The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics

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This essay offers a rational political explanation for the notorious inefficiency of pork barrel projects with an optimization model of legislative behavior and legislative institutions. The model emphasizes the (economically arbitrary, from a welfare point of view) importance of the geographic incidence of benefits and costs owing to the geographic basis for political representation. We explore the implications of a legislator's objective function and derive conditions under which a representative legislature will select an omnibus of projects each of which exceeds the efficient scale.

The inefficiency of public decision making has long been a concern for students of public policy. Models of bureaucratic behavior, legislative institutions, interest-group influence, vote-maximizing politicians, and fiscal illusion all point toward sources of bias in these nonmarket contexts.[1] Yet none has established why a cooperative legislature would stand for policies which are Pareto dominated.

[1] Consult Downs 1957, 1967; Niskanen 1971; Riker and Brams 1973; Breton 1974; Ferejohn and Fiorina 1975; Wagner 1976; Aranson and Ordeshook 1978; and Fiorina and Noll 1978.

Specifically, if the bias works to the benefit of some identifiable group, then why do political actors not insist on efficiency in combination with a compensation scheme? This would leave the identified group at least as well off, all others at least as well off, and then leave the efficiency gain at the political discretion of representatives, thereby enhancing their role. From the anomaly of sustained political ineffi- ciency, it appears that there is a divergence between normative eco- nomic principles, on the one hand, and the preferences of political actors on the other. Prominence is given in the following analysis to the political mechanisms that create and maintain this divergence.

In this paper, we develop a model of the public choice mechanisms comprising a representative legislature in order to show the political sources that systematically bias public decisions toward larger than efficient projects in the area of distributive policymaking. By distribu- tive policies we mean those projects, programs, and grants that con- centrate the benefits in geographically specific constituencies, while spreading their costs across all constituencies through generalized taxation.[2] This collection of public decisions includes the traditional pork barrel of public works and rivers and harbors projects as well as the more recent examples of highway construction, categorical grants-in-aid, urban renewal, mass transit, and sewage treatment plants. The model identifies the political sources of efficiency bias— and there are several—by unpacking the democratic institutions into their components, thereby focusing on the influence of each. This takes the form of a progression of models beginning with an effi- ciency benchmark. Then, one by one, political features are added until the final form models a representative legislature divided into n districts. The approach shows how political institutions transform the economic basis of costs and benefits into political costs and benefits. The latter, and not their economic counterparts, define rational deci- sions for political actors.

The model reveals three important sources of bias. The first is a consequence of the political definition of benefits and costs and its divergence, in important respects, from the economic definition. The second source stems from the districting mechanism which divides the economy into n disjoint political units called districts. The method of project financing through generalized taxation constitutes the third source of bias. Moreover, we show that the mechanism of popular election of legislative representatives complements these sources of bias so that these three sources, in conjunction with the reelection mechanism, explain the inefficiency of political choice.

[2] See Lowi (1964) for a discussion of different kinds of policies based on the charac- teristics of beneficiaries as well as the mechanisms of financing.

The General Approach

Our model is one of policymaking in the realm of distributive policy, so we begin by clarifying that concept. A distributive policy is a political decision that concentrates benefits in a specific geographic constituency and finances expenditures through generalized taxation. These policies—sewage treatment plants, land reclamation, the rivers and harbors omnibus, urban renewal projects—authorize collections of projects, each targeted to a geographic location and each generating benefits in that geographic location unrelated to projects in other locations. This latter characteristic is crucial since the omnibus-like quality of distributive programs allows decisions to be made on a project-by-project, locality-by-locality basis. Each project of the omnibus may be fashioned independent of others in the omnibus.

While it is clear that all policies have a geographic incidence of benefits and costs, what distinguishes a distributive policy is that benefits are geographically targeted. In contrast, a nondistributive program, say an entitlement program, though having geographic incidences, is fashioned with nongeographic constituencies in mind, for example, socioeconomic groups. Subsidies to beekeepers, for example, generate a distribution of benefits that depends on the geographic distribution of beekeepers. No geographic area has a claim on program benefits except as it contains residents in the entitled category. Thus, by our definition, programs targeted to the malnourished (food stamps), the unhealthy (Medicare), the poor (welfare), the retired (social security), the injured worker (workmen's compensation), or the automobile driver (automotive product safety) are not distributive policies because any citizen may obtain program benefits if he falls in the specific category. Thus, an entitlement program confers benefits on all individuals in the designated category, benefits which may not be varied without similarly varying them for others in the category. Although the motivation to create nondistributive programs may have a geographic basis (as when a politician is moved to support a policy because many of his constituents fall into the beneficiary group), the fact remains that the beneficiary group is not geographically defined or determined. In contrast, geography is the hallmark of distributive politics: Programs and projects are geographically targeted, geographically fashioned, and may be independently varied. Importantly, geography is also the basis for political organization and representation.

A distributive policy for the jth district, $P_j(x)$, is a project located in that district, where x is a decision parameter. Although x may be treated as a vector of project characteristics, we assume that x simply describes the scale or size of the project. Associated with the project

$P_j(x)$ are both benefits and costs. Let $b(x)$ represent the present value of the economic benefits which flow from the project to the particular political constituency. This includes consumption benefits, say cleaner water from a sewage treatment plant, and potential pecuniary gains to producers, for example, increased profits to project input owners from price rises in factor markets.[3]

ASSUMPTION 1: $b'(x) > 0$, $b''(x) < 0$.

Let $c(x)$ represent the total resource cost involved in producing the project. It decomposes into three components, $c(x) = c_1(x) + c_2(x) + c_3(x)$. The first component, $c_1(x)$, is the real resource expenditures for project inputs spent in the constituency in which the project is located; $c_2(x)$ is the real resource expenditures for project inputs spent outside the district; $c_3(x)$ is nonexpenditure real resource costs imposed on the district (e.g., nonpecuniary externalities, such as the destruction of the natural environment, and pecuniary externalities in the form of price rises to consumers in factor markets).[4]

ASSUMPTION 2: $c_i'(x) > 0$, $c_i''(x) \geqslant 0$, $i = 1, 2, 3$.

