5

Punctuated-Equilibrium Theory

Explaining Stability and Change in American Policymaking

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Punctuated-equilibrium theory seeks to explain a simple observation: Political processes are often driven by a logic of stability and incrementalism, but occasionally they also produce large-scale departures from the past. Stasis, rather than crisis, typically characterizes most policy areas. However, crises often occur. Dramatic changes in public policies are constantly occurring in many areas of American politics and policymaking, as public understandings of existing problems change. Important governmental programs are sometimes altered dramatically, even if most of the time they continue as they did in the previous year. The observation, then, is that both stability and change are important elements of the policy process. Most policy models have been designed to explain, or at least have been more successful at explaining, either the stability or the change. The punctuated-equilibrium theory encompasses both.

How to explain punctuations and stasis in a single theory? Punctuated-equilibrium theory places the policy process on a double foundation of political institutions and boundedly rational decisionmaking. It emphasizes two related elements of the policy process: issue definition and agenda setting. As issues are defined in public discourse in different ways, and as issues rise and fall in the public agenda, existing policies can be either reinforced or questioned. Reinforcement creates great obstacles to anything but modest change, but the questioning

of policies at the most fundamental levels creates opportunities for dramatic reversals in policy outcomes.

Neither boundedly rational theories of incrementalism nor globally rational theories of preference maximization fit well with the joint observations of stasis and dramatic change that are the dual foci of the punctuated-equilibrium approach. However, rather than centering on the problems of purely incremental policy theories or purely rational choice theories, punctuated-equilibrium theory extends current agenda-setting theories to deal with both policy stasis and policy punctuations.

Several loosely related approaches in political science have noted that although agenda setting and policymaking often proceed smoothly with marginal accommodations, they also are regularly torn by lurches and significant departures from the incremental past (Kingdon, 1984, 1985/1995; Baumgartner and Jones, 1991, 1993; Dodd, 1994; Kelly, 1994). A unifying theme of these approaches is that we observe the same institutional system of government organizations and rules producing both a plethora of small accommodations and a significant number of radical departures from the past.

For the authors of this chapter, the clearest explanation for both marginal and large-scale policy changes comes from the interaction of subsystem politics and behavioral decisionmaking, a combination that creates patterns of stability and mobilization or punctuated equilibria.[1] In this chapter, we examine punctuated-equilibrium theory and its foundations in the longitudinal study of political institutions and in political decisionmaking. Next, we extend the punctuated-equilibrium theory to national budgeting and provide some recent evidence of punctuations and equilibria in national government spending since World War II. We conclude with an assessment of the strengths and weaknesses of this approach to understanding policymaking in America.

PUNCTUATED EQUILIBRIA IN AMERICAN POLICYMAKING

Since the path-breaking work of E. E. Schattschneider (1960), theories of conflict expansion and agenda setting have stressed the difficulty that disfavored groups and new ideas have in breaking through the established system of policymaking (Cobb and Elder, 1983; Bosso, 1987). As opposed to smooth, moderate adjustments to changing circumstances, the conservative nature of the national political system often favors the status quo, thereby making conflict or an extraordinary effort necessary for a major change.

When Baumgartner and Jones (1993) analyzed a number of policymaking cases over time and over a variety of issue areas, they found (1) that policymaking both makes leaps and undergoes periods of near stasis as issues emerge on and recede from the public agenda; (2) that this tendency toward punctuated equilibria is exacerbated by American political institutions; and (3) that policy

images play a critical role in expanding issues beyond the control of the specialists and special interests that occupy what they termed "policy monopolies."

Baumgartner and Jones (1991, 1993) saw that the separated institutions, overlapping jurisdictions, and relatively open access to mobilizations in the United States combine to create a dynamic between the politics of subsystems and the macropolitics of Congress and the presidency—a dynamic that usually works against any impetus for change but occasionally reinforces it. For example, mobilizations are often required to overcome entrenched interests, but once under way, they can engender large-scale changes in policy. The reason is that once a mobilization is under way, the diffuse jurisdictional boundaries that separate the various overlapping institutions of government can allow many governmental actors to become involved in a new policy area. Typically, the newcomers are proponents of changes in the status quo, and they often overwhelm the previously controlling powers. Institutional separation often works to reinforce conservatism, but it sometimes works to wash away existing policy subsystems.

In short, American political institutions were conservatively designed to resist many efforts at change and thus to make mobilizations necessary if established interests are to be overcome. The result over time has been institutionally reinforced stability interrupted by bursts of change. These bursts have kept the U.S. government from becoming a gridlocked Leviathan despite its growth in size and complexity in this century. Instead, the U.S. government has become a complex, interactive system. Redford (1969) differentiated between subsystem politics and macropolitics. Baumgartner and Jones extended Redford's insight and combined it with the issue expansion and contraction insights of Schattschneider (1960) and Downs (1972) to form this theory of long-term agenda change and policymaking.

