Intergovernmental Grants: 
A Model of Political Competition in a Federal System

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Abstract

Intergovernmental grants are based on the interrelated choices of: (1) the national government deciding whether to offer the grant; (2) the national government determining grant conditions, including grant size and policy mandates; (3) the subnational government deciding whether to accept the grant; and (4) the subnational government determining policy, including spending levels, upon grant receipt. Empirically and theoretically, scholars have often studied each of these decisions separately, leading to an incomplete understanding of grant-related behavior. This paper develops a non-cooperative game theoretic model of intergovernmental political competition to capture all four of these choices in a single model. This approach helps to better explain puzzles surrounding intergovernmental grants, including the “flypaper effect,” asymmetric responses of recipient governments to grant increases and decreases, the decisions by subnational governments regarding whether or not to accept grants, and tradeoffs between the size of grants and the strings that are attached.

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Intergovernmental Grants: A Model of Political Competition in a Federal System

Scholars of federalism have long been interested in the use and effects of intergovernmental grants. Grants have often been viewed as part of a system of cooperative federalism (Elazar 1962, 1966; Grodzins 1966), under which the national and subnational governments together attempt to solve problems affecting their joint constituencies. Under an idealized version of this view, subnational governments rely on the national government for funding and guidance in order to achieve the best solutions to public problems. This cooperation is especially useful when the national government is more effective at raising revenue while the states and localities are better positioned to use that revenue to implement policies. However, there are many aspects of the intergovernmental grant system that seem more competitive than cooperative. For instance, the national government often attaches restrictions and mandates to grants that are undesirable to subnational governments. And national politicians seek to claim credit for new roads, police services, and educational excellence brought about at the subnational level partly through intergovernmental grant funding.

Across a broad array of policy areas, the intergovernmental grant-making process is characterized by at least four distinct yet interrelated decisions. First, policymakers at the donor level (here described as the national government) must decide whether or not to offer a grant. Their other options include offering no grant or providing goods and services directly, without reliance on other levels of government. Second, the national policymakers must decide what conditions (if any) to attach to the receipt of grant funds, in terms of how the funds are to be spent and what policies the recipient government must follow. Third, the recipient government (here described as the subnational government) must often decide whether or not to seek or
accept the grants. Finally, the subnational government must decide how to set policy and spend grant funds.

Empirically, each of these four decisions has received substantial attention. Studies of whether and where Congress allocates grant funds often focus on coalition size, privileged positions of committee members and party leaders, or other national government concerns.\(^1\) Attaching strings or conditions to grant funds can be done directly in related areas (such as with highway funds linked to state-set speed limits or substance abuse prevention grants tied to state attempts to reduce youth smoking), or in unrelated areas, sometimes through unfunded mandates (Posner 1998). Scholarly work at the state and local level captures not only whether grants are sought and received (e.g., Stein 1984; Fossett 1990; Choi, Turner, and Volden 2002), but also how recipient governments respond to grant funds. For example, there has been evidence of an asymmetric response to grant increases and decreases (Stine 1994, Gamkhar and Oates 1996, Volden 1999, Gamkhar 2000) and of a “flypaper effect,” with grant funds sticking where they hit instead of being spread across the state budget (e.g., Hines and Thaler 1995, Bailey and Connolly 1998).

The theoretical bases for these empirical works have typically fallen into one of three categories.\(^2\) Either implicitly or explicitly, scholars studying grant-making decisions by the national government rely on models of distributive politics (e.g., Weingast 1979, Baron and Ferejohn 1989, Dixit and Londregan 1995). Such models help scholars to determine when, where, and how grant funds are allocated. Those studying grant-making decisions at the state or local levels often rely instead on indifference curve models of spending with budget constraints

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\(^1\) See Bickers and Stein (2004) for an excellent recent summary of this literature and a movement away from such national focus.

\(^2\) Certainly these categories do not capture all theoretical models of intergovernmental grants, but they do characterize the vast majority of such works. For alternative approaches and recent summaries, see Persson and
from the classical public finance literature (e.g., Scott 1952, Wilde 1971) or on more political theories focused exclusively on politics within the recipient level (e.g., Romer and Rosenthal 1980). The third broad category of theoretical work on intergovernmental grants cuts across these two levels, typically through reliance on principal-agent models (e.g., Chubb 1985). Each of these approaches is problematic. Most simply, focusing only on one level of government neglects the interrelated decisions between the national and state governments. The size and conditions of the grant influence states responses; and how states will likely respond influences national policymakers’ formulation of the grant in the first place. Moreover, these interrelated decisions are poorly characterized by a principal-agent approach. State governments are not the same as federal bureaucrats carrying out the wishes of Congress and the president. Rather, they have independent sources of financing and political power, and must be responsive to their own constituents.

Treating the distinct steps of the grant-making process individually, whether empirically or theoretically, may result in an incomplete understanding of the politics of intergovernmental grants. For example, studies of grant funding or the mandates attached to grants must focus not only on the desires of coalitions of national politicians but also on likely state and local government responses. Similarly, how subnational governments respond to grant increases and decreases is likely related to the reasons for those increases and decreases at the national level.

This paper presents a game theoretic model of intergovernmental grants that includes all four of the above choices, in order to more completely characterize this important aspect of federal systems. In so doing, propositions are generated regarding when the national government offers grants, when grant sizes and mandates vary, when subnational governments apply for and

accept grants, and how they alter their spending upon grant receipt. Policymakers throughout the model are assumed to care about the policy direction chosen, the credit they can generate from providing goods in the policy area, and the blame they face for the taxation necessary to provide goods and services. Implications of the model for studies of the flypaper effect, asymmetric responses to grant increases and decreases, the grant acceptance decision, and tradeoffs between grant sizes and grant restrictions are examined following the formal model, the analysis of which is broken into many sections detailing its assumptions, derivations, and propositions.

**A Formal Model of Intergovernmental Grants and Political Competition**

The model of federalism proposed here focuses on elected politicians in a national government and a subnational government competing with each other to claim credit for providing goods and services to constituents in a given policy area, and to set the direction of that policy.\(^3\) This vertical competition within a federal system takes place through the choices of policy direction in a particular policy area and the level of spending in that area. The politicians are seeking to represent the desires of their constituents (presumably to gain reelection).

Constituents benefit from spending in a particular program area but dislike the taxes they have to pay to bring about that spending. They also have preferences over the policy direction taken in the program area.

The subnational government provides some level of funding for the desired good and typically sets the direction that the policy will take in this area. For example, states and localities spend tax revenue and set policy regulations over environmental cleanup, police services,

\[^3\text{The model therefore sets aside decisions about government spending and intergovernmental grant use in policy areas other than the one under investigation. This limits the present work, given the possibility that grants in one area might lead to spending increases in other areas or to tax cuts. Such an effect can be examined here in part given the specific focus on the effect of taxation detailed below.}\]
welfare programs, education, and health care. The national government can allow the subnational government to address the policy concern on its own, can join with the subnational government in providing the good jointly in order to gain some of the credit from the public for its provision, or can offer an intergovernmental grant to the subnational government (potentially with strings attached).

This process is modeled formally through a game structured as shown in Figure 1, which builds upon work by Volden (2005). There are two actors in the game, a national and a subnational government, acting in a federal system. Although federal systems are made up of many states, cities, regions, etc., here I simplify to a single representative subnational government in order to provide a clear understanding of vertical competition without horizontal or multiple-level concerns. Throughout the game, the subnational government is assumed to take some role in good provision – thus this paper excludes policy areas such as national defense in which the subnational governments’ role is limited, an acceptable assumption for present purposes because such policy areas do not contain intergovernmental grants.

The national government makes the first move in the game, choosing: to not become involved in the provision of the good, to become involved through direct joint provision of the good, or to offer an intergovernmental grant to the subnational government to aid in its provision of the good. These are typical choices made by the central government in federal systems –

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4 The terms “national” and “subnational” are used for simplicity. Similar logic applies for intergovernmental grants among subnational governments (such as from states to localities) and within multinational federations. In a federation of countries, such as the European Union, consider the central (EU) government to be the “national government” with the countries’ governments being “subnational” for sake of the present exposition.

5 Considerations such as equalization across regions are thus implicitly absent from this work. Thankfully, Mieszkowski and Musgrave (1999), Nechyba (1996), and others are exploring some of these issues.

6 Volden (2005) analyzes a game of intergovernmental political competition in which both the national and subnational governments face the choice of whether to provide the good or not. That paper also examines the
whether to leave the provision of education to states and localities or to offer a grant to increase
the number of teachers and reduce class sizes, whether to provide a welfare program directly or
fund it through subnational governments, whether to engage in environmental cleanup or to leave
such cleanup decisions to the subnational levels.

