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Budgetary reform and formal modeling: A comment on Gabel and Hager *

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Abstract. In a recent article, Gabel and Hager argue that the line-item veto and the balanced budget amendment (BBA) promote and may increase pork-barrel spending. In their discussion of the balanced budget amendment, Gabel and Hager present one example to support their claim. I demonstrate that the effect of a BBA in their model is highly contingent on parameter values, and that their results hold only for a specific set of parameter values. Further, in a generalized model where the balanced budget amendment is crafted endogenously, the BBA that is enacted has the effect of either decreasing spending or keeping it constant.

1. Introduction

In a recent issue of this publication, Gabel and Hager (2000) argue that the line-item veto and the balanced budget amendment promote and may increase pork-barrel spending. Their larger claim is unequivocally accurate: the efficacy of procedural reforms in stanching the flow of government expenditures should be examined carefully, as the law of unintended consequences often rears its ugly head whenever reforms are implemented. However, Gabel and Hager's (GH) analysis of the balanced budget amendment (BBA), based on a numerical example and a five-member legislature, is only one part of the story. In this comment, I show that once a general model is constructed based on their example, the prediction does not always hold, and paradoxically, the balanced budget amendment they describe would never be enacted in the legislature. The only balanced budget amendment that could survive the legislature would never result in increased spending.

GH's analysis is reproduced in Table 1. Each of 5 legislators has a pet project that gives him a benefit of 9 but has a cost of 10. Assuming that costs are split equally among all legislators and that members receive benefits only from projects in their district, this implies that the passage of a legislator's project gives him a net benefit of $(9 - 2) = 7$ and a net benefit to all other

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Table 1. Gabel and Hager model

Legislator's constituency	Pork projects				
	Technology research	Wheat subsidy	Build a port	Housing assistance	Highway construction
Silicon Valley	7	–2	–2	–2	–2
Great Plains	–2	7	–2	–2	–2
Eastern Seaboard	–2	–2	7	–2	–2
Urban	–2	–2	–2	7	–2
Rural	–2	–2	–2	–2	7

legislators of $(0-2) = -2$. GH predict that without a BBA, deficit spending (or tax increases) will be incurred and 3 projects will pass. Then they show that if a BBA is enacted that requires an 80% supermajority to engage in deficit spending, the legislature will pass 4 inefficient projects, thereby increasing the size of the budget.

2. A general model with no BBA

I keep my analysis as close as possible to GH and generalize it as follows. Posit a legislature consisting of n members, n odd, with each member representing a separate (identical) district. Suppose that there is one project that can be funded in every district, and that each project confers a benefit, denoted b, to the legislator, and a cost c, divided equally among all the legislators, Assume $b < c$, such that all projects are inefficient.[1] Net benefits are $x_i b - dc/n$, where $x_i = 1$ if a project in representative i's district is funded, and 0 otherwise, and d refers to the number of districts receiving a project. Further suppose that government revenue T is given exogenously, and that T and any subsequent deficit spending are obtained in equal amounts from the districts. While b is completely unrelated to government revenue or project costs – think of it as a political benefit or a consumer surplus – c and T are linked. A deficit will result if total expenditures (based on c) exceed T.[2]

Let's take up the case of a one-period game in which the legislature can spend freely, revenues do not constrain behavior, the agenda-setter is chosen randomly, and he makes a take-it-or-leave-it proposal to the legislature.[3] If $b > cm/n$, where $m = (n+1)/2$, the agenda-setter proposes a project for his district and $(n-1)/2$ other districts. Thus, the legislators with projects each receive net benefits of $b - cm/n$, and each legislator without a project receives $0 - cm/n$. A deficit is incurred if $T < cm$. In Gabel and Hager's example,

$b = 9$, $c = 10$, $n = 5$, and $m = 3$; hence net benefits for coalition members are $(9 - 6) = 3$, and net losses for the excluded members are 6. Note that a deficit is not necessarily implied by this analysis, since T is exogenous.

