

The Supply of Information and the Size of Government in the United States

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Abstract

In this paper, we explore the idea that the production of policy-relevant information is encouraged in pluralistic political arrangements characterized by jurisdictional overlap and inter-organizational competition. Because the congressional committee system is the primary institutional mechanism for legislative information-processing, we develop a measure of diversity in the supply of information via the committee system based on mathematical communications theory, using data from the Policy Agendas Project. Then we track changes in this measure across the post World War II period, showing that information supply ebbs and flows across the period.

Next we examine the causes of these variations, finding that media coverage follows rather than causes congressional information-gathering, that no simple social trend can account for variations in information, and that political dynamics have a complex relationship to information. Finally, we study the consequences of information by relating information supply via the committee system to the size of government (measured as both employment and budgets), showing that increases in the supply of information lead to bigger government, but that bigger government does not generate by itself more information. That is, changes in the information supply cannot be explained by congressional efforts to oversee and control bureaucracies.

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“As long as the reason of man continues fallible, and he is at liberty to exercise it, different opinions will be formed.”

--James Madison in Federalist #10

Sound information is a necessary condition for effective policy design. When will information relevant to public policy be supplied and when will it be withheld? This question is deceptively simple, but seldom raised either in the academy or in the councils of government. James Madison, in Federalist #10, assumed that opinions (a form of information in democracies) would simply be produced, and would generate political factions; the task of government being to winnow the noxious policy proposals that invariably would be generated by these factions. Yet it is not so clear that people will invariably voice opinions and produce reasons justifying them. Social psychologists in the 1940s and early 1950s produced experimental results that could only be explained by ‘group think’. Solomon Asch (1952) showed that people would offer objectively wrong answers on the length of lines if others (confederates of the experimenters) had just previously attested to the wrong answer. The continual struggle to protect whistle-blowers in government, the tendency of agency chiefs to down-play discordant information to leaders, and the decline of objective policy analysis in the federal government all attest that the problem of information suppression continues into the modern era (Williams 1998). Leaders often do not like to hear unpleasant information, and can work to suppress it. But more information can lead to better decisions.

We think a re-examination of Madison’s assumption about the free offering of information to government is long overdue. It may not be the case that policy-relevant information is invariably freely supplied. Nor do we accept uncritically the notion that information, as a valuable good, must be paid for, as economists would claim (whether paying

costs improves the quality of the information supplied is a different issue). Sometimes it is quite freely supplied. Rather, the supply of information may wax and wane with political conditions and it may be facilitated or discouraged by different institutional arrangements (Bimber 2003). We hasten to add that we do not underestimate the problem of separating reliable and valid information from biased and error-ridden information. Of course modern governments face Madison's problem of prioritizing—of winnowing the noxious schemes that self-interested citizens press on government. But supply and prioritization are not the same, and we will do well to analyze them separately (Jones and Baumgartner 2005).

In this paper, we explore the idea that the production of policy-relevant information is encouraged in pluralistic political arrangements characterized by jurisdictional overlap and inter-organizational competition. Redundancy, competition, and disaggregation in organizations lead to increases in the amount of information available to policymakers (Landau 1969; Bendor 1985; Heimann 1993, 1997), and it may improve the reliability of that information (Lupia and McCubbins 1995). Here redundancy has a special meaning: the information must be supplied through parallel, independent channels; otherwise there is an 'echo chamber' effect in which messages do not improve the overall supply of information. Sources as well as message content are relevant. As we show here, these aspects of political information-processing can be measured and assessed.

Viewing information supply through the lenses of organization theories that have established the role of redundancy allow us to integrate the processing of information in politics with mathematical communications theory (Shannon and Weaver 1949). Institutional overlap, inefficiency, redundancy, competition and other characteristics of the separation of powers and federalism have critical consequences for the production of information, and we explore the consequences of these ideas here.

Once information supply is correctly understood and measured, we may proceed to assess its causes and consequences. We propose the following hypothesis: the greater the supply of policy-relevant information, the larger the government response, and hence the larger government grows. Information is supplied when political actors think problems exist that government can solve. Governments respond when information indicates that action is desirable. When actors believe that government cannot solve their problems, they will not bother to supply information; information supply is conditioned on likely success. Political actors will supply information when chances for action by government on the solutions they press have a good chance of being adopted.

Virtually all aspects of public policy are multidimensional and more complex than public debate about them at any given time (Jones and Baumgartner 2005). With more sources of information about a given aspect of public policy, a greater range of dimensions comes into regular discussion in government; these dimensions are 'organized in' to the political discussion and government responds with policies specifically focused on particular elements of the problem. Therefore we expect a tight relation between the range of policy information available and the degree of government response; the size of government should be directly related to the amount of information. As a consequence, the supply of information becomes fodder for politics, with conservatives seeking to limit the supply of information and liberals seeking to enhance it. Information supply explains government growth; politics explains information supply.

The congressional committee system is the primary institutional mechanism for legislative information-processing. We first develop a measure of diversity in the supply of information via the committee system, using data from the Policy Agendas Project (Baumgartner and Jones 2002). Then we track changes in this measure across the post World War II period, showing that information supply ebbs and flows across the period. Next, we examine the causes of these variations, finding that media coverage follows rather than causes

congressional information-gathering, that no simple social trend can account for variations in information, and that political dynamics have a complex relationship to information. Finally, we study the consequences of information by relating information supply via the committee system to the size of government (measured as both employment and budgets), showing that increases in the supply of information lead to bigger government, but that bigger government does not generate by itself more information. That is, changes in the information supply cannot be explained by congressional efforts to oversee and control bureaucracies.

The Role of Information in Politics

Plenty of political scientists have highlighted the role of information in policymaking. Matthews and Stimson (1975), Kingdon (1989), Bradley (1980) and Sabatier and Whiteman (1985) all focus on the legislator as an information-processor, and all point to the roles of both the contents and sources of messages. Sources include interest groups, congressional committees, other legislators, executive agencies and legislative accounting offices. Message content is a more complex matter.

As a consequence of the complexity of message content, the role of Information in politics is not a straightforward process of reducing uncertainty about policy impacts, although it has sometimes been conceived that way (Gilligan and Krehbiel 1987, 1989). Information may affect the policy debate by influencing problem definitions and interpretations or by bringing new issues to the policy table, and actually may add to uncertainty. It may not add to the understanding of the programmatic impact of the policy, since policymakers attend to both technical and political information for policy decisions (Sabatier 1991). Information is often not used in a neutral fashion, and what policy makers learn from available information must be considered in the context of political interests and political power (Bennett and Howlett 1992: 291). Oftentimes reports presented by those who would influence political outcomes are as biased as the presentations of a defense lawyer with a guilty client.

None of this should deter us from pursuing the role of information supply in the policy process, but it should make us properly cautious in what we claim. If we need no other justification, it is enough to note that standard approaches to policymaking that are rooted in institutions, interests, and political parties are too static to explain policy change (John 1998). Rapid policy change associated with crises, scandals, and issue redefinitions, all of which require recognition by political actors that the policymaking environment has changed in a significant fashion. Normatively, such a view is far less cynical about the course of public policy, because politics becomes an adaptive mechanism through which a polity responds to challenges in its environment rather than solely a venue for contentions among competing selfish interests. Government may process information well or poorly, but they in any case process it, and we cannot understand policy change in the absence of a theory of where this information comes from and what governments do with it.

Information Processing

Information processing may be defined as collecting, assembling, interpreting, and prioritizing signals from the environment. A *signal* is simply some detectable change in what is happening “out there.” All signals are characterized by *uncertainty* (we can’t always be sure something out there has actually changed) and *ambiguity* (we can’t be certain what the signal may mean). As a consequence, there is always a question of whether there has been a relevant change in the policymaking environment. Moreover, objective changes in the environment—signals—must be distinguished from attention to these signals. In politics, as in communication theory, signal detection is critical to future action. Here we address only the issue of supply, treating it as an antecedent to the process of prioritization.

Supplying Information

When will information relevant to the policy process be supplied? From one point of view, information may be seen as a scarce and valuable good, one that will not be supplied without remuneration. If policymakers need estimates of the intentions of foreign countries, they

set up agencies with paid professional staffs to study and report on the problem. Similarly it is common for Congress to delegate information-gathering functions to specialized committees and sub-committees, which make recommendations to the chamber. The “pay-off” is some deference by the chamber to the committee (Krehbiel 1991). Policymakers delegate the collecting and assembling of information to others, more expert in the particulars.

These kinds of activities imply that information will be generally in short supply on matters of public policy and that policymakers already know what information they need. Information is a valuable resource since it can reduce uncertainty and can change the expected value of a decision. Only experts provide information, and they will do so only if compensated. This delegation approach is in line with classic economics-based understandings of “search” and “information” costs (Downs 1957; Stigler 1961). Because information search is costly, a principal, such as a legislative body, must rely on agents, such as congressional committees, to provide information about policy options, consequences, and success.