If the national government takes no involvement in the provision of the good, the
subnational government is left to choose a quantity of good provision \( (q_s) \) and the direction that
the policy should take in that program area \( (y) \). This policy direction is simplified to be a choice
on a one-dimensional policy line, with the subnational government potentially having a different
ideal policy than the national government. If the national government decides to provide the
good jointly with the subnational government, the national and subnational governments
sequentially choose the quantities of the good they each wish to provide. The subnational
government is still allowed to dictate the policy direction.\(^7\)

If the national government decides instead to offer an intergovernmental grant, it must
choose the size of the grant \( (g) \), and may place conditions on the grant in terms of the policy
direction \( (y) \).\(^8\) The subnational government can then choose to accept or reject the grant, given
its policy restrictions. If the subnational government accepts the grant, it chooses the quantity of
the good it will provide given revenue from the grant and any taxes it chooses to raise. If the

\( \) possibility of multiple subnational governments under a single national federal government. It does not, however,
explore the possibility of intergovernmental grants.

\(^7\) Perhaps a more accurate reflection of the world would allow the policy position to be a convex combination of the
preferences of the national and subnational governments, in proportion to their involvement in the policy area. Such
an assumption does not allow closed-form solutions below. For the purposes of the present paper, it is important
that the intergovernmental grant case allow the national government to place additional “strings” or restrictions on
the policy position above and beyond what is found in the joint provision case. This can easily be assured by
allowing the subnational government to choose the policy position in the joint provision case. An alternative
assumption that \( y \) is placed a fixed distance between the national and subnational ideal points yields substantively
similar results.

\(^8\) Here the intergovernmental grant is assumed to be a lump-sum grant. Future work exploring the differences
between the use of block and matching grants within the context of the present model may be quite fruitful.
As described above, the politicians in these two levels of government are essentially representative agents of their constituents. They benefit from providing popular goods, from keeping taxes low, and from choosing a policy direction reflecting their preferences. Specifically, the utility equations for the subnational and national governments, respectively, are as follows:

\[ U_s = (q_s + q_n) f_{C,S} d - (t_s + t_n)^2 f_{B,S} - |y - x_s| \]

\[ U_n = (q_s + q_n) f_{C,N} d - (t_s + t_n)^2 f_{B,N} - |y - x_n| \]  

(Equations 1a and 1b)

The first term in each of the utility equations captures the credit received by the governments for providing the good. The amount of credit is increasing in the total quantity \((q_s + q_n)\) provided and in the level of public demand \((d)\) for the good. The credit is divided between the subnational and national governments, with \(f_{C,S}\) being the fraction of credit going to the subnational government and \(f_{C,N}\) being the fraction going to the national government. The second term in each utility equation captures the blame associated with taxation. The amount of blame is increasing in the square of the level of total taxation \((t_s + t_n)\), giving a large negative utility for over-taxation. Again, the blame is divided among the two governments, with the fraction \(f_{B,S}\) going to the subnational government and the fraction \(f_{B,N}\) going to the national government. In combination, the credit and blame terms reflect the scenario in which there is an ideal level of program spending somewhere between zero and infinity. At this ideal level, any
less spending would give a net disutility from less credit for the good provision and any greater spending would give a net disutility from over-taxation.  

The final term in each utility equation captures the disutility associated with taking a policy direction other than that desired by the government.  Each government has an ideal policy position on the one-dimensional line, $x_S$ for the subnational government and $x_N$ for the national government. The governments receive greater utility for policy outcomes ($y$) closer to these ideal points. For simplicity and without loss of generality, I assume that $x_N \geq x_S = 0$. 

As shown in Figure 1, the choice variables involve the quantities of goods provided, the policy direction, and the grant size. The choice of taxation levels comes about through a balanced budget assumption – taxes are raised to be just enough to provide the desired quantity of good or level of intergovernmental grant. Specifically, in the model, goods are assumed to have constant marginal (per unit) costs, which may differ between the state ($m_S$) and national governments ($m_N$), depending on their abilities at providing the specified goods or services. 

Program costs are paid for through taxes, such that, for the national government $t_N = \frac{m_N q_N}{\alpha_N}$, and for the subnational government $t_S = \frac{m_S q_S}{\alpha_S}$. The $\alpha$ terms ($0 < \alpha \leq 1$) capture the efficiency at which the governments are able to raise taxes. For $\alpha = 1$, the government is able to raise taxes at a perfectly efficient rate. Lower values indicate inefficiency, such as with government waste or drags on the economy due to taxation or other limitations in abilities or tax capacity. The

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9 Clearly, other utility functions could be used to reflect these properties. These are used for ease of explanation and model tractability.
10 By simply adding this policy-based term to the utility equation, I am implicitly assuming that the public’s credit and blame decisions are separable from the direction of the policy chosen. While this may not perfectly reflect reality, it does seem clear that politicians are able to claim credit for such outcomes as environmental cleanup and educational progress even if they do not choose the optimal sites to clean or subjects to teach. What this utility equation does allow, however, is some loss associated with not reflecting constituent policy preferences perfectly.
model allows for a distinction between the national and subnational governments in their abilities to raise taxes and to provide goods cheaply.

For the case of an intergovernmental grant \((g > 0)\), the quantity of the good provided directly by the national government is zero \((q_N = 0)\), and the level of taxation by the national government is simply based on the amount of the grant: \(t_N = \frac{g}{\alpha_N}\). The subnational government receiving the grant thus does not need to raise as much in taxes. Its balanced budget equation therefore becomes: \(t_s = \frac{m_s q_s - g}{\alpha_s}\). In deriving with the utility equations below, these taxation levels are thus inserted into Equations 1a and 1b.

The game is solved for a subgame perfect equilibrium, accomplished through backwards induction. The following three sections explore each of the three subgames that follow from the national government’s choice of funding mechanism. Once those are solved, the initial choice by the national government is examined.

**No National Provision Subgame**

In the first subgame, only the subnational government provides the good, without the aid of an intergovernmental grant. In doing so, the subnational government receives full credit for spending, full blame for taxation, and the ability to set the policy direction. We therefore focus on the utility of the subnational government, as given in Equation 1a, now with \(f_{C,S} = 1, f_{B,S} = 1, q_N = 0,\) and \(t_N = 0\). Thus, the subnational government is attempting to maximize:

\[
U_{S|\text{No national provision}} = q_S d - t_s^2 - |y|. \tag{2}
\]

\(^{11}\) Goal conflict between the national and subnational government (Nicholson-Crotty 2004) thus occurs in this model where \(x_s\) is large.
Given the balanced budget assumption, the level of taxes can be expressed in terms of the fixed and marginal costs, and relative tax efficiency, as described above. This yields:

\[ U_{S|NNP} = q_s d - \left( \frac{m_s q_s}{\alpha_s} \right)^2 - |y| \]  

(3)

The subnational government is attempting to maximize its utility with its choice of quantity of good provision \((q_S)\) and policy outcome \((y)\). Utility is maximized when:\(^\text{12}\)

\[ y = y^*_NNP = 0, \quad q_s = q^*_S\text{NNP} = \frac{d \alpha_s^2}{2 m_s^2}. \]

As might be expected, the subnational government chooses the policy direction at its ideal point, and chooses a level of good provision that is increasing in public demand and tax efficiency, while decreasing in marginal program costs. These optimal choices yield a utility for the subnational government of:

\[ U^*_{S|NNP} = \frac{d^2 \alpha_s^2}{4 m_s^2}. \]  

(4)

The national government receives no credit or blame in this subgame, but does experience some disutility from the policy choice away from its ideal point. Thus:

\[ U^*_{N|NNP} = -x_N. \]  

(5)

**Joint Provision Subgame**

In this subgame, both the national and subnational governments provide the good and seek credit for its provision. I assume that the governments receive credit and blame in

\(^{12}\) All derivations are given in the appendix.
proportion to their quantities provided and their levels of taxation, respectively. Thus

\[ f_{C,S} = \frac{q_S}{q_S + q_N}, f_{C,N} = \frac{q_N}{q_S + q_N}, f_{B,S} = \frac{t_S}{t_S + t_N}, f_{B,N} = \frac{t_N}{t_S + t_N} \]

must be inserted into Equation 1.

Along with the balanced budget constraints, \( t_N = \frac{m_N q_N}{\alpha_N} \) and \( t_S = \frac{m_S q_S}{\alpha_S} \), the utilities for the joint provision (JP) of the good become:

\[ U_{S|JP} = q_S d - \left( \frac{m_S}{\alpha_S} q_S + \frac{m_N}{\alpha_N} q_N \right) - |y|, \]

\[ U_{N|JP} = q_N d - \left( \frac{m_N}{\alpha_N} q_N + \frac{m_S}{\alpha_S} q_S \right) - |y - x_N|, \quad \text{(Equations 6a and 6b)} \]

The game assumes that the national government acts first in choosing its quantity of good provision, and that the policy position choice is left to the subnational government, as explained above. Thus the maximization of utility is found through backwards induction based on the first order conditions, as shown in the appendix. Assuming fairly equivalent abilities in raising taxes and in program costs \( \left( \frac{m_N}{2 \alpha_N} < m_S < \frac{3 m_N}{2 \alpha_N} \right) \), both levels of government will join in provision. The equilibrium solution is given by the following:

\[ y = y^{*}_{JP} = 0, \quad q_S = q^{*}_{S|JP} = \frac{d \alpha_S (3 m_N \alpha_S - 2 m_S \alpha_N)}{4 m_N m_S^2}, \quad q_N = q^{*}_{N|JP} = \frac{d \alpha_N (2 m_S \alpha_N - m_N \alpha_S)}{2 m_S^2 m_N}. \]

By looking at comparative statics, we can see how the quantities of the good provided by the national and subnational governments change under varying conditions. Three relations are

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13 This assumption of accurate assessment of credit for good provision thus differs from Bednar (2004) who explores the effects of uncertainty on the part of voters regarding which level of government should receive credit for good provisions. Alternative assumptions biasing credit or blame assignment toward the national or subnational government yield substantively similar results to those presented below, as long as blame increases in some proportion to taxation and credit increases in some proportion to quantity provided by the respective governments.