The expenditures are financed through taxes so that the tax bill for $P_j(x)$ is

$$T(x) = c_1(x) + c_2(x). \tag{1}$$

We assume a tax system that covers all expenditures, assigning non-negative tax share t_i to the ith district, where $\Sigma_{i=1}^{n} t_i = 1$ and n is the number of districts. The tax bill for the ith district for the project $P_j(x)$, therefore, is $t_i[c_1(x) + c_2(x)]$.

As the above development suggests, there are several mechanisms at work in the realm of distributive policy which our model captures. First, economic benefits are geographically concentrated in a politically relevant way. Second, production costs may be unpacked, again in a politically relevant way. Some costs are extracted from the economy and returned as geographically earmarked expenditures—$c_1(x)$ and $c_2(x)$; other costs are nonexpenditure in nature, imposed on the local economy in which the project is located—$c_3(x)$. Third, the tax bill, $T(x)$, is paid for by each political subdivision according to the tax shares t_i, $i = 1, \ldots, n$. The relevant mechanisms which we examine

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[3] Some students of cost-benefit analysis, e.g., McKean (1958, chap. 8), argue against including pecuniary external effects in the calculations, claiming instead that these constitute distributional effects that are not germane for efficiency determinations. The treatment of pecuniary external effects remains controversial in cost-benefit analysis. Our results reported in this paper do not depend on how this controversy is resolved.

[4] There is a fourth component of costs, namely, nonexpenditure real resource costs that spill over into other political constituencies. Since $P_j(x)$ is a concentrated project, we ignore this for the present. We return to this point in the concluding section. For analysis of other kinds of policies not possessing the particular properties of distributive projects, see Shepsle and Weingast (1980).

below are (1) the political cost-accounting mechanism, (2) the districting mechanism, and (3) the taxation mechanism. After examining these mechanisms and their effects on the characteristics of distributive policy, we explore the complementarity of legislators' reelection objective. First, however, we develop the familiar efficiency criterion.

Model E: Maximizing Economic Efficiency

The benchmark for the entire set of political institutions developed below is the efficiency criterion. This requires the maximization of economic net benefits. This is given simply by

$$\max_x E(x) = b(x) - c(x). \tag{2}$$

The familiar first- and second-order conditions are

$$b' - c' = 0,$$

and   (3)

$$b'' - c'' < 0.$$

The second-order condition follows directly from assumption 1 and assumption 2 so that the solution to (2), x^E in figure 1, is a unique global maximum.

The Politicization of Expenditures

The first transformation of the standard approach is the politicization of economic costs. This transformation rests on a crucial political property. Project costs, paid from general revenues, become geographically earmarked expenditures. The political process distributes those expenditures in the form of c_1-type and c_2-type costs. Thus, for $P_j(x)$ in district j, production inputs are purchased from firms and individuals in the district (c_1) and from their counterparts outside the district (c_2). More important is the political evaluation of the distribution of geographically earmarked expenditures. While these expenditures are not lump-sum transfers of wealth to factor owners, they do entail pecuniary gains since they represent increases in demand for project input factors, thereby driving up their prices.[5] Not only does

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[5] This statement presumes that factors of production are geographically fixed in the short run. This does not preclude the bidding away of pecuniary gains as the long-run supply of factors adjusts to this change in demand. For some projects, which are one shot and nonrepetitive in nature, the short-run analysis holds since the long-run adjustment process is attenuated. For other programs, in which a permanent increase in demand has occurred (e.g., the continuing flow of military procurement projects to a district), long-run market forces adjust with the concomitant bidding away of pecuniary
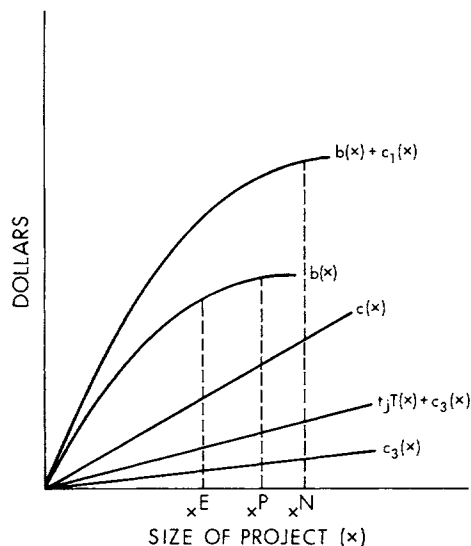
$$b(x) + c_1(x)$$

$$b(x)$$

$$c(x)$$

$$t_j T(x) + c_3(x)$$

$$c_3(x)$$

DOLLARS

x^E x^P x^N

SIZE OF PROJECT (x)

Fig. 1

the public project entail new business for input owners; it allows them to receive a higher price for the sale of inframarginal units as well.[6] As this discussion suggests, geographic expenditures are important because they distribute pecuniary effects. Consequently, the distributional effects of local expenditures combine with consumption benefits in the district's valuation of a project. Put simply, a dollar's valuation of a project may come in either of two forms: a pecuniary gain to a factor owner or a benefit to a project consumer. Partly as a consequence of these distributional effects, and partly for additional reasons enumerated below, the political evaluation of pecuniary effects diverges from their economic treatment.

We may distinguish several classes of agents who are differentially advantaged or harmed (in addition to their tax obligations) by the provision of $P_j(x)$: (1) *in-district consumers*, who receive benefits through consumption of the public project but are unaffected by pecuniary effects; (2) *in-district factor owners*, who obtain pecuniary gains in production of, as well as benefits in consumption from, $P_j(x)$; (3) *out-of-district factor owners*, who obtain pecuniary gains in production (but no consumption benefits since they do not reside in the local constituency); (4) *in-district consumers who make factor market purchases*,

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gains. Nevertheless, the political effect is the same, though now manifested in an aversion to pecuniary losses suffered if demand were to contract (i.e., the flow of projects cease).