The relationship between principals and agents is often asymmetric because agents have more information than principals about their actions, and they can choose whether or not to share information with the principals. Principals, therefore, must establish institutions to overcome the asymmetries and provide incentives for the agents to provide information (Austen-Smith and Riker 1987, 1990, Diermeier and Feddersen 2000, Gilligan and Krehbiel 1987, 1989, Krehbiel 1991, McCubbins, Noll, and Weingast 1987, and Miller and Moe 1986).

But this cannot be the whole story, for the observation that information will be undersupplied in politics flies in the face of the clamoring diversity of information that characterizes modern America. Information on policy matters is supplied by bureaucratic agencies, interest groups, individual policy activists, think tanks, political parties, and congressional committees. Oversupply rather than undersupply seems to be the problem. Policymakers generally report that they are literally bombarded with information, of varying quality; they are not normally in the position of having to seek it out. As Richard Hall (1996: 90)

notes, “Policy-relevant information is abundant, perhaps embarrassingly rich, on Capitol Hill. Interest groups, Congressional Research Service, Government Accounting Office, various administration reports, pre-printed hearing testimony, studies conducted by academics, think tanks, and policy analysts in and out of government” supply it (see also Bimber 1991).

Interest groups in particular are critical components of the signal detection system of the political system. Far more than simple influence peddlers, they provide information about the political feasibility of policy alternatives and technical information about the substance of policy alternatives (Bauer, Pool, and Dexter 1969; Bradley 1980; Cobb and Elder 1972 [1983]; Esterling 2004; Hansen 1991; Heitshusen 2000; Milbrath 1963; Sabatier and Whiteman 1985; Wright 1990, 1996).

So in many respects information is not scarce resource in politics. The economics of information breaks down when there are multiple, competing sources of information. Competition among the various interest groups and agencies seeking policy benefits encourages them to share information with Congress in order to shape the policy debate. An interested party who might wish to withhold information can be certain that another source is likely to provide the information. Thus they are likely to provide a great deal of policy information to policymakers, and this has clear collective benefits.

This does not mean that the issue of supply is solved. The structure of a political system can induce increases in the supply of information. Institutions filter and direct this information, in addition to structuring the relationships among political players including interest groups (Bimber 1991; Heitshusen 2000). Studies of congressional committee jurisdictions indicate that overlapping jurisdictions in which committees mutually interfere with one another led to breakdowns in informational monopolies, thereby increasing the supply of information available for policymaking (Jones, Baumgartner, and Talbert 1996; King 1999; Baumgartner, Jones, and MacLeod 2000). In general, we strongly suspect that pluralist, non-hierarchical systems produce more information than unitary, hierarchical systems, such as those envisioned in many

conceptions of delegation to experts. That information may be less reliable (but the question of bias is open), and it will be more difficult to prioritize, because it comes from diverse sources. But there will likely be more of it. Finally, ebbs and flows of information may occur, stimulated by the perceptions of participants that policymakers are open to this information. In fact James Madison and his colleagues seemed to have understood this as well since the separation of powers and federal system they devised seems perfectly designed to generate multiple independent sources of information.¹

Entropy and Information

Our approach to the supply of political information centers on the notion that more information is supplied when messages on a variety of policy topics are produced by multiple non-redundant sources. Message content is simplified into a count of topics addressed in the message via content coding. If we think of a single source of information, then increases in the number of messages that the source chooses to send imply an increase in the information available. Then, by extension, as the number of sources increases, information similarly increases. This is a meaning of information supply that is very close to that developed by Claude Shannon in the 1940s to analyze telephone transmissions. Shannon's measure, entropy, has been widely adopted in many fields of endeavor (Pierce 1980).

Entropy in policymaking implies the absence of concentration of policy effort in issue categories. Information supply is associated with variability in message content across potential sources. The more different messages are supplied and the larger the number of sources providing the information, the greater will be the supply of information (and the larger the entropy coefficient). Talbert and Potoski (2002), following agenda-setting work in mass

¹ If political debates centered on factual disputes than theoretically a single source of objective information would be best. But debates involve value judgments and comparisons across multiple dimensions of evaluation. In this context, multiple sources of information ensure that multiple dimensions of evaluation are structured into the system rather than structured out. This is the most important sense in which information is related to structure. And of course, the more competing sources of information exist, the more difficult the final choices.

communication studies (Chaffee and Wilson 1977; McCombs and Zhu 1995), adapt Shannon and Weaver's (1949) classic formula for entropy in communications transmission to policy agendas. For reasons that will become apparent, we follow this lead, but first we will need to explain exactly what the entropy index will tell us about policymaking.

Claude Shannon, working at Bell Laboratories in the late 1940s, developed the notion of entropy to analyze uncertainty in the transmission of messages. Shannon's notion of uncertainty can be understood in terms of selecting an object from a set of categories. If we observe an object, the question is how certain we can be that the object came from a particular category. Entropy is a summary measure for this type of uncertainty. Entropy is defined as:

$$H = \sum P(x) \bullet \log(1/P(x)) = -\sum P(x) \bullet \log(P(x)), \quad (1)$$

Where x represents an object, $P(x)$ is the probability that an object falls within a particular category, and the index is summed over all the categories.²

If all objects are in one category, and we observe an object, we know with certainty what category it belongs in. In that circumstance, $H = 0$. In Shannon's information theory, the object is a 'message' and the category is the 'source'. When $H = 0$, we can learn nothing new from observing a message, because we could already predict what the message would be without observing it. In Shannon's theory, information comes from uncertainty—or, actually, the reduction in uncertainty after we observe the message or object. In general, the more concentrated the objects are within categories, the lower the entropy; the more spread around the objects are within the categories, the higher the entropy. Observing a message offers more information in the latter circumstance.³

² Because logarithms are undefined at zero, and many categories are likely to have zero entries, the convention is adopted that for $P(x) = 0$, $0 \bullet \log(0) = 0$. In practice, for ease of calculation, we added a very small fraction to the actual proportions (estimates for $P(x)$) equal to .000001.

³ Congressional scholars have used the Herfindahl Index, which economists use to assess market concentration, to examine changes in jurisdictional monopolies in congressional committees (Baumgartner, Jones, and McLeod 2000, Hardin 1998, 2002). Entropy and the Herfindahl Index tap similar aspects of object concentration within categories, since both are based on similar measurements

Messages and Sources in Politics

The crux of information theory is the set of relationships among the information source, the potential messages that might be sent, and the receiver of the message. In information theory, no attention is given to the capacity of the receiver to interpret the message; that is left to the field of information processing (Jones and Baumgartner 2005). “The *information source* selects a desired message out of a set of possible messages” (Shannon and Weaver 1963:7), and sends it to the receiver. The key question is whether the receiver’s level of uncertainty is reduced upon receiving the message.

Legislatures set up committees to study legislation and problems that might be addressed by legislation; as such, committees are a major source of information on policy matters for policymakers. But as is well-known, committees can become parts of policy subsystems that operate at the behest of affected interests. As a direct consequence, a message on, say, agriculture will be less informative to the legislative chamber if it is from the Agriculture Committee than it will be from, say, the Education and Labor Committee. While the information may be relevant to log-rolling or other legislative agreements, it will provide little new information to those outside of the committee if it comes from only one source. Multiple sources provide more information.

The notion of information that is enshrined in Shannon’s entropy are different from those current in the study of congressional committees today (Krehbiel 1991; Gilligan and Krehbiel 1987, 1989). Both define information in relation to uncertainty reduction, but the similarity stops there. In the former case, diversity among supplying sources add to information supply; in the

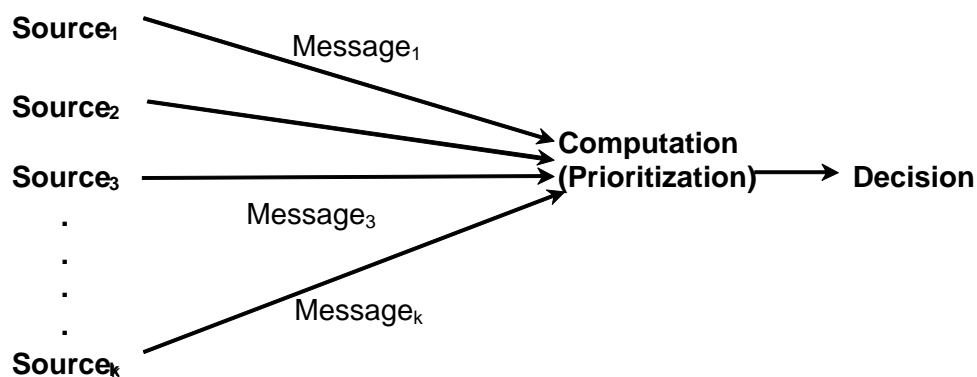
(the Herfindahl, on the sum of the squared proportion of items in each category; entropy on the sum of the proportion times the log of the proportion). Because of their different formulas, the two measures produce different results. Still, the two are highly correlated. In the Policy Agendas Datasets, for hearings categorized at the major topic level, Shannon’s Entropy and the Herfindahl are correlated -.992; for statutes, -.983, for the Congressional Quarterly stories, -.973, and for the New York Times, -.947. Entropy, however, does a better job at distinguishing among situations with low levels of concentration than does the Herfindahl, which is highly sensitive to changes at high levels of concentration but distinguishes less well at lower levels.

latter, experts hone advice on specific topics and reduce uncertainty on those topics. In the former, diversity of messages and a panoply of potentially competing sources is lauded; in the latter, it is distracts at best and interferes with expert judgment at worst.

