Polycentric governance and the impact of special districts on fiscal common pools

Robert A. Greer
Bush School of Government and Public Service, Texas A&M University, USA
rgreer1@tamu.edu

Tima T. Moldogaziev
Department of Public Administration and Policy, University of Georgia, USA
timatm@uga.edu

Tyler A. Scott
Department of Environmental Science and Policy, University of California, Davis, USA
tascott@ucdavis.edu

Abstract: Local government services are increasingly being provided in fragmented polycentric systems where the overlapping jurisdictions draw resources from the same fiscal base. Developing optimal policies for the efficient management of fiscal resources requires a consideration of the total underlying fiscal pool. In this study, we evaluate the impact that special purpose districts have on debt ratios at the county "common pool" level in the State of Georgia (U.S.) between 2005 and 2014. Empirical findings suggest that inclusion of all general government and special purpose debt for each county may at times result in a greater burden on fiscal common pool than existing rules permit. These results call into question the efficacy of fiscal policies in a polycentric governance system that neglect to account for debt levels for all actors within the confines of a single fiscal common pool unit. Results also show that total debt ratios are significantly affected by special districts that operate within boundaries of a single county. We find no evidence that independent special districts have a differential impact on fiscal common pools compared to their dependent counterparts.

Keywords: Fiscal common, polycentric governance, special district

1. Introduction

The number of special purpose local governments in the United States (also known as special districts or public authorities) has grown over the last fifty years to become one of the most frequently used types of municipal government. According to the latest U.S. Census of governments, special districts make up more than 40% of all local governments (US Census Bureau 2012; Maynard 2013). The increasing role of special districts in local governance has prompted a growing body of research considering their advantages and disadvantages for delivering public services (Foster 1997; Eger 2006; Mullin 2008; Savitch and Adhikari 2017). More broadly, however, the proliferation of these institutional structures also brings to the forefront long standing theoretical questions regarding the organization of local governance systems (Ostrom et al. 1961). Adding additional jurisdictional layers and separating service delivery functions into separate organizations can contribute to "a pathological phenomenon… that there are too many governments and not enough government" (Ostrom et al. 1961, 831; McGinnis 1999).

Just as individual resource users face collective action dilemmas with respect to the use of common pool resources (CPR) and the production of public goods, so do local government institutions with fragmented authority (Feiock 2013). Simply put, in the absence of adequate coordination mechanisms, "the outcomes of individual decisions will be collectively inefficient" (Feiock 2013, 398). Polycentricity and fragmentation have largely been theorized in the context of transboundary problems, such as water resource management, and fragmentation of interrelated functionalities, such as land use planning and infrastructure (Feiock 2013; Lubell 2013). However, the fiscal capacity of a local region that government entities collectively rely upon – such as the ability to issue debt and access credit – presents a similar dynamic. Fiscal base or capacity has been recognized as a prominent common pool resource that local governments draw upon (Berry 2008); the proliferation of special districts exacerbates this collective action dilemma as there are more entities that can potentially levy taxes and issue debt from the same fiscal resource base. This paper uses the theoretical lens of polycentric governance (Ostrom 2010; Feiock 2013; Lubell 2013) to build on the idea of multilevel fiscal common pools (Berry 2008) and explore whether special districts influence the burdens that are exerted on fiscal common pools.

In the United States, state governments often seek to manage local fiscal resources by implementing fiscal control measures on local governments such as tax, expenditure, and debt limitations. However, existing limitations can be ineffective when local governments adopt new types of organizational

arrangements that operate outside of enacted fiscal institutions. Specifically, the proliferation of special district governments may render existing coordination mechanisms ineffective and reduce the ability of both citizens and state governments to monitor the benefits and costs of public institutions. For instance, the number of colocated special district governments is associated with greater overall debt levels (Faulk and Killian 2016) and higher interest rates paid on debt (Greer 2015).

Of course, the link between special districts and increased public debt is perhaps not interesting if special districts are a sign of increased activity and service provision. For example, metropolitan areas are generally expected to have greater overall debt and more public entities given their unique service environments. Thus, while existing evidence supports the general idea that having more colocated governments leads to greater overall debt (e.g. Faulk and Killian 2016), we argue that a critical theoretical and empirical follow-up question is how colocated special purpose entities intersect with – and potentially circumvent – policy mechanisms intended to regulate local fiscal common pools by increasing polycentric, rather than collective, decision making. Specifically, by focusing on 159 counties in the U.S. State of Georgia during a decade between 2005 and 2014, we estimate the collective burdens that are exerted on county-level fiscal common pools. Our measure of collective pressure that local general purpose governments and special districts exert on a fiscal common pool is the county's observed total ratio of debt outstanding to assessed property values. A similar measure, albeit focusing narrowly on individual general purpose governments on a piecemeal basis, is in place in the State of Georgia as a state-mandated debt limitation tool. The broader measure, we argue, is a more appropriate approach in polycentric systems to assessing the total burden of local governments on a common fiscal base in each county. Therefore, in addition to addressing our research question, we offer policy relevant conclusions that shed more light on Georgia's approach to controlling and monitoring local government debt expansion.

We apply our research question to the State of Georgia because of its high levels of polycentricity – within 159 counties there are over 500 cities and over 1100 special districts. Using detailed fiscal data in each fiscal common pool unit, we are well positioned to examine whether special districts result in greater burdens on fiscal common pools and whether it produces extra-constitutional fiscal behavior that circumvents the state imposed debt limit rule. Detailed financial statements obtained for all county, city, and special purpose governments in the state, help us to determine the effect of polycentric governance and the increased strain that a proliferation of special districts, and their types, may collectively exert on fiscal common pools.

2. The fiscal commons

In the economics and resource sciences literature, the management of common pool resources (CPR) is a well-known and often discussed topic. The concept of

CPRs has since been extended to both fiscal resources and financial risk. Common pool resources are traditionally thought to be "sufficiently large natural or man-made resources that it is costly (but not necessarily impossible) to exclude potential beneficiaries from obtaining benefits from their use" (Gardner et al. 1990, 337). The concept of a CPR has since been extended to taxation, expenditures, and public debt and has been referred to as a fiscal common-pool resource (Berry 2008). The underlying rationale for this comparison is that – on the benefits side – public spending is concentrated within a relatively small group, but that group does not bear the full costs associated with those benefits (Greer 2015).

The rationale also exists on the taxation side, where multiple jurisdictions have taxation and bonding authority, which means it is difficult to exclude jurisdictions from taxing or leveraging the same population. As Wrede (1999) demonstrates, the tax base overlap is the fiscal analogue to the common property resource or fiscal common resource. In the context of local governance, fiscal externalities exist both horizontally between jurisdictions of the same type and vertically among different, overlapping jurisdiction. The result of these externalities is that multiple jurisdictions have access to a rivalrous good, the tax base that is over extracted (or over leveraged). In the familiar tragedy of the commons, the good is over extracted in the current period, which changes opportunities of all actors in the future.

