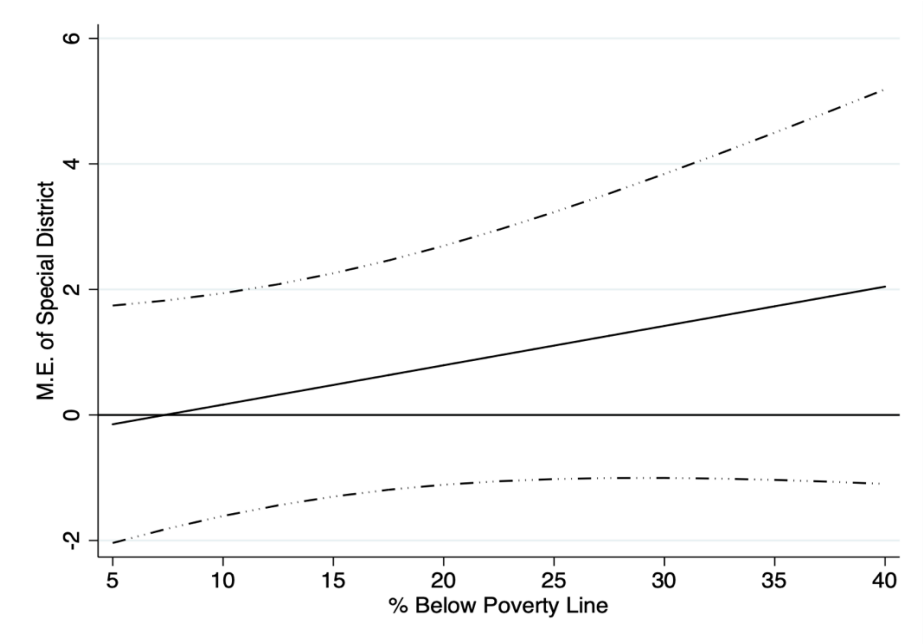
	(3)		(4)	
	HM		*AR*	
	Coefficient	p-Value	Coefficient	p-Value
Special District	-0.35	.214	-0.46	.667
	(0.28)		(1.07)	
Special District X Poverty	0.05	.013	0.06	.192
	(0.02)		(0.05)	
PDSI	0.24	.009	-2.22	.006
	(0.09)		(0.81)	
Logged Population Served	-0.15	.039	-0.41	.149
	(0.07)		(0.28)	
% Poverty	0.00	.960	0.19	.021
	(0.02)		(0.08)	
% Bachelor's	0.00	.667	0.09	.023
	(0.01)		(0.04)	
Median Income	-0.00	.875	-0.00	.042
	(0.00)		(0.00)	
% Black Population	0.00	.915	-0.03	.048
	(0.01)		(0.02)	
% Hispanic Population	-0.01	.066	-0.09	.001
	(0.00)		(0.03)	
Purchased Water	0.35	.022	1.42	.038
	(0.15)		(0.68)	
Groundwater	-0.79	<.001	0.38	.627
	(0.13)		(0.77)	
Constant	6.78	<.001	10.23	.017
	(1.22)		(4.29)	
R^2	.26		.15	
Observations	1049		1049	

Figure 2: The Marginal Effect of Special Districts on *HM,* Conditional on Poverty



In contrast, however, the interaction is not statistically significant in the case of *AR*. Figure 3 shows the marginal effect of special districts across values of the poverty rate. The relationship is in the same direction as the *HM* model, with the difference between special districts and general-purpose governments growing as service are poverty increases, but the difference never reaches statistical significance at conventional levels.

Figure 3: The Marginal Effect of Special Districts on *AR,* Conditional on Poverty



Discussion

Overall, these results do provide some evidence to suggest that special districts may be less equitable with regards to distributing the costs of basic services. While most of the previous empirical literature on specialized local government has found little difference between the forms of government, or found support in favor of local government specialization, these results suggest that there is perhaps something to the argument that specialization will be to the detriment of parts of the population. At least in the case of *HM*, special districts appear to supply water less affordably than general-purpose governments, although the effect size is relatively small.

Additionally, while the direct effect models showed some difference between special districts and general-purpose governments, there was also evidence of a conditional relationship with issue severity. These results provide an interesting contrast, however, with Mullin's conditional finding. While Mullin found increasing issue severity/salience decreased the difference between special districts and general-purpose governments with respect to the adoption of inclining block rates and impact fees, the results here showed the opposite. It is in the areas with the highest levels of property that the affordability gap between special districts and general-purpose governments is greatest. This does not mean the theoretical mechanism, however, is different. It is possible that the difference is indeed from general-purpose governments paying more attention to affordability policy in the presence of high levels of resident poverty, much like they pay attention to conservation when water scarcity is high. The difference is that special districts do not appear to have as much of a focus on water affordability as conservation policy. As discussed earlier this may be in part due to the different constituencies of general-purpose government and special district politicians. More residents vote in general purpose government elections and issues like taxes, rates, and fees can feel highly salient to these constituencies. In contrast, special district politicians may be elected by more narrow slices of the population and, if critics are correct, they are more likely to be captured by special interests they have little incentive to set rates in ways that are beneficial to low and middle income customers as the expense of high-income customers and commercial enterprises.