If information supply is increased by entropy, the difficulties in prioritizing those messages are proportionally increased, and one would rely ideally on a system of weighting (by, say, reliability of source) and averaging (Jones and Baumgartner 2005b). In Gilligan and Krehbiel's approach, experts define priorities as well as supply (or else why turn the policy over to but one set of experts?).

Of course neither of these perspectives holds all truth. We trust our health to a single doctor (but we reserve the right to obtain second opinions!). We may read the New York Times, trusting its journalistic expertise, but a good look at the Wall Street Journal can introduce issues never touched upon in the Times. In politics as in life, it makes sense to rely on not one expert but on a number of them, especially if they come from different professional persuasions.

The diagram below illustrates this decision-making perspective. A decision-maker received numerous messages from potentially competing sources. The higher the number of sources and the less the concentration of messages within a single source, the higher the entropy and hence the higher the supply of information (and hence the more difficult the problem of prioritization). With only a single source of relevant information, decisions are easily made. But decisions may be better when based on many independent sources of news.



Entropy and Congress

Now let us turn to the issue of information supply in the policymaking process. We restrict ourselves to Congress for the present, but the theory of information supply is entirely general. The 'source' is 'the congressional committee system, the 'receiver' is the legislative chamber collectively (because the chamber receives the report from the committee), and the 'message' is the report itself.

For the present, we simply categorize the message as its primary substantive topic. If there are k possible topics that Congress considers, then at any one instant, the committee system can send any one of k possible messages on to the floor. The total amount of information produced by the committee system, per arbitrary unit of time, is the entropy for the system, essentially the uncertainty associated with probabilities of sending messages about the k topics.

The total amount of information produced by a single committee, per unit of time, is similarly computed for a single committee. If a committee sends only messages about a single topic, then the committee's entropy, or supply of information, is zero. Here the quantitative calculation of entropy conflicts a little with a qualitative understanding of what is going on. A committee clearly can say something surprising about the topic under its jurisdiction. It is more likely that a committee not normally active in the policy area will do so (Baumgartner, Jones, and McLeod 2000), and it is that aspect of information supply that quantitative entropy measures assess.

Here entropy simply measures the degree to which attention to a given topic is devolved to a single source of information—a committee in this instance—or is divided among many potentially different sources. From an informational perspective, it is clear that more independent sources provide richer information. Of course, this comes with a substantial cost, which is the indexing problem, or what the larger body should do once it receives all this

conflicting and overlapping information. So information-generation and prioritization are different problems and in fact are inversely related with each other; what enhances the one reduces the ease of the second problem.

The table below depicts this. The committees occupy the rows, the policies the columns. Each cell entry is the proportion of the time that a committee spends discussing a particular policy—providing information on that policy. Summing down a column indicates *policy entropy* for a particular policy; it is the amount of information provided by the system of committees about a policy. Summing across a row provides *committee entropy* is the amount of information provided for all policies by a given committee. The sum of the matrix is an estimate of the total amount of information that congressional committees provide the chamber in a given time period (year or Congress).

[Table 1 about here]

Table 1: Congressional Entropy

	Policy A	Policy B	...	Policy K	Committee Entropy
Committee 1	P(1A)	P(1B)		P(1K)	$-\sum_y P(1Y) \bullet \log(p(1Y))$
Committee 2	P(2A)	P(2B)		P(2K)	
...					
...					
...					
Committee N	P(NA)	P(NB)		P(NK)	$-\sum_y P(NY) \bullet \log(p(NY))$
Policy Entropy	$-\sum_x P(XA) \bullet \log(p(XA))$	$-\sum_x P(XA) \bullet \log(p(XA))$	

For any given committee, the estimate of the entropy would be the proportion of hearings on Policy A, weighted by the inverse of the logarithm of that proportion, plus the proportion of hearings on Policy B, weighted by the inverse of the logarithm of that proportion, and so forth across all the policy topics. For any given policy, the calculation simply involves the spread of delegation for providing information across the committees: the broader the spread, the higher the entropy score. An entire legislature can be summarized, using these

calculations, concerning the relative entropy of its consideration of various policies. Similarly, each committee can be assessed as to its own entropy score.

Delegation, Specialization, and Information Supply

In Shannon's communication theory, more information is associated with more entropy—more spreading around messages across categories. Shannon's definition of information was technical, and did not incorporate the multidimensional structure of messages that is so critical in politics, but it is completely consistent with this view. The raising of ignored attributes or dimensions provides a key dynamic in issue evolution in politics. Moreover, an approach to information based in source diversity is consistent with the notion of information as involving delegating policy problems to experts for review, analysis, and recommendations. We simply require multiple experts. Devolution of policy expertise to a single set of expert agents comes at a large cost in terms of information, however easy it makes prioritization.

In spite of whatever benefits come from devolving authority to specialists and giving them incentives to study hard, becoming informational masters, clearly a broader range of information is available when more sources weigh in on the problem even where those sources are not expert in the subject-matter. All sources are not equally valid or reliable, so they should not be equally weighted in the decision-making process. But it is undeniable that more non-redundant sources of information increase the overall level of information, even if those sources produce biased analyses of the problem. In politics, in particular, information often involves raising unappreciated attributes in complex situations, something that can be readily accomplished by non-experts. Knowledge and information are not the same thing.

The lack of redundancy is important. It is common for venues of activity to send similar messages. It is of little added interest to read a Hoover Institution report on deregulation when one has already read an American Enterprise report on the same subject. The messages are redundant. Similar venues produce similar messages; that is why multiple non-redundant

venues are the key to entropy. Complexity, in politics, increases the supply of information. Complexity is associated with entropy. As a consequence, entropy increases the supply of information to policymakers. Because complexity can yield confusion, however, more information does not imply actionable information. Policy action is governed not just by the information flow, but by the processes of attention allocation and the set of institutional rules governing collective action.

Trends in the Supply of Policy-Relevant Information

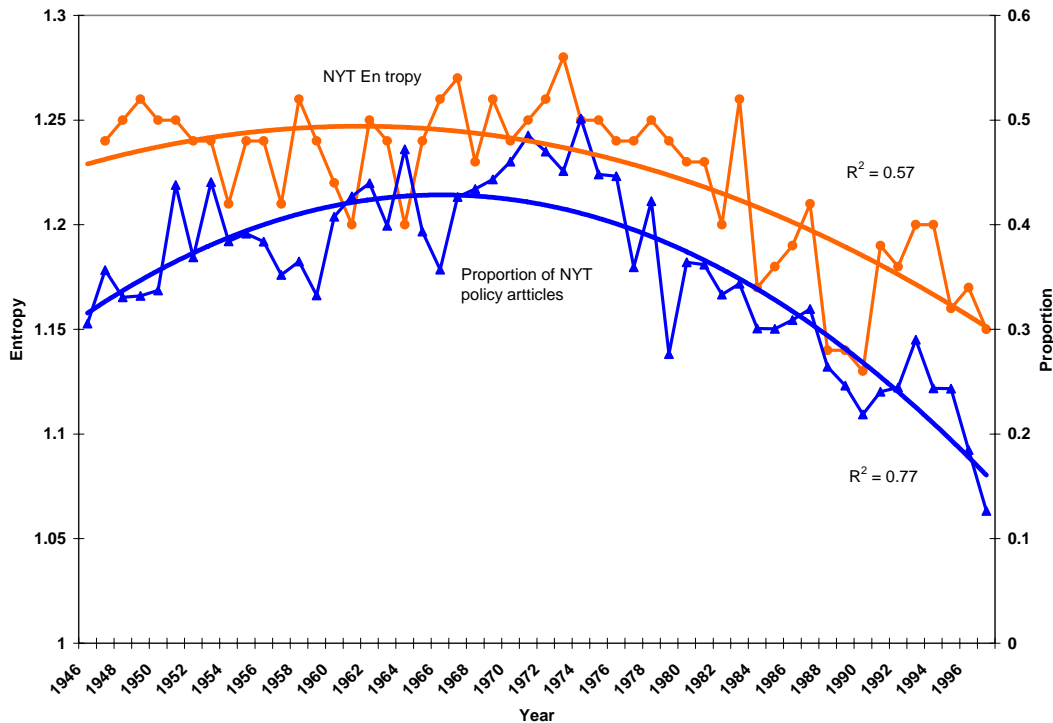
Now we are in a position to study the notion that the supply of policy information ebbs and flows in American politics. In addition to examining variation in information supplied by the congressional committee structure, we also study time trends in media reporting on policy affairs. The Policy Agendas Project's coding of a sample of New York Times stories allow us to calculate entropy across all topics addressed in that newspaper and to trace this measure across the period of our study.