In the case of fiscal common resources, like traditional CPRs, actors may fail to achieve the co-operative outcome without some government intervention or explicit cooperative agreement. For example, Selmier (2017) argues that the effects of financial risk can be viewed as a club or common pool resource good, where the impact of a private actor's investment decisions spread to affect society. Due to the externalities associated with financial risk, the governance structure and regulatory policies that apply to the financial sector can be analogous to other governance systems that more regularly deal with traditional CPRs. This approach has become more salient in light of the 2008 financial crisis as regulatory regimes attempt to develop policies for polycentric credit systems (Salter and Tarko 2017; Selmier and Winecoff 2017). The complexities of intergovernmental strategic interactions including both horizontal and vertical competition over a fiscal common pool resource have also been considered most often with regard to sub-national tax bases (Besley and Rosen 1998; Goodspeed 2000; Devereux et al. 2007; Berry 2008; Wu and Hendrick 2009), expenditures (Turnbull and Djoundourian 1993; Revelli 2001), and debt (Martell 2007; Greer 2015). The underlying theoretical argument is that the fiscal resource base is a CPR that is utilized by a variety of governments.

The current landscape of regional fiscal governance is complex. There exists a set of politically independent, yet functionally co-dependent jurisdictions that both compete and cooperate on a variety of issues. The landscape is characterized by both polycentric governance and multilevel governance which intersect in the case of special districts. Special districts both fragment fiscal authority and create multiple centers of power within an area and are co-located with traditional general government jurisdictions. In a theoretical setting, a set of utility

maximizing governments with benevolent planners would set taxes and service levels at the Samuelson optimum so that the sum of marginal benefit equals marginal costs.[1] The resulting level of taxes, expenditures, and debt would be the same as the levels under a single jurisdiction (Berry 2009). Furthermore, in this public choice perspective system, local governments compete with one another, which lowers costs and provides citizens with more taxation and service level options (i.e. Tiebout (1956)). Unfortunately, this model breaks down when special jurisdictions are susceptible to political capture, are not utility maximizing, or do not consider the cost of their actions that is imposed on other jurisdictions, all of which tend to apply to special districts (Foster 1997; Mullin 2009). Given the empirical findings of overlapping governments and fiscal under-performance generally (Jimenez 2015) and increased municipal debt specifically (Martell 2007; Greer 2015; Faulk and Killian 2016), the ability to issue debt backed by taxes and fees acts as a fiscal common resource similar to a traditional CPRs.

For state and local governments, debt capacity, defined as the level of debt outstanding or debt service that can be supported without affecting default risks or creating undue budgetary constraints, is a pressing issue (Ramsey and Hackbart 1996). One potential problem that arises is that the amount of debt issued by one level of government may affect the ability of other government entities to issue debt in the future through either access to capital, exceeding externally imposed debt limits, or by altering the risk associated with future debt issues which increase interest rates (Greer 2015). As such, co-located, overlapping governments face an institutional collective action problem (Feiock 2009) with respect to how they manage and use the fiscal common pool. The mechanism used to solve most local level fiscal collective action problems has traditionally been externally imposed authority at the state and/or Federal level. For local government debt, this comes in the form of fiscal institutions, often devised by individual states, aimed at limiting or controlling their capital financing abilities.

A potential problem with this approach is that the regulatory policy targets one local government type at a time and does not include the entire system of actors that draws from the fiscal common pool simultaneously, resulting in policies that often ignore special districts. The result is a state-level CPR management approach that may deepen the pressures on fiscal commons by incentivizing governments to create special districts to circumvent any state limitations (Bunch 1991), which obfuscates the true fiscal capacity of each common pool. The end result may be an increase in local government fragmentation without any real limitation on aggregate local government debt (Foster 1997).

3. Special districts and public debt

To conceptualize the fiscal externalities that arise in a system of co-located, overlapping jurisdictions it is helpful to consider a city government that shares a tax

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[1] In the Samuelson optimum, the costs born by other districts would be internalized.

base with a school district both of which are located within the borders of a county (Greer 2015). In this scenario, when the city, school district, and county all issue tax-backed debt they are pledging future revenues of the same tax base. Even in the case where each jurisdiction has a different tax base (income, property, sales, etc.) they are still taxing the same geographic area and same group of residents or citizens. This scenario is complicated further when the core functions of the city are fragmented and spun off into independent special districts responsible for a single service. Now in that same county, there exists a city, school district, water district, fire district, and transportation district. Each special district may (or may not) have coterminous boundaries with the county. In this type of system, reaching optimal levels of taxation, expenditures, and debt requires either coordination among the actors or centralized authority, such as the state government, to impose restrictions on the common fiscal resource.

The proliferation of special purpose entities in recent decades (Mullin 2009; Maynard 2013) has served to exacerbate the issues of managing fiscal common resources, especially through state-level debt limitation policies. One of the commonly cited reasons for the increased use of special districts is administrative flexibility (Billings and Carroll 2012). This is particularly true when considering debt limitations. Special districts are often exempt from fiscal constraints that apply to other local governments, such as restrictions on the amount and type of debt that can be issued or held by general purpose governments (Greer 2016). By using special districts to issue debt and pursue infrastructure projects, general government policymakers at the local level are able to maintain growth strategies while technically complying with state regulations. This is particularly useful for capital intensive public services such as public utilities and transportation services (Mullin 2008). Thus, it is not surprising that a positive relationship between the number of special districts and public debt has been shown in previous studies (Faulk and Killian 2016).

One important caveat to existing empirical evidence is that a correlation between the number of special districts active in a region and overall debt should at least in part be positive for reasons that have nothing to do with fragmentation *per se*. Special districts are often uniquely suited and purposely intended to be debt-carrying vehicles: financing infrastructure and avoiding fiscal limitations is one of the functions of special districts (Foster 1997; Mullin 2009). To the extent that special districts are a sign of increased government activity, for instance in metropolitan areas that finance large infrastructure projects, both total debt and the number of special districts will likely be greater.