[6] There are pecuniary losers as well—namely, other users of project factors who experience rising prices.

who obtain consumption benefits from the project but suffer pecuniary losses in the form of higher prices for factors; and (5) *out-of-district purchasers of factors,* who suffer pecuniary losses through higher prices in factor markets (and who, moreover, obtain no consumption benefits since they do not reside in the district). Public good theorists like Samuelson, Bator, and Head, in their market-failure models of public good provision, typically focus only on type 1 agents and the nonappropriable product of public projects. Cost-benefit studies and welfare analyses (Prest and Turvey 1965; Mishan 1976) also focus on type 1 agents, limiting the role played by the other four types. These studies compute costs and benefits in consumption followed by an appropriate adjustment for pecuniary effects. But these studies may have missed the point. As Aranson and Ordeshook (1978) have emphasized generally, and Stigler (1971) and Peltzman (1976) for the case of regulation, it may well be the appropriable pecuniary gains and losses of factor owners and competing factor users, respectively, that drive the political production process. In this latter view, the consumption benefits of the public project—clean water, mass transit, or whatever—are a by-product of factor owners and factor users seeking pecuniary gains and the avoidance of pecuniary losses, respectively.

How these pecuniary effects are distributed geographically, and whether they are gains or losses, have different kinds of political impacts. Since political representation is geographic, legislators care about who gains and who loses in proportion to their geographic locations. We assume that local gains and losses are politically more significant to the legislator's objectives (reelection and constituency service) than nonlocal effects. Hence representatives use whatever legislative influence they can exercise on behalf of those affected locally by pecuniary effects.

Additionally, there are several reasons to believe that pecuniary gains are exaggerated and pecuniary losses diminished in the representative's political calculus. They relate to the concentration of pecuniary gains and the dispersion of pecuniary losses. First, in what might be termed the "Robert Moses effect" (named after that famous New Yorker who appreciated and exploited it so effectively), is the observation that pecuniary gains in the form of increased jobs, profits, and local tax revenues go to named individuals, firms, and localities from whom the legislator may claim credit and exact tribute. Pecuniary gains may be targeted to constituents; pecuniary losses, on the other hand, are often more widely dispersed, falling on constituents and nonconstituents alike. Second, pecuniary losses, principally through higher prices in factor markets, are not always fully linked to the effects of increased factor demand from the project in

question. Indeed, the illusion may be such that pecuniary losers are unable to distinguish the source of their losses from general price inflation. Hence there is a perceptual asymmetry between pecuniary gains and losses. Accompanying this asymmetry in perception is an asymmetry in capacity to convert perceptions of gains and losses into political influence. Third, then, as Peltzman (1976) has noted in another context, gainers typically are smaller in number, more cohesive in political interest, and, consequently, better organized politically. They are capable of rewarding the local legislator for delivering the bacon in a fashion in which pecuniary losers are unable to punish. The combined impact of the Moses, the illusion, and the Peltzman effects is an exaggerated political importance accorded local pecuniary gainers. The local legislator, then, is strongly encouraged to generate projects with large c_1-type components (vs. c_2-type) and tends to be less concerned with associated pecuniary losses (vs. pecuniary gains).

Since, on the arguments above, there is political value in securing local expenditures for their own sake, the representative, in assessing the project $P_j(x)$, incorporates, on the benefit side of his political calculus, both the consumption benefits his constituents obtain, $b(x)$, and the politically distorted pecuniary effects. Since the latter depend on local expenditures $(c_1[x])$, we write it as $f[c_1(x)]$. For the propositions below, we stipulate $f[c_1(x)] = c_1(x)$ to enable the clear presentation of results unencumbered by mathematical detail; our results are qualitatively unaffected so long as f and f' are positive.[7] Thus, the representative of the single political constituency j seeks a project scale that maximizes his political maximand which, in turn, depends on his constituency's benefits minus its share of the costs: $[b(x) + c_1(x)] - [t_j T(x) + c_3(x)]$.

Model P: A Single Political Constituency

Consider the case of a single national constituency. Then $t_j = 1$ and expenditures earmarked for the constituency now consist of all ex-

[7] A straightforward comparative statics analysis, which we do not pursue here, would examine how alternative specifications of f affect optimal choices. Such an analysis would confirm that as long as f is positive, the qualitative nature of our results stands. As noted, it is not too misleading to equate $f[c_1(x)]$ with $c_1(x)$ or some linear function thereof, namely, $f[c_1(x)] = \beta c_1(x)$, in the relevant range. But only up to a point! If expenditures yield not only consumption benefits but β dollars per dollar expended of additional "benefit," then, subject only to external costs $(c_3[x])$, legislators would be motivated to expend the entire GNP, clearly an absurdity. The function $f[c_1(x)]$ is meant to represent the political (read: electoral) advantage secured by the legislator who delivers $c_1(x)$ dollars of public expenditure to his district. Ultimately this advantage must tail off so that, in a general mathematical analysis, $f[c_1(x)]$ eventually exhibits diminishing returns.

penditures, that is, $c_1(x) + c_2(x)$. With these assumptions and the
identity in (1), the political objective function reduces to

$$\max_x P(x) = [b(x) + c_1(x) + c_2(x)] - [c_1(x) + c_2(x) + c_3(x)]$$
$$= b(x) - c_3(x). \tag{4}$$

The first-order condition is

$$b' - c_3' = 0, \tag{5}$$

and the second-order condition requires that

$$b'' - c_3'' < 0.$$

The solution to equation (5) yields point x^P on figure 1. The following
theorem shows that $x^P > x^E$.

THEOREM 1: $x^P > x^E$.