Figure 1 does this, and, in addition, it presents the proportion of policy articles on an annual basis. A quadratic trend adequately fits each series. Peak entropy for the all stories occurred in 1973; not inconsequently, the highest proportion of stories devoted to public policy matters occurred the following year. Since then editors at the Times have imposed a steady and marked decline of policy-relevant material on the paper's coverage, all the while producing an increasingly less diverse news product. In the 1970s, 40 to 50 percent of coverage was devoted to politics and policy; by the 1990s, this had dropped to around half of the previous level. (It is worth noting that the overall size of the Times, the number of articles, also declined over this time; so there was much more news coverage in the 1970s than there is today.) The New York Times has steadily but surely moved from a strong and diverse outlet for discussion of policy and politics to a less diverse format dominated by style, arts, leisure, and sports. The move to 'soft news' has been well-documented in media studies (Patterson 2000); our

contribution is to note the clear and unmistakable decline in diversity and in policy content that has become so marked since the 1970s.

[Figure 1 about here]

Figure 1: The Decline of Policy Information in the New York Times

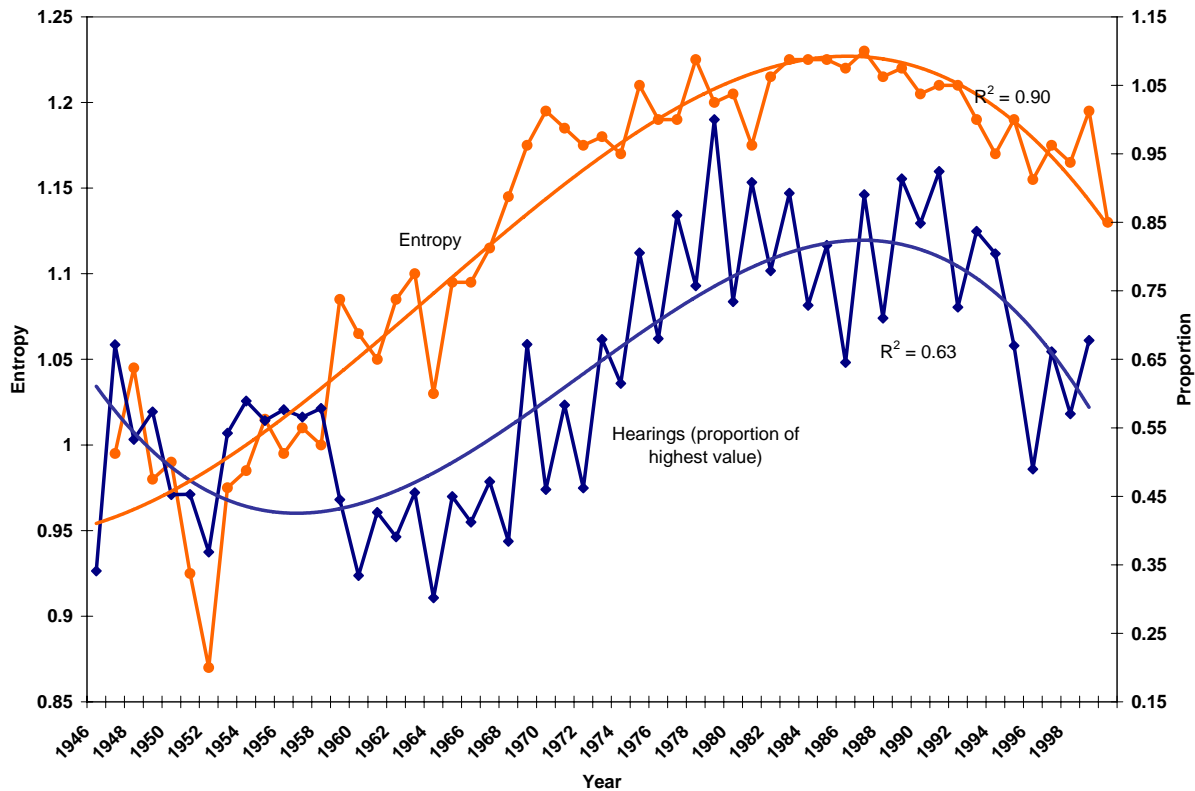


Is the decline in press coverage simply a media phenomenon or does it affect government? Figure 2 presents our entropy measure calculated for each house of Congress for major topic categories and committees, averaged across the chambers, as illustrated in Table 1. The entropy value for each year is the sum of a corresponding committee-by-topic matrix for that year. It indexes the total supply of information made available by the congressional committee system through the hearings process. As can be seen in the figure, the time path of information supply provided to Congress through its committee system traces a roughly similar pattern as New York Times coverage. We also present the total number of hearings held, showing this number as a proportion of its peak value, 2246 in 1979. Clearly, the capacity to hold hearings has varied substantially over time. Just as clearly, this is fully within

the control of Congress and its members, and they have both expanded and restricted the energy and resources they devote to the hearings process. As hearings expanded during the 1960s and 1970s, so entropy and information grew; as hearings have declined since 1980 or so, so has the supply of information.

[Figure 2 about here]

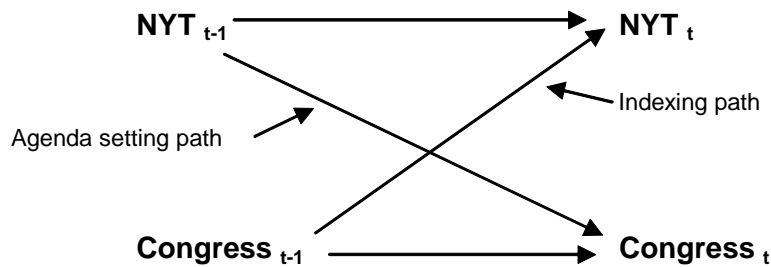
Figure 2: Congressional Entropy and the Number of Hearings



Untangling Press Coverage and Congressional Information

The supply of information provided for policy purposes by Congress and to the public through the press are intertwined—the simple correlation between Congressional and New York Times (for policy stories only) is .62. Does Congress respond to issues raised in the press, or does the press simply cover policy matters raised by Congress (and other Washington policymakers), as Bennett’s (1990) indexing thesis implies? By cross-lagging appropriately, we can examine which of these is correct (or whether both are partially valid). The diagram below

shows how we will proceed. Information supplied by the press is potentially a function of inertial factors plus the influence of the supply of information provided by Congress (the 'indexing' path). Similarly information supplied by Congress is potentially a function of the press raising issues (the 'agenda setting path') and inertial factors. The relative sizes of the cross-lagged coefficients will indicate the relative strengths of these causal mechanisms. While the lag period of a year is perhaps not ideal, it is dictated by the data and fully justified by the approach we use. The issue is simply whether more information in the media in one year leads to more information in congress in the next, and whether more information filtering through congress leads to more coverage in the media in the next year.



As Table 2 indicates the pattern of relationships rules out the agenda-setting path and strongly confirms the indexing path. Congressional entropy at t - 1 positively affects both press entropy and congressional entropy at t, but press entropy at t - 1 fails to influence congressional entropy and it even fails to account for the pattern of press coverage at t.