If special district use simply represents a shift toward an organizational form that still remains subject to debt limit rules, this might be the end of the story. However, the shifting of debt issuance from general-purpose municipalities to special districts has several critical implications for fiscal common pool management. First, sustainable CPR management requires the presence of evaluative criteria, which can be used to monitor the status of collective resources (Ostrom 2007). Increasing jurisdictional fragmentation through the use of special districts

makes monitoring fiscal positions more difficult. Special districts can reduce local government transparency and accountability, making it harder for average citizens and state regulators alike to monitor local fiscal behavior. Districts often can have unelected boards (Eger 2006), and a Governmental Accounting Standards Board (GASB) report in 2008 found that special districts have the lowest rate of financial reporting compliance of all governments and a lower profile when it comes to performance reporting (GASB 2008). Moreover, empirical studies have found a positive relationships between the number of governments within a county and per capita taxation levels (Dolan 1990), increased expenditures per capita (Berry 2008), and lower perceived public service quality (Christenson and Sachs 1980). As the number of local governments increases with the shift to special districts, coordination becomes more difficult, and each jurisdiction may operate with different priorities and policy goals.

For all of these reasons, we expect the presence of special districts to affect the governance of local common fiscal pools. In the context of debt finance, fiscal common pool condition at the local government level can be operationalized as the ratio of debt outstanding to a jurisdiction's assessed property value. As noted above, special districts are associated with increased debt overall, in part because they are often intended to be debt-carrying vehicles. What we are particularly interested in is whether special districts influence the aggregate ratio of government debt to local tax base. This total debt ratio is a measure of collective pressure that local general purpose governments and special districts exert on a fiscal common pool. It should be noted that we have no a priori expectation for the optimal level of debt for a given fiscal pool, but rather that the current governance strategies (i.e. debt limitations) do not capture all the relevant actors and dimensions of the fiscal pool, which results in low transparency about the true level of public debt.

We begin by aggregating special district debt with general purpose debt in each county to assess whether there is a greater burden on fiscal common pools and whether such burdens are in excess of existing debt limitations on individual municipalities in our case, the State of Georgia. We further expect that total debt ratios are significantly affected by the number of special districts within each fiscal common pool unit. Given the administrative flexibility of special districts and the potential ability to circumvent state debt limitations, the increased debt issuance by special districts is an expected outcome for our first baseline hypothesis:

Hypothesis 1: As the number of special districts active in a county increases, the ratio of total local public debt over the county property tax base will increase.

Another relevant attribute to consider with respect to how different types of special districts might influence collective action dilemmas that local governments face is jurisdictional overlap in polycentric systems. Some special districts are considered to be single-jurisdictional, in that the administrative boundaries of the special district are coterminous with or wholly comprised by a city or county government.

Other, multijurisdictional special districts transgress the administrative boundaries of multiple general purpose governments. There are several reasons why we expect multijurisdictional and single-jurisdictional special districts to differ in their relationship with total debt levels. Multijurisdictional special purpose entities add an additional layer of complication to the basic coordination problem that any special district presents. By dividing functions across different entities, special district creation fosters collective action problems related to externalities that spillover between interrelated functional areas (Feiock 2009).

However, multijurisdictional special districts also present a horizontal collective action problem, as the actions of multi-jurisdictional districts can generate externalities that spill across multiple other jurisdictions (Feiock 2009). In a more general sense, one might think of multijurisdictional entities as increasing the complexity within polycentric systems of local governments, where entities are formally independent of, but functionally intertwined with, multiple general purpose entities rather than just one.[2]

Hypothesis 2: As the number of multi-jurisdictional special districts increases (with respect to general purpose governments), the ratio of total local public debt over the county property tax base will increase; while the corresponding count of single-jurisdiction districts is not predicted to increase the total debt ratio.

Finally, special districts can differ with respect to degree of autonomy from general purpose governments. The literature points to several dimensions that are anticipated to affect the degree to which a general purpose government is able to influence the actions of a special purpose entity, including funding sources and the method of leadership appointment (e.g. appointed or elected commissions) (Eger 2006). In the State of Georgia, special districts are considered dependent if their finances are included on the financial statement of a local government and if operating decisions are made by a local government's leadership (this classification scheme is discussed in more detail in the data section below).

The differences between dependent and independent SDs present clear implications for the nature of a fiscal common pool. Since other governments have

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[2] Multijurisdictional entities present a common agency problem (Bernheim and Whinston 1986), in which "several principals [general purpose governments] simultaneously try to influence or control the actions of a single agent [special purpose entity]" (Bertelli and Lynn 2004, 172). The expected common agency result is that the system of incentives offered to the single principal (in this case, the special purpose entity that spans multiple general purpose governments) will efficiently aggregate the preferences of all involved parties (Bertelli and Lynn 2004). However, common agency models assume complete information, which is directly challenged in this context by the lack of transparent fiscal behavior by special purpose entities relative to monitoring that is applied to city and county governments. Given this, we expect multijurisdictional special purpose entities to correspond to higher debt ratios, because no one constituent general purpose government has primacy over the activities of such a special district, and because the special purpose entity can exploit information and other resources from its multiple overlapping constituent bases.

greater oversight over the fiscal activities of dependent districts and more direct control of special district operations, this oversight capability is expected to serve as a coordination mechanism that inhibits the special district from imposing external decision costs on the controlling general purpose entity (Feiock 2013). Put more simply; we expect that dependence reduces the degree of polycentricity in local governance by restricting the formal autonomy of a special district, and thus will result in greater coordination (and therefore a lower overall debt ratio since entities are not independently drawing upon the fiscal common pool).

Hypothesis 3: As the number of independent special districts increases, the ratio of total local public debt over the county property tax base will increase; while the corresponding count of dependent districts is not predicted to increase the total debt ratio.

4. Data and methods

Unlike a number of states in which there is no formal registration system with which to keep track of special purpose entities, the Department of Community Affairs (DCA) maintains a yearly database of registered authorities in the State of Georgia. This database provides a unique opportunity to comprehensively examine the full extent of overlapping, fragmented authorities across a fairly large scale. From the DCA database, we code all special districts active between 2005 and 2014, with covariates including purpose, affiliated general purpose governments, and whether a special purpose entity is formally classified as dependent or independent. Data concerning county level governments in Georgia are obtained from the Georgia GIS Data Clearinghouse. Finally, a comprehensive set of city government boundaries in Georgia are obtained from the US Census Bureau.

In total, the State of Georgia has 159 counties, 531 cities, and 1141 special districts. As shown in Table 1, the largest categories of special districts in Georgia are Development and Downtown Development Districts followed by Housing and Hospital Districts. While available data for city and county general purpose governments in the state include spatial location, to the best of our knowledge no GIS data exist on a consistent basis for special purpose entities. Thus, we generate a spatial polygon for each special purpose entity on the basis of its institutionally affiliated local governments. The DCA special district registry includes data about local governments with jurisdictions that overlap with special districts. We use these institutional affiliation records to develop a spatial polygon for each special district that reflects its service delivery area.[3] Figure 1 is the resulting heat map

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[3] If a special purpose entity has two different county governments listed as institutional members, we make a shape for that entity that is the union of the two county government polygons. Special purpose entities that are not multijurisdictional (for instance, an entity with only one city as an institutional member) are assigned the same spatial location as the single institutional member.

