

**State of Nature: Modeling Variation in  
Environmental Protection among American States**

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**May 9<sup>th</sup>, 2008**

Literature indicates that political and socioeconomic factors influence the types of policy that a state creates. The form that enacted policy takes is also shaped by regional policy trends in innovation and diffusion. The question this paper addresses is what accounts for American States differing in the solutions to the same policy problem. To do so the nature of state policy variation is examined through the lens of environmental protection. A logistic regression model was used on cross-sectional data for states in 2000. This model estimates the probability that a state created an independent executive agency for environmental protection, using factors including regional policy adoption, political variables, and economic variables. A nested-model Likelihood Ratio (LR) Test is then used to test for significant differences in the explanatory impacts between the groups of regional, political, and economic variables. No significant variable coefficients resulted from the full model tested, but the nested-model LR test indicated that political variables had the greatest explanatory value to the model. Regional variables had negligible worth in the model. This study confirms literature stating that political variables are most influential in shaping policy content.

In 1970, President Nixon signed the National Environmental Policy Act (NEPA) into law.

Immediately afterward, the director the Office of Management and Budget recommended that President Nixon create an independent regulatory agency to oversee the enforcement of the growing body of environmental law and regulation. Issuing an executive order in July, 1970, Nixon created the Environmental Protection Agency (EPA) and gave it a four-point mission: to establish environmental protection standards, to conduct research and gather information on sources, effects, and solutions to pollution, to use grants and other means to stop pollution, and to assist the Council on Environmental Quality in recommending policy changes (U.S. Environmental Protection Agency, 2007).

The individual states were responsible for enforcing the bulk of environmental policy. Minimum standards were created by Congress and the EPA in order to allow for state prerogative and avoid preempting their authority altogether. Ultimate responsibility still fell upon the EPA to ensure compliance (Dresang 2004, 83-84). Nevertheless, states had mechanisms in place, or created them shortly after 1970, to enforce these mandates. While some states followed the federal government's model of reorganizing diverse elements of environmental protection into a single independent regulatory body, other states consolidated or absorbed the responsibilities in extant departments and agencies. A few states created an EPA-style body before the federal government. Regardless of

creation time, states then have different responses to the same policy problem of environmental protection. States are responsible for enforcing the bulk of this legislation and regulation, presenting a policy problem. The diversity of response exists in how the states organize the execution of the growing body of environmental legislation. In order to account for this diversity in response among states, whether or not they create an independent agency, literature regarding state policy variation must be consulted.

## Literature Review

Research on state politics and variation in public policy goes back to the examination of Southern politics in 1949 by V.O. Key, Jr. He argued that only in a competitive, two-party system would candidates take distinct ideological positions to compete for votes, compared to one-party, noncompetitive systems that would be dominated by elites. There he established the idea that factors internal to a state's political and socioeconomic environment have some influence over the outcome of elections and ultimately the policies produced. Following Key, political scientists have produced various perspectives that account for variation in policy content.

A prominent model helpful in understanding the policy process is systems theory. Systems theory indicates that government responds to inputs in the form of demands and supports for action from the political environment to produce a given policy output (Easton, 1965). These demands and supports are themselves generated by reactions within political environment to the policy outputs. This model describes factors within the political environment that influence the policy process. Factors that influence the policy process are both internal to a state, in the form of political and socioeconomic factors, as well as external to a state, the regional and intergovernmental context of a federal system. The challenge is to measure effects individual environmental characteristics have on policy content. In

this case, of political, socioeconomic, and regional factors, which is most valuable in accounting for diversity in the state responses to the problem of managing environmental regulation?

## **Political Factors**

Arguably, political factors are important factors that shape policy content. Some of the first research on the matter of political factors considered electoral forces. Key found that two-party competition plays a role in a state's political environment. The two-party system produces a more competitive environment, and has liberalizing effects on policy output, especially when combined with a second political factor, ideological makeup of the state legislature. It follows that a state with a more liberal legislature will produce more liberal policies, but political competition is required to turn the "liberal party successes into liberal policy outcomes" (Barrilleaux, Holbrook and Langer, 2002). Institutional factors and limitations on parties also seem to play a part in policy outputs. Professionalization of state legislature variables, including session length, salary, number of staff, and existence of term limits, seem to play a role in the responsiveness of the political system to these demands and supports.