Next, suppose $b < cm/n$. In this case, the equilibrium outcome is for no spending to take place. For example, if $n = 5$, $b = 5$, $c = 10$, and $m = 3$, then no projects will be funded, since even those members who get projects would be better off without them, as their net benefits would be $5 - 6 = -1$. In this case, there is a surplus equal to T, since there is no spending. In subsequent discussions, I assume that $b/c > .5$, since for values of $b/c < .5$, spending is never affected by institutional changes.

3. A general model with a BBA

I now add to the game a balanced budget requirement, $T = dc$, where d represents the number of districts that receive a project. Again, assume that T is exogenously given, and suppose that deficit spending is required to fund projects for $d \geq m$ (i.e., $dc \geq T$). (If this does not hold, then the BBA will have no effect on behavior, since a minimum winning coalition (MWC) will form.) The legislature faces a budget constraint that can be waived if a supermajority agrees to suspend it. Let this supermajority be of size pn, where $p > .5$ is the proportion of the n legislators required to approve a budget that produces deficit spending. Call p the rule to waive the balanced budget requirement. Assume pn is an integer for ease of exposition, and for now, let p be exogenously given. Clearly, if an equilibrium involves $d > 0$, then $d = pn$, the smallest sustainable coalition under supermajority rule.

There is a critical relationship between b, p, and c, which determines whether pn projects are funded, or no projects are funded. The net benefit to a member of a potential coalition is $b - pnc/n$, or $b - pc$. If $b < pc$, net benefit is negative, which means that all members of the coalition wish to vote against this measure. Conversely, if $b > pc$, net benefit is positive, ensuring passage. This is a *more* stringent requirement on projects, and it suggests that if the legislature can choose p endogenously, then an efficient outcome is more likely. Not surprisingly, when $p = 1$, the requirement has the effect of allowing only efficient projects to be passed (again assuming that deficit spending is required to fund a bare majority of projects).[4] In Gabel and Hager's example, $p = .8$, $n = 5$, $c = 10$, and $b = 9$, so projects are funded, since $b > pc$. But suppose we reduce b to slightly less than 8. Then no projects are funded. Project funding hinges on whether some efficiency threshold is reached. Specifically, the ratio of benefits to costs must be greater than or equal to the supermajority requirement p.

Table 2. Cases for generalized Gabel and Hager model, $.5 < b/c < 1$

Case	Effect of balanced budget amendment with rule to waive set at $p > .5$	Size of supermajority requirement that passes legislature	Net effect of BBA that passes legislature
$T < cm$	Higher spending if $p < b/c$; Lower spending if $p > b/c$	$p > b/c$	Lower spending
$T > cm$	No effect	$.5 < p \leq 1$	No effect

4. A general model with p chosen endogenously

Now I present a model where p, the rule to waive the balanced budget requirement, is chosen by the legislature before projects are selected. The game proceeds as follows. First, the legislature chooses p. Then an agenda-setter is chosen randomly. Next, the legislature votes on her proposal. Solving for the optimal balanced budget amendment in this model is straightforward. If $T > cm$, any rule p to waive the balanced budget requirement can pass, since it will have no effect on the legislative outcome. In this case, there would be no deficit spending, since T is greater than the cost of projects in a MWC of districts. Next, suppose that $T < cm$. Note that the expected value of the budget game for a given rule $p < 1$ is $p(b - c)$ if $b - pc \geq 0$, and is 0 otherwise.[5] The expected value of the budget game for $p = 1$ is 0, since $b < c$, implying that no projects will be funded.[6] Since all legislators face the same future in expectation, we can just consider a representative legislator's decision. Let z be the value of p such that $z = b/c$. Then for any value of $p < z$, the expected value of the game is negative. For any value of $p > z$, the expected value of the game is 0, as no member of any potential coalition would vote for the proposed allocation. A representative legislator selecting a p^* will then select any value of $p > z$, since this value maximizes her expected utility. This implies that the BBA will have the effect of lowering expenditures in this case. In Gabel and Hager's example, $b/c = .9$, so $p^* \geq .9$, and no projects are funded.