Table 1: Count of government types in Georgia, 2015.

Government Type	# of entities	Government Type	# of entities
County	152	Special Purpose	1141
City-County Consolidations	7	Airport	44
City	531	Building	38
		Development	235
		Downtown Development	207
		Hospital	112
		Housing	165
		Industrial Development	43
		Joint Development	52
		Public Facilities	21
		Recreation	18
		Solid Waste	28
		Tourism	20
		Urban Redevelopment	33
		Water and Sewer	64
		Other	61

of the number of active local governments including counties, cities, and special districts in the State of Georgia.

4.1. Dependent variable

In most cases, assuming that the relevant spatial boundaries for special districts matches with the spatial boundaries of institutional members is clearly appropriate for the purposes of this paper. For instance, a county transit authority provides services – and likely levies taxes on – all county residents. Even for special purpose entities with a very limited physical geographic footprint, such as county airport authorities, the scope of the airport authority's fiscal behavior likely extends to the entire county. In a few cases, such as that of downtown development districts, the downtown area under special district control does not likely match the administrative boundaries of the city itself. Nonetheless, these types of service providers constitute a reasonably low proportion of all special purpose entities in the state, and assuming spatial boundaries to be in keeping with the boundaries of institutional members (i.e. general purpose governments) is a justifiable approach.

Shapefiles for city, county, and consolidated governments are then matched with general purpose government financial data from the Georgia Department of Community Affairs' (DCA) annual fiscal survey of municipal governments. The data are reported by the finance office of each local government. These are not audited figures, although the instructions accompanying the survey indicate that the figures should be reported on the same basis as the government accounting system in the state and should be the audited figures, when available. These data include basic metrics such as yearly revenue, expenditures, short and long
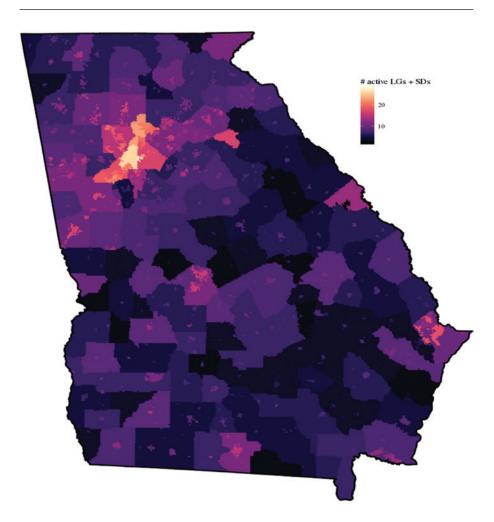
Figure 1: Density of general and special purpose governments in Georgia, 2015.

term debt, and debt service paid by general purpose local governments each year. Likewise, fiscal data concerning special purpose entities for similar spending, revenue, and debt attributes are obtained from Georgia DCA' separate survey of special districts.

Following Berry (2008), Greer (2015), and Martell (2007), counties are a common focal point for research examining the fiscal commons and local government financial behavior. For each county in Georgia (159 counties), we aggregate county level financial data with the corresponding variables for each census-designated city in that county, as well as all special purpose entities whose jurisdiction overlaps that of the county. We incorporate ten years of data, from 2005 to 2014.

In the State of Georgia, the Constitution requires that the debt issued by local governments not exceed 10% of the total assessed value of all taxable properties in the political subdivision. With respect to how special purpose entities affect transparency, it is this debt margin statistic that is most relevant. Thus, for each fiscal year, we summarize outstanding debt by summing general obligation[4] debt outstanding, revenue bond debt outstanding, and other remaining debt outstanding for each county. We then compute the same metric for each city and add these city measures to the county measures in which the city is located. One point to note is that many cities and counties in the state also utilize financing via lease-purchase agreements, which can be viewed as a variation of long-term debt.[5] Thus, we add outstanding lease-purchase dollars to the county and city debt figures as well.

Special district debt data are recorded each year as the total balance of debt outstanding at the conclusion of the fiscal year. For special purpose entities wholly contained within county boundaries, the entire amount of a given variable is assigned to the county. In cases where a special purpose entity spans two counties, we assign a portion of the given special purpose entity variable to each county. For instance, if County A and County B are institutional partners of a special district, each county is assigned half of the special district's expenditures, debt, revenue, and other figures.[6]

As shown by Faulk and Killian (2016), the presence of special districts in a county is positively associated with the total amount of debt held across regional governments. What we are specifically concerned with in this regard, however, is how incorporating the fiscal behavior of special districts changes the fiscal position of each local area with respect to state constitutional debt limits (i.e. not simply how much debt is held, but the extent to which special districts subvert debt control efforts). Thus, after compiling all outstanding debt across all governments in each county, we divide this aggregate public debt figure by the total assessed property value in each county (this is the assessed value for bond purposes recorded each year with the GA Department of Revenue, which we are considering as the fiscal CPR). This ratio of aggregate local public debt to total assessed values in each county is the primary dependent variable in the article. Figure 2 plots the aggregate

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[4] General-obligation debt is secured by the full faith, credit, and taxing power of the issuing government whereas revenue-backed debt is secured by specific revenues generated by the issuer. For more explanation of different debt types see Johnson et al. (2014).

[5] Lease-Purchase agreements are a hybrid tax-exempt structure with features similar to both a loan and a lease. They can be used as an alternative to traditional bonds and typically require annual appropriations for the acquisition of capital assets and an outside investor to advance funds. They are technically not debt because no multi-year obligation is created even though these are long-term contracts. Empirical results are robust to exclusion of this type of local government indebtedness, nevertheless.

[6] Note that in order to test for sensitivity of our results to this method of allocating debt from multi-jurisdictional special districts, we fit a series of models excluding multi-jurisdictional districts from all variables (i.e. count of districts, total debt calculations, etc.) as a robustness check. The results remain unchanged, with no substantive deviations from the primary results presented in the article.
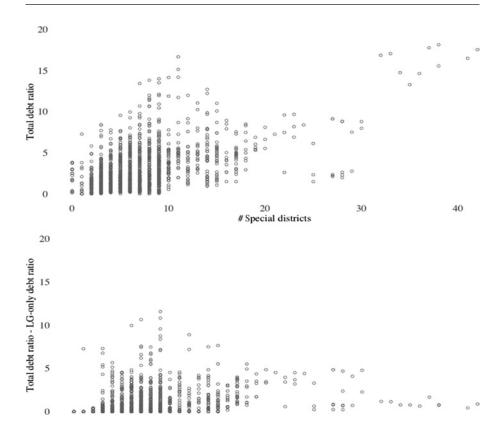
Figure 2: Aggregate local public debt over total assessed property value by county, 2005–2014.

debt ratio and compares it to debt held only by general purpose local governments across the count of active special districts in each county.

