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Exploring the Sub-State Intergovernmental Game

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Abstract

Cooperative budgeting arrangements between state and local governments jointly fund local programs. The mix of state and local revenues contributed to these arrangements can change as budget priorities shift over time. This study examines the strategic choices public officials make as they determine their contributions to jointly-funded programs. Using a game theory model known as the "Diner's Dilemma", the analysis explores how each level of government considers how much revenue to contribute and whether it can induce its partner to increase their level of support. This analysis applies primarily to local programs with regional externalities. The model illustrates how local efforts to aggressively try to shift costs to the state government can backfire, particularly during periods of state fiscal stress.

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Introduction

Many types of local public services and infrastructure are funded through cooperative budgeting arrangements between multiple government entities (Mitchell and Thurmaier 2011; Khalid, Matkin, and Morse 2017). How do public officials respond when their co-funding partners cut their contributions to the shared activity? Letting overall funding drop would require cuts to services and reduce maintenance to public infrastructure. Increasing contributions to offset the cuts by the other layer of government may require higher taxes or sacrificing other service responsibilities. Choosing either option is especially difficult if the outcome has strategic implications for future rounds of intergovernmental budgeting. For example, local officials may fear that increasing local taxes to offset cuts to state aid may lead the state to make further cuts to intergovernmental grants.

Responding to cuts in intergovernmental support is especially relevant during periods of economic decline. States once interested in supporting local economic development projects may realign their priorities towards unemployment benefits, Medicaid and other elements of the state social safety net. For example, in 2011 Nebraska cut transportation infrastructure aid to cities and counties as an effort to close its state budget gap. In 2015, when a proposal was brought to the state legislature to restore the aid, state officials were concerned that local governments would use the aid to lower local property taxes rather than increase overall transportation investment (Hammel

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2015). Officials at the state and local level are interested in both achieving public service objectives and keeping their share of the cost of the joint service from rising.

Another side of this issue is whether state governments co-funding services with fiscally distressed local governments are willing to increase their contributions. If state officials observe that a local government can't sustain its current level of spending, under what conditions is it more likely to increase aid or alternatively allow the joint service to diminish or even be terminated? Local governments regularly lobby their state governments for supplemental funding. Developing a conceptual framework for better understanding which services and in which economic conditions the state is more likely to offer emergency support may help local officials be more strategic as they seek state aid.

The effect of collaborative budgeting on administrative behavior is the subject of a small, but growing literature. Khalid et al. (2017) conduct a case study of joint capital budgeting arrangements and identify a variety of motivations and ownership structures for these partnerships. Their study revealed that two most frequently cited motivations for entering into collaborative budgeting agreements were cost sharing and overcoming collective action problems. Many capital projects provide benefits that expand beyond the borders of a single government and sharing the funding responsibility helps ensure that the infrastructure is funded and scaled to an efficient level.

There are many unanswered questions about how these collaborative budgeting affects administrative behavior. Mitchell and Thurmaier (2011) conducted an exploratory analysis of several public collaboration networks in the Chicago area and found significant shortfalls in the financial reporting on these agreements. Additionally, these

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arrangements suffered from a lack of transparent reporting on the goals, performance measures and overall commitments to the agreement by the participating governments.

The uncertainty associated with these agreements creates an environment that fosters self-serving administrative behavior. Once public officials enter into collaborative budgeting agreements they may feel the incentive to try to shift an increasing share of the joint fiscal burden to their partner governments. This incentive is an example of the moral hazard problem that Posner (2009) identified in his essay on the challenges associated with intergovernmental collaboration.

The objective of this study is to develop a conceptual model for the strategic decisions that public administrators face once they have entered into a joint funding agreement. The model focuses particularly on services and public infrastructure that generate positive externalities and therefore generate the kind of collective action problem identified by Khalid et al. (2011). One contribution of this paper is that it introduces a new application of game theory to intergovernmental finance. The behavioral predictions generated by this theoretical approach can help public administrators consider their options more deliberately. This model also generates testable hypotheses that may guide future empirical research.

The challenge of deciding how much to contribute to a jointly funded service has similarities to a problem commonly encountered when a group of friends go out to dinner and agree ahead of time to split the bill evenly. While ordering from the menu, each diner must decide whether to order an expensive dish and a nice glass of wine, or a cheaper dish and just have a soft drink. Diners that ordered more expensive dishes than their companions are subsidized, while those that were more restrained end up paying more for

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their meal than the cost of what they actually consumed. Similarly, local officials don't want to have to pay the full cost of a bridge that provide broad regional transportation benefits, and states don't want their aid to allow localities to reduce contributions to joint services.

