SSQU	250	B	Dispatch: 11.9.04	Journal: SSQU	CE: Blackwell
Journal Name	Manuscript No.		Author Received:	No. of pages: 22	PE: Saravan/HVA

Ignorance in Congressional Voting? Evidence from Policy Reversal on the Endangered Species Act*

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Objective. In 1978 Congress weakened several key provisions of the Endangered Species Act (ESA), which had been enacted only five years earlier. The objective is to compare alternative explanations for this policy reversal. *Methods.* Probit and multinomial logit models are used to explain empirically how senators voted in both 1973 and 1978, and to investigate why many senators switched their vote from supporting ESA to weakening it. *Results.* The findings here indicate that party affiliation and policy-maker preferences were not important to the 1973 vote, but they were key variables in the 1978 votes and the vote-switching decision. Proxies for unexpected economic impacts of ESA on individual states have little explanatory power. *Conclusions.* Ignorance, as measured here, does not appear to explain this policy reversal; rather, an influx of relatively conservative Democrats between 1973 and 1978 presents itself as the leading explanation.

Congress passed the landmark Endangered Species Act (ESA) in 1973. After the 1978 Supreme Court ruling in *Tennessee Valley Authority v. Hill et al.* (437 U.S. 153), which halted construction of the Tellico Dam to protect the endangered snail darter, Congress amended the Act to weaken several of its key provisions. The 1978 amendments required balancing economic costs against species protection and created exemption procedures for development projects. This policy reversal raises a number of questions for political economy and environmental policy.

Policy reversals interest political economics for at least two reasons. First, constituents' control over their representatives remains a controversial question. Some scholars believe politicians must faithfully represent their (organized) constituent interests or be quickly voted out of office (Wittman, 1995). Others believe that infrequent elections and widespread voter

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SOCIAL SCIENCE QUARTERLY, Volume 85, Number 4, December 2004

ignorance produce significant slack in the principal-agent relationship, which legislators exploit to pursue their own or special interests at their constituents' expense. Policy reversals allow a test for slack: with tight constraints, a shift in political equilibrium must be a result of a change in the relative strength of competing interests.[1] Second, information costs play a significant but elusive role in politics. Legislators cannot possibly know all the details of the hundreds of votes cast each year, and ill-informed politicians can succumb to special interests and create inefficient policies. In the case of the ESA, many congressional members claimed that they thought the Act would apply to a few dozen species of higher vertebrates and that species preservation could not stop federal construction projects. Senate voting on ESA provides an opportunity to test if politicians lacked (or ignored) readily available proxies for the cost of species protection.

The early history of the ESA also provides insights into environmental policy. Environmental protection is a public good, and thus collective-action problems should plague interest groups seeking this goal relative to groups seeking excludable benefits. Furthermore, interest groups can attain private advantages through legislation appearing to protect the environment (Maloney and McCormick, 1982; Pashigian, 1985). Yet despite obvious collective-action problems, environmental interest groups possess considerable political clout and few new environmental policies are ever reversed. Species protection is particularly problematic since their protection requires interspecies altruism. Species protection remains a topic of considerable political interest with about 50 bills at the start of 2004 seeking to modify the ESA. The early political history of the ESA may hold clues for its future.

We examine Senate voting on the ESA and the 1978 amendments to identify the determinants of this policy reversal. We discuss in the next section four possible explanations for policy reversal: (1) a shift of power among constituents and organized interests (shift in political equilibrium); (2) a shift of senator-specific characteristics that determine how they vote; (3) ignorance or miscalculation by voters or senators of the ESA's costs; and (4) an ideological shift among senators with agenda control (party leaders or relevant committee members). We evaluate the fourth explanation with nonparametric analysis, then estimate probit and multinomial logit models of the 1973 and 1978 votes to discriminate between the first three explanations. We use several variables that measure the cost of species protection to a state, including the percent of land in the state owned by the federal government and the number of species in the state listed as endangered in 1973 and 1978. These variables allow a rare test of the role of limited information in policy making. We also estimate an mlogit model of the change in senators' votes between 1973 and 1978.

[1]Several recent papers (Bender and Lott, 1996; McGarrity and Sutter, 2000; Stratmann, forthcoming) have used votes on the same issue over time to investigate the influence of interest groups on roll-call voting.

Our findings indicate that state-specific and senator-specific variables explain senator voting, while the ESA variables have less explanatory power. Party affiliation does not explain the 1973 vote but becomes highly significant in the 1978 vote, whereas certain of the constituent-interest variables lose explanatory power in 1978 compared to 1973. We also find that when party does matter to predicting the votes, it works in the opposite direction as ideology: the probability of supporting ESA is *lower* for Democrats but higher for more liberal senators. This result, we argue, seems to be due to the historically unusual changes occurring at this time in the Senate among party balance, regional representation, and the distribution of policy preferences within and between the parties. Overall, the data suggest that this policy reversal is explained partly by changes in constituent interests but mostly by an influx of Democrats, particularly conservatives from nonsouthern states. Ignorance or miscalculation of the cost of species protection does not appear to explain the reversal.

Potential Causes of Policy Reversals

A change in the balance of constituent interests provides a first explanation for a policy reversal. If voters and organized interests effectively control politicians, then a change in policy (or roll-call votes) must result from a change in the balance of political pressures. Marginal political benefits and costs determine legislator behavior in the political equilibrium view (Peltzman, 1976; Becker, 1983). Policy change would result from some combination of decreased marginal political benefits or increased marginal political costs of species protection. This could result from a change in the relative political strength of competing interests (e.g., urban residents become more numerous or influential in a state), or a change in an interest group's attitude toward species protection (e.g., suburbanites decide the cost of species protection is too high). If a change in constituent interests explains this policy reversal, then state-specific variables should be significant in our empirical models.