## **Socioeconomic Factors**

While support exists for political factors shaping policy content, socioeconomic factors are similarly supported as explanations for policy content. As early as the 1780s, James Madison recognized the importance of large complex societies as factors in government when he argued that "a greater variety of parties and interests" reduced the likelihood that a tyrannous majority could form (Federalist #10, 1787). Socioeconomic conditions within a state are thought to produce demands in the political environment. Public policy, according to Thomas Dye (1966), is "largely a product of differing socioeconomic levels rather than a direct product of political variables." Public services require revenue from a tax base and states that have larger economies may find it easier to provide these services.

Various researchers including Dye, Hofferbert, and Sharkansky illustrated that taxing and spending is influenced by voter demands modeled as income, education, urbanization, or other demographic data. Recent studies have expanded the use of socioeconomic variables to model interactions with political forces including interest group formation and representation. Measures including complexity of a state's economy have grown to encompass variables ranging from the level of wealth, diversity of a state's economy, and the relative size of a state's productive capacity when compared to the other states (Gray and Lowery, 1993).

While these socioeconomic variables may capture differences in state economic or social settings, evidence regarding a causal relationship is lacking. It is difficult to assess the degree to which per capita income or other specific socioeconomic variables can act as causal inputs in the government system. While socioeconomic variables may serve to capture specific characteristics of a state, they lack external validity, and the relationship found could be tied to a third variable. Additionally, there has yet to be a study that causally links socioeconomic variables to policy output (Anderson 2003, 45). Studies from Dawson and Robinson to Dye and Hofferbert have shown that state economic factors, such as economic development, correlate better with policy variation than political measures (i.e. inter-party competition), but do not specify a causal link connecting economic variables to policy content.

## Regional Factors

A complete theory cannot be reached, however, by looking only at internal factors of a state; external factors including regional trends may also influence policy. The states are not isolated actors, but rather a member of a complex federal system. American federalism created a decentralized, intergovernmental setting wherein states became free to create independent policy responses to problems. Madison argued for competition in democracy, stating: "In the compound republic of America, the power surrendered by the people is first divided between two distinct governments, and then the portion allotted to each subdivided among distinct and separate departments. Hence a double

security arises to the rights of the people. The different governments will control each other; at the same time that each will be controlled by itself” (Madison, Federalist #51, 1788).

The potential for growth and constraint on federal and state governments is apparent throughout the Constitution. In distributing power between the levels of government two primary forms of democratic competition emerged: intergovernmental and interstate (Kincaid 1991, 97). Through mechanisms of interstate competition, American states act as suppliers of public goods and services to the consumers (citizens of each state). Both sides have powers and demands. The state has the power to tax in order to provide services, but must remain responsive to the citizenry. The Constitution prevents competition from becoming debilitating through the “Interstate Commerce” and “Privileges and Immunities” clauses. Additionally, it prevents undue influences or advantages at the federal level through bicameralism and separation of powers, among other checks on state-level governments. The Constitution also encourages competition for citizens through the reapportionment of the U.S. House of Representatives (*Ibid.*, 105). As Cliff Walsh (1989, 219) noted, “the coercive powers of subnational governments are further constrained by their being put into political competition with one another, voters (and businesses) having the power to vote with their feet as well as through the ballot box.”

Mobility, or the ability for citizens, industries, or capital to move from one state to another, remains the driving force of competition. It forces governments to become more responsive and efficient in fulfilling the demands of consumer-taxpayers (Dye 1990, 178-179). This competition has led to policy innovation among the states. When a state pioneers a new public service area, “forces of competitive emulation convert yesterday’s expensive novelty (or public service “frill”) into today’s standard budgetary fare.” (Shannon 1991, 119) This diffusion of innovation is only a matter of time for many policies. Much of the competition is regional, but larger states such as New York or California,

must compete with the policy environments found in other large states such as Texas and Florida (*Ibid.*, 123).