The problem just described is known as the "Diner's Dilemma" in the field of game theory economics. The Diner's Dilemma is used in this paper to describe the strategies that state and local governments employ in their fiscal policies relating to intergovernmental transfers. This paper is the first application of the Diner's Dilemma to intergovernmental financing decisions. This model may increase public officials' understudying and awareness of the strategic implications of their choices when engaged in co-funding relationships between state and local government. Additionally, the model generates multiple predictions that may help guide future empirical fiscal research. The primary result of this model is that it helps reveal how geographic externalities created by co-funded services play a major role in determining the types of strategies state and local governments use. These results give insight into the conditions when states are willing to bail out local governments that are struggling to finance local services.

Jointly Funded Local Programs

State and local governments jointly funding public programs indicates that both levels of government share an interest and responsibility for certain services. Consider an arrangement where local governments received no aid and were solely responsible for funding their activities with local taxes, charges and borrowing. Voters and creditors would very likely view the obligations of sub-state governments as "sovereign", and it

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would be irrational for localities to expect the state government to offer a bailout during periods of fiscal distress. This independence would influence the total level of local public spending. Introducing state aid would be expected to change the way the local governments spend and change their expectations of the fiscal implications of a recession.

Theoretical and empirical studies in political economics suggest that individuals view intergovernmental revenue and "own-source" revenues through different lenses (Gramlich 1977; Nice 1987). Intergovernmental revenues can create the appearance that local public spending is funded by nonresidents (Oates 1999). Intergovernmental revenue programs often supply concentrated local benefits that are funded by a common pool of resources (Shepsle, Weingast, and Johnsen 1981). Local voters and local politicians receive fiscal or political benefits from intergovernmental revenue programs without internalizing their full cost, causing them to demand more expenditures funded by intergovernmental revenue than own-source fees, charges, or taxation. The vast empirical literature on the "flypaper effect" indicates that increases in intergovernmental revenue rarely lead to tax reductions. Contrarily, increases in intergovernmental revenue stimulate much higher expenditures than do similar increases in own-source revenues (Hines and Thaler 1995; Fisher and Papke 2000). Lee and Plummer (2007) find that intergovernmental revenues increase the growth in budgeted expenditures year over year in local school district governments. The universal theme propagated is that intergovernmental revenue modifies the perceptions and beliefs about the levels of sustainable sub-state spending.

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Empirical literature has established a link between intergovernmental revenue dependence and the positive growth of government (West and Winer 1980; Rodden 2003). When intergovernmental revenue as a proportion of total revenue is increasing, sub-state governments move toward intergovernmental revenue dependence. In this context, dependence refers to the share of revenues used to finance local services that come from the state government. Local governments that are highly dependent on state aid, when presented during an adverse fiscal shock, are placed in a potentially inflexible position to raise additional revenue. Without capacity to increase their own revenues, sub-state governments may be forced to cut service, run a deficit, or delay payment to both employees and contractors.

If a financial situation escalates into a fiscal crisis in which the sub-state government is unable to maintain a positive fiscal position, the sub-state government may claim, with some justification, that it is not responsible for the situation due to the dependence on state intergovernmental revenue. If the sub-state government is successful in this strategy, it may be very difficult for the state government to resist political pressure from bondholders, banks, public sector unions, and other stakeholders. This game provides an incentive to intergovernmental dependent sub-state governments to be fiscally irresponsible. Even if such sub-state governments could take simple but politically costly steps to avoid an impending fiscal crisis, it may be more rewarding to position themselves for bailouts. The pressure placed on the state government's own creditworthiness might be called into question if it fails to enforce a loan contract against a defaulting sub-state government. Approached by creditors and facing the prospect of failing in its obligation to enforce property rights, the state government might see a

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bailout as the simplest solution. The perceived probability of future bailouts would be expected to increase with intergovernmental revenue dependence.

Overall the empirical evidence is mixed as to whether or not sub-state governments exhibit expenditure responses to intergovernmental revenues. When spending responses are found, there is the additional question of whether sub-state governments pick up the slack and spend more in response to intergovernmental revenues (fiscal replacement), or spend less in response to intergovernmental revenues (fiscal restraint). Stine (1994) studied 66 Pennsylvania county governments and found that own source revenue fell in response to federal intergovernmental revenue, while county spending rose in response to intergovernmental revenue from state governments, an asymmetric outcome. Gamkhar and Oates (1996) used aggregate time series data for state and local expenditures finding symmetric state expenditure response to intergovernmental revenue. Modeling with artificial data has shown that all models tested exhibit peculiarities such as discontinuities in marginal responses and counterintuitive predictions, which are not generally observed in economic behavior in real world data (Shama Gamkhar and Olson 2001)