Political equilibrium models typically abstract from the structures of government. Peltzman's model of regulation, for instance, does not include bureaucrats or the judiciary, just a unitary political actor. Landes and Posner (1975) extended the interest-group model to include the judiciary, and argued that the judicial interpretation of laws according to the legislature's original intent would increase the durability and value of legislation. Since the Supreme Court's Tellico Dam decision immediately preceded the 1978 amendments, a rift between the branches of government might have contributed to the policy change.

A change in legislators' characteristics provides a second possible explanation. Individual senators may update their attitudes toward species protection, or newly entering senators may have different characteristics. If there

is considerable slack, then these variables would have strong explanatory power while the state-specific variables would not. But a change in constituent preferences may be the cause of turning over senator characteristics (Dougan and Munger, 1989), so significance of the senator variables, for a given significant influence of state variables, would indicate joint power of these two explanations.

Miscalculation of the costs of species protection by senators or constituents is a third possible explanation. Miscalculation could take one of several forms. Public policies generate nonexcludable benefits, leading to the well-known problem of rational ignorance. Some public-choice scholars argue that pervasive public goods outcomes produce a citizenry with little interest in acquiring knowledge of politics or the effects of policies. Indeed, even politicians may be ill informed about many of the votes they cast. Due to ignorance or miscalculation, Congress might have mistakenly passed an ESA in 1973 that did not allow any balancing of the costs and benefits of protecting specific species.[2] In addition, legislators might wish to claim ignorance as a cover for a less popular interest-group motive. Miscalculation could also result from economizing on information costs. Obtaining accurate information about the total cost and breakdown by state of species protection costs is costly to politicians and constituents. Senators might have acquired seemingly adequate information in 1973, and then reversed their positions in 1978 based on realized costs. Thus miscalculation in the passage of the ESA in 1973 may have been efficient ex ante. Although descriptive accounts of legislator behavior emphasize the cost of information, scholarly studies of roll-call votes rarely consider the possibility of mistakes, due likely to the difficulty of falsifying explanations based on mistakes. The ESA variables allow a rare test of the miscalculation hypothesis.

An ideological shift among legislative leaders with agenda control is a fourth possible explanation for policy reversal. The location of the median legislator could shift because of a change in the preferences of returning members or because of a composition effect where new senators have different preferences than the senators they replace (Poole and Rosenthal, 1997; Goff and Grier, 1993; McGarrity and Picou, 2001). Committees possess de facto property rights over issues, and the institutional structure of Congress helps determine policy outcomes (Shepsle, 1979; Shepsle and Weingast, 1981). A change in the leadership in either chamber or a change in the membership on the relevant oversight committees could produce a policy reversal. Changes in oversight committee membership have been found to produce a change in Federal Trade Commission policy (Weingast and Moran, 1983) and monetary policy (Grier, 1991). A change in policy preferences among committee members may have caused the reversal on ESA.

[2]The initial ESA explicitly allowed only scientific criteria when listing species and habitats. It therefore disallowed economic criteria.

To evaluate the agenda control possibility, we compared the distributions of DW-NOMINATE scores between relevant committees. DW-NOMINATE scores measure a senator's ideal point along a liberal-conservative dimension from -1 to $+1$, with higher scores indicating a more conservative voting record (Poole and Rosenthal, 1997). An overhaul of the Senate committee structure occurred in 1977 and jurisdiction over endangered species changed from Commerce in 1973 to Environment and Public Works in 1978, which suggests that agenda control might have caused this policy reversal. The membership on these two committees, however, overlapped considerably and there was no statistically significant shift in the DW-NOMINATE scores of the two committees or the Senate as a whole, which suggests that agenda control does not explain the reversal.[3]

Dependent Variables: The Votes Considered

The final votes on the ESA and the 1978 amendments were nearly unanimous in both the House and Senate (355–4 and 92–0 in 1973 and 384–12 and 94–3 in 1978). This low variation in a small sample leaves little for a maximum likelihood approach to explain. Several floor amendments in the Senate, however, were balanced enough for estimation. We therefore estimate one vote from 1973 and five floor amendments from 1978.

- *Roll Call Vote 312* (V312): To authorize the federal government to enforce endangered species protection in states that provided inadequate enforcement. Sponsor: Stevens (R, Alaska). Accepted 60–33. (This is the 1973 vote.)
- *Roll Call Vote 216* (V216): To allow heads of federal agencies to exempt projects from the Act, as well as construction projects under way or under contract in 1973. Sponsor: Stennis (D, Mississippi). Rejected 76–22.
- *Roll Call Vote 217* (V217): To protect endangered species only when "consistent with the welfare and national goals of the people of the United States." Sponsor: Scott (R, Virginia). Rejected 86–10.
- *Roll Call Vote 218* (V218): To limit protection of the Act to species of "substantial benefit to mankind." Sponsor: Scott (R, Virginia). Rejected 87–2.
- *Roll Call Vote 219* (V219): To limit eligibility for exemptions from the Act to projects for which "a substantial and irretrievable commitment of resources" were made before the species was found in the given location. Sponsor: Nelson (D, Wisconsin). Rejected 70–25.
- *Roll Call Vote 220* (V220): To require only four votes instead of five from the Endangered Species Committee to approve an exemption from the Act. Sponsor: Scott (R, Virginia). Rejected 69–23.

[3]Complete descriptive statistics on the Senate and the relevant committees in both years are available from the authors on request.

All but V219 among the 1978 amendments would have weakened the ESA further than the amendments that ultimately passed.[4]

The near unanimous reversal by both the House and Senate on the final ESA votes merits discussion. Virtually all returning members voted first to enact ESA then to weaken it, which is evidence against a member turnover explanation. Also any explanation based on a change in the balance of interest-group strength must be national in breadth. Yet the final votes might easily overstate the change in support for species protection. Unanimous consent under a simple majority decision rule does not have the same implications about consensus as unanimous consent with voluntary participation (Holcombe, 1986; Sobel and Holcombe, 2001). Once it was clear that the ESA and amendments would pass, the cost to Senators of voting for the legislation falls dramatically.