Competition is one of two perspectives within geographical policy diffusion literature. Policy diffusion theory is rooted in social learning theory found in sociology, education, and communication. Diffusion, under social learning theory, is a product of communication about innovations among people and organizations. When that theoretical framework is applied to state government, a potential regional effect on policy content emerges (Mooney 2001, 104-105). In a practical sense, states compete to maximize “good things” and minimize “bad things.” A state will create a lottery system to recapture potential income lost to citizens purchasing tickets in another state (Berry and Berry, 1990). From even a noncompetitive perspective, the inherent cognitive bias of citizens and state policymakers to accept things that are familiar would cause them to “satisfice” solutions to policy problems. They naturally look to their neighbors with familiar and similar policy environments and population for good policy ideas (Boehmke and Witmer 2004, 40). But, when it comes to innovation, states are limited by the market on taxing and spending. If they become overzealous, then business and citizens may shift to another state with reduced services, but a more livable tax burden.

## Variation in States

Factors both internal and external play a role in shaping state-level responses to policy problems, but which variables offer the best explanation of variation in policy content? Studies have examined the relationship between political and socioeconomic variables, but often neglect the effect of the federal context in which states produce policy. While studies by Mooney (2001) and others have examined the regional effects on policy diffusion, the question of explanatory power compared to other factors is unanswered. A gap in the literature exists regarding the comparative value of regional effects, political factors, and economic factors. To venture into that unexplored area, this paper looks to ask: Of

political, socioeconomic, and regional factors, which is most valuable in accounting for diversity in state responses to managing environmental regulation?

## Hypotheses

Based on the examination of theory, it would seem that the socioeconomic variables would be most valuable in accounting for policy responses. Socioeconomic variables tend to perform well in models and result in strong correlation coefficients.

H1. States with a higher proportion of “adjacent adopters” are more likely to have an independent environmental agency.

H2. States with higher legislative professionalism scores are more likely to have an independent environmental agency.

H3. States without term limits are more likely to have an independent environmental agency.

H4. States with more complex economies (higher diversity, greater wealth, and greater size) are more likely to have an independent environmental agency.

While the full model with all the categories of variables is important in this study, the primary focus is on the effects of the three categories of variables: regional, political, and economic. These categories will be examined comparatively in the model and result in a determination of which category is most influential and holds the greatest explanatory power for variation in policy content. The literature suggests that socioeconomic variables tend to have high correlations with variation in policy content. Therefore, the socioeconomic variables will perform the best of the three categories.

## Data and Measurement

Data regarding each state’s method of organizing environmental protection regulation was gathered from individual state websites and sometimes contact with the state agency or department to



analyze the degree of independence and focus each agency had. The definition used to determine the dichotomous variable was two-fold: (1) the agency must not be subordinate to another department, agency, or division and (2) the agency must be focused on issues of environmental pollution, prevention, and regulation. A key problem in the latter criterion was that some states combined environmental protection with natural resource conservation or public health, and that was beyond the scope of environmental pollution, prevention, and regulation. Education and research were acceptable responsibilities, but were not required to be defined as an independent agency. Once the list was determined, the variable was coded with a value of one being assigned to states with an agency (34) and a value of zero assigned to all others (16). A map showing the distribution of states is located in the Appendix (Figure 1).