Framework for the Game

The strategies behind intergovernmental aid can be modeled as a "diner's dilemma" game. The diner's dilemma references the problem when a large party goes to a restaurant with an expectation of splitting the check evenly among all diners. Each individual, when deciding what to order, chooses between an inexpensive meal and a more costly dish. If they had to pay the full price they would order the cheaper meal, but

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they might order the expensive dish if they expected that some of the cost may be spread to other members of the party. Additionally, diners might fear that if they order a cheaper meal they would have to pay more than the value of the meal they enjoyed once the check has been split evenly. As a result, everyone in the dinner party has an incentive to order the more expensive meal (Gneezy, Haruvy, and Yafe 2004).

Applying this game to a governmental context, state and local governments must decide how much to contribute to a jointly funded service and attempt to shift more of the cost to another level of government. Local governments hope the state will increase its funding share by providing additional intergovernmental aid, while the state would like the local government to use their own-source revenues (taxes, fees, and charges) to finance services. During economic downturn or other forms of fiscal stress, local governments may try to lower their taxes and hope that the state government would offset reduced spending with an increased level of intergovernmental aid. The state may be willing to provide aid to help offset the effects of recessions and other types of fiscal stress, but it would not want to encourage local governments to lower their taxes in hopes of getting additional state aid.

The formal objective of the game for state and local governments is to maximize the net political benefits received from providing local public services. Governments receive political benefits from public spending, especially from tangible projects that voters are able to observe and experience. Generating the revenue to pay for this spending, however generates political costs. From the public officials' perspective, an optimal fiscal structure maximizes the net political benefits associated with public

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spending (Hettich and Winer 1984; 1988). In other words, they seek to get the greatest political benefit from spending at lowest political cost.

For services that are jointly funded by state and local government, both parties incur political costs and receive political benefits. Local governments fund the joint service with direct spending, while the state makes an intergovernmental transfer in the form of a block grant. The state pays for these grants with state-level taxes. The model presented below examines how much support each level of government chooses to provide within a strategic context in order to identify the optimal strategies for state and local governments. This model can then be used to examine how fiscal stress may influence budgetary policy.

The first part of the model describes how local governments approach this game. Equation (1) describes local officials' goal of maximizing their net political benefits from providing public services. Local officials seek to maximize U, which is the sum of net political benefits received from each of the N taxpayers residing the jurisdiction. Net political benefits are the difference between the political benefit received from local public spending (E) and the political cost of levying local taxes (v). The political support that taxpayer i provides to the government in return for spending E is expressed by the function b(). The political cost of collecting v dollars in taxes from taxpayer i is given by the cost function c(). The sum of net political benefits across the N taxpayers is the total net benefit public officials receive for a given level of public spending. This may be expressed as votes or other signs of public satisfaction with the current fiscal policies.

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$$Max\ U = \sum_{i=1}^{N} \{b_i(\bar{E}) - c_i(v_i)\} \tag{1}$$

$$subject\ to\ \ \bar{E} - L - I = 0$$

Where:

$$v_i = \frac{L}{N}$$

Local government spending is subject to a budget constraint. Total spending must equal total local taxes and other own-source revenues (L) plus intergovernmental aid (I). The budget is balanced when spending (E) minus taxes (L) and intergovernmental revenue (I) is equal to zero. The taxes paid by each local voter is (v_i) is simply the total amount of local taxes divided by the number of voters.