4.2. Explanatory variables

The primary explanatory variable of interest is the number of special districts active in the county; these counts are obtained via Georgia DCA's historical registered authority database. This database records each general purpose government that is associated in some formal capacity with each special district. Since we aggregate by county, special districts associated with a given city or county are counted as part of the total for the county in which they are located. This measure is used to test for hypothesis 1.

To test for hypothesis 2, we account for whether a special district spans a single county jurisdiction or several jurisdictions. If a special district is jointly affiliated with a city and county government from the same county, it is only counted once for that county. Furthermore, districts can be dependent upon or independent from a general purpose government; as described earlier, the key

Table 2: Summary of explanatory variables.

	County×Year	Mean	St. Dev.	Min	Median	Max
Total Districts	159×10	7.27	4.95	0	6	42
Multi-jurisdictional Districts	159×10	2.47	1.49	0	2	10
Single-jurisdictional Districts	159×10	4.80	4.23	0	4	32
Independent Districts	159×10	5.04	3.46	0	4	31
Dependent Districts	159×10	2.23	2.28	0	2	15
SD/SD+LG Operating Expense Ratio	159×10	0.21	0.24	0.00	0.10	0.93

distinctions are whether district finances are included on the financial statement of a local government and if operating decisions are made by a local government's leadership. All other entities are classified as independent special districts. We rely on this measure to test for hypothesis 3.[7] Both dependence and jurisdictional location are classified by the Georgia DCA. Along with the total count of special districts active in each county, in subsequent models, we compare the predicted impact of districts falling under these classifications. Table 2 summarizes these measures.

4.3. Covariates

Of course, one issue that entity count alone cannot speak to is activity level. In other words, whether a special district exists on paper but is of little practical consequence should matter. Moreover, if a special district plays a major role in providing local public goods and services, such a district might on average carry more debt as well, but this debt might not be incommensurate given the scope of operations. Thus, we incorporate operating expenses for each special purpose entity as a control covariate. Each registered authority reports their total operating expenses for a given year to Georgia DCA. We sum these operating expenses by county to produce an overall metric of special district activity. This value can be viewed as reflecting the extent to which a county relies on special districts to provide public goods and services. For special purpose entities that are associated with multiple counties, operating expenses are split accordingly.

The extant literature further speaks to an array of covariates that are important to control for when analyzing the fiscal behavior of local governments. Greer and Denison (2016) identify fiscal, legal, and political attributes as three broad contextual factors that are expected to influence debt levels. Fiscal attributes concern local economic conditions that facilitate or constrain borrowing. In our analysis, we include county-level measures of income per capita and the unemployment rate to reflect fiscal health. Descriptive statistics for these control variables are shown in Table 3. While findings differ regarding the direction of the relationship

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[7] Both dependence and jurisdictional location are classified by the Georgia DCA.

Table 3: Summary of control variables.

	County×Year	Mean	St. Dev.	Min	Median	Max
Population (10k)	159×10	6.043	12.655	0.167	2.259	99.646
Yearly pop. growth (%)	159×10	0.710	1.868	−16.090	0.568	12.417
% pop. over age 65	159×10	13.715	3.749	2.618	13.557	32.263
% pop. with Bachelor's	159×10	4.041	3.322	0.000	3.300	23.500
% households with children	159×10	30.145	6.099	12.144	29.750	56.464
Unemployment %	159×10	8.395	3.024	3.000	8.250	22.900
Income per capita (1k)	159×10	28.546	6.220	14.127	27.535	64.877
Rural-Urban Continuum:	Metro: 44.5%		Suburban: 39.6%		Rural: 15.9%	

between income per capita and borrowing behavior, scholars nonetheless agree on the importance of this variable as a control measure (Bahl and Duncombe 1993; Clingermayer and Wood 1995). Fisher and Wassmer (2014) further point to the unemployment rate as a theoretically relevant control variable.

Political factors that influence debt issuance relate to local demographics and ideology (both necessity and willingness to issue debt). Faulk and Killian (2016) control for total population, the population growth rate (as a measure of growth pressure), education (operationalized as the percentage of county residents with a Bachelor's degree or higher), the percentage of the population over the age of 65, and the percentage of households with children under 18 in the county. We further include the indicators drawn from the US Department of Agriculture's Rural Urban Continuum (RUC) Codes that distinguish between counties in metro areas, nonmetro counties with a small urban population, and completely rural counties. These Codes are based upon decennial censuses, and were created in 2003 and 2013; we thus assign 2003 RUC codes to observations between 2003 and 2012, and 2013 codes to more recent observations. While RUC subcategories can be more fluid, there do not appear to be major changes observed in Georgia across these three broad categories between 2003 and 2013, so extrapolating codes across other years is appropriate in this case.

4.4. Model

This paper uses a series of Bayesian hierarchical regression models. The Bayesian approach is valuable for modeling complex temporal, spatial, and within-group dependencies that exist in empirical common pool resource situations (e.g. Gotor and Caracciolo 2009; Deslatte et al. 2016; Scott et al. 2017). The multilevel component refers to the fact that county level variance is actively modeled; spatio-temporal models likewise account for spatially and temporally correlated errors. The dependent variable, the difference between the ratio of outstanding debt to total assessed property value with and without factoring in debt incurred by special purpose entities, is measured for each county in each year. This debt ratio is modeled as:

$$\eta = \alpha_j + \sum_{m=1}^{M} \beta_m X_{j[i]} + \tau_{ij} + \lambda_p + \epsilon_{ijt} \tag{1}$$

where α_j is the random intercept estimated for county j; β_m is the coefficient associated with time-varying county-level covariate m for observation i (e.g. covariates such as population that are observed at each county-year observation and variables of interest such as the number of active special districts); τ_{tj} represents an autoregressive time series term fit for each county; λ_j represents the semi-parametric function used to model the spatial random effect (discussed in greater detail below); finally, ε_{ijt} is the county-year error term.