(Table 2 about here)

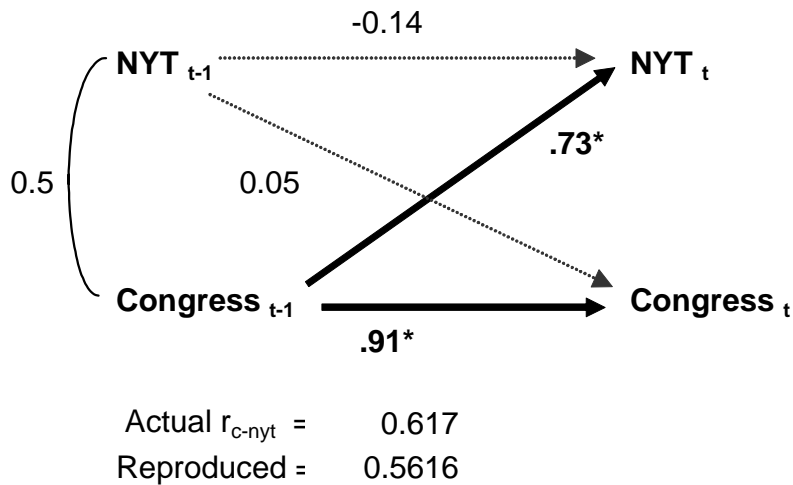
Table 2: Information Supply, Congress and the Press

	Dependent Variable: NYT Policy Entropy	Dependent Variable: Congressional Entropy
Constant	.954*** (.143)	-.002 (.150)
NYT Policy Entropy, Lag 1	-.145 (.143)	.124 (.155)

House-Senate Entropy, Lag 1	.324*** (.061)	.897*** (.066)
R2	.451	.870
Adj. R2	.423	.863
DW	1.92	2.54
N	41	41

That is, press coverage on policy matters is explained by what Congress is doing but not the pattern of press coverage in the past.

The diagram below is a path analysis of the system, where the path coefficients are estimated by standardized regression coefficients. By multiplying through the proper paths, one can calculate an estimate for the correlation between press coverage and congressional information. It comes quite close to the actual, as shown below. The overall pattern of the diagram strongly supports the indexing hypothesis. Reporters report. If the national legislature investigates more policy topics, the news covers it.



Determinants of Entropy

One would suppose that the supply of information to Congress is affected by social, economic, and political trends. We examined three general hypotheses relating to the causes of changes in congressional information. The first is that social trends, and in particular increasing social complexity, lead to increases in information. As society grows more complex, so do its problems and the need for information to monitor them. The second is that increases in economic prosperity lead to a greater supply of information, independent of complexity.

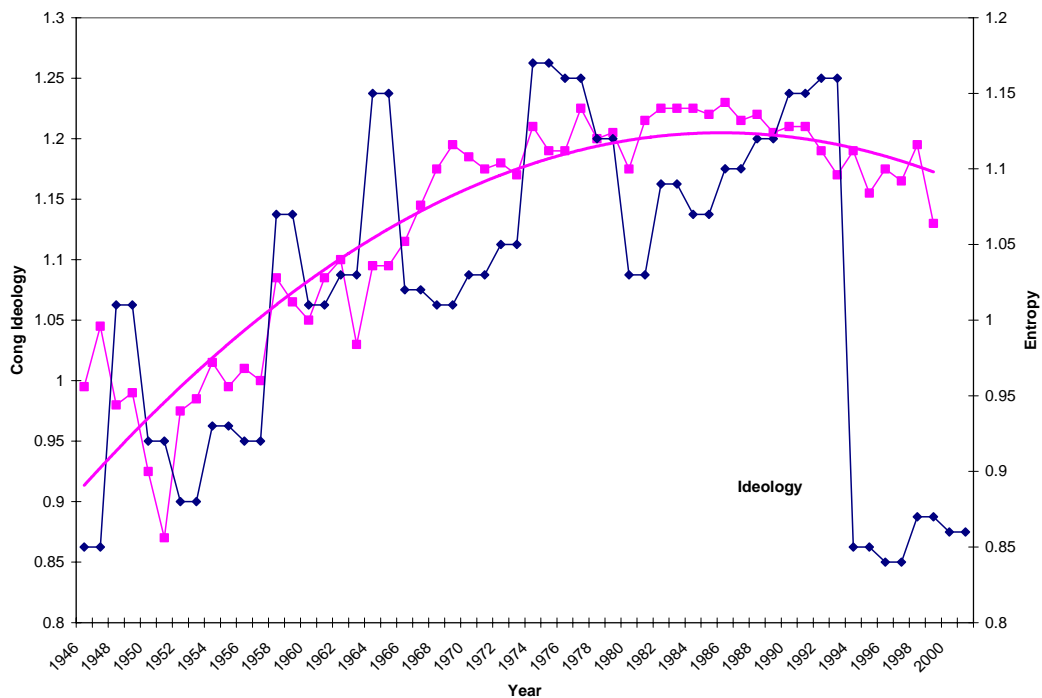
Finally, there may well be a politics of information provision, with liberals seeking to expand the supply of information in order to justify new government programs and conservatives resisting.

It is easy to dismiss the complexity hypothesis. Social complexity has continued to increase in the US since the Second World War by most meaningful measures, but entropy increases and then declines. There seems to be no simple sociology of information that will explain the trends we observe.

On the other hand, political changes seem more promising. There is a correspondence between ideological voting members of Congress and polarization (Poole and Rosenthal's (1997) DW Nominate 1st dimension scores), as indicated by Figure 3. There we graph congressional entropy versus the average DW Nominate score for the two chambers (reversed in polarity). The increase in conservative voting in 1965, however, is not matched by a proportionate fall in information processing.

[Figure 3 about here]

Figure 3: Entropy and Ideology



We examined a more general model of the causes of congressional entropy based on these considerations. The model included as independent variables lagged Entropy, Gross Domestic Product, income distribution (Gini index for families), ideology (DW Nominate voting scores), polarization (the differences between the party means on the DW Nominate first dimension), the proportion of Democrats in Congress, and the party holding the presidency. Using House Entropy (used because certain of our measures, such as polarization, are chamber-specific), we found income distribution (with more equal distribution leading to more information), ideology (with more liberal congresses leading to more information), and polarization (with less polarization leading to more information) significantly associated with Entropy. The model seemed satisfactory on the face of it (with an R^2 of .874, adjusted to .863, a Durbin-Watson statistic of 2.6), and all coefficients statistically significant. Income distribution was only marginally significant, however, and removing this variable left polarization insignificant; dropping polarization left ideology insignificant, with lagged entropy the only variable in the equation.

[Table 3 about here]

Table 3: Explaining Chamber Entropy

	House Entropy as dependent variable	Senate Entropy as dependent variable
House Entropy	--	.469*** (.115)
House Entropy Lag 1	.676*** (.089)	--
Senate Entropy	.323*** (.105)	--
Senate Entropy Lag 1	--	.365** (.131)
R-sq	.876	.770
Adj R-sq	.871	.761
DW	2.67	1.96
N	52	52
Standard Errors in Parentheses. * p < 0.10 ** p < 0.05 *** p < 0.01		

Finally, we entered an institutional component into the model, in which Senate Entropy could influence House entropy, and developed a similar model for Senate Entropy. There are clear cross-institutional connections, as indicated in Table 3: each chamber's information supply affects the others'. In this model, all other independent variables were insignificant.

The difficulty in developing a satisfactory model suggests difficult underlying dynamics suggests both complexity and underlying multicollinearity in the system of variables we used. Several things are clear, however. First, there is no simple relationship between increasing social complexity and the supply of information. As the United States became more socially complex over time, the supply of policy-relevant information filtered through congressional committees first rose and then stabilized and declined. Second, it is highly probable that political dynamics account for changes in the supply of information, and that those dynamics involve institutions, parties, and ideologies—the usual suspects. Just how these interact, however, must await further work.

Congressional Dynamics and the Size of US Government

One limitation of current congressional studies is the difficulty of linking the internal dynamics of Congress to broader questions of policymaking. Much good work has examined inputs into these dynamics—questions such as representation and the linkage of constituencies to committee composition and hence behavior, and there are many studies of specific policy results of legislative action, but there are virtually no studies of how internal dynamics influence external trends. In this section we study empirically the linkage between the supply of information on policy matters by congressional committees and certain aspects of government growth—the first systematic linkage between internal congressional processes and policy outputs.

The literature on the growth of government is voluminous and not infrequently driven by ideological and normative considerations. Theories abound, findings are rich and varied, and many studies of more limited aspects of policymaking bear directly on the issue—as, for

example, the determinants of expenditure and the state-building literatures. Some things are clear: external challenges such as wars can generate 'ratchets' that lead to bigger government even when the crisis is alleviated (Higgs 1987; Peacock and Wiseman 1974; Sparrow 1996), but internal dynamics are critical as well (Berry and Lowery 1987; Jones, Baumgartner, and True 1998).

We measure two aspects of changes in the size of the US national government. First, we used executive branch civilian employment in civilian agencies. We excluded an examination of employment in the armed forces and of civilian employment in defense agencies. This assesses the size of government in terms of the people in employ, but it may fall prey to the problem of contracting out (Light 1999). So we supplemented this analysis with a study of Congressional Budget Authority, which assesses the spending authorized by Congress to government programs.