Figure 1. Optimizing Net Political Benefits from Local Public Spending

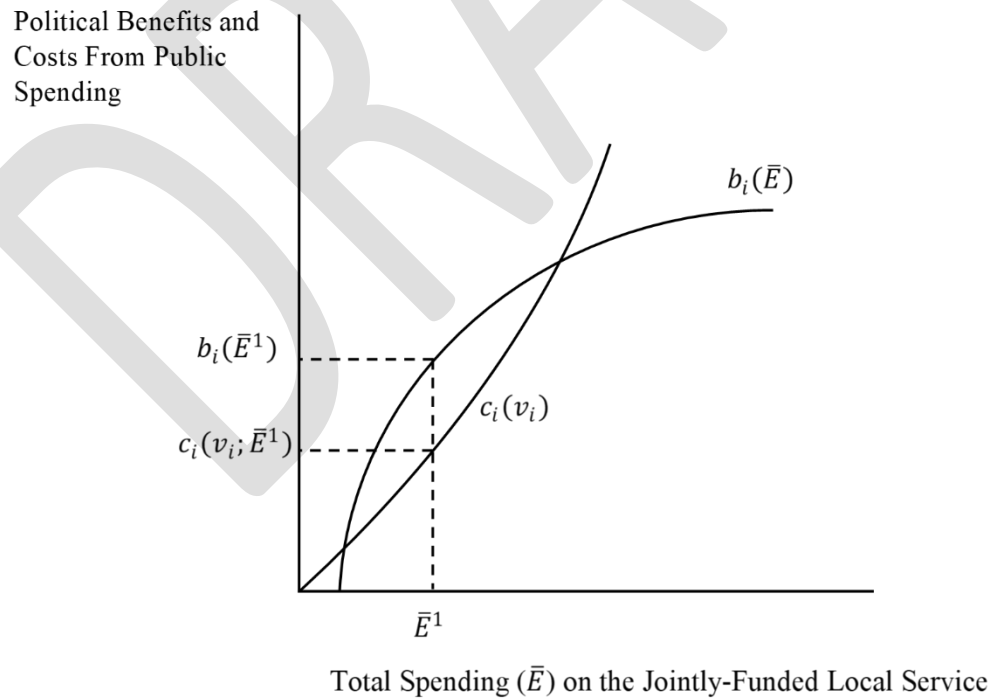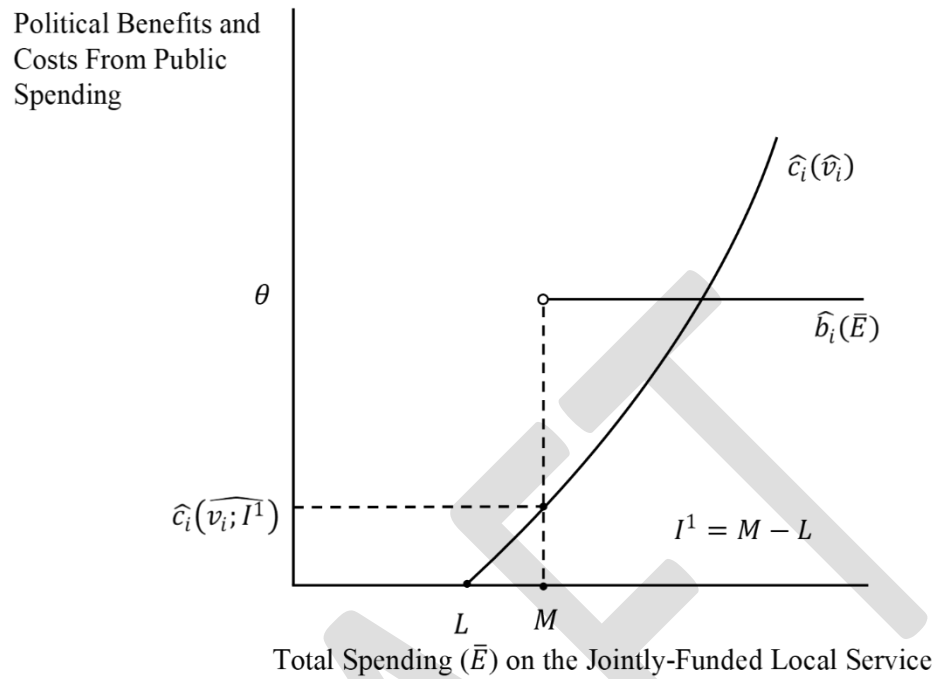Total Spending ($\bar{E}$) on the Jointly-Funded Local Service

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Figure 1 depicts the local government's optimization of its provision of public services, $(\bar{E})$. The $b_i(\bar{E})$ curve depicts diminishing marginal political benefits derived from $\bar{E}$. The $c_i(v_i)$ curve depicts increasing marginal political costs of raising sufficient local revenue to fund the local service. The optimal level of local spending maximizes the net political benefit, or the vertical distance between $b_i(\bar{E})$ and $c_i(v_i)$. This is shown at the point $\bar{E}^1$.

The scenario depicted in Figure 1 leaves the local government alone to fund the local service. Figure 2 introduces supplemental state funding. The effect of the state aid is to shift the $c_i(v_i)$ curve to the right by the amount of the intergovernmental aid (I). Even if the local government reduced its taxes to zero, it would still spend I on the local service. The effect of I on the level of $\bar{E}$ depends on the shape of the benefit and cost curves. The level of spending may increase, but if the local government chooses to reduce its own contribution and increase its net political benefits by cutting taxes, then the effect of I on $\bar{E}$ would be reduced[1]. The local government choses a new optimum point at $\bar{E}^2$ which maximizes the distance between $b_i(\bar{E})$ and the new shifted cost curve. The service is now jointly funded by I and local own-source revenues. Up to this point, local fiscal policy is static, meaning the local government takes the state's provision of I as a given. We now introduce the state's optimization model which will all the analysis to introduce dynamic strategic behavior to the game.