Institutional structures provide an important basis for the punctuated-equilibrium idea, and the agenda-setting process provides another. No political system features continuous discussion over all issues that confront it. Rather, discussions of political issues are usually disaggregated into a number of issue-oriented policy subsystems. These subsystems can be dominated by a single interest, can undergo competition among several interests, can be disintegrating over time, or may be building up their independence from others (Meier, 1985; Sabatier, 1987; Browne, 1995). They may be called *iron triangles, issue niches, policy subsystems,* or *issue networks,* but any such characterization can be considered only a snapshot of a dynamic process (Baumgartner and Jones, 1993, p. 6). Whatever the name one gives to these communities of specialists operating out of the political spotlight, most issues most of the time are treated within such a community of experts. Nonetheless, within the spotlight of macropolitics, some issues catch fire, dominate the agenda, and result in changes in one or more subsystems.

Herbert Simon (1957, 1977, 1983, 1985) distinguished between parallel processing and serial processing in individual and organizational decisionmaking. Some decision structures are capable of handling many issues simultaneously, in

parallel. Others handle issues seriatim, one or a few at a time. Political systems, like humans, cannot simultaneously consider all the issues that face them, so the existence of some form of policy subsystems can be viewed as a mechanism that allows the political system to engage in parallel processing (Jones, 1994). Thousands of issues may be considered simultaneously in parallel within their respective communities of experts. This equilibrium of interests does not completely lock out change. Issue processing within subsystems allows for a politics of adjustment, with incremental change resulting from bargaining among interests and marginal moves in response to changing circumstances. But parallel processing does operate against larger policy changes, because it tends to be insulated from the glare of publicity associated with high-agenda politics.

Sometimes the parallel processing of issues breaks down, and they must be handled serially. The macropolitical institutions of Congress and the public presidency constitute governmental serial processing where high-profile issues are considered, contended over, and decided one at a time or, at most, a few at a time. When an issue moves higher on the political agenda, it is usually because new participants have become interested in the debate: "When a policy shifts to the macropolitical institutions for serial processing, it generally does so in an environment of changing issue definitions and heightened attentiveness by the media and broader publics" (Jones, 1994, p. 185). It is then that major changes tend to occur. Issues cannot forever be considered within the confines of a policy subsystem; occasionally macropolitical forces intervene. It is the intersection of the parallel processing capabilities of the policy subsystems and the serial processing needs of the macropolitical system that creates the nonincremental dynamics of lurching that we often observe in many policy areas. Punctuated equilibria in politics stem from this requirement of politics: Politicians cannot simultaneously deal with all important issues, but governments must.

When dominated by a single interest, the subsystem is best thought of as a policy monopoly. A policy monopoly has a definable institutional structure responsible for policymaking in an issue area, and its responsibility is supported by some powerful idea or image. This image is generally connected to core political values and can be communicated simply and directly to the public (Baumgartner and Jones, 1993, pp. 5–7). Because a successful policy monopoly systematically dampens pressures for change, we say that it contains a negative feedback process. Yet policy monopolies are not invulnerable forever.

A long-term view of U.S. policymaking reveals that policy monopolies can be constructed, and they can collapse. Their condition has an important effect on policymaking within their issue areas. If the citizens excluded from a monopoly remain apathetic, the institutional arrangement usually remains constant, and policy is likely to change only slowly (the negative feedback process). As pressure for change builds up, it may be resisted successfully for a time. But if pressures are sufficient, they may lead to a massive intervention by previously uninvolved political actors and governmental institutions. Generally, this requires a substantial

change in the supporting policy image. As the issue is redefined, or as new dimensions of the debate become more salient, new actors feel qualified to exert their authority where previously they stayed away. These new actors may insist on rewriting the rules, and on changing the balance of power that will be reinforced by new institutional structures as previously dominant agencies and institutions are forced to share their power with groups or agencies that gain new legitimacy. Thus, the changes that occur as a policy monopoly is broken up may be locked in for the future as institutional reforms are put in place. These new institutions remain in place after public and political involvements recede, often establishing a new equilibrium in the policy area that lasts well after the issue recedes back off the agenda and into the parallel processing of a (newly altered) policy community.

Punctuated-equilibrium theory includes periods of equilibrium or near stasis, when an issue is captured by a subsystem, and periods of disequilibrium, when an issue is forced onto the macropolitical agenda. When an issue area is on the macropolitical agenda, small changes in the objective circumstances can cause large changes in policy, and we say that the system is undergoing a positive feedback process. Bak and Chen's (1991) study of large interactive systems helps flesh out this process of positive feedback. Like earthquakes, these policy punctuations can be precipitated by a mighty blow or by relatively minor events. What determines whether an issue will catch fire with positive feedback or not? The interaction of changing images and venues of public policies does.