It is also important to note the differences in results between the *HM* and *AR* models. While the direction of the results in all of the models was the same, the *HM* differences between special districts and general-purpose governments were consistently statistically significant, while the *AR* were not. It is possible that the nature of the variables and the level of control local governments have over them can account for these differences. The factors that determine disposable income for families are far more varied and unpredictable than those that determine the minimum wage. Indeed, since the models here control for state fixed effects, any difference in the denominator of the *HR* measure will usually be made by the same local government setting the rate policy, such as Seattle setting a higher minimum wage than the state of Washington. In this way, once state variation is controlled for, the level of *HR* is almost entirely in the hands of the local government. On the other hand, the denominator in the *AR* measure, disposable income at 20^{th} percentile income, is highly context dependent. It is a function of both income at the

20th percentile, which can obviously vary greatly from place to place and other essential costs, including housing or private utility costs, which again are outside the direct control of local governments. The extreme variation, largely out of the control of local governments, of the *AR* measure means that it may not be as useful a measure for comparing across utilities. There simply may be too much external noise. Indeed, *HM* and *AR* only have a correlation of .20 for the 1,049 utilities included here, suggesting that they may be capturing different elements of affordability. This does not necessarily mean the *AR* measure is flawed as a way of understanding affordability, but rather that it may not be as useful for comparing across utilities.

Conclusion

Overall, these results point to some differences between special districts and general-purpose governments with respect to water affordability and, more broadly, equity. It appears that lower income residents bear more of the costs of service when water is provided by special district governments. While these results do favor the "shadow government" perspective on special districts, the size of the results is not so substantial as to suggest that special districts are wholly less equitable providers of water services than general-purpose governments. The results here suggest that customers making minimum wage would have to work somewhere between twenty minutes and an hour more a month if they receive water from special districts. While we wouldn't attempt to minimize the impact of an hour of a working person's month, we also wouldn't draw sweeping conclusions about the equity of services provision in total based on such a number.

Additionally, local governments in general are notorious for undercharging for water services and not investing in water infrastructure, largely due to the downward pressure of the ballot box and fear of politicians losing reelection (Levin et al. 2002, Hansen et al. 2021). It is possible that special district rates are higher due to greater levels of investment in infrastructure. This could potentially result in better water quality performance. It is not advisable to assume that because general-purpose governments provide water slightly more affordably that they are better in all aspects of service quality. It is important note that affordability is just one facet of equity. Affordable but low-quality water or water delivered through aging infrastructure is hardly equitable in the minds of most individuals. This leads us to some of the limitations to this analysis.

First, while focusing on larger utilities is useful for data collection and population coverage (the utilities analyzed here serve well over half the United States population), it does mean losing potentially important variation. Much of the concern over special districts may not apply as easily to large special districts like the ones included in this analysis. For example, MUDs in Texas, the focus of Galvan's (2006) analysis, are generally much smaller than the utilities included here. It is possible that large special districts do not suffer to the same extent from the visibility issues ascribed to them by critics.

Second, while we think water utilities are a useful area to study special districts, due to the high number of special districts responsible for water services, we would note that to our knowledge all of the previous empirical investigations into how special district service

delivery differs from general-purpose service delivery use water utilities or transportation districts as the unit of analysis. It would be useful to explore the influence of special districts outside of these areas. Even within transportation, exploring equity could be an interesting approach to future research. For example, do differences in local government institutions affect where in a locality new bus and train stops are built and existing stops refurbished? How does this change when accounting for salience as measured in neighborhood congestion or population change? Furthermore, examining other services will allow us to understand any differences that may exist between the provision of essential services for life like water and sewer and less essential service like transportation and parks when comparing general purpose governments and special districts.

Finally, like many studies of local government, we are ultimately limited by the observational nature of the data. While it may be possible to study some questions related to special districts using quasi-experimental designs, local government studies are often constrained by data availability. While we attempt to control for relevant variables, it is always possible that other variables could possibly explain the differences.

Despite these limitations, we believe there are a few important practical takeaways from this research. First, while the differences are relatively small, we do provide statistical evidence of some differences between special district and general purpose governments. Twenty minutes to an hour of work may not seem like a lot, but in the context of essential services it could be significant. Second, we believe that the differences in our findings between the *HM* and *AR* measures also point to the potential usefulness of the two measures. As noted, *AR* may be a noisier measure due to the lack of control local governments exhibit over the inputs. Additionally while not a reason privilege the results of the *HM* model over the *AR*, we believe the *HM* measure is also more intuitive, and therefore more generally useful for practitioners. *AR* involves more complex concepts like a percentage of disposable income, as well as a more involved calculation. While providing valuable information, this measure is more challenging to conceptualize than a simply count of the number of hours of minimum wage work required to afford basic water service. While we, like Teodoro (2018), recommend viewing *HM* and *AR* results together for a fuller picture of water affordability, *HM* is a far more intuitive measure for those without backgrounds in water, economics, and finance. This can make *HM* an easier metric for policymakers and utilities to explain to the public when setting rates and discussing water affordability and the way a rate structure may affect low-income customers.