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[1] There is a broad and well known public finance literature examining the effect of intergovernmental aid on public spending. A part of it has examined an empirical result known as the "flypaper effect" (Wyckoff 1991; Hines and Thaler 1995; S. Gamkhar and Oates 1996; Turnbull 1998; Becker 1996). This is the observation that, although public funds are fungible, lump-sum grants appear to create a larger boost to spending in the function that they targeted than the income elasticity of demand for public services would suggest. Intergovernmental revenue tends to "stick" where it initially lands.

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Figure 2. Optimizing Net Political Benefits from State Public Spending

Total Spending $(\bar{E})$ on the Jointly-Funded Local Service

The state government maximizes a slightly more complicated utility function, as depicted by Equation 2. The state provides two types of public services: state level services through direct spending (S) and local services $(\bar{E})$ that are financed with intergovernmental aid (I) to the local government. The function $g(S)$ represents the political benefits that the state receives from state-level services, while $\widehat{b}_\iota(\bar{E})$ describes the political benefits state officials receive from local services.

$$Max \; V = \sum_{i=1}^{N} \{g(S) + \widehat{b}_i(\bar{E}) - \widehat{c}_i(\widehat{v}_i)\} \tag{2}$$

$$s.t. \quad S + I - R = 0$$

Where:
$$\widehat{b}_i(\bar{E}) = f(\bar{E}) \;\; \text{for} \;\; \bar{E} < M$$

$$\widehat{b}_i(\bar{E}) = \theta \qquad \text{for} \;\; \bar{E} \geq M$$

and

$$\widehat{v}_i = \frac{R}{N}$$

The most important difference between the behavior of state and local governments is that state officials' interest in local spending is based on preventing negative geographic externalities. Negative externalities refer to spillover effects from one community that harm other communities within the state. If a county operates and maintains flood control and wastewater treatment infrastructure, the state may be interested in supporting this program because these facilities may provide benefits and protection to other communities outside of the county.

For some local services, like education or transportation infrastructure, the state has an interest in ensuring that a minimum quality threshold (M) is met throughout the state. Levels of service beyond that threshold reside entirely within the local jurisdiction and aren't a concern for the state government. For example, a state may help fund programs that support literacy and math, but not provide targeted grants that support arts and foreign language classes. The state provides I to ensure that all jurisdictions are able to finance the minimum threshold that mitigates the primary negative externalities. In

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contrast, local governments can receive the political benefits from all levels of spending on E, even in excess of M.

The state's political benefits function for the co-funded local service, $\widehat{b}_\iota(\bar{E})$, is split at (M). When $\bar{E}$ is less than M the state receives political benefits from any increase to spending on the joint service. Once $\bar{E}$ has reached M, however, the state receives no additional benefit from higher levels of spending. The $\widehat{b}_\iota(\bar{E})$ curve flattens at θ for all spending above the threshold. This reflects that the level of spending is sufficient to eliminate any negative regional externalities and further spending just benefits the residents of the local governments. The shape of $\widehat{b}_\iota(\bar{E})$ for $\bar{E} < M$ describes the political benefits the state receives from local serves that are below its minimum threshold. This function can take multiple forms and the local government may not know the state's true preferences for below-threshold spending. This uncertainty becomes a key component in the game.

At one extreme, the state may derive no political benefits from $\bar{E} < M$ and $\widehat{b}_\iota(\bar{E})$ is equal to zero at that range. Figure 2 depicts this scenario. The state's political cost curve, $\widehat{c}_\iota(\widehat{v}_\iota)$, intersects horizontal axis point L, indicating the local government's contribution to the joint service. The state derives zero political benefits from L, which falls below its minimum threshold, and would therefore raise I^1 in state tax revenues and provide a grant to the local government. Total spending on the local service increases to M, and the state receives $\theta - \widehat{c}_i(\widehat{v}_i; \bar{E})$ in net political benefits.