Independent Variables

We use three sets of independent variables—senator-specific variables, state-specific variables, and ESA variables—which correspond to the first three potential explanations discussed above. We have observations for both 1973 and 1978 for all variables except when noted. Table 1 provides detailed descriptive statistics.

Senator-Specific Variables

- DEMOCRAT: Binary coded 1 for Democrats, who are usually stronger environmental protectors.
- DW-NOMINATE: A measure of senator-specific ideology along a -1 to $+1$, liberal-conservative policy space, as revealed through his or her entire past voting record (Poole and Rosenthal, 1997). Although a senator's past voting record is not determined solely by ideological preferences, we will follow the use of this shorthand terminology.[5]
- TENURE: Number of years a senator had served consecutively in the Senate. This variable controls for the effects of seniority and demonstrated ability to win election to the senate.

[4]The amendments did not weaken the ESA as greatly as feared since appeals to the Endangered Species Committee have been rare and the number of species listed increased in the mid 1980s. Yet the potential for these amendments to reduce species protection is unmistakable and environmental groups strongly opposed the amendments (Yaffee, 1982).

[5]Since ESA is an environmental issue, we could instead use an index of a senator's vote record on environmental issues only. For example, the League of Conservation Voters calculates an index that places legislators on a 0 (extreme anti-environmental) to 100 (extreme pro-environmental) space. Since senators employ the same voting calculus on both ESA and the issues that inform LCV scores, we use the broader NOMINATE scores to avoid potential endogeneity bias (cf. Jackson and Kingdon, 1992).

TABLE 1

Summary Statistics

	1973 Subsample					1978 Subsample				
	N	Mean	*SD*	Min	Max	*N*	Mean	*SD*	Min	Max
Senator-Specific Variables										
DEMOCRAT[b]	100	0.56	0.498	0	1	100	0.61	.49	0	1
DW-NOMINATE[e]	100	−0.077	0.353	−0.72	0.66	100	−0.103	0.347	−0.717	0.681
TENURE[c]	100	10.86	8.41	1	33	100	10.79	8.63	0	36
AGE[c]	100	56.5	10.61	31	81	100	56.07	10.33	36	81
State-Specific Variables										
ENVIROS[a]	100	0.68	0.33	0.13	1.73	100	0.68	0.33	0.13	1.73
METRO[a]	100	57.7	25.5	0.0	93.3	100	58.8	24.3	0.0	92.4
COLLEGE[a]	100	10.6	2.2	6.6	14.9	100	19.0	4.1	11.8	29.4
INCOME[d]	100	4675	641	3448	5889	100	7560	986	5736	10851
UNEMPLOYMENT[a]	100	4.6	1.5	2.0	10.4	100	5.7	1.5	2.9	11.2
ΔUNEMP[a]	100	−0.60	0.50	−2.4	0.20	100	−0.90	0.90	−2.6	1.8
Importance-of-ESA Variables										
FEDLAND[a]	100	16.0	23.2	3.0	96.7	100	16.7	23.5	4.0	98.5
LIST73[d]	100	3.42	5.37	0	28	—	—	—	—	—
PROJECT[b]	—	—	—	—	—	100	0.14	.349	0	1
NEWLIST[d]	—	—	—	—	—	100	2.46	4.78	0	25
Dependent Variables (Votes)										
V312[b]	93	0.645	0.481	0	1	—	—	—	—	—
V216[b]	—	—	—	—	—	98	0.225	0.419	0	1
V217[b]	—	—	—	—	—	96	0.104	0.307	0	1
V218[b]	—	—	—	—	—	89	0.022	0.149	0	1
V219[b]	—	—	—	—	—	95	0.263	0.443	0	1
v220[b]	—	—	—	—	—	92	0.250	0.435	0	1
VEXEMPT[d]	—	—	—	—	—	93	0.967	0.714	0	2
VSWITCH[d]	—	—	—	—	—	93	1.69	1.01	0	3

[a]Indicates variable is measured in whole percent units.

[b]Indicates variable is binary.

[c]Indicates variable is measured in years.

[d]Please see explanation in text.

- AGE: The senator's age in years at the time of the vote. Environmental protection became an important political issue in the early 1970s, so senators of different age cohorts may have different environmental policy preferences. Age may also affect senators' time horizon.

Constituent Interest (State-Specific) Variables

- ENVIROS: Membership in the six largest environmental groups as a percentage of voting-age population, as provided by Kalt and Zupan (1984).[6] Larger environmental group membership should produce stronger support for species protection. Data are for 1978 only.
- METRO: Percent of a state's population living in metropolitan areas. Urban residents tend to have a greater demand for environmental protection and also tend to bear a smaller portion of the cost of species protection since most listed species' critical habitats are rural areas.
- COLLEGE: Percent of a state's population with a college degree. Increased education is expected to lead to greater support for endangered species protection.
- INCOME: Per capita income in the state, measured in thousands of nominal dollars. Environmental protection is generally considered a superior good.
- UNEMPLOYMENT: The state's unemployment rate. Species protection can adversely affect economic activity, so a higher unemployment rate could reduce support for species protection. But employment fluctuations are temporary while species extinction is permanent, so a zero coefficient would be consistent with a long-term view of preservation.
- ΔUMEMP: The change in a state's unemployment rate from the previous year. A rising unemployment rate might make voters less willing to sacrifice economic activity.

Cost of Species Protection Variables

- FEDERAL LAND: Percentage of land in a state owned by the federal government. Since the ESA applies in the first instance to federal actions, this variable measures the potential ESA costs to a state. Support for ESA should be lower in states with more federal land.
- LIST73: Number of species indigenous to the state listed as endangered or threatened through 1973. Species protection will be costlier in states with more listings, producing less support for species protection. But if states view endangered species as resources worthy of protection,

[6]The authors thank Mark Zupan for providing the data set from Kalt and Zupan (1984). The six environmental groups are Sierra Club, National Audubon Society, Environmental Defense Fund, Friends of the Earth, National Wildlife Federation, and Wilderness Society.

constituents could demand greater species protection. Data are for 1973 only.