14 Where the subnational marginal costs are below this range, it is only beneficial for the subnational government to engage in provision. Likewise, for subnational costs above this range, only the national government will find good
worth noting. First, both levels of government provide greater quantities of more highly
demanded goods, because they receive more political credit for doing so. Second, each level of
government provides a greater amount of the good when its own costs of provision decline and
when the other level’s costs rise. This means that, in competition with one another, each
government seeks to expand its good provision (and thus the credit it receives) when it gains a
comparative advantage. Third, similarly, each level of government provides a greater quantity
when its own tax efficiency rises and when the other government’s efficiency declines. All of
these findings are as we might expect.

Inserting the chosen quantities and policy outcome into the utility equations yields:

\[ U_{SJP}^* = \frac{d^2 \left( 3 m_N \alpha_S - 2 m_S \alpha_N \right)^2}{16 m_N^2 m_S^2}, \]

\[ U_{NJP}^* = \frac{d^2 \left( 2 m_N \alpha_N - m_N \alpha_N \right)^2}{8 m_N^2 m_S^2} - x_N. \]  

(Equations 7a and 7b)

**Intergovernmental Grant Subgame**

In the third subgame, the national government offers a grant to the subnational
government, which comes with strings attached in terms of restrictions on the policy direction
chosen. Again, credit and blame are associated with the relative roles that the national and
subnational governments play in good provision and taxation. Specifically, I assume:

\[ f_{C,N} = \frac{g}{m_S q_S}, \quad f_{C,S} = 1 - \frac{g}{m_S q_S}, \quad f_{B,N} = \frac{t_N}{t_S + t_N}, \quad f_{B,S} = \frac{t_S}{t_S + t_N}. \]

As before, the blame for taxation is divided relative to the levels of taxation. The credit
for good provision is divided in proportion to the size of the grant (g) and the total spending by

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provision beneficial. This latter case is set aside here as we are focusing on policy areas with a substantial
the subnational government \((m_S q_S)\). The levels of taxation reflect the balanced budget conditions: \(t_N = \frac{g}{\alpha_N}\) and \(t_S = \frac{m_S q_S - g}{\alpha_S}\). Inserting these equations into Equation 1 yields:

\[
U_{S|G} = \left( q_S - \frac{g}{m_S} \right) d - \left( \frac{m_S q_S - g}{\alpha_S} \right) \left( \frac{m_S q_S - g}{\alpha_S} + \frac{g}{\alpha_N} \right) - |y|
\]

\[
U_{N|G} = \left( \frac{g}{m_S} \right) d - \left( \frac{g}{\alpha_N} \right) \left( \frac{m_S q_S - g}{\alpha_S} + \frac{g}{\alpha_N} \right) - |y - x_N| \quad \text{(Equations 8a and 8b)}
\]

The order of play in this subgame is such that the national government first offers a grant size \(g\) and policy proposal \(y\) to the subnational government. Then the subnational government decides whether to accept or reject the intergovernmental grant. If it accepts the grant, then it decides what quantity of the good to provide. If it rejects the grant, then it plays an identical subgame to the “no national provision subgame” described above.

This game is solved through backwards induction. Beginning with the grant acceptant subgame, the optimal choice of quantity is:

\[
q_S = q_{S|G}^* = \frac{d}{\alpha_N} \frac{\alpha_S^2 + g m_S (2 \alpha_N - \alpha_S)}{2 m_S^2 \alpha_N}
\]  

(9)

This is \(\frac{g (2 \alpha_N - \alpha_S)}{2 m_S \alpha_N}\) units greater than the quantity of good provided in the absence of any national government involvement.\(^{15}\) This equation gives the first insight into the role of intergovernmental grants in the model:

**Proposition 1:** The quantity of goods provided by a grant-receiving government increases in proportion to the size of the grant received. The effect of the grant is greater in regions where the costs of good provision are low and where the subnational government is inefficient in raising taxes, relative to the national government.

\(^{15}\) This is an increase as long as \(\alpha_S < 2 \alpha_N\), a reasonable assumption. As we see below, no grants are offered and accepted over the range where this assumption is not met.
Proof: Proofs of all propositions are given in the appendix.

This proposition indicates that recipient governments will differ in the effect that grants have on their levels of good provision depending on characteristics of taxation and costs within their regions. Subnational governments that can provide the good quite cheaply \((m_S \text{ low})\) will be able to provide more of the good in response to the intergovernmental grant. Those governments that have difficulty raising taxes on their own \((\alpha_S \text{ low})\) will respond very favorably to the grant, increasing good provision greatly. This is because they were previously limited in their level of good provision due to their inability to raise taxes effectively. If they wish to receive a substantial portion of credit upon receipt of the grant, they cannot cut back own-source spending too dramatically.

Inserting the optimal choice of quantity from Equation 9 into the subnational government’s utility Equation 8a yields:

\[
U^*_{S|G} = \left( \frac{g m_S - d \alpha_N \alpha_S}{m_S \alpha_N} \right)^2 - |y| \tag{10}
\]

The subnational government will accept the grant as long as this utility exceeds that from the subgame with no national provision described above. As derived in the appendix, the grant is accepted as long as:

\[
|y| \leq y^*_{\text{Accept grant}} = \frac{g (g m_S - 2 d \alpha_N \alpha_S)}{4 m_S \alpha_N^2} \tag{11}
\]

Analyzing this finding yields the following proposition:

**Proposition 2:** All else equal, subnational governments will accept grants when: \(a\) the policy constraints imposed in grant conditions are small, \(b\) the size of the grant is large, \(c\) the subnational government is not able to raise taxes efficiently, \(d\) costs of good provision are large, and \(e\) public demand is low.
Parts of this proposition are quite intuitive. When the grant comes with very few restrictions or when the grant is large relative to program costs, then the subnational government will accept the grant. Furthermore, because they are unable to provide a substantial level of the good on their own, subnational governments that have difficulty raising tax revenue will be especially eager to accept the revenue provided by the national government, as will those governments facing large costs for good provision. Finally, public demand plays an interesting role here. Subnational governments may turn down grants for programs that are highly demanded, because they do not wish to share the credit for their provision with the national government.

We now step backwards in the game to the national government’s decision about the grant size to offer and the policy mandate to attach to the grant. Given the constraint imposed by Equation 11, there are five conditions to consider. First, it may be the case that any grant that the national government is willing to offer will not be acceptable to the subnational government. Second, the constraint from Equation 11 may be binding, with the policy direction chosen at the subnational government’s ideal point (\(y = 0\)). Third, the constraint may be binding with the policy direction chosen between the two governments’ ideal points. Fourth, the constraint may be binding with the policy chosen at the national government’s ideal point (\(y = x_N\)). Finally, when the national government’s ideal point is close to the subnational government’s and the national government desires to offer a large grant, the constraint is no longer binding. These five cases occur under the following conditions, and are described in order below.
\[
\begin{align*}
\text{Case I} & \quad \text{if } \alpha_N < \frac{3\alpha_S}{2} \\
\text{Case II} & \quad \text{if } \frac{3\alpha_S}{2} \leq \alpha_N \leq 2\alpha_S \\
\text{Case III} & \quad \text{if } 2\alpha_S < \alpha_N < \frac{3\alpha_S}{2} + \sqrt{\frac{4}{m_S^2} x_N + \frac{d^2}{\alpha_S^2}} \quad \text{and} \quad x_N > y^* \text{ Accept grant} \\
\text{Case IV} & \quad \text{if } 2\alpha_S < \alpha_N < \frac{3\alpha_S}{2} + \sqrt{\frac{4}{m_S^2} x_N + \frac{d^2}{\alpha_S^2}} \quad \text{and} \quad x_N \leq y^* \text{ Accept grant} \\
\text{Case V} & \quad \text{if } \frac{3\alpha_S}{2} + \sqrt{\frac{4}{m_S^2} x_N + \frac{d^2}{\alpha_S^2}} \leq \alpha_N
\end{align*}
\]

**Case I: No grant.**

Unless the national government is substantially more effective at raising tax revenue, states and localities will not look to the national government for intergovernmental grants in this model. Even grants with no strings attached are not desired by the subnational government unless they are sufficiently large. With \( \alpha_N < \frac{3\alpha_S}{2} \), it is not in the national government’s interest to offer a substantial enough grant to entice the subnational government to accept the grant and share credit for the program’s success with the national government. This points to an inefficiency that can arise in the model of political competition advanced here. Where the national government is somewhat (although not dramatically) more efficient at raising tax revenue (\( \alpha_S < \alpha_N < \frac{3\alpha_S}{2} \)), it would make sense for the national government to generate revenue and share that revenue with the subnational government. The quest for political credit, however, limits the desire of politicians to engage in such cooperative behavior. Nevertheless, as the following cases illustrate, such apparent cooperation arises when the national government is substantially more efficient in raising taxes.