If the local government responds to the state aid by cutting its own taxes, the state's political cost curve, $\widehat{c_\iota}(\widehat{v_\iota})$, will shift to the left. If the shift is relatively small and the intersection of $\widehat{b_\iota}(\bar{E})$ and $\widehat{c_\iota}(\widehat{v_\iota})$ remains to the right of M, the state will increase intergovernmental aid to I^2, as shown in Figure 3. This action reduces the net political benefits the state received, but is the new optimum. In this case the local government has successfully shifted some of the cost of funding the local service to the state government. If the cut is sufficiently large, however, and the state's political cost curve $\widehat{c_\iota}(\widehat{v_\iota})$ shifts so far to the left that it no longer intersects $\widehat{b_\iota}(\bar{E})$, then the state will eliminate funding for the local service entirely. In this scenario, the political cost for the state to increase its aid to I^3 outweighs its concern for mitigating any negative externalities. Local managers must be cautious when trying to increase their reliance on intergovernmental revenue because the state may withdraw funding if it perceives local governments aren't putting in sufficient tax effort on their own. In other words, if local governments try too hard to dine at the state's expense, the state may ask for a separate check.

If a local jurisdiction reduces its own-source support for a service that the state has an interest in, then the state must balance its cost of increasing I with the benefits it receives from that service. It may choose to either accept the lower service levels or increase I to offset reduced local contributions. This decision is influenced by a concern for creating moral hazard for local governments. If the state signals that it will offset any reductions in local revenue, it creates an incentive for localities to reduce their tax effort (Fisher and Papke 2000). The concept of local tax effort refers to the amount of revenue collected for a given tax base. Two localities may have the same property tax base per capita, but if one imposes a higher property tax rate then it is exerting greater tax effort

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than the other. The state does not want to incentivize localities to reduce their own-source taxes in response to intergovernmental revenue.

Figure 3. Optimizing Net Political Benefits from State Public Spending

Total Spending ($\bar{E}$) on the Jointly-Funded Local Service
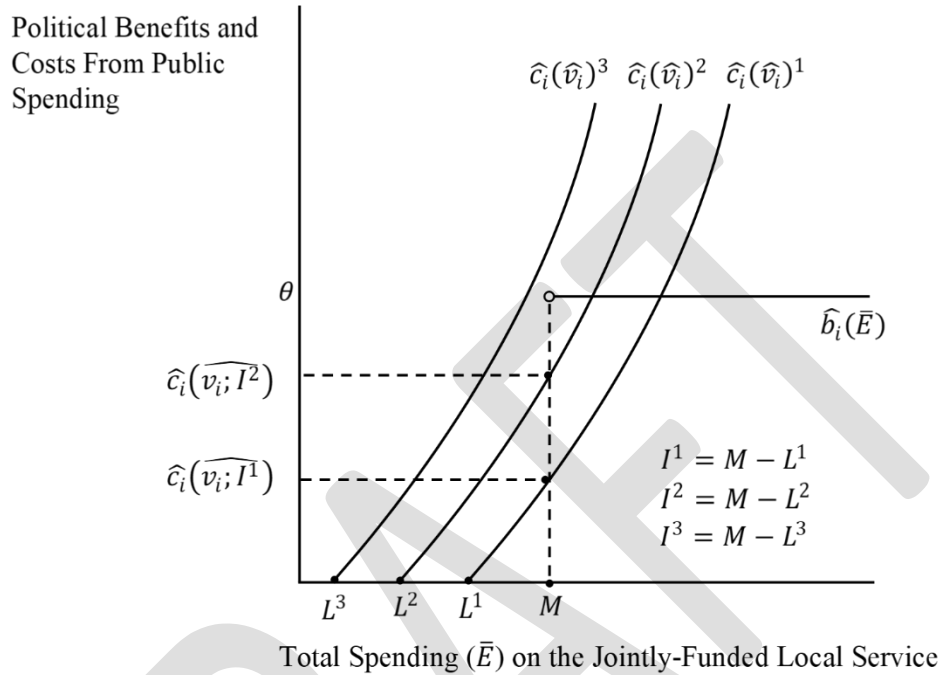
Several other factors could shift the state's political cost curve, $\widehat{c}_\iota(\widehat{v}_\iota)$, and create similar effects. The onset of a recession may changes voter's preferences and increase the political cost of raising state revenue through taxation. The political climate or changes to the industrial base of the economy may also influence the political cost of taxes. The $\widehat{b}_\iota(\bar{E})$ may also be shifted if state officials change their assessment of what mix of state and local services would provide the greatest political payoff. Perceptions of eroding infrastructure may make state highways and bridges more politically lucrative than schools and sewers. A recession could similarly raise the demand for state welfare services.