Briefly, the benefits of using random effects for counties are twofold. First, whereas fixed effects only pool variance within each group, actively modeling each group-level intercept essentially acts as a smoother between the pooled sample (i.e. no group indicators) and non-pooled sample (fixed group indicators) based upon the variance and number of within-group observations (Gelman et al. 2013; Hodges 2014). Second, this formulation allows us to actively model the predicted impact of variables at both the county-year and county levels (Gelman et al. 2013). The county-level random effect is modeled as:

$$\alpha_j = \alpha_0 + \sum_{n-1}^{N} \zeta_n Y_{jn} + \omega_j \tag{2}$$

where α_0 is the pooled-sample mean and j represents a vector of coefficients corresponding to time-invariant county attributes (e.g. area, RUC classification) 1 to N, and ω_j represents the county-level error term.

The first order autoregressive term for each county j is specified as:

$$\tau_{t[j]} = \rho \tau_{t[j]-1} + \epsilon_t \tag{3}$$

This specification assumes that at each time period τ_t, the debt ratio for county j is a function of the prior observation in period τ_{t-1}. The specification outlined above accounts for the nested and temporal structure of these data; however, observations are also spatially distributed. In other words, all else being equal, neighboring counties are more likely to exhibit similar fiscal behavior than are two randomly selected counties (and thus exhibit location-based residual dependency). We account for potential spatial correlation using an intrinsic conditional autoregressive (ICAR) model (Besag 1974), such that:

$$\lambda_j \mid \lambda_{-j} \sim \text{Normal}\left(\frac{1}{N_j} \sum_{k=1}^{n} \alpha_{jk} \lambda_k, \, s_j^2 \right) \tag{4}$$

where θ_j is random spatial effect for county j and λ_{-j} represents a vector of spatial effects for all other counties. What this equation essentially achieves is modeling county j as conditional on surrounding counties. Equation 4 incorporates an indicator for whether counties j and k are neighbors (α_{jk}), a random variable for each county k (λ_k), and the variance for county j (s_j^2) (Blangiardo and Cameletti

2015). The summed value of j's neighboring coefficients is then divided by the count of j's neighbors (N_j) (we define neighbors as sharing a boundary; counties that touch only as one point are not counted as neighbors).[8]

5. Results

The Bayesian modeling approach outlined above estimates a posterior distribution for each parameter on the basis of a prior distribution and the modeled data (Gelman et al. 2013).[9] The "prior" is what is known about a parameter before fitting the model, and the "posterior" is the new estimated distribution updated in light of the observed data. We have limited evidence to support the use of informative priors. For instance, other empirical studies on this subject, such as Greer (2015) and Faulk and Killian (2016), use different dependent variable measures and wholly different model specifications, which makes application of their results into model priors problematic.[10] Thus, we use uninformative priors recommended by the R-INLA software package (Lindgren and Rue 2013) for the variety of components in our hierarchical model; this includes uniform, uninformative priors for linear covariates and "weakly informative" priors for model hyperparameters associated with hierarchical components such as the county random effects. Weakly informative priors provide some structure, so as to avoid extreme results, but still allow the observed data to drive posterior estimates (Gelman et al. 2008). To present our results, we extract the 95% credible interval from each posterior distribution or the range between the 0.025 and 0.975 quantile values. Credible intervals that span zero support the null hypothesis that a given parameter has no distinguishable effect on the dependent variable.

Figure 3 presents coefficient credible intervals for parameter estimates from three different models. Each model regresses the aggregate debt ratio in each

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[8] Technically, our full model is a Besag-York-Mollie (BYM) model because it incorporates both a spatially structured random effect and an exchangeable random effect for each area (shown in equation 2) (see Blangiardo and Cameletti 2015). However, we discuss these components separately to show more clearly how the exchangeable random effect is modeled as a function of time-invariant county-level covariates.

[9] Note that we use an alternative estimation method to fit these models. Most commonly, these types of Bayesian models are estimated using a Markov chain Monte Carlo (MCMC) algorithm that produces sampled posterior parameter distributions (Gelman et al. 2013). Instead, we use the Integrated Nested Laplace Approximation (INLA) method (Rue et al. 2009). INLA estimates hierarchical Bayesian models much more efficiently, without sacrificing accuracy (Rue et al. 2009; Blangiardo and Cameletti 2015). While statisticians continue to explore the comparative performance of INLA and MCMC in various contexts (Held et al. 2010; Taylor and Diggle 2014), INLA has been demonstrated to replicate the accuracy of MCMC methods while fitting hierarchical Bayesian models much more efficiently (Rue et al. 2009; Lindgren and Rue 2015).

[10] Further, the hierarchical model specification outlined above relies on "hyperpriors" to inform the initial probability distributions for the hyperparameters fit for model elements such as county random effects, spatial correlation, and temporal autoregression. Thus, specifying a full set of customized priors would be somewhat unwieldy, and setting some priors while leaving others as generic options potentially influences the results in an irregular fashion.
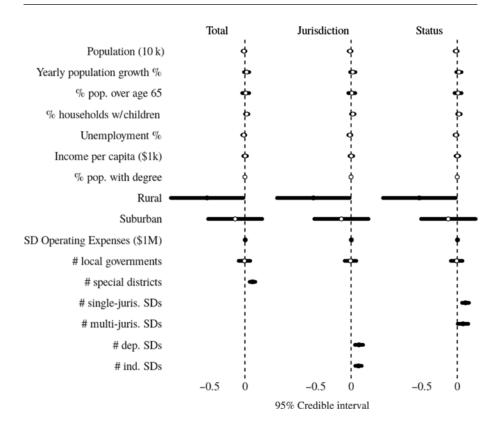
Figure 3: 95% credible intervals for linear covariates testing H1 – H3 (models also include
random effects for time, county, and spatial correlation).

county on relevant covariates and a count of special districts active in a county for
that year. The models differ in the way that the count of special districts is speci-
fied. The first model regresses the debt ratio on the total count of special districts,
irrespective of their type (H1). The second model contrasts the impact of the
counts of special districts that are multijurisdictional versus single jurisdictional
(H2). Finally, the third model compares the impacts of the counts of dependent
special districts to that of independent special districts (H3).[11]

Turning to the results in column 1 of Figure 3, only total population, total
special district operating expenses, and total special district counts are shown to

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[11] Recall that the models further contain an unstructured random effect and a random spatial effect
for each county, and an autoregressive time series term. These parameters are provided in an appen-
dix, including goodness-of-fit measures. Note as well that we tested model specifications interacting
special district type counts (e.g. # multi-jurisdictional SDs × # single-jurisdictional SDs), but the
interaction terms were statistically inconsequential.

have a non-zero predictive impact on the overall ratio of debt to total assessed property value in a county. Rural and suburban counties are different on average from metro counties, but after controlling for other key differences, the posterior distribution for this difference is very wide (not an unexpected outcome given that we simultaneously control for many socio-economic drivers and nest observations within county and time. Turning to the coefficients of substantive interest, the predicted impact of special districts on debt is positive; each additional special district in a county is predicted to increase the overall debt ratio by 0.20 percentage points (see Appendix A for coefficients). Since the average observed total debt ratio is only 3.03, and the median number of active special districts per county is 6, the practical significance of this change is noteworthy. This provides sufficient and substantive evidence in favor of hypothesis 1.