- NEWLIST: The number of species added to a state's list between 1973 and 1978. More new listings may alter the how a state values the tradeoff between species protection and its economic cost. Data are for 1978 only.[7]
- PROJECT: A binary variable coded 1 if the state had a major federal project disrupted to protect the habitat of an endangered species, as listed in Harrington (1981). The cost of species protection is higher for these states (Colorado, Maine, Mississippi, Missouri, Nebraska, Nevada, Tennessee, and Utah), so their senators should be more likely to oppose species protection in 1978. Data are for 1978 only.

Few empirical roll-call studies entertain the hypothesis that ignorance or miscalculation helps determine the vote outcome. Presumably, this is due to the lack of data measuring miscalculation. The endangered species variables allow us to test whether constituents or senators miscalculated the cost of species protection. FEDERAL LAND and LIST73 measure the cost of species protection by state and were available to inform the 1973 debate. Low predictive power for these variables in 1973, but strong predictive power in 1978, would support the miscalculation hypothesis. The variables NEWLIST and PROJECT proxy cost "surprises," which senators and constituents could use in updating the cost of species protection. To the extent that these variables explain the 1978 votes, constituents or senators may have inaccurately predicted the costs of the ESA, which could represent a rational updating of net cost estimates, not necessarily an initial miscalculation of cost.

The fact that Congress weakened the ESA immediately after the Tellico Dam appears to support the ignorance/miscalculation hypothesis. Senators might have seen a vote for the ESA as a low-cost opportunity to signal their commitment to the environment, yet realized and corrected their mistake after the Tellico Dam case. This reading of events, however, ignores the substantial flexibility in the implementation of the Act. In practice, the listing of species, the designation of critical habitat, and the issuance of jeopardy rulings considers economic cost (Yaffee, 1982). Consultation with the U.S. Fish and Wildlife Service (USFWS) typically leads to modification rather than outright halting of development projects (Rhodes and Wilson, 1995); in only 54 of 96,832 formal or informal consultations between 1987 and 1992 did the USFWS totally block a project (Ehrlich and Ehrlich, 1996:117–18). Thus we must require more systematic evidence of miscalculation.

[7]The number of species listed in 1973 and the number of new listings between 1973 and 1978 exhibit considerable variation across states. LIST73 ranged from 28 (Hawaii) to 0 (Connecticut, Massachusetts, Rhode Island) and NEWLIST ranged from 0 (various states) to 25 (Tennessee). LIST73 and NEWLIST are not highly correlated (+0.168), so multicollinearity is not a problem.

Estimations of the 1973 and 1978 Votes

Estimation of the 1973 Vote

Columns 1 and 2 of Table 2 present the results from two probit estimations on the 1973 vote (V312). The independent variables are presented in groups, with senator-specific variables listed first, then the state-specific variables, and finally the importance-of-ESA variables. Among the senator variables, ideology (DW-NOMINATE) and TENURE are statistically significant determinants of the 1973 vote. DW-NOMINATE has an unexpected sign—more conservative senators were more likely to vote for federal enforcement of the ESA.[8] Also of note, DEMOCRAT does not explain this vote; the effect of this variable in both magnitude and statistical significance is close to zero. AGE and TENURE carry opposite signs as they often do in models of congressional voting: AGE may affect the legislator's time horizon whereas TENURE is generally understood to measure political capital. As for constituent variables, ENVIROS, UNEMPLOYMENT, METRO, and COLLEGE are statistically significant. Senators from states with more environmental group members and more urban populations were surprisingly less likely to vote in favor of species preservation. Senators from states with higher unemployment rates (but not rising unemployment rates) and a higher percentage of college graduates were also more likely to vote for species protection. As for the endangered species variables, FEDERAL LAND is a positive and significant determinant of voting while LIST73 is statistically insignificant. Note that the sign on FEDERAL LAND is the reverse of that predicted because states with more federal land should bear a higher cost of species protection, ceteris paribus. We will discuss these results further as we contrast them with the 1978 votes.

Joint Estimation of the 1978 Votes

We would like to incorporate voting on the three Scott amendments even though individual probit estimations on these votes are not feasible. When viewing the five amendments together, one discovers that senators voted in well-defined patterns, and the empirical determinants of these patterns offer insight into reversal on ESA. Consider the alignment of the proposals. Again, V219 would strengthen, and V216 weaken, the ESA. We propose the following arrangement of the votes on a single dimension:

V216	V217-218-220	V219
(Stennis)	(Scott)	(Nelson)

Weakens ESA → Strengthens ESA

[8]As with all results in this article, we also estimated this equation using LCV scores rather than DW-NOMINATE and achieved similar results.

TABLE 2

Probit Estimation of Individual Votes

	1973 Vote (V312)	
	Column 1	Column 2
DEMOCRAT▲	−0.107	0.008
	(0.194)	(0.187)
AGE	−0.009	−0.006
	(0.009)	(0.008)
TENURE	0.018*	0.009
	(0.010)	(0.009)
DW-NOMINATE	0.497*	0.478*
	(0.303)	(0.289)
ENVIROS	−0.683**	−0.947**
	(0.302)	(0.312)
UNEMPLOYMENT	−0.048**	—
	(0.038)	
ΔUNEMPLOYMENT	—	−0.170
		(0.096)
METRO	−0.009***	−0.012***
	(0.003)	(0.003)
COLLEGE	0.085**	0.109**
	(0.039)	(0.042)
INCOME	−0.057	0.053
	(0.143)	(0.138)
FEDERAL LAND	0.008**	0.007**
	(0.004)	(0.003)
LIST73	−0.013	−0.012
	(0.010)	(0.010)
NEWLIST	—	—
PROJECT▲	—	—
Log Likelihood	−37.31	−37.03
χ^2	40.50	39.27
Prob > χ^2	0.0002	0.0001
Pseudo R^2	0.3831	0.3878
N	93	93

NOTES: Dependent variable = 1 indicates vote for stronger species protection. Marginal probability estimates (change in probability of voting year for a continuous increase in the independent variable) appear on the line with the variable name. These are transformed from the associated probit coefficient estimates. Robust standard errors and are reported in parentheses.