5. Discussion

These results suggest two concerns with the GH model. First, the model does not permit the size of projects, the size of the budget, or the size of T to be determined endogenously.[7] To say that only one project is available per district, and that it is of fixed size, may be helpful for illustrative purposes in other

situations, but it does not speak to predictions of deficits. In this model, *the determination of deficit spending is a function of entirely exogenous parameters and institutional features*.

Second, the connection between the size of government and deficit spending is ignored in the analysis, Table 2 depicts the possible relationships between T, the cost of a bare majority of projects, and a bare supermajority of projects. Suppose it were the case that $T > mc$. In other words, suppose a bare majority of projects could be supported without deficit spending. Then the balanced budget amendment would not change the game's outcome. In fact, only when $T < mc$ and $b/c > .5$ does the balanced budget amendment have an effect. When the BBA has bite, the only version that passes a legislature leads to zero spending in equilibrium.

6. Conclusion

In this comment, I have shown that grossly inefficient projects will never be funded in a generalized GH model. If projects are moderately inefficient, then a balanced budget amendment's effects are contingent on the values of p, b, c, and T. The key results of the generalized model are as follows. The BBA has a negative effect only when projects are moderately inefficient and revenues are sufficiently small; in other cases it either has no effect or lowers spending. Under no circumstances does a BBA that passes the legislature produce higher spending. These stark predictions suggest the importance of keeping key elements of the budget process endogenous when attempting to tease out the effects of reforms.

This comment suggests ways to build upon Gabel and Hager's important work to produce a more comprehensive understanding of budgetary reforms. In order to show that a rule to waive a balanced budget requirement is problematic, one should propose a model where legislators enact such a reform (or show why others would want to impose it exogenously), and that in such a model, the predictions of larger spending hold. A model of this sort might include heterogeneous districts, incomplete information, endogenous selection of project sizes, non-random agenda-setters, and preferences over deficits and taxation.

Notes

1. Note that this assumption, popular in the literature, ignores the fact that most projects are subject to cost-benefit analysis. While this is not to say that inefficient projects are not funded, it is to suggest that the inefficiencies are not as great as one might believe. Also, Gabel and Hager (2000) note that spending financed by deficits should be discounted,

since it is not paid off until well into the future. This is a subtle point that depends on many factors; in fact, the argument can go the other way. Benefits on money spent today may be realized over an extended time period, as in the building of a bridge. For the purposes of this essay, I let the discount factor =1, and assume that the discounting calculation is already reflected in the b and c terms. For a nice discussion of the issue, see Ferejohn (1974) and, for recent work, DelRossi and Inman (1999).

2. Gabel and Hager (2000) allude to the fact that costs can be addressed either through deficit spending or tax increases, but do not elaborate. I assume then that T is fixed at the present time, and that any overspending will hence be financed by deficits. In practice, this is a tax increase on future generations, since in the limit revenues must equal expenditures.
3. With some minor modifications, the equilibrium will be identical if we consider a game with T periods, where T is not necessarily finite.
4. This is in seeming contradiction to the idea that universal coalitions will form in pork-barrel politics. Again, this is a phenomenon that has been assumed but rarely if ever convincingly demonstrated in a formal model.
5. To see this, notice that the probability of receiving a project if projects are funded is p, so the expected benefit is pb. If projects are funded, then one's expected costs are $pnc/n = pc$. So expected net benefits arc $p(b - c)$. But in the allocation stage, if net benefits are negative, then no projects will be funded. This occurs when $b - pc < 0$.
6. Setting $p = 1$ is the equivalent of imposing an efficiency rule that requires all projects to be minimally efficient.
7. Baron (1991, 1993) and Ferejohn, Fiorina, and McKelvey (1987) consider endogenously chosen project sizes, and Primo (2001) considers endogenously chosen budget sizes.

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