Policy images are a mixture of empirical information and emotive appeals. The factual content of any policy or program can have many different aspects, and it can affect different people in different ways. When a single image is widely accepted and generally supportive of the policy, it is usually associated with a successful policy monopoly. When there is disagreement over the proper way to describe or understand a policy, proponents may focus on one set of images while their opponents refer to a different set of images. For example, when the image of civilian nuclear power was associated with economic progress and technical expertise, its policymaking typified a policy monopoly. When opponents raised images of danger and environmental degradation, the nuclear policy monopoly began to collapse (Baumgartner and Jones, 1991, 1993, pp. 25–28, 59–82). As we see in the next section, Jones (1994) further analyzed the importance of policy images not only to issue definition and redefinition in policymaking, but also to the serial and parallel processes of individual and collective decisionmaking in a democracy.

A new image may attract new participants, and the multiple venues in the American political system constitute multiple opportunities for policy entrepreneurs to advance their case. Not only do federalism, separation of powers, and jurisdictional overlaps inhibit major changes during periods of negative feedback, but they also mean that a mobilization stymied in one venue may be successful in

another. A problem that has not advanced onto the national agenda can sometimes be acted on by the states, and vice versa. The U.S. system of multiple policy venues is an important part of the process of disrupting policy monopolies during periods of positive feedback.

In summary, subsystem politics is the politics of equilibrium—the politics of the policy monopoly, incrementalism, a widely accepted supportive image, and negative feedback. Subsystem decisionmaking is decentralized to the iron triangles and issue networks of specialists in the bureaucracy, congressional subgroups, and interested parties. Established interests tend to dampen departures from inertia (except perhaps for the annual marginal increase in the budget) until a political mobilization, advancement on the governmental agenda, and positive feedback occur. At that point, issues spill over into the macropolitical system of Congress and the public presidency.

Macropolitics is the politics of punctuation—the politics of large-scale change, competing policy images, political manipulation, and positive feedback. Positive feedback exacerbates impulses for change: It overcomes inertia and produces explosions or implosions from former states (Baumgartner and Jones, 1991, 1993; Jones, Baumgartner, and Talbert, 1993; Jones, 1994; Talbert, Jones, and Baumgartner, 1995; Jones, Baumgartner, and True, 1996).

Policymaking in the United States is not well characterized by gridlock and a straitjacket view of government. Vast changes have occurred in U.S. policy over the years. Some of the change has been incremental, and some of it has occurred in bursts or punctuations. During quiet periods for an issue area, the issue is not widely seen as a public problem. Or if it is, then its policymaking is in the hands of a subsystem (often a policy monopoly) with a generally accepted and supportive image. Nonetheless, there almost always remains some possibility that conflict expansion or a mobilization of enthusiasm will generate new images and attract new participants. Then the issue area is no longer quiet. It advances on the agenda, and the macropolitical institutions grapple with it and with each other in an effort to resolve the new "hot" issue. Major policy changes may be initiated, one or more policy subsystems may be disrupted, and a new agency or program may be created: "Punctuated equilibrium, rather than stability and immobilism, characterizes the American political system" (Baumgartner and Jones, 1993, p. 236).

BOUNDEDLY RATIONAL FOUNDATIONS AND THE CENTRALITY OF DECISIONMAKING

Embedded in the punctuated-equilibrium theory of policy change is an implicit theory of individual and collective decisionmaking. From a decisionmaking perspective, large-scale punctuations in policy spring from either a change in preferences or a change in attentiveness. If we regard preferences as relatively stable,

how can we explain nonmarginal changes in government policy? Particularly, how can we explain apparent cases of choice reversal when later studies find no large changes in the external environment?

Baumgartner and Jones (1993) explained "bursts" of change and policy punctuations as arising from the interactions of images and institutions. When an agreed-upon image becomes contested, a policy monopoly is usually under attack, and the likelihood grows of a new mobilization (a wave of either criticism or enthusiasm) advancing the issue onto the macropolitical agenda. How can policy images play such a central role in government agenda setting? Part of the answer is found in Jones's (1994) analysis of serial attention and rational decisionmaking, both individually and collectively.