As candidates for independent variables, we considered Stimson's (1999) Public Mood index, media activity (New York Times entropy), income inequality (Gini index for families), Gross Domestic Product, the party affiliation of the president, the number of Democrats in both chambers of congress, the median ideology of the Congress (Poole and Rosenthal's DW-NOMINATE scores on the economic (first) dimension), the number of Policy Agendas Project subtopics being considered in Congress, and the amount information available in Congress—measured as the entropy of committee hearings.

We conducted a linear regression for these variables for executive branch civilian employment in civilian agencies, controlling for employment in the previous year. We conducted separate regressions for the House and the Senate where necessary due to chamber-specific variables. Then we conducted a combined regression for the House and Senate (taking the average entropy and the average median ideology for the House and Senate, for example). The best model included a one-year lag in entropy and ideological voting are the best variables to predict growth in government employment, controlling for government

employment in the previous year and employment two years prior. Government employment increases when the previous years' entropy (spread of information) increases and when ideology becomes more liberal. Table 4 presents the results.

These models control for a one-year lag in government employment and a two-year lag in government employment. The one-year lag significantly impacts the model in all three models, while the two-year lag does not significantly impact the models. However, without the two-year lag for government employment, auto-correlation becomes a problem (the Durbin-Watson score is less than 2). Models 2 and 3 in Table 4 indicate model robustness by displaying results for dropping the second lag and ideology. In sum, the size of government, measured as civilian employment in civilian agencies, is influenced by the flow of information in Congress and the ideology of members (the latter of course highly correlated with party).

[Table 4 about here]

Table 4: Explaining Government Employment

Dependent Variable: Executive Branch Civilian Employment in Civilian Agencies (1,000s)	Model 1: All variables	Model 2: Drop ideology	Model 3: Drop 2-yr lag govt. employment
(Constant)	-117.83 * (63.19)	-166.30 *** (61.63)	-132.34 ** (66.70)
House-Senate Median Entropy, Lag 1	237.45 *** (81.72)	279.11 *** (82.69)	257.86 *** (86.82)
House-Senate Median Ideology, Lag 1 (Median DWNOMINATE Score, Dimension 1)	-97.32 ** (43.98)		-136.85 *** (40.35)
Government Employment, Lag 1 (Executive Branch Civilian Employment in Civilian Agencies) (1,000s)	0.97 *** (0.13)	1.11 *** (0.12)	0.84 *** (0.04)
Government Employment, Lag 2 (Executive Branch Civilian Employment in Civilian Agencies) (1,000s)	-0.12 (0.12)	-0.26 ** (0.11)	
R2	0.988	0.987	0.986
Adjusted R2	0.987	0.986	0.986
Durbin-Watson	2.103	2.252	1.659
N	51	51	52
Standard Errors in Parentheses.			
* p < 0.10 ** p < 0.05 *** p < 0.01			

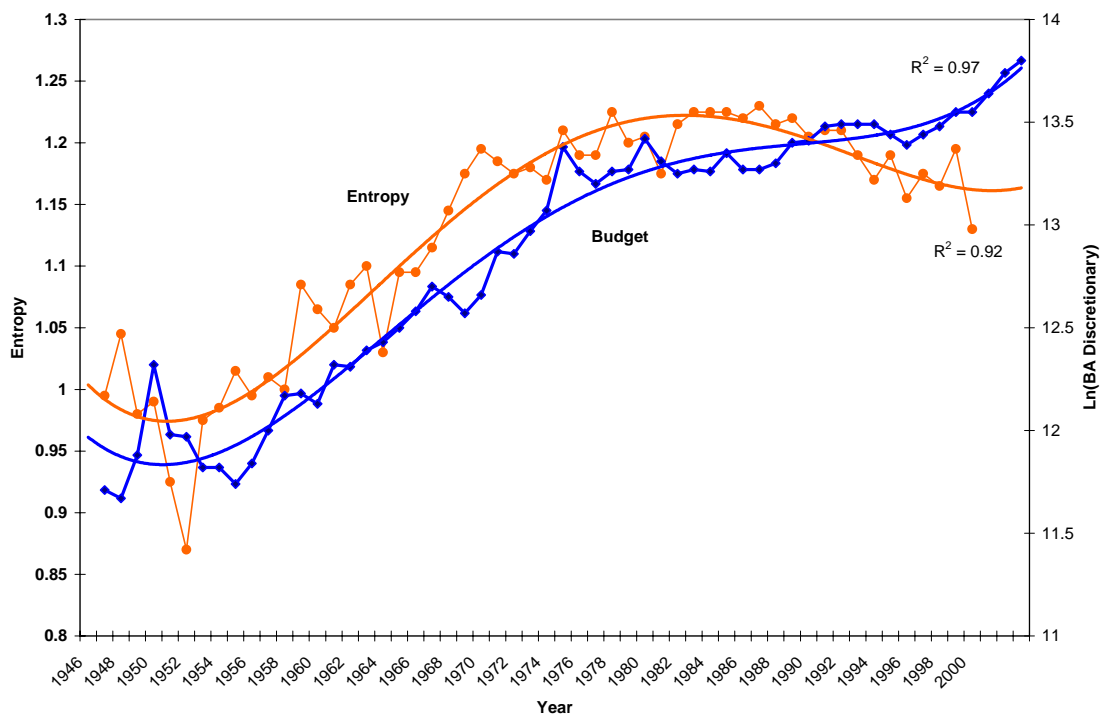
Government Growth Measured as Budget Authority (in 2003 dollars)

We now turn to patterns of spending. We concentrate on domestic discretionary spending (total congressional budget authority less defense and domestic entitlements).⁴ This is the part of the budget that is most likely to be sensitive to changes in the supply of information in the shorter run. Domestic entitlements are written into statute, and defense expenditures are often driven by external events.

Figure 4 graphs Entropy against this measure. An interesting divergence occurs in 1995, right at the time of the inauguration of the first Republican congress since the early 1950s. Entropy continues to drift downward, but the budget measure, after leveling off from the late 1970s through 1995, resumed a sharp upward direction.

[Figure 4 about here]

Figure 4: Entropy and Domestic Discretionary Budgeting



⁴ Specifically, Log[Budget Authority in 2003 constant dollars (millions), minus authorizations for Defense, Social Security, Medicare, Net Interest, and Undistributed Receipts]

To explore these relationships further, we conducted a linear regression on the logarithm of Congressional Budget Authority for domestic discretionary expenditures in 2003 dollars for the following independent variables: Congressional ideology, Congressional ideological polarization, Stimson public mood, spread of media attention, income inequality [Gini coefficient], Democratic president, and entropy in the House and Senate, and combined), lagged one year. For variables related to the House and Senate, we conducted separate regressions for the House and the Senate. Then we conducted a combined regression for the House and Senate. Finally, we developed separate models for the full time period and for the period 1947-1995, under the notion that the most recent period of partisan control represented a new era: one of growth without information.

The results indicated that a one-year lag in entropy and a one-year lag in congressional ideology predict growth in congressional budget authority, controlling for the budget authority in the previous year. Table 5 displays the results. Again, the supply of information is the keystone to explaining changes in patterns of government expenditure. But the role of ideological voting at first is puzzling. In Model 1, estimated for the period 1947-95, more liberal congresses spend more, even controlling for the flow of information. This is in keeping with the findings for employment, presented in Table 4. In the full period, however, ideology adds nothing to the explanatory power stemming from Entropy.

The reason is easy to discern by examining Figures 3 and 4. The great increase in conservative voting in 1995 and afterward in essence has reversed the role of ideology—now Republicans are spenders. What is different about the modern era is that liberal ideology and diversity of information no longer work in lock-step; rather they push in different directions. It has been abundantly clear the GW Bush has pushed government spending far higher (and this holds for domestic spending as well as defense), but the analysis here shows that the seeds of the rapid new increases in the size of the federal government are directly traceable to the 1994 election.