The regional effect of neighbor state policy adoption was quantified using a percentage of adjacent states with an independent environmental agency. The raw data was gathered from the list of dependent variables and was calculated for each individual state. A similar method of calculating regional effect was used by Christopher Mooney (2001), where he calculated the average percentage of adjacent adopters for his event-history analysis of policy diffusion. In that case the percentage of adjacent state adopters was used to standardize the data across the states. In order to simplify that measure for use in a cross-sectional analysis, the time-averaged variable was reduced to a proportion of adjacent adopting states in the year 2000. Because of the nature of this variable, it required elimination of Alaska and Hawaii, reducing the sample to the 48 contiguous states. The formula used was:

$$\textbf{Percentage of Adjacent Adopters} = \frac{\textbf{Number of adopting adjacent states}}{\textbf{Total number of adjacent states}}$$

In addition to the regional variables, a pair of legislative professionalism variables was used in the research to represent political factors. The first was a five-point scale estimating a state's requirement for legislative service. National Council of State Legislatures (NCSL) data for demands on a

legislature came in the form of a red, white, and blue scale including intermediate zones. Red states were defined as closest to full-time with demands equal to or greater than 80% of a full-time job. Additionally, those states have higher salaries, longer sessions, and larger staffs, which reinforce the full-time status. White states were defined as hybrid states that demand the equivalent of two-thirds of a full-time job. These states are moderately compensated with intermediate staffs. Blue states are the part-time legislatures with the smallest staffs and low compensation that often requires legislators to maintain a second job. Intermediate categories bridged the data gap to create a more precise distributional scale. That data translated easily into a five-point scale with red gaining a value of five down to blue's value of one. One concern about this data is from 2008 and some states may have changed since 2000. A summary of the characteristics of the states in the main Red, White, and Blue categories is located in Appendix Table 3.

The second legislative professionalism variable was more of a measure of "anti-professionalism." A dichotomous variable indicating the presence of legislative term limit laws was created from the listing of state term limit laws enacted on the NCSL website. The states with legislative term limit laws enacted, but not repealed or void in 2000, were coded as one, while all other states were coded as zero. A list of states with term limit laws is found in Appendix Table 4.

Economic variables used were based off previous studies that captured state-level income and urbanization. Measures used were similar to those used by Gray and Lowery in their 1993 work, "The Diversity of State Interest Group Systems." There they used a measure of economic complexity that captured a state's economic wealth, economic size, and economic diversity. All data in this case was taken from U.S. Bureau of Economic Analysis figures for the year 2000, in chained 2000 dollars. Economic size was the Real Gross State Product (GSP). Economic wealth was the GSP per capita. Economic diversity had to be simplified for this study. Gray and Lowery used a Herfindahl-type Index to determine concentration (and its inverse, diversity). In order to quantify economic diversity in this

study, the dollar-value nineteen private-sector NAISC categories and government were collected for each state, resulting in a twenty category breakdown of each state's GSP. To control for variation in size of the economies, the values were then converted to standardized percent-shares of a state's economy. Then, the concentration of the state's economy was calculated from the standard deviation of all twenty percentages. Following the same line as the Gray and Lowery variable, the inverse of economic concentration is economic diversity.

$$\text{Diversity of a State's Economy} = \frac{1}{\sigma}, \text{ where } \sigma = \sqrt{\frac{1}{20-1} \sum_{i=1}^{20} \left( \frac{K_i}{\text{GSP}} - \frac{1}{20} \right)^2}$$

## Data Analysis and Results

To analyze this data, a logistic regression model was used. Logistic regression using a dichotomous dependent variable, estimates the probability that a specific case results in a value of one. In this case, the model predicts the likelihood that a state has created an independent environmental agency in 2000. The variables were placed in three groups: regional, political, and economic. A nested-model Likelihood Ratio (LR) Test was used to test for significant differences in the explanatory impacts between the groups of regional, political, and economic variables. In the nested-model tests, each variable group was excluded once and the fit statistics were compared with the full model. Four logistic regression models were run: the full model and three models that extracted one group of variables each. The full model could be expressed as “the probability that a state has adopted an independent environmental agency is a function of regional variables, political variables, and economic variables.”

$$p(\text{Independent Agency}) = f(\text{Regional Variables}, \text{Political Variables}, \text{Economic Variables})$$

In the nested models, one of the variable categories is removed from the model. The effect of removing each variable category is compared to the effects of removing the other categories to see

which category, when removed, harmed the model the most. It follows that the variable category removed from the worst-performing nested model is the category with the greatest explanatory value.