Jones (1994) argued that individual and collective decision changes, including choice reversals, do not spring from rapid flip-flops of preferences or from basic irrationality (choosing to go against our own preferences); they spring from shifts in attention. He called such rapid changes "serial shifts." Individually, our serial attentiveness means that the senses may process information in a parallel way, but attention is given serially to one thing, or at most a few things, at a time (Simon, 1977, 1983). This means that although reality may be complex, changing, and multifaceted, we cannot smoothly integrate competing concerns and perspectives. We focus usually on one primary aspect of the choice situation at a time (Simon, 1957, 1985; Jones, 1994; see also Tversky, 1972; Zaller, 1992). Collectively, a shift in the object of attention can lead to a disjointed change in preferred alternatives, even when the alternatives are well defined (Jones, 1994, 1996).

Bounded rationality was wedded early to incrementalism (Lindblom, 1959; Wildavsky, 1964), yet incrementalism proved to be, at best, an incomplete explanation of government policymaking and, at worst, a misleading one. The basic problem with incrementalism surfaced when it was tested empirically. For example, when Davis, Dempster, and Wildavsky (1966) made a longitudinal study of bureau-level budget results, they found and reported empirical evidence of both incremental decision rules and two types of nonincremental shifts. The first shift apparently happened when a decision rule was temporarily set aside for a short period (called a *deviant case*), and the second occurred when a new decision rule was adopted (called a *shift point*) (1966, pp. 537–542). Except for these punctuations, these authors found support for a relatively incremental view of the budgetary process. The punctuations themselves were excluded from the model, and the authors' conclusions pointed to the significance of finding equations for the budget process and to the central role that the prior-year "base" played in those equations.

Focusing solely on incremental changes caused early behavioral decision theorists to downplay empirical evidence of large-scale change, and it led boundedly rational decisionmaking into a theoretical cul-de-sac. Incrementalism did seem to explain much of what happened in the budgetary process, but it had nothing

to say about major policy changes. Indeed, boundedly rational decisionmaking even had a difficult time determining when changes could no longer be considered incremental (Wanat, 1974; Padgett, 1980; Berry, 1990; Hayes, 1992).

With Jones's reconceptualization, however, boundedly rational decisionmaking is a foundation for both major and minor changes—for both punctuations and equilibria. In the case of policymaking in America, the twin foundations of conservative and overlapping political institutions and boundedly rational decisionmaking (especially the role of images in dampening or exacerbating mobilizations against entrenched interests) combine to create a system that is both inherently conservative and liable to occasional radical change.

PUNCTUATIONS AND STABILITY IN U.S. GOVERNMENT SPENDING

We have recently extended the punctuated-equilibrium theory to produce an agenda-based model of national budgeting (Jones, Baumgartner, and True, 1995, 1996, 1998). Its foundation remains the boundedly rational process of human decisionmaking interacting with disaggregated political institutions, specifically serial attentiveness and parallel subsystems. Collectively, government decisionmakers usually process information in a parallel way through subsystems, policy monopolies, iron triangles, and issue networks. When that happens, budgets change only incrementally. However, sometimes issues move from subsystem politics to macropolitics, and national attention in the Congress and in the presidency is of necessity given to one or a few high-profile items at a time. In the attention limelight of the macropolitical institutions, policies and programs can make radical departures from the past, and budgets can lurch into large changes.

National budget decisions are as boundedly rational as the policymaking decisions discussed above. Choice situations are multifaceted, yet decisionmakers tend to understand choices in terms of a circumscribed set of attributes, and they tend to have considerable difficulties in making trade-offs among these attributes. If a given policy promotes economic growth but simultaneously has some negative consequences in terms of human rights, one or the other of those competing values may be in the forefront of decisionmakers' attention. If attentiveness to these two dimensions were to shift—say as a result of scandal or changes in the composition of the group of decisionmakers, as sometimes occurs—then the chosen policy might shift dramatically as well. In general terms, Jones (1996) noted that decisionmakers tend to stick with a particular *decision design* (a term that refers to the attributes used in structuring a choice) until forced to reevaluate the decision design.

Budgets react to both endogenous and exogenous forces. The forces that might cause a change in the decision design may be external to the decisionmaker. Such

influences may include changing levels of public attention, striking and compelling new information, or turnover in the composition of the decisionmaking body (say, when an election changes control of Congress, and when committee leaderships are rotated from one party to the other). When changing external circumstances force us out of an old decision design, the result is often not a modest adjustment but a major change in choice. Yet subsystem politics and the bureaucratic regularity of annual budget submissions constitute endogenous forces that tend to favor continuing with the same decision design. As a consequence, budget decisions tend either to be static, arrived at by applying the current decision design and subsystem institutions to the new choice situation, or disjointed, arrived at by utilizing a different decision design and macropolitical institutions that may incorporate new attributes into the choice structure or shift attention from one dimension to another. Even these explanations do not exhaust the possible interactions among institutions, images, and the environment, for large changes can also arise from endogenous conflicts over the appropriate image and from shifts in attention when the external circumstances have changed little, if at all.