[Table 5 about here]

Table 5: Explaining Domestic Discretionary Budgeting

Dependent Variable: Log (Domestic Discretionary Budget Authority) †	Model 1: 1947-1995	Model 2: 1947-2001
Constant	1.92*** (.493)	.936** (.382)
Log(Budget Authority), Lag 1†	.762*** (.063)	.862*** (.057)
House-Senate Median Entropy, Lag 1	.993** (.404)	.765* (.409)
House-Senate Median Ideology (1st DWNOMINATE Dimension), Lag 1	-.551** (.243)	-.007 (.175)
R2	.969	.968
Adj. R2	.967	.966
DW	2.43	2.30
N	47	53

Standard Errors in Parentheses.
 * p < 0.10 ** p < 0.05 *** p < 0.01
 † Total Congressional Budget Authority in constant (2003) dollars (millions) minus authorizations for Defense, Social Security, Medicare, Net Interest, Undistributed Receipts

Can government growth simply be propelling increases in information-gathering on the part of Congress, rather than the other way around? After all, adding government programs and the agencies that administer them adds to the oversight responsibility of congressional committees. We can address this issue by examining congressional entropy as a function of the size of government (assessed by our civilian employment and discretionary domestic budget variables), and including the standard political and economic variables that we included in the above regressions. The answer is that causal flow is primarily from information to programs, and the feedback from government programs to information flow is weak. The only variable that can be remotely seen as influencing congressional entropy is government civilian

employment the year before, and that is weak indeed, with a t-value of but 1.93 (df = 52), when a lag for entropy is included.

Summary and Concluding Comments

Separation of powers and federalism multiply the number of independent sources of information in government. In the case of Congress, the supply of information is enhanced when committees overlap in their jurisdictions on diverse policy matters. This is not efficient, of course. Multiple overlapping sources of information on the same topic naturally can produce a cacophony of different proposals, making it difficult for decision-makers to choose among them. Similarly in the executive branch, multiple sources of information can lead to confusion or group-think. While overlapping jurisdictions can appear to be inefficient, information is powerfully related to political power. Information always has its biases and independent organizations with political power want their own sources of information and also to present their views on important matters of public policy. Information includes opinions as well as facts; in politics it is relevant to know not only the facts but also what social groups support and oppose a given proposal.

This abundance of information can be messy and reformers in and out of government continually put forward proposals for changes to reduce the inefficiencies associated with redundancy in executive agencies and in congressional committees. The most recent example of this kind of thinking is the 911 Report, which called for more hierarchy and control among intelligence agencies and among congressional committees overseeing those agencies. Problems of how to prioritize and use information are not best solved through a reduction in its supply, however. Multiple sources of information may be bad for those who would like monopoly control over the direction of public policy, but just as we have three branches of government in order to insure that no one branch has too much power, those involved in government know that information is, indeed, power. Diffuse sources of information diffuse power. Many in power do not like it. A system with multiple competing sources of information

virtually requires that diverse perspectives be incorporated into a decision-making process. Any redundant system is inefficient, but this inefficiency is a necessary prerequisite for ensuring a steady supply of information in the policy process. In the longer-term incomplete monitoring of relevant information leads to periodic crises, punctuations, and 'alarmed discovery' that a relevant indicator has changed (see Jones and Baumgartner 2005). Political information processing invariably leads to policy lurches and crises; limitations in the supply of information just exacerbate this process.

In this paper we have explored the role of divergent information sources by developing a measure of the information supplied via the congressional committee system based on Shannon's entropy coefficient. The more diverse the sources supplying information, the greater the supply of information. From our analysis, we conclude the following.

1. Information supply has waxed and waned over time, neither driven by increasing societal complexity, or press agenda-setting, or ideological changes in national government. Press coverage on policy matters, however, is driven by Congress. This holds true both of media information in general, as assessed by our analysis of the New York Times, and of government itself, as indicated by congressional hearings.
2. Changes in the supply of information have consequences for public policy. Information supply is related to the size of government, and it is the most important variable in accounting for both civilian national government employment and domestic discretionary spending.
3. While these trends are robust through 1995, after then the US entered a period of government growth without the corresponding increases in information supply that had characterized earlier eras. This seems to be a consequence of ideological shifts in congress.

Government has not grown only because more issues have "hit the agenda" in the post-war era. In addition to that, new agencies that have been created and new institutional

structures of all forms have organized certain types of information into the system, ensuring their continued attention over time. So there has been a complicated give-and-take between governmental structures that help perpetuate attention to given aspects of important social issues and the issues themselves. But our evidence also shows that these trends are reversible as indeed they have reversed in recent years. There is nothing inevitable about the growth of government, just as there is nothing inevitable about the supply of information or its growth over time.

There does seem to be a critical association between diverse and independent sources of information in politics and continued attention to diverse social issues. By attacking the informational sources of government growth, conservatives in Congress may have had more success than they had anticipated. But the 'big government' conservatives in control in Washington since 1995 find themselves pushing the size of government ever higher without the diversity of voices that characterized the pre-1995 period. We are far from understanding the specifics of the links between political dynamics, information, and government growth, but we hope this paper will be a significant step toward that end.

References

- Arnold, R. Douglas. 1990. *The Logic of Congressional Action*. New Haven, Conn.: Yale University Press.
- Austen-Smith, David, and William H. Riker. 1987. "Asymmetric Information and the Coherence of Legislation." *American Political Science Review* 81:897-918.
- Austen-Smith, David, and William H. Riker. 1990. "Asymmetric Information and the Coherence of Legislation: A Correction." *American Political Science Review* 84:243-245.
- Bauer, Raymond A., Ithiel de Sola Pool, and Lewis A. Dexter. 1963. *American Business and Public Policy: The Politics of Foreign Trade*. New York: Atherton Press.
- Baumgartner, Frank R., and Bryan D. Jones. 1993. *Agendas and Instability in American Politics*. Chicago: University of Chicago Press.
- 2002. "Positive and Negative Feedback in Politics." In *Policy Dynamics*, eds. Frank R. Baumgartner and Bryan D. Jones. Chicago: University of Chicago Press.
- Baumgartner, Frank R., and Beth L. Leech. 1998. *Basic Interests: The Importance of Groups in Politics and in Political Science*. Princeton: Princeton University Press.
- Baumgartner, Frank R., Bryan D. Jones, and Michael C. MacLeod. 2000. "The Evolution of Legislative Jurisdictions." *Journal of Politics* 62: 221-249.
- Bennett, C. and Michael Howlett. 1992. "The lessons of learning: Reconciling theories of policy learning and policy change." *Policy Sciences* 25: 275-294.
- Bennett, W. Lance. 1990. Toward a Theory of Press-State Relations in the United States. *Journal of Communication* 40: 103-25.
- Bernstein, Marver H. 1955. *Regulating Business by Independent Commission*. Princeton: Princeton University Press.
- Berry, William D. and David Lowery. 1987. *Understanding United States Government Growth*. New York: Praeger.
- Bimber, Bruce. 1991. "Information as a Factor in Congressional Politics." *Legislative Studies Quarterly* 16:585-605.
- Bimber, Bruce. 2003. *Information and American Democracy*. Cambridge: Cambridge University Press.
- Bradley, Robert B. 1980. "Motivations in Legislative Information Use." *Legislative Studies Quarterly* 3: 393-405.
- Buchanan, James, and Gordon Tullock. 1962. *The Calculus of Consent*. Ann Arbor: University of Michigan Press.
- Busenberg, George J. 2002. "The Evolution of Wildfire Policy in the United States: Punctuated Equilibrium and Policy Failure." Paper presented at the 2002 Meeting of the American Political Science Association, Boston, MA.
- Cobb, Roger W., and Charles D. Elder. 1972 [1983]. *Participation in American Politics: The Dynamics of Agenda-Building*. Boston: Allyn and Bacon, Inc.

- Cox, Gary W., and Matthew D. McCubbins. 1993. *Legislative Leviathan: Party Government in the House*. Berkeley, University of California Press.
- de la Mare, Erin. 2004. "Information Dynamics: Explaining the pattern of information in policy debates." Paper presented at the annual meeting of the Midwest Political Science Association, Chicago, IL., April 15-18.
- Diermeier, Daniel, and Timothy J. Feddersen. 2000. "Information and Congressional Hearings." *American Journal of Political Science* 44:51-65.
- Downs, Anthony. 1957. *An Economic Theory of Democracy*.
- Esterling, Kevin M. 2004. *The Political Economy of Expertise*. Ann Arbor: University of Michigan Press.
- Gilligan, Thomas W., and Keith Krehbiel. 1987. "Collective Decisionmaking and Standing Committees: An Informational Rationale for Restrictive Amendment Procedures." *Journal of Law, Economics and Organization* 3:287-335.
- Gilligan, Thomas W., and Keith Krehbiel. 1989. "Organization of Informative Committees by a Rational Legislature." *American Journal of Political Science* 34:531-564.
- Gray, Virginia and David Lowery. 1996. *The Population Ecology of Interest Representation*. Ann Arbor: University of Michigan Press.
- Hall, Richard L., and Frank W. Wayman. 1990. "Buying Time: Moneyed Interest and the Mobilization of Bias in Congressional Committees." *American Political Science Review*, 84: 797-820.
- Hammond, Thomas H., and Jack H. Knott. 1988. "The Deregulatory Snowball: Explaining Deregulation in the Financial Industry." *The Journal of Politics* 50:3-30.
- Hansen, John Mark. 1991. *Gaining Access: Congress and the Farm Lobby, 1919-1981*. Chicago: University of Chicago Press.
- Hardin, John. 1998. Advocacy versus Certainty: The Dynamics of Committee Jurisdiction Concentration. *Journal of Politics* 60: 374-97.
- Hardin, John W. 2002. "Multiple Topics, Multiple Targets, Multiple Goals, and Multiple Decision-Makers: Congressional Consideration of Comprehensive Health Care Reform." In *Policy Dynamics*, eds. Frank R. Baumgartner and Bryan D. Jones. Chicago: University of Chicago Press.
- Heitshusen, Valerie. 2000. "Interest Group Lobbying and U.S. House Decentralization: Linking Informational Focus to Committee Hearing Appearances." *Political Research Quarterly* 53:151-176.
- Hilgartner, Stephen, and Charles L. Bosk. 1988. "The Rise and Fall of Social Problems: A Public Arenas Model." *The American Journal of Sociology* 94:53-78.
- Hinich, Melvin J. & Michael C. Munger. 1994. *Ideology and the Theory of Political Choice*. Ann Arbor: University of Michigan Press.
- Higgs, Robert. 2004. *Against Leviathan*. Oakland, CA: The Independent Institute.
- Higgs, Robert. 1987. *Crisis and Leviathan*. New York: Oxford.
- Huntington, Samuel. 1952. "The Marasmus of the ICC." *Yale Law Journal* 6: 467-509.
- John, Peter. 1998 *Analysing Public Policy*. New York: Continuum.