Hypothesis 2 considers how multi-jurisdictional and single-jurisdictional special districts are likely to be related to the aggregate debt ratio in each county. To analyze this, we fit a model that separates the counts of multi- and single-jurisdictional special districts in each county ("Jurisdiction" model in Figure 3). Contrary to the expectation of hypothesis 2, we find no support for the expectation that the count of multi-jurisdictional SDs will exhibit a stronger relationship with overall debt levels. In fact, the count of single jurisdiction SDs shows a strong positive predicted impact, while the credible interval for the count of active multi-jurisdiction SDs spans zero and has a lower magnitude of the coefficient. We consider potential explanations for this finding in the discussion below. Briefly, one reason might be that multi-jurisdictional entities present their own collective action problem. Because no single locality has full control over a multi-jurisdictional SD, policy makers or voters in one locale can, to some extent, impose debt burden on others. Thus, we speculate that authorizing governments prefer to use multi-jurisdictional SDs for tasks of limited scope to preserve local autonomy. While the result is not in the hypothesized direction, it nevertheless offers nuanced evidence for the effect of SDs on debt ratios.

Finally, the "Status" model in Figure 3, as specified in hypothesis three, contrasts the predicted impact of the counts of active dependent and independent SDs in a county on the total debt ratio in each county. The predicted associations for each type is very similar both in the direction of effect and in magnitude. Thus, in this case, the hypothesized conceptual distinction with respect to the impact of oversight and control by a general purpose entity is not borne out in practice. We fail to generate evidence in favor of hypothesis 3 and must conclude that SD dependence is not important for debt ratios.[12]

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[12] Although the models presented above control for total special district operating expenses, one concern is that the relationship between the presence of special purpose entities and overall debt is in part determined by the amount of governance tasks carried out through special purpose entities rather than the simple count of special districts. Thus, as an additional robustness check we also fit an alternative specification of debt. To examine this, instead of regressing the aggregate debt ratio on the count of special districts, we instead model how the proportion of total yearly operating costs (across all general and special purpose entities) that are incurred by special purpose entities within a county

6. Discussion and conclusion

This article utilizes the theoretical framework of polycentric governance and explains why special districts might be associated with increased public debt, whether intended or not, due to structural and institutional considerations. We posit that fiscal policies must be viewed in the context of CPR framework, one in which special districts play a significant and necessary part. Polycentric governance of common pool resources is often associated with sector-specific transboundary issues such as groundwater extraction or provision of a public service (Ostrom 2010), we extend this perspective to better understand managing fiscal resources that are also a community resource that different local actors draw upon (Berry 2008). In doing so, we show the role that special districts play in both polycentric governance as well as multilevel governance and the challenges this poses to managing fiscal resources.

This article has examined how the growth of special purpose entities for delivering public goods and services complicates management of fiscal resources by increasing functional fragmentation of public authority in local regions. Longstanding research on common pool governance demonstrates the importance of "rules-in-use" (i.e. rules that "specify common understanding of those involved related to who must, must not, or may take which actions" (Ostrom 2010, 648) and evaluative criteria (used to assess performance) as critical drivers of common pool resource system outcomes. Standard regulations that govern local fiscal behavior, such as constitutional limits on the allowable ratio of outstanding debt to the local property tax base, are typically monitored and enforced only for general purpose governments. Lesser monitoring and oversight of special districts may inhibit the power of current rules-in-use and may position special districts' use of the fiscal common pool outside of standard evaluative criteria. This problem is only exacerbated by the continued proliferation of special districts, which further fragment intralocal authority.

Existing research on fiscal common pools has demonstrated the sub-optimal effects of both fragmentation and multilevel governance on fiscal outcomes including spending levels, tax rates, debt levels, and tax-exempt bond

relates to the predicted debt ratio. In other words, this metric (between 0 and 100) reflect the percentage of local government activities carried about by special purpose entities (with activity proxied by operating expenditures) and places less weight on districts that might formally exist but have little functionality. Overall, the substantive results are similar. The primary difference is that as the ratio of multi-jurisdictional special district operating expenses to total operating expenses increases, the aggregate debt ratio is predicted to increase; no significant impact is shown for single-jurisdictional operating expenses. This result is opposite of that shown in Figure 3 for the district count model. One speculative reason for this result is that if multi-jurisdictional SDs are largely coordinative in function (e.g. regional planning councils), then an impact upon the fiscal common pool is unlikely to exist regardless of the multi-jurisdictional nature of the district but rather because the district does not engage in tasks that might require debt financing. Thus, measuring the prominence of multi-jurisdictional special districts in terms of operating expenses may offer nuanced evidence regarding service delivery activities conducted by these districts.

interest rates. This study extends previous work on fiscal commons pools and demonstrates the role that special districts play in complicating the management of these resources. By focusing on the approach used in the State of Georgia, which is common among US states that limit local government debt, we can demonstrate the challenges in managing common fiscal resources. A lack of transparency and accountability for those that have access to the common good (bonding authority in this case) combined with the competitive nature of local governments, makes coordination strategies difficult (Boyne 1996; Bullock et al. 2018). In the absence of self-governance strategies, centralized state regulations are needed to manage the resource. We show that, in the case of Georgia, these policies are currently insufficient for capturing all the relevant actors and are contributing to withdrawal levels from the common fiscal pool that are greater than constitutionally defined limits.

This article supports existing empirical findings that special districts are associated with increased public debt levels, but we extend this finding and demonstrate that it is not merely the number of special districts in an area that should be considered. By drawing on the polycentricity literature, the findings above show that special districts contribute to institutional fragmentation and represent a greater burden on the fiscal common than previously thought. Special districts are correlated with increased government activity overall, in that urban regions tend to provide more public services (e.g. public transportation, convention and stadium authorities, port authorities, etc.) and to have more special districts. Thus, if debt is the dependent variable regressed on the number of active special districts, then support for hypothesis one in this paper is not necessarily indicative that special districts cause increased debt so much as the fact that areas with increased government activity both have higher debt levels and more active special districts (even after controlling for key indicators such as population density or development statistics). Leveraging theoretical expectations drawn from the literature on polycentricity and institutional collective action helps to more pointedly address the role of fragmentation in driving fiscal resource use. By comparing districts that differ in terms of the functional, vertical, and or horizontal fragmentation they induce, this paper is able to better understand how special districts affect the fiscal commons.