Because political institutions amplify the tendency toward decisional stasis interspersed with abrupt change (as opposed to smooth, moderate adjustments to changing circumstances), the agenda-based model of policymaking and the serial shift model of decisionmaking together produce a pattern of punctuations and equilibria in the budget processes. As attentiveness shifts to the new aspect or attribute, so, too, do outcomes shift, and this process is often not smooth. Occasionally, in almost every issue area, the usual forces of negative feedback and subsystem maintenance will be replaced by deviation-enhancing positive feedback forces. Positive feedback leads to episodic and sporadic change (as institutionally induced stability tends to reassert itself after the punctuation).

This attention-driven, agenda-based budget model encompasses both periods of punctuation and periods of stability. In contrast to earlier theories, the agenda-based model has an almost tectonic flavor. Like earthquakes and avalanches, modern budgets reflect many small tremors and occasional major upheavals. Applied to budgets, the punctuated-equilibrium theory continues to differentiate between serial and parallel policy processing in government, and it incorporates a role for public mobilizations on an issue or issues. In elaborating on the theory, this model calls for varying interactions between mobilization pressures and resource constraints over time, and it calls for punctuations to occur at all levels of the budget.

This view of the budget process leads us to expect that annual budget changes within a given spending category should not be distributed in the normal, bell-shaped curve. Rather, these changes should reflect the nonnormal distributions found in earthquakes and other large interactive systems (see Mandelbrot, 1963; Padgett, 1980; Midlarsky, 1988; Bak and Chen, 1991; Peters, 1991). The "earthquake" budget model anticipates many minuscule real changes, few moderate changes, and many large changes (Jones et al., 1996).

The model implies that punctuations ought to occur at all levels of policymaking and at all levels of the budget, not to be driven simply by external (exogenous) factors in a top-down manner. This is a consequence of two factors. First, budget decisions are hostage to the statics and dynamics of selective attention to the underlying attributes structuring a political situation. Second, the theory of punctuated policy equilibrium is based in part on a "bottom-up" process in which policy change may occur in isolated subsystems; may spill over into other, related subsystems; or may be affected by exogenous shocks (Jones et al., 1996, 1998). If punctuations did not occur at all levels of scale in the budget, from the program level to the macropolitical level, and if they did not occur during all time periods, then we would have to question the application of this theory to budgeting.

Yet, because national budget decisions take place within political institutions, we expect that hierarchy will produce an inequality in the transmission of punctuations from one level to another. This inequality of transmission is connected to the notion of parallel versus serial processing of issues. Both the president and Congress are capable of transmitting top-down budget changes to many agencies at once, and they do so when an issue affecting many agencies or programs reaches the national agenda and is processed serially. Such top-down punctuations from fiscal stress will be more easily transmitted to departments, agencies, and bureaus than bottom-up punctuations from within those institutions will be transmitted upward. The reason is that the insular nature of parallel processing within subsystems damps out the spillover effects among subsystems. As a result, we expect fewer punctuations at the top than at the bottom levels of governmental organization.

PUNCTUATIONS IN PREVIOUS BUDGET THEORIES

Many different models of the policy process have predicted abrupt change, but they have generally postulated exogenous change. In particular, in the empirical and theoretical literature on public budgeting there is ample precedent to expect budget punctuations, beginning as shown above with Davis, Dempster, and Wildavsky (1966). Their studies focused on the use by decisionmakers of budget decision rules. These rules, understood by participants and offering a stable organizational environment for decisionmaking, were based on the concepts of base and fair share, which led to incrementalism in both process and output. But these authors later added that "although it is basically incremental, the budget process does respond to the needs of the economy and society, but only after sufficient pressure has built up to cause abrupt changes precipitated by these events" (Davis et al., 1974, p. 427). Exogenously caused punctuations in budget results are consistent with Ostrom and Marra (1986), Kamlet and Mowery (1987), Kiewiet and McCubbins (1991), and Su, Kamlet, and Mowery (1993).

The "earthquake" budget model departs from all of the cybernetic, optimizing, and adaptive models in emphasizing stasis or large change but not moderate change. The policymaking literature is replete with models of exogenously forced policy change. In addition to the authors cited above, such models are also suggested in the work of comparativists (Krasner, 1984) and scholars who study public representation. They see changes in public policy as exogenously driven by changes in public opinion (Stimson, MacKuen, and Erikson, 1995) or, alternatively, both responding to opinion and causing changes in opinion through a thermostat-like device (Wlezien, 1995). These models call for punctuations only if there is a change in macrolevel exogenous forces.