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Local officials may attempt to identify the state's minimum service threshold and cut local taxes up to the point that the state is providing the largest amount of intergovernmental aid possible. This strategy is risky, however, if the state's preferences for local services regularly change during periods of fiscal stress. A shock that causes the state to deprioritize local services in favor of spending on state programs would reduce the political benefits that the state receives from funding the joint local service. Figure 4 depicts this outcome. If local governments were spending at L^2 to maximize the state grant, the shift downward in the state benefit curve would result in the complete elimination of state aid to the program. Local governments in Georgia experienced this kind of dramatic cut to state aid when a property tax relief program was terminated in 2008 as the Great Recession shifted state budget priorities (Brien and Sjoquist 2014).

Figure 4. Effect of State Fiscal Stress on Intergovernmental Aid

Total Spending ($\bar{E}$) on the Jointly-Funded Local Service
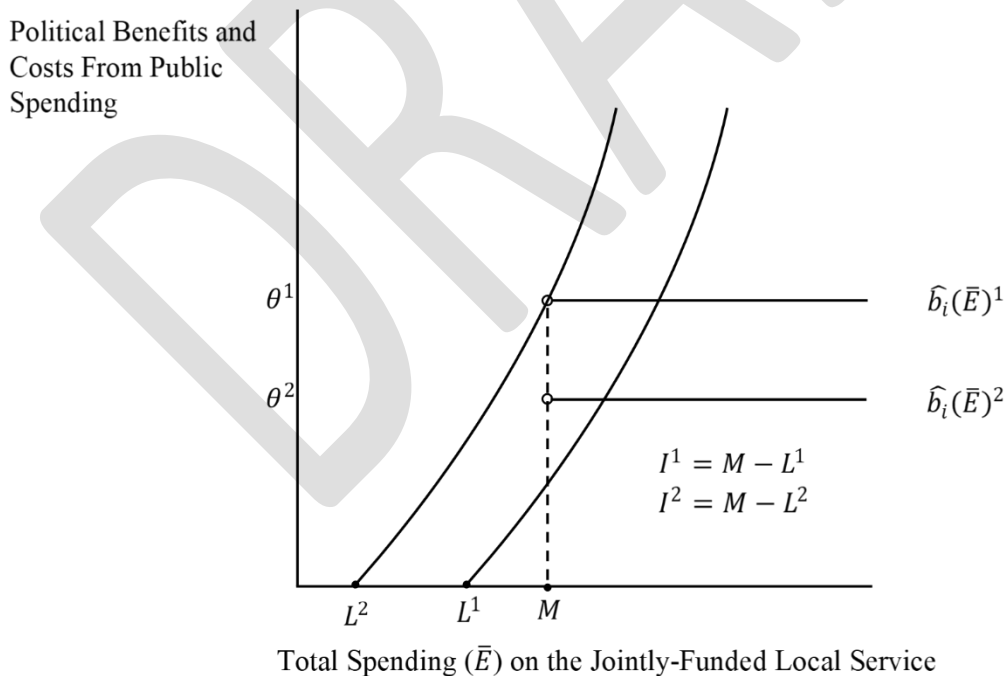
Local governments may be able to avoid this scenario by increasing their own contributions to the joint service and spending at L^2. When the state is hit with a fiscal shock and it deprioritizes local services, it still values correcting the reginal externality enough to be willing to contribute I^1. This analysis predicts that increasing local government contributions to the joint service may create a buffer that shields state contributions from cuts during periods of state budget reprioritization. Strategically, local governments should be cautious about aggressively seeking to shift costs to the state government to mitigate the risk of complete elimination of intergovernmental aid.

Application for Special Districts

The intergovernmental context of multiple incentives, organizations, actors, and agencies is the arena of intergovernmental revenue for sub-state governments. The organizational structure of the recipient organization may determine the role of intergovernmental funding for the joint service. The US Census Bureau divides sub-state governments into four basic types: counties, municipalities, townships, and special districts. As of 2012, there were 90,056 sub-state governments which were composed of 38,910 general purpose governments including 3,031 counties and 35,879 sub-county governments (19,519 municipalities and 16,360 townships) and 38,266 special districts governments and 12,880 school districts (Hogue 2013). While the number of general purpose governments has been relatively constant over the last three decades, the number of special districts has increased dramatically to meet public service needs. Most special district governments perform only a single function such as natural resources, fire

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protection, water supply, housing and community development, sewerage, and other public services.