While the particular context within any county or state that govern the use of special purpose entities differs, we can more generally understand special districts as a source of functional institutional fragmentation, where service provision tasks are divided within local areas amongst different authorities. Empirical findings suggest that including special district debt in addition to general purpose debt for each county results in a greater burden on fiscal commons. Increasing debt exposure due to aggregate activities of general purpose and special purpose governments within a single fiscal common pool unit is not an inherent problem. After all, localities often form special purpose entities to accomplish new activities not currently undertaken, such as building and operating a transit system or providing support for business development, and so increased activity is

a purposive result of special district formation. Rather, the issue is that special districts may largely operate outside of the accountability measures and coordination mechanisms which govern the behavior of city and county governments (e.g. Galvan 2006; Scutelnicu and Ganapati 2012). Special districts can serve to institutionalize private interests (Burns 1994), and so potentially lack responsiveness to public preferences or the incentive to steward local public goods (e.g. Perrenod 1984; Horswell 2015). As we find, total debt burdens of all actors within the same fiscal common pool are in excess of existing debt limitations on individual city or county governments in the State of Georgia. Hence, these results call into question the efficacy of policies that enable special districts to proliferate, and which neglect to account for all actors involved in fiscal common pools in polycentric systems. As the roles special districts play in local governance continue to increase, new approaches are needed for ensuring that common fiscal pools are managed sustainably and with responsiveness to public preferences.

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Appendix A: Tabular model results and goodness of fit

Tables A1 and A2 present model coefficient estimates for the full model presented in Figure 3 above. Table A1 shows the posterior mean and 95% credible interval estimates for each parameter estimate.

Table A1: Tabular parameter estimates for models shown in Figure 3.

	Total Districts	District Jurisdiction	District Status
Population (10k)	−0.014 (−0.036, 0.008)	−0.014 (−0.036, 0.007)	−0.016 (−0.038, 0.007)
Yearly population growth %	0.024 (−0.014, 0.063)	0.025 (−0.014, 0.064)	0.025 (−0.014, 0.064)
% pop. over age 65	0.011 (−0.040, 0.062)	0.011 (−0.041, 0.062)	0.012 (−0.040, 0.064)
% households w/children	0.026 (−0.000, 0.052)	0.026 (−0.000, 0.052)	0.026 (−0.000, 0.052)
Unemployment %	−0.018 (−0.040, 0.005)	−0.018 (−0.041, 0.004)	−0.018 (−0.040, 0.004)
Income per capita ($1k)	0.002 (−0.025, 0.029)	0.002 (−0.025, 0.029)	0.003 (−0.024, 0.030)
% pop. with degree	−0.001 (−0.001, 0.000)	−0.001 (−0.001, 0.000)	−0.001 (−0.001, 0.000)
Rural	−0.556 (−1.089, −0.022)	−0.554 (−1.087, −0.020)	−0.556 (−1.089, −0.022)
Suburban	−0.144 (−0.541, 0.254)	−0.142 (−0.540, 0.256)	−0.132 (−0.531, 0.267)
SD Operating Expenses ($1M)	0.004 (0.003, 0.006)	0.004 (0.003, 0.005)	0.004 (0.003, 0.005)
# local governments	−0.008 (−0.093, 0.078)	−0.008 (−0.093, 0.077)	−0.008 (−0.094, 0.077)
# special districts	0.111 (0.069, 0.153)		
# single-juris. SDs			0.122 (0.071, 0.173)
# multi-juris. SDs			0.086 (0.008, 0.163)
# dep. SDs		0.117 (0.057, 0.176)	
# ind. SDs		0.109 (0.062, 0.156)	

*Posterior mean (0.025, 0.975 quantiles).

Table A2 shows model hyperparameters, in particular the hyperparameters for the autoregressive time effects and for the county random and spatial effects (recall that the BYM formulation involves fitting both a random intercept adjustment and a spatial correlation term for each areal unit).

For Bayesian models, a common goodness-of-fit assessment tool is posterior predictive checks. We use two predictive measures, the conditional predictive ordinate (CPO) (Pettit 1990) and the probability integral transform (PIT) (Dawid 1984), both of which are implemented as part of the R-INLA package (Lindgren and Rue 2013). The CPO for a given observation is the probability of that observation conditional on all other data points:

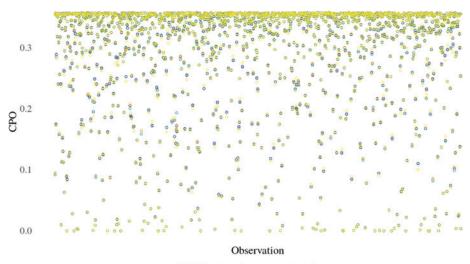$$\text{CPO}_i = \pi(y_i^{\text{obs}} \mid y_{-1}) \tag{A1}$$

where y_i^{obs} is the observed outcome for observation i, and y_{-1} are all observed values y except for y_i, which is omitted. In essence, this serves as a leave-one-out cross-validated predictive check applied to each observation (Held et al. 2010). Very low CPO values indicate unlikely observations given the current model (Gelman et al. 2013). Thus, by plotting CPO values for each model we can demonstrate that there are few outlying observations no more than would be expected by chance.

Figure A1 plots CPO values by observation; the close overlap of CPO values between the three models demonstrates fairly consistent performance, although lower deviance information criterion (DIC) (Spiegelhalter et al. 2002) and Watanabe-Akaike information criteria (WAIC) (Watanabe 2013) scores for models grouping special districts by jurisdictional type indicate that these models best fit the data.

Table A2: Random effect coefficient estimates for models shown in Figure 3.

	Total	Jurisdiction	Status
Precision for the Gaussian observations	0.033 (−0.006, 0.338)	0.033 (−0.006, 0.332)	0.033 (−0.006, 0.337)
Precision for Year	0.822 (0.635, 1.037)	0.820 (0.634, 1.036)	0.823 (0.638, 1.044)
Rho for Year	1933.578 (127.764, 6841.167)	1858.089 (128.302, 6716.727)	1788.939 (125.042, 6591.693)
Group Rho for Year	18079.047 (1221.672, 66239.178)	17489.928 (1189.490, 65241.233)	18352.315 (1249.464, 66756.094)
Precision for county (iid component)	0.887 (0.823, 0.954)	0.887 (0.823, 0.954)	0.886 (0.823, 0.953)
Precision for county (spatial component)	0.018 (−0.988, 0.987)	0.013 (−0.988, 0.987)	0.009 (−0.987, 0.987)

* Posterior mean (0.025, 0.975 quantiles).

Figure A1: CPO values for each model plotted against observations.