**Case II: Constraint binding, \( y = 0 \).**
In this case, with $\frac{3\alpha_s}{2} \leq \alpha_N \leq 2\alpha_s$, the national government is able to raise tax revenue more effectively than the subnational government. However, the optimally sized intergovernmental grant from the national government’s point of view would not be acceptable to the subnational government. Instead, in order to entice the subnational government to accept the grant and share credit for the good provision, the national government must offer a sizable grant with no strings attached. The grant size is chosen to be just large enough to entice the subnational government to accept it instead of providing the good on its own, as specified in the constraint of Equation 11. Specifically, the grant size is $g^* = \frac{2 d \alpha_N \alpha_s}{m_s}$, leading to a subnational quantity of $q_{s[i]}^* = \frac{d \alpha_s \left(4 \alpha_N - \alpha_s\right)}{2 m_s^2}$. The grant size is larger when there is greater public demand for spending in the particular program area, and when the costs of good provision are low. Moreover, the grant is larger upon increases in either national or subnational government tax efficiency. If the national government is able to raise taxes more efficiently, it can pass a more sizable grant on to the subnational government. And if the subnational government is able to raise taxes more efficiently, it is better able to provide the good without intergovernmental assistance, and can thus demand a larger grant.

**Case III: Constraint binding, 0 < y = y^*_{Accept grant} < x_N.**

This case arises where the national government is quite a bit more efficient at raising tax revenue than is the subnational government, and where the two levels of government differ significantly in their desired policy directions. Here, again, the national government offers the smallest grant that the subnational government will accept. However, in this case, the national
government offers a grant with policy strings attached. In equilibrium, the policy direction is selected at \( y^* = \frac{d^2 \left( \alpha_N - 2 \alpha_S \right) \left( \alpha_N - \alpha_S \right)}{m_S^2} \), the grant size is \( g^* = \frac{2 d \alpha_N \left( \alpha_N - \alpha_S \right)}{m_S} \), and the subnational government’s quantity choice is \( q_{s|g}^* = \frac{d \left( 4 \alpha_N^2 - 6 \alpha_N \alpha_S + 3 \alpha_S^2 \right)}{2 m_S^2} \).

The federal mandate on the policy direction in this case is more substantial when public demand for the good is greater, when the good can be provided at a lower cost, and when the tax efficiency of the national government is high relative to that of the subnational government. These are the same conditions that lead to a larger grant – as the policy constraints must be coupled with financial incentives in order to ensure the subnational government’s acceptance.

**Case IV: Constraint binding, \( y = x_N \).**

This is the final case in which the constraint of Equation 11 is binding. Once again, the grant size is chosen to make the subnational government just indifferent between accepting and rejecting the intergovernmental grant. In this case, however, the national government is able to dictate the policy direction perfectly to its ideal policy. To do so, it needs to provide a substantial grant, of size \( g^* = \frac{\alpha_N \left( d \alpha_S + \sqrt{4 m_S^2 x_N + d^2 \alpha_S^2} \right)}{m_S} \). This entices the subnational government to provide the following quantity of the good in equilibrium:

\[
q_{s|g}^* = \frac{2 d \alpha_N \alpha_S + (2 \alpha_N - \alpha_S) \sqrt{4 m_S^2 x_N + d^2 \alpha_S^2}}{2 m_S^2}
\]

As in Case II, here the grant size is larger when public demand is high, when program costs are low, and when tax efficiency is high for either level of government. Moreover, the grant is larger when the national and subnational governments’ policy preferences differ more substantially.
from one another. In order to entice the subnational government to accept the grant that moves the policy direction to the national government’s ideal point, a larger grant must be offered.

**Case V: Constraint not binding, y = x_N.**

This final case occurs where the national government is significantly more efficient in its tax raising abilities than is the subnational government, and when the policy preferences of the two levels of government are not too divergent from one another. Under these conditions, the national government selects its optimal level of grant provision to maximize its utility (credit minus blame) from providing the grant. Because the national government is far more effective at raising taxes, the grant size is substantial enough to be attractive to the subnational government, despite the policy constraints imposed. Specifically, in equilibrium, the grant size is

\[
g^* = \frac{d}{2} \frac{\alpha_N \left(2 \alpha_N - \alpha_S\right)}{\alpha^2},
\]

and the subnational government’s resultant quantity provided is

\[
q^*_{s|G} = \frac{d}{4} \frac{\left(4 \alpha_N^2 - 4 \alpha_N \alpha_S + 3 \alpha_S^2\right)}{\alpha^4}.
\]

As in Case III, grants are larger when public demand is high, when program costs are low, when the national government is relatively more effective at raising taxes, and when the subnational government is relatively less effective at raising taxes.

Taken together, these cases give us some insight into the size of intergovernmental grants:

**Proposition 3:** All else equal, grant size will be larger when: (a) public demand for spending on the good is high, (b) costs of good provision by the subnational government are low, and (c) the national government is able to raise taxes efficiently.

It makes sense that the national government would provide a larger grant in areas highly desired by the public. This would be a good opportunity for national-level politicians to gain
political credit. Likewise, when the subnational government is able to provide the good effectively (at a low cost), more substantial grants are offered in order to get a larger “bang for the buck.” Larger grants are also given when the national government can raise revenue effectively. Taken as a whole, these appear to be a form of “cooperative federalism” (Elazar 1962, 1966; Grodzins 1966). The national government, in a better position to raise taxes, offers substantial grants to states and localities that are in a better position to provide goods and services at low cost. Yet there is no assumption that the politicians in this model are in any way cooperative. Rather such behavior is a product of competitive forces, with each level of government seeking credit from good provision and trying to limit the blame that comes with taxation. Indeed, even with credit divided between the competing actors here, seemingly “cooperative” behavior results under the same conditions identified in the cooperative federalism literature.

Proposition 3 does not contain comparative statics results for how the grant size changes in response to changing tax efficiency at the subnational level. This is because the effects of such a change vary across the different cases. In Cases II and IV, larger grants are required when the subnational government’s tax efficiency is high, in order to entice this government to accept the grant instead of providing the good on its own. In Cases III and V, however, larger grants are given when the subnational government’s tax efficiency is low. In Case V, this is done as an attempt to gain a larger portion of the credit for the good provision. In Case III, the lower subnational tax efficiency allows the national government to place a greater restriction on the policy direction chosen, but such a restriction must be coupled with a larger grant to remain acceptable to the subnational government.
The equilibrium results within Case III, as well as across these cases, help us understand the nature of federal mandates attached to intergovernmental grants.

**Proposition 4:** All else equal, mandates on grant recipients are more restrictive when: (a) public demand for spending on the good is high, (b) costs of good provision by the subnational government are low, (c) the national government is able to raise taxes efficiently, and (d) the subnational government is not able to raise taxes efficiently.

In Proposition 3, we found that larger grants are offered when public demands are high, when marginal costs are low, and when the national government is able to raise taxes efficiently. Because larger grants are more attractive to subnational governments, these same conditions allow more restrictive mandates to be attached to these larger grants. In addition, when the subnational government is not able to raise revenue effectively on its own, it finds intergovernmental grant revenue more attractive. National politicians are able to exploit this desire for grant revenue by imposing greater policy restrictions on the subnational government. Finally, in Cases IV and V, the policy restrictions are greater as the policy preferences of the national government diverge from those of the subnational government.

**National Government’s Funding Mechanism Choice**

Having resolved the choices made in each of the subgames, we can now take a step backward in the game to determine whether the national government would prefer no national provision of the good, joint provision of the good with the subnational government, or funding through an intergovernmental grant. This choice is made through a determination by the national government as to which of these three options will yield the highest utility. As calculated in the appendix, the national government chooses its funding mechanism based on the following conditions:
where $m_N$ is characterized as being “large” or “small” relative to the other parameters depending on the various cases of grant provision noted in the section above. These broad conditions can be summarized informally as follows:

**Proposition 5:** The national government will leave good provision to the subnational government when it can neither effectively raise taxes nor cheaply provide goods and services, relative to the abilities of the subnational government. The national government will provide goods directly when it is effective at raising taxes and providing goods cheaply, relative to the subnational government’s abilities. And the national government will provide intergovernmental grants when it is able to raise taxes effectively but not able to provide goods as cheaply as the subnational government.

The components of this proposition are quite straightforward. Put simply, the national government does most what it does best. If the national government has a comparative advantage in neither taxation nor good provision, it lets the subnational government provide the goods and services by itself. When it has a comparative advantage in both of these areas, however, the national government provides the good directly. And when it has a comparative advantage only in effectively raising tax revenue, it provides the good through an intergovernmental grant to the states or localities. While this overall behavior mimics that proposed by scholars of cooperative federalism, it is actually produced through non-cooperative
means. Politicians at each level of government are interested in receiving credit from providing goods and services and limiting the blame they face from taxation. These simple goals lead to the fairly efficient, and seemingly “cooperative,” behavior of Proposition 5.