- Jones, Charles O. 1976. "Why Congress Can't Do Policy Analysis (or words to that effect)." *Policy Analysis* 2:251-264.
- Jones, Bryan D. 1994. *Reconceiving Decision-Making in Democratic Politics: Attention, Choice, and Public Policy*. Chicago: University of Chicago Press.
- 2001. *Politics and the Architecture of Choice: Bounded Rationality and Governance*. Chicago: University of Chicago Press.
- Jones, Bryan D., and Frank R. Baumgartner. 2005. *The Politics of Attention: How Government Prioritizes Problems*. Chicago: University of Chicago Press.
- Jones, Bryan D., Frank R. Baumgartner, Jeffrey C. Talbert. 1993. "The Destruction of Issue Monopolies in Congress." *American Political Science Review* 87: 657-671.
- Jones, Bryan D., Frank R. Baumgartner and James L. True. 1998. Policy Punctuations: US Budget Authority, 1947-95. *Journal of Politics* 60: 1-30.
- Jones, Bryan D. Jeffery Talbert, and Matthew Potoski. 2003. "Uncertainty and Political Debate: How the dimensionality of political issues gets reduced in the legislative process." In *Uncertainty in American Politics*, ed. Barry C. Burden. Cambridge University Press, p. 118-136.
- King, David C. 1997. *Turf Wars: How Congressional Committees Claim Jurisdiction*. Chicago: University of Chicago Press.
- Kingdon, John W. 1984. *Agendas, Alternatives, and Public Policies*. Boston: Little, Brown
- Kingdon, John W. 1989. *Congressmen's Voting Decisions*. Michigan: University of Michigan Press.
- Krehbiel, Keith. 1991. *Information and Legislative Organization*. Ann Arbor: University of Michigan Press.
- Krehbiel, Keith. 1998. *Pivotal Politics*. Chicago: University of Chicago Press.
- Light, Paul C. 1999. *The True Size of Government*. Washington: Brookings.
- Lindblom, Charles E. 1959. "The 'Science' of Muddling Through." *Public Administration Review* 19: 79-88.
- Lowi, Theodore J. 1964. "American Business, Public Policy, Case Studies, and Political Theory." *World Politics* 16: 677-715.
- 1969. *The End of Liberalism: Ideology, Policy and the Crisis of Public Authority*. New York: W W Norton & Company.
- Lupia, Arthur, and Mathew D. McCubbins. 1995. "Who Controls? Information and the Structure of Legislative Decision Making." *Legislative Studies Quarterly* 19:361-384.
- MacLeod, Michael. 2002. "The Logic of Positive Feedback: Telecommunications Policy through the Creation, Maintenance, and Destruction of a Regulated Monopoly." In *Policy Dynamics*, eds. Frank R. Baumgartner and Bryan D. Jones. Chicago: University of Chicago Press.
- McCombs, Maxwell, and Jian-Hua Zhu. 1995. "Capacity, Diversity, and Volatility of the Public Agenda: Trends from 1954 to 1994." *Public Opinion Quarterly* 59:495-525.
- McCubbins, Mathew, Roger Noll, and Barry Weingast. 1987. "Administrative Procedures as Instruments of Political Control." *Journal of Law, Economics and Organization* 3:243-267.

- McFarland, Andrew S. 1991. "Interest Groups and Political Time: Cycles in America." *British Journal of Political Science* 21:257-284.
- Matthews, Donald R. and James A. Stimson. 1975. *Yeas and Nays: Normal Decision-making in the US House of Representatives*. New York: Wiley.
- Milbrath, Lester W. 1963. *The Washington Lobbyists*. Chicago: Rand McNally.
- Miller, Gary J., and Terry Moe. 1986. "The Positive Theory of Hierarchies." In *Political Science: The Science of Politics*, ed. Herbert F. Weisberg. New York: Agathon Press.
- North, Douglas C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.
- Olson, Mancur, Jr. 1965. *The Logic of Collective Action*. Cambridge: Harvard University Press.
- Orren, Karen and Stephen Skowronek. 1994. "Beyond the Iconography of Order: Notes for a 'New Institutionalism.'" In *The Dynamics of American Politics: Approaches and Interpretations*, eds. Lawrence C. Dodd and Calvin Jillson. Boulder, CO: Westview Press.
- Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Peacock, Alan T., and Jack Wiseman. 1994. *The Growth of Public Expenditures in the United Kingdom*. 2nd Ed., reprinted. Aldershot, England: Gregg Revivals.
- Peltzman, Sam. 1976. "Toward a More General Theory of Regulation." *Journal of Law and Economics* 19:211-240.
- Pierce, John R. *An Introduction to Information Theory*. New York: Dover.
- Poole, Keith T. and Howard Rosenthal. 1997. *Congress: A Political and Economic History*. New York: Oxford University Press.
- Riker, William H. 1996. *The Strategy of Rhetoric*. New Haven, Conn: Yale University Press.
- Rohde, David W. 1991. *Parties and Leaders in the Postreform House*. Chicago: University of Chicago Press.
- Rubsamen, Valerie. 1989. "Deregulation and the State in Comparative Perspective: The Case of Telecommunications." *Comparative Politics* 22: 105-120.
- Sabatier, Paul A. 1991. "Toward Better Theories of the Policy Process." *PS: Political Science and Politics*.
- Sabatier, Paul A and Hank C. Jenkins-Smith, eds. 1993. *Policy Change and Learning: An Advocacy Coalition Approach*. Boulder, CO: Westview Press.
- Sabatier, Paul, and David Whiteman. 1985. "Legislative Decision Making and Substantive Policy Information: Models of Information Flow." *Legislative Studies Quarterly* 107:395-421.
- Shannon, Claude, and Weaver, Mayiam. 1971. *The Mathematical Theory of Communication*. Urbana, Ill.: University of Illinois Press.
- Shepsle, Kenneth A., and Barry Weingast. 1987. "Positive Theories of Congressional Institutions." In *Positive Theories of Congressional Institutions*, eds. Kenneth A. Shepsle and Barry Weingast. Ann Arbor: University of Michigan Press.
- Shepsle, Kenneth A. 1979. "Institutional Arrangements and Equilibrium in Multidimensional Voting." *American Journal of Political Science* 23: 27-60.

- Simon, Herbert A. 1997 (1947). *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organizations*, 4th ed. New York: Basic Books.
- Sparrow, Bartholomew. 1996. *From the Outside In*. Princeton: Princeton University Press.
- Stimson, James A. 1999. *Public Opinion in America: Moods, Cycles and Swings*. Boulder, CO: Westview Press.
- Stigler, George. 1961. The Economics of Information. *Journal of Political Economy* 69: 2134-225.
- Stone, Deborah. 1989. "Causal Stories and the Formation of Policy Agendas." *Political Science Quarterly*, 104: 281-300.
- Talbert, Jeffrey, and Matthew Potoski. 2002. "The Capacity, Complexity and Volatility of the House Agenda" in *Policy Dynamics*, Frank Baumgartner and Bryan Jones, eds. Chicago: University of Chicago Press.
- Williams, Walter. 1998. *Honest Numbers and Democracy*. Georgetown: Georgetown University Press.