PROOF: From assumptions 1 and 2, x^E is the unique global
maximum of $E(x) = b(x) - c_1(x) - c_2(x) - c_3(x)$. Consequently, $b'(x^E)$
$- c_1'(x^E) - c_2'(x^E) - c_3'(x^E) = 0$. From assumption 2, $c_1'(x^E) + c_2'(x^E) >$
0; therefore, $P'(x^E) = b'(x^E) - c_3'(x^E) > 0$. But this violates the
first-order condition for a maximum of $P(x)$. Indeed, from the prop-
erties of strictly concave functions, since $P'(x^E) > 0$, then either (i)
$P'(x) = 0$ for $x = x^P > x^E$, or (ii) $P'(x) = 0$ for no finite x. In the first
case, x^P is a global interior maximum which exceeds x^E. In the second
case, there is no interior maximum since $P(x)$ increases without
bound. A fortiori, a project scale larger than x^E is preferred. Q.E.D.

Model N: Non Est e Pluribus Unum, or Every District for Itself

The next stage in our examination of political mechanisms is to
partition the single national constituency into multiple, disjoint politi-
cal units called "districts" with representation in a legislature. Each
district, through its representative, is presumed to maximize its net
(private) benefits without regard to the costs imposed on other dis-
tricts. Publicly supported projects are funded through taxes which fall
primarily on other districts. Hence, the benefits are concentrated
while the costs are diffused.

Any political choice institution consisting of representatives of mul-
tiple, disjoint constituencies is characterized by a principle of
aggregation—that is, a voting or decision rule—and by the substan-
tive choices made under that decision rule. There are several litera-
tures which address these issues.[8] The theoretical thrust of these

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[8] These include research on logrolling, constitutional choice, and distributive
policymaking. There is a large literature on each of these topics, but Buchanan and
Tullock (1962) remains the best introduction and overview.

literatures is twofold: (1) Why is one institutional decision rule employed rather than another? and (2) What are the policy consequences of a given decision rule? Regarding the first, with special emphasis on majority rule, theorists have focused on the instability of decisive coalitions, the ex ante uncertainty surrounding the composition of winning coalitions, and the cost of organizing and monitoring coalition partners. Their express purpose is to address how institutional actors seek, through suitably arranged institutional practices, to improve their circumstances by evolving coping strategies, formal rules, and other mechanisms (called norms in the sociological literature, rules or binding commitments in the game theory literature, and contracts in the property rights literature). The second question takes institutional practices as fixed and examines the policy decisions implied by those practices. The historical origins of and rationales for institutional rules are of little concern in these latter analyses.

Our chief concern is the second question in which we assess the project choices of a legislature in the distributive policy area. In those policy areas characterized by a project-by-project orientation, the geographic concentration of benefits, and the diffusion of costs, there is abundant evidence that universalism and reciprocity are prevailing decision rules in the U.S. Congress. The former practice assures any interested district a project; the latter, in recognition of the fact that district differences translate into different policy priorities, facilitates a process of mutual support and logrolling. These two practices combine to permit packages of distinct projects earmarked for interested districts to obtain the support even of those without a stake in the package in exchange for reciprocal treatment. Empirical studies, moreover, repeatedly observe the operation of universalistic criteria. Examples include the pork barrel of rivers and harbors (Maass 1951; Ferejohn 1974); model cities and urban renewal (Plott 1968); tax loopholes (Manley 1970); the traditional tariff (Schattschneider 1935); private member bills (Froman 1967); military procurement (Rundquist 1973); and categorical grants-in-aid (Mayhew 1974). Indeed, some scholars observe a tendency to infuse controversial policies with distributive elements in order to build a more inclusive coalition.[9]

Elsewhere (Fiorina 1978; Weingast 1979; Shepsle and Weingast 1981) the conditions under which institutional actors prefer universalistic criteria to pure majority rule are derived. These results, together with the preponderance of empirical evidence cited above, provide the basis for our focus on universalism and its policy consequences. First we explore the consequences of universalism in the

[9] See Stockman (1975) and Fiorina (1978) for illustrations.

extreme in which each legislator independently determines whether to propose a project and, if so, at what scale. The following section then examines the conditions under which there are incentives for legislators to coordinate project selection. Consider legislator j's maximand regarding his district's project:[10]

$$N_j(x) = b(x) + c_1(x) - t_j T(x) - c_3(x). \tag{6}$$

The legislator is presumed to maximize the district's private benefits, $b(x) + c_1(x)$, minus its share of the taxes, $t_j T(x) = t_j[c_1(x) + c_2(x)]$, minus the externalities of the project which fall on the district, $c_3(x)$. This simply reflects the proposition that legislators are reelection oriented and that their prospects are positively associated with the net benefits they deliver to their constituents. According to this reelection mechanism, voter decisions correspond to a "what have you done for me lately?" evaluation.[11]

Maximization of (6) yields the first-order condition

$$b' + c_1' - t_j T' - c_3' = 0,$$

or

$$b' + c_1' = t_j(c_1' + c_2') + c_3'. \tag{7}$$

The second-order condition requires

$$b'' + c_1'' - t_j(c_1'' + c_2'') - c_3'' < 0.$$

Equation (7) has a solution yielding a maximum point x^N for (6) depicted in figure 1. The next theorem establishes that, in a wide set of circumstances, x^N exceeds x^P.

THEOREM 2: If $c_1' > t_j(c_1' + c_2')$, then $x^N > x^P$.

PROOF: Note that $N(x)$ defined in (6) may be recast as

$$N(x) = P(x) + c_1(x) - t_j[c_1(x) + c_2(x)],$$

where $P(x) = b(x) - c_3(x)$. At the maximum of $P(x)$, $x = x^P$,

$$P'(x^P) = b'(x^P) - c_3'(x^P) = 0.$$

This implies that at $x = x^P$

$$N'(x^P) = P'(x^P) + c_1'(x^P) - t_j[c_1'(x^P) + c_2'(x^P)]$$

$$= c_1'(x^P) - t_j[c_1'(x^P) + c_2'(x^P)].$$

Therefore, the premise of the theorem implies that $N'(x) > 0$ for all x

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[10] Eq. (6) does not contain district j's total benefits and costs, only those falling within its control. Theorem 4 below establishes the innocuousness of this omission.