**Implications of the Model**

Scholars of federalism have raised a variety of interesting questions about the use of intergovernmental grants. For example, why do grants have greater effects on recipient government spending in the targeted program area than would an equivalent increase in tax revenue? Why do recipient governments seem to cut program spending by less when faced with a declining grant than by the amount they raise spending upon a grant increase? Under which conditions do recipient governments accept grants in the first place? The following subsections explore these questions, explaining how the model advanced in this paper gives insight in these areas and may be empirically tested in the future.

**The flypaper effect**

Initially studied through standard indifference curve analyses in economics (Scott 1952, Wilde 1971), intergovernmental grants were perceived to affect the budget constraints of recipient governments in ways similar to an increase in tax revenue at that level of government. Therefore, it was expected that grant revenues would simply reduce own-source revenues in the given program area, allowing across-the-board spending increases or tax cuts. However, even early empirical work, such as that summarized by Gramlich (1977), showed that recipient governments were not treating grant revenues in the same fashion as additional tax revenue. Rather, governments receiving grants in a particular program area would increase funding of that
area, perhaps not by the entire amount of the grant, but by substantially more than expected by economic theorists. This finding was deemed the “flypaper effect,” that grant funds stuck where they hit. Numerous scholars have attempted to explain the flypaper effect theoretically, and empirically to isolate the conditions under which it is strong.

Bailey and Connolly (1998) summarize the theoretical and empirical work on the flypaper effect. They note ten existing theoretical explanations of the flypaper effect that fall into two broad categories. The first category entails complexities in the public policy process. The flypaper effect may arise due to the institutional structure of recipient governments, agenda setting, uncertainty, fiscal illusion, and other details of decision-making (Aronson and Munley 1996, Dougan and Kenyon 1988, Fossett 1990, Romer and Rosenthal 1980, Schneider and Ji 1987). The second category of explanations relies on the fact that grants often require specific funding choices, such as the non-substitution of grant funds for own-source revenues, which may be monitored by the granting government (Chubb 1985). Empirical analysis lends support to some of these theories, and generally shows that the existence and size of the flypaper effect vary across institutional settings and over time (Becker 1996; Benton 1992; Filimon, Romer, and Rosenthal 1982; Ladd 1993; Romer, Rosenthal, and Munley 1992; Wyckoff 1991). This variance has not been explained systematically.17

The model presented above may shed some light on when and where the flypaper effect might occur.18 In the simplest sense, recipient governments are shown in Proposition 1 to differ

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16 Of course, matching and block grants would differ in their effects.
17 But see Strumpf’s (1998) attempt to explain variation across communities based on administration overhead expenditures and Becker and Mulligan’s (2003) explanation based on deadweight costs.
18 One potential limitation of this model in explaining the flypaper effect is its focus on spending decisions in a single program area. The flypaper effect is often described in terms of whether grant funds are spent in the targeted program area, in other areas, or in tax cuts. Here the only possibilities are spending in the given program area or decreasing taxes. While this may be viewed as a limitation, one can think of the taxation term as implicitly accounting for desired spending in other program areas. Just as with the program area under examination, spending in other areas is selected at the point that makes the government indifferent between greater spending and lower
in their responses to intergovernmental grants. In particular, upon the receipt of a grant of size $g$, the recipient government increases its quantity of good provision by

$$\frac{g \left( 2 \alpha \gamma - \alpha_\gamma \right)}{2 m_5 \alpha_{\gamma}}.$$  

Were every dollar of the grant spent to provide additional goods, at a marginal cost of $m_5$, then the quantity would increase by $\frac{g}{m_5}$, which would only occur in the model for $\alpha_\gamma = 0$. Thus, the model shows that the flypaper effect is expected to be strongest where the recipient government is unable to efficiently raise taxes ($\alpha_\gamma$ low), and weakest in subnational governments with the greatest tax efficiency, relative to the government giving the grant. Because subnational governments’ abilities to raise taxes can be assessed empirically (as Berry and Fording 1997 do for state governments), scholars should be able to examine this explanation of the flypaper effect systematically across subnational governments.

For example, we might anticipate a larger flypaper effect for grants from the federal government with its massive tax base to poor localities than we would for grants from a state to its largest city. Hines and Thaler (1995) list a number of studies in which the flypaper effect was found. Their list is reconfigured here as Table 1. Although more thorough empirical analysis is desirable in the future, the results of the table are largely consistent with the predictions of the above model. The most sizable flypaper effect, increasing spending by $1.06$ per grant dollar, was found for a federal grant to West Virginia school districts. The smallest effect was for state and federal grants to large urban governments. Clustered between 0.40 and 0.65 are grants from the federal government to the states or from state governments to localities, as we might expect.

[Insert Table 1 about here]

taxes. As such, the conditions under which grant funds would be diverted to other program areas are the same ones that lead to decreased taxes in the present model.
In a more complex sense, however, the *appearance* of the flypaper effect may result under a variety of conditions in the model. According to Proposition 3, the donor government increases its grant size under a variety of conditions, such as when demand for the good increases. A number of these conditions correspond to those that would cause the subnational government to increase its spending even in the *absence* of an increased grant. For example, given an increase in public demand, or given a decrease in the marginal costs of good provision by the subnational government, the quantity of goods provided increases (even in the absence of a grant) *and* the grant size increases. This would give the appearance of a flypaper effect, even though the increase in the good provision would have occurred without the grant.\textsuperscript{19} Under other conditions, such as a decline in the tax efficiency of the subnational government, the grant might increase while the subnational government’s spending decreases. Under such conditions, less of a flypaper effect would be detected.\textsuperscript{20}

*Asymmetric responses to grants*

With the federal government in the United States running deficits throughout the 1970s and 1980s, a variety of federal grants to states and localities were reduced, at least relative to inflation. A number of scholars found that, for many of these program areas, recipient governments replaced lost funds with their own revenues (Forrester and Spindler 1990, Stonecash 1990, Stotsky 1991). Students of federalism started to speculate that there may be an “asymmetric response” to grant increases and decreases (Oates 1999). The flypaper effect may cause a dramatic increase in spending upon receipt of a grant that is not similarly offset upon the

\textsuperscript{19} Careful and clever econometric analyses may be able to isolate each of these effects, if the relevant variables are available and able to be accurately measured. Knight (2002) provides a promising step in this direction.

\textsuperscript{20} This argument is somewhat similar to that advanced by Brennan and Pincus (1996) who make predictions about the flypaper effect given an endogenous choice of grant conditions by the federal government.
removal of a grant. Just as with the flypaper effect, scholars attempted to determine when and why such an asymmetry might occur. Stine (1994) explores the response of local governments in Pennsylvania, finding mixed support for the asymmetry hypothesis. Gamkhar and Oates (1996) question Stine’s approach and find no asymmetries across broad categories of grants. With regard to specific grant programs, Volden (1999) finds asymmetries under the AFDC welfare program linked to bureaucratic strength in the states, and Gamkhar (2000) finds asymmetrical responses to changing highway funding grants. This initial evidence points to the possibility that, as with the flypaper effect, the asymmetrical effects of grants might be specific to certain programs and conditions under which grant sizes change.

The present theory complements such an empirical finding. As suggested above, conditions such as changing public demand and costs of provision might cause grant sizes and recipient government spending to rise in concert with one another. Other conditions, such as changes in the tax efficiency of the subnational government, may lead grant and other spending pressures to move in opposing directions. Therefore, if a grant program is established or expanded in response to increased public demand in a given program area, but cut back or abandoned in response to a decrease in the national government’s relative ability to raise taxes, then such an asymmetric response to changing grant conditions might occur. This may correspond to the finding of grant increases for popular programs in the 1960s and 1970s that were cut back in the face of federal deficits in the 1970s and 1980s (Stonecash 1990, Weaver 1996). On the other hand, a reverse of such reasons for grant changes could result in the appearance of no spending rises associated with grant increases and dramatic spending cuts associated with declining grants, similar to Stine’s (1994) finding of Pennsylvania counties’ responses to federal government aid.
**The grant acceptance decision**

In addition to explaining behavior upon grant receipt, students of federalism seek to understand when governments apply for and receive grants in the first place. While many grants are quite beneficial and accepted by all subnational governments, other grants come with very costly regulations, mandates, and restrictions. Scholars have explored both economic and political reasons for recipient government choices. In his explanation of the flypaper effect, Fossett (1990) suggests that the uncertainty of whether grant funding will endure leads recipient governments to spend on the targeted program area rather than shifting funding priorities or cutting taxes, which may have to be adjusted back at great political cost when the grant funding is removed. Similarly, Stein (1984) speculates that such uncertainty may lead local politicians to be wary of grant funding in the first place, especially with regard to enhancing municipal public employment.