Special district governments are quite different from general purpose governments. The legal boundaries of many special districts are not coterminous with general purpose governments, either counties or sub-counties. This is due to the special legislation afforded special purpose governments in which the special purpose entity may cross any political boundary. Local governments may attempt to finance infrastructure improvements through the creation of a special district to avoid major budget constraints and political pressures (Douglas R. Porter 1992; Faulk and Killian 2017). Based on special-purpose governments in more than 300 metropolitan areas in the United States, **Porter, Lin, and Peiser** (1987) **find that special districts are created increasingly to finance infrastructure to promote development.**

According to Mizany and Manatt (2002), there are some disadvantages as well as advantages to special districts. The existence of many special districts may lead to inconsistency with regional planning and a decrease in accountability. When special districts overlap jurisdictions, conflict often occurs, resulting in inefficiencies such as duplicated services. Using data from California special districts, entities organized as subordinate bureaus of general purpose governments had higher spending than independent district (Mehay 1984). Mehay's (1984) study focused primary on expenditures, but the result implies that there may be a relationship between administrative dependence and the financial condition of the organization.

Special districts have significant fiscal and administrative autonomy and the degree of autonomy varies. Eger (2006) provides a theoretical typology of special

purpose entities, based on the degree of financial and governing autonomy. He classifies

the governing autonomy into three levels: limited (advisory boards), moderate (self-

governing boards), and high (elected boards). While many researchers have focused on

the financial characteristics related to the ability to issue debt (Bennett and DiLorenzo

1982; Leigland 1994; Merrifield 1994), Eger emphasizes the importance of the ability to

tax. When an entity has the ability to tax, the financial independence is higher than when

the entity has the ability to only issue debt. Although there is no clear relationship

between intergovernmental revenue and financial autonomy, the financial autonomy –

measured by the ability to tax – may affect the amount of intergovernmental revenue used

to fund the service.

The basic premise of this model is that the state is interested in controlling for

externalities of the public service that spread beyond the borders of the government

providing it. The creation of special purpose districts that spread across multiple general

purpose governments may complicate the determination of whether any externalities

exist. If, for example, a flood control district is formed that spans multiple municipalities,

state officials may determine that the flood risk is wholly contained within the district and

therefore no externality needs to be mitigated. This assessment may not be factually

correct, however, and therefore all levels of government must face some uncertainty and

incomplete information in their strategic decisions.

Conclusion

The purpose of modeling intergovernmental aid policy with the Diner's Dilemma

model is to provide practitioners and academics with a new tool for thinking about the

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strategic implications of jointly funding public services. State and local governments may share an interest in providing certain services, but preferences for the quantity and quality of services may vary widely across levels of government. Our model focuses on services that provide benefits that spill over local government borders and influence other communities in the region. The construction and maintenance of capital projects such as flood control, wastewater treatment, and transportation infrastructure frequently provide regional benefits and regularly receive state funds. This model helps clarify the strategic choices both state and local officials face when deciding how to budget for these joint projects, particularly during periods of fiscal stress.

For public practitioners, our analysis reveals the risks of trying to shift too much of the burden of funding joint services to another level of government. If state governments are primarily interested in correcting for regional service externalities, then there is a hard limit on how much states are willing to contribute to joint services. Local governments may induce the state to increase intergovernmental aid by cutting spending, but only to a point. Cutting too much may induce the state to shift from its highest potential level of funding to completely dropping support for the program. Using the Diners' Dilemma analogy, an overly greedy member of a dinner party may lead members of the group to start asking for separate checks rather than splitting the bill.

The predictions of this model generate multiple hypotheses that may guide further academic research into intergovernmental aid. The first prediction is that over a certain range, cuts to local government contributions to a jointly funded program would be offset by increases to state aid. Empirical research is needed to test whether this actually occurs and, if so, over what time frame. State replacement of local spending would be expected

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to vary across spending types, so an empirical exercise should take care to identify similar types of joint programs.

A second prediction is that that at a certain point, local government cuts would induce significant reductions to state aid. This occurs when the state's contribution to the joint program would exceed how much it values mitigating the externality. An empirical challenge for testing this prediction is specifying the spending cuts. If the state is using a cost-benefit analysis approach to make its decision, then measuring spending in levels would be appropriate. If state officials are concerned about fairness and relative effort by each level of government, then the proportion of spending by the different partners may also influence fiscal behavior. Game theory experiments have found that participants will sacrifice some of their own wellbeing in order to punish actors that have behaved "unfairly" (Rabin 1993; Diekmann 2004). Empirical work is needed to measure whether state officials are willing to systematically withhold aid to prevent local governments from cutting taxes to shift costs upward.

A third prediction from this model is that joint programs receiving the lowest possible level of local fiscal support are more likely to have their state aid terminated during periods of state fiscal stress. Assuming that state priorities shift during fiscal downturns to devalue jointly-funded local projects, the kinked benefit curve would leave localities with higher local spending unaffected, while those at the margin would be completely defunded. This hypothesis could be tested by examining the relative state/local funding ratios for joint programs and then identifying which programs had their state funding eliminated.

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