▲In the case of discrete variables, the marginal probability is for a change from 0 to 1.

***Significant with 99 percent confidence; **significant with 95 percent confidence; *significant with 90 percent confidence.

If this arrangement is correct and voting is sincere, we should expect consistency in voting on the three Scott amendments (a positive correlation) and inconsistency between the Stennis and Nelson amendments (a negative correlation). The correlation coefficients of the roll-call votes confirm these relationships: the Nelson amendment is negatively correlated (− 0.338) with

the Stennis amendment, and the three Scott amendments are all positively correlated (in excess of +0.50). Moreover, senators tended to fall into three categories of vote patterns on these five votes.

1. Twenty-five senators voted "nay" on Stennis and "yea" on Nelson, and *none* of these voted "yea" on *any* of the Scott amendments. *These 25 voted against weakening ESA.*
2. Forty-six senators voted "nay" on both Stennis and Nelson. This might suggest their taking a moderate position if they voted "yea" on the others. But a full 38 of these voted "nay" on all three of the other Scott amendments, another three voted "nay" on two and abstained on the other, and the remaining five voted "yea" only on the procedural one (V220). *These 46 senators voted for the level of difficulty in exemptions contained in the final amendments.*
3. Twenty-two senators who voted on both V216 and V219 voted "yea" on Stennis and "nay" on Nelson. Although support among these senators for the Scott amendments was mixed (9, 2, and 16 of these 22 voted for V217, V218, and V220, respectively), *these 22 senators voted for even further weakening of ESA.*

This suggests a trichotomous grouping of senators with the above categories (1, 2, and 3) being coded {0, 1, 2}. This defines our multi-category dependent variable, which we call VEXEMPT. Since VEXEMPT is not ordinal in utility, the appropriate estimator is multinomial logit.[9] The mlogit procedure calculates a set of beta coefficient estimates for each category of the dependent variable, with estimates in the selected base category set to zero. We set VEXEMPT = 1 as the base category. The mlogit beta coefficient estimates are not of direct interpretive value, but can be converted to estimates of marginal effect—defined as the effect of a change in the independent variable on the probability that the dependent variable takes a given category *relative to* the probability that it takes the base category. We report these estimates.

Table 3 presents the results. The top panel presents the estimates for VEXEMPT = 0 and the bottom for VEXEMPT = 2, relative to the base category. A negative (positive) beta is associated with a probability ratio less (greater) than unity, and greater deviation from unity indicates a stronger marginal effect. We expect the relative probability estimates for Categories 0 and 2 to be on opposing sides of unity. Table 3 indicates that this expectation is typically upheld, though not for every independent variable. Consider party affiliation. In the top panel for Model 1, being a Democrat *reduces* the probability of voting strongly against weakening ESA, relative to

[9]It may appear that the appropriate estimator is ordered probit. Oprobit applies when all choosers believe that the higher categories of the dependent variable impart greater utility. Clearly this is not the case, as different senators will order the categories of VEXEMPT differently in their utility functions. For this reason, mlogit is appropriate despite the apparent ordinal character of this dependent variable.

TABLE 3

Multinomial Logit Estimation of 1978 Votes

	Relative Prob. Est.	Robust *t*-Statistic	95% CI	
VEXEMPT = 0 (N = 25)				
DEMOCRAT	0.099**	−1.71	0.007	1.41
AGE	0.980	−0.34	0.878	1.09
TENURE	0.982	−0.25	0.852	1.13
DWNOM	0.00024***	−3.03	1.12e^{-06}	0.052
ENVIROS	0.648	−0.22	0.014	29.47
UNEMPLOYMENT	1.378	0.89	0.677	2.80
ΔUNEMPLOYMENT	—	—	—	—
METRO	1.01	0.65	0.965	1.07
COLLEGE	1.38*	1.78	0.967	1.97
INCOME	0.484	−0.80	0.082	2.85
FEDERAL LAND	0.945	−1.52	0.880	1.01
LIST73	1.003	−0.029	0.780	1.29
NEWLIST	0.832	−0.83	0.541	1.28
PROJECT	0.00	0.00	0.00	—
VEXEMPT = 2 (N = 22)				
DEMOCRAT	38.54**	2.14	1.36	1092
AGE	1.13*	1.91	0.996	1.29
TENURE	0.977	−0.033	0.853	1.12
DWNOM	995***	2.67	6.33	156470
ENVIROS	0.0004*	−1.91	1.62e^{-07}	1.27
UNEMPLOYMENT	1.063	0.18	0.550	2.05
ΔUNEMPLOYMENT	—	—	—	—
METRO	0.970	−1.15	0.921	1.02
COLLEGE	1.19	1.05	0.858	1.67
INCOME	3.16	1.20	0.482	20.74
FEDERAL LAND	1.05	1.27	0.973	1.13
LIST73	0.944	−0.49	0.751	1.19
NEWLIST	0.979	−0.27	0.818	1.17
PROJECT	2.32	0.41	0.043	125.7
Log-likelihood	−47.63		χ^2 (26)	98.62
Pseudo R^2	0.509			

***Significant with 99 percent confidence; **significant with 95 percent confidence; *significant with 90 percent confidence.