When this uncertainty is coupled with mandates and restrictions, it is not surprising that many potential grants go unclaimed. For example, there were a number of states that initially did not participate in the AFDC welfare program grants due to federal restrictions. More recent grants, such as those to place 100,000 new police officers onto America’s streets and 100,000 new teachers into America’s classrooms, were accepted by only a limited number of cities and school districts. A curious set of questions involve which subnational governments apply for such grants and why. Choi, Turner, and Volden (2002) ask these questions with a focus on the Community Oriented Policing Services (COPS) program. The present model gives some insight generally.
As shown in Proposition 2, there are a number of conditions that make grants more attractive to subnational governments. Of course, larger grants and those that impose fewer policy restrictions are attractive. Additionally, subnational governments that are inefficient at raising taxes are more likely to seek and accept grants. Cities, states, school districts, and so on that do not have a substantial tax base or an ability to raise revenue effectively will under-fund desired activities. Therefore, they will desire intergovernmental grants in order to increase their provision of government services and goods. As described above, these are precisely the types of subnational governments that increase their spending the most upon receipt of grants.

Moreover, those subnational governments with high costs and low public demand are more likely to accept intergovernmental grants. Regarding costs, for example, those cities with the highest costs for providing new police officers and those school districts with the largest teacher salaries will be more likely to accept grants for police and teachers, respectively, because they face the greatest need of grant funds. Taken together, these conditions describe how generalized and optional grant programs, in and of themselves, might be effective at targeting needy subnational governments. The subnational governments that are most likely to seek grants are often those most in need of grants – those that are limited in their abilities to raise revenues on their own, and those with the greatest costs of providing goods.

**Tradeoffs between grant size and grant restrictions**

In 1996, when Congress was considering how to reform the AFDC welfare program, a number of governors made an interesting proposal. They suggested that they would be willing to accept smaller federal grants if they would be given greater flexibility in structuring their welfare
programs. Given the continued federal deficits at that point in time, this proposal appealed to national politicians as well.

Such a coupling of a smaller grant with fewer federal mandates fits well with the model advanced above. Unlike the other cases of grant receipt in which the policy direction is set at the ideal points of either the national government or the state government, in Case III of the model a compromise is reached with the mandated policy being somewhere between the directions desired by the two levels of government. In the equilibrium of this case, when the states become relatively more effective at raising their own tax revenue, they desire less restrictive grant conditions, and are willing to accept a smaller grant as a means to achieve this goal. This combination of a lower grant and fewer restrictions is also appealing to the national government in this case, and is even more attractive when the national government is revenue constrained and when the program is declining in terms of public demand. Given the lack of popularity of AFDC in 1996, the continued federal deficits, and rising state revenues, the governors’ proposal was a political winner for both levels of government. With welfare reform, credit could be claimed by both levels of government for any policy success, without additional blame that would have accompanied higher taxes. Early in the current decade, with declining state revenues, governors had been looking to the federal government for additional money, while Congress had been considering additional restrictions to state welfare-to-work programs.

**Conclusion**

This paper advances a model of intergovernmental political competition in which national and subnational politicians seek to claim credit for providing popular goods, to avoid blame for the taxation necessary to pay for such goods, and to advance their policy agendas.
These goals can be accomplished through the direct provision of goods or through the giving and seeking of intergovernmental grants. The model predicts conditions under which national politicians wish to offer intergovernmental grants, rather than leaving policy control solely to the subnational government or providing goods jointly with the subnational government. It specifies the size of such grants offered and the nature of the policy restrictions that the national government places on grants. And it details when subnational governments will seek grants and how their spending levels will be affected by such grants.

The findings of this paper point to the possibility of intergovernmental grants as part of a competitive federalism model, rather than cooperative federalism. Viewing grants in this light may help students of federalism understand where to look empirically for conditions such as the flypaper effect and asymmetric responses to grant increases and decreases. It also enhances our knowledge of the likelihood of subnational governments to seek and accept grants, as well as our understanding of the restrictions and mandates that are placed on such grants.
Appendix

No National Provision Subgame
With no national provision, the subnational government’s utility equation becomes:
\[ U_{S|\text{No national provision}} = q_S \cdot d - \frac{m_S}{\alpha_S} \cdot q_S - |y| \cdot \alpha_S. \]

Inserting the balanced budget equation, \( t_S = \frac{m_S}{\alpha_S} \cdot q_S \), yields:
\[ U_{S|\text{NNP}} = q_S \cdot d - \left( \frac{m_S}{\alpha_S} \cdot q_S \right)^2 - |y| \cdot \alpha_S. \]

The optimal choice of \( y \) is \( y^*_{NNP} = 0 \). For the optimal choice of \( q_S \), we take the first derivative with respect to \( q_S \), set it equal to zero, and solve:
\[ \frac{\partial U_{S|\text{NNP}}}{\partial q_S} = \left( d - \frac{2 m_S^2}{\alpha_S^2} \cdot q_S \right) = 0 \Leftrightarrow q_S = q_S^*_{\text{NNP}} = \left( \frac{d \alpha_S^2}{2 m_S^2} \right). \]

The subnational government’s utility is thus:
\[ U^*_{S|\text{NNP}} = \frac{d^2 \alpha_S^2}{4 m_S^2}. \]

Joint Provision Subgame
Equations 6a and 6b are:
\[ U_{S|JP} = q_S \cdot d - \left( \frac{m_S}{\alpha_S} \cdot q_S \right) \left( \frac{m_S}{\alpha_S} \cdot q_S + \frac{m_N}{\alpha_N} \cdot q_N \right) - |y| \cdot \alpha_S. \]
\[ U_{N|JP} = q_N \cdot d - \left( \frac{m_N}{\alpha_N} \cdot q_N \right) \left( \frac{m_S}{\alpha_S} \cdot q_S + \frac{m_N}{\alpha_N} \cdot q_N \right) - |y - x_N| \cdot \alpha_N. \]

Once again, the subnational government’s optimal choice of \( y \) is \( y^*_{JP} = 0 \).

Solving through backwards induction, we first examine the quantity choice by the state, based upon the given national provision. Thus we examine the first of the above utility equations, maximizing utility based on the choice of \( q_S \). The first order condition is:
\[ d - \frac{m_S}{\alpha_S} \left( 2 \frac{m_S}{\alpha_S} \cdot q_S + \frac{m_N}{\alpha_N} \cdot q_N \right) = 0. \]

Solving this for the choice of \( q_S \) generates:
\[ q_S = \frac{\alpha_S (d \alpha_N \alpha_S - m_N m_S q_N)}{2 m_S^2 \alpha_N}. \]

Taking the next step backward in the analysis, we insert this chosen quantity \( q_S \) into the national government’s utility equation, yielding the following maximization problem:
\[ \max_{q_N} \quad U_N = q_N \cdot d - \left( \frac{m_N}{\alpha_N} \cdot q_N \right) \left( \frac{m_N}{\alpha_N} \cdot q_N + \frac{d \alpha_N}{2 m_S} \cdot \alpha_S - m_N m_S q_N \right) - x_N \cdot \alpha_N. \]

The first order condition for this maximization is:
\[ d - \frac{m_N}{\alpha_N} \left( \frac{m_N}{\alpha_N} \cdot q_N + \frac{d \alpha_S}{2 m_S} \right) = 0. \]

Solving this for the choice of \( q_N \) generates:
\[ q_N = q_N^*_{\text{JP}} = \frac{d \alpha_N \alpha_N (m_S \alpha_N - m_N \alpha_S)}{2 m_N^2 m_S}. \]
Inserting this optimal choice of national government’s quantity back into the state government’s quantity choice yields: \( q_S = q_s^* = \frac{d \alpha_S (3 m_N \alpha_S - 2 m_S \alpha_N)}{4 m_N m_S^2} \).

These choices of quantities are positive under the following conditions.

\[ q_N^* |_{JP} > 0 \iff m > \frac{m_S \alpha_S}{2 \alpha_N} \]

\[ q_S^* |_{JP} > 0 \iff m < \frac{3 m_S \alpha_S}{2 \alpha_N} \]

When these conditions are not met, only one level of government provides the good. Inserting the chosen quantities and policy outcome into the above utility equations yields:

\[ U_S^* |_{JP} = \frac{d^2 (3 m_N \alpha_S - 2 m_S \alpha_N)^2}{16 m_N^2 m_S^2}, \quad U_N^* |_{JP} = \frac{d^2 (2 m_S \alpha_N - m_N \alpha_S)^2}{8 m_N^2 m_S^2} - x_N \].