[11] This model of voting is known as retrospective voting in contrast to the prospective voting model, initially popularized by Downs (1957), in which voters respond to promises for future policy.

$\leqslant x^P$. Consequently, if $N(x)$ possesses a maximum—call it x^N—then $x^N > x^P$. Moreover, if $N(x)$ does not possess a maximum, then our theorem obtains a fortiori since $N(x)$ then increases without bound. Q.E.D.

The condition in the premise of theorem 2, $c_1' > t_j(c_1' + c_2')$, can be presumed to hold in most circumstances. This condition requires that, in district-initiated projects, locally earmarked expenditures grow more rapidly with project scale than local taxes. Since t_j is ordinarily quite small, only a modicum of imagination by legislators is required to find projects with this local expenditure characteristic. For example, if taxes are shared evenly by districts, then $t_j = 1/n$, where n is the number of districts, and the condition becomes

$$c_1' > \frac{1}{n}(c_1' + c_2').$$

That is, so long as district-targeted expenditures grow with project scale at a rate at least $1/n$th as fast as total expenditures, the premise (and hence the conclusion) of theorem 2 holds; in even moderate-sized legislatures this is a fairly weak condition.

More generally, suppose $t_j = t_j(z)$ where z might be any characteristic (examples of which are given below). Then the following comparative statics result may be established.

THEOREM 3: Let x^N be the optimum for (6). Then $dx^N/dz > 0$ if and only if $t_j' < 0$.

PROOF: Rewriting (6), we have

$$N(x) = b(x) + [1 - t_j(z)]c_1(x) - t_j(z)c_2(x) - c_3(x),$$

and first-order condition

$$N'(x) = b'(x) + [1 - t_j(z)]c_1'(x) - t_j(z)c_2'(x) - c_3'(x) = 0.$$

The second-order requirement is

$$N''(x) = b''(x) + [1 - t_j(z)]c_1''(x) - t_j(z)c_2''(x) - c_3''(x) < 0.$$

Totally differentiating the first-order condition yields

$$\{b''(x) + [1 - t_j(z)]c_1''(x) - t_j(z)c_2''(x) - c_3''(x)\}dx$$
$$= [c_1'(x) + c_2'(x)]t_j'(z)dz.$$

Thus,

$$\frac{dx}{dz} = \frac{[c_1'(x) + c_2'(x)]}{\{b''(x) + [1 - t_j(z)]c_1''(x) - t_j(z)c_2''(x) - c_3''(x)\}}t_j'(z).$$

The numerator of the coefficient on the right-hand side is positive (from assumption 2) and the denominator is negative (from the

second-order condition). The coefficient, therefore, is negative, establishing that the sign of dx/dz is opposite that of $t'_j(z)$:

$$t'_j(z) < 0 \rightarrow \frac{dx}{dz} > 0,$$

$$t'_j(z) > 0 \rightarrow \frac{dx}{dz} < 0.$$

Q.E.D.

COROLLARY (The Law of $1/n$): If district tax share is a declining function of the number of districts (n), then the degree of inefficiency in project scale $(x^N - x^E)$ is an increasing function of the number of districts.

PROOF: Let $t_j = t_j(n)$ with $t'_j(n) < 0$. Then, from theorem 3, $dx^N/dn > 0$. Q.E.D.

The corollary indicates that when taxes are apportioned as a decreasing function of the number of political units—for example, $t_j(n) = 1/n$ for all j—then the optimum project scale for any district grows as the polity is more finely partitioned into districts.[12] Theorem 3, however, is more general, for it applies to tax mechanisms that may be the function of any politically relevant characteristic. If a district's tax share is a decreasing function of certain of its legislator's institutional characteristics (membership or influence on tax-writing committee), political characteristics of its representative (is he a committee chairman? is he associated with the majority party?), or economic or demographic characteristics of the district (proportion of families below poverty level, proportion of population above age 65), then we can associate increasingly inefficient projects with particular kinds of districts as defined by these tax-relevant characteristics. In all these cases, theorem 3 indicates that the equilibrium scale of a district's project (and, given the assumptions, its degree of inefficiency) changes with respect to some tax criterion in precisely the opposite way the tax share changes with respect to that criterion.

Institutional Incentives to Restrict Project Size

We have just shown that decentralized choice by a representative legislature characterized by a universalism mechanism, a tax-sharing

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[12] This analysis presumes that the only change in $N(x)$ following a change in the number of districts is the tax rate, t_j. If, however, $c_1(x)$, $c_2(x)$, and $c_3(x)$ depend on the configuration of districts, then two countervailing tendencies may be observed. Increasing the number of districts (1) transforms some portion of $c_1(x)$ into $c_2(x)$ and (2) decreases the tax share of the district. Since the first effect reduces and the second increases the optimal project scale, the net effect is ambiguous without further specification.

rule, and a political objective function yields a vector of projects $x^N = (x_1^N, \ldots, x_n^N)$. Theorems 1 and 2 provide the conditions in which $x_i^N > x_i^E$, $i = 1, \ldots, n$. However, x_i^N, the project scale for district i that maximizes its legislator's political objective function (6), is computed in isolation of computations by other legislators; therefore, it does not take the expenditure and tax externalities (positive and negative) generated by those other projects into account.