NOTES: Dependent variable VEXEMPT = {0, 1, 2} indicates voting {against, neutral, for} weakening ESA (making exemptions easier). VEXEMPT = 1 (*N* = 46) is the base (comparison) category. Reported point estimates are probability ratios of falling in the category relative to the base category. These are transformed from the associated m-logit coefficient estimates. The probability ratios are lower bounded by zero. The signs on the beta estimates are preserved in the signs on reported *t*-statistics.

the probability of voting neutral, by an estimated factor of 10 (or 1/0.099). In the bottom panel of Model 1, being a Democrat *increases* the probability of voting strongly in favor of weakening ESA, relative to voting neutrally, by an estimated factor of 38.54. The relative probability estimate on DW-NOMINATE is close to zero in Category 0 but quite large in Category 2,

and both are significant with 99 percent confidence. Thus conservative senators are far more likely to vote neutrally than to vote against weakening ESA, and far more likely still to vote to weaken ESA than to vote neutrally. The mlogit estimates indicate an atypical result: that ideology and party work in opposite directions. As for constituent variables, COLLEGE increases the probability of voting against a weaker ESA, while ENVIROS reduces the probability of voting for a weaker ESA. Interestingly, none of the ESA variables is statistically significant, nor are their effects unambiguous on the 95 percent confidence interval (they all straddle unity).[10] We also ran individual probit estimations on V216 and V219 (the sufficiently balanced votes). These support our mlogit findings on VEXEMPT, that party and ideology dominate the explanatory power in 1978, with some constituent-interest variables playing roles as well. The ESA variables, however, do not have significant explanatory power.[11]

Analysis of Vote Switching

The voting data reveals that many senators who voted on V312 in 1973 switched their support for the ESA in 1978. We now analyze the determinants of which senators switched their votes as opposed to those who maintained their position on the ESA. Two modeling problems arise in defining a dependent variable to measure vote switching. The first concerns the 33 senators who left office between 1973 and 1978. Analysis of vote switching could observe only those *senators* who cast votes in both roll calls or observe all *states* whose senators voted in both years even if they replaced their senators. The appropriate sample depends on whether the *member* or the *district* is the appropriate unit of choice. If senators are good agents of their constituents' interests, then the senate seat is the appropriate unit, but the member is the appropriate unit of observation if members can pursue their own preferences in office. Since the evidence on shirking

[10]We constructed variations on NEWLIST to investigate a possible nonlinear effect of new listings. First, fully half the states had zero new listings so we defined NEWLIST2 as a binary variable equal to 1 if a state had any new listings. We also found that 38 states had between one and five new listings, whereas 12 states had between 7 and 28, so we defined another variation NEWLIST3 as {0, 1, 2} for {0, 1–5, 7–28} new listings. Finally, we defined dummy variables NEWD2 = 1 for states with 1–5 new listings, and NEWD3 = 1 for states with 7–28. None of these alternative specifications, however, performed significantly different.

[11]A referee suggested that we more closely proxy the state-by-state costs of ESA using measures of economic development: the more economic development, the costlier ESA would be to a state, and the less supportive of ESA a senator would be, ceteris paribus. We gathered the data for the appropriate years by state for three variables: (1) miles of interstate highways constructed; (2) total costs of dams constructed; and (3) construction spending. Then we reestimated all the above models, adding one of these variables at a time. Our essential result holds up: none of these variables exhibits consistent explanatory power in the individual vote models, and none is statistically significant in the VEXEMPT model. Details are available from the authors on request.

suggests that the agency problem is not too severe (Bender and Lott, 1996), we use the seat as our unit of observation. We control for turnover with a binary variable RETURNER, which is set to 1 if the same senator held the seat in 1978 as in 1973.

The second modeling issue is a potential selection problem related to missing voting data. Nine senate seats failed to cast a vote on both V312 and V216. Let the dependent variable VSWITCH categorize senators according to whether they maintained opposition/support or switched their vote. To this end, VSWITCH takes the following categories.

- 0 if senator voted *against* ESA in 1973 and then *for* ESA in 1978;
- 1 if senator voted *for* ESA in *both* years; and
- 2 if senator voted *for* ESA in 1973 and then *against* ESA in 1978.

To explain the overall policy reversal on ESA, we are most interested in the determinants of Category 2. Considering the 91 seats for which senators cast votes on both V312 and V216, the count in each category {0, 1, 2} is {32, 39, 19}.[12] Ignoring these nine in an mlogit is problematic since the decision not to vote is related to the alternatives being voted on.[13] Instead of dropping these observations, we could combine them into a fourth category, but these nine senators would not necessarily have voted all alike and thus do not clearly belong in the same category. Our approach is to calculate fitted values—that is, predictions of how these senators would have voted on V312 and V216—using probit models. The nine senators are then individually assigned to one of the above three categories based on the predicted probabilities, after which the count in each category {0, 1, 2} of VSWITCH is {32, 46, 21}.[14] Hence, a state's senator switched votes 53 times and maintained position 46 times.

Table 4 reports mlogit estimation of VSWITCH with the base category set to 1, so the results are read the same was as the mlogit in Table 3. Table 4 reports two different specifications, however; one with levels and another with changes in the independent variables. The pattern in these results sheds important light on why Congress reversed direction on the ESA. First,

[12]The sum of these three categories is only 90, not 91. In fact, one senator voted against ESA in 1973 and also in 1978, but this is not enough observations to add a fourth category. We ignore this one senator in estimating VSWITCH.

[13]Note that there was missing voting data regarding our earlier estimation on VEXEMPT as well, and the model includes only 93 observations as a result. As an informal test, we checked the results reported in Table 4 against the same model run on four categories, after placing the remaining seven into a fourth category. The estimates for Category 0 and 2 stayed statistically the same, and no variables except DEMOCRAT were significant in the fourth category. The stability of the estimates after adding this fourth category implies that excluding these seven observations was not biasing our results. These results are available from the authors on request.

[14]An appendix to this article contains a complete explanation of our procedure. It is available from the authors on request.