Other authors have allowed for complex interactions between endogenous and exogenous budget changes. Kiel and Elliott (1992) approached budgeting from a perspective of nonlinear dynamics, incorporating both linear and nonlinear processes. They noted the existence of likely nonlinearities in the budgeting process in which "exogenous and endogenous forces simply have varying impacts on budget outlays over time" (Kiel and Elliott, 1992, p. 143). Nonlinear, interactive processes imply occasional punctuations. Thurmaier (1995) reported the results of experiments in budget scenarios in which decisionmakers shift from economic to political rationales for their decisions after being given new information about political calculations. Such shifts in the bases of decisions can lead to punctuations. True (1995) found that domestic political factors had more influence on spending for national defense than had the dissolution of the Soviet Union. The case for both endogenous and exogenous influences on national budgets seems to be a strong one.

Most modern work in this area (including our own) must reckon with the seminal work of John Padgett (1980, 1981) on budget decisionmaking. Padgett's serial judgment model of the budget process implies "the occasional occurrence of very radical changes" (1980, p. 366). Both Padgett's serial judgment model and our agenda-based approach allow for endogenous mobilizations as well as exogenous shocks. Davis, Dempster, and Wildavsky (1966) suggested only exogenous shocks, but all three sets of authors have suggested punctuations in the budget process. The "earthquake" budget model alone, however, ties budget making both to an embedded cognitive decision theory and to an explicit policymaking theory—the punctuated-equilibrium theory of governance.

Following Padgett's lead, our agenda-based budget model assumes that budgeting is a stochastic process. It remains extremely difficult (and perhaps impossible) to specify precise causal linkages among all of the variables that interact nonlinearly or interdependently to produce changes in all of the line items of annual national budgets (especially if, like us, one hopes to do so for the entire postwar period). However, it is possible to develop hypotheses about the distribution of budget changes that can be derived from our agenda-based model and that can be distinguished from previous budgeting models. And that is the strategy we have followed (Jones et al., 1995, 1996).

Because we expect budgets generally to change very little, but occasionally to change a great deal, we hypothesize that annual budget changes will be distributed leptokurtotically. That is, their univariate distribution should have a large, slender central peak (representing a stability logic), weak shoulders (representing the difficulty in making moderate changes), and big tails (representing episodic punctuations). Note that a normal or Gaussian distribution would be found if continuous dynamic adjustment were the primary decision mechanism (Davis et al., 1966; Padgett, 1980; for a careful examination of univariate distributions, see Johnson, Kotz, and Balakrishnan, 1994).

Because we expect the dynamics of budget decisionmaking to occur at all levels, we hypothesize scale invariance. That is, we expected the underlying, nonnormal distribution of annual changes to be evident at all levels of aggregation (program, function, subfunction, and agency). Yet, because we expect changes in budget decisions to be more easily transmitted down the organizational chain than up, we expect that punctuations will be more pronounced at the bottom of the hierarchy than at the top. That is, we expect subfunctions to be more leptokurtotic than functions, and functions to be more leptokurtotic than higher aggregations.

These expectations diverge from the predictions of other budget and decision models. The boundedly rational models of Davis et al. (1966, 1974) explicitly describe the normality of their residual terms. That is, year-to-year changes are usually normally distributed, and after an exogenous factor has caused a shift in parameters, the series will again be modeled with a normal residual term. The "cybernetic" models of Ostrom and Marra (1986), Kamlet and Mowery (1987), or Blais, Blake, and Dion (1993) depend upon the assumption of normality to justify their use of linear regressions and pooled-regression models.

Budget-maximizing models have made few particular predictions in this area (Niskannen, 1971), but it is reasonable to expect a normal distribution of first differences from them as well, and indeed most regression analyses and analyses of variance depend upon the central limit theorem for their justification. Maximizing models do not predict punctuations unless there is a shift in exogenous factors, but if such a shift occurs, most maximizing models assume that the accumulation of exogenous factors will asymptotically approach normality.

We tested our hypotheses of nonnormal changes with a new data set of budget authority for Office of Management and Budget (OMB) subfunctions from fiscal year 1947 through FY 1995. We used actual budget authority corrected for inflation. This measure is more accurate than appropriations, which can confuse the timing of contract spending and depend upon estimates for trust fund spending. And budget authority is closer to the congressional decisionmaking process than outlay data, which can be delayed for several years after the decision has been made. We constructed the relevant estimates from original contemporary budgets based upon our analysis of current budget categories. We focused primarily on OMB's subfunction level, which divides the seventeen core governmental

functions into seventy-four groupings based on the national purposes they are supposed to serve. We have limited our data set to sixty-two programmatic subfunctions, eliminating twelve primarily financial subfunctions because of their heavy use of offsetting receipts and net, rather than complete, results. The budget data were converted to constant calendar year 1987 figures by means of the implicit deflator for the gross domestic product of the *National Income and Product Accounts of the United States* and the National Income and Product Tables of the *Survey of Current Business*. We compared the percentage changes in each category for each pair of years from FY 1947 to FY 1994, approximately 2,700 observations in all.