The variables were input into SPSS and run through a binary logistic regression analysis. The cutoff used was .500; therefore, every case with a predicted probability of less than .500 was predicted to not have an independent agency and those with probabilities above .500 were predicted to have an independent agency. The coefficient output of the analysis is summarized in Table 1.

The full model had no variables that performed at any level of confidence. This model had little value in gauging the independent effect on each variable; therefore, it can be generally stated that the model failed-to-support H1 through H4. The only model that produced a variable coefficient at a 90% confidence level was the model without economic variables. In that model, the  $\beta$ -coefficient for the dichotomous term limit variable had a p-value of .065.

**Table 1. Beta Coefficients for the Logistic Regression Models**

	Full Model	Model without:		
		Regional	Political	Economic
Constant	1.2463757	0.9505533	1.0476496	0.0324769
<b>Regional</b>				
Percent Adjacent Adoption	-0.2391289	-	0.0806117	-0.1433154
<b>Political</b>				
Term Limit	1.2303139	1.2075757	-	1.3625367
RWB Scale	0.0584114	0.0831694	-	0.1435731
<b>Economic</b>				
Wealth	-0.0000621	-0.0000615	-0.0000725	-
Size	0.0000018	0.0000017	0.0000017	-
Diversity	0.0383847	0.0414902	0.0795462	-

In logistic regression models, the goal is to maximize the likelihood statistic ( $\lambda$ ), but the measure is reported as the more usable  $-2\log\lambda$ , which has a  $\chi^2$  distribution.<sup>1</sup>

$$\lambda = \prod_{i=1}^n (p_i)^{y_i} (1 - p_i)^{1 - y_i}$$

<sup>1</sup> All logarithms referenced in the fit statistics are base  $e$ , natural logarithms.

Table 2 lists the fit statistics for each model. As shown, the full model had poor fit statistics ( $\chi^2$ , -2log L) and did not perform well. The worst-performing model in this case was the model with political variables. Thus, political variables had the highest comparative worth to the model. Second most valuable was the economic variable category. The removal of the regional category had a negligible effect on the model. The model illustrated that the most important variable category was not economic, as the hypothesis stated, but the political variable category.

**Table 2. Model Coefficients for the Logistic Regression Models**

	Chi-square	-2log likelihood	df
Full Model	5.705	53.919	6
-Regional	5.675	53.949	5
-Political	2.941	56.684	4
-Economic	3.961	55.663	3

## Conclusions

Political variables and economic variables were similar in their comparative worth. Political variables had the greatest explanatory value in this model, confirming literature on the usefulness of political variables in accounting for variation in state-level policy content. What is interesting about the political variable category performing better is that those variables were discrete rather than continuous. All the variables in the economic variable category were continuous. In that way, the strength of the political variables in the model also seemed to overcome the disadvantage associated with the more blunt measure. This would suggest that the political variables may be more influential than even the data suggested in this study.