**Intergovernmental Grant Subgame**

Equations 8a and 8b are:

\[
U_S |_G = \left( q_s - \frac{g}{m_s} \right) d - \left( m_s q_s - \frac{g}{\alpha_S} \right) \left( m_s q_s - \frac{g}{\alpha_S} \right) + \frac{g}{\alpha_N} \right) - |y|, \\
U_N | G = \left( \frac{g}{m_N} \right) d - \left( \frac{g}{\alpha_N} \right) \left( m_s q_s - \frac{g}{\alpha_S} \right) + \frac{g}{\alpha_N} \right) - |y - x_N| .
\]

Through backwards induction we first focus on the quantity decision of the subnational government:

\[ \frac{\partial U_S | G}{\partial q_s} = d - \frac{m_s}{\alpha_N} \left( m_s q_s - \frac{g}{\alpha_S} \right) \left( m_s q_s - \frac{g}{\alpha_S} \right) + \frac{g}{\alpha_N} = 0 \]

\[ \iff q_s = q_s^* = \frac{d \alpha_N \alpha_S^2 + g m_s (2 \alpha_N - \alpha_S)}{2 m_S^2 \alpha_N} .
\]

**Proof of Proposition 1:** The proposition is evident from the following comparative statics:

\[ \frac{\partial q_s^* | G}{\partial g} = \frac{m_s (2 \alpha_N - \alpha_S)}{2 m_S^2 \alpha_N} > 0, \quad \frac{\partial \left( q_s^* | G - q_s^* |_{\text{NPNP}} \right)}{\partial m_s} = -g \frac{2 \alpha_N - \alpha_S}{2 m_s^2 \alpha_N} < 0, \]

\[ \frac{\partial \left( q_s^* | G - q_s^* |_{\text{NPNP}} \right)}{\partial \alpha_N} = \frac{g \alpha_S^2}{2 m_S^2 \alpha_N^2} > 0, \quad \frac{\partial \left( q_s^* | G - q_s^* |_{\text{NPNP}} \right)}{\partial \alpha_S} = -\frac{g}{2 m_s \alpha_N} < 0 .
\]

Returning to the derivation, we insert this optimal quantity choice into the subnational government’s utility equation to yield: \( U_S^* | G = \left( \frac{g m_s - d \alpha_N \alpha_S}{m_S \alpha_N} \right)^2 - |y| \).

The subnational government will accept the grant if this utility level is greater than that received by providing the good without any national governmental help or restrictions, derived above:

\[ U_S^* | \text{No Grant} = U_S^* |_{\text{NPNP}} = \frac{d^2 \alpha_S^2}{4 m_S^2} .
\]

Thus the grant is accepted iff:
Proof of Proposition 2: The grant is accepted when the imposed restrictions are less than \( y^*_{\text{Accept grant}} \).

Comparative statics show where \( y^*_{\text{Accept grant}} \) is large, increasing the range of grant acceptance, all else equal. The proposition is evident from the following comparative statics:

\[
\frac{\partial y^*_{\text{Accept grant}}}{\partial g} = \frac{g m_s - d \alpha_N \alpha_s}{2 m_s \alpha_N^2} > 0, \quad \frac{\partial y^*_{\text{Accept grant}}}{\partial \alpha_s} = -\frac{g d}{2 m_s \alpha_N} < 0, \quad \frac{\partial y^*_{\text{Accept grant}}}{\partial m_s} = \frac{g d \alpha_s}{2 m_s^2 \alpha_N} > 0,
\]

\[
\frac{\partial y^*_{\text{Accept grant}}}{\partial d} = \frac{-g \alpha_s}{2 m_s \alpha_N} < 0.
\]

We now step back to the national government’s choice of grant size and restrictions on the policy direction. There are five cases to explore:

**Case I: No grant offered.**

To determine the range over which no acceptable grant will be offered, we examine the two binding constraints, making each of the governments at least as well off as they would be in the absence of the grant. Above, we derived this constraint for the subnational government, in terms of \( y^*_{\text{Accept grant}} \). Even in the extreme case where \( y = 0 \), the subnational government will still only accept grants that are sufficiently large: \( g \geq \frac{2 d \alpha_N \alpha_s}{m_s} \). At the minimal grant level satisfying this equation, the subnational government’s chosen quantity is:

\[
q^*_{s|g} = \frac{d \alpha_N \alpha_s}{2 m_s^2 \alpha_N} + g m_s \left(2 \alpha_N - \alpha_s\right) = \frac{d \alpha_s \left(4 \alpha_N - \alpha_s\right)}{2 m_s^2}.
\]

Inserting these values for the policy direction, grant size, and quantity choice into the utility equation for the national government yields:

\[
U_N = \frac{d^2 \alpha_s \left(2 \alpha_N - 3 \alpha_s\right)}{m_s^2} - x_N.
\]

This value only matches or exceeds that in the no grant case

\[
(U^*_N)_{\text{nnp}} = -x_N
\]

where \( \alpha_N \geq \frac{3 \alpha_s}{2} \). For \( \alpha_N \) below this value, no grant can be offered that the subnational government will accept.

**Case II: Constraint binding, \( y = 0 \).**

For \( \alpha_N \geq \frac{3 \alpha_s}{2} \), the national government can offer an attractive grant to the subnational government.

Over the range of values in Case II, the policy direction is set at \( y = 0 \), the grant size is the smallest that is
acceptable to the subnational government $g^* = \frac{2 \alpha_N \alpha_N}{m_S}$, and the quantity chosen is

$$q_{s|g}^* = \frac{d \alpha_N (4 \alpha_N - \alpha_S)}{2 m_S^2}.$$  These are all derived above, and discussed as part of Case I.

Comparative statics over the grant size in this case are as follows:

$$\frac{d g^*_{\text{Case II}}}{d} = \frac{2 \alpha_N \alpha_S}{m_S} > 0, \quad \frac{d g^*_{\text{Case II}}}{d \alpha_N} = \frac{2 d \alpha_N \alpha_N}{m_S} < 0, \quad \frac{d g^*_{\text{Case II}}}{d \alpha_S} = \frac{2 d \alpha_N}{m_S} > 0, \quad \frac{d g^*_{\text{Case II}}}{d \alpha_S} = \frac{2 d \alpha_S}{m_S} > 0.$$

The national government’s utility in this case is:

$$U_{N|\text{Case II}} = \frac{d^2 \alpha_S (2 \alpha_N - \alpha_S)}{m_S^2} - x_N.$$

**Boundary conditions between Case II and Cases III-IV**

For somewhat more efficient national taxation abilities, the national government prefers to offer a larger grant than in Case II, shifting the policy direction away from that desired by the subnational government. This occurs in Cases III, IV, and V. To determine the boundary between Case II and Cases III and IV, we examine the national government’s utility equation, given the optimal quantity choice of the subnational government ($q_{s|g}^* = \frac{d \alpha_N \alpha_S^2 + g m_S (2 \alpha_N - \alpha_S)}{2 m_S^2 \alpha_N}$) and given the constraint of Equation 11:

$$|y| \leq y^*_{\text{Accept grant}} = \frac{g (g m_S - 2 d \alpha_N \alpha_S)}{4 m_S \alpha_N^2}.$$  Inserting these constraints into the national government’s utility equation yields:

$$U_N = \frac{d g (\alpha_N - \alpha_S)}{m_S \alpha_N} - \frac{g^2}{4 \alpha_N^2} - x_N.$$

This utility equation is maximized by the choice of $g$ that solves the following first order condition:

$$\frac{d (\alpha_N - \alpha_S)}{m_S \alpha_N} - \frac{g}{2 \alpha_S} = 0.$$

In such a case, the grant size chosen is $g^* = \frac{2 d \alpha_N (\alpha_N - \alpha_S)}{m_S}$. Inserting this choice into the constraint of Equation 11 yields:

$$|y| \leq y^*_{\text{Accept grant}} = \frac{g (g m_S - 2 d \alpha_N \alpha_S)}{4 m_S \alpha_N^2} = \frac{d^2 (\alpha_N - 2 \alpha_S) (\alpha_N - \alpha_S)}{m_S^2}.$$  This value is positive for $\alpha_N > 2 \alpha_S$, which defines the boundary between Case II and Cases III and IV.

**Case III: Constraint binding, 0 < y = y^*_{\text{Accept grant}} < x_N.**

This case occurs where $\alpha_N > 2 \alpha_S$ and where the desired policy direction of the national government differs substantially from that desired by the subnational government. Here, the policy direction mandated by the national government is somewhere between these two ideal points. As noted in the above discussion, here the grant size chosen is $g^* = \frac{2 d \alpha_N (\alpha_N - \alpha_S)}{m_S}$, and the policy direction is

$$y^*_{\text{Accept grant}} = \frac{d^2 (\alpha_N - 2 \alpha_S) (\alpha_N - \alpha_S)}{m_S^2}.$$  Inserting this grant size into the subnational government’s quantity choice yields:
\[ q_{S|G}^* = \frac{d}{2 m^2_s} \left( \alpha_N \alpha_S^2 + g m_s (2 \alpha_N - \alpha_S) \right) = \frac{d}{2 m^2_s} \left( 4 \alpha_N^2 - 6 \alpha_N \alpha_S + 3 \alpha_S^2 \right). \]

Comparative statics over the grant size in this case are as follows:
\[ \frac{\partial g^*_{\text{CaseIII}}}{\partial d} = \frac{2 \alpha_N (\alpha_N - \alpha_S)}{m_s} > 0, \quad \frac{\partial g^*_{\text{CaseIII}}}{\partial m_s} = -\frac{2 d \alpha_N (\alpha_N - \alpha_S)}{m_s} < 0, \quad \frac{\partial g^*_{\text{CaseIII}}}{\partial \alpha_N} = -\frac{2 d \alpha_N}{m_s} < 0, \]
\[ \frac{\partial g^*_{\text{CaseIII}}}{\partial \alpha_N} = \frac{2 d (2 \alpha_N - \alpha_S)}{m_s} > 0. \]