The Distribution of Budget Changes

If we take the simple indicator of annual percentage change for each of the sixty-two programmatic budget subfunctions from FY 1947 through FY 1995, we get the distribution shown in the histogram in Figure 5.1. The distribution is clearly leptokurtotic and positively skewed. It diverges widely from a normal curve even when we drop the top 5 percent of the outliers when computing the mean and standard deviation for the normal curve. (If we include all of the observations in computing the normal curve, it is even flatter and more positively skewed.) Note the leptokurtotic peak, indicating the great number of very small changes; the weak shoulders, indicating fewer than normal moderate changes; and the big tails, indicating more than normal radical departures from the previous year's budget. Changes greater than 300 percent are grouped at that point.

Whether we plot percentage changes, first differences, or changes in logged data, the distributions are leptokurtotic and not normal. When we compare annual changes in budget authority for functions and subfunctions, the characteristic leptokurtosis remains, although the subfunctions are more leptokurtotic than the functions. When we plot the distribution of annual changes by agency, leptokurtosis remains. We examined plots of the following: subfunction budget outlay data, 1962–1994; subfunction budget authority data, 1976–1994; and agency-level budget authority data, 1976–1994. These series were assembled by OMB, and all exhibited leptokurtosis. We even plotted outlay data for the U.S. government for the period 1800–1994, in this case adjusting for inflation using the Consumer Price Index. Again leptokurtosis was in evidence.

Conclusions from Our Stochastic Budget Study

First, we conclude that the distribution of annual changes in budget authority is consistent with the "earthquake" budget model (as called for by the punctuated-equilibrium theory), but not with the boundedly rational theories of Davis et al. (1966), with the models of Kamlet and Mowery (1987), or with our understanding of budget-maximizing or adaptive behavior models. Second, we note that an-

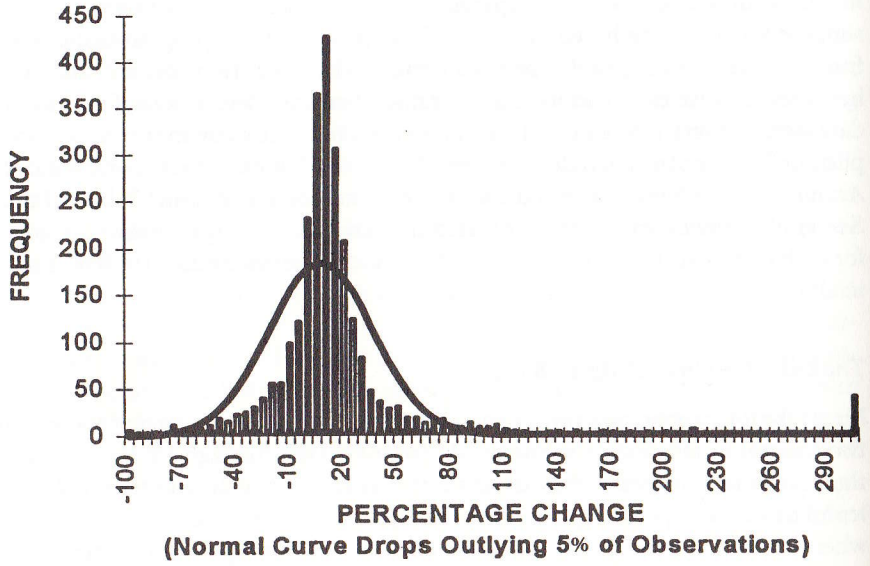

FIGURE 5.1 Annual Percentage Changes in Budget Authority for Programmatic Subfunctions

SOURCE: Frank R. Baumgartner and Bryan D. Jones Agenda Setting Project. Data are available from the Center for American Politics: <http://weber.u.washington.edu/~ampol.>

nual budget changes tend to be scale-invariant. The leptokurtotic distribution appears at the function level and the subfunction level; it appears in annual percentage changes and in annual first differences; and it survived logarithmic transformation. Leptokurtosis appears in the annual differences of budget authority for agencies and for outlay data of the government overall.