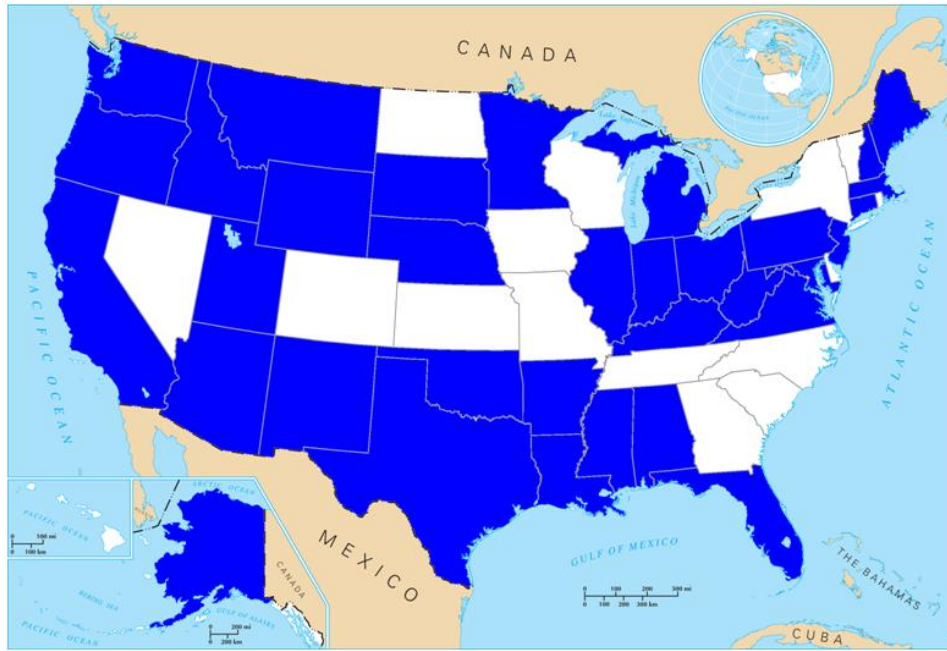
Regional variables, as measured in this study, have little explanatory value in accounting for variation in policy content. Diffusion theory has mostly focused on time-series and event history analysis to model regional effects. It is possible that the lack of influence in this model, therefore, is due to a cross-sectional view that ignores the effect over time. What was of note regarding the regional variable was the negative beta coefficient in two of the three regional models used. While the

confidence of that coefficient was low, it was still an interesting observation that seemed to counter the idea of adjacent state diffusion. It also suggests a smaller percentage of adjacent states would lead to more likely adoption, but beyond a certain level the effect would be reversed.

Additional study in the effect of political variables could open the diversity of the category to measures beyond state legislative professionalism. Measuring the comparative effects of the variable groups over time could better capture any regional effect that was missed in this study. Most important would be creating a better measure of policy content variation. While the dichotomous variable works well with the logistic regression model, it may be better to determine criteria which could more effectively measure state environmental policy. A variable regarding regulation enforcement or specific law requirements may better capture a state's commitment to environmental protection.

## Appendix

**Figure 1. States with Independent Agencies**



Blue States have adopted independent environmental agencies. Data collected by researcher from state websites and contact information related by U.S. Environmental Protection Agency. Map source: (U.S. Geological Survey, U.S. Department of Interior, 2004)

**Table 3. Red, White and Blue Legislatures**

Red	Red Light	White		Blue Light	Blue
California	Illinois	Alabama	Missouri	Georgia	Montana
Michigan	Florida	Alaska	Nebraska	Idaho	New
New York	Ohio	Arizona	North	Indiana	Hampshire
Pennsylvania	Massachusetts	Arkansas	Carolina	Kansas	North
	New Jersey	Colorado	Oklahoma	Maine	Dakota
	Wisconsin	Connecticut	Oregon	Mississippi	South
		Delaware	South	Nevada	Dakota
		Hawaii	Carolina	New Mexico	Utah
		Iowa	Tennessee	Rhode Island	Wyoming
		Kentucky	Texas	Vermont	
		Louisiana	Virginia	West	
		Maryland	Washington	Virginia	
		Minnesota			

Source: (National Conference of State Legislatures, 2008, Table 1)

**Table 4. Average Job Time, Compensation and Staff Size by Category of Legislature**

Category of Legislature	Time on the Job (1)	Compensation (2)	Staff per Member (3)
Red	80%	\$68,599	8.9
White	70%	\$35,326	3.1
Blue	54%	\$15,984	1.2
<b>Notes:</b> 1. Estimated proportion of a full-time job spent on legislative work including time in session, constituent service, interim committee work, and election campaigns. 2. Estimated annual compensation of an average legislator including salary, per diem, and any other unvouchered expense payments. 3. Ratio of total legislative staff to number of legislators.			

*Source:* (National Conference of State Legislatures, 2008, Table 2)

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**Table 5. Term limited states in 2000**

Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming

*Source:* (Bowser, 2006)



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