TABLE 4

Multinomial Logit Estimation of Vote Switching from 1973 to 1978

	Model 1 All Variables But LIST73 Are in 1978 Values				Model 2 Variables in *Italics* Are 1978–1973 Values				
	Relative Prob. Est.	Robust *t*-Statistic	95% CI			Relative Prob. Est.	Robust *t*-Statistic	95% CI	
VSWITCH = 0 (N = 32)									
DEMOCRAT	0.511	−0.58	0.052	5.01	DEMOCRAT	0.241	−1.52	0.038	1.52
AGE	1.17**	2.09	1.00	1.23	AGE	1.11**	2.29	1.02	1.21
TENURE	0.852*	−1.84	0.719	1.00	TENURE	0.927	−1.09	0.812	1.06
DWNOM	0.029*	−1.73	0.0006	1.56	DWNOM	0.009***	−2.62	0.0003	0.309
ENVIROS	1,010***	2.81	8.10	12,6033	ENVIROS	15.41*	1.87	0.880	269
ΔUNEMPLOYMENT	1.12	0.23	0.414	3.05	*UNEMPLOYMENT*	1.47	1.37	0.843	2.58
METRO	1.09***	2.69	1.02	1.15	*METRO*	0.958	−0.47	0.805	1.14
COLLEGE	0.591***	−2.88	0.413	0.845	*COLLEGE*	0.635**	−2.04	0.411	0.982
INCOME	0.586	−0.069	0.129	2.64	*INCOME*	0.999	−0.21	0.998	1.00
FEDERAL LAND	0.975	−1.07	0.933	1.02	*FEDERAL LAND*	0.771	−0.91	0.440	1.35
LIST73	1.19**	1.98	1.00	1.43	LIST73	1.12	1.55	0.969	1.30
NEWLIST	0.699*	−1.64	0.455	1.07	NEWLIST	0.821	0.27	0.581	1.16
PROJECT	0.927	−0.068	0.105	8.19	PROJECT	0.972	0.98	0.141	6.71
RETURNER	5.20	1.47	0.578	46.83	RETURNER	1.64	0.59	0.277	9.64
VSWITCH = 2 (N = 21)									
DEMOCRAT	43.64**	2.14	1.37	1,388	*DEMOCRAT*	62.8**	2.35	1.99	1,979

TABLE 4—Continued

Model 1 All Variables But LIST73 Are in 1978 Values					Model 2 Variables in *Italics* Are 1978–1973 Values				
	Relative Prob. Est.	Robust *t*-Statistic	95% CI			Relative Prob. Est.	Robust *t*-Statistic	95% CI	
AGE	1.20**	2.43	1.03	1.39	*AGE*	1.19**	2.10	1.01	1.41
TENURE	0.976	−0.29	0.833	1.14	*TENURE*	0.948	−0.589	0.795	1.13
DWNOM	3,186***	3.02	17.14	59,1995	*DWNOM*	9,977***	2.96	22.74	43,77759
ENVIROS	0.004	−1.35	1.08e−06	12.19	ENVIROS	0.006	−1.19	1.16e−06	27.42
ΔUNEMPLOYMENT	3.08*	1.64	0.802	11.82	*UNEMPLOYMENT*	1.22	0.34	0.376	3.99
METRO	1.00	0.09	0.950	1.05	*METRO*	1.13	1.12	0.911	1.40
COLLEGE	1.15	0.79	0.806	1.66	*COLLEGE*	1.99*	1.67	0.888	4.45
INCOME	1.55	0.44	0.212	11.4	*INCOME*	1.00	1.49	0.999	1.00
FEDERAL LAND	1.04	1.25	0.975	1.11	*FEDERAL LAND*	0.321	−1.11	0.043	2.38
LIST73	0.904	−0.87	0.722	1.13	LIST73	0.768	−1.36	0.527	1.12
NEWLIST	0.917	−0.81	0.744	1.13	NEWLIST	1.02	0.17	0.801	1.30
PROJECT	1.904	0.26	0.013	268	PROJECT	0.392	−0.47	0.008	19.36
RETURNER	0.258	−0.98	0.017	3.85	RETURNER	0.376	−0.65	0.019	7.11
Log-likelihood	−50.93		χ2 (28)	106.5	Log-likelihood	−57.99		χ2 (28)	91.93
Pseudo R^2	0.510				Pseudo R^2	0.442			

***Significant with 99 percent confidence; **significant with 95 percent confidence; *significant with 90 percent confidence.

NOTES: Dependent variable VSWITCH = {0, 1, 2} for {against then for, for then for, for then against} species protection. VSWITCH = 1 ($N = 46$) is the base (comparison) category. Reported point estimates are probability ratios of falling in the category relative to the base category. These are transformed from the associated m-logit coefficient estimates. The probability ratios are lower bounded by zero. The signs on the beta estimates are preserved in the signs on reported *t*-statistics.

consider the endangered species variables. If miscalculation drove the policy reversal on the ESA, these variables should be statistically significant determinants of Category 2 (*for*-then-*against* ESA). Yet none of the species variables is statistically significant in this category. Only in Category 0 (*against*-then-*for* ESA) do we see that LIST73 increases, and NEWLIST decreases, the probability of switching from against to for (relative to *for*-then-*for* ESA). This makes sense if listings as of 1973 were seen as a cost of ESA while new listings between 1973 and 1978 were seen as resources in need of protection. PROJECT is not an important explanatory variable here. FEDERAL LAND tends to decrease the relative probability of voting *for*-then-*against*, but with a *t*-statistic of -1.07 its sign in Category 2 is negative with only 75 percent confidence. Thus we find no evidence that the cost of species protection or cost "surprise" variables led senators to switch their position on ESA. If the Act was inefficient then senators evidently took account of this in their initial voting decisions.[15]

Next, consider the state-specific constituency variables. Here, too, we see only a minor role among these variables in Category 2. A rising unemployment rate (in Model 1) and an increasingly college-educated populace (in Model 2) both increase the relative probability of switching from for to against ESA. As with the endangered species variables, the constituency variables exert most of their influence in Category 0. ENVIROS, for example, increases the relative probability of voting *against*-then-*for*, but is insignificant in Category 2. Similarly, METRO is positive and significant in Category 0 but insignificant in Category 2. The remaining constituent variables are insignificant in both categories. Based on these results, it appears that a shift in the balance of constituent interests played a small role in reversing direction on the ESA.