Third, we conclude that within this nearly universal leptokurtosis, there is nonetheless a hierarchical difference. As expected, punctuations are more pronounced at the bottom of the organizational ladder than at the top. Subfunctions are more leptokurtotic than functions. Agencies are more leptokurtotic than the budget as a whole. Although we view these results as support for our asymmetry hypothesis on the transmission of punctuations, there is a possibility that the observed differences may be more a function of the smaller N available from the more highly aggregated series (Mandelbrot 1963; Fama 1963). That is to say, there is a possibility that if we had 2,699 years of total budget data as we have 2,699 cases of annual subfunction changes, then we might observe as much leptokurtosis in the total budget as we do now in its parts.[2]

In summary, the extension of the punctuated-equilibrium model to national budgeting resulted in the following: (1) its elaboration into an agenda-based, attention-driven budgeting model; (2) hypotheses concerning the distribution of

annual budget changes and its underlying structure; and (3) empirical evidence that conforms to the new theory but that is antithetical to the normal changes expected from incremental theory or from most other budget theories. Punctuated equilibrium, rather than incrementalism alone, characterizes national budgeting in America; just as punctuated equilibrium, rather than gridlock or marginalism, characterizes overall policymaking in the American political system.

EVALUATING THE STRENGTHS AND WEAKNESSES OF PUNCTUATED EQUILIBRIUM

Founded on the bounded rationality of human decisionmaking and on the nature of U.S. government institutions, punctuated equilibrium can make a strong claim that its propositions closely accord with what we have observed about national policymaking. It accounts both for periods of stability and incremental change and for periods of upheaval and large-scale change. Incremental adjustments and even stasis will occur often, but not always. Punctuations and radical policy departures are not aberrations, and outliers to be discarded so that linear mathematics or the technology of the central limit theorem can function. Punctuations are a regular and important feature of U.S. budget making and U.S. policymaking.

The ubiquity of serial attentiveness and organizational routines of operation lead us to expect that stability and punctuations are a feature of policymaking in many governments. At the same time, the institutional aspect of multiple venues interacts with boundedly rational decisionmaking to make punctuated-equilibrium theory particularly apt for relatively open democracies. Indeed, the punctuated-equilibrium model is proving useful in understanding stability and change in British trunk roads policy (Dudley and Richardson, 1996), in congressional committee jurisdiction concentrations (Hardin, 1996), and in protracted interstate rivalries (Cioffi-Revilla, 1997).

Yet the utility of this theory and its accord with what is observed come at a price. A full appreciation of the complexity and changing interactions of the American policy process convinces us that individual-level predictions about policy outcomes will be possible only to the extent that either we can choose areas and periods for study that avoid the periods and areas of positive feedback and punctuations or we limit our "predictions" to periods when we can know after the fact what were the successful mobilizations. Nonlinearity, nonnormality, interdependencies, and high levels of aggregation for empirical data mean that clear causal chains and precise predictions will work only in some cases and for some times. To the extent that this is most of the cases and most of the times, scholars may be convinced that they have a good working model of the process. But a complete model will not be locally predictable, since we cannot predict the timing or the outcomes of the punctuations. What will cause the next big shift in

attention, change in dimension, or new frame of reference? And when will any of these occur in a particular policy area? At the systems level, punctuated equilibrium, as a theory, leads us to expect that some policy punctuation is under way almost all of the time. And the theory joins institutional settings and decision-making processes to predict that the magnitude of local changes will be related to their systems-level frequency of occurrence. Punctuated-equilibrium theory predicts a form of systems-level stability, but it will not help us to make specific predictions for particular policy issues.

We can have a systems-level model of the policy process even though not having an individual-level model for each policy. Linear predictions about the details of future policies will fail each time they meet an unforeseen punctuation; they will succeed as long as the parameters of the test coincide with periods of equilibrium. This limitation means that it will be tempting to offer models applicable only to the more easily testable and confirmable periods of relative stability. In our view, a clearer, more complete, and more empirically accurate theoretical lens is that of punctuated equilibria in American political processes. But we understand that this theoretical completeness comes with a cost.

NOTES

1. Punctuated equilibrium was first advanced as an explanation of the development of differences among species, or speciation (Eldridge and Gould, 1972; Raup, 1991). Rather than changing smoothly and slowly as in the later Darwinian models, evolution and speciation were better characterized as a near stasis punctuated by large-scale extinctions and replacements. For example, there was a virtual explosion of diversity of life in the Pre-Cambrian Period, an explosion that has never been repeated on such an immense scale (Gould, 1989). The notion has been vigorously contested by evolutionary biologists, who claim that disconnects in evolution are not possible (although variations in the pace of evolution clearly are) (Dawkins, 1996). Interestingly, some of these scholars have argued that consciousness makes possible punctuations in human cultural evolution: What cannot occur via genes can occur via memes (Dawkins's term for the transmitters of cultural adaptive advantage) (Dawkins, 1989; cf. Boyd and Richerson, 1985).

2. The central limit theorem holds only for Gaussian distributions. As a consequence, we have no guarantee that a sample drawn from a leptokurtotic distribution (such as the Paretian) will produce sample statistics that are leptokurtotically distributed.

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