Overall we believe that the analysis presented here provide a strong step forward in our understanding of the impact of special districts on service delivery. By exploring the implications of government specialization for water affordability, we have provided important evidence of how specialized local government influences equitable service outcomes.

References

Agthe, Donald E. and R. Bruce Billings. 1987. "Equity, Price Elasticity, and Household Income under Increasing Block Rates for Water." *The American Journal of Economics and Sociology* 46 (3): 273-286.

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): 163-185.

Augenblick, John G., John L. Myers, and Amy Berk Anderson. 1997. "Equity and Adequacy in School Funding." *The Future of Children* 7(3): 63.

Barbara, Coyle McCabe. 2000. "Special-District Formation Among the States." *State and Local Government Review* 32 (2): 121-131.

Bauroth, Nicholas. 2005. "The Influence of Elections on Special District Revenue Policies: Special Democracies or Automatons of the State?" *State and Local Government Review* 37(3): 193–205.

Berry, Christopher R., and Jacob E. Gersen. 2010. "The Timing of Elections Symposium: Reassessing the State and Local Government Toolkit." *University of Chicago Law Review* (1): 37–64.

Bollen, John C. 1957. "Special Districts Governments in the United States John C. Bollen" ed. John C. Bollen. *The Southwestern Social Science Quarterly* 38(3): 268–70.

Burns, Nancy. 1994. *The Formation of American Local Governments: Private Values in Public Institutions*. Oxford University Press.

Einstein, Katherine Levine, Maxwell Palmer, and David M. Glick. 2019. "Who Participates in Local Government? Evidence from Meeting Minutes." *Perspectives on Politics* 17 (1): 28-46.

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

Galvan, Sara C. 2006. "Wrestling with Muds to Pin down the Truth about Special Districts." *Fordham Law Review* (6): 3041–80.

Goodman, Christopher, Suzanne Leland, and Olga Smirnova. 2020. "The Consequences of Specialised Governance on Spending and Expansion of Public Transit." *Local Government Studies*: 1–16.

Governmental Accounting Standards Board (GASB). 2010. "State and Local Government Use of Generally Accepted Accounting Principles for General Purpose External Financial Reporting." http://www.gasb.org/cs/ContentServer?c=Document_C&pagename=GASB%2FDocument_C%2FGASBDocumentPage&cid=1176156726669.

Hajnal, Zoltan L., and Paul G. Lewis. 2003. "Municipal Institutions and Voter Turnout in Local Elections." *Urban Affairs Review* 38(5): 645–68.

Harlan, Sharon L., Scott T. Yabiku, Larissa Larsen, and Anthony J. Brazel. 2009. "Household Water Consumption in an Arid City: Affluence, Affordance, and Attitudes." *Society and Natural Resources* 22 (8): 691-709.

Killian, Larita J., and Kimdy Le. 2012. "Citizen Perceptions of General-Purpose and Special District Governments: A Comparative Analysis." *Journal of Public Budgeting, Accounting & Financial Management* 24(3): 397–428.

Mini, Caroline, T.S. Hogue, and Stephanie Pincetl. 2014. "Estimation of Residential Outdoor Water Use in Los Angeles, California." *Landscape and Urban Planning* 127: 124-135.

Mullin, Megan. 2008. "The Conditional Effect of Specialized Governance on Public Policy: CONDITIONAL EFFECT OF SPECIALIZED GOVERNANCE." *American Journal of Political Science* 52(1): 125–41.

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

Ostrom, Elinor. 2000. "The Danger of Self-Evident Truths." *PS: Political Science and Politics* 33(1): 33.

Ostrom, Vincent, Charles M. Tiebout, and Robert Warren. 1961. "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry." *American Political Science Review* 55(4): 831–42.

Rocha, Rene R., and Daniel P. Hawes. 2009. "Racial Diversity, Representative Bureaucracy, and Equity in Multiracial School Districts." *Social Science Quarterly* 90(2): 326–44.

Teodoro, Manuel P. 2005. "Measuring Fairness: Assessing the Equity of Municipal Water Rates." *Journal of the American Water Works Association* 97 (4): 111-124.

———. 2018. "Measuring Household Affordability for Water and Sewer Utilities." *Journal of the American Water Works Association* 110 (1): 13-24.

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.

United States Census Bureau. 2017. *US Census of Governments 2017*. . Census of Governments. https://www.census.gov/programs-surveys/cog/data/tables.html.

About the Authors

Robin Rose Saywitz earned her PhD from Texas A&M University in the Department of Political Science in 2022. While doing her graduate work she studied a variety of different topics including environmental policy, local government, and the bureaucracy. Robin completed this work while completing her graduate studies.

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. His work primarily concerns how the economic, political, and environmental context of local governments impact water and climate policy development and implementation.