Finally, consider the senator-specific variables. Party affiliation is unimportant in Category 0, indicating that being a Democrat did not affect the relative probability of voting *against*-then-*for*. But in Category 2, DEMOCRAT is large in magnitude and of statistical significance. Combined with the increase in the size of the Democratic majority between 1973 and 1978 (from 56 to 61 seats), this variable appears to have been central to the overall reversal on ESA. But why would party work opposite ideology? Examining the influence of DW-NOMINATE on VSWITCH, more conservative senators were more likely to reverse position from supporting to opposing ESA. Although there was a slight liberal drift of the overall chamber from a mean of -0.077 in 1973 to -0.103 in 1978, other changes occurring in the Senate during this period help explain the contribution of this variable to reversal on ESA. First, Republicans lost five seats while shifting to the left and becoming higher in variance. Democrats gained five seats and shifted to the right. Democrats also effectively replaced two southern liberals with two

[15]We reestimated VSWITCH adding the measures of economic development discussed in note 11, but none were statistically significant.

TABLE 5

Log-Likelihood Values and Associated Likelihood Ratio Test Statistics

	Log-Likelihood	χ^2-test	Significant With
Senator-specific variables (4 df)	−74.03	46.2	>99%
Constituency variables (5 df)	−67.35	16.42	>99%
Endangered species variables (4 df)	−56.74	11.62	>97.5%

nonsouthern conservatives.[16] Thus, the Democratic shift to the right was greater in magnitude than the Republican shift to the left and, as a result, there were more Democrats in 1978, who were more conservative, and who were more likely to switch their vote from supporting ESA to opposing the Act.

RETURNER is not significant in either category, indicating that state and senator characteristics mattered more to VSWITCH than the identity of the senator. This suggests that senators tended to vote the way constituents wanted them to on this issue.

Tests of joint significance bolster our overall interpretation. Removing one set of variables (senator, state, and ESA) at a time from Model 1 in Table 4, we compared the three restricted models. As can be seen in Table 4, the log likelihood in the unrestricted model is −50.93. The log-likelihood values and associated likelihood ratio test statistics for each of the restricted models are as shown in Table 5.

Thus, we reject the null hypothesis that any of our three sets of variables does not belong in the model. Although all three groups of variables pass the minimum test of joint significance, the endangered species variables contribute the least to the likelihood function while senator-specific variables contribute the most.

Finally, consider the potential role of the Supreme Court in this policy reversal. If the Court had markedly changed its interpretation of environmental laws, the 1978 amendments might merely have reestablished the 1973 policy and not reversed it. To explore this possibility, we examined all Supreme Court decisions in the 1970 and 1977 terms for evidence of a shift in position on environmental protection. The Court decided only one

[16]Summary statistics for DW-NOMINATE scores for senators by party in 1973 and 1978 are as follows:

	1973					1978				
	Mean	*SD*	Min	Max	*N*	Mean	*SD*	Min	Max	*N*
Republicans	0.198	0.282	−0.411	0.659	44	0.176	0.303	−0.481	681	39
Democrats	−0.294	0.233	−0.717	0.243	56	−0.281	0.238	−0.717	0.496	61
Southern Dems	−0.001	0.186	−0.429	0.243	15	−0.059	0.156	−0.281	0.286	18

environmental case in 1970, so we cannot make any conclusions regarding a trend.[17] In another major environmental case during the 1977 term, however, the Court in *Duke Power Co. v. Carolina Environmental Study Group, Inc., et al.* (438 U.S. 59) upheld the constitutionality of the Price-Anderson Act, which limits the liability of private companies for accidents at nuclear power plants. A Court pursuing an activist environmental agenda could have crippled the nuclear power industry by ruling this Act unconstitutional. The Court's rulings on the ESA and Price-Anderson seem consistent with Landes and Posner's (1975) model of the judiciary in interest-group politics, in which courts interpret legislation as written to increase the durability and value of statutes.

Conclusion

Our analysis offers several insights regarding Congress's reversal on species protection in the 1970s. First, we can through nonparametric analysis rule out a change in the composition of the overall Senate or the relevant oversight committees as a likely cause. Second, we find that senators were responsive to constituent interests: environmental variables such as ENVIROS, economic variables such as unemployment, and demographic variables such as COLLEGE, are good predictors of the way senators voted. Third, the senator's party and ideology were relatively unimportant in the 1973 votes but significantly explained the 1978 votes. In general, it seems apparent that the coalitions regarding species protection were well formed by 1978, and that these coalitions tended to follow party lines. It is also possible that ESA had become a sufficiently ideological issue—identifying a senator as conservative or liberal—that the senators almost had to vote party lines or consistently with their overall voting reputation in 1978. Perhaps our most surprising result comes from our contribution to the much discussed but rarely tested claim of ignorance in congressional voting. The ESA variables allow us to formulate refutable hypotheses regarding senators' ignorance of the costs of the Act. The species protection cost variables matter little to how senators voted or whether they switched their support for ESA. Our results do not support the assertion that senators were ignorant or miscalculated the costs of the initial 1973 ESA.

A shift of policy-maker preferences, particularly an influx of more conservative Democrats, is a better explanation. If the influx was due to changes in constituent preferences, our story is consistent with a "composition effect" (Poole and Rosenthal, 1997), by which newly entering members are the key to a change in equilibrium policy. Indeed, the variable RETURNER

[17]The 1970 case, *Ohio v. Wyandotte Chemicals Corp. et al.* (401 U.S. 493), involved allowing the state court in Ohio to hear a case against polluters and was decided on narrow procedural grounds.

does not exert explanatory power in the vote-switching model, supporting the view that there was little slack in voting on ESA. In this case, models of rational political equilibrium (Peltzman, 1976; Becker, 1983) would explain this policy reversal more so than ignorance or miscalculation. The extra twist in this case was the role of the Supreme Court, which seemingly failed to enforce the legislative bargain enacted in 1973. Landes and Posner (1975) argue that courts increase the durability and value of legislation by interpreting the law according to Congress's intent. The reason for the Court's decision in this case and its implications for the interest-group theory of government remain important questions for future research.

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