In this section, we seek to determine whether or not there is an institutional basis for restraining unbridled universalism.[13] In particular, we turn to an examination of packages of projects and seek to discover whether there exists a package of constitutionally restricted projects, $x^C = (x_1^C, \ldots, x_n^C)$, with the property that $x^C >_i x^N$ (where $>_i$ is the preference order of district i over packages of projects). To accomplish this, consider the complete political maximand of legislator j, $B^j(x_1, \ldots, x_n)$, which rewrites (6) to incorporate the effects of projects in other districts. The net benefits to district j consist of b-type benefits from its own project, $b(x_j)$; c_1-type expenditures from its own project, $c_1(x_j)$; c_2-type expenditures spent in district j from other projects, $\sum_{i \neq j} c_{2j}(x_i)$; nonexpenditure costs from its own project $c_3(x_j)$; and its tax share of the total expenditures, $t_j \sum_{i=1}^n [c_1(x_i) + c_2(x_i)]$. Thus

$$
\begin{aligned}
B^j(x_1, \ldots, x_n) = &\left[b(x_j) + c_1(x_j) + \sum_{i \neq j} c_{2j}(x_i) \right] \\
&- \left\{ c_3(x_j) + t_j \sum_{i=1}^n [c_1(x_i) + c_2(x_i)] \right\}.
\end{aligned}
\tag{8}
$$

Before considering the possibility of restrictions on project size, we first characterize choice under the complete political maximand, $B^j(x_1, \ldots, x_n)$. Calling x_j^B legislator j's solution to the maximization of (8), we have:

THEOREM 4: $x_j^B = x_j^N$.

PROOF: Equation (8) may be rewritten

$$
\begin{aligned}
B^j = &\{ b(x_j) + c_1(x_j) - c_3(x_j) - t_j[c_1(x_j) + c_2(x_j)] \} \\
&+ \left\{ \sum_{i \neq j} c_{2j}(x_i) - t_j \sum_{i \neq j} [c_1(x_i) + c_2(x_i)] \right\},
\end{aligned}
\tag{9}
$$

which, from (6), becomes

$$
B^j = N_j(x_j) + \left\{ \sum_{i \neq j} c_{2j}(x_i) - t_j \sum_{i \neq j} [c_1(x_i) + c_2(x_i)] \right\}.
\tag{10}
$$

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[13] In Shepsle and Weingast (1981), we describe results that demonstrate the ex ante superiority of universalism to pure majority rule in the eyes of each legislator. Here we ask whether a restricted form of universalism, in turn, is superior to pure universalism.

Since the terms in braces are not functions of x_j, the first- and second-order conditions for B^j are the same as those for $N_j(x_j)$; thus, their respective maxima are the same. Q.E.D.

Theorem 4 establishes that our initial focus on N_j (instead of B^j) involved no loss of generality for questions about decentralized project choice. Moreover, theorem 4 establishes that x_j^N is a Nash strategy for legislator j and that the project vector, x^N, is a Nash equilibrium.[14]

Turning to the role of cooperatively imposed restrictions on project size, we state a characterization theorem that establishes the circumstances under which districts (or their representatives) prefer a restricted collection of projects, x^C, to the collection under unrestrained universalism, x^N. For the vector of projects $x^K = (x_1^K, \ldots, x_n^K)$, let $E_j(x^K)$ represent the tax and expenditure effects of other projects on district j. Specifically,

$$E_j(x^K) = \sum_{i \neq j} \{t_j[c_1(x_i^K) + c_2(x_i^K)] - c_{2j}(x_i^K)\}.$$

In effect, $E_j(x^K)$ is the tax bill for district j for all other projects net of local expenditures to district j from these other projects—that is, net negative external costs.

THEOREM 5: $x^C >_j x^N$ if and only if $N_j(x^N) - N_j(x^C) < E_j(x^N) - E_j(x^C)$.

Theorem 5 conveys the following idea: Legislator j has an interest in substituting a collection of projects $x^C = (x_1^C, \ldots, x_n^C)$ for $x^N = (x_1^N, \ldots, x_n^N)$ if and only if his district's reduction in political benefits from the reduced scale of its own project is compensated for by a concomitant reduction in its burden of net negative external costs. There are several ways in which this may fail to hold for a given district j. For example, (i) district j has a sufficiently small tax share, t_j; (ii) district j is, disproportionately, a source of project inputs for other districts, in which case the $c_{2j}(x_i)$ terms are large; and (iii) the political benefits for district j with project scale x_j^N, $b(x_j^N) + c_1(x_j^N)$, are inordinately large. In each of these cases, the condition may fail, implying the absence of a unanimous preference for x^C over x^N. Moreover, there do not appear to be any interesting properties associated with the family of functions $b(x)$, $c(x)$, and $t(x)$ that satisfy the condition in theorem 5; nor is there any ex ante basis for supposing that the condition in theorem 5 will be encountered in empirical settings.

Despite the lack of unanimous preference for restriction under all

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[14] This view interprets our model of unrestricted universalism as a game. The choice set for player j is the size of his project, x_j, when project choice is governed by a universalism mechanism. The Nash equilibrium follows from the separability of the positive and negative externalities of other projects in (10). As a result, each district makes its own decisions without attending to the externalities it produces or consumes.

circumstances, legislators have something to gain by properly accounting for the pecuniary externalities of project scale selection. The next theorem provides some insight into the optimal set of projects which internalizes these effects.

THEOREM 6: x^P maximizes $\sum_{j=1}^{n} B^j(x)$, given in (8).

PROOF:

$$L = \sum_{j=1}^{n} B^j(x) = \sum_{j=1}^{n} \left\{ b(x_j) + c_1(x_j) + \sum_{i \neq j} c_{2j}(x_i) - c_3(x_j) \right.$$

$$\left. - t_j \sum_{i=1}^{n} [c_1(x_i) + c_2(x_i)] \right\}$$

$$= \sum_{j=1}^{n} [b(x_j) + c_1(x_j) + c_2(x_j) - c_3(x_j) - c_1(x_j) - c_2(x_j)]$$

$$= \sum_{j=1}^{n} [b(x_j) - c_3(x_j)].$$

The first-order conditions are

$$\frac{\partial L}{\partial x_j} = b'(x_j) - c_3'(x_j) = 0, \quad j = 1, \ldots, n.$$

Noting that $(\partial^2 L)/(\partial x_i \partial x_j) = 0$ for $i \neq j$, the second-order conditions are

$$\frac{\partial^2 L}{\partial x_j^2} = b''(x_j) - c_3''(x_j) < 0, \quad j = 1, \ldots, n.$$

These equations and inequalities are the same as (5), which identifies the vector x^P in figure 1. Q.E.D.