Comparative statics over the policy direction are as follows:
\[ \frac{\partial y^*_{\text{CaseIII}}}{\partial d} = \frac{2 d (\alpha_N - 2 \alpha_S) (\alpha_N - \alpha_S)}{m_s^2} > 0, \quad \frac{\partial y^*_{\text{CaseIII}}}{\partial m_s} = -\frac{2 d^2 (\alpha_N - 2 \alpha_S) (\alpha_N - \alpha_S)}{m^3_s} < 0, \]
\[ \frac{\partial y^*_{\text{CaseIII}}}{\partial \alpha_N} = \frac{d^2 (2 \alpha_N - 3 \alpha_S)}{m^2_s} > 0. \]

The national government’s utility in this case is:
\[ U_{N|\text{CaseIII}} = \frac{d}{m^2_s} \left( \alpha_N^2 - \alpha_S^2 \right)^2 - x_N. \]

**Case IV: Constraint binding, y = x_N.**

For a closer alignment between the policy preferences of the national and subnational governments, the desired policy may be chosen at the national government’s ideal point, with the grant size still constrained to be larger than desired by the national government in order to remain attractive to the subnational government. With \( y = x_N \), the subnational government requires a large enough grant to continue to satisfy Equation 11:
\[ |y| \leq y_{\text{Accept grant}} = \frac{g (m_s - 2 \alpha_N \alpha_S)}{4 m_s \alpha_N^2}. \] This is satisfied where the grant size is:
\[ g^* = \frac{\alpha_N \left( d \alpha_S + \sqrt{4 m_s^2 x_N + d^2 \alpha_S^2} \right)}{m_s}. \] Inserting this grant size into the subnational government’s optimal quantity choice equation yields:
\[ q_{S|G}^* = \frac{2 d \alpha_N \alpha_S^2 + g m_s (2 \alpha_N - \alpha_S)}{2 m^2_s} = \frac{2 d \alpha_N \alpha_S + (2 \alpha_N - \alpha_S) \sqrt{4 m^2_s x_N + d^2 \alpha_S^2}}{2 m^2_s}. \]

Comparative statics over the grant size in this case are as follows:
\[ \frac{\partial g^*_{\text{CaseIV}}}{\partial d} = \frac{\alpha_N}{m_s} \left( \alpha_N + \frac{d \alpha_S^2}{\sqrt{4 m^2_s x_N + d^2 \alpha_S^2}} \right) > 0, \quad \frac{\partial g^*_{\text{CaseIV}}}{\partial m_s} = \frac{d \alpha_N \alpha_S}{m_s^2} \left( -1 - \frac{d \alpha_S}{\sqrt{4 m^2_s x_N + d^2 \alpha_S^2}} \right) < 0, \]
\[ \frac{\partial g^*_{\text{CaseIV}}}{\partial \alpha_N} = \frac{d \alpha_N + \sqrt{4 m^2_s x_N + d^2 \alpha_S^2}}{m_s} > 0, \quad \frac{\partial g^*_{\text{CaseIV}}}{\partial \alpha_S} = \frac{2 m_s \alpha_N}{\sqrt{4 m^2_s x_N + d^2 \alpha_S^2}} > 0. \]

The national government’s utility in this case is:
\[ U_{N|\text{CaseIV}} = \frac{d (2 \alpha_N - 3 \alpha_S) \left( d \alpha_S + \sqrt{4 m^2_s x_N + d^2 \alpha_S^2} \right)}{2 m^2_s} - 2 x_N. \]
**Case V: Constraint not binding, \( y = x_N \)**

In this final case, the national government’s ideal grant size and policy mandate is such that it is significantly attractive to the subnational government. Therefore, the constraint in Equation 11 is no longer binding. Here, the national government sets the policy direction equal to its ideal point, and chooses an optimal grant size based on the expected quantity choice the subnational government will select in response to the grant:

\[
q^*_{s|g} = \frac{d \alpha_N \alpha_s^2 + g m_s (2 \alpha_N - \alpha_s)}{2 m_s^2 \alpha_N}.
\]

Inserting these conditions into the national government’s utility equation yields:

\[
U_{N|g} = g \left( \frac{2 d \alpha_N^2 - d \alpha_N \alpha_s - g m_s}{2 m_s \alpha_N^2} \right).
\]

Utility is maximized with respect to the choice of grant size as determined by the first order equation:

\[
2 d \alpha_N^2 - d \alpha_N \alpha_s - 2 g m_s = 0.
\]

The optimal grant size is thus:

\[
g^* = \frac{d \alpha_N (2 \alpha_N - \alpha_s)}{2 m_s}.
\]

Inserting this grant size into the subnational government’s choice of quantity equation results in:

\[
q^*_{s|g} = \frac{d \alpha_N \alpha_s^2 + g m_s (2 \alpha_N - \alpha_s)}{2 m_s^2 \alpha_N} - d \left( \frac{4 \alpha_N^2 - 4 \alpha_N \alpha_s + 3 \alpha_s^2}{4 m_s^2} \right).
\]

Inserting these results into the subnational government’s utility equation yields:

\[
U_{s|g} = \frac{d^2 (2 \alpha_N - 3 \alpha_s)^2}{16 m_s^2} - x_N.
\]

This utility is sufficiently large to induce grant acceptance iff:

\[
U_{s|grant}^* \geq U_{s|no\ grant}^* \iff \frac{d^2 (2 \alpha_N - 3 \alpha_s)^2}{16 m_s^2} - x_N \geq \frac{d^2 \alpha_s^2}{4 m_s^2} \iff \alpha_N \geq \frac{3 \alpha_s}{2} + \frac{\sqrt{4 m_s^2 x_N + d^2 \alpha_s^2}}{d}.
\]

This equation thus defines the boundary between Case V and Cases III-IV.

Comparative statics over the grant size in this case are as follows:

\[
\frac{\partial g^*_{CaseV}}{\partial d} = \frac{\alpha_N (2 \alpha_N - \alpha_s)}{2 m_s} > 0, \quad \frac{\partial g^*_{CaseV}}{\partial m_s} = -\frac{d \alpha_N (2 \alpha_N - \alpha_s)}{2 m_s^2} < 0, \quad \frac{\partial g^*_{CaseV}}{\partial \alpha_s} = -\frac{d \alpha_N}{2 m_s} < 0,
\]

\[
\frac{\partial g^*_{CaseV}}{\partial \alpha_N} = \frac{d (4 \alpha_N - \alpha_s)}{2 m_s} > 0.
\]

The national government’s utility in this case is:

\[
U_{N|CaseV} = \frac{d^2 (2 \alpha_N - \alpha_s)^2}{8 m_s^2}.
\]

**Proof of Proposition 3:** The proposition is evident from the above comparative statics over \( g^* \) for each case.

**Proof of Proposition 4:** The proposition is evident based on comparative statics over \( y^* \) from Case III and based on the cutpoints between Cases II and III, and between Cases III and V. The comparative statics within Case III are given above; the comparative statics between Cases II and III are trivial.

Between Cases III and V, define the cutpoint \( \alpha^*_{N,III-V} = \frac{3 \alpha_s}{2} + \frac{\sqrt{4 m_s^2 x_N + d^2 \alpha_s^2}}{d} \), as derived above.

Where this value is large, Case III holds and the mandates are less restrictive. In particular:
National Government's Funding Mechanism Choice:
First we compare the national government's utility from no provision to that from joint provision with the subnational government. As noted in the joint provision subgame above, the national government prefers joint provision over no provision iff: 

$$m_s \geq \frac{m_N \alpha_s}{2 \alpha_N}.$$ 

Next we compare the national government’s utility from no provision to that from offering an intergovernmental grant. As noted in the grant provision subgame above, the national government prefers grant provision over no provision iff: 

$$\alpha_s \geq \frac{3\alpha_s}{2}.$$ 

Finally, we compare the national government’s utility from joint provision of the good to that from offering an intergovernmental grant. The national government offers the grant iff: 

$$U_{N|Grant}^* \geq U_{N|Joint provision}^*.$$ 

Case by case calculations are not included here due to space considerations. In all cases, grant provision is preferred over joint provision for $m_N$ sufficiently large.

Proof of Proposition 5: The proposition is evident from the above conditions.
References


Figure 1: Grant Provision Game Tree

NG

Joint provision

No national provision

Offer grant

SG

qS, y

(U_N(q_S,y), U_S(q_S,y))

qN

SG

qS, y

(U_N(q_N,q_S,y), U_S(q_N,q_S,y))

g, y

SG

Accept

(U_N(g,q_S,y), U_S(g,q_S,y))

Reject

qS, y

(U_N(q_S,y), U_S(q_S,y))
### Table 1: Some Estimates of the Flypaper Effect

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<th>Sample</th>
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<td>Inman (1971)</td>
<td>Federal and state grants to 41 cities</td>
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<td>Weicher (1972)</td>
<td>State grants to 106 municipalities</td>
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<td>Feldstein (1975)</td>
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<td>(1993)</td>
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<td>Federal and state grants to 10 large urban governments</td>
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*Source: Hines and Thaler (1995).*