Theorem 6 shows that total political net benefits are maximized with the vector $x^P = (x_1^P, \ldots, x_n^P)$. Potential gains may be captured if the system of universalistic project selection is amended so that, while each district is assured a project, the project scale is determined as if there were but a single district (as in model P above). Notice that theorem 6 does not assert that $x^P >_j x^N, j = 1, \ldots, n$ (substituting x^P for x^C, theorem 5 shows the restricted circumstances in which this will hold). What theorem 6 does assert is that a compensation scheme which redistributes net benefits is feasible so that x^P together with this compensation is preferred by all districts not only to x^N but to any other omnibus of projects.

It is occasionally asserted that the distributive politics game is a prisoner's dilemma in the economic sense—that unrestrained universalism produces a project package that is an economically inefficient Nash equilibrium, on the one hand, and is unanimously regarded as

less preferable than x^E ($x^E >_j x^N, j = 1, \ldots, n$) on the other. Theorems 1, 2, and 4 establish the first part of this assertion. However, retaining the political conceptualization of net benefits given in (8), theorem 5 shows that the second part of the assertion does not always follow. The collection x^E is not always unanimously regarded as preferable to x^N. More importantly, theorem 6 shows that even when all representatives favor restrictions, the *politically* optimal set of projects is x^P, not x^E.

This discussion underscores the basic point of the paper. The efficient collection, x^E, though normatively attractive in welfare analysis, is not always behaviorally relevant. The implication of the political maximand (8) and theorems 1, 2, 5, and 6 is that legislators hold no brief for efficiency, per se, either with regard to their own project selection or a package of such projects.

Extensions and Discussion

The model developed in the previous sections roots the inefficiency of distributive politics in democratic mechanisms and especially in the geographic basis of political constituencies. This latter feature produces two independent sources of bias. First, locally targeted expenditures are counted by the local constituency as benefits. Second, the districting mechanism in conjunction with the taxation system provides incentives to increase project size beyond the efficient point by attenuating the relationship between beneficiaries and revenue sources. A cooperative legislature has no incentive to remove entirely these sources of inefficiency (beyond that described in the discussion following theorem 6).

In this section, we examine several related themes and applications. Each of these is either an extension of our model to domains beyond that of traditional distributive policy or a specialization of our model to substantively relevant cases of distributive policy.

Congressional Limitation on Project Size

A well-known behavioral mechanism has operated in Congress since the 1880s that restrains the attempts of legislators to fund their pet projects. At the authorization stage, a universalism mechanism is at work—the annual omnibus public works bill, for example, typically contains authorizations for projects in most congressional districts. Following the passage of authorizing legislation comes the separate stage of actually appropriating monies. Here, the Committee on Appropriations systematically scales down each project (for a description of this process, see Fenno [1966] and Ferejohn [1974]).

Our model sheds some light on this well-established congressional practice. First, suppose the premise of theorem 5 holds, where $x^P = x^C$. Hence, $x^P >_j x^N, j = 1, \ldots, n$. Second, assume legislator j and only legislator j knows x_j^P and x_j^N. Theorem 5 implies that legislators unanimously favor a mechanism reducing project sizes from the uncoordinated choice, x^N. But there does not appear to be a straightforward "demand-revealing" mechanism inducing legislators to announce anything other than their maximizing Nash strategy, x_j^N. Thus, in the face of imperfect information, the simpler mechanism of scaling down all projects—the current practice of the appropriations committee—may yield a vector of project sizes less than x^N and preferred by all legislators.[15]

Examination of Interesting Subclasses

We mention briefly, as an indication of the utility of this approach, some interesting special cases of the political maximand (6):

$$N(x_j) = b(x_j) + c_1(x_j) - c_3(x_j) - t_j[c_1(x_j) + c_2(x_j)].$$

The details may be provided by the reader.

1. *Benefit tax.*—This tax scheme requires the district to pay the entire cost of a strictly local public project ($t_j = 1$). The maximand becomes

$$N_j(x_j) = b(x_j) - c_2(x_j) - c_3(x_j),$$

and assumptions 1 and 2 imply a project scale x_j^* with the property $x_j^E \leq x_j^* \leq x_j^P < x_j^N$. Note that if $c_2(x_j) = 0$, then $x_j^* = x_j^P$ whereas, if $c_1(x_j) = 0$, then $x_j^* = x_j^E$. This last fact suggests that a benefit tax in conjunction with no local expenditures is a sufficient condition for public sector efficiency.

2. *Free-ride tax.*—In this case, $t_j = 0$ and the maximand is

$$N(x_j) = b(x_j) + c_1(x_j) - c_3(x_j),$$

which implies a scale $x_j^* > x_j^N$. This case approximates local public goods, financed by user fees, where the local residents rarely number among the users. For example, if Yellowstone National Park were financed by user fees assessed states in proportion to their respective

[15] A complete analysis must resolve two issues. First, as a consequence of the scaling down practice by the Appropriations Committee, will the legislator strategically seek a project scale in excess of x_j^* so that, when it is scaled down, it will eventually reach size x_j^N? Alternatively, are there sanctions discouraging artificial inflation of project scale at the authorizing stage? Second, are there sanctions available to be applied against the Appropriations Committee to ensure it does not scale down too much? See Fenno (1966) for some empirical details. These issues concerning demand revelation mechanisms are theoretically intriguing but take us too far afield to be dealt with here.

share of the population using the park, then Wyoming residents receive a cheap, if not free, ride on taxes.

3. *Foreign aid versus military assistance.*—We can interpret the political popularity of the latter and unpopularity of the former via the following calculation. Let x^F and x^M describe levels of the two forms of aid; assume $b(x_j^F) = b(x_j^M)$, ceteris paribus, for any political constituency (assumed, in any event, to be small unless the constituency contains partisans of or emigrants from the benefiting country); for some constituencies (producers of military hardware), $c_1(x_j^M) > 0$; for all constituencies, on the other hand, $c_1(x_j^F) = 0$; for all constituencies, $c_3(x_j^M) = c_3(x_j^F) = 0$. Thus,

$$N(x_j^M) = b(x_j^M) + (1 - t_j)c_1(x_j^M) - t_jc_2(x_j^M),$$

$$N(x_j^F) = b(x_j^F) - t_jc_2(x_j^F).$$

Assumptions 1 and 2 imply $(x_j^M)^* > (x_j^F)^*$, an observation consistent with their respective popularities. It also makes sense of the recent policy innovation of attaching strings to foreign aid requiring recipients to make purchases in the United States (c_1-type expenditures).

4. *Rube Goldberg machines and military bases.*—Suppose $b(x_j) = 0$ for a project in a given constituency, j. Then

$$N(x_j) = (1 - t_j)c_1(x_j) - t_jc_2(x_j) - c_3(x_j).$$

Even though $b(x_j) = 0$, the (politically) optimal project scale may be greater than zero. Specifically,

$$x_j^N > 0 \text{ if } N'(0) > 0, \text{ or } (1 - t_j)c_1'(0) - t_jc_2'(0) - c_3'(0) > 0.$$

Consider the case of many military bases (and other Rube Goldberg machines) which, by the Department of Defense's own admission, provide virtually no contribution to defense ($b[x] = 0$). These nevertheless remain attractive to local constituencies (hence $x_j^N > 0$) because of the overriding importance of these projects to the local economy in the form of c_1-type benefits. Throughout this paper, we have emphasized the political inappropriateness of economic net benefits as a relevant decision criterion. In this special case, it appears that even the absence of economic benefits altogether is not a disqualifying characteristic in political choice.

Generalization to Non–Pork Barrel Policies[16]

One of the central features of our models is the unpacking of costs in politically relevant ways in which we distinguish project costs returned

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[16] These themes are developed in more detail in Shepsle and Weingast (1980).

to the district as expenditures, costs returned to other districts, and nonexpenditure costs borne within the district. We focused, however, on distributive or pork barrel projects, defined as projects whose benefits are geographically concentrated and whose costs are spread through general taxation. Two extensions offer further insight into nondistributive policies. The first distinguishes an additional cost, $c_4(x)$, or external, nonexpenditure costs borne by other districts. The second defines another source of economic benefits, $b_2(x)$, that accrues to other constituencies as a consequence of a project in a particular district.

1. *Additional external costs.*—If additional external costs of the jth project spill over into other districts, it can easily be shown that the degree of inefficiency increases when governed by decentralized project choice under the political maximand, $N(x)$. Since the model now divides externalities into their politically relevant components, $c_3(x)$ and $c_4(x)$, we can make further observations about the degree to which the political system can be relied upon to internalize externalities associated with public activities. If the externalities are not too large (in the sense that they are local and do not extend into neighboring districts), the public sector action governed by a representative legislature internalizes them. However, if they are large, public sector action may not.

The politically relevant (though economically arbitrary) distinction implied by district boundaries suggests that the public sector can only provide certain categories of public goods which are not available through private market arrangements. Hence, jurisdictional questions become of paramount importance when producing a local public good like flood walls along a river which divides two political jurisdictions. Some of the most infamous cases of pork barrel politics illustrate this point: The flood walls along the lower part of the Mississippi River, which divides Louisiana from Mississippi, are 3 feet higher on the Mississippi side (see Ferejohn 1974, pp. 56–58). Similarly, the levees on the Indiana side of the Wabash River are higher than those on the Illinois side. Thus, a universalistic representative legislature is biased toward projects with low c_3-type costs while failing to consider c_4-type costs.

2. *Additional external benefits.*—Let $b(x_j) = b_1(x_j) + b_2(x_j)$ where $b_1(x_j)$ are the benefits of the jth project concentrated in district j and $b_2(x_j)$ are the benefits consumed by residents of other districts (presumed zero throughout the body of the paper). That is, $b_2(x_j)$ is the positive consumption externalities (as compared with $c_2[x_j]$, which are the positive production externalities).

Because the benefits outside the district are not readily internalized

under a distributive policy mechanism, large multidistrict (multistate) projects are likely to be rare relative to projects with concentrated local benefits. Consequently, multidistrict public goods (in the economic sense) are not only likely to be underproduced by a market mechanism but by a representative legislature as well (see Aranson and Ordeshook 1978). A universalistic representative legislature is biased toward projects with high b_1-type benefits, while failing to internalize b_2-type benefits. Thus, both positive and negative externalities adversely affect public as well as private provision.

Conclusion

Throughout this paper we have focused on the sources of inefficiency in public decision making. Our model demonstrates that democratic institutions play an important role. Three mechanisms were shown to influence the politically optimal project choice: the political cost-accounting mechanism, the districting mechanism, and the taxation mechanism. These features of the political economy systematically transform the economic benefits and costs into political counterparts. Since it is the latter that determine the maximands for political actors and not their economic counterparts, these govern political choice.

   While our modeling of the districting and taxation mechanisms is straightforward and uncontroversial, there are circumstances in which our treatment of the incidence of gains and losses from local expenditures is implausible. We have presumed that pecuniary gainers figure more prominently than pecuniary losers in a legislator's reelection constituency. However, under some circumstances this may not be true. A legislator's reelection constituency, for example, may be dominated not by factor owners of a public project but by those who would bear the brunt of the pecuniary losses and the nonpecuniary external costs of the project. We would not, therefore, expect the legislator to seek such projects. Indeed, since the menu of distributive programs is sufficiently diverse, there normally is something available for everyone. Thus we tend to find reclamation projects in the West, locks and dams in river districts with an active construction industry, and wildlife refuges in Sierra Club districts. Because of this diversity in policy preferences and program categories, the logic supporting the political distortion of pecuniary incidences continues to hold.

   Our principal conclusion is that since political institutions fundamentally alter the perceptions and incidence of benefits and costs, they systematically bias project choices away from the efficient outcomes. In the context of distributive politics, this was shown to imply larger projects and programs than are economically warranted.

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